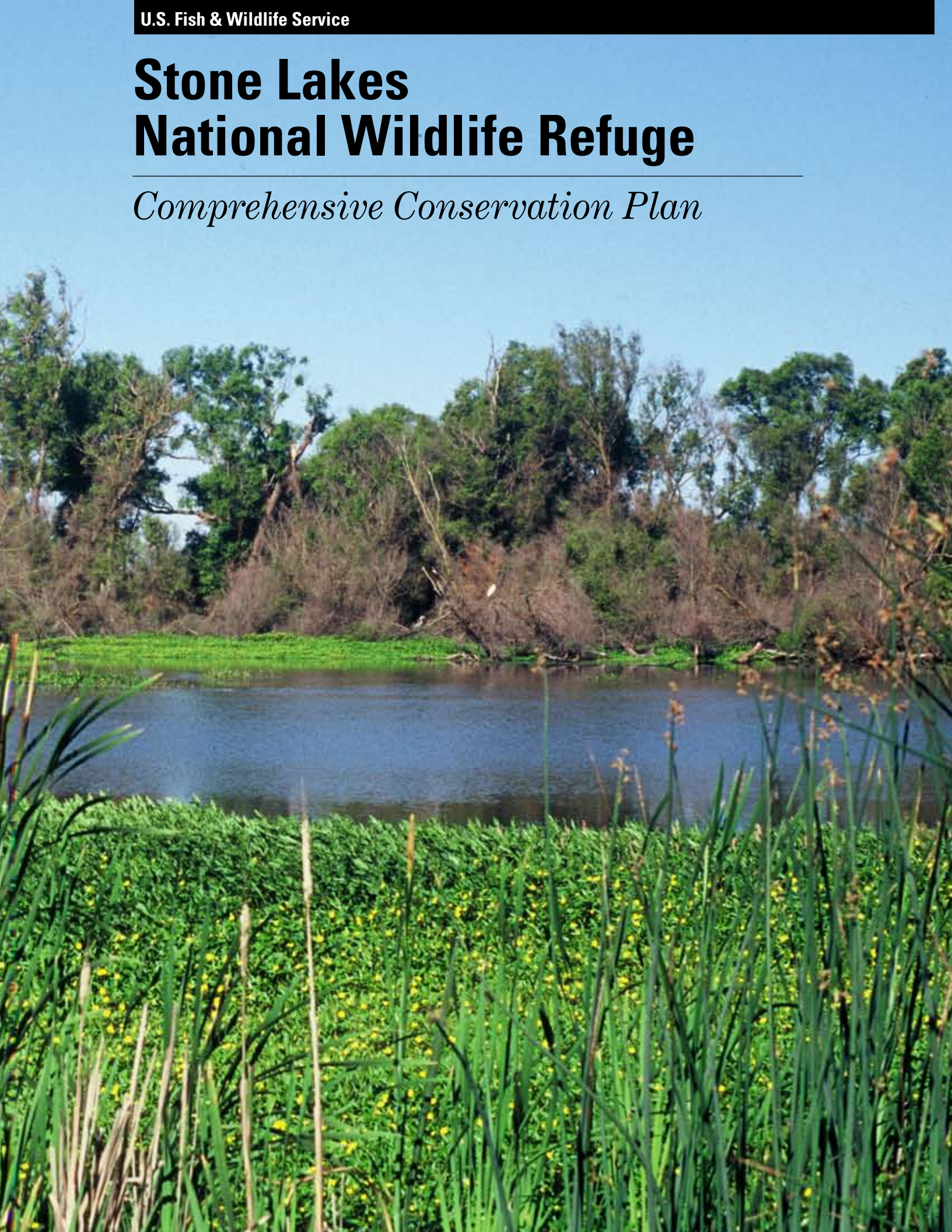
U.S. Fish & Wildlife Service

Stone Lakes National Wildlife Refuge

Comprehensive Conservation Plan



Vision Statement

Stone Lakes National Wildlife Refuge belongs to a limited group among the 540 national wildlife refuges that protect fish, wildlife, and habitat within an urban area. Through collaboration with public and private partners, Stone Lakes conserves and enhances a range of scarce Sacramento-San Joaquin Delta and Central Valley habitats and the fish, wildlife, and plants they support. It sustains freshwater wetlands, wooded riparian corridors, and grasslands that facilitate wildlife movement and compensate for habitat fragmentation. Managed wetlands are of sufficient size to maintain abundant wildlife populations. Grasslands consist of a sustainable mix of native and desirable nonnative species that support a variety of grassland-dependent species. The Refuge reduces further habitat fragmentation and buffers the effects of urbanization on agricultural lands and adjacent natural areas within the Delta region.

The Refuge pursues a land conservation program that complements other regional efforts and initiatives. Management efforts expand and diversify habitats for migratory birds and a range of species at risk. The Refuge promotes cooperative farming opportunities and strives to maintain traditional agricultural practices in southwestern Sacramento County that have proven benefits for migratory birds experiencing declines, such as long-billed curlews (*Numenius americanus*), Swainson's hawks (*Buteo swainsoni*) and sandhill cranes (*Grus canadensis*). Through cooperation with other agencies, conservation organizations, neighbors, and other partners, the Refuge develops and manages wetlands in a manner that reflects historic hydrologic patterns and is consistent with local, State, and Federal floodplain management goals and programs.

Stone Lakes was established as a national wildlife refuge because of passionate support from people who recognized its ecological importance and critical role for the floodplain of the Beach-Stone Lakes basin.. The community sees the Refuge as a sanctuary for fish, wildlife and the habitats upon which they depend, a site for recreation and learning and a natural setting that can enrich their lives according to their values. Visitors representing the area's diversity enjoy increasing opportunities for accessible recreation that harmonizes with Refuge conservation efforts, such as hunting, fishing, wildlife observation and photography. The education community looks to the Refuge as a key partner in environmental education programming. Volunteers from all walks of life find an outlet for their interests and talents in a responsive and appreciative setting.

Disclaimer

CCPs provide long term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Stone Lakes

National Wildlife Refuge

Comprehensive Conservation Plan

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Acronyms

California Department of Boating and Waterways	DBW
California Department of Fish and Game	DFG
California Department of Water Resources	DWR
California Endangered Species Act	CESA
Comprehensive Conservation Plan	CCP
California Department of Transportation	Caltrans
California Department of Parks and Recreation	DPR
California Native Plant Society	CNPS
Endangered Species Act	ESA
Environmental Assessment	EA
Environmental Impact Statement	EIS
Global positioning system	GPS
Memorandum of Agreement	MOA
Memorandum of Understanding	MOU
National Wildlife Refuge	Refuge
National Wildlife Refuge System	Refuge System
National Wildlife Refuge System Improvement Act of 1977	Improvement Act
Natural Resources Conservation Service	NRCS
National Environmental Policy Act	NEPA
Native American Grave Protection and Repatriation Act	NAGPRA
Sacramento-San Joaquin Delta	Delta
Stone Lakes National Wildlife Refuge	Refuge
Sacramento Regional County Sanitation District	SRCSD
State Water Resources Control Board	SWRCB
Sacramento Regional Wastewater Treatment Plant	SRWTP
Sacramento-Yolo Mosquito and Vector Control District	SYMVCD
University of California	UC
U.S. Army Corps of Engineers	USACE
U.S. Environmental Protection Agency	USEPA
U.S. Fish and Wildlife Service	Service
U.S. Department of Agriculture	USDA
U. S. Geological Survey	USGS

1 Introduction

Introduction

Stone Lakes National Wildlife Refuge (Refuge) was established in 1994, becoming the 505th refuge in the National Wildlife Refuge System (NWRS). The Refuge boundary was estimated at 18,212 acres when established (USFWS 1992), but subsequent surveys have revised the actual Refuge boundary to a more accurate figure of 17,641 acres. The boundary included a core Refuge area of approximately 9,000 acres and an approximately 9,000 acre "Cooperative Wildlife Management Area" where the Service first seeks to enter into cooperative agreements and memoranda of understanding with landowners or purchase conservation easements. The Service actively manages approximately 6,000 acres. The Refuge is located in the Beach-Stone Lakes Basin within the Sacramento Valley in southwestern Sacramento County; it lies about ten miles south of the city of Sacramento, straddling Interstate-5 from the town of Freeport south to Lost Slough.

Purpose and Need for the Comprehensive Conservation Plan (CCP)

The Service prepared this draft CCP to guide management of fish, wildlife, plants, other natural resources and visitor use on the Refuge for the next 15 years. The Comprehensive Conservation Plan (CCP) is flexible; it will be revised periodically to ensure that its goals, objectives, implementation strategies and timetables remain valid and appropriate. Major revisions require and provide a process for public involvement and National Environmental Policy Act (NEPA) review, if needed.

The NWRS Improvement Act of 1997 requires that the Service develop a CCP for each refuge by 2012, and that refuges be managed in a way that ensures the long-term conservation of fish, wildlife, plants, and their habitats and provides for compatible wildlife-dependent recreation. The purposes for developing a CCP are to:

- Provide a clear statement of direction for the future management
- Provide long-term continuity in Refuge Complex management;
- Communicate the U.S. Fish and Wildlife Service's management priorities for the Refuges to their conservation partners, neighbors, visitors, and the general public;
- Provide an opportunity for the public to help shape the future management of the Refuges;
- Ensure that management programs on the Refuges are consistent with the mandates of the National Wildlife Refuge System (Refuge System) and the purposes for which each Refuge was established;
- Ensure that the management of the Refuges fully considers resource priorities and management strategies identified in other Federal, State, and local plans;
- Provide a basis for budget requests to support the Refuge's needs staffing, operations, maintenance, and capital improvements; and
- Evaluate existing and proposed uses of each refuge to ensure that they are compatible with the refuge purpose(s) as well as the maintenance of biological integrity, diversity, and environmental health.

U.S. Fish and Wildlife Service and National Wildlife Refuge System

U.S. Fish and Wildlife Service Responsibilities

The U.S. Fish and Wildlife Service (Service) is the primary Federal agency responsible for conserving and enhancing the nation's

fish and wildlife populations and their habitats. Although this responsibility is shared with other Federal, State, Tribal, local, and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, inter-jurisdictional fish and certain marine mammals. The Service has similar responsibilities for the lands and waters it administers to support the conservation and enhancement of fish and wildlife.

The Service has specific responsibilities for migratory birds such as this great egret.
Photo by Tom Harvey, USFWS

The National Wildlife Refuge System

The National Wildlife Refuge System (NWRS) is the largest system of lands in the world dedicated to the conservation of fish and wildlife. Operated and managed by the Service, it currently includes 545 refuges with a combined area of more than 94 million acres. The majority of refuge lands (over 77 million acres) are located in Alaska. The remaining acreage is scattered across the other 49 states and several island territories. About 20.6 million acres are managed as wilderness under the Wilderness Act of 1964.

The NWRS started in 1903, when President Theodore Roosevelt protected an island with nesting pelicans, herons, ibis, and roseate spoonbills in Florida's Indian River from feather collectors decimating their colonies. He established Pelican Island as the nation's first bird sanctuary and went on to establish many other sanctuaries for wildlife during his tenure. This small network of sanctuaries continued to expand, later becoming the NWRS. In contrast to other public lands, which are managed for multiple uses, refuges are specifically managed for fish and wildlife conservation.

The mission of the NWRS, established by the NWRS Improvement Act of 1997, is: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The goals of the NWRS, as established by the Policy in the Service Manual (601 FW 1) (July 26, 2006), are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Legal and Policy Guidance

Legal mandates and Service policies govern the Service's planning and management of the NWRS. A list and brief description can be found at the "Division of Congressional and Legislative Affairs, USFWS" Web site (http://laws.fws.gov). In addition,

the Service has developed draft or final policies to guide NWRS planning and management. These policies can be found at the "NWRS Policies" Web site (http://www.fws.gov/refuges/policymakers/nwrpolicies.html). The main sources of legal and policy guidance for the CCP and EA are described below.

National Wildlife Refuge System Improvement Act of 1997

Statutory authority for Service management and associated habitat management planning on units of the NWRS is derived from the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act), which was significantly amended by the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act, 16 U.S.C. 668dd-668ee). Section 4(a)(3) of the Refuge Improvement Act states, "With respect to the National Wildlife System [NWRS], it is the policy of the United States that – (A) each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established…" The Refuge Improvement Act also states that the "…purposes of the refuge and purposes for each refuge mean the purposes specified in or derived from law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."

The Refuge Administration Act, as amended, clearly establishes wildlife conservation as the core NWRS mission. House Report 105-106, accompanying the Refuge Improvement Act, states "…the fundamental mission of our System is wildlife conservation…wildlife and wildlife conservation must come first." In contrast to some other systems of federal lands which are managed on a sustained-yield basis for multiple uses, the NWRS is a primary-use network of lands and waters. First and foremost, refuges are managed for fish, wildlife, plants, and their habitats. In addition, units of the NWRS are legally closed to all public access and use, including economic uses, unless and until they are officially opened through an analytical, public process called the refuge compatibility process. With the exception of refuge management activities which are not economic in nature, all other uses are subservient to the NWRS' primary wildlife management responsibility and they must be determined compatible before being authorized.

The Refuge Improvement Act provides clear standards for management, use, planning, and growth of the NWRS. Its passage followed the promulgation of Executive Order 12996 (April 1996), "Management of Public Uses on National Wildlife Refuges", reflecting the importance of conserving natural resources for the benefit of present and future generations of people. The Refuge Improvement Act recognizes that wildlife-dependent recreational uses including hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when determined to be compatible with the mission of the System and purposes of the Refuge, are legitimate and appropriate public uses of the Refuge System. Section 5 (C) and (D) of the Refuge Improvement Act states "compatible wildlife-dependent recreational uses are the priority general public uses of the Refuge System and shall receive priority consideration in planning and management; and when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated, subject to such restrictions or regulations as may be necessary, reasonable, and appropriate."

The Refuge Improvement Act also directs the Service to maintain adequate water quantity and quality to fulfill the NWRS mission and refuge purposes, and to acquire, under state law, water rights that are needed for refuge purposes.

Compatibility Policy

Lands within the NWRS are different from other multiple use public lands in that they are closed to all visitor uses unless specifically and legally opened. The Improvement Act states that ". . . the

Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a Refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety." The Improvement Act also states that ". . . compatible wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation) are the priority general public uses of the System and shall receive priority consideration in Refuge planning and management."

In accordance with the Improvement Act, the Service has adopted a Compatibility Policy (603 FW 2) that includes guidelines for determining if a use proposed on a national wildlife refuge is compatible with the purposes for which the refuge was established. A compatible use is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the NWRS mission or the purposes for which the Refuge was established and contributes to the maintenance of biological integrity, diversity, and environmental health. The Policy also includes procedures for documentation and periodic review of existing refuge uses.

When a determination is made as to whether a proposed use is compatible or not, this determination is provided in writing and is referred to as a compatibility determination. An opportunity for public review and comment is required for all compatibility determinations. For compatibility determinations prepared concurrently with a CCP or step-down management plan, the opportunity for public review and comment is provided during the public review period for the draft plan and associated NEPA document. The Refuge has completed compatibility determinations for fishing, wildlife observation and photography, environmental education and interpretation, high speed boating, recreational boating, research, grazing, plant collecting, and mosquito monitoring and control. These compatibility determinations will be finalized with the CCP. The compatibility determinations prepared in association with this draft CCP/EA are provided in Appendix A.

Biological Integrity, Diversity, and Environmental Health Policy

Section 4(a)(4)(B) of the Refuge Improvement Act states, "In administering the System, the Secretary shall…ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans…" This legislative mandate represents an additional directive to be followed while achieving refuge purposes and the NWRS mission. The Act requires the consideration and protection of a broad spectrum of fish, wildlife, plant, and habitat resources found on a refuge. Service policy guiding implementation of this statutory requirement provides a refuge manager with an evaluation process to analyze his/her refuge and recommend the best management direction to prevent further degradation of environmental conditions; and, where appropriate, and in concert with refuge purposes and NWRS mission, to restore lost or severely degraded resource components. Within the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3[3.7B]), the relationships among biological integrity, diversity, and environmental health; NWRS mission; and refuge purposes are explained as follows, "…each refuge will be managed to fulfill refuge purpose(s) as well as to help fulfill the System mission, and we will accomplish these purpose(s) and our mission by ensuring that the biological integrity, diversity, and environmental health of each refuge are maintained and where appropriate, restored."

When evaluating the appropriate management direction for refuges, Refuge

Managers will use sound professional judgment to determine their refuge's contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, an understanding of the refuge's role within an ecosystem, and the knowledge of refuge resources, applicable laws and best available science, including consultation with resource experts both inside and outside of the Service.

The priority visitor uses of the NWRS are not in conflict with this policy when they have been determined to be compatible. The directives of this policy do not envision or necessitate the exclusion of visitors or the elimination of visitor use structures from refuges; however, maintenance and/or restoration of biological integrity, diversity, and environmental health may require spatial or temporal zoning of visitor use programs and associated infrastructures. General success in maintaining or restoring biological integrity, diversity, and environmental health will produce higher quality opportunities for providing wildlife-dependent recreational uses.

Draft Wilderness Stewardship Policy Pursuant to the Wilderness Act of 1964
This policy updates guidance on administrative and public activities on wilderness and proposed wilderness within the NWRS. The purpose of the policy is to prescribe how the Service:
"...preserves the character and qualities of designated wilderness while managing for the refuge establishing purpose(s), maintains outstanding opportunities for solitude and primitive and unconfined type of recreation, and conducts minimum requirements analyses before taking any action that may impact wilderness character."

The policy emphasizes recreational uses that are compatible and wilderness-dependent. The policy clarifies conditions upon which generally prohibited uses (motor vehicles, motorized equipment, mechanical transport, structures, and installations) may be necessary for wilderness protection. It confirms that:
"...we will generally not modify habitat, species population levels, or natural ecological processes in refuge wilderness unless doing so maintains or restores ecological integrity that has been degraded by human influence or is necessary to protect or recover threatened or endangered species."

National Environmental Policy Act of 1969
This Draft CCP and associated National Environmental Policy Act (NEPA) document has been prepared consistent with the requirements of NEPA, the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Secs. 1500 et seq.), and the Department of Interior's NEPA procedures (Department Manual, Part 516).

Stone Lakes National Wildlife Refuge

Location

The Refuge is located in southern Sacramento County, west of the city of Elk Grove. It lies within the Morrison Creek, Cosumnes River and Mokelumne River watersheds as well as the Sacramento-San Joaquin Delta (Delta) (Figure 1. Ecoregion and Watershed Map). The approved Refuge boundary is roughly defined by Morrison Creek to the north, Franklin Boulevard and Interstate-5 to the east, the former Southern Pacific Railroad to the west and Lost Slough to the south.

Refuge Setting

Before European settlement, the Beach-Stone Lakes Basin was a magnet for wildlife, such as elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*) and grizzly bear (*Ursus arctos horribilis*). During winter storms, the flooded basin could stretch from lower Morrison Creek to the Mokelumne River, expanding lakes and seasonal wetlands that supported tens of thousands of migratory birds. The land destined to become a national wildlife refuge teemed with wildlife.

The Plains Miwok relied on the land, its plants and its abundant wildlife for survival. These American Indians camped, hunted and fished along the shores of the area's

Figure 1. Watershed and Ecosystem Setting

Stone Lakes
National Wildlife Refuge

lakes. Historic Beach Lake once covered nearly 1,000 acres and North and South Stone Lakes were also extensive. Located in the heart of the Refuge, the lakes received their names in the mid 1800s from a former landowner, a Sacramento merchant named Rockwell Stone. The Stone family held about 1,000 acres until 1891.

Changes began in the mid 1800s. Levees were constructed along the Sacramento River and around Delta islands so the land could be farmed. The Southern Pacific Railroad was built, bisecting the basin, allowing nearly complete drainage of its lakes. Finally, Interstate-5 was constructed, ushering in tremendous pressure for urban development.

As Sacramento grew in the mid 1960s, the U.S. Army Corps of Engineers (USACE) suggested building channels in the area to hold floodwaters. Conservation organizations also became interested in the basin in late 1960s, hoping to avoid a major flood control project and keep the area natural. During the same period, a local landowner proposed build a new town for 50,000 people around North Stone Lake.

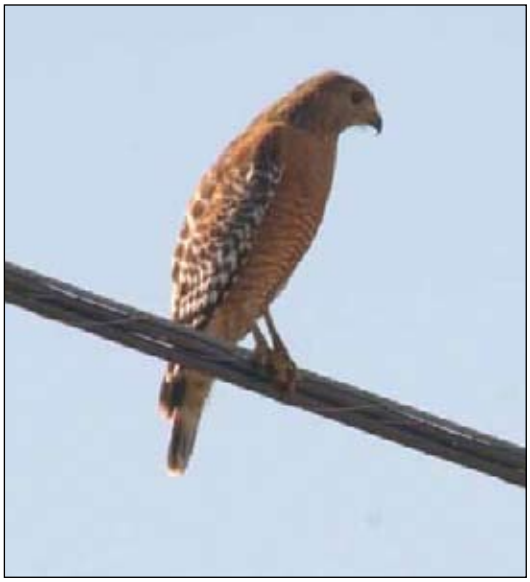
In response to these pressures and in recognition of the importance of the Stone Lakes Basin floodplain, the State of California and County of Sacramento purchased about 2,600 acres in the 1970s, turning the land over to their respective park departments to manage.

By the late 1980s the idea of further protecting the Stone Lakes Basin by establishing a national wildlife refuge took hold. Support for the Refuge derived partly from the fact that the unique lakes and waterways of the basin lie entirely within the 100-year floodplain. The basin also occupies a strategic location for buffering the effects of urban encroachment into the Delta. Additionally, a national wildlife refuge could potentially provide a link with ongoing nearby land conservation efforts such as the Cosumnes River Preserve.

Several local legislators supported protecting the land from development and were in a position to help move the process forward.

History of Refuge Establishment and Acquisition

In July 1992, the Service completed a complex two year public planning process resulting in finalization of an environmental impact statement (EIS). The EIS (USFWS 1992) defined the present 18,000 acre approved Refuge boundary.



With a broad base of local support the Refuge was established in 1992, protecting habitat for native species like this red-shouldered hawk.
Photo by Tom Harvey, USFWS

During circulation of the draft EIS, , the Service received written and verbal input from over 6,000 citizens about potential effects a refuge could have on the landscape and the EIS' adequacy in addressing these issues. Despite litigation under NEPA over the adequacy of the EIS , the Service successfully defended its Record of Decision and with a broad base of local support, established the Refuge in 1992.

With acquisition of the first property in 1994, the Refuge was officially established as the 505th unit in the National Wildlife Refuge System. It joined the ranks of other local land conservation and management projects, including the Cosumnes River Preserve to the southeast and the Vic Fazio Yolo Bypass Wildlife Area to the west, which have similar goals of protecting and enhancing vital Central Valley fish and wildlife habitats.

Land Protection

The approved boundary for the Refuge is the area within which the Service is authorized to work with willing landowners to acquire and/or manage land (Figure 2. Land Status). The Refuge consists of an approximately 9,000 acre core area

(Figure 3. Core and Cooperative Wildlife Management Areas), encompassing Upper and Lower Beach Lakes and North and South Stone Lakes and an approximately 9,000 acre Cooperative Wildlife Management Area (CWMA), encompassing lands to the east and south of the core area. Within the approved Refuge Boundary, the Service may pursue a number of approaches to conserve and manage lands, depending on the preferences of willing landowners. These may include: technical assistance, cooperative agreements, memoranda of understanding and acquisition of conservation or agricultural easements and fee title interest. In the EIS (USFWS 1992), the Service agreed to use fee title acquisition within the CWMA only on a case by case basis and after seeking approval by the Sacramento County Board of Supervisors. The preferred approaches to conserve lands within the CWMA are: cooperative agreements, memoranda of understanding, and purchase of conservation or agricultural easements. According to the August 1992 Land Protection Plan for The Refuge, a primary objective of the CWMA is to maintain lands in private ownership and continue agricultural production.

To date, the Service manages approximately 6,000 acres within the approved project boundary including: 2,617.9 acres under cooperative agreements; 1,738.8 acres in fee title ownership; and 1,519.9 acres under agricultural easement. Approximately 11,622 acres of non-refuge lands lie within the approved refuge boundary.

The Service is also exploring cooperative management of an additional 2,210 acres within the approved boundary that are owned by two other agencies: (1) Sacramento Regional Sanitation District (1,800 acres); and (2) California Department of Water Resources (410 acres).

Land Conservation Methods

Working with willing landowners and local and state agencies, the Service may use various means to conserve or manage fish and wildlife and their habitats within the approved Refuge boundary. These may include: fee title acquisition, conservation easements, memoranda of understanding and cooperative agreements, financial incentives and technical assistance and education and outreach. It is the established policy of the Service to seek the minimum degree of interest in property needed to accomplish refuge land conservation objectives.

In fee title acquisitions, the Service acquires full ownership of property through fee simple purchase, donation, exchange, or transfer from another Federal agency. Land acquired in fee title by the Service is removed from county tax roles. To partially offset this loss, the Service provides annual payments to counties as authorized by the Refuge Revenue Sharing Act (Public Law 95-469). The Service is required under the U.S. Constitution to pay fair market value for property and purchases are dependent on the availability of funds.

In acquiring a conservation easement, the Service purchases the minimum rights needed to conserve fish and wildlife habitat, while allowing the existing landowner to retain title to the land. Easements may include wetland or waterfowl habitat easements, upland easements, agricultural practices easements and non-development easements. The easement interest acquired by the Service becomes part of the Refuge and is subject to applicable laws and regulations pertaining to refuges. The easement is a permanent interest in the property that runs with the land and the landowner remains responsible for all property taxes About 5,000 acres within the approved Refuge boundary and CWMA are currently publicly owned and managed for conservation purposes by five local and State agencies. A majority of these lands are or will be jointly managed with the Service through memoranda of understanding and cooperative agreements.

The Service may also assist in securing financial incentives for landowners who are not willing to sell an interest in their property but wish to explore conservation or enhancement of fish and wildlife habitats

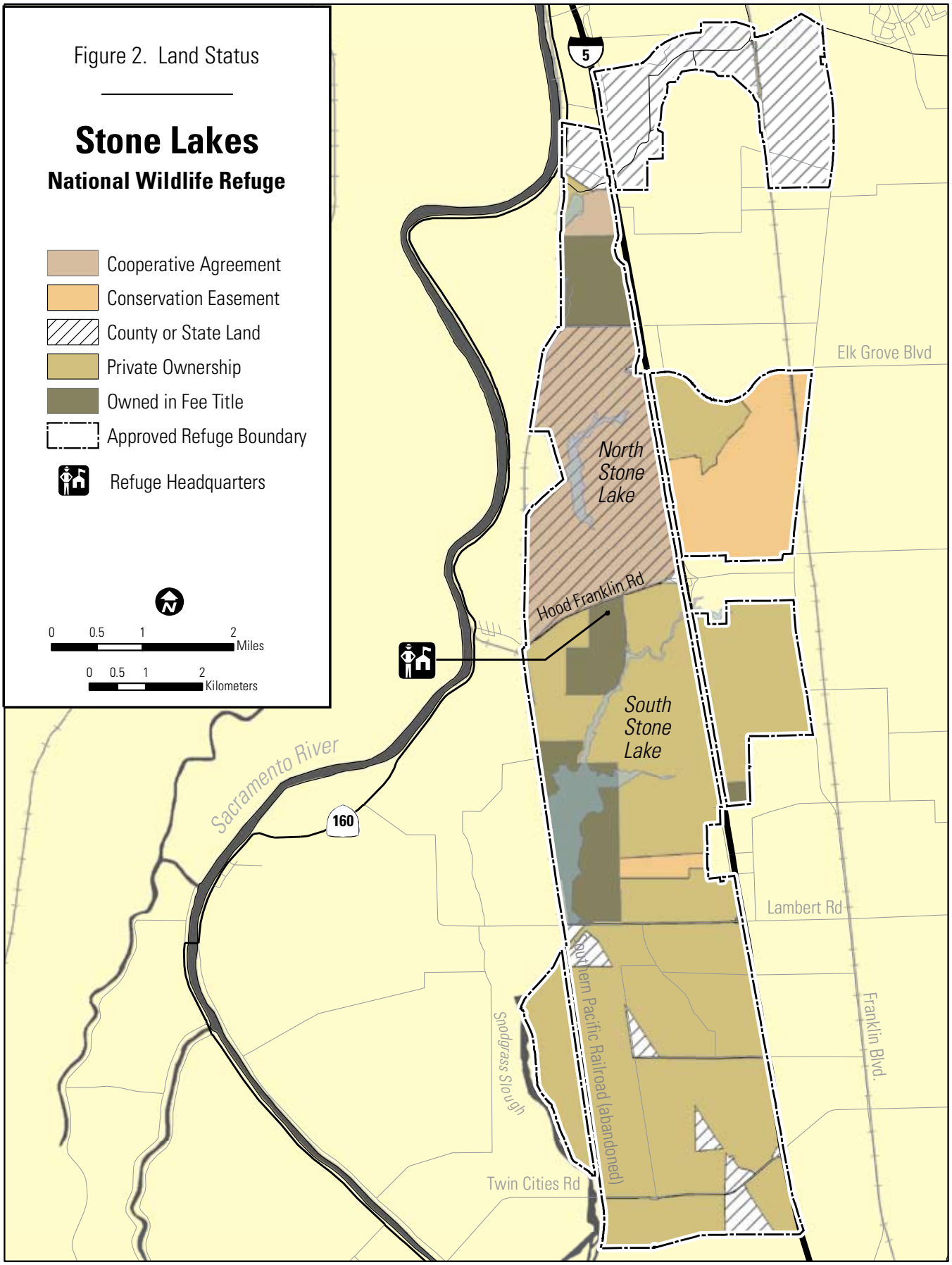


Figure 2. Land Status
Stone Lakes
National Wildlife Refuge
Cooperative Agreement
Conservation Easement
County or State Land
Private Ownership
Owned in Fee Title
Approved Refuge Boundary
Refuge Headquarters
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
5
Elk Grove Blvd
North Stone Lake
Hood Franklin Rd
South Stone Lake
Sacramento River
160
Lambert Rd
Southern Pacific Railroad (abandoned)
Snodgrass Slough
Franklin Blvd.
Twin Cities Rd

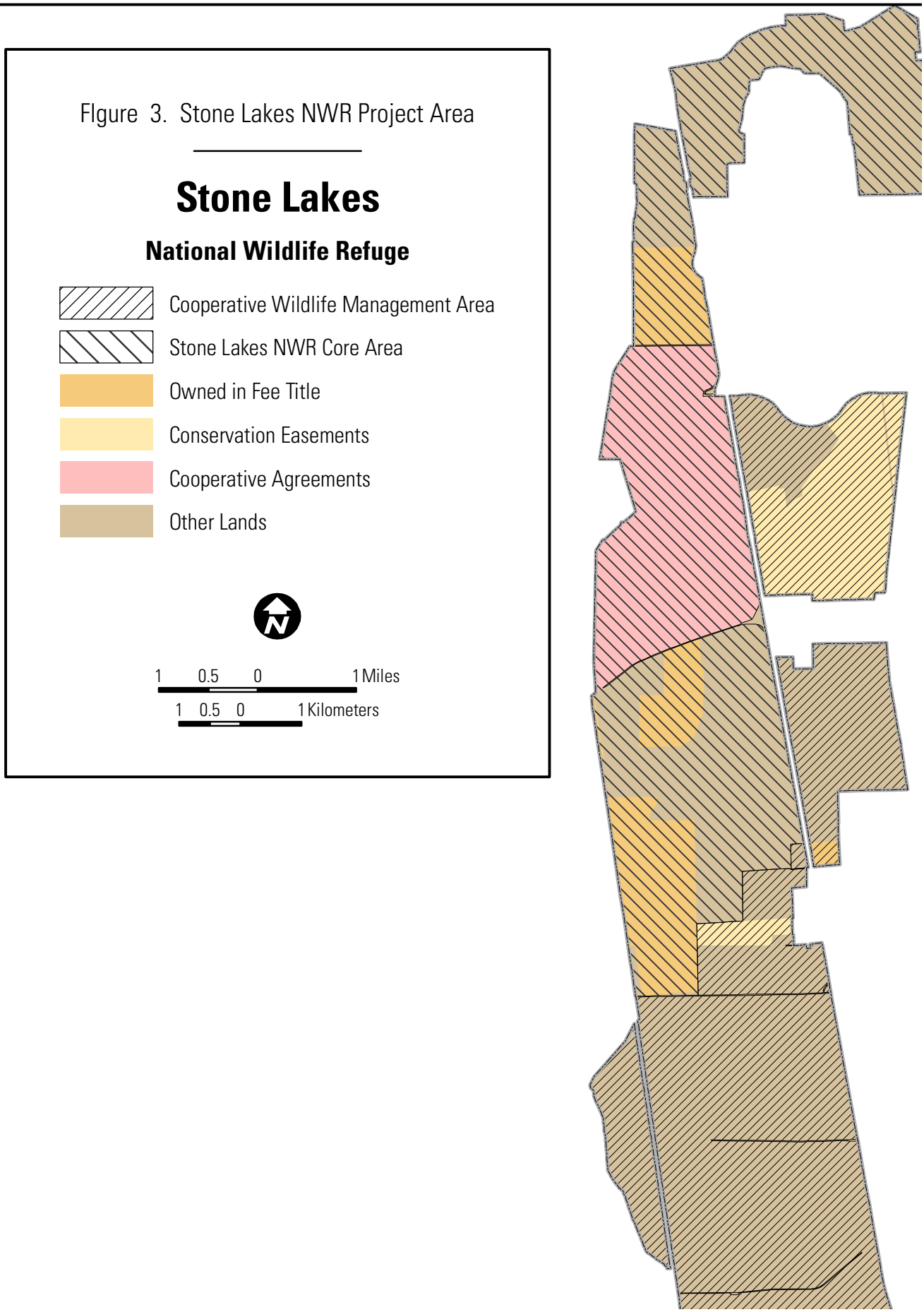


Figure 3. Stone Lakes NWR Project Area
Stone Lakes
National Wildlife Refuge
Cooperative Wildlife Management Area
Stone Lakes NWR Core Area
Owned in Fee Title
Conservation Easements
Cooperative Agreements
Other Lands
N
1 0.5 0 1 Miles
1 0.5 0 1 Kilometers

on their property. For example, through the Partners for Fish and Wildlife program, landowners may apply for financial assistance from the Service to protect, enhance, or restore wetland, riparian, or native grassland habitats on their property. In addition, the Service could assist a landowner to secure funds from Farm Bill programs available from the U.S. Department of Agriculture/Natural Resources Conservation Service (NRCS). Potential NRCS programs that could benefit landowners and further Refuge land conservation objectives include the: Conservation of Private Grazing Land Program, Environmental Quality Incentives Program, Farmland Protection Program, Wetlands Reserve Program and Wildlife Habitat Incentives Program. Finally, Service staff is available to provide technical assistance and education and outreach information to willing landowners who are interested in conserving fish and wildlife habitats on their lands.

The Refuge has financed most of its land acquisition and restoration efforts with grants from a wide range of state and federal agencies and private organizations. These sources have played a vital role in advancing the Refuge's land conservation and management programs. Grants have been provided by: City of Sacramento, County of Sacramento, California Wildlife Conservation Board, California Environmental Enhancement Mitigation Fund, California Environmental License Plate Fund, Cigarette and Tobacco Product Surtax, Department of Transportation-TEA 21 Fund, CALFED Bay Delta Program, North American Wetlands Conservation Act, Land and Water Conservation Fund, Central Valley Project Improvement Act, National Fish and Wildlife Foundation, David and Lucille Packard Foundation, The Trust for Public Land and other private donations.

Partnerships

Partnerships have been a cornerstone of Refuge development and management. A consortium of public and private organizations strongly supported the designation of Stone Lakes as a national wildlife refuge and has since been joined by many others as the Refuge has expanded. The Refuge's urban location and the local and state agencies that own land within the Refuge boundary have provided numerous opportunities for partnerships from the Refuge's inception.

The Refuge staff routinely discusses and coordinates restoration activities, jointly applies for grants and discusses other management issues with the Sacramento County Department of Regional Parks, Recreation and Open Space (North Stone Lake Unit), the Sacramento Regional County Sanitation District (Bufferlands) and the California Departments of Transportation (Caltrans) (Beach Lake Mitigation Bank), California Department of Parks and Recreation (DPR) (North Stone Lake Unit) and California Department of Water Resources (DWR) . The Service has finalized a cooperative agreement with Sacramento County Department of Regional Parks, Recreation and Open Space over management of the North Stone Lake unit and partners closely with Sacramento Regional County Sanitation District on the annual event, Walk on the Wildside, and the water hyacinth control program.

Controlling water hyacinth a nonnative, invasive aquatic plant, has been a prime motivation for formation of an important partnership, the Stone Lakes Water Hyacinth Working Group, in which the Refuge plays a central role. This group includes more than a dozen local and state agencies, organizations, and private individuals who own or manage land in the Stone Lakes Basin, affected by this noxious weed. Recent partners in the group have included: the Refuge, California Department of Boating and Waterways (DBW), Sacramento Regional County Sanitation District (SRCSD), Sacramento County Supervisor Don Notolli, Sacramento County Department of Water Resources, Sacramento County Agricultural Commission, Sacramento-Yolo Mosquito and

Controlling and eliminating invasive water hyacinth, shown here being removed from Lambert Ditch by volunteers, was the prime motivation for another important partnership: the Stone Lakes Water Hyacinth Working Group.
Photo by USFWS

Vector Control District (SYMVCD), Florin Resource Conservation District, Caltrans, Vino Farms, the Whitney Family, LaRue Schock and the San Francisco Estuary Institute. The working group cooperates on eradication, has applied for and received grants and has produced educational materials to reduce the spread of water hyacinth in local waterways.

The Refuge also coordinates with California Departments of Fish and Game (DFG) and DBW , Resource Conservation District #813 and Sacramento County Department of Environmental Review on issues of mutual management concern. Much of the restoration that has occurred on Refuge managed land occurred through partnerships with a variety of private organization, including Ducks Unlimited, California Waterfowl Association, Wildlands, Inc., Stone Lakes National Wildlife Refuge Association, American Lands Conservancy, Sacramento Tree Foundation, Safari Club, and Trust for Public Land.

The Service entered into a Memorandum of Understanding (MOU) with SYMVCD in 1993 to address concerns regarding potential effects the Refuge may have on mosquito populations. According to the MOU, the Service agreed to consult with SYMVCD on the design and management of Refuge wetlands and provide access to SYMVCD to monitor the mosquito population on the Refuge. The Service also agreed to submit Pesticide Use Proposals for pesticides SYMVCD may wish to use on the Refuge, if thresholds for larval or adult control are exceeded. SYMVCD and the Service rely on a full range of integrated pest management techniques to manage mosquito populations, including water and vegetation management, biological control (e.g., planting of mosquito fish [*Gambusia affinis*]) and if necessary, chemical control of larval or adult mosquitoes. As a result, mosquito larval control activities since 1994 have been largely limited to localized (less than five acres) applications of larvicides and until 2005, and only three applications of an adulticide.

In 2005, West Nile Virus (WNV) became established in Sacramento and Yolo counties, triggering aggressive and widespread mosquito control efforts. In August of 2005 the number of human WNV cases and rate of infected adult mosquitoes were so high that SYMVCD conducted aerial applications of pyrethrin over a major portion of Sacramento County (Sacramento County 2006). During 2005, the Refuge received ultra-low volume (ULV) ground treatments of pyrethrin on 18 occasions from September 28 through October 12. As of July 2006, the Refuge has been adulticided six times between June 27 and July 21.

The Service also cooperates with SYMVCD in the monitoring of landbird populations on the Refuge, primarily to evaluate the role of wild bird populations as reservoirs of mosquito-borne diseases, such as western equine encephalitis, St. Louis encephalitis, and West Nile Virus. The landbird monitoring program began in 1995 and involves mist netting and banding of a wide variety of birds. A small blood sample (0.10 cc) is taken from some species for disease analysis. In addition to contributing to the goals of mosquito management, the program has provided valuable information regarding bird use on the Refuge, timing of migration, reproductive ecology and reproductive success.

In addition to those already mentioned,

several programs and nongovernmental organizations (NGOs) provide vital support for Refuge land conservation, restoration and visitor services programs, including the CALFED Bay Delta Authority Ecological Restoration Program, Central Valley Project Improvement Act, North American Wetlands Conservation Act, Audubon California, California Native Plant Society, California Waterfowl Association, The Nature Conservancy and Sacramento Open Space. These groups routinely assist with grant writing and fundraising, coordinate research or census efforts, help with planning programs and activities and provide coverage of Refuge activities in their publications or events.

Refuge Purposes

Lands within the Refuge System are acquired and managed under a variety of legislative acts and administrative orders and authorities. The official purpose or purposes for a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, funding source, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. The purpose of a refuge is defined when it is established or when new land is added to an existing refuge. When an addition to a refuge is acquired under an authority different from the authority used to establish the original refuge, the addition takes on the purposes of the original refuge, but the original refuge does not take on the purposes of the addition. Refuge managers must consider all of the purposes. However, purposes that deal with the conservation, management, and restoration of fish, wildlife and plants and their habitats take precedent over other purposes in the management and administration of a refuge.

The Refuge System Improvement Act directs the Service to manage each refuge to fulfill the mission of the Refuge System, as well as the specific purposes for which that refuge was established. Refuge purposes are the driving force in developing refuge vision statements, goals, objectives and strategies in the CCP. Refuge purposes are also critical to determining the compatibility of all existing and proposed refuge uses.

Stone Lakes National Wildlife Refuge was established under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, The Migratory Bird Conservation Act and The Endangered Species Act of 1973.

According to these authorities, the Refuge purposes are:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. §§ 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

Related Projects and Studies in the Area

U.S. Fish and Wildlife Service

Final Environmental Impact Statement

Stone Lakes National Wildlife Refuge (EIS). In 1972, Jones and Stokes Associates prepared an EIS for the Refuge. The purpose of the EIS was to evaluate the effects of various Service alternatives to acquire and protect lands in southwestern Sacramento County to establish the Refuge. The EIS includes interim Refuge management goals and proposed habitat restoration areas.

The interim Refuge management goals are as follows:

- Preserve, enhance, and restore a diverse assemblage of native Central Valley plant communities and their associated fish, wildlife and plants;
- Preserve, enhance, and restore habitat to maintain and assist in the recovery of rare, threatened, and endangered plants and animals;
- Preserve, enhance, and restore wetlands and adjacent agricultural lands to provide foraging and sanctuary habitat needed to achieve the distribution and population levels of migratory waterfowl and other water birds consistent with the goals and objectives of the North American Waterfowl Management Plan and Central Valley Habitat Joint Venture;
- Create linkages between refuge habitats and habitats on adjacent lands to reverse past impacts of habitat fragmentation on wildlife and plants;
- Coordinate refuge land acquisition and management activities with other agencies and organizations to maximize the effectiveness of refuge contributions to regional habitat needs;
- Provide for environmental education, interpretation and fish and wildlife oriented recreation in an urban setting accessible to large populations; and
- Manage riverine wetlands and adjacent floodplain lands in a manner consistent with local, State and Federal flood management; sediment and erosion control, and water quality objectives.

Draft North Stone Lake Management and Restoration Plan. The 2,791 acre North Stone Lake Unit consists of two adjacent parcels owned by the DPR (1,224 acres) and Sacramento County (1,567 acres). The goal of the Service is to cooperatively manage both these properties with the County and the State, as a unit of the Refuge. The Service currently has a cooperative agreement with Sacramento County for management of their property and is drafting an agreement with DPR that addresses the State-owned land. Since Sacramento County has managed both parcels collectively as the North Stone Lake Wildlife Refuge, they drafted a management and restoration plan in 1992. The plan has now been revised and updated by the Service. Some wetland restoration elements in the 1992 plan that were not considered to have neutral effects on floodplain storage were removed or modified in the revision but the plan has not been adopted by Sacramento County. . Under the revised draft plan, the North Stone Lake Unit would be managed for a diversity of native animal and plant species by enhancing and restoring a diversity of wetland and grassland habitats. Once completed, many of the restoration projects will require little management. Other restored habitats, such as seasonal marshes and grasslands, will require intensive management and manipulation.

Other Agencies and Projects

Sacramento Regional Wastewater Treatment Plant and Bufferlands. The Sacramento Regional County Sanitation District (SRCSD) constructed the Sacramento Regional Wastewater Treatment Plant (SRWTP) to treat wastewater for the urbanized area of Sacramento. In addition to constructing the plant, SRCSD purchased 2,650 acres surrounding the treatment plant to serve as a buffer between the plant and surrounding planned and existing residential communities. This land is known as the Bufferlands. Approximately 1,800 acres of the Bufferlands lie within the approved Refuge boundary The Service and SRCSD have drafted a cooperative management agreement for the Bufferlands to be managed a unit of the Refuge. SRCSD restores native habitats such as wetlands, riparian forest, and native grasslands and actively manages the Bufferlands as wildlife

habitat. They also provide opportunities for; environmental education, interpretation, wildlife observation and fishing; oversee a volunteer program and partner with the Service and others on the annual Refuge event, Walk on the Wildside.

Vic Fazio Yolo Basin Wildlife Area. The Vic Fazio Yolo Wildlife Area is managed by the California Department of Fish and Game and located along Interstate-80 where 16,000 acres in the Yolo Bypass floodway have been restored to wetlands or support agricultural lands managed for the benefit of fish and wildlife. . The Wildlife Area lies approximately 15 road miles northwest of the Refuge and was created through the cooperative efforts of an array of private, State and Federal partners. It covers approximately six square miles and provides visitor opportunities such as bird watching, outdoor educational programs and waterfowl hunting.

Cosumnes River Preserve. The Cosumnes River Preserve is located adjacent to and southeast of the Refuge's approved boundary and just upstream from the confluence of the Cosumnes and Mokelumne rivers. The Preserve was established through the cooperative efforts of a private/public partnership that includes The Nature Conservancy, Ducks Unlimited, U.S. Bureau of Land Management, Sacramento County and California Department of Water Resources. The project strives to conserve and enhance nearly 46,000 acres of riparian forest, wetlands and grasslands along the Cosumnes River, which is the only remaining un-dammed tributary of the Sacramento River.

The Cosumnes River floodplain provides habitat for tens of thousands of migratory waterfowl, songbirds and birds of prey; a large portion of the Central Valley's population of greater sandhill cranes (*Grus canadensis tabida*); and rare reptiles and mammals, such as the endangered giant garter snake (*Thamnophis gigas*). Chinook salmon (*Oncorhynchus tshawytscha*) and Pacific lamprey (*Lampetra tridentate*) spawn and native Delta fish breed and rear their young in the shallow waters of the wetlands.

The Cosumnes River floodplain provides habitat for tens of thousands of migratory waterfowl, songbirds, and birds of prey; a large portion of the Central Valley's population of greater sandhill cranes; and uncommon reptiles and mammals, such as these river otters.
Photo by USFWS

The Central Valley Joint Venture. The Central Valley Joint Venture (CVJV) is a partnership of private conservation organizations and State and Federal agencies whose goal is to protect, maintain and restore habitat to increase Central Valley waterfowl populations to levels comparable to the 1970s and consistent with other objectives of the North American Waterfowl Management Plan. The Central Valley of California is the most important waterfowl wintering area in the Pacific Flyway, supporting 60 percent of the flyway's duck and goose population. It is especially important that 65 percent of all pintails (*Anas acuta*) in the United States use the Central Valley.

CALFED Bay-Delta Authority (CALFED). CALFED, a consortium of stakeholders and State and Federal agencies, is attempting to develop a plan to address water supply and flood control concerns, as well as restoration of fish and wildlife populations of the Sacramento-San Joaquin Delta (Delta). Under CALFED's ecological restoration program funding was made available to purchase the Sun River portion of the South Stone Lake Unit.

Central Valley Project Improvement Act (CVPIA).
The CVPIA was adopted to incorporate

conservation and enhancement of fish and wildlife populations into operation of the Central Valley Project by the U.S. Bureau of Reclamation. It provides for the allocation of water supplies for the recovery of native fishes and for State and Federal wildlife management areas. Funding available through the program assisted the Refuge with acquisition of the Headquarters Unit.

2 The Planning Process

The Planning Process

The Refuge Planning Chapter of the Fish and Wildlife Service Manual (Part 602 FW 2.1, November 1996) and evolving policy related to the Refuge System Improvement Act of 1997 help to guide the process followed for developing this Comprehensive Conservation Plan (CCP). Key steps include:

- Gathering information;
- Initiating public involvement;
- Analyzing resource relationships;
- Identifying issues and developing vision and goals;
- Developing alternatives and assessing environmental effects;
- Identifying a preferred alternative;
- Publishing the draft CCP and NEPA document;
- Documenting public comments on the draft CCP;
- Revising the draft CCP and preparing the final CCP;
- Securing approval of the California/ Nevada Operations; and
- Implementing the CCP.

The CCP may be amended at any time, as necessary, under an adaptive management strategy. Public involvement and NEPA review will be required if major revisions are needed.

The Stone Lakes CCP Process

In a Federal Register Notice, dated August 26, 2002, the Service announced that it was preparing a CCP for the Refuge. The first Refuge planning update, distributed in July 2002, provided the public with background about the Refuge and the National Wildlife Refuge System and explained how CCP development fits into the overall picture of refuge management.

The second planning update, released in September 2002, announced a series of the public meetings and explained how the public could become involved in the planning process. The purpose of the meetings was to solicit public involvement in the CCP process and help Service staff identify issues and gather information to help develop the CCP.

This draft CCP and Environmental Assessment (EA) (Appendix B) are being distributed to Refuge cooperators, nearby landowners, State and Federal government agencies, local jurisdictions, private organizations, community groups and private citizens. The public has 30 days from the draft's release to provide comments. A final planning update will be issued at the same time as the final CCP. The draft CCP and EA can also be viewed at the following internet sites: http://stonelakes.fws.gov/publicreview.htm and http://library.fws.gov/ccps.htm.

The CCP will assist Refuge staff with preparation of annual work plans and updating the Refuge Operational Needs System (RONS) database. The RONS database describes the unfunded budget needs for each refuge and is the basis upon which funding increases are allocated for operational needs. The plan may also be reviewed during routine inspections or programmatic evaluations. Results of the reviews may indicate a need to modify the plan. Periodic review of the objectives and strategies is an integral part of the plan, and management activities may be modified if the desired results are not achieved. Depending on the degree that changes may be required, the appropriate level of public involvement and NEPA documentation will be determined by the Refuge Manager. The CCP will be formally revised every 15 years.

Issues Identified by the Public

During the CCP public scoping process, issues, concerns, and opportunities were identified through public meetings, discussions with planning team members and other key contacts. The public had an opportunity to attend four scoping meetings, in Elk Grove, Davis, Walnut Grove and Sacramento, where their comments were recorded. More than 135 people attended these meetings. Over 250 people also provided written comments by mail and e-mail and through personal conversations with the Refuge and planning staffs. During the planning process, the Service has received numerous comments and suggestions regarding the potential for public hunting on the Refuge. Due to opportunities related to recent conveyance of the Sun River property to the Refuge and commitments by the Service to maintain hunting opportunities in the South Stone Lake area, the Refuge opted to establish a public waterfowl hunting program during 2005-2006 through a separate planning process, independently of this CCP. All comments, issues, concerns, and opportunities compiled by the Service are summarized in the following narrative which has been organized by several broad topics.

Public comments, on Comprehensive Conservation Planning for the Refuge, were received in writing, via e-mail, via postal mail and during four public meetings.
Photo by USFWS

Management

Several meeting attendees observed that the future of Refuge wildlife will rely on establishing sanctuary areas separate from visitor use areas, or establishing times within use areas when wildlife are not disturbed. They asked that visitor uses be compatible with Refuge conservation purposes and that management decisions be based on resource values. One group asked the Service to assess the negative impacts of waterfowl management on other native plants and animals and asked the Service to mitigate the impacts of recreational activities. The same group also requested that the Service assess the effects of predator management strategies to protect sensitive, threatened and endangered species. Some hope to see Refuge staff work with the city of Elk Grove and Cosumnes River Preserve to develop an open space greenbelt to contain development.

A number asked about the Refuge land acquisition priorities and plans for potential acquisitions, hoping to see site specific plans developed for each property that is purchased. Others felt the Refuge needs more conservation easements and other land protection strategies. Specific reference was made to the areas east of Interstate-5 and North of Hood-Franklin Road and also South of Lambert Road as places to favor easements over fee title acquisition.

Some local landowners would like to see a balance between historic land uses, such as agriculture, and expanded recreation opportunities. They suggested that the Refuge establish a 500-foot buffer zone for agricultural spraying and other historic farming activities to avoid problems between existing arming activities and Refuge activities and between privately owned lands and Refuge restoration activities.

There were several comments about the Refuge's floodplain location, the need to maintain its floodplain capabilities and concern regarding how proposed activities and landscape modifications would impact flooding. Refuge plans should leave room for Sacramento County or the State to deal

with the Morrison Creek flood problem. They should also recognize that surrounding agricultural lands are on higher ground, providing a natural escape for animals during flooding. Because one of the Refuge's goals is to expand or enhance threatened and endangered species, some neighboring landowners feel they need an incidental take provision that would allow them to continue their farming operations should flooding and endangered species displacement occur.

Along the same lines, concern was expressed about mosquito-related problems and the existing MOU with the Sacramento-Yolo Mosquito and Vector Control District. If an emergency occurs and action is required, there is concern that the bureaucracy will cause unnecessary delays that could impact neighboring private lands. They would like to see some sort of pre-approved plan established for such emergencies.

Some people commented that the Refuge must be a good neighbor and responsible landowner and help pay overhead costs, just as other private landowners. This means that the Refuge should pay water usage fees to the North Delta Water Agency and reclamation districts and pay mosquito abatement costs and other fees. Some feel this has been a source of frustration for ten years and that private landowners cannot subsidize public ownership

A few people asked how the Refuge acquires water rights. One attendee suggested that the Refuge should use treated wastewater because a pipe conveying treated water already passes through the Refuge. People would like to see water quality and groundwater monitored/tested. They would also like assurance that Elk Grove and Sacramento meet clean water standards before their runoff reaches the Refuge. An additional concern regarding waterways relates to the spread of water hyacinth (*Eichhornia crassipes*). A request was made for the Refuge to continue its cooperative program to manage/control water hyacinth and other noxious weeds.

There was a general recognition that Refuge management is labor intensive and that it should be a high priority for the Refuge to have adequate staffing and funding. A suggestion was made to charge day use fees for all activities to help cover management, expansion, fish stocking, etc.

The Delta Protection Commission acknowledged the Refuge's outreach efforts to invite comments during the CCP process. The Commission's comment reflected their mission of keeping as much land in private ownership as is possible within the primary zone of the Delta and working with the habitat values associated with agriculture. The Refuge Staff was also extended an invitation to brief the Commission about CCP progress.

General Access

Many comments expressed concern about the current lack of, or very limited access to the Refuge. There were numerous requests that the Refuge allow many more types of recreational activities and that these expanded opportunities occur soon.

Many types of recreational uses were mentioned. Hunting received the greatest number of requests, from both individuals and hunting organizations. Horseback riders and a water ski group have accessed portions of the Refuge from private lands since prior to its establishment and they asked for continued access. Comments asked for many other types of uses, including fishing, photography, hiking, bird watching, small boat launching facilities, bicycle trails, dog trials, environmental education, wildlife observation areas and facilities, picnic and day use facilities and a visitor center. They also requested restrooms. They suggested that the Refuge may want to consider camping or rustic lodging facilities.

Some said that the Refuge should obtain the needed funding to fully staff daily operations to allow improved open access. Several meeting attendees expressed the belief that since this is Federal land, it is their right to have opportunities for these activities. And several offered to support these activities by helping to build facilities, patrol the Refuge, or perform other needed work.

Several comments asked that recreational uses be balanced, specifically requesting that hunting be balanced with other uses. They asked that recreational opportunities be allowed in a way that protects wildlife. They suggested that some activities, such as hunting and wildlife viewing, be restricted to specific areas or times to avoid conflicts.

To support their requests, several made comparisons to Yolo Basin Wildlife Area, observing that it originally had less land under management but supported more types and amount of usage, and to the American River Parkway, which allows considerable recreational usage. They suggested thinking about obtaining funding from other sources for these types of programs. A few attendees hoped that the Refuge would remain rustic and unimproved, calling this "symbolic."

Many asked questions about or commented on the waterways as part of the public trust. They wanted to know if the Refuge's waterways were considered navigable and what the Refuge policy would be regarding their use. Historic use of waterways was cited several times, as well as the belief that use of waterways should not be restricted.

Boating/Waterskiing

Several comments asked that the Refuge provide opportunities for sculling, canoeing, and non-motorized boating or boating with trolling motors only; they also requested a ban on jet skis.

Comments fell on both sides of whether to allow waterskiing. Some felt it was inappropriate. Several members of the local water ski club that has used Beach Lake for many years asked the Refuge to allow this historic use to continue, citing that it is a very seasonal, limited use and does not conflict with other uses or wildlife. They suggested creating a designated waterski area. Several waterskiers offered to help the Refuge by picking up trash or acting as docents of the waterways.

The California Canoe and Kayak School, a paddling school and retail center in Northern California, asked if there would be an opportunity to open a commercial operation with docent led activities.

Horseback Riding

Several horseback riders who had accessed the Refuge through the privately owned Beach Lake Stables said there has been historical, "prescriptive" use of the Refuge for horseback riding since 1970. They would like to continue to ride on the Refuge, saying that there are only ten to 15 regular riders who ride seasonally.

Some horseback riders attending the meetings asked that the Refuge be opened to riding, with designated areas for riding and other uses. They commented that riding is low impact and can coexist with wildlife and the six priority visitor uses. They would like the opportunity to show it is compatible and requested restrictions on horseback riding if there is a conflict with hunting. Several riders spoke of their willingness to respect the sensitivity of the ecosystem and remain on trails. They offered to organize a volunteer horse patrol, similar to the Lake patrol and help maintain trails and report poachers, vandalism, fires, etc.

Others expressed concern as to whether horseback riding and hunting would be compatible with each other. One comment expressed concern about the environmental effects of horseback riding, particularly erosion.

Fishing

Several comments asked about the Refuge's plans regarding fishing. Some said they used to fish at Stone Lakes prior to its designation as a national wildlife refuge and would like the opportunity again. They would like year-round fishing, especially bass fishing.

Comments suggested that fishing and hunting should be separated to avoid conflicts. One comment was that if hunting and fishing are allowed, the hunt area should be closed to fishing on hunt days. Another comment suggested that the Refuge should stock fish to provide good family experiences. The Refuge offers a

great opportunity for reintroduction of Sacramento perch.

Hunting

There is strong support for a hunting program that includes waterfowl and upland birds, including pheasant, dove, and quail. Many people mentioned that hunting has occurred historically at Lodi Gun Club and other parts of the Refuge both to support their request and as rationale for allowing interim hunting on some of these existing Refuge properties. A few attendees asked to include big game hunting, such as deer (with a shotgun) and small game, such as rabbit.

They also pointed out that hunting exists on other refuges. They feel that if the top third of the Refuge is closed to hunting due to County regulations and the bottom third is closed due to agricultural use, then the middle area south of Hood-Franklin Road should be developed for hunting, not as wildlife sanctuaries. They asked whether hunting could be allowed on the State and County properties that the Refuge manages.

Several specifically requested that the Refuge establish an interim compatibility determination to allow hunting now. A few felt that a hunting program should be developed when suitable property and adequate staffing are available.

In terms of access, some feel that nonconsumptive uses, such as wildlife viewing and photography, are being given and will continue to be given precedence over hunting and fishing. They would like to see a balanced program between hunting and non-hunting areas.

Several asked how the Refuge will manage hunting. Some suggested that the Refuge explore how the California Department of Fish and Game (DFG) manages hunting at other Central Valley refuges. They wondered if there is a general agreement between DFG and the Service, or if each refuge establishes their own arrangement.

Several attendees said that hunting is sustainable and supported by numerous organizations. Hunting related purchases can help local businesses. Hunters have a long tradition of helping with conservation, funding and facilities. There were numerous references to fees hunters pay to acquire and manage habitat through the Duck Stamp and Federal excise taxes on hunting equipment. Several want to see if some of these funds could be earmarked for a hunting program or to purchase land for hunting at Stone Lakes. They feel the Refuge should expand wetlands and increase ponds available for hunting. There were offers from many hunters to help fund, develop, build and monitor hunting facilities. There were requests that the Refuge develop interpretive materials explaining the role of hunters in conservation.

A number of people expressed concern over a hunting program. A few mentioned hunting related accidents as a cause for concern. Some moved to the area to get away from places that allow hunting and are opposed to it on the Refuge. They would like to see the Refuge advance, but not at the expense of wildlife. They questioned whether hunting is compatible with conservation goals and other uses, such as education and wildlife viewing. They felt that if it is allowed, hunting should not occur at the same time as these other uses. One group was opposed to both hunting and trapping on the Refuge.

Conversely, some said they bought property close to the Refuge because of the potential public access and the prospect of being able to hunt close to home. Many look to the Stone Lakes Refuge as the potential sole opportunity for public hunting in Sacramento County. They want a place where they can hunt locally, without having to drive a long distance. They expressed a need for a hunting program for hunters who do not belong to a duck club.

Others were concerned whether there are adequate bird populations to support observations and hunting and whether hunting causes too much disturbance.

Hunters expressed their hope that the Refuge would not be like Cosumnes River

Preserve, which they feel promised hunting programs and has failed to provide them.

There was strong consensus on developing a junior hunt program; some suggested it could be supported by volunteers with dogs, time and experience. Several people said that a Refuge hunting program should not be just exclusively for junior hunters. It should also be for adult hunters, both beginners and experienced.

The Refuge received many suggestions regarding the proportion of land to be used for hunting, but most felt that from 40 to 50 percent of the Refuge should be hunted. There was strong interest in splitting access between free roam and blind hunting, including floating blinds and two to four person blinds. There were many requests to carefully locate hunt and sanctuary areas. Blinds should be accessible to those with disabilities.

People also had suggestions regarding how hunting access should occur. Some felt that the Refuge should use a lottery/reservation system and both monitor and limit the number of hunters to assure a quality hunt. Many cited hunting programs at Sacramento, Colusa, Delevan and Gray Lodge as models. They would like to see adequate facilities, such as good land and water access with boat ramps, parking, restrooms and other amenities. A request was made to allow hunting from scull boats and to provide boats to hunters who do no have them.

One comment expressed concern that the Refuge would serve as a sanctuary and draw birds from Yolo (Bypass), negatively affecting hunting in Yolo.

Education/Interpretation

Numerous people commented on the value of the Refuge's educational resources. Several programs were noted, such as school field trips, events and special projects at local schools. Some felt that the primary focus of use for the Refuge should be educational. They would like to see more education programs, including college level research projects. The Refuge should work with teachers to develop a curriculum and teacher/docent training to enhance the Refuge visitation experience. It should also have a field trip coordinator.

The current limited access and Refuge facilities were noted. Comments asked that the Refuge develop trails and facilities for family use and school field trips. A visitor center and signs along trails would help students learn about the unique features of the Refuge. Having greater access to more areas of the Refuge would allow more community involvement. The Refuge should also consider other outreach sites and centers and do what it can to keep these activities free.

Several visitor improvements were suggested, from a visitor center to new interpretive trails. It was suggested that the money for these improvements would not likely come from Refuge funding, but from private fundraising efforts and other organizations.

Wildlife Observation

Several comments supported wildlife viewing, but stated that the priority must be to maintain habitat for wildlife. The Refuge should control access to prevent an impact on wildlife. They also want to be sure that there are no conflicts between wildlife observation, hunting and other uses.

There were several requests for more trails, good interpretive signing and specific suggestions regarding auto tour routes. The Vic Fazio Yolo Basin Wildlife Area auto tour route was cited as an example for avoiding congestion.

An observation was made that bird watching lacks a funding base. Birdwatchers should pay a use fee to help cover the costs of facilities. A suggestion was made to see if money from DFG fines could be used to build Refuge facilities.

A specific comment was made that the State Railroad Museum is considering an excursion train for wildlife viewing between

the museum and Hood-Franklin Road. We should consider a cooperative venture with them where our interests overlap.

Other Comments

Comments requested other forms of recreational access, such as areas for gun dog training and field trials, bicycle access on existing roads and trapping fur bearing mammals to help reduce the need for a predator control program.

General

A comment was made that the waterways need docents to serve as an extra set of eyes. Two comments were very supportive of the expansion of open space land held by public trust agencies and organizations. This is particularly so for projects involving natural and native habitats, restoration and preservation.

Resource issues and opportunities were also identified during the scoping process. The results of this effort are described in Chapter 4, Problems and Opportunities.

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3 Refuge Resources

Ecoregion Setting

Stone Lakes National Wildlife Refuge is located in the Central Valley/San Francisco Bay Ecoregion. This Ecoregion encompasses the Sacramento-San Joaquin Delta located within the San Francisco Bay-Delta Watershed, with an estuary that encompasses roughly 1,600 square miles and drains more then 60,000 square miles of California's runoff (SFEP 2000). The Delta is composed of 57 leveed islands and over 700 miles of sloughs (DWR 2006). The Delta includes the confluence of the two longest rivers in California, the Sacramento and San Joaquin rivers. Following winter rains and Sierra snow melt, the Sacramento River and its tributaries would historically rise above the natural levees and inundate the floodplain. This system was dynamic, depositing rich alluvium, creating and cutting streambanks, providing conditions necessary the growth of riparian forests, changing the river's course and creating oxbow lakes and backwaters, clearing debris and streambeds, exposing and depositing gravel and sand, and creating salmonid spawning habitat. Toward the Delta, with the greater influx of sediment, more substantial natural levees were deposited where larger, more diverse riparian forests occurred (Katibah 1984).

Flyway Setting

The Refuge is located within the Pacific Flyway. The Pacific Flyway is used by millions of waterfowl and shorebirds for migration to wintering and breeding grounds. This Refuge is an important stopover area for migrating shorebirds in the fall and spring and provides important wintering habitat for waterfowl, supporting approximately 60 percent of the total population (CVJV 1990).

Natural/Historic Conditions

Historically the Central Valley supported about four million acres of wetlands with associated grasslands and riparian areas (CVJV 1990). Permanent and seasonal wetlands provided wintering and breeding habitat for waterbirds and other wildlife that flourished through the region. Prior to large scale disturbance, natural processes dominated the area. The Stone Lakes Basin is located within the 100-year floodplain. Historically, periodic floods would sweep through the area changing the course of the rivers and waterways and resetting natural community succession in the area. In addition, fire was a regular component of the area's ecosystem, sweeping through the area every three years.

The 1992 EIS (USFWS 1992) identified the location and extent of historic wetlands in the Refuge planning area, based on U.S. Geological Survey (USGS) atlas sheets of the Sacramento Valley surveyed in 1903-1910. Before 1903, activities related to flood control, water conveyance, and agricultural conversion had already reduced the extent of wetlands prior to the survey. The NRCS, formerly the Soil Conservation Service, mapped locations of hydric soils in 1990 that are generally assumed to correspond to the locations of historic wetlands.

Most of the open water, wetland, and riparian areas present on the Refuge in 1910 have since been drained and converted to agricultural uses. Today, over 95 percent of the riparian habitat in the Central Valley has been destroyed due to agricultural expansion and urbanization. Beach Lake and its associated wetland and riparian vegetation covered a much larger area before it was drained and farmed as recently as the 1960s (Figure 4) (USFWS 1992).

North Stone Lake, which is similar in size to its historic extent, had been drained, cleared and farmed prior to World War II. South Stone Lake was originally about three times its present size extending well west of the former Southern Pacific Railroad levee that now forms its western boundary.

An extensive area of freshwater wetlands 1.0 - 1.5 miles wide, was present in overflow areas east of Snodgrass Slough and between Snodgrass Slough and the Mokelumne River. Bear Lake, a narrow lake more than two miles long located between Lambert Road, Twin Cities Road, Snodgrass Slough and the railroad, no longer exists.

Overflow areas of the Cosumnes River supported extensive freshwater wetlands, about 1 mile wide, upstream of Grizzly Slough and downstream of Twin Cities Road. An unnamed lake about 1.5 miles long and 1,000 feet wide located east of Bruceville and west of the Cosumnes River, was drained and converted to agricultural land.

Little historical data is available that describes waterfowl use of the Refuge. However, maps of the Refuge developed by USGS prior to 1910 indicate that large, tidally influenced, permanent and seasonal wetlands existed, especially in the southern portion of the Refuge toward the Cosumnes River and at Beach, North Stone and South Stone lakes. These wetlands undoubtedly attracted large numbers of swans, geese, ducks and other waterbirds. Levee construction and channelization of rivers, creeks and other natural drainages and conversion of floodplains to agriculture have largely reduced the numbers of breeding and wintering waterfowl the Refuge can support. Historically, ducks were likely more abundant on the Refuge than they are at present (USFWS 1992). Local residents reported successful private duck hunting at South Stone Lake and the farmlands near Hood-Franklin and Lambert Roads from the 1940s until the early 1960s (USFWS 1992). Duck hunting at South Stone Lake was marginal by the early 1960s and has continued to decline during the last three decades (USFWS 1992).

Geographic and Physical Setting

Topography

The Refuge is part of a fairly level, but undulating, ancient alluvial plain incised by Morrison Creek, the Cosumnes River and several small creeks. Morrison Creek traverses the northern portion of the Refuge. The land slopes west to the Sacramento River. Elevations on the Refuge range from near mean sea level to 25 feet above mean sea level. Several small creeks traverse the western and northwestern portions of the Refuge.

While much of the Refuge was laser leveled in the past for agriculture, portions of it, particularly in the North Stone Lake area, still have their native undulating topography.

Geology

The Refuge is within the Great Valley Physiographic Province. The dominant geologic structure is the northwest to southeast-trending asymmetrical syncline that underlies the valley. A syncline is a fold in the rocks of the Earth's crust in which the layers or beds dip inwards, thus forming a trough like structure with a sag in the middle.

The Refuge is underlain by materials comprised of quaternary alluvial and intertidal depositions. Most of the Refuge is underlain by the Victor formation. The Victor alluvial formation was deposited in the late Pleistocene (about one million years ago) by materials washed from the Sierra Nevada. During the mid-Holocene era, about 5,000 years ago, basin, intertidal, levee and channel deposits accumulated along the Sacramento and Cosumnes rivers. The Victor formation consists of poorly sorted alluvial materials that vary in size from clays to boulders. Erosion of the Victor Formation has led to accumulation of finer grained basin deposits along the Sacramento and Cosumnes rivers near the Delta. Intertidal deposits of soft mud and peat accumulated west of Snodgrass Slough at the margin of the Delta. More recently, natural levee and channel deposits have accumulated along the Sacramento and Cosumnes rivers.

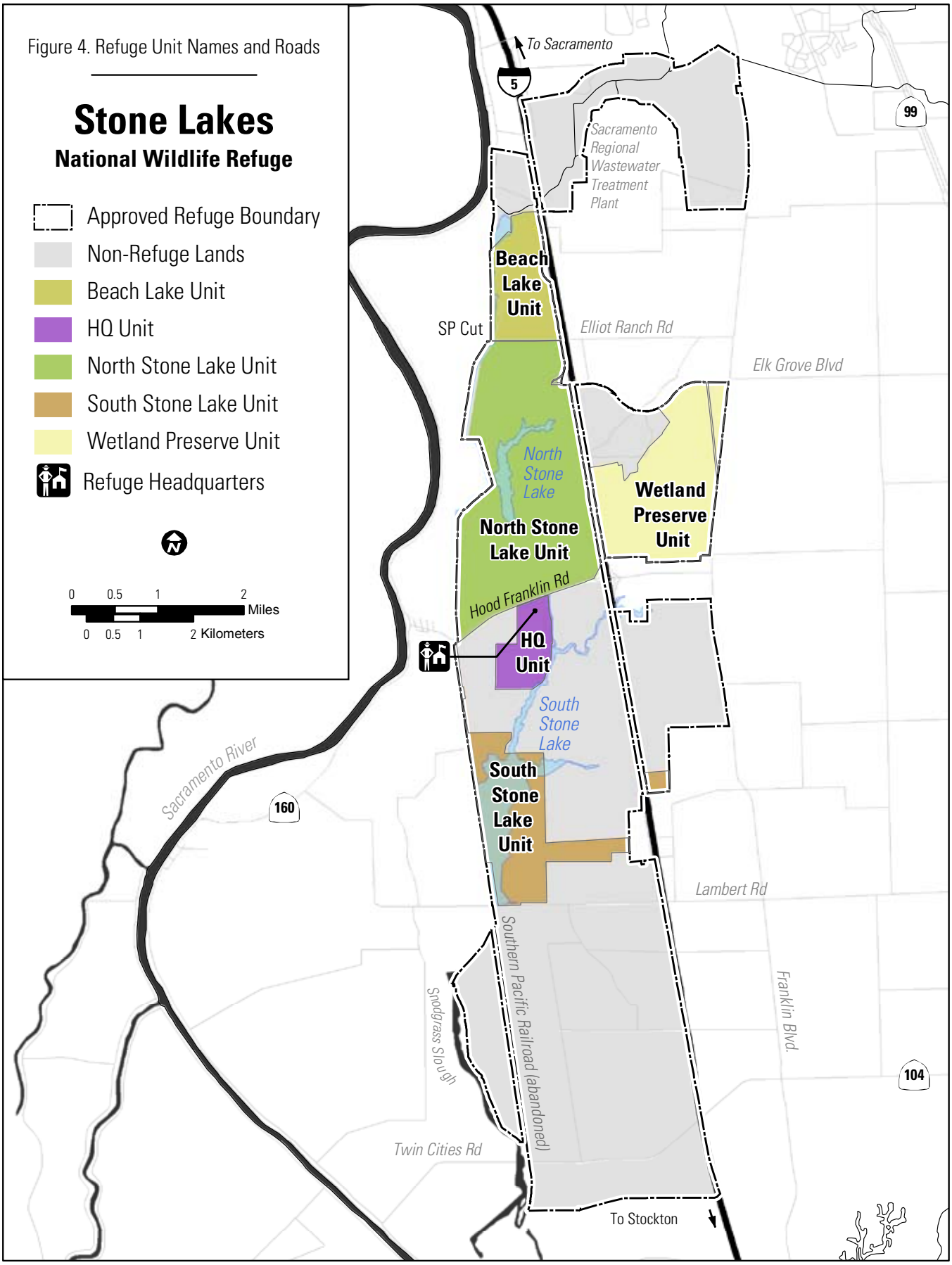


Figure 4. Refuge Unit Names and Roads
Stone Lakes
National Wildlife Refuge
Approved Refuge Boundary
Non-Refuge Lands
Beach Lake Unit
HQ Unit
North Stone Lake Unit
South Stone Lake Unit
Wetland Preserve Unit
Refuge Headquarters
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
To Sacramento
5
99
Sacramento Regional Wastewater Treatment Plant
Beach Lake Unit
SP Cut
Elliot Ranch Rd
Elk Grove Blvd
North Stone Lake
Wetland Preserve Unit
North Stone Lake Unit
Hood Franklin Rd
HQ Unit
South Stone Lake
South Stone Lake Unit
Sacramento River
160
Lambert Rd
Southern Pacific Railroad (abandoned)
Snodgrass Slough
Franklin Blvd.
104
Twin Cities Rd
To Stockton

Soils

Two systems are used by the NRCS to describe the Refuge soils: general soil map units and detailed soil series. The general soil map units represent broad patterns of the soil, topographic relief and drainage classes. Typically, each general soil map unit consists of one or more soil series. The general soil map can be used to compare the suitability of large areas for general land use (USFWS 1992). Soil series maps provide the finer level of detail necessary for site specific planning.

Refuge soils can be classified into three general soil types.

- Egbert Clays and Valpac Loams
- Dierssen sandy clay loams and clay loams
- Clear Lake Clays

Along the Sacramento River, the soils are characteristically very deep and nearly level. These soils are in the floodplain and originally supported extensive wetland and riparian habitats. The Egbert-Valpac general soil type forms a continuous one mile wide strip along the Sacramento River and Snodgrass Slough. It is comprised of somewhat poorly drained soils in areas with a high water table either throughout the year or seasonally. Prime farmland soils with high fertility are generally found in Egbert-Valpac general soil units.

The dominant general soil on the Refuge is Dierssen. Dierssen map units are comprised of somewhat poorly drained soils in areas with a perched water table and are moderately deep to deep over a cemented hardpan. Clear Lake soils, which are present in small areas east of the Dierssen soil unit, are also somewhat poorly drained and underlain by a shallow cemented hardpan. They have a seasonally high water table perched above the hardpan. Both the Dierssen and Clear Lake general soil map units are nearly level and are found in basins and on basin rims. Both areas are protected by flood control levees.

Clays are the most dominant soil particle on the Refuge; thus soils tend to be hydric. Hydric soils correspond to historic locations of wetlands and open water bodies, forming under frequent water saturation and the resulting anaerobic soil conditions. Silty and/or sandy soil belts are interspersed and are identifiable by the associated vegetation. Soils on the Refuge have been divided into soil mapping units. A total of 30 soil map units are found on the Refuge. These map units were used in the EIS (USFWS 1992) to predict the best areas for restoration.

Climate

The Refuge lies between the Coast and Diablo Ranges to the west and the Sierra Nevada to the east. The Carquinez Strait provides a sea-level gap between the Coast Ranges and the Diablo Range. The Carquinez Strait is about 55 miles southwest of the Refuge and the intervening terrain is mainly flat with rolling hills. The prevailing winds blow from the south, primarily due to marine breezes through the Carquinez Strait. During winter, the sea breezes diminish and winds from the north occur more frequently. However, winds from the south still predominate. The climate in the Refuge area is temperate and semiarid, with hot, dry summers and cool, damp winters. Annual temperatures in the area average highs of 52 degrees Fahrenheit in January to about 93 degrees Fahrenheit in July and lows of 38 degrees Fahrenheit in January to 58 degrees Fahrenheit in July. Annual precipitation averages about 17 inches. Dense “tule” fog is common in winter (USFWS 1992).

Air Quality

Air Pollution Control Agencies. The Federal Clean Air Act (42 U.S.C. §§ 7401, as amended) mandates the establishment of ambient air quality standards and requires areas that violate these standards to prepare and implement plans to achieve the standards by certain deadlines. The deadline for attaining both the ozone and carbon monoxide (CO) standards was August 31, 1988. Areas that do not meet Federal primary air quality standards are designated as “nonattainment” areas. Areas that comply with Federal air quality standards are designated as “attainment”

areas. Attainment and nonattainment designations are pollutant specific. Thus, while Sacramento County is a nonattainment area for particulate matter less than 10 microns in diameter (PM10) and ozone it is an attainment area for carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO_2) and lead.

Many agencies are involved in air pollution control, including the U.S. Environmental Protection Agency (USEPA 2006), California Air Resources Board (ARB), Sacramento Metropolitan Air Quality Management District (SMAQMD) and other air quality management districts (AQMDs).

In California, all agricultural burning is regulated jointly by the ARB and local AQMDs. Each day the ARB determines, based on recent and anticipated weather conditions, whether the following day will be a permissible burn day or a no-burn day. Each ARB's primary objective in making this determination is to control the amount of smoke from agricultural burning that reaches urban areas. On permissible burn days, few restrictions are placed on the amount of land that may be burned in the region. On no-burn days, fields may be burned only if a special permit has been issued by the local AQMD. Such burn permits are allocated based on an estimated allowable acreage for the entire region.

Ambient Air Quality Standards and Existing Air Quality in Sacramento County

Both the State of California and the Federal government have established a variety of ambient air quality standards. The following discussion focuses on the ambient standards and existing concentrations for PM10, ozone and CO for two reasons: Sacramento County's air quality currently exceeds the allowable ambient standards for PM10 and ozone and these pollutants, together with CO, are the primary pollutants that could be affected by the Refuge.

PM10. Health concerns associated with suspended particles focus on those particles small enough to reach the lungs when inhaled. Few particles larger than 10 microns in diameter reach the lungs. Consequently, both the Federal and State air quality standards for particulate matter have been recently revised to apply only to these small particles (designated as PM10).

The entire Sacramento Valley, including Sacramento County, is classified as a PM10 moderate nonattainment area (USEPA 2006). Both the 24 hour and annual California PM10 standards are violated on a regular basis in the Sacramento area (USFWS 1992). Sacramento County PM10 emissions are generated by a variety of sources, primarily entrained road dust, construction and demolition activities. Farming operations and agricultural waste burning are also important sources of PM10 in Sacramento County.

Ozone. Ozone is a respiratory irritant that also increases susceptibility to respiratory infections. Ozone causes substantial damage to leaf tissues of crops, natural vegetation and damages many materials by acting as a chemical oxidizing agent.

The Federal air quality standard for ozone is exceeded several times a year at monitoring stations in Sacramento County. As a consequence of the recorded violations of the Federal ozone standard, the entire Sacramento Valley Air Basin, including Sacramento County, has been designated a serious nonattainment area of ozone (USEPA 2006). This indicates that the ozone levels in the Sacramento Valley air basin are a potential threat to public health. Human health effects of ozone can include difficulty breathing and lung tissue damage (ARB 2006).

Ozone, the main component of photochemical smog, is primarily a summer and fall pollution problem. Ozone is not emitted directly into the air but is formed through a complex series of chemical reactions involving other compounds that are directly emitted. These directly emitted pollutants, also known as ozone precursors, include reactive organic gases (ROG) and NO_x (ARB 2006). The period required for ozone

formation allows the reacting compounds to be spread over a large area, producing a regional pollution problem. Ozone problems are the cumulative result of regional development patterns, rather than the result of a few significant emission sources. Motor vehicles are the primary source of NOx and ROG in Sacramento County and therefore, are primary contributors to regional ozone concentrations.

Carbon Monoxide (CO). CO combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Relatively low concentrations of CO can meaningfully affect the amount of oxygen in the bloodstream because CO binds to hemoglobin 220-245 times more strongly than oxygen. Both the cardiovascular system and the central nervous system can be affected when 2.5 percent to 4.0 percent of the hemoglobin in the bloodstream is bound to CO rather than to oxygen. State and Federal ambient air quality standards for CO have been set at levels intended to keep CO from combining with more than 1.5 percent of the blood's hemoglobin (U.S. EPA 1978, California ARB 1982).

Sacramento County has been designated as a nonattainment area for CO in the past, but is no longer considered a nonattainment area (USEPA 2006). Motor vehicle emissions are the dominant source of CO in most areas. As a directly emitted pollutant, CO disperses as it is transported away from the emission source, reducing pollutant concentration. Consequently, CO problems are usually localized, often the result of a combination of high traffic volumes and traffic congestion. Data from previous studies suggest that CO problems occur primarily near major traffic arteries having large amounts of commercial development. The Refuge is located on either side of Interstate-5 adjacent to and within the Sacramento urban area.

CO is primarily a winter problem. High CO levels develop primarily during winter when periods of light winds or calm conditions combine with the formation of ground level temperature inversions (typically in the evening through early morning period). These conditions result in reduced dispersion of vehicle emissions, allowing CO problems to develop and persist during hours when traffic volumes are declining from peak levels. It is unknown how elevated CO levels affect Refuge resources. Motor vehicles also exhibit increased CO emission rates at low air temperatures (USFWS 1992).

Contaminants and Water Quality

Water sources within the Refuge boundary include Morrison and Laguna creeks, Upper and Lower Beach lakes, urban runoff and agricultural drainage, Southern Pacific Cut (SP Cut), North and South Stone lakes and groundwater. Water quality monitoring by the SRCSD and the Service have been completed to date on the Refuge and in the surrounding area.

Water quality in North and South Stone Lakes is affected by limited Delta and San Joaquin River daily tidal flows moving up Snodgrass Slough through the Lambert Road bridge water control structure. Agricultural activities upstream of lakes may influence water quality from direct drainage into the lakes and the SP Cut. Groundwater discharge/recharge and Mokelumne River upflow via Snodgrass Slough to and from the lakes may also influence water quality in the lakes. The SRWTP does not discharge effluent into the Morrison Creek watershed. Instead, the treated effluent is dechlorinated and discharged directly to the Sacramento River near the community of Freeport.

The Refuge has many drainages that originate in urban and agricultural areas and empty into Refuge wetlands and lakes. In addition, a significant portion of land within the approved Refuge boundary is currently in agriculture. These areas are likely sources of nonpoint source contaminants, however they also provide important habitat for fish, aquatic invertebrates and foraging areas for birds that feed on these resources. Monitoring of aquatic habitats for nonpoint pollution is important, especially on this Refuge which is surrounded by urban development and actively managed agriculture.

The Sacramento Regional Wastewater Treatment Plant conducts ongoing quarterly water sampling for certain trace elements at several locations along Morrison Creek, Laguna Creek, and Meadowlark and Black Crown lakes. Furthermore, the USACE sampled water from the Morrison Creek watershed from 1982 to 1984. Concentrations of cadmium (Cd), copper (Cu) and lead (Pb) exceeded the USEPA acute toxicity criterion for aquatic life in all samples. The DFG and SWRCB collected and analyzed largemouth bass (*Micropterus salmoides*) from Meadowlark Lake from 1985 – 1987 and analyzed for heavy metals and organochlorine pesticides (OCs). Elevated levels of mercury (Hg), Cu, chlordane, dacthal, total DDT and total polychlorinated biphenyls (PCBs) were detected. Environmental contaminants are clearly present in the Stone Lakes area, but have been poorly delineated.

Baseline sampling on the Refuge and in nearby areas was conducted by the Service in 1997. The Service collected water, sediments, crayfish, fish, and waterbird eggs and analyzed them for OCs, PCBs and trace elements. Generally low levels of trace elements were found in water and biota, and generally low levels of organic compounds were present in sediments and biota. Concentrations of certain trace elements exceeded the USEPA's threshold effects level in sediments. Concentrations of trace elements were consistently higher (relative to other sites) in sediments from Lower Beach Lake. Lower Beach Lake is the terminus of Morrison Creek and may accumulate contaminants that originate in the greater Sacramento metropolitan area. Further sampling and toxicity tests of water and sediments are needed to identify the source of the contamination in Lower Beach Lake and other nearby areas (USFWS 2003a).

Water, sediment and biota samples were collected from eight locations (three sites in Morrison Creek, two sites in North Stone Lake and three sites in South Stone Lake) in spring on 1997 (Thomas 1997). Samples were analyzed for dissolved oxygen, temperature, heavy metals (arsenic, cadmium, copper, lead, mercury, selenium and zinc), salts (sodium chloride, calcium ion and magnesium), Nitrate NO_3 and pH. Results indicate that levels of heavy metals, although present, were not sufficient to cause deleterious impacts to wildlife; concentrations of selenium in all five waterbodies tested are above levels recommended for the protection of aquatic life.

Additional sampling was conducted from December 1998 to January 2000 on stormwater runoff onto the Refuge. The water quality of the Refuge and surrounding areas is continuously being degraded by irrigation drainwater and urban drainage in the summer, and the flushing of accumulated pollutants via urban stormwater runoff in the winter. Water samples and water quality data (temperature, dissolved oxygen, conductivity and pH) were collected from 11 sites on the Refuge during four storm events from December 1998 to January 2000. Temperature, pH, dissolved oxygen and conductivity were within normal limits for all sites, except for dissolved oxygen at Morrison Creek, which was at or below 3.0 milligrams/liter (mg/L) during two of the storm events. Overall, trace element concentrations in stormwater entering the Refuge were relatively low. Seven of 16 trace element samples collected during the two storm events had copper concentrations above the hardness adjusted chronic criterion and of those, three were also above the acute criterion. Four of 16 samples had lead concentrations above chronic criterion. Only one sample out of 16 had a concentration of cadmium that would be considered significantly elevated above the hardness adjusted chronic criterion (3.75 times the criterion). Nearly all sites had Diazinon levels above DFG's proposed 50 mg/L chronic criterion; however, they did not all produce measurable toxicity when daphne (*Ceriodaphnia dubia*) were exposed to the samples. Two sites, one on the Lower Beach Lake Unit and another that flows into Lower Beach Lake, consistently showed levels of Diazinon that produced toxicity to

Ceriodaphnia along with detectable levels of chlorpyrifos. Concentrations of Diazinon at these sites ranged from 101 to 1,488 mg/L with measured toxicity units ranging from 3.2 to 3.5 (USFWS 2003b).

Sacramento County's National Pollutant Discharge Elimination System (NPDES) Municipal Permit requires that pollutants found in urban stormwater runoff be reduced to the maximum extent possible. Dry detention stormwater runoff treatment facilities were constructed as part of the 3,000-acre development east of the Refuge identified in the East Franklin Specific Plan and would likely be included in other projects as well. These detention basins are effective in reducing pollutants by 30 to 90 percent.

Discharge Water Quality Monitoring
The Central Valley Regional Water Quality Control Board (Regional Board) issued order No. R5-2006-0054, regulating discharges from irrigated lands, effective beginning July 1, 2006 and ending June 30, 2011 (CVRWQCB-CVR 2006). The order detailed an individual discharger conditional waiver of waste discharge requirements. The order states that individual dischargers can seek coverage under the Individual Discharger Conditional Waiver or under the Coalition Group Conditional Waiver, by joining a coalition group. The conditional waiver requires Dischargers to pay a fee to the State Water Board. The Water Quality Control Plan for the Central Valley Region designates beneficial uses and establishes water quality objectives (CRWQCB-CVR 2004).

During the development of the irrigated lands waiver the Regional Board included discharges from "managed wetlands" in the definition of irrigated lands (USFWS 2004). However, the term "managed wetlands" is not defined by the Regional Board. There is a broad range of management activities that occur on Refuge wetlands. Some forms of management are relatively passive while others are very intensive due to enhance habitat for endangered and threatened species as well as migratory birds.

During the development of the waiver, the Service objected to being included under the waiver and recommended that a separate waiver be developed for managed wetlands. The Regional Board recognized that wetland discharges were sufficiently different than agriculture and a separate waiver would be appropriate but they did not have sufficient funds and staff to develop a separate waiver at the time. Thus the Regional Board's irrigated lands waiver and its requisite monitoring programs are primarily designed to address pesticide discharges from agriculture and does not take into consideration the differences and uniqueness of wetlands.

Meeting the waiver requirements is at best awkward for wetland managers, including the Refuge, because the irrigated lands waiver is designed to address discharges from irrigated agriculture. In evaluating the irrigated lands waiver requirements, the Service believes that the monitoring requirements for an individual discharger under the waiver are more appropriate for wetland discharges. They require monitoring of pesticides and toxicity only if certain chemicals or pollutants of concern are discharged, whereas the primary monitoring program for coalitions requires monitoring of all pollutants of concern since a coalition is more likely to represent a large variety of pesticide uses and discharge types.

The Refuge manages seasonal and permanent wetlands on the South Stone Lake, Headquarters and Beach Lake Units totaling approximately 335 acres. Periodic draw downs of the permanent wetland impoundments on the Beach Lake Unit is done when vegetation, such as cattails, covers more than 75 percent of the wetland and to control weeds and undesirable fish species, such as carp. During years with no restrictions on water use, flood ups of seasonal wetlands begin in early to mid-September and continue through late fall depending on rainfall. Drawdowns commence in early April and continue through mid-June. Seasonal wetland

drawdowns are accomplished through a combination of evaporation and opening of water control structures. Depending on annual rainfall, flood waters are pumped out of the Sun River property of the South Stone Lake Unit to minimize damage to infrastructure and facilitate draw downs. Supplemental summer irrigation of seasonal wetlands to stimulate desirable plant growth for migrating waterfowl is done in late July and early August to a maximum depth of 12 inches for 24 hours and then drawndown by opening water control structures within a few days.

Only one type of discharge to waters of the State, as defined in Regional Board order No. R5-2006-0054, occurs on the Refuge: storm water runoff from the Refuge during flooding events. Discharge to waters of the State is defined by order No. R5-2006-0054 as "Surface discharges, such as irrigation return flows, tailwater, drainage water, subsurface drainage generated by irrigating crop land or by installing and operating drainage systems to lower the water table below irrigated lands (tile drains), stormwater runoff flowing from irrigated lands, stormwater runoff conveyed in channels or canals resulting from the discharge from irrigated lands, and/or operational spills containing waste" (CVRWQCB-CVR 2006). See "Current Management Practices: Wetlands" in Chapter 3 for a detailed discussion of Refuge wetland management practices.

Pesticide Use and Toxicity Testing

The Service does not propose to do toxicity testing of its wetland discharges. All pesticide use on the Refuge, is part of an Integrated Pest Management (IPM) plan and adheres to pesticide label instructions, Intra-Service Section 7 Consultations under the Endangered Species Act, Sacramento County pesticide bulletin protective measures for threatened and endangered species, buffer requirements and other appropriate best management practices.

Since the mid-1990s, the Refuge has collaborated with a number of private, local and state entities as a participant in the Stone Lakes Basin Water Hyacinth Control Group (SLBWHCG). As a result of water hyacinth control efforts to date, the extent of plant infestations has been reduced to an estimated 30 to 35 acres. With continued applications, it is anticipated that beyond 2006, control efforts may be scaled back to occasional treatments (two to three per week) during the hyacinth growing season to spot-treat small infestations.

The Stone Lakes Basin water hyacinth control program is permitted under a Statewide National Pollution Discharge Elimination System (NPDES) General Permit (No. CAG990005) for discharge of aquatic pesticides. Field crews with the Service and the SRCSD conduct chemical control of water hyacinth on approximately 670 acres of open water habitats on Lower Beach Lake, SP CUT (the borrow channel for the former Southern Pacific Railroad), North Stone Lake and South Stone Lake and its tributaries. Control activities occur in natural lakes and sloughs as well as man-made irrigation or drainage ditches and channels. Treated waterways lie within lands owned by the Service, the State of California, Sacramento County and a number of private landowners. Since infestations of water hyacinth within the Basin have been greatly reduced due to past efforts, it is anticipated that a steadily decreasing quantity of herbicide will be needed as the program becomes more of a maintenance operation. To comply with the monitoring and reporting requirements of the NPDES General Permit, the Refuge and SRCSD provide an annual report to the California Regional Water Quality Control Board summarizing aquatic pesticide applications and the results of water quality monitoring for the water hyacinth control program.

The Refuge also cooperates with Sacramento-Yolo Mosquito Vector Control District (SYMVCD) to mitigate the risk of mosquito borne diseases. See Appendix A, Compatibility Determination for Monitoring and Control of Mosquitoes for detailed information. The SYMVCD and the Service rely on a full range of

IPM techniques to manage mosquito populations, including wetland design features, water and vegetation management, biological control and chemical control of larval or adult mosquitoes. As a result of IPM practices larvicide applications on the Refuge have been limited to small acreages and adulticides have historically been used infrequently (i.e., three ground ultra-low volume applications during 10 years). Largely due to the 2005 detection of West Nile Virus, the Refuge received ground ultra-low volume applications of the adulticide pyrethrin on 18 occasions in 2005 and six applications to date in 2006. Additional applications of adulticides are likely during the remainder of the 2006 season. .

Since the majority of Refuge uplands are not irrigated they do not technically fall under the irrigated lands waiver. The IPM methods that the Refuge uses to control weeds include burning, mowing, discing and application of herbicides including Roundup (glyphosphate) and 2, 4-D. Multiple treatments on the same acreage in one year are rare and are usually spot applications. Also, since these are Refuge uplands, virtually all areas where applications occur have vegetated buffers between applications and any waterbodies.

While irrigated agriculture is conducted within the approved Refuge boundary, it is not conducted on lands under the control (i.e., fee title ownership, cooperative management agreement, conservation easement) of the Refuge. While participating in a watershed monitoring coalition group with adjacent irrigated agricultural producers is a possible option, discharge from adjacent agricultural lands, not managed by the Service, is ultimately the responsibility of the discharger.

The Refuge, by policy and mandate, is managed utilizing many of the best management practices to reduce pesticide and fertilizer runoff, they are considered the basic elements of good refuge habitat management. Refuge policy mandates limited use of pesticides only after physical or other means (e.g., controlled burns, grazing, mowing) are used and after review and approval by management. Most herbicide treatments are a part of long-term habitat restoration and management plans on uplands where treated areas are being restored to native habitat. Except for approximately 490 acres of irrigated pasture land, Refuge uplands are not irrigated.

All applications of herbicides on Refuge uplands occur where there are natural vegetated buffers from aquatic habitats. Many riparian areas have understory vegetation that minimizes potential drift into waterbodies. Also, aerial applications are not utilized on the Refuge. Applications for upland weeds are typically spot treatments of discrete stands of plants and multiple applications on the same acreage in one year are rare . For these reasons the Service does not propose to do toxicity testing of its wetland discharges.

Pesticide Monitoring

The Refuge and SRCSD will continue monitoring of water quality required under the NPDES General Permit for the application of aquatic herbicides for the water hyacinth control program. Given that minimal discharge, if any, occurs from the Refuge and that water quality monitoring is already occurring, the Refuge intends to file as an individual discharger, under the Central Valley Regional Water Quality Control Board's, Irrigated Lands Conditional Waiver for water dischargers.

Water Quality is further discussed in Chapter 4.

Hydrology

The Refuge lies within the Beach-Stone Lakes Basin in the northeast portion of the Sacramento-San Joaquin Delta. This Basin is within the lower watershed of the Morrison Creek drainage, with the Sacramento River to the west and the Mokelumne and Cosumnes rivers nearby to the southeast (Figure 1). The lower Morrison Creek watershed governs the surface water flow patterns over the Refuge. This 180-square-mile system of streams and

floodplain originates in eastern Sacramento County and includes portions of the City of Sacramento, Morrison, Unionhouse, Laguna, Elk Grove and Elder creeks. Streamflows in these channels are affected by storm runoff, springs, urban drainage, groundwater pumping for irrigation, water supply and diversions and surface storage ponds located throughout the watershed. Waters on the Refuge are also influenced by the Cosumnes and Mokelumne rivers, especially during floods when water from the two rivers backs up the Southern Pacific Railroad borrow canal (SP Cut).

The Morrison Creek stream group drains a large urban and agricultural watershed that includes Laguna and, Morrison creeks and Beach Lake. Many commercial and industrial sources contribute runoff to Morrison Creek. Most streams are intermittent and historically dry during the summer. Today, urbanization and agricultural practices in this watershed have resulted in low summer flows consisting of runoff from irrigation, wastewater flows and agricultural return flows (USFWS 1992).

Elevations in the Morrison Creek watershed range from 300 feet above mean sea level (MSL) in the northeast and slope gently down to sea level in the Beach-Stone Lakes Basin in the southwest. Construction of a reclamation district levee before the turn of the twentieth century divides Upper Beach Lake, which extends northeastward under Interstate-5, from Lower Beach Lake. This levee directs water draining down Morrison Creek from Upper Beach Lake to an electric pump (City Sump 90) that discharges it directly into the Sacramento River near the town of Freeport.

During winter high-flow periods when Upper Beach Lake rises 3 feet above MSL, water overtops the dike dividing Upper and Lower Beach Lake and spills into Lower Beach Lake and the Southern Pacific railroad borrow ditch (SP Cut). Water then continues south to North Stone Lake, Hood-Franklin Road and South Stone Lake; passes through the Lambert Road Bridge flood control structure; and then enters Snodgrass Slough. Snodgrass Slough provides a surface hydrologic connection for the Basin and the Sacramento-San Joaquin Delta near the town of Locke (Jones and Stokes Associates 1989). Nearly all the lands within the approved Refuge boundary are within the 100-year floodplain.

Also see Chapter 4, Hydrology.

Water Supply

Water sources available for maintenance and management of Refuge fish and wildlife habitats and irrigation include: runoff from local sources such as the Morrison Creek drainage, shallow groundwater and surface flows from Snodgrass Sough. Surface flows from direct precipitation and surplus irrigation returns within the Beach-Stone Lakes Basin provide water sources for habitats and farming operations adjacent to the SP Cut. The Basin and SP Cut are also used as a tailwater and stormwater runoff drain for reclamation districts lying to the west.

Interception of shallow groundwater is used to sustain habitats and agricultural lands within the Refuge and the Beach-Stone Lakes Basin. Due to irrigation withdrawals, there is a groundwater depression in the water table south and east of the Refuge area. This groundwater depression creates a gradient away from the Sacramento River and locally induces flow from the river across the Refuge area toward the center of the depression. Therefore, groundwater that is intercepted by channels and wells within the Beach-Stone Lakes Basin is likely seeping from the river.

In response to the daily tidal cycle, water levels in Snodgrass Slough and the SP Cut are influenced by operation of a slide gate and flap gates on the Lambert Road Bridge flood control structure; diversion of water by various upstream users, including the Refuge and operation of the Delta Cross Channel by the California Department of Water Resources for the State Water Project. South to north flows of surface water occur through the Lambert Road Bridge flood control structure and these

reverse flows play a substantial role in sustaining the water supply in the Beach-Stone Lakes Basin.

Biological Resources

Plant Communities

Vegetation communities are categorized below as grassland, riparian, woodland or wetland (Figure 5. Vegetation Map). Agricultural crops, vineyards, and urban developments are only addressed on the Vegetation Map.

Grasslands. Grasslands on the Refuge are broken into three categories: annual grassland, perennial grassland and irrigated pastures. Grasslands are open habitats supporting grasses and forbs with little or no woody vegetation. The gently rolling terrain surrounding North Stone Lake is covered with large areas of annual grasslands mixed with seasonal wetlands.

Annual. Most of the grasslands in California are dominated by annual, nonnative grasses and forbs as a result of cultivation, livestock grazing, changes in fire regimes and other disturbances (Heady 1988). Characteristic species include the dominant species, wild rye (*Lolium* sp.), as well as wild oats (*Avena fatua*), bromes (*Bromus* spp.) and filarees (*Erodium* spp.). Some annual grasslands are interspersed with native perennial grasses and forbs. Restoration and management are a focal part of grassland management for native grasses and forbs, such as creeping wild rye and California poppy (*Eschscholzia californica*), as well as many other species. The grazing regime is the primary tool, used by managers, to enhance native grassland species; however, prescribed burning, water manipulations, mowing and discing are also utilized. See the section on "Grasslands" under "Current Management" later in this chapter for more information.

Perennial. Before Euroamerican settlement, most of the Central Valley grassland was dominated by native purple needlegrass (*Nassella pulchra*). Open areas between the tussocks of this perennial bunchgrass supported many wildflowers, including owl's clover (*Orthocarpus purpurascens*), lupine (*Lupinus* spp.), brodiaea (*Brodiaea* spp.) and many others. This native grassland community, known as valley needlegrass grassland, has been almost completely replaced by annual grassland. Remnants of valley needlegrass grassland occur as small patches, usually in marginal habitats, such as undisturbed moist sites and areas protected from grazing or only lightly grazed. Valley needlegrass grassland may occur on the Refuge, although no occurrence has been identified. Another native perennial grassland that was once common is the valley wild rye grassland, dominated by creeping wild rye and associated with California mugwort (*Artemisia* spp.) and stinging nettle (*Urtica dioica*). Patches of this grassland occur on the Refuge and are being actively restored.

Irrigated Pasture. Irrigated pastures on the Refuge are irrigated and optimally grazed in the summer months (June through August) to promote and enhance native vegetation. Grazing is monitored to provide a mosaic of habitats, thus increasing biodiversity. Monitoring consists of visual calibration and measuring residual dry matter in pounds per acre. These pastures support a good ratio of forbs (eg., clovers, lupines, poppies and succulent grasses) to grasses, which provide valuable forage for white-faced ibis (*Plegadis chihi*), geese, black-bellied plovers (*Pluvialis squatarola*) and others. Currently, irrigated pastures, found on the North Stone Lakes and Gallagher properties, play a valuable role in habitat and wildlife management.

Grassland Wildlife. Grassland habitats are important foraging areas for many species. Less than 1 percent of California's native grassland remains due mainly to advances in large-scale irrigation in the 1930s; therefore, grassland management plays a vital role in contributing to the Refuge System's biological integrity, diversity and environmental health. Refuge grassland management promotes grasslands at varying heights and densities in order to create a mosaic of grassland habitats at the ecosystem level. Species utilizing grasslands

Figure 5. Land Cover

Stone Lakes National Wildlife Refuge

1 0.5 0 1 Miles

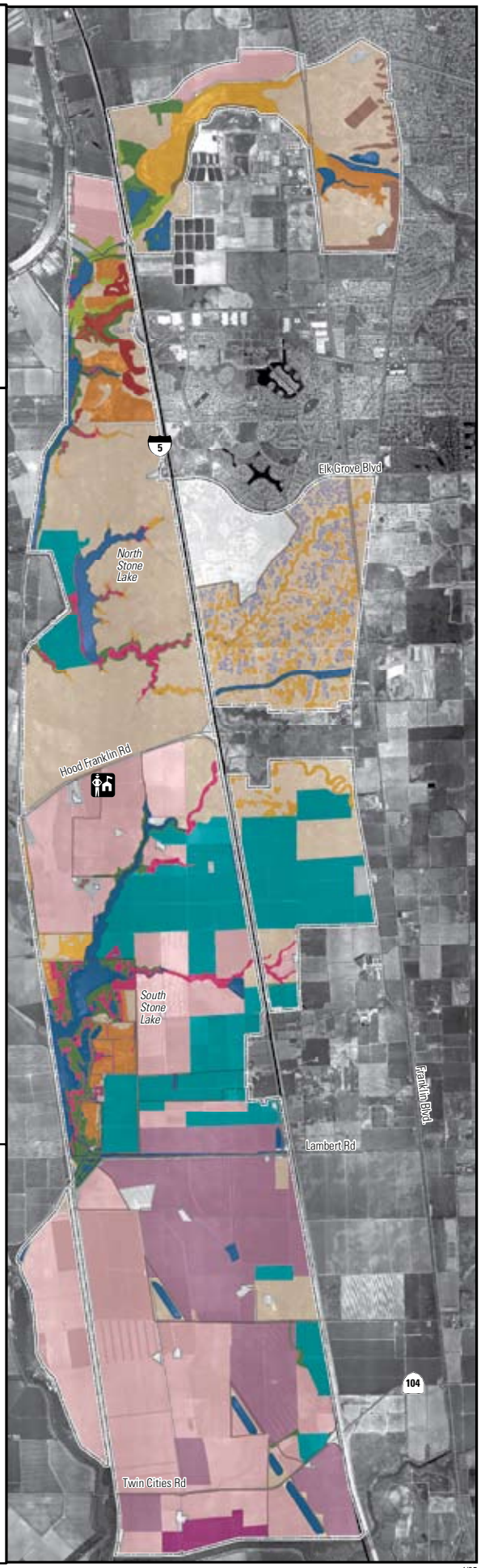
1 0.5 0 1 Kilometers

Land Cover

- Approved Refuge Boundary
- Agricultural Croplands
- Open Water / Aquatic Bed
- Perennial Marsh
- Cottonwood Willow Riparian
- Developed
- Disturbed/Fallow/Bare Land
- Grasslands
- Irrigated Pasture/ Wet Meadow
- Managed Permanent Wetland
- Managed Seasonal Wetland
- Mixed Riparian
- Orchards
- Riparian Scrub
- Passive Seasonal Wetland
- Upland Forest
- Valley Oak Riparian
- Vernal Pools
- Vineyard

Land Status

- Cooperative Agreement
- Conservation Easement
- Non-Refuge Lands
- Owned in Fee Title



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dominated by shorter grasses include birds of prey such as northern harriers (*Circus cyaneus*), white-tailed kites (*Elanus leucurus*), red-shouldered hawks (*Buteo lineatus*) and Swainson's hawks; shorebirds such as the black-bellied plover; wading birds such as white-faced ibis, great blue herons (*Ardea herodias*) and great egrets (*Ardea alba*); tree swallows (*Tachycineta bicolor*), cliff swallows (*Petrochelidon pyrrhonota*), barn swallows (*Hirundo rustica*) and other species of birds. Species utilizing taller grass habitats include savannah and white-crowned sparrows (*Passerculus sandwichensis, Zonotrichia leucophrys*) , western meadowlarks (*Sturnella neglecta*), California horned larks (*Eremophila alpestris*), loggerhead shrikes (*Lanius ludovicianus*) as well as mammals such as coyote (*Canis latrans*), deer mice (*Peromyscus maniculatus*), pocket gophers (*Thomomys bottae*), black tailed hares (*Lepus californicus*), California voles (*Microtus californicus*) and California ground squirrels (*Spermophilus beecheyi*). Since species often utilize more than one habitat type, the aforementioned habitats and their associated species are generalizations.

Riparian Forest. Riparian forests support the densest and most diverse wildlife communities in the Sacramento Valley. The diversity of plant species and growth forms provide a variety of food and microhabitat conditions for wildlife. The unique combination of surface water and groundwater, fertile soils, high nutrient availability and layered vegetation provide diverse conditions for wildlife. North and South Stone Lakes support riparian scrub and forest habitats along with marshes dominated by cattail (*Typha* sp.), tule (*Schoenoplectus acutus* var. *occidentalis*), smartweed (*Polygonum* sp.) and seasonal wetlands. Riparian habitat is also supported along some of the ephemeral swales and stream courses found in the Refuge.

Riparian forests support the densest and most diverse wildlife communities in the Sacramento Valley.
Photo by USFWS

Riparian areas are particularly important to migratory wildlife as they provide corridors along migration routes. It is important to maintain the integrity and continuity of riparian corridors which provide nesting and foraging habitat and shelter from inclement weather and predation. For these reasons, riparian restoration and management is a vital part of the Refuge's habitat and wildlife management. Three types of riparian forests occur on the Refuge: cottonwood, mixed, and valley oak (*Quercus lobata*). Mature riparian forests are diverse, multilayered communities associated with occasional to frequent flooding and perennial subsurface water.

Cottonwood Riparian Forest. Cottonwood riparian forests occur along perennial streams where inundation occurs every spring. The forest canopy is dominated by Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*) typically draped with California grape vines (*Vitis californica*). The understory often supports California box elder (*Acer negundo* var. *californicum*), California blackberry (*Rubus ursinus*), white-stemmed raspberry (*Rubus leucodermis*), buttonbush (*Cephalanthus occidentalis*) and blue elderberry (*Sambucus mexicana*).

Mixed Riparian Forest. Mixed riparian forests occur in areas where the floodwater inundation occurs more often and for longer periods of time than valley oak and less often and for shorter duration than cottonwood.

Canopy dominants include Fremont cottonwood, valley oak, Goodding's willow, red willow (*Salix laevigata*), yellow willow (*Salix lucida*), California black walnut (*Juglans hindsii*) and California sycamore (*Platanus racemosa*). Common understory dominants include California box elder, Oregon ash (*Fraxinus latifolia*), poison oak (*Toxicodendron diversilobum*) and buttonbush. California grape envelops trees and shrubs in this area, giving this forest a jungle-like appearance.

Valley Oak Riparian Forest. The highest portion of the floodplain with the least frequent inundation supports the valley oak riparian forest. Valley oak riparian forest persists in well-drained soils which are not extensive within the Refuge boundary. The dense forest canopy is dominated by valley oak with associated tree species of Oregon ash, California sycamore, and California black walnut. The understory typically supports annual grasses, however, moister soils support vines and shrubs, such as poison oak, California blackberry and wild rose (*Rosa californica*).

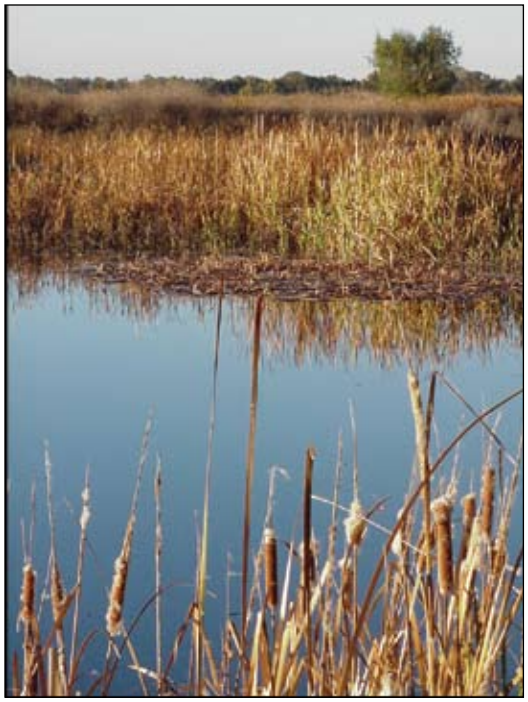
Valley Oak Woodland. Scattered valley oaks form woodland and savanna habitats on deep, well-drained alluvial soils. Typically the valley oak is the only tree found in this community. The understory is usually annual grassland, but moister sites support shrubs, such as poison oak and wild rose. Valley oak woodland is often transitional between valley oak riparian forest and valley oak savanna. Valley oak woodlands are not prominent on the Refuge because of a lack of appropriate soils and elevations to support their growth; however, valley oak woodland can be found on the Beach Lake Unit.

Wetlands. Two wetland vegetation types occur on the Refuge: perennial and seasonal. Seasonal vegetation can be divided into two categories, vernal pools and seasonal vegetation in actively managed wetland units or cells. Refuge wetlands are managed to maintain and enhance biodiversity, particularly for waterbirds, reptiles, amphibians and invertebrates. North and South Stone Lakes support wetlands dominated by cattail, tule and smartweed along with seasonal wetlands. The most extensive areas of freshwater marsh and aquatic bed vegetations in southern Sacramento County are at South Stone Lake.

The highest portion of the floodplain with the least frequent inundation supports valley oak dominated riparian forest, shown being restored above with the active support of volunteers from the Sacramento Tree Foundation.
Photo by USFWS

Perennial. Shallow, perennial wetland vegetation consists primarily of cattails, tules, cottonwood, willow, sedges (*Carex* spp.) and rushes (*Juncus* spp., *Scirpus* spp.). The vegetation varies in regards to the presence of tules and cattails, both of which require more saturated conditions than most seasonal wetlands provide. Conversely, wetlands also vary in regards to watergrass (*Echinochloa crus-galli*), swamp timothy (*Crypsis schoenoides*) and annual smartweed (indicative of seasonal wetlands), which require seasonal irrigation, as opposed to frequent or constant inundation.

Seasonal. Seasonal wetland vegetation on the Refuge is usually considered transitional between perennial wetlands and vernal pools. Seasonal wetland vegetation consists primarily of watergrass, swamp timothy, annual smartweed, curly dock (*Rumex crispus*), cocklebur (*Xanthium strumarium*), sedges and rushes. Seasonal wetlands are managed to promote vegetation that has relatively higher food value for migratory waterbirds, as well as to provide



The most extensive areas of freshwater marsh and aquatic bed vegetations in southern Sacramento County are at South Stone Lake, on the Refuge.
Photo by USFWS

cover and substrate for birds, mammals, reptiles, amphibians and invertebrates.

Vernal Pools. Vernal pools are ephemeral or seasonal shallow pools with an underlying impervious layer. The pools fill with rain water in the winter and retain water through the spring until they evaporate due to the Central Valley's intense summer heat. There are over 150 plant species associated with similar vernal pool habitat on the nearby Cosumnes River Preserve and 90 percent of the plants are native with more than half of them being endemic. Plants and animals associated with vernal pools are adapted to the unique environment of vernal pools. For example, orcutt grasses (*Orcuttia* spp.) have a submerged vegetative phase with floating leaves. As the pools dry, a terrestrial phase emerges. Typical vernal pool species include downingia (*Downingia* spp.), Sacramento and pilose orcutt grass (*Orcuttia viscida*, *Orcuttia pilosa*), popcorn flower (*Plagiobothrys* spp.), goldfield (*Lasthenia* spp.), vernal pool tadpole shrimp (*Lepidurus packardi*), fairy shrimp (*Branchinecta lynchi*), California tiger salamander (*Ambystoma californiense*), western toad (*Bufo boreas*) and the western spadefoot toad (*Spea hammondii*), although some of these species can also be found in some of the seasonal wetland units. The majority (98 percent) of the Refuge vernal pools can be found on the Wetland Preserve Unit, with the rest found on the Beach Lake Unit. Barely 12 percent of the vernal pools located on the Refuge are naturally occurring; the remainder have been created over the last 14 years as mitigation for vernal pool losses due to development. The Wetland Preserve Unit is owned in fee title by AKT Development Corporation and managed by the Refuge under a conservation easement.

Cattle grazing and prescribed fire are the primary management tools for maintaining and enhancing vernal pools with grazing considered most beneficial for vernal pool plants, invertebrates and amphibians (J. Marty, TNC, pers. comm.). Primary benefits of grazing come from phytomass removal and trampling of nonnative invasive annual grasses and other weeds in the pool margins and surrounding uplands. If left unchecked, these non-native plant species competitively exclude native vernal pool plants, especially around pool margins; reduce the inundation period of the pool which increases evapotranspiration; promote the grow of algae, which appears to negatively affect vernal pool crustaceans; and can inhibit the overland migration of vernal pool-breeding amphibians (Robins 2002). In addition to discouraging nonnative grasses, cattle also compact the soil to where grazed vernal pools hold water an average of 50 days longer than un-grazed vernal pools. This enhanced water retention capability also provides benefits for plant and wildlife species. The Wetland Preserve Unit of the Refuge is managed by the Service under conservation easement. Refuge staff are in the process of developing a grazing management plan in cooperation with the landowner that will protect vernal pool and other seasonal wetland habitats on the unit.

Wildlife

The diverse vegetation of the Beach-Stone Lakes Basin provides habitat for a range of mammals, birds, reptiles, amphibians and invertebrates. Wildlife can be found on all units of the Refuge. North and South Stone Lakes are especially important wildlife habitat areas because of the combination of grasslands, extensive riparian forest, seasonal and perennial wetlands and open water they support. A survey of North Stone Lake reported three amphibian species, eight reptile species, 101 bird species and 23 mammal species (USFWS 1992). The same survey also reported finding active nesting sites of

52 great egrets, 49 great blue herons, 61 black-crowned night-herons (*Nycticorax nycticorax*), 20 snowy egrets (*Egretta thula*), and 17 double-crested cormorants (*Phalacrocorax auritus*).

South Stone Lake is rich in riparian and wetland habitats supporting a diversity of amphibian, reptile, bird and mammal species. Two waterfowl hunt clubs were operated on the lake for many years prior to establishment as a refuge. However, hunting success has declined substantially during the last three decades. The primary waterfowl species likely to be encountered at South Stone Lake are mallard (*Anas platyrhynchos*), American wigeon (*Anas americana*), green-winged teal (*Anas crecca*) and occasionally, northern pintail (USFWS 1992).

Mammals. Grassland habitats support small prey species, such as deer mice, California voles, pocket gophers, California ground squirrels, desert cottontails (*Sylvilagus auduboni*) and black-tailed hares. Ungrazed grasslands with dense cover typically support more wildlife species than do grazed pastures or disturbed grasslands and some species prefer ungrazed pastures, such as badgers (*Taxidea taxus*), black-tailed hares, coyotes and California ground squirrels.

Valley oak woodlands supply acorns for western gray squirrels (*Sciurus griseus*) and black tailed deer (*Odocoileus hemionus*), which depend on the acorns as a critical autumn food source. Riparian forest and scrub provide habitats for many of the same species as the valley oak woodlands. Mature cottonwood, Goodding's willow and valley oak trees provide habitat for cavity-nesting species, such as bats, western gray squirrels, raccoons (*Procyon lotor*) and ringtails (*Bassariscus astutus*). Riparian understory plants, such as California grape, blackberry and elderberry, supply food sources for Virginia opossum (*Didelphis virginiana*), raccoon, striped skunk (*Mephitis mephitis*) and gray fox (*Urocyon cinereoargenteus*). As with birds, narrow and discontinuous riparian areas favor wildlife that forage near, in or over water, such as beavers (*Castor canadensisis*), river otters (*Lutra canadensis*) and bats. Riparian scrub provides cover and forage for California ground squirrels. Beavers preferentially feed on young cottonwood shoots and many small mammals feed on willow seeds. Bramble thickets offer escape cover to desert cottontails and black-tailed hares. Aquatic areas near riparian scrub habitats provide foraging habitats for carnivores and omnivores, such as river otters and gray foxes. Ground insectivores that inhabit riparian scrub include broad-footed moles (*Scapanus latimanus*). Striped skunks also prey on other small animals using the riparian scrub.

Perennial wetlands support river otters, muskrats (*Ondatra zibethicus*) and beavers. Upland species, such as black-tailed hares and desert cottontails, take cover and forage at the margins of wetland habitats.

Birds. Over 200 bird species have been sighted at in the Beach-Stone Lakes Basin (USFWS 2003a). About 90 species are confirmed to have nested on the Refuge. These species include numerous waterbirds, songbirds, and raptors. For a detailed list of birds see Appendix C.

Refuge grasslands are important foraging areas for many birds of prey, such as black-shouldered (white-tailed) kites, red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks, red-shouldered hawks, northern harriers, golden eagles (*Aquila chrysaetos*), American kestrels (*Falco sparverius*), prairie falcons (*Falco mexicanus*), great horned owls (*Bubo virginianus*) and barn owls (*Tyto alba*). Songbirds forage in grassland habitats, including loggerhead shrikes, yellow-billed magpies (*Pica nuttalli*), horned larks, water pipits (*Anthus rubescens*), western bluebirds (*Sialia mexicana*), savannah sparrows and a variety of swallow species. A few birds nest in grasslands, such as killdeer (*Charadrius vociferous*), ring-necked pheasants (*Phasianus colchicus*), northern harriers, western kingbirds (*Tyrannus verticalis*) and western meadowlarks.

Pastures on the Refuge and nearby farmland may represent an important stopover point for geese during spring migration; Canada, snow, white-fronted, and Ross' geese are regularly observed on Refuge pastures and waterbodies during spring.
Photo by USFWS

Ungrazed grasslands with dense cover typically support more wildlife species than do grazed pastures or disturbed grasslands. However, some bird species prefer grazed pastures, such as burrowing owls (*Athene cunicularia*), mourning doves (*Zenaida macroura*), Brewer's blackbirds (*Euphagus cyanocephalus*), turkey vultures (*Cathartes aura*), red-tailed hawks, black-shouldered kites, ring-necked pheasants and yellow-billed magpies. Pastures on the Refuge and nearby farmland may represent an important stopover point for geese during spring migration; more than 1,500 white-fronted geese (*Anser albifrons*) were observed on pasture near Hood-Franklin Road in the late 1970s (USFWS 1992) and large numbers continue to use grasslands adjacent to North Stone Lake. Canada (*Branta canadensis*), snow (*Chen caerulescens*) and Ross' (*Chen rossii*) geese are also observed on Refuge pastures and waterbodies regularly during spring. Except for some species such as robins, blackbirds, and mourning doves, vineyards provide virtually no suitable bird habitat, while orchards can provide some nesting habitat for birds of prey and food and cover for other birds and mammals.

The mature Fremont cottonwood, willow (*Salix* spp.) and valley oak trees of riparian vegetation provide nesting support for large birds, such as hawks, owls, American crows (*Corvus brachyrhynchos*), great egrets and great blue herons. Cavity nesting birds, such as woodpecker species and wood ducks (*Aix sponsa*), require mature stands. Dense understory consisting of blackberry (*Rubus* spp.), raspberry (*Rubus* spp.), California grape and elderberry produce important food for wildlife. Common birds that depend on the nectar, fruits, and seeds of riparian plants include California towhees (*Pipilo crissalis*), spotted towhees (*Pipilo maculatus*), Anna's hummingbirds (*Calypte anna*) and black-headed grosbeaks (*Pheucticus melanocephalus*).

The high quality riparian vegetation on the Refuge provides excellent habitat for neotropical migrants. The riparian and valley oak woodland vegetation supports an abundance of insect prey that sustain a high diversity and density of migratory and resident birds, including western flycatchers (*Empidonax difficilis*), yellow warblers (*Dendroica petechia*), MacGillivray's warblers (*Oporornis tolmiei*) and song sparrows (*Melospiza melodia*). Habitat destruction and nest parasitism by nonnative brown-headed cowbirds (*Molothrus ater*) may be primary causes of bird decline on the Refuge (USFWS 1992). Insectivorous species that have dramatically declined or been eliminated from the Central Valley's nesting avifauna, but have been seen on the Refuge, include: yellow-billed cuckoos (*Coccyzus americanus*), willow flycatchers (*Empidonax* spp.), yellow

warblers, yellow-breasted chats (*Icteria virens*) and blue grosbeaks (*Passerina caerulea*). Some riparian areas are narrow and discontinuous and favor wildlife species that forage in adjacent grassland or agricultural fields, including black-shouldered kites, American kestrels and western kingbirds. Riparian areas also provide perches and cover for species that forage in or over water, such as double-crested cormorants, green-backed herons (*Butorides virescens*), belted kingfishers (*Ceryle alcyon*), black phoebes (*Sayornis nigricans*) and violet-green swallows (*Tachycineta thalassina*). Riparian scrub provides cover and forage for California (valley) quail (*Callipepla californica*), ring-necked pheasants, American goldfinches (*Carduelis tristis*), lesser goldfinches (*Carduelis psaltria*) and California towhees. Bramble thickets provide potential nesting habitat for tri-colored blackbirds (*Agelaius tricolor*). Aquatic areas near riparian scrub habitats provide foraging habitats for ground insectivores, such as killdeer, spotted sandpipers (*Actitis macularius*) and western kingbirds.

Valley oak woodlands provide shade, shelter and nesting habitat for many bird species, including various woodpecker species and other cavity-nesting birds, such as American kestrels, western screech owls (*Megascops kennicottii*), white-breasted nuthatches (*Sitta carolinensis*) and western bluebirds. Acorns are an important food source for many species, including acorn woodpeckers (*Melanerpes formicivorus*), valley quail, northern flickers (*Colaptes auratus*) and scrub jays (*Aphelocoma californica*). Valley oak foliage and bark attract insects that are eaten by ash-throated flycatchers (*Myiarchus cinerascens*), plain titmice (*Baeolophus inornatus*), white-breasted nuthatches and northern orioles (*Icterus galbula*). Valley oak woodlands provide the best habitat on the Refuge for aerial-foraging species, such as acorn woodpeckers, ash-throated flycatchers and western wood-pewees (*Contopus sordidulus*). This habitat also offers perch sites for ground foraging species, such as western bluebirds and northern flickers. Swainson's hawks, red-tailed hawks and black-shouldered kites use valley oak woodlands as habitat because they require sturdy nesting sites with open canopy for easy access. Great blue heron and great egret maintain important rookeries in the valley oak woodlands near North Stone Lake and near Black Crown Lake on the Bufferlands Unit.

Perennial wetlands provide habitat for a variety of species, including pied-billed grebe (*Podilymbus podiceps*), American bitterns (*Botaurus lentiginosus*), American coots (*Fulica Americana*) and Virginia rails (*Rallus limicola*). Upland species, such as ring-necked pheasants and California quail, take cover and forage at the margins of wetland habitats. Diving and dabbling ducks and other aquatic birds also use the perennial wetlands of North and South Stone Lakes and the Bufferlands; however, most wintering waterbirds depend on the seasonal wetlands.

Waterbirds that make extensive use of the managed wetlands at North Stone Lake and the Bufferlands include grebes, herons, egrets, pelicans, cormorants, rails, cranes, plovers and other waterbird species (USFWS 1992). Flooded pastures and croplands and other seasonal wetlands provide foraging and roosting habitat for thousands of shorebirds migrating along the Pacific Flyway. For example, 4,090 shorebirds and 4,440 waterbirds were observed at Upper Beach Lake in a single survey on April 28, 1990 (USFWS 1992). A DFG aerial survey conducted in February 1972 recorded 5,750 waterfowl in the Beach-Stone Lakes basin. As many as 15,000 waterfowl were observed on other surveys (USFWS 1992). Dominant waterfowl species included tundra swans (*Cygnus columbianus*), snow geese, white-fronted geese, Canada geese, mallards, northern pintails, northern shovelers (*Anas clypeata*), cinnamon teal (*Anas cyanoptera*), green-winged teal, wood ducks and ruddy ducks (*Oxyura jamaicensis*). The Service also collected data on waterbird abundance in the Beach-Stone Lakes basin during January through March in 1982 and 1983. The basin supported two million annual

Refuge grassland habitats commonly support reptiles like this rehabilitated gopher snake, shown being released onto the Refuge.
Photo by USFWS

bird use days (one bird present for one day); of these 1.2 million were waterfowl (USFWS 1992). Based on the observations of local landowners and data collected by the Service, DFG and Ducks Unlimited, the Refuge appears to be most important as a feeding and resting area for waterfowl in the early spring rather than an important overwintering area. North and South Stone Lakes have the potential to be managed as waterfowl breeding and nesting areas during the spring and summer (USFWS 1992). Other wetland obligate bird species include common yellowthroats (*Geothlypis trichas*), red-winged blackbirds (*Agelaius phoeniceus*) and marsh wrens (*Cistothorus palustris*).

Open water portions of the Refuge's lakes, ponds and sloughs offer roosting habitat for waterbirds, such as pied-billed grebes, eared grebes (*Podiceps nigricollis*), common moorhens (*Gallinula chloropus*), American coots and a variety of waterfowl species. Diving and dabbling ducks and other water birds forage on submerged aquatic plants and associated invertebrates in aquatic beds associated with open water. Fisheries in open waters of Beach Lake, and North and South Stone Lakes provide an important food source for fish eating species, including American white pelicans (*Pelecanus erythrorhynchos*) and double-crested cormorants. In addition, double-crested cormorants nest at North Stone Lake (USFWS 1992).

Reptiles and Amphibians. Reptiles and amphibians can be found among the various habitat types on the Refuge. Common reptiles and amphibians on the Refuge include Pacific treefrogs (*Hyla regilla*), bullfrogs (*Rana catesbeiana*), western pond turtles (*Clemmys marmorata*), pond slider turtles (*Trachemys scripta*), western fence lizards (*Sceloporus occidentalis*), western terrestrial garter snakes (*Thamnophis elegans elegans*) and gopher snakes (*Pituophis catenifer*). Suitable habitat exists for the federally-threatened giant garter snake along sparsely vegetated lakes, sloughs and wetlands. Refuge grassland habitats commonly support gopher snakes, common garter snakes (*Thamnophis sirtalis*), California kingsnakes (*Lampropeltis getulus californiae*), western fence lizards and western toads. Valley oak woodland reptiles observed at North Stone Lake include western fence lizards, California alligator lizards (*Elgaria multicarinata multicarinata*), western yellow-bellied racers (*Coluber mormon*), Pacific gopher snakes, California kingsnakes and common garter snakes. Amphibians have also been seen in the valley oak woodlands at North Stone Lake, including bullfrogs, western toads and Pacific treefrogs. Reptiles seen in the riparian scrub include the ground insectivorous western fence lizard and the predatory gopher snake. Perennial wetland habitat provides breeding and foraging habitat for common garter snakes, Pacific treefrogs and bullfrogs. This habitat also has the potential to provide habitat for the giant garter snake. When standing water is available, amphibians such as California tiger salamanders, western toads and Pacific treefrogs use vernal pools for egg laying and

for the development of their young.

Fish. Fish are found in all bodies of water on the Refuge, including North and South Stone Lakes. Various surveys done from 1992 to present have yielded 30 species on the Refuge (See Appendix D, Fish Species Found on Stone Lakes NWR). Only five of the species observed, Sacramento blackfish (*Orthodon microlepidotus*), prickly sculpin (*Cottus asper*), hardhead minnow (*Mylopharodon conocephalus*), California roach (*Hesperoleucus symmetricus*) and sculpin are California natives. Common fish on the Refuge include mosquito fish, threadfin shad (*Dorosoma petenense*), black crappie (*Pomoxis nigromaculatus*), redear sunfish (*Lepomis microlophus*), catfish (*Ictalurus* spp.), largemouth bass, carp (*Cyprinus carpio*) and common bluegill (*Lepomis macrochirus*) (D. Vanicek , CSUS, 1999, B. Treiterer, USFWS, pers. comm.). Other introduced species include silverside (*Menidia beryllina*) and shrimp species. While many problems are associated with introduced fishes, they have a value for sportfishing (largemouth bass, catfish, etc.), controlling mosquitoes (*Gambusia* spp.), and as forage for other fish and wildlife.

North and South Stone Lakes are best described as shallow and eutrophic, characterized by enriched dissolved nutrient levels (such as phosphates) that stimulate growth of aquatic plants and algae. As the abundant plants and algae decay the dissolved oxygen levels are reduced by microbial blooms. Due to the abundant plankton, these lakes are dominated by planktivorous (plankton-eating) fish. The food chain is stimulated by nutrients from abundant bird use, which helps produce the dense phytoplankton population. The phytoplankton in turn support a large zooplankton population, which supports the fish. Piscivorous (fish-eating) fish are not abundant in the lakes. The SP cut is less turbid than the lakes and contains fewer planktivorous fish.

Aquatic habitats occurring on the Bufferlands of the SRWTP consist of Laguna and Morrison creeks and five lakes. A total of 22 fish species have been documented from Bufferlands waterbodies. Meadowlark Lake comprises 19 acres of permanent water and was created as a borrow pit for construction of Interstate-5. It is filled each winter from overflows of Morrison and Laguna creeks and has steep banks with almost no vegetation. Black Crown Lake covers 28 acres and is very similar in nature and origin to Meadowlark Lake. However, it has some vegetation for cover and shade, is connected to Morrison Creek, and has a more stable water level in summer. Nineteen and 21 species of fish have been documented from Meadowlark and Black Crown lakes, respectively. Nicolaus Pond is an 8 acre pond, fed with water from a leased aquaculture facility on the Bufferlands. The banks are gradual and contain some grassy areas and some emergent vegetation. Five species of fish have been found in this pond. Fishhead Lake was created as part of a wetland mitigation project. The lake consists of 13.5 acres of permanent water with an additional 30.5 acres of seasonal water. Tailwater from Laguna Creek Fish Farm feeds the lake almost year round. The banks are steep, but stable water levels have allowed emergent vegetation to become established. The lake contains 18 species of fish. The 6.2-acre Lost Lake was formed from an abandoned gravel mining operation. Most of the lake is about ten feet deep and steep sided. Five species have been found in Lost Lake.

About 16,000 lineal feet of Laguna Creek passes through the Bufferlands. It is not channelized and appears to be high quality fish habitat. The upper sections have gentle slopes and large patches of emergent vegetation while the lower sections are lined with mature riparian trees. A total of 14 species of fish have been found in the creek. A 15,000 lineal foot section of Morrison Creek runs through the Bufferlands and receives most of its summer water from Sacramento storm drains. Fish kills have been observed here in the past, possibly a consequence of impaired water quality. Above its confluence with Laguna Creek, Morrison Creek is highly channelized and appears to have little high quality

fish habitat. Some stretches of bank are vegetated; however, most banks are steep and bare when water levels recede during the summer. In summer, large patches of floating water primrose (*Ludwigia peploides*) sometimes cover the entire surface of the creek. Past the confluence, the banks are lined with riparian trees offering a higher degree of cover. Ten species of fish have been found in Morrison Creek.

Invertebrates. There has been no comprehensive invertebrate survey conducted at the Refuge. However, some surveys occasionally conducted by SYVCMD and refuge staff have found that aquatic vertebrates, such as grass shrimp, Louisiana swamp crayfish, clam shrimp (*Cyzicus californicus*), Odonata larvae (dragon and damselfly), Notonectiday larvae (backswimmers), cladocerans, copepods and water beetles (*Corixidae larvae*), inhabit seasonal and permanent wetlands and also the vernal pools.

Vernal pools are located on the Wetland Preserve, North Stone Lake and Beach Lake units of the Refuge. Please see the description of vernal pool fairy shrimp and vernal pool tadpole shrimp below. Two species of fairy shrimp, the vernal pool fairy shrimp and the vernal pool tadpole shrimp, have been identified in the pools.

Special Status Species

Stone Lakes provides or has the potential to provide habitat for Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA) threatened and endangered species.

Federally-listed Species

Vernal pool fairy shrimp (*Branchinecta lynchi*). The vernal pool fairy shrimp is an ESA listed threatened species and is a small (0.4 inches to 1.0 inch long) crustacean with a delicate elongate body, large stalked compound eyes and 11 pairs of swimming legs. This species is endemic to vernal pool habitats in California and southwestern Oregon (USFWS 1994).

Vernal pool fairy shrimp typically inhabit vernal pools with clear to tea-colored water, most commonly in grass or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands. They also may exist in alkaline vernal pools. The water in pools inhabited by this species has low total dissolved solids, low conductivity, low alkalinity and low chloride. Fairy shrimp feed on algae, bacteria, protozoa, rotifers and bits of detritus (USFWS 1994).

The primary threats to vernal pool fairy shrimp are the loss and alteration of habitat due to urban and agricultural development and random extinction by virtue of the small isolated nature of the remaining population.

Vernal pools are found on the Wetland Preserve and Beach Lake units. Vernal pool fairy shrimp have been documented within vernal pools on the Wetland Preserve Unit.

Vernal pool tadpole shrimp (*Lepidurus packardi*). The vernal pool tadpole shrimp is an ESA listed endangered species. Vernal pool tadpole shrimp are primarily benthic (living on the bottoms of the pools) animals that swim with their legs down. Vernal pool tadpole shrimp climb or scramble over objects, and plow along bottom sediments as they forage for food. Their diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (USFWS 2003c). Females disperse fully developed cysts into the pool, where the cysts are then deposited into the sediment. Vernal pool tadpole shrimp pass the summer months as dormant cysts in the soil. Some of the cysts hatch as the vernal pools are filled with rainwater in the next or subsequent seasons, while other cysts may remain dormant in the soil for many years. When winter rains refill inhabited pools, tadpole shrimp reestablish from dormant cysts and can become sexually mature within three to four weeks of hatching (Ahl 1991; Helm 1998). The tadpole shrimp will continue to grow as long as their vernal pool habitat remains inundated, in some cases for six months or longer. They periodically shed their shells, which can often be found along the edges of vernal pools where vernal pool tadpole shrimp occur. Mature vernal pool

tadpole shrimp range from 0.6 to 3.4 inches in length. Mature adults may be present in pools until the habitats dry up in the spring (USFWS 2003c).

Tadpole shrimp can be found in California's Central Valley and the San Francisco Bay area. The geographic range of this species includes disjunct occurrences in the Central Valley, from Shasta County to northern Tulare County and in the Central Coast Range from Solano County to Alameda County. The primary threats to vernal pool tadpole shrimp are the same as for the vernal pool fairy shrimp.

Vernal pools can be found on the Wetland Preserve and Beach Lake units. Vernal pool tadpole shrimp have been documented within vernal pools on the Wetland Preserve Unit.

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*, VELB). The valley elderberry longhorn beetle is an ESA listed threatened species. The VELB is a medium-sized beetle, typically about two cm long.

The VELB is associated with elderberry trees (*Sambucus* spp.) during its entire life cycle. The adults emerge from pupation inside the wood of these trees in the spring as their flowers begin to open. The exit holes made by the emerging adults are distinctive small oval openings. Often these holes are the only detectable clue that the beetles occur in an area. The adults feed on elderberry foliage until about June, when they mate. The females lay eggs in crevices in the bark. Upon hatching, the larvae begin to tunnel into the tree where they will spend one to two years eating the interior wood, which is their sole food source.

The elderberry tree is associated with riparian forests which occur along rivers and streams. Historically the VELB ranged throughout the Central Valley; however, recent surveys have revealed the VELB to persist only in scattered localities along the Sacramento, American, San Joaquin, Kings, Kaweah and Tule rivers and their tributaries. Over 95 percent of our riparian forests have been cleared in the past century for agricultural, as well as urban and suburban, and development uses (Smithsonian Zoological Park). The wood from these forests has also been used extensively as fuel and building materials. Additionally, extensive use of pesticides, grazing and other mismanagement have severely degraded otherwise undisturbed patches of riparian habitat.

There are no documented sightings of the VELB or of any exit holes on the Refuge. However, elderberry trees of appropriate size can be found on the Beach Lake Unit. New elderberry shrubs planted for mitigation on the South Stone Lake Unit are expected to reach the appropriate size for VELB habitat in the future.

Giant garter snake (*Thamnophis gigas*). The giant garter snake is an ESA listed threatened species. Historically, the range of this snake was the San Joaquin Valley from the vicinity of Sacramento and Antioch southward to Buena Vista and the Tulare Lake Basin (CDFG 2000). The current distribution extends from near Chico to Fresno County. This species is one of the most aquatic garter snakes and is usually found in areas of freshwater marsh and low gradient streams. Permanent wetlands are especially important as they provide habitat over the summer and early fall when seasonal wetlands are dry. Although the snake is absent from larger rivers (such as the Sacramento River), it has adapted to human made habitats, such as drainage canals and irrigation ditches, especially those associated with rice farming. Riparian woodlands do not provide suitable habitat because of excessive shade and inadequate prey resources (USFWS 1993).

Generally quite aquatic, these garter snakes forage primarily in and along streams, taking fish, amphibians and amphibian larvae (Fitch 1941). Most current food sources may be introduced species, such as carp, mosquito fish, and bullfrogs, because the native prey such as blackfish, thick-tailed chub (*Gila crassicauda*) and red-legged

frog (*Rana aurora draytoni*) are no longer available (Rossman et al. 1996). Courtship and mating normally occur soon after spring emergence. Young are born alive between mid-July and early September, usually in secluded sites, such as under the loose bark of rotting logs or in dense vegetation near pond or stream margins.

The giant garter snake is now very scarce throughout its range in the Central Valley. Populations have been eliminated or decimated by the elimination of natural sloughs and marshy areas. Heavy use of pesticides is also suspected as a contributing factor in the decline of this once abundant garter snake. Fortunately, protection of waterfowl habitat may allow it to survive in a small portion of its original range.

The giant garter snake was last documented on the Refuge 14 years ago in 1992 at Beach Lake. The species is presumed to be present throughout the Refuge where suitable habitat exists (Wylie 1997). The Refuge lies within the Sacramento Basin subpopulation of the giant garter snake.

Bald eagle (*Haliaeetus leucocephalus*). The bald eagle has suffered from habitat destruction and degradation, illegal shooting and contamination of its food source, most notably due to the pesticide DDT. The bald eagle is listed as an ESA threatened and CESA endangered species. Although there have been no documented sightings of the bald eagle on the Refuge, (DFG 2004) habitat exists for them on the Refuge.

State-Listed Species

Greater sandhill crane. The greater sandhill crane is a CESA listed threatened species. The Refuge and adjacent public and private lands provide habitat for greater and lesser sandhill (*Grus canadensis canadensis*) cranes. The California Central Valley provides wintering habitat for 6,000 – 6,800 cranes, nearly 14 percent of the world's total population of greater sandhill cranes (Pacific Flyway Council 1997). The San Joaquin-Sacramento Delta is one of the two most important winter use areas for the Central Valley population of greater sandhill cranes; over 61 percent of the Central Valley population has been recorded on the Delta (Ivey and Herziger 2001).

Historically, greater sandhill cranes were fairly common breeders on California's northeastern plateau (Grinnell and Miller 1944). The greater sandhill crane is now reduced greatly in numbers and breeds only in Siskiyou, Modoc, Lassen, Plumas and Sierra counties (James 1977; Remsen 1978; McCaskie et al. 1979). The subspecies winters primarily in the Sacramento and San Joaquin Valleys (Grinnell and Miller 1944) but can also be found near Brawley in Imperial County and Blythe, in Riverside County (Garrett and Dunn 1981), along with lesser sandhill cranes. Greater sandhill cranes formerly wintered more commonly in Southern California, but have declined greatly there and throughout their range. They are extremely rare outside of their known wintering grounds except while migrating over interior California. There have been a few coastal sightings from Marin County southward, but there are no records from offshore islands.

The Refuge's wintering cranes migrate southward from the northeast in September and October and northward in March and April. Cranes travel in great flocks, both day and night, with stops only for short periods to feed and rest. Migration is rapid and direct. In winter, cranes frequent dry grasslands and croplands especially near open and emergent wetlands (Grinnell and Miller 1944), although they may also feeds on dry plains far from water. When foraging, cranes prefer open treeless short grass plains, grain fields and open wetlands where predators can be easily seen (Grinnell and Miller 1944, Cogswell 1977). They feed mostly on cereal crops (e.g., newly planted or harvested) and will also consume grasses and forbs. Cranes also use their long bills to probe in soil for roots, tubers, seeds, grains, earthworms and insects. Larger prey, such as mice, small birds, snakes, frogs, and crayfish, are also taken (Terres 1980; Eckert and Karalus 1981). Fruits and berries are eaten if available (Eckert and Karalus 1981). Grazing can be detrimental to sandhill

crane, when they are nesting and fledging (Littlefield and Ivey 2002), however nesting is not known to occur on the Refuge.

Cranes roost at night in flocks standing in moist fields or in shallow water (Terres 1980). They also roost in expansive, dry grasslands, island sites, and wide sandbars (Johnsgard 1975; Eckert and Karalus 1981).

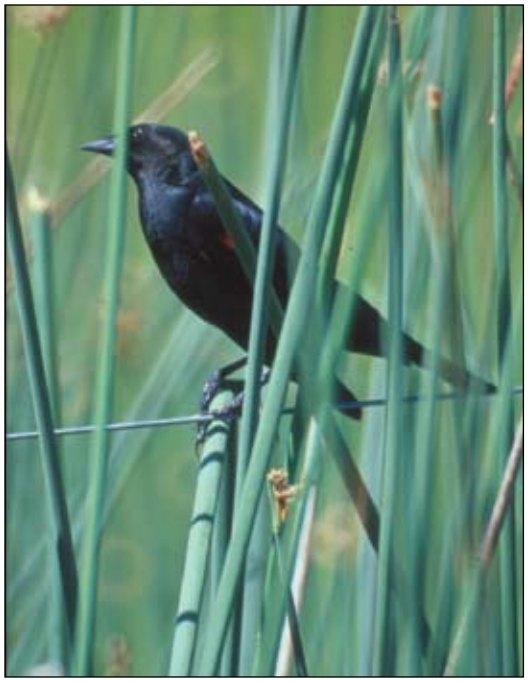
In California, sandhill cranes establish nesting territories in wet meadows that are often interspersed with emergent marsh habitat. The last statewide breeding population study in California was conducted in 1988. The breeding population in California was estimated to be 276 pairs. Favorable roost sites and an abundance of cereal grain crops characterize the cranes' preferred Central Valley wintering ground. Rice is used extensively by cranes near the Butte Sink area of Butte County and corn is the principal food source at most other Central Valley wintering areas, particularly in the Sacramento-San Joaquin Delta near Lodi in San Joaquin County. Irrigated pastures are chosen for resting sites throughout the wintering ground. A key requirement of wintering habitat is a communal roost site consisting of an open expanse of shallow water (CDFG 2000).

Currently, the estimate for greater sandhill cranes within their Pacific Flyway range is between 5,000 and 6,000 individuals. This species continues to experience threats on both wintering and breeding grounds by agricultural and residential conversion of habitat, predation, human disturbance and collisions with power lines (CDFG 2000).

Surveys indicate 300-350 greater sandhill cranes feed, roost and loaf on the Refuge during the winter season. The cranes roost and forage in managed impoundments, pastureland, and other agricultural land throughout and adjacent to the Refuge. Cranes are commonly seen on irrigated pastures on the South Stone Lake Unit and on the grasslands of North Stone Lake and the Wetland Preserve Unit. They can also be found on the Whitney (in the southeast corner) and Zacharias Island properties, lands that are not managed by the Refuge but are within the approved refuge boundary. In general, a mix of greater and lesser sandhill cranes can be found south of Hood-Franklin Road, with only greater sandhill cranes occurring north of Hood-Franklin Road.

When foraging, greater sandhill cranes prefer open treeless short grass plains, grain fields and open wetlands where predators can be easily seen.
Photo by USFWS

Swainson's hawk (*Buteo swainsoni*).
The Swainson's hawk is a State-listed threatened species. The Swainson's hawk is an uncommon breeding resident in the Central Valley (Polite 2000). Swainson's hawks breeding in the Central Valley appear to winter in Mexico and Columbia (CDFG 2001). Bloom (1980) estimated 110 nesting pairs, and a total of 375 pairs in California (Polite 2000). The diet of the Swainson's hawk is varied, although its staple in the Central Valley is the California vole, augmented with a variety of bird and insect species. Over 85 percent of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats. Swainson's hawks often nest peripherally to riparian systems of the valley, as well as within lone trees or groves of trees in agricultural fields. Valley oak, Fremont cottonwood, walnut and large willow are the most commonly used nest trees in the Central Valley, each with an average mature height of about 58 feet,



Many species of concern have been seen on the Refuge including this tricolored blackbird.
Photo by USFWS

and ranging from 41 to 82 feet tall. Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops and certain grain and row croplands. Unsuitable foraging habitat includes crops, such as vineyards, orchards, certain row crops, rice, corn and cotton crops. Suitable nest sites may be found in mature riparian forests, lone trees or groves of oaks, other trees in agricultural fields and mature roadside trees.

Declining numbers of Swainson's hawks are, in part, caused by loss of nesting habitat (Polite 2000). Converting compatible agricultural lands to residential and commercial developments and noncompatible agricultural activities are a serious threat to Swainson's hawks throughout California (CDFG 2000). Swainson's hawks have been seen on nearly the entire Refuge (B. Treiterer, USFWS, pers. comm.).

Other species that have been seen on the Refuge include the following State or Federal species of concern: white-faced ibis, tri-colored blackbird, western burrowing owl, oak titmouse (*Baeolophus inornatus*), white-tailed kite, loggerhead shrike, rufous hummingbird (*Selasphorus rufus*), lamprey (*Lampetra ayresii*), Pacific lamprey, small-footed bat (*Myotis ciliolabrum*) and Yuma myotis bat (*Myotis yumanensis*).

Wildlife viewing is the most popular wildlife-dependent activity among ecoregion residents with 56 percent of outdoor recreators participating.

Visitor Services

Ecoregion Scale

Wildlife viewing is the most popular wildlife-dependent activity among ecoregion residents with 56 percent of outdoor recreationists participating. About 41 percent of residents participate in freshwater fishing, 19 percent in saltwater fishing and 9 percent in hunting.

The population in the ecoregion is expected to rise by 47 percent between the year 2000 and the year 2020. Unmet demand appears to be highest in the region for wildlife viewing, trail hiking, picnicking, camping and freshwater fishing with this trend expected to continue. Outdoor recreationists in the Central Valley/San Francisco Bay Ecoregion tend to be mostly white (78 percent) with growing participation by the Hispanic and Asian-American communities. In general, residents of moderate or high family incomes have the greatest interest in wildlife-dependent recreation, both consumptive and non-consumptive types.

The nearest other national wildlife refuges are Antioch Dunes, San Pablo Bay, Sutter and San Joaquin River. Of these, only Sutter is open to unsupervised visitor use. Other

nearby public lands offering similar wildlife-dependent recreational activities include the Yolo Basin Wildlife Area, Cosumnes River Preserve and the American River Parkway. The U.S. Forest Service and Bureau of Land Management have considerable land holdings in the ecoregion and all wildlife-dependent priority recreational uses are accommodated on various portions of their lands. There are 16 State Wildlife Areas or Ecological Areas operated by DFG within an hour's drive of the Refuge. These 16 areas provide opportunities for wildlife observation, interpretation, hunting and/or fishing. In addition, there are five State Parks within approximately one hour's drive that offer fishing, wildlife observation and/or interpretation.

Local Scale

More than 50 percent of lands within the Refuge's approved boundary are privately-owned and the Service has no authority to provide for visitor use of those lands. However, limited visitor use is available on Refuge lands that are owned by or over which the Service has management authority.

Wildlife-Dependent Recreation.
In the Refuge System Improvement Act of 1997, Congress recognized six wildlife-dependent priority recreational uses of refuges: hunting, fishing, wildlife observation and photography, interpretation and environmental education. More than 6,000 people per year visit the Refuge to participate in a variety of wildlife dependent recreational and educational activities. Currently, the Refuge accommodates waterfowl hunting, wildlife observation and photography, interpretation and environmental education.

Hunting. In 2004, the Service began a planning process for a public waterfowl hunt program on the South Stone Lake Unit of the Refuge. The first Refuge-managed hunt occurred during the 2005-2006 hunt season. The program consists of spaced-blinds accessible by foot and boat and emphasizes opportunities for youth and hunters in wheelchairs. Prior to acquisition by the Service, waterfowl hunting had occurred on the South Stone Lake Unit on the Sun River and Lodi Gun Club properties while they were private duck hunting clubs. Some illegal waterfowl hunting also occurs occasionally in the Beach Lake, North Stone Lake, and South Stone Lake units due to limitations in Refuge law enforcement capability and opportunities to gain illegal access via private property and by boat.

Wildlife Observation and Photography. The Refuge, with its proximal location to a major urban center, wildlife diversity and mosaic of habitats, is steadily increasing in popularity with the surrounding community. The North Stone and Beach Lake units of the Refuge are open every second and fourth Saturday of each month (except during July and August) from 7:30 a.m. to 2:00 p.m. and 9:00 a.m. to 3:00 p.m., respectively. Visitors access the Refuge from the trailhead at the Elk Grove Boulevard entrance, west of Interstate-5. Refuge staff and/or volunteers greet visitors who may take a 3-mile round trip self-guided walk through grasslands on the North Stone Lake unit, past seasonal and permanent wetlands, and along riparian habitat to an observation platform overlooking Lower Beach Lake and wetland impoundments. Visitors in wheelchairs or with small children may drive directly to the universally accessible trail leading to the viewing platform. Visitors typically spend

The first Refuge-managed hunt occurred in the 2005/2006 hunt season, including this wheelchair accessible hunting blind on the South Stone Lake Unit.
Photo by USFWS

Since the establishment of the Refuge, educators and youth care professionals from Sacramento, San Joaquin and Yolo counties have been using the Refuge as an outdoor classroom to enhance course curricula.
Photo by USFWS

between two and four hours per visit and there is no daily entrance fee.

Environmental Education. Since the establishment of the Refuge, educators and youth care professionals from Sacramento, San Joaquin and Yolo counties have been using the Refuge as an outdoor classroom to enhance course curricula. Educators include teachers, professors and outdoor education leaders. Youth care professionals include leaders for Scouts, 4H, Campfire and church groups. Most of the educators and youth care professionals who are served by the Refuge's environmental education program work with kindergarten through college age students. Currently, most educational field trips are guided by Refuge volunteers or staff on the Beach Lake Unit, with occasional classroom visits. These programs are available by special arrangement.

Interpretation. Current Refuge interpretation consists of interpretative panels on the wildlife viewing platform, Refuge brochures, special guided tours by Refuge volunteers and staff, Refuge website and special events such as the Refuge's annual Walk on the Wildside event.

Fishing. The Refuge does not currently have a formal fishing program open to the public, although several points of illegal entry exist and are regularly used by shore and boat anglers.

Non-Priority Visitor Uses Before its establishment as a national wildlife refuge, a number of visitor uses occurred on the Refuge. The EIS (USFWS 1992) described recreational resources and uses that were cited in "...public comments on the draft EIS, staff of land management organizations and agencies in the study area, representatives of recreation and conservation groups, marina operators, Sacramento County Sheriff's Department boat patrol members and boaters who regularly recreate on the waterways in the study area." Many of these historic uses continue in addition a number of other authorized and unauthorized non-priority wildlife dependent visitor uses occur on the Refuge including: bird-watching and nature study (e.g., National Audubon Society annual "Christmas bird counts"); target shooting/firearm discharging; hunting

Refuge visitors may take a 3-mile round trip, self-guided walk through managed grasslands and along a riparian zone to an observation platform overlooking a managed wetland.
Photo by USFWS

(mostly pheasant and waterfowl); trapping (to control populations of burrowing animals, such as beaver, muskrat and mink to control levee damage); hiking and walking; water-oriented recreation such as motorized boating, canoeing, kayaking, waterskiing, house-boating, fishing and swimming/ sunbathing; horseback riding; jogging; bicycling; ultralight flying; helicopter training; fruit and nut gathering; picnicking and camping; and natural history plant collecting.

Socioeconomic Demographics

The Refuge is located within Sacramento County, bounded by the city of Elk Grove on the east, and 15 miles south of downtown Sacramento. Sacramento County's population was estimated at over 1.36 million in 2005 (USCB 2006) and is projected to grow by almost 0.5 million by 2025 (SACOG 2000). Sacramento is by far the biggest city in the county; and even though the Greater Sacramento Region includes portions of five other counties, 65 percent of the city's population lives within Sacramento County. By percentage, Elk Grove was the fastest growing large U.S. city, between 2004 and 2005 (USDOC 2006). Elk Grove incorporated in 2000 with a population of 81,400 (SACOG 2000) and had reached 112,338 by July, 2005 (USDOC 2006).

In 2004, there were an estimated 649,782 citizens in the labor force in Sacramento County (ACS 2004). In 2005 unemployment averaged 4.8 percent and is projected to decline in 2006 to 4.6 percent (SFP 2006). The sectors of the economy accounting for the largest numbers of jobs in the county in 2004 were: management, professional and related occupations (35 percent); sales and office occupations (31 percent) and service occupations (15 percent) (ACS 2004). In 2004 Sacramento County per-capita income averaged $23,589 and median family income averaged $57,488 (ACS 2004). Of people over the age of 25, 16 percent did not have a high school diploma, 23 percent had a high school diploma or equivalency, 19 percent attained a bachelor's degree and 8 percent attained a graduate or professional degree (ACS 2004). In 2004, approximately 10 percent of Sacramento County residents were living in poverty (ACS 2004).

The largest age group distributions in Sacramento county are: between 25 and 44 years old (30 percent); under 18 (28 percent) and between 45 and 64 (22 percent) (ACS 2004). The racial compositions of Sacramento County and the city of Elk Grove are relatively diverse. Sacramento County's population is composed of 54.4 percent Caucasians, 16.1 percent Hispanics, 12.9 percent Asians and 10.4 percent African Americans (ACS 2004). The most recent statistics available for Elk Grove, from 2000, show that Elk Grove has a slightly higher percentage of Asian people (17.6 percent) and slightly less African Americans, Hispanics and Caucasians when compared to Sacramento County in the aggregate (USCB 2000). In Sacramento County there was an estimated 181,077 households with one or more people under the age of 18, in 2004 (ACS 2004).

Despite increasing urbanization, agriculture continues to be an important economic sector in Sacramento County. Sacramento County ranked 27th, out of 58 counties, in the State for gross value of agricultural production for 2002-2003 (CASS 2004). The county's top ten farm commodities in 2002 were grapes, milk, nursery stock, pears, poultry, vegetable crops, rice, cattle, corn and livestock (CASS 2004). While agriculture continued to be an important sector of the economy, 0.92 percent of prime farmland and 5.05 percent of agricultural land was converted to urban and build-up uses between 1988 and 1998 (Kuminoff et al. 2000).

The median home price in Sacramento County jumped to $287,672 by 2004 (ACS 2004) and has continued to rise, reaching $360,000 by April of 2006 (CLMI 2006). Housing units in the county are projected to increase from 473,211 in 2000 to 662,004 in 2025 (SACOG 2000). Of the increase, 45 percent will occur in unincorporated areas, and 25 percent in the city of Sacramento, but fully 20 percent of the increase is projected to occur in Elk Grove where housing units

increased from 24,817 in 2000 (SACOG 2000) to 66,733 in 2005 (CEG 2006).

Cultural Resources

Cultural Resources and Ethnographic Background

Cultural resources include a variety of links to past cultures, such as physical remains, sites, objects, records, oral histories and traditional culture, but can also include landscapes, plants, animals, sacred locations and traditional cultural properties that play a role in the traditional community. Other historic sites represent a wide variety of activities, including homesteading and settlement, trade, transportation, agriculture and ranching.

Most of the recorded cultural resources at the Refuge are archaeological sites linked with American Indian occupation that include large village sites, small seasonally occupied camps, sites with burials and sites considered sacred. The material remains of historic activities within the project boundary may include standing structures and foundations, still-occupied dwellings, abandoned trails, ferry sites, extant roadways and railroad lines.

The Plains Miwok formerly occupied the lands now within the approved Refuge boundary. The Refuge contains a rich array of Plains Miwok cultural history because its abundant flora and fauna made it a suitable place for humans. Before the area was settled by Euroamericans, the Plains Miwok territory extended from north of the lower reaches of the Cosumnes River to south of the lower reach of the Mokelumne River, along both sides of the Sacramento River and southwest to the vicinity of Mt Diablo in Contra Costa County. The eastern boundary of their territory was the foothills of the Sierra Nevada, which they shared with the Central Sierra Miwok (Levy 1978, Service 1992).

Typical of the surrounding Central California groups, the political organization of the Plains Miwok is believed to have centered around small tribelets. Each tribelet was essentially sedentary and occupied a place more or less continuously for generations. Resources were variably controlled with acorn and hunting lands considered communal, while seed tracts and fishing stations could be individually allocated in accordance with inherited use rights for one or more seasons. The tribelets also used seasonal camps to exploit seasonal resources, such as salmon, acorns, etc. (Tremaine 1997, Kroeber 1932, Bennyhoff 1977).

Numerous Plains Miwok village locations were identified during the waning years of traditional American Indian inhabitation of the region. Major village sites are plotted along the Sacramento, Mokelumne and Cosumnes rivers. Additionally, several locations in Sacramento County have been identified as sacred by the Native American Heritage Commission. The “Hulpoomne” appears to be the nearest known “tribe” associated with the north portion of the Refuge, being associated with a principal village in the area where the town of Freeport now stands (Merriam 1907).

Today, descendants of the Plains Miwok continue to have ties to their ancestral lands. Known cultural sites on and off Refuge lands have been identified and efforts have been made to work with tribal representatives to restore native habitats while preserving these sites. In some cases and at the request of tribal representatives, previously-disturbed archeological sites have been capped with layers of soil and vegetation to help prevent human remains and other objects from being exposed on the surface. The comprehensive conservation planning process gives us the opportunity to plan for the future of the Refuge, working to protect these important resources and providing a link to the past for current generations of Plains Miwok.

Historic Setting

Spanish explorers arriving in the 1700s were the first people other than American Indians to enter the Sacramento Valley area. For the most part, the region was little affected by Spanish occupation, being removed from the missions’ sphere of influence. Land in

the Sacramento Valley was not claimed for private ownership until Mexican land grants were issued in the 1830s. The Rio Ojotska land grant, issued in 1833 to J.B.R. Cooper, was the earliest land grant given in the area; however, the recipient failed to lay claim to the land and renounced the grant the following year (USFWS 1992).

New Helvetia, established by John A. Sutter in 1839 near the present site of Sacramento, was the first Euroamerican settlement in the valley. Sutter obtained 11 leagues of land through a grant from the Mexican government, which approved of Sutter's plan to build a fort and establish order on the edges of their frontier. Sutter's Fort was founded with goods purchased from the Russians when Fort Ross was abandoned in 1841. A large number of horses and cattle were brought to Sutter's Fort, along with a cannon and several pieces of artillery. These accoutrements gave the fort a military appearance, which undoubtedly discouraged skirmishes between the settlers and American Indians (USFWS 1992).

Lands along the Cosumnes River, northeast of the Refuge, were claimed in 1844 by two employees of Sutter. At the time, the Cosumnes area was "thickly populated by Indians" (USFWS 1992). The land, which was claimed to graze cattle, was called Rancho Omochumnes after the local American Indian tribelet. Another land grant, Sanjon de los Moquelumnes, included the southeastern portion of the Refuge; this land grant was also named after a Plains Miwok tribelet.

In 1848, California and the Sacramento Valley were changed forever by the discovery of gold in the Sierra Nevada foothills. Until that time, most of California had been unaffected by Euroamerican settlement. With the discovery of gold, thousands of miners entered the state. Thousands of settlers soon followed the miners. Sacramento was the main community, surrounded by dozens of smaller settlements. In the beginning, the locations of early towns coincided with mining activities. Probably only limited mining occurred in the vicinity of the Refuge because of the scarcity of gold-bearing gravels at such low elevations. Later, as agricultural pursuits replaced mining, farming communities appeared. By the 1860s, agricultural enterprises were well established in the Sacramento Valley and the Delta region. A variety of crops were grown on and west of the Refuge while areas to the east were used for mixed agriculture and to raise livestock. Towns that were established near the Refuge include Franklin, Bruceville, Locke, Sheldon and Wilton.

Archeology

Requests have been submitted to the North Central Information Center of the California Archaeological Inventory for information regarding the types and location of archeological sites on and in the vicinity of the Refuge. Historic and ethnographic sources were also reviewed for information pertaining to the area.

Types of Archeological Sites. Intensive prehistoric and historic habitation and use in the Sacramento area has resulted in a large and diverse archeological resource base. Over 450 archeological sites have been recorded in Sacramento County. Many sites have been recorded, although most lands within the approved Refuge boundary have not been surveyed systematically for cultural resources.

Most of the recorded sites within the vicinity of the Refuge are prehistoric in nature. Although this is partly because prehistoric site density is greater than historic site density in the Refuge area, it is also because most archeologists working in the area did not record historic sites until quite recently. Sites associated with American Indian occupation include large sites, small, seasonally occupied camps, sites with burials and sites that were considered sacred. Historic sites represent a wide variety of activities, including homesteading and settlement, trade, transportation, agriculture and ranching. The material remains of these activities probably include standing structures and foundation, still occupied dwellings, abandoned trails and ferry sites, extant roadways and railroad

lines.

Location of Archeological Sites. Both prehistoric and historic sites within and around the Refuge tend to be located on high ground near permanent water sources. Determining areas of historic sensitivity is difficult, however, because of the lack of identified historic period sites within the Refuge. For the most part, early historic settlements (before the establishment of reliable flood control measures) were located on prehistoric sites. In fact, it is common to find a prehistoric midden site under a historic dwelling because American Indians often chose to live on topographic high points. American Indian habitation sites became even higher points of land as their refuse accumulated over hundreds or even thousands of years of occupation, and these mounds were attractive building locations for early settlers. In addition to topographic high points, historic remains should be expected near early settlement locations, along railroad lines and near ferry sites.

Many prehistoric archeological sites have been identified along major drainages, such as the Mokelumne and Cosumnes rivers and Laguna, Skunk, Badger and Deer creeks. Many unidentified sites are probably present on these drainages although intensive, systematic surveys have never been done. Additional areas of prehistoric sensitivity include the lands around Beach, North, and South Stone lakes and Snodgrass and Bear sloughs.

Land Use

Natural biologic communities presently occurring within the entire approved Refuge project boundary encompass a total of 8,158 acres and include: annual grasslands (62 percent), seasonal wetlands (14 percent), perennial wetlands (5 percent), riparian forest and scrub shrub (8 percent), deepwater aquatic habitat (9 percent) and oak woodlands (2 percent). Existing agricultural cover types within the Refuge occupy an additional 8,740 acres and are comprised of: corn (28 percent), pasture (21 percent), range (17 percent), wheat (8 percent), sugar beets (8 percent), grapes (7 percent), other field crops (4 percent), pears (2 percent) and tomatoes (1 percent).

Adjacent lands in this region are shifting from low density, rural, residential homes and structures, agriculture, and recreational areas to medium density single family suburban tract homes, master-planned communities and vineyards (B. Treiterer, USFWS, pers. comm.)

Wilderness and Other Special Management Areas

As required by Service planning policy, a wilderness review (Appendix E) was conducted for the Refuge. None of the Refuge lands were eligible for wilderness designation.

Current Management Practices

The primary management focus of the Refuge is enhancing, restoring and maintaining wetlands, riparian woodlands, grasslands and valuable agricultural lands. Wetland habitats include permanent and seasonal wetlands, including vernal pools, riparian woodlands, open water and aquatic beds.

Wetlands

Water Management. As an integral part of the Refuge program, the Service manages water on seasonal and permanent wetlands on the South Stone Lake, Headquarters and Beach Lake units totaling approximately 335 acres. Sources of water for managed Refuge wetland units include SP Cut, Lower Beach Lake, Sacramento Drainage Canal and South Stone Lake. A total of seven surface pumping stations draw water from Refuge waterways to manage wetland impoundments on the Refuge. Water control structures (i.e., screw gates) are also used to manage water entering other permanent wetlands areas, such as North Stone Lake and Parker Slough and portions of the Sun River property. The overall water flow in the SP Cut is controlled by screw and flap gates passing under Lambert Bridge, upstream drainage, groundwater levels and irrigation return flows.

Flood up, drawdown and summer irrigations

are planned to provide habitat for migrating, wintering and breeding water birds. Timing of flood up is constrained to varying degrees by the amount of water available under appropriative and riparian water rights in any given year and to minimize mosquito production.

Permanent Wetlands. Permanent wetlands are managed to provide brood rearing habitat during the summer months for waterfowl and other waterbirds and year round habitat for other species, including bitterns, herons and marsh wrens. Periodic draw downs of the permanent wetlands on the Beach Lake, Headquarters and South Stone Lake units are done when vegetation, such as cattails and tules, covers more than 75 percent of the surface area and to control undesirable fish species such as carp. These treatments occur approximately every three to five years. Not more than three out of the five permanent wetland impoundments on these units are drawn down in any given year, in order to maintain habitat for the federally-threatened giant garter snake and summer resident birds. In other permanent wetlands, such as Parker Slough, North Stone Lake, and the Sun River property, water levels can be manipulated using screw gates to lower levels, but not completely de-water wetlands. In these situations, the goals are to stimulate growth of desirable moist soil plants along pond edges and allow for some control of dense vegetation, if necessary.

Seasonal Wetlands. Seasonal wetlands are managed to provide feeding and loafing habitat for the thousands of migratory waterbirds that winter in the Central Valley and make use of the Beach-Stone Lakes Basin. During years with no restrictions on water use, flood ups begin in early to mid-September and continue through mid-October. To minimize mosquito production, impoundments are rapidly filled to a maximum depth of one to two feet. Occasional pumping may be required during the winter if rainfall levels are below normal. Drawdowns commence in early April and continue through mid-June. Varying the draw down schedule in wetland units stimulates production of different plants. Early draw downs favor grasses, such as swamp timothy and watergrass; late drawdowns favor smartweeds and some undesirable plants, such as cocklebur. Late drawdowns occur in one or two wetland units per year to provide habitat for nesting shorebirds, including black-necked stilts (*Himantopus mexicanus*), American avocets (*Recurvirostra Americana*) and Wilson's phalaropes (*Phalaropus tricolor*). Summer irrigations are designed to stimulate the growth of high quality foods for waterfowl, such as swamp timothy and watergrass. These are done in late July and early August when the unit is flooded to a depth of 12 inches and then drawn down. Close coordination with the Sacramento/Yolo Mosquito Vector Control District is essential to minimize mosquito production on managed wetlands.

SP Cut. Water levels in the SP Cut are controlled by screw and flap gates passing under Lambert Bridge, upstream drainage, groundwater levels and irrigation return flows. Through informal agreement with Sacramento County Department of Water Resources, the screw gate on the Lambert Bridge flood control structure is operated by a local landowner to manage availability of upstream water for irrigation and wetland management. Water levels are generally higher during the summer months when the gate at Lambert Bridge is open and farmers upstream are irrigating crops. During the winter, water levels are determined by rainfall levels and drainage entering from upstream. During large rainfall events, water enters SP Cut when floodwaters overtop the Morrison Creek dam at the north end of Lower Beach Lake.

North Stone Lake. North Stone Lake is roughly 260 acres in size with depths ranging from 0.5 feet to 8.0 feet. Water enters the lake via concrete culverts under Interstate-5 that bring water from upstream developed areas to the east and from SP Cut to the west, through a single pipe fitted with a screw gate. Water levels in the lake can be manipulated to a limited degree (12 inches maximum) by opening or closing this screw

gate, depending on water fluctuations in the SP Cut. There are no control structures on the Interstate-5 culverts.

South Stone Lake. Water levels in various parts of South Stone Lake fluctuate with levels in SP Cut and tidal influences from downstream of Lambert Bridge. As with North Stone Lake, water levels are highest during the summer irrigation months and winter rainfall months. Except for requesting opening of the screw gate at Lambert Bridge, Refuge staff have little control over water levels in South Stone Lake.

Habitat Manipulations. Managed wetlands are dynamic systems that require periodic habitat manipulations to maintain a desired successional stage, optimal for feeding, loafing, breeding waterfowl and waterbirds. Mowing, prescribed burning, discing and noxious weed control during late summer are all part of efforts to manage less desirable vegetation with limited food value for migratory waterbirds, such as cocklebur and spike rushes. These activities also improve conditions for grasses and forbs to grow, such as watergrass, swamp timothy, smartweeds as well as other desirable vegetation, such as bulrush, buttonbush and willow. Each unit is evaluated annually to determine the need for manipulations. Permanent wetland units are disced every three to five years to maintain an equal ratio of open water to vegetation. Seasonal wetlands are disced or mowed every other year, depending on vegetation response. The perimeter of each wetland is disced to enhance access by mosquito fish and water management.

Mosquito Control

The Refuge staff works closely with the Sacramento/Yolo Mosquito Vector Control District (SYMVCD) to reduce or eliminate production of mosquitoes on the Refuge. In accordance with the EIS (USFWS 1992), the Refuge entered into an MOU with SYMVCD in 1993. This MOU outlines an effective mosquito suppression program that includes biological and chemical controls to be used on the Refuge, wetland design and water level and vegetation management recommendations and research partnerships. Biological controls include the placement of mosquito fish and guppies (*Poecilia reticulate)* in permanent and seasonal wetlands and the use of *Bacillus thuringiensis israeliensis* (Bti) and *B. sphaericus*, which are effective at controlling certain life stages of mosquito larvae with minimal non-target organism impacts. Any pesticides to be used on the Refuge must be approved by the Service prior to the onset of mosquito season in early spring. Pesticides may target mosquito larvae and adults and may include aerial applications, as well as ultra-low volume ground application. In keeping with the MOU, the Refuge consults with SYMVCD to ensure wetlands are designed to minimize mosquito habitat. For example, berms along some managed wetland units are graded with a slope of 1.5-2.0 feet horizontal to 1.0 foot vertical to limit the growth of marginal vegetation. Furthermore, the perimeters of seasonal wetlands may be disced to enhance access by foraging mosquito fish to larvae. Wetlands are also designed and constructed to allow for rapid flooding and draw down.

Riparian

Agricultural conversion, water conveyance, and flood control, and other changes in land use have eliminated much of the original riparian and oak woodland habitat from the Beach-Stone Lakes Basin. Overall, the Central Valley has lost over 95 percent of its wooded riparian habitats. Within the approved Refuge boundary, the widths of riparian forest corridors vary from 10-300 feet wide along Morrison Creek, SP Cut, Parker Slough, the south arm and smaller branches of North Stone Lake, and South Stone Lake (see Figure 5, Vegetation Map). The only mature valley oak forest remaining in the basin exists along Morrison Creek. Restoration efforts on the Beach Lake, North Stone Lake, Headquarters and South Stone Lake units have expanded riparian zones by 100-120 acres.

Restoration practices include planting a variety of riparian trees, such as Fremont cottonwood, willow, box elder, sycamore,,

valley oak and associated understory shrubs and grasses and then providing supplemental irrigation and weeding for a period of three to five years to facilitate plant establishment. In the case of valley oaks, both planting acorns with no watering and seedlings with watering have been used with success. Choosing an appropriate site based on soil type and elevation is the most important aspect of a successful restoration project.

Grasslands

Grasslands once covered vast stretches of the Central Valley, supporting extirpated species, such as pronghorn antelope, tule elk (*Cervus elaphus nannodes*), grizzly bear and millions of waterfowl and other migratory birds. These grasslands supported seasonal wetlands such as vernal pools and wet meadows populated by perennial and annual grasses. Over 98 percent of Central Valley native grasslands have been converted to agriculture and urban development or displaced by exotic vegetation. . Many native annual grassland species no longer occur and have been replaced by nonnative annuals such as annual rye. The remaining grasslands are now a mix of native and nonnative species.

The North Stone Lake Unit of the Refuge supports one of the only remaining continuous tracts of un-leveled grasslands in the eastern Sacramento-San Joaquin Delta region, with approximately 1,900 acres of annual and perennial grasslands. Preservation of this remnant grassland topography is a high priority. Other small (one to 21 acres) areas exist on the Beach Lake and Headquarters units. General management goals for the North Stone Lake Unit are to: maintain and expand existing native grasses, such as creeping wild rye (*Leymus triticoides*), meadow barley (*Hordeum brachyantherum*), and sedges; minimize the fire hazard posed by accumulated dead grasses; control the spread of noxious weeds; and provide habitats for grassland-dependent species, including greater sandhill cranes, arctic nesting geese, white-faced ibises, long-billed curlews, western meadowlarks, horned larks, and birds of prey, including Swainson's hawks, burrowing owls, and northern harriers. These management goals are being accomplished through implementation of a cattle grazing program, small-scale prescribed burning, and aggressive noxious weed control.

General restoration goals for the grasslands on the North Stone Lake Unit are to: maintain and expand existing native grasses, decrease the fire danger, control noxious weeds and provide habitat for a variety of grassland dependent species like this Swainson's hawk.
Photo by USFWS

The Refuge grazing program on the North Stone Lake Unit consists of running cattle on the dry pasture from November through mid-June, until annual grasses turn brown. Some cattle are then moved to the 172 acres of irrigated pasture on the unit from June through October. Cattle stocking rates vary in the five dry pastures depending on rainfall, timing, quantity and frequency, with a target of 1,500-2,000 pounds of Residual Dry Matter (RDM) in three of the five pastures and 2,000-4,000 pounds of RDM in the remaining two pastures. The irrigated pastures are stocked at a rate of one animal unit month (AUM), which is the amount of forage needed by a cow and her suckling calf for one month, per one to two acres. Following a 10-year period during which grazing had been curtailed on the North Stone Lake Unit, use by sandhill cranes, long-billed curlews, white-fronted geese, and other waterfowl has increased substantially on the unit after the Refuge re-introduced a grazing program in 1999. Excluding cattle from the majority of riparian areas through fencing was completed in 2003. Other measures to improve management of the unit will include developing alternative watering sources ,erosion control measures near the irrigated pastures, noxious weed control and continued monitoring of wildlife responses.

The Refuge holds title to a conservation easement on the 1,400-acre Wetland Preserve Unit that supports a mixture of natural and man made vernal pools and seasonal wetlands. Recent studies at the

Cosumnes River Preserve (J. Marty, TNC, pers. comm.) indicate that a managed grazing program is most effective at maintaining and enhancing vernal pool plant and animal species. Grazing conducted by the landowner from November through June on the preserve results in a RDM rate of 600 to 800 pounds and is ideal to reduce competition between vernal pool plants and nonnative grasses, such as annual rye grass, and noxious weeds, such as yellow starthistle (*Centaurea solstitialis*). Refuge staff are working with representatives of the landowner, AKT Development Corporation, to develop a grazing program that will protect and enhance seasonal wetlands on the preserve.

Weed Control

Since 1995, the Refuge has adopted an active aquatic and terrestrial weed management program in the Beach-Stone Lakes Basin, particularly as a founding member of the Stone Lakes Water Hyacinth Control Group. The Refuge conducts treatments for control of water hyacinth under a Statewide National Pollution Discharge Elimination System (NPDES) General Permit (No. CAG990005) for discharge of aquatic pesticides. The Refuge and SRCSD utilize Reward (Diquat) and Aquamaster (glyphosphate) to control water hyacinth in the basin. Another aquatic species, Brazilian elodea (*Egeria densa*), is also abundant in waterways and may emerge as a management concern as opportunities for recreational boating are developed on the Refuge.

The Refuge Integrated Pest Management approach used to control weeds relies on burning, mowing, grazing, discing and herbicide applications. Due to the persistence and abundance of most weeds in the environment and regulatory constraints on use of fire, chemical applications are the only currently effective method for controlling water hyacinth, perennial pepperweed (*Lepidium latifolium*) and yellow star thistle. The Refuge uses Transline and Telar to control yellow star thistle and perennial pepperweed, respectively. Mechanical control methods tend to spread, rather than control, perennial pepperweed. Potential biological control organisms, including water hyacinth-eating weevils (*Neochitina* spp.) and moths (*Sameodes albiguttlilis*), have been introduced into the Delta through a cooperative program with the U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS) and California Department of Food and Agriculture (CDFA) to evaluate control of water hyacinth. Unfortunately, these biological control agents have not been affective in reducing stands of water hyacinth. Given the vast amounts of hyacinth produced each year on the Refuge and its inaccessibility to equipment, mechanical control is not feasible. Mechanical removal in isolated water ways would be prohibitively expensive, costing an estimated $80,000 annually and accessing sites with heavy equipment would likely cause significant impacts to sensitive habitats. Non-chemical methods to prevent the spread of water hyacinth include deploying log booms at strategic locations to prevent spread, screening culverts to prevent re-introduction and removing water hyacinth from small water bodies by hand. The Refuge also participates in the Sacramento Weed Abatement Team which is coordinated by the Sacramento County Agricultural Commission.

Farming Program

A variety of migratory birds, including waterfowl, long-billed curlew, black-bellied plover, white-faced ibis and sandhill cranes, feed on waste grain and invertebrates remaining in agricultural fields after harvest. These migratory birds depend on farm fields of small grains, alfalfa, tomatoes, etc. for a marked portion of their diet. Therefore, it is vital that the Service, private landowners, and Sacramento County cooperate to maintain viable "wildlife friendly" agriculture in the vicinity of the Refuge. Except for the grazing programs that the Refuge oversees, cooperative farming on Refuge lands currently is limited to the Headquarters Unit. To date, the goal of the farming program has been to maintain the fields in corn, wheat, safflower, or grass

to provide habitat for wildlife and control weeds until a larger scale restoration project is implemented.

Monitoring and Surveys

A variety of surveys and studies have been conducted by Service staff, volunteers and students on the Refuge since its establishment. These studies are primarily intended to evaluate the effectiveness of management activities and monitor the status of biological resources. A summary of ongoing surveys and studies and their objectives follows.

- Colonial waterbird survey. Rookeries of nesting great blue heron, great egrets, and double-crested cormorants are monitored yearly to determine abundance, distribution and nesting success.
- Landbird monitoring program. A cooperative mist netting and bird banding program is conducted in selected areas with SYMVCD to monitor and document bird diversity and relative abundance. The program is also investigating the role of wild bird populations as reservoirs for mosquito-borne diseases such as Western equine encephalitis virus, St. Louis encephalitis virus and west Nile virus.
- Modesto song sparrow study. As part of the landbird banding program, song sparrows are also color banded on the South Stone Lake Unit in an ongoing effort to determine nesting success and survival of young.
- Weekly waterfowl survey, October through May. Waterbird (waterfowl, shorebirds and cranes) counts are done weekly during the fall, winter and spring to determine population trends and use patterns.
- Plant surveys. Vegetation in moist soil wetlands is qualitatively surveyed each spring to guide management actions such as discing, mowing and timing of summer irrigations.
- Noxious weed surveys. Refuge units are surveyed and mapped with GPS equipment to monitor noxious weeds such as yellow starthistle, perennial pepperweed and water hyacinth.

A cooperative mist netting and bird banding program is conducted in selected areas with the Sacramento-Yolo Mosquito and Vector Control District to monitor and document the diversity and relative abundance of bird species, such as this blue grosbeak, and to evaluate their role in the transmission of mosquito-borne viruses.
Photo by USFWS

- Pasture monitoring A residual dry matter survey (measure of the amount of dry grass remaining after the growing season) is conducted annually to adjust grazing rates for the upcoming year.
- The following studies have been completed primarily by graduate students on the Refuge:
- Western pond turtle survey. Determined turtle survival and reproductive success.
- Native grass. Determined effects of various treatments (e.g., burning, grazing and no treatment) on three species of native grasses on the North Stone Lake Unit.
- Nitrogen. Determined the role increased nitrogen levels may play in exotic weed expansions along freeway corridors.
- Sunflower moth. Evaluating the relationship between the California sunflower and its parasitoids.
- Bats. Conducted presence or absence surveys on selected sites on the Refuge.
- Aquatic surveys. Conducted fish, amphibian, and reptile surveys to determine presence and absence of various species.

Further refinement of survey and monitoring protocol for the Refuge is needed. Additional baseline inventories need to be completed and a relational database should be developed to store and access monitoring and inventory data.

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4 Challenges

Invasive Species

As defined in Executive Order 13112, an invasive species is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species can impact human health, interfere with agriculture and aquaculture, interfere with water delivery, increase flooding and erosion, block access to water ways, decrease habitat for native plants and animals and compete with native species for resources. Invasive species are one of the most critical nationwide challenges facing national wildlife refuges (NWRA 2002). The Service and other bureaus within the Department of the Interior have been working to eradicate invasive species on Federal lands and are partnering with State agencies and local organizations to restore ecosystems with native plants and species. By 1998, the battle against invasive species was costing the Refuge System an estimated $13 million per year (NWRA 2002). By 2002 a $150 million backlog of critical invasive species projects had been identified within the Refuge System (NWRA 2002). Most current management practices are aimed at control and eradication of existing invasive species; much work remains to prevent introduction of additional invasive species, educate the public and to fund more research and monitoring.

A large number of invasive species now reside on the Refuge. Vertebrate invasive species found on the Refuge that are well established in the region include European starlings (*Sturnus vulgaris*), rock doves (*Columba livia*), American bullfrogs red-eared sliders, feral dogs (*Canis lupus familiaris*), feral cats (*Felis silvestris*), black rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*) and house mice (*Mus musculus*). The majority of fishes occurring in Sacramento-San Joaquin Delta and Refuge waterbodies are non-native, including carp, catfish, sunfish and largemouth bass. Except for capture of feral dogs and cats and localized reductions of rodents near buildings and carp from wetland impoundments, no active control of these species is currently conducted or planned. As urban areas expand, we expect to see increases in feral dogs and cats, rock doves and great basin Canada geese. Preliminary studies at the Cosumnes River Preserve indicate black rats are negatively affecting reproductive success in a variety of songbirds nesting in mature valley oak riparian forest. Invasive invertebrates found on the Refuge, such as various species of mosquitoes and mitten crab (*Eriocheir sinensis*), may act as hosts to various diseases. Control of mosquito populations is addressed in Chapter 3 under Current Management. Mosquitoes are a vector for western equine encephalomyelitis virus. St Louis encephalitis and west Nile virus that can cause disease in humans. Mitten crabs can act as a host to the Asian lung fluke (*Paragonimus westermani*), which can cause disease in humans and other mammals if consumed without thorough cooking (ANSTF 2003).

Methods used to control invasive weeds include chemical, mechanical (including mowing, discing and hand removal) and biological control. The majority of grasslands on the Refuge and throughout California are now composed of nonnative annual grasses, such as annual rye, soft chess (*Bromus hordeaceus*), wild oats and Mediterranean barley (*Hordeum marinum*). Himalayan blackberries (*Rubus armeniacus*) are prevalent in riparian zones and along waterways. Invasive tree species

on the Refuge include black locust (*Robinia pseudoacacia*) and osage orange (*Maclura pomifera*). Many of these invasive species have replaced native vegetation, but are so well established that eradication would be nearly impossible. Current control and eradication efforts concentrate on three noxious weeds that require immediate attention (Table 1). Other species being considered for monitoring, control and eradication from grassland, aquatic, and riparian habitats include: medusahead grass (*Taeniatherum caput-medusae*), barbed goat grass (*Aegilops triuncialis*), Brazilian elodea, and giant reed (*Arundo donax*).

Basin Hydrology and Water Quality

Floodplain Conditions

The hydrologic regime and configuration of the 100-year floodplain in the Beach-Stone Lakes Basin have been dramatically altered when compared with historic pre-settlement conditions. Changes to the landscape have included: (1) completion of the Sacramento River levee system and Sacramento Flood Control Project; (2) dam placement on the Mokelumne River; (3) construction of the Southern Pacific Railroad; (4) reclamation of tracts and islands in the basin for farming; and (5) constricting of downstream channel capacities due to raising of levees.

The approved Refuge boundary lies entirely within the 100-year floodplain of Morrison Creek and the Cosumnes and Mokelumne rivers and the current 100-year flood elevation is 16.00 feet above mean sea level. Damaging floods have occurred in the Beach-Stone Lakes basin an average of one out of every three years (USACE 1987, Hart 1999). Extensive flooding occurred in 14 of the last 40 years. The primary source of water during flood events is from the accumulated flows of the 192 square mile watershed of the Morrison Creek Stream Group (Morrison, Elder, Unionhouse, Florin and Laguna creeks). During high water events, Morrison Creek drains from east to west, then south through Beach Lake, North Stone Lake, and South Stone and finally through the Lambert Road bridge to Snodgrass Slough, thence into the North Mokelumne River. Alternately or concurrently, flood waters may flow south to north from the Cosumnes and Mokelumne Rivers up Snodgrass Slough and the Sacramento Drainage Canal, over the top of the Lambert Road bridge and into SP Cut

Table 1. Invasive Plant Species Targeted for Control on Stone Lakes National Wildlife Refuge.

Common Name	Scientific Name	**State Noxious Listing	Distribution and Origin
perennial pepperweed	*Lepidium latifolium*	B	waterways, riparian restoration sites, grasslands and along roadsides
yellow starthistle	*Centaurea solstitialis*	C	grasslands, roadsides
water hyacinth	*Eichhornia crassipes*	none	waterways, permanent wetlands, lakes
Brazilian elodea	*Egeria densa*	none	waterways, permanent wetlands, lakes
giant reed	*Arundo donax*	none	waterways, ditches
black locust	*Robinia pseudoacacia*	none	ornamental landscapes
osage orange	*Maclura pomifera*	none	hedgerows, ornamental landscapes
medusa head grass	*Taeniatherum caput-medusae*	C	grasslands

**"B"—Eradication, containment, control or other holding action at the discretion of the commissioner. "C"—State endorsed holding action and eradication only when found in a nursery; action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a cropseed for planting or at the discretion of the commissioner (CDFA 2006).

and the Beach-Stone Lakes basin. Cosumnes and Mokelumne river flows may also enter the basin from the west by backing up along and passing under the Western Pacific Railroad grade. The flood season normally extends from November through April (USFWS 1992).

The Refuge receives storm water runoff from upstream urban developments, including Laguna West, Lakeside and Stonelake, which flow into Beach Lake and North Stone Lake. Projections are that continued urbanization will lead to a loss of upstream storage area and a doubling of storm water runoff entering the Stone Lakes basin. Build-out of the East Franklin, Poppy Ridge, Laguna Ridge and Lent Ranch projects east of Franklin Boulevard, will result in an additional 10,000 acres of urban development between Interstate-5 and Highway 99. This may lead to increases in both the elevation of the 100-year floodplain and duration of downstream flooding (CEG 2000). Under this scenario, impacts are anticipated to Refuge infrastructure, habitats and wildlife.

Increases in elevation and duration of flooding resulting from upstream development may affect the grassland, riparian and wetland habitats and associated wildlife now using the Refuge. Noxious weeds, such as perennial pepperweed, yellow star thistle and other species, may become more invasive on grassland habitats as seed sources are washed into the Refuge. Long term monitoring will be necessary to document changes in the nature of grasslands. Riparian habitats may be affected due to prolonged high flood water levels, particularly during the spring. Conversion of stands of willows and cottonwood trees in low lying areas to more aquatic habitats may result and the composition of seasonal and permanent wetlands may change.

Migratory birds that frequent large expanses of open water may benefit from these habitat conversions, such as white pelicans and tundra swans and the composition of local duck populations may shift from dabbling ducks, such as mallard and northern pintails, to diving ducks, such as canvasbacks (*Aythya valisineria*) and lesser scaup (*Aythya affinis*). Reduction in the availability of high ground for high water refugia may further impact listed species such as the giant garter snake and valley elderberry longhorn beetle.

More frequent and longer flooding events could also affect management of the grazing program on the North Stone Lake Unit of the Refuge. From November through mid July, cattle are rotated among five pasture units and during heavy rainfall events, they are moved from the southern to the northern pastures in anticipation of flooding. Floodwaters rose 6 inches an hour during heavy rains in the winter of 2000, making unsafe conditions for driving the cattle north. Similar heavy rains during the winter of 2005/2006 also required relocation of cattle grazing. Increases in storm water flows could exacerbate this situation which may result in shortening of the grazing period.

Some species that frequent large expanses of open water, such as white pelicans, may benefit from more frequent flooding of the Refuge.
Photo by USFWS

Flood Control Projects

In addition to ongoing upstream development, hydrologic regimes on the Refuge may also be affected by new projects that could alter the configuration or depth of the 100-year floodplain. The hydrology of the Mokelumne and Cosumnes rivers and

the Morrison Creek watershed has been studied extensively for various potential flood control projects by the USACE, California Department of Water Resources, City of Sacramento and Sacramento County. These projects include a recently completed project by Sacramento Area Flood Control Agency and the USACE to raise and re-configure levees along Morrison Creek and a project by Teichert to realign Laguna Creek for gravel extraction, which may decrease summertime flows from reaching Beach Lake.

Since the mid-1980s, Sacramento County has been exploring the feasibility of implementing a flood control project in the basin that could reduce the extent of the 100-year floodplain and in particular, decrease flooding in the community of Point Pleasant in southern Sacramento County. In 1998, the County Board of Supervisors adopted the Beach-Stone Lakes Flood Control Plan, outlining county policies for reducing flooding in the basin. Most recently, the County has convened a facilitated private and public stakeholder forum to explore alternatives for reducing or compensating for flood damages to landowners in the Beach-Stone Lakes basin. The forum will report back to the County Board of Supervisors with the results of their deliberations regarding a potential regional project to attenuate peak flood flows or improve flood conveyance. The County will then utilize engineering studies and the forum results to prepare a report on key findings of this effort.

Water Quality

Water quality is an important component in determining the overall function of the Refuge area ecosystem and is a major factor in determining the health of wildlife, aquatic organisms and fisheries. Water, sediment, and biota samples collected from eight locations indicate that levels of heavy metals, although present, were not sufficient to cause deleterious impacts to wildlife; however, concentrations of selenium in all five waterbodies tested are above levels recommended for the protection of aquatic life (USFWS 1992).

The Refuge is virtually surrounded by urban and agricultural areas. Environmental contaminants on the Refuge or in the area have the potential to accumulate on the Refuge and affect large numbers of fish and wildlife. Agricultural lands to the east, south, and southwest are potential sources of contaminants to Snodgrass Slough, as well as to South and North Stone lakes. Many small waterways and seasonal swales connect the agricultural lands with the Snodgrass Slough and North and South Stone lakes. The City of Sacramento is another potential contaminant source. Morrison Creek runs through southern Sacramento prior to entering the north end of the Refuge and has been characterized by the Environmental Protection Agency (EPA) as an impaired waterway because of high Diazinon concentrations. The EPA found that Diazinon poses unacceptable risks to agricultural workers and to birds and other wildlife species. Diazinon can overstimulate the nervous system, causing nausea, dizziness and confusion and at very high exposures caused by accidents or major spills, it can also cause death.

Additional studies of water quality conducted by Service Contaminants staff from 1999 to 2000 found that levels of pesticides with Diazinon in Morrison Creek were sufficient to cause mortality in bioassay organisms after rainfall greater than one inch. Most likely these pesticides were flushed through the stormwater runoff drainage system after accumulating on lawns and other areas during the dry season. Also see Chapter 3, Contaminants and Water Quality.

Sacramento County's National Pollutant Discharge Elimination System (NPDES) Municipal Permit requires reduction of pollutants found in urban stormwater runoff to the maximum extent possible. Stormwater detention basins are constructed as urban expanses east and upstream of the Refuge are developed. These basins are effective in reducing pollutants by 30 percent to 90 percent. The pollutants that are not detained will likely enter the Refuge in runoff, potentially affecting fish and wildlife.

Land Use Changes

Urbanization and Vineyard Conversion

Elk Grove incorporated as a city in 2000 and had the fastest growth rate for any large U.S. city between July 2004 and July 2005 (USDOC 2006). The city adopted its general plan in November 2003. When the City of Elk Grove incorporated, it adopted as a feature of its general plan, the urban service boundary previously identified in the Sacramento County General Plan, which defines the limit of urban development in the County. A 90-acre portion of the Wetland Preserve Unit of the Refuge lies within Elk Grove's city limit. As provided for in the Elk Grove general plan, approximately 8,000 acres of former agricultural land east and upstream of the Refuge is now being developed into residences, a regional shopping mall and office parks. Over 18,000 additional homes are expected to be constructed by 2010 on land previously supporting dry and irrigated pastureland and crops (SACOG 2000). Many migratory birds which frequent the Refuge are also dependent on habitats outside of the Refuge. For example, the greater sandhill crane has a wintering range of approximately three square miles (G. Ivey, pers. comm. 2003). Therefore, cranes utilizing the Refuge also rely on nearby agricultural fields, grasslands and wetlands for feeding, loafing, etc. As open land is lost, these birds are either forced to fly longer distances to suitable habitat or pushed into smaller and smaller parcels. Over the last ten years, the ability of the eastern Sacramento-San Joaquin Delta region to support wintering cranes and other species such as long-billed curlew, white-faced ibis, burrowing owl and Swainson's hawk has declined and continues to be threatened by urban development and conversion of pasture and row crops to vineyards. From 1992 to 2004, the acreage planted in vineyards within the approved Refuge boundary increased from 685 to 2,013 acres. The acreage of vineyards in Sacramento County nearly doubled from 1998 to 1999 (Sacramento County 1999, Sacramento County 2000). Whereas smaller vineyards interspersed with pasture, croplands and natural habitats can support a variety of wildlife, large expanses of vineyards provide little to no habitat for migratory birds and other wildlife.

Other Human Impacts

Air Quality

Poor air quality injures wildlife and vegetation, causes acidification of water, accelerates weathering of buildings and other facilities and impairs visibility. Air quality, and pollution control in particular, is regulated by a number of Federal and State agencies. Both the State of California and the Federal government have established a variety of ambient air quality standards. PM10 land ozone are two pollutants that are monitored and used to determine air quality on a daily basis. PM10 refers to particulate matter suspended in the air that is smaller than 10 microns, which are small enough to reach the lungs. Ozone is the main component of photochemical smog, which is formed through a series of chemical reactions involving compounds known as ozone precursors.

Sacramento County PM10 emissions are generated by a variety of sources, primarily entrained road dust, construction and demolition activities. Farming operations and agricultural waste burning are also important sources. Motor vehicles are the primary contributors to regional ozone concentrations because they are sources of ozone precursors. The U.S. EPA has declared that the Sacramento region is not meeting air quality standards. The Federal air quality standard for ozone is exceeded several times a year and the County has been classified as a PM10 nonattainment area (USEPA 2006).

Illegal Activities

The majority of illegal activities involve some sort of trespass by people or incursions by feral animals, such as cats and dogs. Trespass occurs in the form of walking, jogging, horseback riding,, hunting, fishing, and plant and material collecting. Trespassing results in poaching, wildlife disturbance, littering, vandalism and wildfires. Feral dogs and cats disturb and kill native wildlife and disturb cattle used to graze managed grasslands. Feral animal

feces can also spread disease to native wildlife populations. Noxious weeds are spread when people and animals trespass into previously uninfested areas. Unwanted pets (rabbits, chickens, guinea pigs, dogs, cats) that are commonly released at entrances to the Refuge can cause similar problems.

Illegal dumping of both non-hazardous and hazardous materials (e.g., methamphetamine lab waste, pesticides, waste oil) near Refuge entrances presents an ongoing concern. Littering along Interstate-5, particular where commercial truck rigs make overnight rest stops (e.g., Hood-Franklin Road exit), has also become a significant problem as traffic increases on the interstate. The Refuge works with the County of Sacramento and the California Department of Transportation (Caltrans) to remove debris as quickly as possible but additional efforts and more cooperation are needed. Finally, arson-caused or accidental fires along Interstate-5 have become a serious management concern as the Refuge has expanded east of the freeway (i.e., Wetland Preserve Unit). As a result, the Refuge has pursued new partnership opportunities with the Elk Grove Community Services District under the Wildland Urban Interface program to create adequate firebreaks and ensure protection of adjacent communities such as the Stonelake subdivision.

Illegal dumping of both non-hazardous and hazardous materials inside and at the entrance gates to the Refuge is an obvious problem.
Photo by Tom Harvey, USFWS

More serious crimes, such as burglary and abandonment of burning stolen cars at more remote Refuge entrances, occur occasionally (one to two times per year). Marijuana gardens and evidence of other illegal drug activities have also been found. Illegal hunting and fishing occur most often along easy access points, such as roads or from private property.

Mosquito Management

In 1993, the Service and the Sacramento-Yolo Mosquito and Vector Control District entered into an MOU regarding management of mosquitoes on the Refuge. The goal of the MOU is to minimize mosquito production and promote the least intrusive approaches to control mosquitoes on the Refuge. The Refuge coordinates with SYMVCD in a variety of ways to minimize mosquito breeding habitat. For example, the Refuge staff ensure that wetlands are designed and water is manipulated in such a way to minimize mosquito production. The SYMVCD monitors wetlands on the Refuge and plants mosquito fish, when necessary, as an initial method of control. Alternately, if mosquito larvae are detected, Bti (*Bacillus thuringiensis israeliensis*) or *B. sphaericus* may be applied..

As a result, mosquito larval control activities since 1994 have been largely limited to localized (less than five acres) applications of larvicides and until 2005, and only three applications of an adulticides. In 2005, West Nile Virus (WNV) arrived and became established in Sacramento and Yolo counties, triggering more aggressive mosquito control. During 2005, the Refuge received ultra-low volume (ULV) ground treatments of pyrethrin on 18 occasions from September 28 through October 12. As of July 2006, the Refuge has been adulticided six times between June 27 and July 21.

Avian Bird Flu

To date, the virulent form of Highly Pathogenic Avian Influenza referred to as H5N1 has not been detected in either wild or domestic birds or in humans in North America. In fact, between 1998 and 2004 more than 12,000 wild bird samples from

Alaska were analyzed, and no evidence of this virus has been discovered, although birds migrating from Asia to Alaska could potentially carry the H5N1 virus.

The Service, U.S. Geological Survey (USGS), State and partnering academic institutions are continuing surveillance of wild birds in Alaska for the H5N1 virus. The Service is working with an interagency group of scientists and public health and policy officials to design an intensified effort for surveillance and early detection of this virus in wild birds. This effort will help ensure that the Service is in position to support prompt detection and response activities and to take appropriate measures to conserve bird populations while protecting the safety of employees, partners and the public.

The USGS National Wildlife Health Center, in consultation with the Centers for Disease Control and Prevention, has produced Wildlife Health Bulletin 05-03, entitled *Interim Guidelines for the Protection of Persons Handling Wild Birds With Reference to Highly Pathogenic Avian Influenza H5N1*. While reiterating that the H5N1 virus has not been detected in North America, these guidelines remind us of the importance of sensible safety practices. As the situation and information with regard to the H5N1 virus changes, these guidelines may be updated.

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5 Refuge Vision, Goals, and Objectives

Vision Statement

"Stone Lakes National Wildlife Refuge belongs to a limited group among the over 540 national wildlife refuges that protect fish, wildlife, and habitat within an urban area. Through collaboration with public and private partners, Stone Lakes conserves and enhances a range of scarce Sacramento-San Joaquin Delta and Central Valley habitats and the fish, wildlife, and plants they support. It sustains freshwater wetlands, wooded riparian corridors, and grasslands that facilitate wildlife movement and compensate for habitat fragmentation. Managed wetlands are of sufficient size to maintain abundant wildlife populations. Grasslands consist of a sustainable mix of native and desirable nonnative species that support a variety of grassland-dependent species. The Refuge reduces further habitat fragmentation and buffers the effects of urbanization on agricultural lands and adjacent natural areas within the Delta region.

The Refuge pursues a land conservation program that complements other regional efforts and initiatives. Management efforts expand and diversify habitats for migratory birds and a range of species at risk. The Refuge promotes cooperative farming opportunities and strives to maintain traditional agricultural practices in southwestern Sacramento County that have proven benefits for migratory birds experiencing declines, such as long-billed curlews, Swainson's hawks and sandhill cranes. Through cooperation with other agencies, conservation organizations, neighbors, and other partners, the Refuge develops and manages wetlands in a manner that reflects historic hydrologic patterns and is consistent with local, State, and Federal floodplain management goals and programs.

Volunteers from all walks of life find an outlet for their interests and talents in a responsive and appreciative setting.
Photo by USFWS

Stone Lakes was established as a national wildlife refuge because of passionate support from people who recognized its ecological importance and critical role for the floodplain of the Beach-Stone Lakes basin.. The community sees the Refuge as a sanctuary for fish, wildlife and the habitats upon which they depend, a site for recreation and learning and a natural setting that can enrich their lives according to their values. Visitors representing the area's diversity enjoy increasing opportunities for accessible recreation that harmonizes with Refuge conservation efforts, such as hunting, fishing, wildlife observation and photography. The education community looks to the Refuge as a key partner in environmental education programming. Volunteers from all walks of life find an outlet for their interests and talents in a responsive and appreciative setting."

Goals

Goals are descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable outcomes. Goals translate Refuge purposes into management direction. Each goal is supported by measurable, achievable objectives with specific strategies needed to accomplish them. Objectives are designed to be accomplished within 15 years. Actual implementation, however, may vary as a result of available funding or other resource limitations. Figures 6 and 7, respectively, show summaries of the proposed habitat management and visitor services plans for Stone Lakes National Wildlife Refuge.

Currently, the Service manages about 30 percent of the lands within the approved Refuge boundary. This CCP presents goals and objectives for only those lands that are or will soon be managed by the Service. The restoration objectives identified in this CCP are consistent with the restoration goals identified in Chapter 3B-3 of the 1992 environmental impact statement (EIS) at the time of establishment of the approved Refuge boundary (USFWS 1992).

Goal 1. Conserve, enhance, restore and manage Central Valley wetland, riparian, grassland and other native habitats to benefit their associated fish, wildlife, plants and special status species.

Objective 1.A. Within 15 years, establish a minimum of 65 acres of valley foothill riparian and oak woodland habitat with a canopy cover of 20-80% and a canopy height of 2-10 meters. These newly planted habitats will have a complex structure with a canopy, subcanopy and understory shrub layer that will continue to mature beyond the lifetime of this CCP. An additional 40 acres of understory shrubs and herbaceous cover would be established in areas restored from 1995-1998. In the restored valley riparian habitats, wild grape will often cover trees and shrubs and will dominate 30 to 50 percent of the ground cover along with a shrub layer consisting of wild rose, California blackberry, blue elderberry, poison oak, buttonbush and willows. The herbaceous layer will consist of various grasses and sedges. Dominant trees will include valley oak, cottonwood, California sycamore, white alder (Alnus rhombifolia), box elder and Oregon ash.

Rationale: Over 89 percent of the historic riparian woodland and 99 percent of oak savanna habitat in the Central Valley has been lost or converted since Euro-American settlement (DFG 2006). Refuge riparian habitat restoration efforts to date have produced approximately 107 acres of restored habitat, primarily on the Beach Lake Unit. Based on the riparian habitat restoration goals defined in the EIS (USFWS 1992), the Service intends to restore a minimum of 65 acres of additional riparian habitat over the next 15 years. Expanding riparian zones along lakes, sloughs and waterways will benefit a variety of species that use these habitats during migration, for nesting, feeding and roosting habitat. These restored habitats would provide breeding and migratory habitat for a variety of riparian dependent species which have been identified by the Central Valley Habitat Joint Venture as species of concern (G. Geupel, pers. comm.), including the yellow warbler, song sparrow, spotted towhee, yellow breasted chat, black headed grosbeak and common yellowthroat. Some of these species, extirpated locally or in severe decline, such as yellow warbler and yellow-breasted chat, would also benefit from restoration efforts. Understory shrub plantings that include elderberry bushes would benefit the Federally-listed valley elderberry longhorn beetle. Additionally, restoring riparian habitat will help achieve the conservation action recommendations set forth in the Riparian Bird Conservation Plan by the California Partners in Flight and the Riparian Habitat Joint Venture (RHJV 2004).

Strategies:

1. Restore and expand cottonwood riparian forest habitat along the south arm of North Stone Lake through planting and beaver exclusion fencing.

Figure 6. Proposed Habitat Management

Stone Lakes National Wildlife Refuge

0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

- Grasslands, Farmlands, & Other
- Unmanaged Wetlands & Vernal Pools
- Managed Wetlands
- Riparian Forest
- Open Water
- Non-Refuge Lands
- Seasonally Flooded
- Wetland Restoration
- Riparian Restoration
- Natural Riparian Expansion

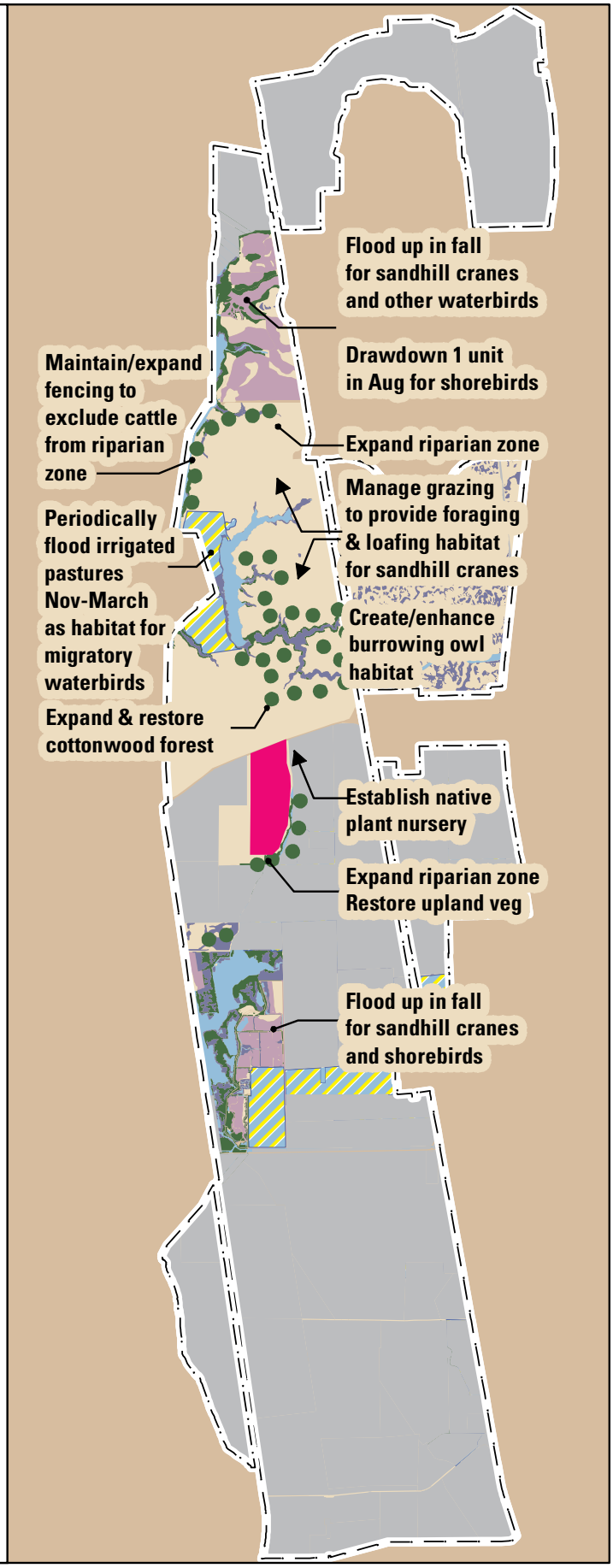


Figure 7. Proposed Visitor Services Plan

Stone Lakes National Wildlife Refuge

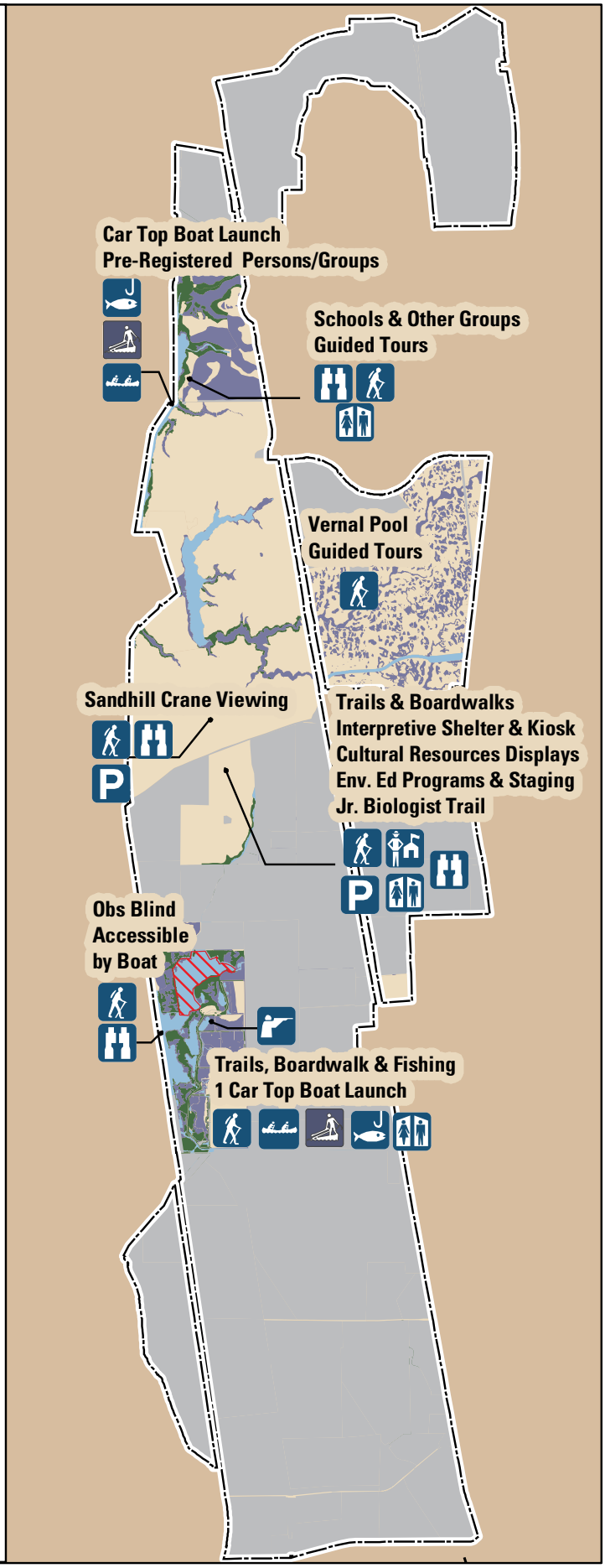
0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

- Refuge Headquarters
- Hiking Trails
- Parking
- Car-Top Boat Launch
- Photo Blind or Observation Platform
- Waterfowl Hunting
- Non-Motorized Boating
- Boat Fishing

- Grasslands, Farmlands & Other
- Wetlands & Vernal Pools
- Riparian Forest
- Open Water
- Non-Refuge Lands

- Wetland Restoration
- Seasonal Closure



2. Expand the riparian zone to a range of 150 to 400 feet wide along the Sacramento Drainage Canal of the South Stone Lake and Headquarters Units.
3. Restore approximately 20 acres to a combination of native trees, shrubs, and grasses on the upland areas of the Headquarters Unit.
4. Establish/enhance subcanopy and understory in new and established riparian habitat areas on the Beach Lake and North Stone Lake units.
5. Establish native plant nursery at the Headquarters Unit for use in restoration projects.
6. Plant early to mid-successional vegetation on the western portion of the of the South Stone Lake Unit (Lewis Investment Co. tract).
7. Assist the Sacramento Regional County Sanitation District in expanding the valley oak forest along lower Morrison Creek on the CAMRAY tract of the Beach Lake Unit by seeking funding and other support for restoration.
8. Allow expansion of riparian habitat along existing riparian corridors including managed seasonal wetlands.
9. Identify and map weed infestations, track assessments and treatments and produce maps and reports that can be shared with other interested parties.
10. Intensify control efforts for perennial pepperweed in riparian areas using a variety of methods including pesticides, mowing, and hand-pulling.
11. Cooperate with U.S. Department of Agriculture (USDA) and local academic institutions to research new methods for controlling invasive plants.
12. Measure habitat characteristics (e.g., canopy cover, species composition) of riparian plantings in areas with a high diversity of bird species, as indicated by mist netting data collected over the past six years on Beach Lake Unit, to guide future restoration efforts.

Objective 1.B: Maintain and manage on an annual basis 425 acres of riparian and oak woodland habitat, consisting of 360 acres of existing habitat and 65 acres of restored habitat (See Objective 1.A). This habitat encompasses riparian and oak woodland habitat in various successional stages comprising a complex structure with a canopy, sub-canopy, and understory shrub layer (usually impenetrable). Restoration would occur through habitat manipulations, including control of invasive plant species and restoration of the sub-canopy and understory shrub layer by planting native species. Wild grape often covers trees and shrubs and dominates the ground cover along with a shrub layer consisting of wild rose, California blackberry, blue elderberry, poison oak, buttonbush and willows. The herbaceous layer consists of various grasses and sedges. Dominant trees include valley oak, cottonwood, California sycamore, white alder, box elder and Oregon ash.

Rationale: Valley foothill riparian habitats occur in the Central Valley and the lower foothills of the Sierra Nevada and Coast Ranges and are associated with low velocity flows, floodplains and gentle topography. Over 89 percent of the historic riparian woodland and 99 percent of oak savanna habitat in the Central Valley has been lost or converted since Euro-American settlement (DFG 2006). These habitats comprise a complex structure with a canopy, subcanopy and understory shrub layer. Based on the population trends and life history requirements of various species in the Central Valley, the Central Valley Habitat Joint Venture has developed a list of focal migratory bird species that can be used to guide restoration and management efforts. Riparian habitats provide breeding and migratory habitat for the following focal species for the Central Valley, as defined by the Central Valley Habitat Joint Venture (G. Geupel, PRBO, pers. comm.): yellow warbler, song sparrow, spotted towhee, yellow breasted chat, black headed grosbeak and common yellowthroat. Furthermore, these riparian areas support heron and egret rookeries that vary in size from ten to 50 nests. The bird species previously listed and others, use a variety of successional stages

within riparian habitat. Maintaining and managing high quality riparian habitat, in various successional stages, will help achieve the conservation action recommendations set forth in the Riparian Bird Conservation Plan (RHJV 2004).

Strategies:

1. Monitor riparian and oak woodland habitats each spring for invasive species such as perennial pepperweed and yellow star thistle and implement control methods based on integrated pest management techniques, including herbicide applications and grazing (see Objective 1.A).
2. Monitor riparian areas for existing and newly-established heron and egret rookeries (See Strategy 2.B.2).
3. Maintain and expand fencing along SP Cut on the North Stone Lake Unit to exclude cattle from riparian areas.
4. Conduct annual surveys of riparian habitats for damage by beavers, research methods to discourage beavers, and implement protection measures (e.g., wrapping trees with hog wire or fencing).

Objective 1.C: Within five years, enhance and maintain approximately 50 acres of seasonal and permanent wetlands created on the 70 acre of the South Stone Lake Unit (Lewis Investment Co. tract) by promoting growth of wetland species such as swamp timothy, smartweeds, watergrass and associated invertebrates. These wetland species provide food for waterfowl and other waterbirds.

Rationale: Approximately 95 percent of wetlands in the Central Valley have been lost or converted to other land uses (DFG 2006). Improving water management on the South Stone Lake Unit would reverse some of these losses and benefit a wide variety of migratory birds and other wildlife, including special status species, such as giant garter snake, western pond turtle, white-faced ibis, greater sandhill crane, long-billed curlew, black-bellied plover, black-necked stilt and long-billed dowitcher (*Limnodromus scolopaceus*) and help achieve CVJV goals.

Strategies:

1. Modify existing water delivery system on the South Stone Lake Unit to deliver water to the Lewis Investment Co. Tract.
2. Control undesirable vegetation using a combinations of the following treatments: mowing, discing, burning, herbicide applications and summer flooding.
3. Explore the possibility of applying reverse-cycle water management on an experimental basis to benefit shorebirds.

Objective 1.D: ***Manage on an annual basis 529 acres as moist soil habitat, characterized by a plant composition of 50 percent or more moist soil, high-energy waterfowl plant foods including: watergrass, swamp timothy and smartweeds. Flood approximately 60 percent of the moist soil units to a depth of 2 to 10 inches for dabbling ducks and shorebirds and 40 percent to depths of 6 inches to 3 feet for diving ducks, grebes, cormorants, pelicans, waders and other waterbirds.***

Rationale: All managed seasonal wetlands on the Refuge consist of moist soil impoundments which support a wide variety of waterbirds, with peak numbers of waterfowl and shorebirds occurring in the late fall and winter. Species groups having varying requirements for vegetation and water depth. For example, dabbling ducks, such as cinnamon and green winged teal, mallard and northern pintail prefer to feed in shallow water, with an equal ratio of open water and emergent vegetation, whereas diving ducks, such as bufflehead (*Bucephala albeola*), canvasback and common goldeneye (*Bucephala clangula*) prefer deeper water. Shorebirds, such as long-billed dowitcher, black-bellied plover, and black-necked stilts, feed on mudflats or in shallow water of varying depths, depending on species. Managed seasonal wetlands on the Refuge are currently operated under a fall-migration-oriented regime with flood-up

from mid-September or October through May, which optimizes habitat availability for fall migrants. Flooding seasonal wetlands under a reverse-cycle regime from March through August could provide late winter food before migration and habitat for breeding shorebirds and waterfowl broods. Species supported by this objective include special status species such as white-faced ibis and greater sandhill crane.

Strategies:

1. Flood moist soil wetland impoundments, depending on water availability, on Beach Lake and South Stone Lake units starting September 1 and no later than mid-September and maintain through March to May for migratory and wintering waterbirds, including waterfowl, shorebirds and sandhill cranes.
2. Stagger the timing of drawdown for moist soil units beginning in March.
3. Irrigate units one or two times from May through August to promote waterfowl food such as watergrass and swamp timothy
4. Disc and/or mow 25-50 percent of the units to stimulate growth of waterfowl food plants and mow or disc to maintain an equal ratio of open water to emergent vegetation.
5. Control undesirable plants such as cocklebur and joint grass using one or more of the following treatments: mowing, discing, burning, herbicide applications, or summer flooding.
6. Explore the possibility of applying reverse-cycle water management on an experimental basis to benefit shorebirds.
7. Draw down one permanent wetland unit beginning in August to provide habitat for migrating shorebirds. Flood the unit again in late September, when other wetlands are being flooded.

Objective 1.E: Maintain 452 acres annually of unmanaged seasonal wetlands (i.e., wetlands with no capability to manipulate water regimes) so they support 50 percent or more moist soil, high energy waterfowl plant foods, including watergrass, swamp timothy, and smartweeds, interspersed with open water while controlling undesirable vegetation, such as cocklebur, yellow star thistle and perennial pepperweed to benefit wintering and migratory waterfowl, as well as other wetland-dependent species.

Rationale: Unmanaged seasonal wetlands with no capability for water manipulations are found on all units of the Refuge. These wetlands receive water passively from rain and runoff only and are typically dry during summer. Once flooded, these wetlands attract a variety of waterbirds such as cinnamon teal, northern pintail, white-fronted goose, black-bellied plover, black necked stilt, long-billed dowitcher, sandhill crane and long-billed curlew.

Strategies:

1. Monitor unmanaged wetlands each spring for undesirable vegetation such as cocklebur and other noxious weeds such as yellow star thistle and perennial pepperweed and implement control methods as needed.
2. Use burning, grazing, discing, mowing and/or herbicide application to control the growth of invasive species and promote the growth of desirable wetland plants, such as watergrass, swamp timothy, smartweeds and nutsedges, in seasonal swales.

Objective 1.F: Annually maintain 136 acres of vernal pool seasonal wetlands characterized by greater than 70 percent native vernal pool vegetation.

Rationale: Vernal pool habitats support a variety of vernal pool species, including the federally endangered vernal pool fairy shrimp and vernal pool tadpole shrimp, as well as various species of special concern, including vernal pool plant species (USFWS 2006). These pools are best managed through prescribed grazing from November through June. Without grazing, a dense layer of nonnative annual grasses can exclude native vernal pool plants and consume water to the extent that vernal pools become prematurely dry. Grazing reduces the competitiveness of native plants versus nonnative plants, and may prolong inundation of vernal pools in the spring (J.

Marty, TNC, pers. comm.).

Strategies:

1. Monitor wetlands each spring for undesirable vegetation, such as cocklebur, and noxious weeds, such as yellow starthistle and perennial pepperweed and implement control efforts as needed.
2. In cooperation with the landowner, develop a grazing management plan for the Wetland Preserve Unit that maintains a residual dry matter level, as measured in August through September, of 800-1000 lbs/acre.
3. Depending on air quality regulatory restrictions, employ prescribed burns to reduce nonnative annual grasses and replicate the historical fire regime as closely as possible.
4. Develop proposals and support research to characterize plant and animal communities in natural versus created vernal pools.

Objective 1.G: Annually maintain 715 acres of deep water wetlands (including wetlands with and without a capability to manipulate water regimes), lakes, sloughs and SP Cut to provide breeding, foraging and loafing habitat for waterfowl and other wetland dependent species, such as giant garter snakes and western pond turtles. Deep water wetlands will be characterized by water depths of greater than three feet supporting wetland plants species such as tules, cattails, burreed (Sparganium spp.) and water primrose. Wetlands with the capability to manipulate water regimes (106 acres) will be managed to support a 50:50 ratio of tall emergent vegetation to open water.

Rationale: Permanent wetlands include wetlands, lakes, sloughs and waterways with different water management capabilities. Deeper water habitats interspersed with tall emergent vegetation, such as cattails and tules, provide excellent habitat for a variety of migrating, wintering and resident birds, including special status species, such as greater white-fronted geese, canvasbacks, northern pintails, wood ducks, common moorhens, American bitterns, American white pelicans and pied-billed grebes. An approximately equal percentage of open water for foraging and tall emergent vegetation for cover provides an optimal mix of habitat types. Riparian habitats associated with these wetlands may support colonies of nesting great blue herons, great egrets, double-crested cormorants, black-crowned night herons, and snowy egrets and a variety of raptors such as the Swainson's hawk. Fallen trees and logs provide basking sites for species such as western pond turtles and permanent wetlands, sloughs and waterways provide habitat for the endangered giant garter snake. Many of these wetlands were degraded through dredging, farming and other activities and are currently further threatened by degradation of water quality and invasive aquatic weeds such as water hyacinth.

Strategies:

1. Reduce human disturbances to nesting birds and other wildlife on deep water habitats such as lakes, sloughs and the SP Cut by limiting public access.
2. Continue to work in partnership with private landowners and local and State agencies and academic institutions to control water hyacinth and participate in the Stone Lakes Basin Water Hyacinth Control Program.
3. Within five years, survey aquatic plants in South Stone Lake and map distribution of Brazilian elodea and other non native plants to determine if control efforts are needed and if so, what methods can be used .
4. Cooperate with the U.S. Department of Agriculture and local academic institutions on evaluating alternate, nonchemical methods of controlling invasive weeds.
5. Assess necessity and feasibility of drawing down North Stone Lake to solidify a portion of the bottom of the lake to stimulate plant growth.
6. Maintain approximately an equal ratio of emergent vegetation to open water on the Beach Lake and South Stone Lake units through a combination

of drawdowns, mowing, discing and prescribed burning in sloughs.

7. Drawdown managed permanent wetlands every two to four years to control carp populations and improve germination of desirable wetland plants..
8. Maintain sanctuary areas for nesting waterbirds, (e.g., pied-billed grebes) waterfowl broods, giant garter snakes, and western pond turtle from May through September in the central portion of South Stone Lake (see Figure 6).

Objective 1.H: Manage and enhance approximately 1,900 acres of non-irrigated grasslands on the North Stone Lake Unit on an annual basis to provide a variety of grass heights and densities as measured by residual dry matter (RDM) at the end of the grazing season, which is typically November to June depending primarily on precipitation and other factors. Pasture rotation reduces grazing pressure on different pasture units and promotes a diversity of grassland-dependent species, such as arctic nesting geese, shorebirds, songbirds, burrowing owl and other raptors, sandhill crane and long-billed curlew which have been identified by the Service as focal species.

Rationale: Over 99.9 percent of historic native grasslands in the Central Valley have been lost to agricultural conversion and urban development since Euro-American settlement (DFG 2006). The large ungulates, pronghorn antelope and tule elk, that once grazed these grasslands were extirpated from the valley by the 1870s. The natural hydrologic regime of the area has also been irreversibly modified. Despite these changes, the 2,600-acre North Stone Lake Unit is one of the largest and relatively unaltered grassland areas left in the Stone Lakes Basin. It supports a variety of special status species, such as the greater sandhill crane, burrowing owl, Swainson's hawk, California horned lark, long-billed curlew and western meadowlark. Since grazing was reintroduced following a ten-year absence, many of the species mentioned above expanded their use of the Refuge.

Strategies:

1. Graze cattle on the North Stone Lake Unit from November 1 to July 15; actual termination dates will vary from year to year depending on rainfall and grass production.
2. Use integrated pest management techniques, including prescribed fire, mowing, discing, hand removal and herbicide applications, to reduce invasive plants, such as yellow starthistle, pepperweed and other undesirable grassland vegetation.
3. Implement a long term grazing management plan developed in collaboration with USDA Natural Resource Conservation Service (NRCS) and other range management experts. The plan prescribes stocking rates to achieve varying grass heights and densities in the five pastures of the unit to accommodate habitat requirements of breeding and wintering bird species, including sandhill cranes, long-billed curlews and western meadowlarks. The overall goal is to annually rotate grazing pressure (e.g., low, medium or high) among the five pastures, resulting in a range of grass heights and densities. Two pastures will be maintained with relatively lower residual dry matter (RDM) values as measured at the end of the grazing season (1,200 lbs/acre), two pastures with medium RDM values (1,750 lbs/acre) and one pasture with a higher RDM value (+2,500 lbs/acre). .
4. Enhance and create habitat for burrowing owls by reintroducing ground squirrels to the North Stone Lake Unit and constructing and maintaining artificial burrows until sufficient natural burrows are available.
5. Develop long term monitoring plan to survey population trends of greater sandhill cranes, arctic nesting geese,

long-billed curlews, white-faced ibis, burrowing owls, and western meadowlarks to evaluate wildlife responses to range management.
6. Develop methodologies to conserve, enhance and restore native grasses on the North Stone Lakes Unit through test plots in conjunction with USDA NRCS and Agriculture Plant Material Center.

Objective 1.I: Annually maintain 460 acres of irrigated pasture/wet meadow to provide habitat for a variety of grassland dependent species, including sandhill cranes, white faced ibis, long-billed curlew and arctic nesting geese.

Rationale: With less than one percent of native grasslands left in the Central Valley, many grassland dependent species now rely on dry and irrigated pastures for migrating and wintering habitat. Irrigated pastures on the North Stone Lake Unit support the largest concentration of native grasses on the Refuge. Irrigated pasture is sheet-flooded in winter to bring invertebrates to the surface, providing foraging habitat for cranes and shorebirds.

Strategies:
1. Continue irrigation of 460 acres of pastures on the North Stone Lake and South Stone Lake units and the Gallagher tract from June through October.
2. If feasible, sheet flood irrigated pastures to a depth of less than six inches every two weeks from November through March on the North Stone Lake Unit (also see 2.A.2).
3. Provide short grass habitat through a managed grazing program from July through October.
4. Develop a monitoring plan to survey native grasses and develop mapping capabilities and strategies to expand native grasses.

Objective 1.J: Restore approximately 30 acres to grassland habitat consisting of a minimum of 70 percent native grasses including; needlegrass, bluegrass (Poa spp.), rye grass, Elymus spp., and Melica spp. on various Refuge units within 10 years to promote biodiversity and improve the grassland communities on the Refuge.

Rationale: Native grasses once covered nearly 22 million acres of California, including much of the Central Valley (Heady 1977). Today, over 99.9 percent of these grasslands have been lost (DFG 2006). Although little is known about the original composition of native grasses of the Stone Lakes Basin, purple needlegrass may have dominated the valley grasslands with a mix of other perennial grasses, including bluegrass, rye grass, *Elymus* spp. and *Mellica* spp.; annual grasses such as Fescue (*Festuca* spp.); and a mixture of broad-leaved forbs (Heady 1977; Stebbins 1965). Because little is known about the original composition of the grasses and dramatic changes in land use and hydrology have occurred, local experts are the best source of information when planning native grassland restorations.

Strategies:
1. Establish small (less than 0.25 acre) experimental native grass plots before large scale restoration activities are conducted.
2. Remove nonnative seed sources by mowing, discing, burning, or chemical applications for two seasons before establishing native grasses and control broadleaves and other invasive plants on newly restored areas for three years or more.
3. Maintain grasslands by periodic disturbance, such as mowing, grazing, burning, or discing outside of the breeding season for birds.
4. Use local expertise in developing native grassland restoration plans.
5. Restore 3-5 acres of the western portion of the South Stone Lake Unit to a grassland community with an objective of 60 percent native grasses through discing, seeding, mowing and herbicide applications outside of the breeding season for birds.

6. Develop a monitoring plan to assess the success of native grass restoration projects.

Objective 1.K: Within 15 years, coordinate the Refuge land conservation program to protect 75 percent of the land within the approved Refuge boundary to help achieve the Central Valley Joint Venture (CVJV) regional habitat protection goals.

Rationale: One of the goals identified in the EIS that established the approved Refuge boundary (USFWS 1992), is creating linkages between Refuge habitats and habitats on adjacent lands to reverse the impacts of past habitat fragmentation on wildlife and plants. Therefore, priority should be given to conserving lands within the approved Refuge boundary and coordinating Refuge land conservation activities with other nearby regional conservation projects to compensate for habitat fragmentation caused by agricultural conversion and urban development. The CVJV is a partnership of conservation organizations and State and Federal agencies whose mission is to work collaboratively through diverse partnerships to protect, restore and enhance wetlands and associated habitats for waterfowl, shorebirds, waterbirds and riparian songbirds, in accordance with conservation actions identified in the CVJV Implementation Plan. Through these actions, the CVJV aims to advance its vision of providing diverse habitats necessary to sustain migratory bird populations in perpetuity for the benefit of those species, resident wildlife and the public. The Central Valley of California is the most important waterfowl wintering area in the Pacific Flyway, supporting 60 percent of the total duck and goose population. In its implementation plan, the CVJV sets out habitat protection, enhancement and restoration objectives for sub-basin of the Central Valley, including the Sacramento San Joaquin Delta.

Strategies:

1. Coordinate Refuge land conservation activities with local and State agencies and private organizations, including the Sacramento Regional County Sanitation District, Sacramento County Department of Regional Parks, Recreation and Open Space, California Department of Parks and Recreation, California Department of Water Resources, The Nature Conservancy, the Trust for Public Land and the American Land Conservancy.
2. Continue to seek congressionally-appropriated funds (including Land and Water Conservation Funds and Migratory Bird Conservation Funds) and other Federal, State and private funding for land conservation.
3. Acquire agricultural and conservation easements on farmland and other fish and wildlife habitats within the approved Refuge boundary.
4. Participate actively in regional land planning efforts by Sacramento County, Cities of Elk Grove and Sacramento, Sacramento Area Council of Governments, and others that may promote the maintenance of open space and wildlife corridors between the Refuge and other regional open space areas.
5. Within one year, complete conveyance of fee title interest in the 150-acre Beach Lake Mitigation Bank (Beach Lake Unit) from California Department of Transportation.
6. Within two years, finalize a cooperative agreement with the Sacramento Regional County Sanitation District for joint management of the 1,800 acres of the Sacramento Regional Wastewater Treatment Plant Bufferlands lying within the approved Refuge boundary.
7. Within 15 years, secure funding to protect 75 percent of land with the approved Refuge boundary by working with willing landowners.

Objective 1.L: Coordinate Refuge habitat conservation efforts with other private and public conservation efforts within the Sacramento-San Joaquin Delta to contribute to regional habitat conservation needs.

Rationale: The EIS establishing the approved Refuge boundary (USFWS 1992) identified two goals: (1) coordinate Refuge land acquisition and management activities with other agencies and organizations to maximize the effectiveness of Refuge contributions to regional habitat needs, and (2) preserve, enhance, and restore Central Valley wetlands and agricultural lands to provide foraging and sanctuary habitat to achieve distribution and population levels of migratory waterbirds consistent with goals and objectives of the Central Valley Joint Venture (CVJV). Therefore, coordination of the conservation efforts of various management entities should support a greater diversity of fish and wildlife values and recreational opportunities. Under the North American Waterfowl Management Plan, the CVJV was established for habitat conservation and management of migratory waterbirds in the Central Valley. Current CVJV habitat objectives for the Sacramento-San Joaquin Delta to which the Refuge may contribute include: (1) restore 19,000 acres of wetlands; (2) enhance 2,112 acres of wetlands; and (3) enhance 23,000 acres of agricultural land. The Service would coordinate efforts with ongoing private and public conservation projects, including the CVJV, Riparian Habitat Joint Venture, Cosumnes River Preserve, Yolo Basin Wildlife Area, Delta Meadows State Park and other State-owned Delta properties.

Strategies:

1. Within three years, modify the existing cooperative agreement with Sacramento County Department of Regional Parks, Recreation and Open Space for their 1,567-acre portion of the North Stone Lake Unit so the agreement has a 30-year duration, and includes the habitat and visitor use strategies outlined in the CCP and Sacramento County's revised Draft North Stone Lake Management and Restoration Plan.
2. Within three years, secure long term management through cooperative agreement of the California Department of Parks and Recreation 1,224-acre portion of the North Stone Lake Unit.
3. Within five years, develop a cooperative agreement with California Department of Water Resources for joint management of the 410 acres they own within the approved Refuge boundary.
4. Pursue inclusion of the Service as a signatory to the joint operating agreement for the Cosumnes River Preserve to support the conservation and management of lands within and adjacent to the approved Refuge boundary.
5. In cooperation with the Natural Resources Conservation Service (NRCS) and other agencies and private organizations, pursue enhancement of privately-owned lands within and outside of the approved Refuge boundary by working with landowners through various programs, such as Partners for Fish and Wildlife and NRCS programs (e.g., Conservation Reserve Enhancement Program, Environmental Quality Incentives Program, and Wildlife Habitat Incentives Program).
6. Continue to participate actively in regional land use planning by State, county and municipal entities that may affect Refuge resources or complement Refuge conservation goals (see also 1.M).

Objective 1.M: Manage Refuge floodplain lands in a manner consistent with local, State and Federal flood management, sediment and erosion control and water quality objectives as described in the environmental impact statement (EIS) establishing the approved Refuge boundary.

Rationale: The importance of the Beach-Stone Lakes Basin as a flood storage area during winter high flow events continues to increase with upstream urban development. The resulting changes in the flooding regime have also reduced the viability of some agricultural operations and modified patterns of remaining natural vegetation.

In the EIS that established the approved Refuge boundary (USFWS 1992), the Service recognized flood storage as an important benefit and natural component of the Beach Stone Lakes ecosystem. Refuge restoration and management will be consistent with Federal, State and local flood guidelines.

Strategies:

1. Participate in regional interagency floodplain management planning efforts that may affect the Beach-Stone Lakes Basin, including the North Delta Improvement Group, Lower Morrison Creek planning, Mokelumne-Cosumnes Watershed Alliance, Pt. Pleasant Flood Control Working Group and Sacramento River Planning Forum.
2. Implement Refuge habitat improvement strategies so that they do not exacerbate local or regional flooding, degrade water quality, or cause erosion impacts for adjacent or nearby landowners or residents.
3. Review and participate in regional planning activities sponsored by Sacramento County and local municipalities, such as the City of Elk Grove, which may affect flooding regimes or water quality in the Beach-Stone Lakes Basin.
4. Develop a Refuge levee flood control channel maintenance MOU in coordination with local agencies, such as reclamation and resource conservation districts, the City of Elk Grove, and Sacramento County, that is consistent with existing or future flood control policies.

Objective 1.N: Within 10 years of CCP approval, work toward achieving the water quality supply standard for wetlands and fish and wildlife resources set forth by the U.S. Environmental Protection Agency (USEPA), the California Department of Fish and Game (DFG) and the Regional Water Quality Control Board.

Rationale: Establishing a water quality monitoring program was recommended as a mitigation measure in the EIS establishing the approved Refuge boundary (USFWS 1992) and as part of subsequent water quality investigations (Thomas 2003). A water quality monitoring program can be used to further education and outreach efforts to local landowners, businesses and agricultural landowners, and can inform regulatory activity, if needed. Current threats to Refuge water quality include: eutrophic conditions (excess nutrients), turbidity, low dissolved oxygen, contaminants in urban and agricultural runoff (e.g., polycyclic aromatic hydrocarbons (PAHs), fecal coliform and pesticides) as well as mercury from historic mining operations.

Two options exist for the Refuge to comply with the Central Valley Regional Water Quality Control Board's (Regional Board) Irrigated Lands Conditional Waiver for water dischargers: filing as an individual discharger; or joining a discharge Coalition Group. Discharges from the Refuge into Waters of the State are not a regular occurrence and only occur periodically during flood events in which most of the flood water stays on Refuge lands and is not discharged. In addition the Refuge cooperates with the SRCSD Bufferlands staff to collect and analyze water samples to assess any impacts resulting from the application of aquatic herbicides. The Refuge complied with water quality testing, to assess any concentration of aquatic herbicides, in compliance with the California Department of Boating and Waterways National Pollution Discharge Elimination System (NPDES) permit. Given that minimal discharge, if any, occurs from the Refuge and that water quality monitoring is already occurring, the Refuge will file as an individual discharger, or as a Coalition Group Member if appropriate.

To comply with the Irrigated Lands Conditional Waiver as an Individual discharger, the Refuge must file a Notice of Intent (NOI) to comply and a Farm Evaluation Report. Additional required reports will include a Monitoring and Report Program Plan and water quality monitoring,

evaluated in a complete annual report to the Regional Water Board. In addition, technical reports may also be required, by the Regional Board, should water quality problems occur. The requirements for those that join a Coalition Group and file under the Conditional Waiver for Coalition Groups are identical except that a Watershed Evaluation Report is required in place of a Farm Evaluation Report. The reports required from the Coalition Groups include the filing of a NOI and General Report, Monitoring and Reporting Program Plan, Annual Monitoring Reports and the potential for a development of a Management Plan if required to resolve exceedance of water quality objectives.

Strategies:

1. Work to ensure coverage under the Central Valley Regional Water Quality Control Board Irrigated Lands Conditional Waiver, either as an Individual discharger or as a Coalition Group member if appropriate.
2. Develop a Refuge water quality monitoring program to track changes in contaminant concentrations, and water quality parameters (pH and dissolved oxygen) resulting from current and future land use patterns around the Refuge within five years.
3. Develop a long-term water quality monitoring program to assess the effects of non-point sources of pollution (including stormwater and agriculture runoff) entering the Refuge and the contaminant levels in fish and other biota.
4. Develop strategies to work with local landowners, businesses and neighborhood organizations within the watershed to educate and reduce quantities of pesticides and runoff entering the Refuge.
5. Expand the Refuge outreach and education effort to inform upstream urban residents and businesses of the sensitivity of downstream water uses.
6. Develop a partnership with Franklin High School to monitor water quality on the Refuge.

Goal 2. Conserve, enhance, and restore high quality migrating, wintering and breeding habitat for migratory birds within the Sacramento San Joaquin Delta of the Central Valley.

Objective 2.A: Manage 2,950 acres of Refuge lands and cooperate with nearby farmers and landowners to conserve and enhance agricultural lands and habitats that support 400-700 greater and lesser sandhill cranes wintering in the Stone Lakes Basin. The Refuge will continue management of seasonal wetlands and irrigated pasture to provide roosting and foraging habitat and pursuing projects and partnerships to maintain dry and irrigated pastures, wheat, corn, and alfalfa for cranes foraging in the basin.

Rationale: The greater sandhill crane is listed by the State as a threatened subspecies, under the California Endangered Species Act (CESA). Cranes winter in the Central Valley and depend on a combination of agricultural lands, wetlands and pasture. As urban expansion and conversion of agricultural crops and pastures to vineyards continues, habitat availability for cranes has decreased. Winter home ranges for greater sandhill cranes are relatively small, averaging less than one square mile, despite fluctuating food availability during the winter season (G. Ivey, pers. comm.). Nightly roost sites need to be in close proximity (less than one mile) to feeding sites. The Refuge can play an important role in the recovery of this subspecies by providing winter roosting and foraging habitat to support approximately 200 to 300 greater sandhill cranes near the North and South Stone Lake units and the surrounding area.

Strategies:

1. Begin flood up of seasonal and permanent wetlands on the Beach Lake and South Stone Lake units in early September to provide habitat for arriving (migrating) cranes, particularly when roosting habitat in the area is in short supply.
2. Periodically sheet-flood irrigated pastures in winter to provide foraging

opportunities on the North Stone Lake Unit.

3. Continue grazing the North Stone Lake Unit to provide foraging and loafing habitat adjacent to roosting sites in wetlands (see objective 1.F).
4. Develop and host workshops to provide private landowners with information about USDA, NRCS and other Federal, State and private grant and incentive programs aimed at maintaining small grain fields for crane forage and protecting or enhancing other habitats important for wintering crane within a five-mile radius of the Refuge.
5. Maintain 40 to 60 acres of agriculture fields on the Headquarters Unit of the Refuge for foraging cranes. Crops could include corn, winter wheat and other small grains.
6. Conduct bimonthly sandhill crane surveys and coordinate results with appropriate researchers and refuges including the Cosumnes River Preserve and Modoc and Malheur national wildlife refuges.
7. Incorporate crane roosting habitat characteristics (e.g., shallow water, small islands with gravel, and minimizing human disturbance) into any new wetland development plans.

Objective 2.B: Develop monitoring strategies for focal species identified in various regional bird conservation plans to assess current and guide future habitat restoration activities. The regional plans include: the Central Valley Joint Venture Implementation Plan, the Riparian Bird Conservation Plan, the Grassland Bird Conservation Plan, the Oak Woodland Bird Conservation Plan, the North American Waterbird Conservation Plan, the North American Waterfowl Management Plan, and the North American Landbird Conservation Plan.

Rationale: Population monitoring and research assessing the habitat requirements of migratory birds is needed to evaluate the effectiveness of Refuge management strategies and facilitate adaptive management. Monitoring and research on the Refuge, in cooperation with other similar efforts in the Central Valley, will provide valuable information about population trends and assist with development of overall strategies for the recovery and management of migratory birds and other key species groups. Collaborative efforts between the Refuge and other agencies, academic institutions, and private organizations will increase the effectiveness of data collection efforts, expand the resources available and enable the Service to address a larger array of research and monitoring needs.

The Sacramento-Yolo Mosquito and Vector Control District (SYMVCD) has monitored landbirds on the Refuge weekly through mist netting and banding since 1995. The program has assisted the Service with assessing the quality of Refuge riparian habitats and avian species diversity. The goals of this program are to: assess the role of wild birds as reservoirs for mosquito-borne diseases such as Western Equine Encephalitis, St. Louis Encephalitis, and West Nile virus; assess the usefulness of bird populations as an early warning system for potential viral episodes; and provide information regarding species diversity, population status, seasonal use and reproductive success and recruitment on the Refuge.

Strategies:

1. Conduct biweekly waterfowl, shorebird and waterbird censuses from September through June and coordinate surveys with the annual inter-agency mid-winter waterfowl survey.
2. Continue monitoring of existing heron and egret rookeries and annually survey suitable riparian areas for new colonies (See Strategy 1.B.2).
3. Pursue opportunities to recruit qualified volunteers and develop

partnerships with resource agencies, academic institutions and private organizations to accomplish monitoring and research projects related to Refuge habitats and wildlife.
4. Develop and annually update a list of Refuge monitoring needs with universities in the region and other agencies which conduct research.
5. Develop surveys on the South Stone Lake, Headquarters, and Wetland Preserve Units and other lands as they come under Refuge management.
6. Develop data management strategies to store data and make data available to other researchers.
7. Assess feasibility of creating tricolored blackbird habitat in grassland habitat (e.g., planting large California blackberry patches and expanding tule areas in wetlands for nesting).

Goal 3. Provide visitors with wildlife-dependent recreation, interpretation and education opportunities which foster an understanding of the Refuge's unique wildlife and plant communities in an urban setting.

Objective 3.A: Within the next five years, recruit and maintain sufficient short and long term volunteers to accomplish three habitat restoration projects, eight wildlife surveys, six environmental education programs, and remain active in offering a variety of other volunteer opportunities.

Rationale: Refuge volunteer programs are a vital instrument for providing educational and interpretive opportunities to the public and for assisting with biological monitoring and visitor use programs. The reauthorization of the National Wildlife Refuge Volunteer and Community Partnership Enhancement Act of 1998 illustrates the importance of volunteer programs and community partnerships in helping to fulfill the mission of the National Wildlife Refuge System.

Strategies:
1. Broaden the scope of volunteer tasks and define volunteer positions to better utilize the diverse interests, talents and abilities of residents in the surrounding communities.
2. Develop a Refuge volunteer manual to aid the volunteer coordinator with planning and implementing the volunteer program.
3. Provide at least one comprehensive volunteer training opportunity per year with a revised and updated volunteer training manual and other educational opportunities.
4. Develop and maintain a volunteer database.
5. Pursue opportunities to collaborate on expanding volunteer activities with the Sacramento Regional County Sanitation District, Cosumnes River Preserve and Delta Meadows State Park.
6. Recruit Student Conservation Association, AmeriCorps, California Conservation Corps and other interns to work in a variety of programs.
7. Explore and continue ongoing outreach efforts to recruit quality volunteers.
8. Expand opportunities for specific one-time volunteer events, ongoing individual opportunities and ongoing group opportunities, including community service hour use opportunities.
9. Continue and expand volunteer participation in three habitat restoration projects on the Headquarters Unit, including 176 acres of managed and passive seasonal and permanent wetlands, 82 acres of wet meadow and upland native grasslands and 83 acres of riparian habitats.
10. Maintain and expand volunteer participation in eight ongoing wildlife monitoring surveys including waterbird monitoring, nest box monitoring, rookery surveys, landbird mistnetting/disease monitoring, sandhill crane surveys, grasslands monitoring, frog malformation survey and Swainson's hawk/burrowing survey.
11. Maintain and expand volunteer participation in six environmental

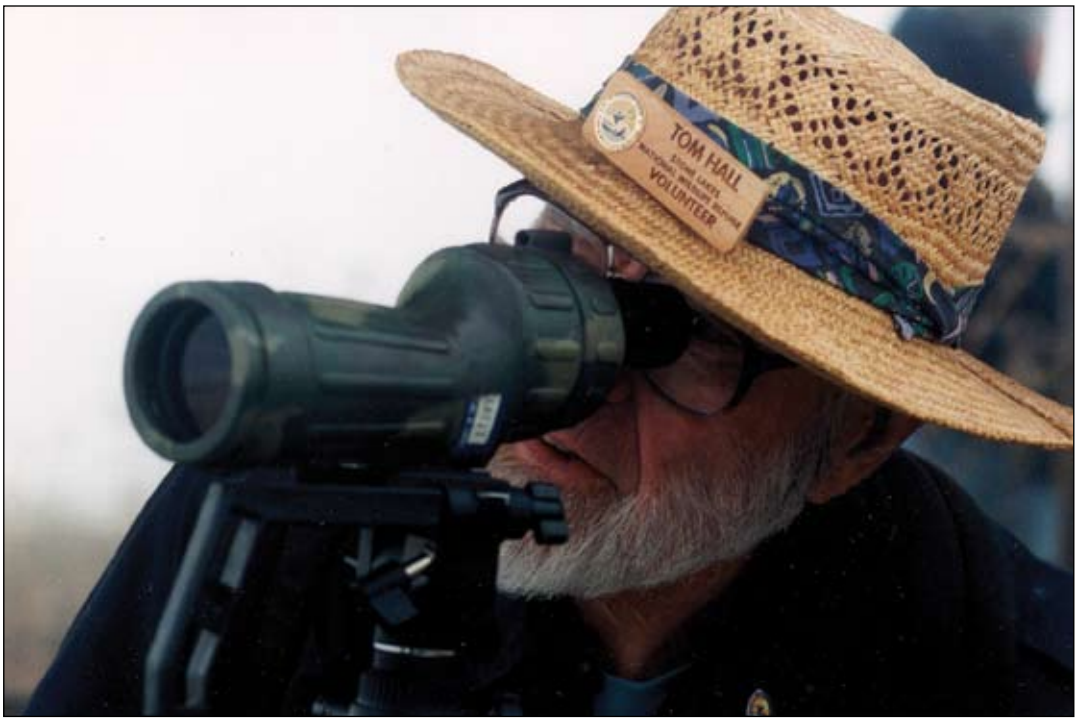
education programs including school groups, special group tours, partnering with schools on curricula, special events, volunteer work and teacher workshops.

Objective 3.B: Construct adequate facilities and develop programs for visitors to visit the Refuge seven days a week to observe, photograph and enjoy the Refuge's unique natural habitats and wildlife during all seasons of the year with a target of 10,500 visit opportunities per year by 2009.

Rationale: Wildlife observation and photography are two of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. These wildlife dependent activities were identified in the EIS (USFWS 1992) and should be offered on the Refuge. Currently, the Refuge has limited visitor access to two days per month and, as a result, the expectations of the visiting public are not being met A great potential also exists to provide visitors opportunities for wildlife observation and photography from boats. To prevent disturbance of wildlife, boats would be limited to using trolling motors. A no-wake zone on the entire Refuge would minimize conflicts with other users, water quality degradation, erosion to levees and disturbance to wildlife. Boating would be allowed from June to September to minimize impacts to heron rookeries and Swainson's hawks nesting along riparian corridors.

Strategies:

1. Construct two photography blinds on the Headquarters and North Stone Lake units.
2. Construct restrooms on the Beach Lake, Headquarters and South Stone Lake units.
3. Construct two miles of universally accessible trails and 200 feet of boardwalk on the Headquarters Unit.
4. Construct a safe entrance road and parking area for approximately 40 vehicles on the Headquarters Unit
5. Construct a viewing platform on the Headquarters Unit overlooking newly constructed wetlands.
6. Construct a safe vehicular access point, a parking area for 15 cars and a trail and a wildlife observation platform



Wildlife observation and photography are two of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997.
Photo by USFWS

on the southern portion of the North Stone Lake Unit, accessible from Hood-Franklin Road. Design and locate facilities to minimize impact on sandhill cranes, arctic nesting geese, giant garter snakes and burrowing owls.

7. Provide parking for approximately 20 cars at the boat launch on the South Stone Lake unit to provide wildlife viewing, photography, fishing and associated cartop boating opportunities. Only non-motorized or electric motor-only boats would be allowed on South Stone Lake from June through September. South Stone Lake would be an enforced no-wake zone.
8. Construct 1.5 miles of foot trails and 200 feet of boardwalk on the South Stone Lake unit open to the public seven days a week with seasonal restrictions.
9. Develop a boat-accessible haul-out site, walking trail and viewing blind on the South Stone Lake Unit (i.e., Lodi Peninsula)..
10. Provide parking and boat launch capacity for approximately 10 cartop boats (including canoes and kayaks) on the Beach Lake unit at the end of Elliott Ranch Road to provide wildlife viewing, photography and fishing opportunities for pre-registered groups in SP Cut from June through September.
11. Once visitor use facilities are made available on the Headquarters unit, shift the focus of the Beach and North Stone Lake units within one year from open-touring days to pre-registered school and docent-guided tour groups.
12. Develop guided tours for the Wetland Preserve Unit.
13. Restrict land-based visitor use near habitat suitable for heron/egret rookeries, nesting Swainson's hawks and other areas used by nesting migratory birds during sensitive laying and incubation periods (approximately February to June 15).
14. Minimize disturbance to sandhill crane foraging and roosting habitats on the Refuge by restricting public access during October through March.
15. Reduce potential spread of invasive species by visitors by restricting access to paved or graveled trails and maintaining trails in good condition through regular weed control.

Objective 3.C: Within five years, develop an environmental education program with a target of providing 80 opportunities per year for groups with an outdoor experience where visitors become aware of the Refuge's role in the conservation of Central Valley and Sacramento San Joaquin Delta habitats and their fish and wildlife.

Rationale: Environmental education is one of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. The Refuge provides a unique opportunity for the local community to experience Central Valley habitats and wildlife in proximity to an urban area. Refuge-based environmental educational activities can also be integrated into both indoor and outdoor classroom curriculums.

Strategies:

1. Offer up to four staff and/or docent lead environmental education tours on the Refuge per week.
2. Within five years, conduct teacher workshops to develop an environmental education program featuring teacher lead tours with a target of training six to 12 groups of teachers per year.
3. Develop a Junior Biologist Trail as part of the proposed Blue Heron Trail System on the Headquarters Unit to be used by schools and other groups and individuals.
4. Develop a Refuge elementary school curriculum manual for teachers to use while visiting the Refuge that includes pre- and post-visitation activities.
5. Explore feasibility of a Refuge fee area to support environmental education programs and general maintenance of

visitor use areas.

Objective 3.D: Within five years, develop two interpretive programs where visitors could learn of the Refuge's role in conserving the Central Valley and Sacramento-San Joaquin Delta habitats and their fish and wildlife, with an emphasis on outdoor hands-on experiences.

Rationale: Interpretation is one of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. Interpretive activities can introduce the public to the Refuge's habitat management activities and familiarize them with the conservation efforts that protect local natural resources.

Strategies:

1. Develop a self-guided trail as part of the proposed Blue Heron Trails System on the Headquarters Unit with hands-on learning stations within two years.
2. Develop a class/group staging area and 5 open air interpretive shelters with one kiosk and exhibits as part of the Blue Heron Trails system that would accommodate approximately 40 children at a time.
3. Develop interpretive displays on the Headquarters Unit that illustrate traditional dwellings, various subsistence strategies and the overall lifestyle of local American Indian Tribes (see Objective 4.F).
4. Continue existing guided hikes and offer one additional interpretive docent guided hike per month.
5. Develop interpretive panels and exhibits on South Stone Lake Unit.
6. Develop self-guided trail and interpretive displays for the Wetland Preserve Unit.
7. Develop a variety of written interpretive materials such as brochures, flyers and handouts

Objective 3.E: Within five years, the Refuge will provide safe, boat-only fishing with day use parking facilities to accommodate approximately 20 boats on South Stone Lake and approximately ten boats on SP Cut from June through September.

Rationale: Fishing is one of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. Fishing has traditionally occurred on South Stone Lake and surrounding Delta waterways since American Indians occupied the area. In this objective, "safe," is defined as the absence of any fishing-related safety incidents.

Strategies:

1. Develop and maintain a safe public parking lot and boat launch facilities to accommodate approximately 20 cartop (not trailered) boats on the South Stone Lake unit, including an informational kiosk with maps and brochures on regulations, health warnings, species identification and Refuge boundaries. Boating will extend up the SP Cut to the culvert on the South Stone Lake unit.
2. Provide a launch for pre-registered canoe/kayak groups in SP Cut on the Beach Lake unit from June through September. Access would be from the end of Elliott Ranch Road and a no wake zone will be enforced.
3. Fishing will be in accordance with all State regulations. Fishing will not include take of frogs or crayfish and will only be done with rod and reel.
4. Restrict water-based visitor use near habitat suitable for heron/egret rookeries and Swainson's hawks during sensitive laying and incubation periods (approximately February to June 15).
5. Develop facilities for mobility impaired persons to enter and exit canoes and kayaks safely.
6. See objective 3.B for other strategies related to opportunities for boating programs.

Objective 3.F: Continue to expand the Refuge outreach program, targeting the local community and nontraditional

users, by expanding partnerships for the annual Walk on the Wildside event and prepare for a minimum of four appropriate off-Refuge events, per year, to increase awareness of the Refuge's role in conserving Central Valley and Sacramento San Joaquin Delta habitats and their associated fish and wildlife.

Rationale: Environmental education is one of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. The urban location of the Refuge provides opportunities for the Service to educate broader audiences within the local community, including nontraditional users, about the Refuge's role in conserving Central Valley habitats and wildlife and the benefits the Refuge provides to the surrounding communities and Central Valley.

Strategies:

1. Maintain Refuge website for a one-stop source of information about Refuge history, events and biological resources with links to the Stone Lakes National Wildlife Refuge Association and other partners.
2. Continue and expand partnerships for the annual Walk on the Wildside festival to celebrate the National Wildlife Refuge System and other events, such as International Migratory Bird Day.
3. Participate in at least four appropriate local off-refuge events each year, such as the Lodi Crane Festival and Salmon Festival.
4. Support the Stone Lakes National Wildlife Refuge Association by actively participating in their events, activities and meetings and making monthly contributions to Association outreach related materials, including newsletters, the website and brochures.
5. Collaborate with and assist local resource-oriented agencies and city departments, such as the Elk Grove Community Service District, on outreach programs involving the Refuge.
6. Develop new portable refuge displays for use at fairs, shows and festivals.
7. Expand the number of presentations given to schools, conservation groups and public service organizations.

Goal 4. In cooperation with tribal representatives, identify and protect cultural resources on the Refuge and educate the public regarding American Indians and the history of the region.

Objective 4.A: Prepare a cultural resources overview of the Refuge, within 15 years of CCP approval.

Rationale: Although record searches have been conducted for all Service-managed properties, a complete compilation of site records and relevant reports summarizing the number and locations of all recorded sites within the approved Refuge boundary would aid in planning land conservation, management and landowner outreach. Refuge planning efforts would be enhanced by identifying the location and composition of collections of human remains, funerary objects, sacred objects, or objects of cultural patrimony that were discovered and removed from within the approved Refuge boundary prior to the Service assuming land management authority. However, this overview would be for the sole purpose of identifying cultural resources and these collections would not fall under Service jurisdiction.

Strategies:

1. Compile and maintain all existing baseline data on cultural resources sites, surveys and reports within one mile of the approved Refuge boundary.
2. In consultation with archaeologists and tribal representatives, approximate the location of unrecorded sites and culturally sensitive areas within the approved Refuge boundary by using site records, maps and other data. Identify cultural resources issues and needs and draft potential solutions.

3. To aid with Refuge planning, identify the location and composition of any collections of human remains and Native American Grave Protection and Repatriation Act (NAGPRA) covered items removed from within the approved Refuge boundary prior to the Service's assumption of land management.

Objective 4.B: Within 15 years of CCP approval, evaluate conditions of known cultural resource sites on Refuge managed lands and conduct seasonal monitoring of known sites.

Rationale: The Service is required to ensure that the integrity of any cultural sites on Refuge lands are protected. As a result of the activities of previous landowners, sites may have been impacted or may still be vulnerable to continued degradation (e.g.,erosion, traffic, theft). Therefore, sites should be evaluated by qualified professionals and measures to stop and/or reverse deterioration of the sites should be developed and implemented.

Strategies:
1. Conduct monthly monitoring visits of known cultural resource sites on the North Stone Lake Unit to ensure that existing grazing protection measures are intact.
2. As needed, consult with professional archaeologists, local tribal representatives and the Regional Office Archaeologist regarding any necessary protection or remediation measures for cultural resource sites.
3. Develop additional measures to protect sites and/or remediate past damages, if necessary.

Objective 4.C: Identify and delineate any cultural resources on new lands coming under Refuge management.

Rationale: Identifying historic properties on lands as they come under Refuge management will enable staff to ensure that any restoration and management programs for fish and wildlife will also protect the integrity of sensitive cultural resources.

Strategies:
1. As funding is available, a qualified archeologist will survey new properties coming under Refuge management to locate and delineate, as needed, any known or previously unrecorded cultural resource sites.
2. In consultation with the appropriate Service or other professional cultural resource experts, evaluate sites on newly-managed properties to identify any protection, restoration, and/or management measures that may be necessary.

Objective 4.D: Meet annually with the Ione Band of Miwok Indians and other concerned tribal groups to discuss land management and restoration activities planned for the upcoming field season.

Rationale: The Service has agreed to meet annually with the Ione Band of Miwok Indians to keep them informed regarding planned Refuge activities. Meetings will also provide a forum for tribal representatives to present any of their proposals or discuss other concerns that relate to management of Refuge lands.

Strategies:
1. As the Service has previously agreed, hold an annual meeting to review previous projects or summarize management or restoration projects and public events that are planned by the Refuge for the upcoming year, whether or not these activities will require formal State Historic Preservation Office consultation.
2. Review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving.

Objective 4.E: Within five years, begin developing a memorandum of understanding or agreement with the Ione Band of Miwok Indians or with other involved tribal organizations to facilitate compliance with the Native American

Grave Protection and Repatriation Act (NAGPRA) and to establish protocols for treating human remains and associated funerary objects, sacred objects or objects of cultural patrimony.

Rationale: Due to previous land uses, some Refuge lands and other properties within the approved Refuge boundary have human remains or NAGPRA covered items exposed on the surface of the ground. Currently, the Refuge consults with the Ione Band of Miwok Indians regarding land management programs and the status of burial sites. In addition to the Ione Band, other organizations may need to be consulted. In consultation with the Ione Band and other relevant authorities and experts, the Refuge has implemented some protection measures and assisted with some repatriation of human remains and funerary items. Since more sites are expected to come under Refuge management and to facilitate compliance with NAGPRA, a formal agreement with tribal groups should be developed to define the protocol to be followed when protection, repatriation and re-interment measures are appropriate.

Strategies:

1. Develop an agreement that includes the following elements: notification procedures; when appropriate, procedures for collection of human remains and associated funerary objects, sacred objects, or objects of cultural patrimony; criteria for defining NAGPRA covered items; any data collection or study of materials that may be warranted; guidelines for any temporary or permanent curation of non-repatriated materials; and a re-interment protocol.

Objective 4.F: Develop a minimum of two interpretive panels and exhibits, located various on units, to educate the public regarding the cultural resources of the Refuge and past and present American Indian cultural practices, within 15 years of CCP approval.

Rationale: Developing interpretive and educational materials to increase public understanding about local American Indian peoples is necessary, given the abundance of cultural resources within the approved Refuge boundary and the historic role of Indians in the Sacramento-San Joaquin Delta. These materials will aid Refuge staff in explaining historical ecological conditions, the importance of restoring and/or maintaining the integrity of those conditions and the role fish and wildlife played in American Indian culture and history.

Strategies:

1. Develop exhibits for the Headquarters and Beach Lake units to illustrate traditional dwellings, various subsistence strategies and the overall lifestyle of local American Indian peoples.
2. Solicit input and advice from concerned tribal representatives in planning, information gathering and review of educational, interpretive and outreach programs and publications. Work with Tribes and universities to identify the messages and resources that would be most appropriate to share with the public.
3. In publications or exhibits, provide a brief history of the indigenous peoples of greater California, scaling down to the Sacramento Valley and then to the Sacramento-San Joaquin Delta region to educate the public.
4. Include a cultural resource element in special events held on the Refuge.

6 Implementation and Monitoring

Once the preferred management alternative and CCP are finalized and approved and the Service has notified the public of its decision, the implementation phase of the CCP process begins. Implementation occurs over a period of 15 years, during which the CCP will serve as the primary reference document for all Refuge planning, operations and management until it is formally revised. The Service will implement the final CCP with assistance from existing and new partner agencies and organizations and from the public.

The activities required to realize the management goals discussed in this CCP are referred to as "projects" below. Every effort will be made to implement the projects by the established deadlines. However, the implementation timing of the management activities proposed in this document is contingent upon a variety of factors, including:

- Completion of detailed step-down management plans
- Funding
- Staffing
- Compliance with other Federal laws and regulations
- Partnerships
- The results of monitoring and evaluation

Each of these factors is described briefly below as they apply to the Service's proposed action.

Step-Down Management Plans

Some projects or types of projects require more in-depth planning than the CCP process is designed to provide. For these projects, the Service prepares step-down management plans. In essence, step-down management plans provide the additional planning details necessary to implement management strategies identified in a CCP. Refuge staff members have already completed a number of step-down plans. These include fire management, grazing, land protection and mosquito integrated pest management plans. This CCP proposes several new step-down plans that are identified in Table 2, along with target dates for completion.

Funding and Staffing

Resources are required to adequately operate any national wildlife refuge including initial capital outlay for equipment, facilities, labor and other expenses as well as recurring, annual costs for staff, contracts, supplies, maintenance and other recurring expenses (See Table 3, Estimated Initial Capital Outlay to Implement CCP). The estimated initial capital outlay for the Refuge, described in this CCP would cost approximately $10 million. Not all of these capital expenditures would occur in the same year as many of these expenses would be most likely implemented over the course of several years. The detailed descriptions of objectives and their associated implementation strategies serve as a guide to the ideal time frame in which to implement capital expenditures. The largest costs for initial outlays are for visitor

Table 2. Step-down Management Plans

Step Down Plan	Target for Completion
Fisheries Management Plan	2008
Invasive Weed - Integrated Pest Management Plan	2008
Volunteer Plan	2009
Comprehensive Inventory and Monitoring Plan	2009
Habitat Management Plan	2009

services and habitat restoration as should be expected for an urban refuge.

To fully implement this CCP, personnel dedicated to the Refuge would include:
• 1 Project Leader
• 1 Deputy Project Leader
• 1 Wildlife Biologist
• 1 Administrative Support Assistant
• 1 Outdoor Recreation Specialist
• 1 Park Ranger
• 1 Motor Vehicle Operator
• 1 Engineering Equipment Operator

Annual contracts or cooperative agreements will also be needed to provide specialized services beyond the core Refuge functions, for which staff are required. The recurring staffing and other costs associated with CCP implementation total approximately six hundred and seventy thousand dollars (See Table 4, Estimated Annual Cost to Implement the CCP). This is approximately a 65 percent increase over the Fiscal Year 2006 operations budget of 435,000.

Compliance Requirements

This CCP was developed to comply with all Federal laws, executive orders and legislative acts to the extent possible. Some activities , particularly those that involve revising an existing step-down management plan or preparing a new one, would need to comply with other laws or regulations. In addition to NEPA and the Improvement Act, full implementation of all components of this CCP would require compliance with:
• Executive Order 11988 (Floodplain Management)
• Executive Order 12372 (Intergovernmental Review of Federal Programs)
• Executive Order 11593 (Protection of Historical, Archaeological, and Scientific Properties)
• Executive Order 11990 (Protection of Wetlands)
• Executive Order 12996 (Management and General Public Use of the National Wildlife Refuge System)
• Executive Order 12898 (Environmental Justice in Minority Populations and Low-Income Populations)
• Secretarial Order 3127 (Hazardous Substances Determinations)
• Endangered Species Act of 1973, as amended
• Refuge Recreation Act of 1962, as amended
• National Historic Preservation Act of 1966, as amended

Partnership Opportunities

As described in Chapter 1, a wide array of private and public partners play an important role in helping the Service achieve its goals and objectives for the Refuge. The Service will continue to rely on these and other partners in the future to help implement the final CCP and to provide input for future CCP updates. This draft CCP identifies many projects that provide new opportunities for existing or new partners. There is great potential for more public participation and assistance in the management and interpretation of the Refuges. The Service welcomes and encourages more public participation in the Refuges.

Adaptive Management

This draft CCP provides for adaptive management of the Refuge. Adaptive management is a flexible approach to long-term management of biotic resources that is directed by the results of ongoing monitoring activities and new data. Management techniques, objectives and strategies are regularly evaluated in light of monitoring results, new scientific understanding and other new information. These periodic evaluations are used to adapt management objectives and techniques to better achieve the Refuge's goals. Monitoring is an essential component of adaptive management in general and of this draft CCP. Specific monitoring strategies have been integrated into the goals and objectives whenever possible.

Plan Amendment and Revision

Refuge CCPs are meant to evolve with each individual Refuge unit. The Improvement Act specifically requires that CCPs be formally revised and updated at least every 15 years. The formal revision process will

follow the same steps as the CCP process (see Chapter 2: The Planning Process). In the meantime, the Service will annually review a checklist of the goals, objectives and management strategies of this CCP to assist in tracking and evaluating progress. The final CCP would also be informally reviewed by Refuge staff while preparing annual work plans and updating the Refuge database. It may also be reviewed during routine inspections or programmatic evaluations. Results of any or all of these reviews may indicate a need to modify the plan. The goals described in the final CCP would not change until they are re-evaluated as part of the formal CCP revision process. The objectives and strategies, however, may be revised to address changing circumstances or to take advantage of increased knowledge of the resources on the Refuge. If changes are required, the level of public involvement and associated NEPA documentation would be determined by the Refuge Manager, in accordance with Service policy.

Table 3. Estimated Initial Capital Outlay to Implement the CCP

Expenditure (Related Strategy)	Unit Cost	Unit	Quantity	Total Cost
Plant trees with beaver exclusion fences (1.A.1)	$15,000	mile	1.3	$19,500
Expand riparian zone at S. Stone Lakes and HQ (1.A.2)	$6,000	acre	5	$30,000
Restore 20 acres by HQ to native plants (1.A.3)	$8,000	acres	20	$160,000
Enhance sub-canopy in BL, NSL units (1.A.4)	$3,000	acre	115	$345,000
Establish native plant nursery by HQ (1.A.5)	$65,399	ea	1	$65,399
Plant early/mid-seccessional vegetation on west portion of the SSL Unit (1.A.6)	$6,000	acre	126	$756,000
Maintain/expand fencing along SP cut (1.B.3)	$10,000	mile	1.3	$13,000
Modify existing water delivery system on SSL Unit (1.C.1)	$25,000	mod.	1	$25,000
Map elodea at SSL and initiate control (1.G.3)	$10,000			$10,000
Enhance burrowing owl habitat at NSL unit (1.H.4)	$15,000	exp. unit	1	$15,000
Establish experimental native grass plots (1.J.1)	$8,000	acre	0.25	$2,000
Restore Beach Lake Unit grasslands (1.J.5)	$8,000	acre	108	$864,000
Develop a levee and flood control channel maintenance MOU (1.M.4)	$20,000	program dev.	1	$20,000
Develop a Refuge volunteer manual (3.A.2)	$19,505	ea	1	$19,505
Develop a Refuge volunteer database (3.A.4)	$19,505	ea	1	$19,505
Construct photography blinds (3.B.1)	$15,000	ea	2	$30,000
Construct restrooms at BL, SSL and HQ (3.B.2)	$50,000	ea	3	$150,000
Construct 2 miles of universally accessible trails at HQ Unit (3.B.3)	$100,000	mile	2	$200,000
Construct 200 ft. boardwalk at HQ (3.B.3)	$1,060	feet	200	$212,000
Construct entrance road and parking area (3.B.4)	$1,500,000	ea	1	$1,500,000
Construct viewing platform and associated boardwalk on HQ site (3.B.5)	$500,000	ea	1	$500,000
Construct parking lot, trail and observation platform at NSL site (3.B.6)	$620,000	ea	1	$620,000
Improve entrance road and parking area at SSL boat launch site (3.B.7)	$1,000,000	ea	1	$1,000,000
Construct foot trails at SSL (3.B.8)	$100,000	mile	1.5	$150,000
Construct 200 ft. boardwalk at SSL (3.B.8)	$1,060	feet	200	$212,000
Develop boat haul out and assoc. trail at Lodi Gun Club (3.B.9)	$30,000	ea	1	$30,000
Improve parking at BLU Lewis tract at end of Elliott Ranch Road (3.B.10)	$163,000	ea	1	$163,000
Develop a Junior Biologist Trail at HQ complete with entrance signs, universally accessible trails, entrance kiosk, interpretive panels (3.C.3, 3.D.1)	$1,630,000	ea	1	$1,630,000
Develop a an EE elementary school curriculum (3.C.4)	$19,505	ea	1	$19,505
Develop open air shelters (5) and main shelter (3.D.2)	$50,000	ea	6	$300,000
Develop local Indian displays at HQ (3.D.3, 4.F.)	$50,000	ea	1	$50,000
Develop interpretative panels at SSL (3.D.5)	$50,000	ea	1	$50,000
Develop self-guided trail and interpretative displays for the Wetlands Preserve Unit (3.D.6)	$300,000	ea	1	$300,000
Develop written interpretative materials (3.D.7)	$19,505	ea	1	$19,505

Table 3. (continued)

Expenditure (Related Strategy)	Unit Cost	Unit	Quantity	Total Cost
Develop parking lot and boat launch at SSL (3.E.1)	$55,000	ea	1	$55,000
Develop disabled accessible boating facilities (3.E.5)	$50,000	ea	1	$50,000
Compile baseline cultural resources data (4.A.1)	$5,000	ea	1	$5,000
Locate unrecorded cultural sites and sensitive areas (4.A.2)	$5,000	ea	1	$5,000
Identify location of human remains and NAGPRA items located in collections and museums (4.A.3)	$5,000	ea	1	$5,000
Develop exhibits for the HQ and BL units to illustrate traditional dwellings, subsistence strategies and lifestyle (4.F.1)	$25,000	ea	2	$50,000
Total				**$9,669,919**

Table 4. Estimated Annual Cost to Implement the CCP

Expenditure (Related Objective)	Unit Cost	Unit	Quantity	Total Cost
Staff Salaries and Benefits (# indicates position filled)				
# Refuge Refuge Manager/PL - GS-13	$102,450	ea	1	$102,450
# Refuge Assistant Refuge Manager - GS -12	$84,032	ea	1	$84,032
Wildlife Biologist GS-9	$65,680	ea	1	$65,680
# Administrative Support Assistant - GS-7	$54,268	ea	1	$54,268
# Outdoor Recreation Planner GS-11	$70,122	ea	1	$70,122
Park Ranger GS-7	$47,372	ea	1	$47,372
Engineering Equipment Operator - WG - 8	$53,560	ea	1	$53,560
# Motor Vehicle Operator WG - 6	$46,540	ea	1	$46,540
Maintenance supplies (1.D., 1.H., 1.F.)	$50,000	1	1	$50,000
Invasive weed management program (1.A., 1.B., 1.D., 1.E., 1.F., 1.H.)	$60,000	ea	1	$60,000
Water/pumping cost (1.I., 2.A.)	$20,000	ea	1	$20,000
Maintain 40-60 acres or agricultural fields (2.A.5)	$5,000	ea	1	$5,000
Levee and flood control channel maintenance MOU coordination (1.M.4)	$10,000	ea	1	$10,000
Water quality monitoring (1.N.)	$60,000	ea	1	$60,000
Travel/training	$6,000	ea	1	$6,000
Supplies	$25,000	ea	1	$25,000
Printing	$5,000	ea	1	$5,000
Pump-out for restroom	$5,000	ea	1	$5,000
Total				**$667,574**

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Appendices

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Appendix A. Compatibility Determinations

Compatibility Determination for Recreational Fishing on the Stone Lakes National Wildlife Refuge

Use: Fishing

Refuge Name:

Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:

Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):

Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (System) is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

Fishing is one of six priority public uses (i.e., hunting, fishing, wildlife observation, photography, environmental education and interpretation) identified in the National Wildlife Refuge System Improvement Act of 1997. Fishing has occurred within the Stone Lakes Basin and surrounding Delta waterways since prior to European settlement of the region. The visitor use program in the CCP proposes to open portions of the Refuge to fishing from boats from June through September and to expand visitor opportunities for wildlife-dependent recreation (USFWS 2006a). Due to limitations in parking space, launching sites, and the navigability of Refuge waterways, only cartop, hand-launched boats, such as canoes and kayaks will be permitted. Gas-powered outboard motors will not be allowed and a no wake zone will be enforced but use of electric motors will be possible in the South Stone Lake unit. Fishing will not include take of frogs or crayfish and will only be with rod and reel. The Service does not intend to allow bank fishing on the Refuge, due to a number of concerns, including: erosion of banks and other habitat impacts from trampling of vegetation, lack of staff to monitor use, and lack of infrastructure such as piers or platforms.

Game fish species to be allowed for legal take will include all native and introduced species listed in the California Freshwater Sport Fishing Regulations (e.g., bass, catfish, crappie, bluegill, sunfish, shad, carp). Fishing will be permitted in accordance with State and Federal regulations to ensure it will not interfere with conservation of fish and wildlife and their habitats. An informational kiosk with maps and brochures on regulations, health warnings, species identification, and Refuge boundaries will be available near the boat launch area. Chapter 5 of the Comprehensive Conservation Plan, Refuge Vision, Goals and Objectives, is herein incorporated by reference.

Availability of Resources:

Staff necessary to oversee the Refuge fishing program will be shared with other programs as described in the Draft Stone Lakes NWR CCP (USFWS 2006a). Shared staff member(s) would be sufficient to operate the modest program described in this plan. Facilities to support the program will require capital outlays and recurring costs however, some of the costs will be available through other visitor use programs, such as wildlife observation and photography. If unexpected costs arise, such as the need for more enforcement or higher than expected maintenance needs, we will reevaluate the program and make necessary adjustments, such as seeking volunteers or other partnerships to maintain facilities and administer the program.

Item	One Time Cost	Recurring Costs
Boat Ramp	$30,000	$5,000
Parking Area	$20,000	$5,000
Maintenance of Parking Lots and Boat Launches	N/A	$5,000
Maintenance (0.50 FTE)	$26,000	$26,000
Restroom	$50,000	$2,000
Law Enforcement (0.50 FTE)	$25,000	$25,000
Administration	$2,000	$2,000
TOTAL	**$153,000**	**$70,000**

Anticipated Impacts of the Use(s):

Impacts are discussed in detail in the environmental assessment for the Draft Comprehensive Conservation Plan (USFWS 2006). Fishing and other human activities may cause disturbance to wildlife (Burger 1981) and the cumulative effects of this expanded use will likely have effects on habitat and the fisheries resource (Buckley and Buckley 1976, Glinski 1976, Miller et al. 1998, Reijnen and Foppen 1994, Smith and Hunt 1995). Fishing

may result in increased problems with vandalism and litter such as discarded monofilament line and tackle. Because few native fish species are found at Stone Lakes, and non-native game species are plentiful, the impact on the native fishery is not expected to be significant.

Federally-listed species that may occur on the Refuge include the giant garter snake, valley elderberry longhorn beetle, and the vernal pool tadpole and fairy shrimp (USFWS 2006b). No impacts to vernal pool species are anticipated from fishing because fishing will be permitted only on waterways of the Beach Lake, North Stone Lake and South Stone Lake units where there are no vernal pools. State-listed species that may inhabit the Refuge include greater sandhill crane and Swainson's hawk. The most sensitive period for Swainson's hawk is during the nesting season, typically mid-February through July. Likely nesting areas would be closed to visitors during the nesting season. Impacts to greater sandhill cranes are not anticipated since the fishing season does not coincide with wintering crane use at the Refuge.

The following measure will be taken to avoid impacts to fish and wildlife:
- Provide printed materials to inform anglers about fishing regulations and boundaries of fishing areas;
- Maintain parking areas, roads, and boat launches to prevent erosion or habitat damage;
- Monitor fishing to ensure that facilities are adequate and wildlife disturbance is minimal;
- Prohibit gas-powered watercraft to protect water quality and submerged vegetation;
- Implement a seasonal closure from October through May to reduce disturbance to wintering, nesting, resting, and foraging birds and other wildlife, their habitats, and public engaged in other wildlife-dependent uses;
- Prohibit watercraft within 0.25 miles of occupied Swainson's hawks nests until the young have fledged (i.e., 2nd half of July);
- Refuge law enforcement staff will randomly check anglers for compliance with state fishing laws and refuge-specific fishing regulations; and
- Comply with all measures identified in the CCP Section 7 Consultation to minimize or eliminate conflicts with federally-listed or non-target species.

Public Review and Comment: One person commented that bank fishing requires no additional staff and should be allowed.

Response: Allowing bank fishing would require additional staff effort based largely on the need for regular trash removal and public safety associated with bank fishing on the Refuge. A step-down fisheries management plan is proposed for completion in 2008 (page 95 of the CCP), which will address management of fishing on the Refuge possibly including bank fishing.

Determination (check one below):

_____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Fishing will be permitted at Stone Lakes NWR with the following stipulations:
- Fishing will be conducted exclusively from boats
- No trailered boats will be permitted. Cartop, hand-launched boats with or without electric motors will be permitted; gas motor boats will not allowed;
- No vehicles will be allowed in boat launch areas;
- All closed areas will be identified in printed materials provided to anglers and posted and

patrolled to prevent trespass through adjacent properties;
• Littering regulations will be strictly enforced;
• Use or possession of alcohol while sport fishing will be prohibited;
• No building or maintaining of fires will be permitted on the Refuge;
• The western portion of the South Stone Lake Unit will be closed to fishing during the waterfowl hunting season; and
• Fishing will be allowed during daytime hours only.

The Refuge Manager will have authority to close certain areas during critical wildlife use periods and cancel any activities deemed necessary to fulfill Refuge purposes or ensure visitor safety. Sensitive nesting areas will be protected from disturbance by visitors with signs and barriers. Visitors will be directed away from areas where major habitat restoration or management projects are under way.

Justification:

Fishing is an appropriate wildlife-dependent recreational activity. Based upon biological impacts described in the Refuge Draft Comprehensive Conservation Plan and environmental assessment, it is determined that fishing within the Refuge will not materially interfere with or detract from the purposes for which the Refuge was established.

Fishing is a priority wildlife-dependent visitor use provided for in the National Wildlife Refuge System Improvement Act of 1997. By facilitating this use on the Refuge, we hope to increase the visitors' knowledge and appreciation of fish and wildlife, which may lead to increased public stewardship of wildlife and their habitats on the Refuge. Increased public stewardship will support and complement the Service's actions in achieving the Refuge's purposes and the mission of the National Wildlife Refuge System. This program as described is determined to be compatible and will not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

Mandatory Reevaluation Date (provide month and year):

February, 2022 Mandatory 15-year Reevaluation Date (for priority public uses)

_____ Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

Conducted with Comprehensive Conservation Plan

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X CCP Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

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Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Wildlife Observation and Photography on the Stone Lakes National Wildlife Refuge

Use: Wildlife Observation and Photography

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):
Wildlife observation and photography are two of the six priority visitor uses (e.g., hunting, fishing, wildlife observation and photography, environmental educations and interpretation)

identified in the National Wildlife Refuge System Improvement Act of 1997. Currently, visitor access to Stone Lakes National Wildlife Refuge (Refuge) is limited to two days per month and as a result the expectations of the visiting public are not being met. The Refuge proposes to provide adequate facilities to observe, photograph and enjoy wildlife and natural habitats during daylight hours in all seasons of the year

The Refuge would provide opportunities for wildlife observation and photography by constructing approximately 4.6 miles of universally accessible trails on the Headquarters, North Stone Lake and South Stone Lake Units, two photography blinds and two viewing platforms, expanding entrance roads and parking areas, and by offering boat access and guided tours to areas of interest, including vernal pools and wetlands. For additional details about this proposed use, please see the Stone Lakes National Wildlife Refuge Final Comprehensive Conservation Plan (USFWS, 2006) which is herein incorporated by reference.

Availability of Resources:

Staff necessary to oversee the wildlife observation and photography programs will be shared with other programs described in the 2006 Draft CCP for Stone Lakes NWR. To fully implement this program as described in the CCP, significant increases in staff and, capital outlays, and recurring costs will be necessary. Facilities and materials to support the program will require capital outlays and recurring costs, however, some of the costs will be shared with other visitor used programs. If unanticipated costs arise, the program will be reevaluated and necessary adjustments made such as seeking volunteer or cooperator assistance to maintain facilities or applying for educational grants.

Item	One Time Cost	Annual Costs
Photo Blinds (HQ, North Stone Lake)	$ 30,000	$ 2,500
Viewing Platforms (HQ, North Stone Lake)	$620,000	$ 5,000
Parking Areas (HQ, North Stone Lake)	$520,000	$ 5,000
Trails		
2.6 miles at South Stone Lake Unit	$150,000	$15,000
2 miles at Headquarters Unit	$400,000	$10,000
Boardwalks		
1500 feet at Sun River	$1,590,000	$ 7,000
200 feet at HQ	$200,000	$ 2,500
Entrance Road Sun River Property (BLU)	$400,000	$ 5,000
Restrooms (HQ, BLU)	$150,000	$ 6,000
Park Ranger (0.5 FTE)	$ 25,000	$ 5,000
Maintenance Staff (0.5 FTE)	$ 26,000	$26,000
Administration	$2,000	
TOTAL	**$4,113,000**	**$89,000**

Anticipated Impacts of the Use(s):

Human activity may disturb migratory birds utilizing the Refuge's habitats for feeding or nesting. Off-trail human activity in habitat restoration areas can slow restoration efforts through soil compaction, vegetation trampling and the introduction of invasive plants. Litter discarded by visitors can entangle wildlife or be ingested, resulting in injury or death. The construction and maintenance of trails and boardwalks may impact soils, vegetation, and in some instances hydrology around the trails. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition and sediment loading (Cole and Marion 1988).

Federally-listed species that may occur on the Refuge include the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole and fairy shrimp. No impacts to vernal pool species are anticipated from wildlife observation and photography. California state-listed species that inhabit the Refuge include greater sandhill crane and Swainson's hawk. The primary disturbance season for Swainson's hawk is during their nesting season, typically mid-February through July. Prime nesting habitat would be closed to visitors during the nesting season.

Of the wildlife observation techniques, wildlife photographers tend to have the largest disturbance impacts (Klein 1993, Morton 1995, Dobb 1998). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even slow approach by wildlife photographers tends to have behavioral consequences to wildlife species (Klein 1993). Other impacts include the potential for photographers to remain close to wildlife for extended periods of time, in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency of casual photographers, with low-power lenses, to get much closer to their subjects than other activities would require (Morton 1995), including wandering off trails. This usually results in increased disturbance to wildlife and habitat, including trampling of plants. Impacts of wildlife observation and photography are also discussed in the Compatibility Determination for environmental education and interpretation.

Public Review and Comment: Many written and oral comments recommended that high-speed boating should not be allowed to continue on the refuge in part because it is disruptive of visitors participating in wildlife observation and photography on the refuge.

Response: High-speed boating was found to be not compatible through a Compatibility Determination. According to the compatibility policy (part 603 FW 2, 2.14) "Existing uses determined to be not compatible will be expeditiously terminated...this process of termination...will not exceed 6 months (without written authorization from the Director)..." The Refuge will follow the Service compatibility policy and eliminate high speed boating as expeditiously as possible, while making a good faith effort to assist high-speed boaters to find an alternative location where this use can be relocated off of the Refuge.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To allow visitor access to the Refuge for wildlife observation and photography, the following measurers would be taken:

- By 2008, interpretive signs and an orientation kiosk will be installed on the Headquarters Unit of the Refuge to inform visitors about Refuge habitats and wildlife and how to minimize adverse impacts. Access to the Refuge will be allowed only between sunrise and sunset, unless a permit for alternative hours is issued by the Refuge Manager in advance.

- The main kiosks on the Headquarters Unit and South Stone Lake units will clearly state the regulations governing wildlife observation and photography on the Refuge and will include the following information:
  (1) a trail map, trail information and regulations;
  (2) a description of the National Wildlife Refuge System; and

(3) an interchangeable sign for any closures during the waterfowl hunting or Swainson's hawk nesting seasons.

- Trails will be well marked and symbolic fencing will be installed to guide visitor access through sensitive habitats. This will minimize trespass into closed areas and reduce disturbance to nesting birds and other sensitive species.

- The Refuge will maintain an active law enforcement presence to ensure visitor compliance with all Refuge rules and regulations. Refuge law enforcement and other Refuge staff presence will be increased to ensure compliance with Refuge regulations.

Justification: The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation and wildlife photography as priority visitor uses for national wildlife refuges, along with hunting, fishing, environmental education and interpretation. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System).

Expanding existing wildlife observation and photography opportunities on the Refuge would allow visitors to experience, enjoy, and learn about native wildlife and plant species in the Central Valley. The Refuge has one of the few remaining natural riparian areas in the valley as well as wetlands, vernal pools, and open water habitats harboring many species of migratory waterfowl, raptors and other wildlife species. Due to its proximity to urban areas, the Refuge attracts a high number of visitors. With management consistent with the stipulations herein, expanding wildlife observation and photography opportunities would substantially increase visitor use and would be compatible with Refuge purposes and the System mission.

Mandatory Reevaluation Date (provide month and year):
February, 2022 Mandatory 15-year Reevaluation Date (for priority visitor uses)

_____Mandatory 10-Year Reevaluation Date (for all uses other than priority visitor uses)

NEPA Compliance for Refuge Use Decision (check one below):

Conducted with Comprehensive Conservation Plan

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X____Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

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U.S. Fish and Wildlife Service (USFWS). 2006. Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment, 2006. U. S. Fish and Wildlife Service, Sacramento, California.

Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Environmental Education and Interpretation on the Stone Lakes National Wildlife Refuge

Use: Environmental Education and Interpretation

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):
Environmental education and interpretation are two of the six priority public uses (e.g., hunting, fishing, wildlife observation and photography, environmental educations and

interpretation) identified in the National Wildlife Refuge System Improvement Act of 1997. Stone Lakes National Wildlife Refuge (Refuge) is one of the few urban refuges in the western region and has the potential to attract thousands of visitors annually from the greater Sacramento area to experience Central Valley habitats including wetlands, grasslands and riparian habitats. Currently, public access to the Refuge is limited to two days per month and as a result expectations of the visiting public are not being addressed.

The Refuge proposes to provide for expanded environmental educational use by: (1)offering staff and/or docent led tours on the Refuge,(2) conducting teacher workshops, (3) developing a class or group staging area, (4) developing a Refuge relevant elementary school curriculum, and (5) exploring the feasibility of a Refuge fee demonstration area.

The Refuge plans to develop an interpretive program by: (1) developing a self-guided trail system, (2) developing interpretive panels and exhibits, and (3) by building an open air interpretive shelter on the Headquarters Unit as part of the Blue Heron Trails project. In addition, the Refuge would develop environmental education and interpretive materials, including fact sheets on particular species and habitats, and an education guide for educators on Central Valley habitat conservation and restoration issues. Additional information about this proposed use are in the Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan (USFWS, 2006) which is herein incorporated by reference.

Availability of Resources: Staff necessary to oversee the Refuge Environmental Education and Interpretation program will be shared with other programs as described in the 2006 Draft CCP for Stone Lakes NWR. Additional staff will be required to fully implement this program, such as an Interpretative Specialist. Facilities and materials to support the program will require capital outlays and recurring costs, however, some of the costs will be shared with other visitor programs. If unanticipated costs arise, the program will be reevaluated and necessary adjustments made, such as securing additional volunteers or financial assistance.

Item	One Time Cost	Recurring Costs
Interpretive Panels	$210,000	$15,000
Kiosks (1 main + 4 small)	$300,000	$5,000
Trails*	$1,630,000	$10,000
Outdoor Rec Planner	$50,000	$50,000
Maintenance Staff	$26,000	$26,000
Administration	$2,000	$2,000
Total	**$2,118,000**	**$108,000**

**Includes "Junior Biologist Trail" at Headquarters Unit, complete with entrance signs, universally accessible trails, entrance kiosk, and interpretive panels.*

Contingent on increased funding and staff identified in the CCP, the Refuge would expand interpretation and environmental education opportunities, as well as generate additional educational materials.

Anticipated Impacts of the Use(s):
Disturbances to wildlife resulting from environmental education and interpretation activities are considered to be of minimal impact because: (1) the total number of students permitted through the reservation system will be limited, (2) students and teachers will be trained in trail etiquette and how to minimize wildlife disturbance, (3) educational groups will be required to have a sufficient adult to student ratio for adequate supervision, (4) trail design will provide adequate cover for wildlife, and (5) observation areas and scopes will be provided to view wildlife at a distance

Human activity may disturb migratory birds utilizing Refuge habitats for feeding or nesting activities. Off-trail human activity in habitat restoration areas can slow restoration efforts through soil compaction, vegetation trampling, and the introduction of invasive plants . Litter discarded by visitors can entangle wildlife or be ingested, resulting in injury or death. The construction and maintenance of trails and boardwalks will impact soils, vegetation and in some instances hydrology around the trails. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition and sediment loading (Cole and Marion 1988).

Federally-listed species that may occur on the Refuge include the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole and fairy shrimp. . No significant impacts to vernal pool species are anticipated from environmental education and interpretation as visitors to vernal pools areas (e.g., Wetland Preserve) will be confined to established trails or led by docents or Refuge staff. California-listed species that inhabit the Refuge include greater sandhill crane and Swainson's hawk. The primary disturbance season for Swainson's hawk is during the nesting season, typically mid-February through July. Prime nesting habitat would be closed to visitors during the nesting season. Impacts are also discussed in Chapter 5 of the Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan (USFWS, 2006).

Public Review and Comment: One comment suggested that educational materials should be developed and employed to define and promote low-impact styles of recreation for the wildlife resources present.

Response: The Refuge agrees and content related to environmentally-friendly recreation already is and will continue to be a part of the educational programs proposed for the Refuge in the CCP.

Determination (check one below):

_____ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility: In order to allow public access to the Refuge for environmental education and interpretation, the following measurers will be taken:

- Access to the Refuge will be allowed only during daylight hours unless a permit for alternative hours is issued by the Refuge manager. The Refuge manager will have the authority to close certain areas to interpretive programs or to cancel activities to fulfill Refuge purposes.
- Public access will be restricted to areas where the least disruption to wildlife and their habitats would occur. Visitors will be directed to remain a safe distance from nesting areas with signs and barriers. Visitors will be directed away from areas where sensitive habitat restoration projects are underway
- Educators or groups who wish to visit or learn about the Refuge would receive interpretive materials in advance.
- Trails from parking lots to viewing areas will be well marked to minimize trespass through closed areas and reduce disturbance to nesting migratory birds and other sensitive resources.

- The Refuge will maintain an adequate law enforcement capability to ensure public safety and compliance with all rules and regulations.

Justification:

The goals of the National Wildlife Refuge System (System) include providing an understanding and appreciation of fish and wildlife ecology and the human role in the environment and providing Refuge visitors with high quality and safe recreational experiences oriented toward wildlife, to the extent that these activities are compatible with the purposes for which a refuge was established and the mission of the System. Moreover, the National Wildlife Refuge System Improvement Act of 1997 identifies environmental education and interpretation as priority public uses for National Wildlife Refuges, along with hunting, fishing, wildlife observation and photography. As expressed priority uses of the Refuge system, these uses take precedence over other potential public uses in Refuge planning and management. The Service strives to provide priority public uses when compatible with the purpose and goals of the Refuge and the mission of the System.

Environmental education and interpretive programs provide opportunities for the visiting public to learn about and experience native plants, fish and wildlife in their natural habitat. The Refuge can also educate the public about its role within the agency and the National Wildlife Refuge System, developing better community awareness, volunteer involvement and advocacy. The Refuge also has the opportunity to provide the community educational information on habitat restoration, migratory waterfowl and wetland conservation in the Central Valley.

Mandatory Reevaluation Date (provide month and year):

February, 2022 Mandatory 15-year Reevaluation Date (for priority public uses)

_____Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

Conducted with Comprehensive Conservation Plan

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X____Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

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Fish and Wildlife Service, Sacramento, California.

Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for High-Speed Boating on the Stone Lakes National Wildlife Refuge

Use: High-Speed Boating

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. " 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. " 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. " 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. " 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. " 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:
High-speed boating, primarily associated with waterskiing, has occurred on Refuge waterways since before lands and waterways were incorporated into the National Wildlife

Refuge System as part of Stone Lakes NWR. Most of the high-speed boaters are members of a private club, Beach Lake Ski Club, who launch power boats from privately-owned land within the approved Refuge boundary. Approximately 85 percent of the 2.6 miles of waterway used for waterskiing lies within Stone Lakes NWR in the Beach Lake and North Stone Lake units. The waterway consists of portions of Lower Beach Lake and Southern Pacific Railroad (SP) Cut and is bounded to the west by the abandoned railroad levee and primarily by Refuge lands to the east. Most of the channel is relatively narrow, approximately 200 to 250 feet across but it expands to approximately 750 feet at its widest point. Boaters first pass through 0.47 miles of a privately-owned portion of SP Cut. The remainder of the waterski route lies in 1.0 mile of water owned in fee title by the Refuge and 1.2 miles owned by the state of California and managed by the Refuge under cooperative agreement (see Figure 1).

Standard waterskiing, slalom, wake board, and barefoot waterskiing all occur on Refuge waters. Boats travel up to 45 mph for barefoot waterskiing (American Barefoot Club 2005) and up to 35 mph for slalom waterskiing (USA Waterskiing 2005). Waterskiers modify Refuge aquatic habitat by removing floating and submerged woody snags and debris presenting a navigational and/or safety hazard and by anchoring a slalom course marked by floats and a covered float for docking boats.

Availability of Resources: No additional funding required.

Anticipated Impacts of Use:
Riparian habitat adjacent to Lower Beach Lake and SP Cut on the Beach and North Stone Lake units provides crucial foraging, resting, and breeding habitat for wide variety of migratory songbirds, raptors, and waterbirds including waterfowl, waders, and shorebirds. Raptors such as the California Endangered Species Act listed Swainson's hawk, red-tailed hawk, red-shouldered hawk, and white-tailed kite and colonially-nesting species such as great blue heron, great egret, black-crowned night-heron, snowy egret, and double-crested cormorant, may all nest in the woody riparian habitat adjacent to Refuge waterways and may be affected by high-speed boating. Though motorized boats generally have a greater effect on wildlife, even non-motorized boat use can alter use patterns, reduce use of particular habitats, alter feeding behavior and nutritional status, and cause premature departure by migratory birds from areas (Knight and Cole 1995). In England, an increased rate of disturbance from boats partly caused a decline in roosting numbers of shorebird species (Burton et al. 1996). In addition, boaters have been observed to cause massive flights of diving ducks on the Mississippi River (Thornburg 1973). Motorized boats within 100 meters of shore caused all wintering waterfowl and shorebirds to flush between the craft and shore in south San Diego Bay, regardless of speed (Huffman 1999). Bow wakes of power boats have been reported to tip over free-floating grebe nests as well as other nests near the fringe of reeds (Reichholf 1976). However, disturbance to birds, in general, was reduced when boats traveled at or below the 5 mph speed limit (Huffman 1999).

The visitor use program proposed in the Comprehensive Conservation Plan (CCP) for Stone Lakes NWR (USFWS 2006) includes wildlife viewing and fishing from non-motorized boats in the South Stone Lake, Beach Lake, and North Stone Lake units, including the same portion of the Refuge currently utilized for waterskiing (Beach Lake and North Stone Lake units). High-speed boating will likely not be feasible alongside non-motorized boaters because wakes created while traveling at high speed may represent a significant safety risk to non-motorized boaters (American Canoe Association 2004). Wakes generated by high-speed boaters within SP Cut's narrow, shallow channel cannot readily dissipate and increase in height and steepness as they pass over the shallow nearshore zone that kayakers and canoeists are likely to frequent. Even in cases where high-speed boat wakes do not actually capsize smaller, non-motorized boats, the waves can create instability sufficient to

discourage other boaters using the channel and diminish their experience of the Refuge (C. Courtright, USFWS, pers. comm.). Boats traveling at high speeds in the narrow channel could experience difficulty in ceding the right of way to smaller vessels because they may lack space in which to give an adequate berth to other boats. In order to drive responsibly, previous studies have indicated that waterskiing boats should allow a safety area of 100 feet on either side of the boat (Bostian 2005. USCG 2006). Where Refuge channels are less than 250 feet wide, a high-speed boat would not be expected to be able to safely share the waterway with non-motorized craft.

Opportunities for wildlife observation and photography the Refuge proposes to offer visitors on waterways in the Beach and North Stone Lake units would also be negatively impacted by waterskiing because the noise and speed associated with high-speed boating disturbs and displaces wildlife. Moreover, visitors to wildlife refuges and natural areas typically seek a natural experience and their wildlife observation experience would be diminished by noise. Previous monitoring has indicated that non-motorized boaters find power boats to be obtrusive and disruptive of their experience (Pinto, A. 2002).

Wakes generated by power boats are also known to cause levee erosion (U.S. Army Corps of Engineers 1997). In non-flow dominated channels, such as SP Cut, boat-generated waves exert the greatest erosive energy against levee banks (Ellis 2002). As a result, concerns have been expressed regarding wakes generated by motorized boats in SP Cut causing significant erosion to the abandoned railroad levee which provides flood protection to Reclamation District 744 (Van Loben Sels 2005, Baxter 2005). Continued high-speed boat traffic could lead to the need for extensive levee repair or even levee failure. Moreover, erosion of the SP Cut levee has resulted in the undermining and toppling of mature riparian trees such as valley oaks, eliminating habitat for an array of wildlife species. Therefore, a no-wake speed limit is warranted to ensure a quality experience for visitors engaging in wildlife-dependent uses, reduce levee erosion, and prevent further loss of property and wildlife habitat.

As part of engaging in high-speed boating within Refuge waters, members of the waterski club periodically remove navigational hazards that may constitute valuable wildlife habitat. These hazards consist largely of submerged snags and floating woody debris which, while hazardous for motorized, high-speed boats, provide valuable basking habitat for western pond turtles (a State and Federal species of concern). In addition submerged snags and floating woody debris provide cover and foraging areas for fish and other wildlife.

Western pond turtle populations are declining throughout most of their range, particularly in Southern California, and the major cause of the decline appears to be the destruction of suitable habitat (Brattstrom 1988, Brattstrom and Messer 1988). The only extensive populations of turtles currently occur in Northern California and Southern Oregon. Despite its name, the western pond turtle is only rarely a pond dweller and prefers the deep, slow-flowing waters of sloughs or pools in rivers (Brury 1986). The quiet waters of SP Cut and Lower Beach Lake are ideal pond turtle habitat. Moreover, recent graduate studies have confirmed that successful nesting by western pond turtles has occurred in tributaries of Lower Beach Lake (S. Oliver, pers. comm.). Other components of optimal turtle habitat include emergent basking sites, emergent vegetation, mud, rocks and logs (Holland 1992). Research conducted on the Trinity River suggests that the preservation and restoration of structural features, such as underwater cover and emergent basking sites, is of prime importance for promoting pond turtle survival (Reese 1998). Removal of snags and floating woody debris for navigational safety purposes degrades the quality of the riparian habitat and is therefore not consistent with Stone Lakes NWR purposes or the National Wildlife Refuge System mission.

Public Review and Comment: One written and several oral comments recommended that high speed boating, associated with water skiing, should be allowed to phase out over a 7 year period, ending in 2013. Many written and oral comments recommended that high speed boating should be eliminated from the Refuge as soon as possible.

Response: High-speed boating was found to be not compatible through this Compatibility Determination. According to the compatibility policy (part 603 FW 2, 2.14) "Existing uses determined to be not compatible will be expeditiously terminated...this process of termination...will not exceed 6 months (without written authorization from the Director)..." The Refuge will follow the Service compatibility policy and eliminate high speed boating as expeditiously as possible, while making a good faith effort to assist high-speed boaters to find an alternative location where this use can be relocated off of the Refuge.

Determination:

_X____Use is Not Compatible

_____Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Not applicable.

Justification:
High-speed boating is not a wildlife-dependent recreational public use. In light of its adverse effects on Refuge natural resources and its affect on the ability of Refuge visitors to engage in wildlife-dependent uses, high-speed boating should not be allowed on Refuge waters. Instead, it is proposed that a no-wake speed limit be enforced for the following reasons:

1) High-speed boaters present a safety risk to non-motorized boaters within the narrow confines of this waterway.

2) High-speed boating disturbs and displaces wildlife because of noise and wake.

3) Wave action from high-speed boating, in narrow waterways, erodes shorelines and levees and causes loss of woody riparian habitat.

4) High-speed boating may adversely affect wildlife-dependent visitor uses and noise associated with high-speed boating may also directly impact visitors.

5) High-speed boating within Refuge waters necessitates removal of navigational hazards that constitute valuable habitat for special status species and other fish and wildlife.

Refuge staff will cooperate with high-speed boaters to seek alternative sites for waterskiing outside of the approved Refuge boundary. Other waterskiing sites are available outside the approved Refuge boundary that do not have significant adverse effects on visitors to the Refuge, wildlife and their habitats, or levee integrity.

Mandatory Reevaluation Date (provide month and year): N/A.

_____ Mandatory 15-Year Reevaluation Date (for priority public uses)

_____ Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____Conducted with Comprehensive Conservation Plan

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X__ Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

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Personal Communications

Clay Courtright, US Fish and Wildlife Service, Sacramento, California, June 4, 2003.

Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Recreational Boating on the Stone Lakes National Wildlife Refuge

Use: Recreational Boating Associated with Hunting, Fishing, Wildlife Observation, and Photography

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include the following.

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.' (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
"The mission of the National Wildlife Refuge System (System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

The visitor use program proposed in the Comprehensive Conservation Plan (CCP) for Stone Lakes NWR (USFWS 2006a) includes recreational boating that supports priority visitor uses, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation. The recreational boating uses addressed in this compatibility determination consist of car-top, hand-launched boats, such as kayaks and canoes and boats with electric motors, with some restrictions.

Regulation of recreational boating on the Refuge will be managed to minimize safety risks, as well as adverse effects on wildlife, habitat, and other recreational users, particularly those engaged in wildlife-dependent uses. These restrictions will include a no-wake speed limit throughout Refuge waters, seasonal closures, and limitations on use of electric motors. No gas-powered outboard motors will be permitted. The no-wake zone is intended to protect non-motorized boaters, wildlife and wildlife habitat. The restrictions are also intended to protect levees from deterioration by wave action (Baxter 2005, Van Loben Sels 2005) and to reduce noise levels that could adversely affect wildlife.

Waterways open to boating will include South Stone Lake, Southern Pacific Railroad (SP) Cut, and Lower Beach Lake. Boat launch, access, and parking for Lower Beach Lake and SP Cut on the Beach Lake Unit will be from the west end of Elliott Ranch Road. Current facilities are limited to a gravel parking area and an unimproved boat launch. Parking approximately 10 cars and an improved boat launch will be constructed at Elliot Ranch Road, contingent upon available funding. The second boat launch site is on the Sun River property of the South Stone Lake Unit where parking will be expanded to accommodate approximately 20 cars. Depending on availability of staff and funding, a new boat haul-out and associated trail and observation blind will be provided at the Lodi Gun club property of the South Stone Lake Unit to be accessible only by boat.

All Refuge waterways will be open for recreational boating from June through September only. Waterways will be closed to recreational boating for October 1 through May 31, to minimize disturbance to nesting waterbirds and raptors such as herons, egrets, grebes, and Swainson's hawks. Waterways being treated for invasive aquatic weeds (e.g., water hyacinth, Egeria densa) will be closed to boating during herbicide applications. Temporary closures to boating may also be required during particular habitat restoration or management projects. Private vendors wishing to lead boating groups will be required to apply for a Refuge Special Use Permit. Chapter 5 of the Comprehensive Conservation Plan, Refuge Vision, Goals and Objectives, are herein incorporated by reference.

Availability of Resources:

The following funding/annual costs would be required to administer and manage boating activities as described above:

Activity	One-time Costs	Recurring Costs
Improvement of boat ramp and parking LOT	$30,000	
Maintenance of Parking Lots and Boat Launches		$5,000
Maintenance (0.50 FTE)	$26,000	$26,000
Law Enforcement (0.5 FTE)	$25,000	$25,000
Install Signs (includes all public use signs)	$10,000	
Maintain Signs		$5,000
Administration	$2,000	$2,000
TOTAL	**$93,000**	**$63,000**

Funding will be sought through the Service budget process. Other opportunities may

include: expanded partnerships with the State and recreational user groups, grants, coordination with other law enforcement agencies, and additional Refuge operations. All funding will be utilized to support a safe, quality public use program as described above.

Anticipated Impacts of Use:

Stone Lakes NWR provides crucial foraging and breeding habitat for wintering migratory birds, including waterfowl, shorebirds, and other waterbirds. Great blue herons, great egrets, double-crested cormorants, and Swainson's hawks, in particular, may be affected by recreational boating since they nest in tall riparian trees adjacent to waterways used by boaters. Though motorized boats generally have a greater effect on wildlife, even non-motorized boat use can alter distribution, reduce use of particular habitats by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). In the Ozark National Scenic Riverway, green heron activity declined on survey routes when canoes and boat use increased on the main river channel (Kaiser and Fritzell 1984). Canoes or slow moving boats have also been observed to disturb nesting great blue herons (Vos et al. 1985). However, compared to motorboats, canoes and kayaks appear to have less disturbance effects on most wildlife species (Jahn and Hunt 1964, Huffman 1999, DeLong 2002) and disturbance to birds, in general, is reduced when boats travel at or below the 5 mph speed limit (Huffman 1999). To protect waterbirds and raptors that nest in riparian trees, the Beach Lake and South Stone Lake units will be closed to recreational boating from October through May, during nesting and breeding seasons. Monitoring of nesting great blue herons, Swainson's hawks and other waterbirds will be periodically conducted to assess the impact of recreational boating use.

Federally-listed species that may occur on the Refuge include the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole, and vernal pool fairy shrimp (USFWS 2006b). No effects on the beetle or vernal pool species are anticipated because recreational boating will occur outside of the habitats of these species. However, giant garter snakes could be affected by vehicular use of the area if they happen to be crossing a roadway. Vehicular speed limits will therefore be enforced within the Refuge to reduce effects to wildlife.

Western pond turtle populations are declining throughout most of their range, particularly in Southern California, and the major cause of the decline appears to be the destruction of suitable habitat (Brattstrom 1988, Brattstrom and Messer 1988). Because of its precipitous decline in numbers, the Western pond turtle has been designated as a Federal and State species of concern. The only extensive populations of turtles currently occur in Northern California and Southern Oregon. Despite its name, the western pond turtle is only rarely a pond dweller and prefers the deep, slow-flowing waters of sloughs or pools in rivers (Brury 1986). The quiet waters of the Beach Lake and South Stone Lake units are ideal pond turtle habitat. Recent graduate studies have confirmed that western pond turtles successfully nest on the Refuge (S. Oliver, pers. comm.). Other components of optimal turtle habitat include emergent basking sites, emergent vegetation, mud, rocks, and logs (Holland 1992). Research conducted on the Trinity River suggests that the preservation and restoration of structural features, such as underwater cover and emergent basking sites, is of prime importance for promoting pond turtle survival (Reese 1998). To occur safely, high-speed boating necessitates removal of snags and other underwater hazards that also provide valuable turtle habitat. However, no such alteration of habitat is necessary to provide no-wake boating opportunities. Nevertheless, canoes, kayaks, and car-top boats with electrical motors can still be expected to have some disturbance effect on turtles by displacing them from basking sites.

Public Review and Comment: Several written comments recommended that the Refuge be opened to paddle boat (canoe, kayak, etc.) recreation.

Response: The Refuge intends to open the SP cut waterway on the Refuge, from the west end of Elliott Ranch Road southward, to car top boating beginning in 2008.

Determination:

_____ Use is Not Compatible

___X___Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility:
The following stipulations are required to ensure that recreational boating is compatible:

- A no-wake speed limit will be implemented throughout Refuge waters. Only human-powered canoes and kayaks, and electric-powered car-top boats (that is, non-trailered boats which can be carried on top of, inside of, or in the back of a vehicle and can be hand-launched into the water) will be permitted throughout Refuge waters.

- A seasonal closure from October through May will be implemented to reduce disturbance to wintering, nesting, resting, foraging, and breeding birds and other wildlife, their habitats, and other recreational users, especially those participating in wildlife-dependent visitor uses.

- Removal of snags and floating woody debris for navigational safety purposes will not be permitted.

- Signs will be installed and maintained to mark closed areas, convey seasonal closures, and indicate no-wake regulations on the Refuge.

- Periodic law enforcement will help ensure compliance with speed limit regulations and area closures. Regulations will be described in brochures and posted at Refuge headquarters and at boat launch sites. Recreational boaters are required to be in compliance with all applicable Refuge, U.S. Coast Guard and State of California regulations and laws.

- Boating activities and associated effects will be monitored with regard to waterfowl, shorebirds, birds of prey, other wildlife and their habitats, and other recreational users, especially those participating in wildlife-dependent visitor uses.

- Monitoring data will be used by the Refuge manager in making necessary adjustments in regulations or other aspects of the Refuge boating program and in the periodic reevaluation of this Compatibility Determination.

Justification: Boating itself is not wildlife-dependent recreation, but many wildlife dependent recreational activities (waterfowl hunting, fishing, wildlife observation, photography, and environmental education and interpretation) are associated with boating. A carefully regulated boating program would help the Refuge provide opportunities for wildlife-dependent priority visitor uses, which would contribute toward fulfilling provisions under the National Wildlife Refuge System Administration Act as amended in 1997.

Although boating has a potential to impact wildlife, implementing the prescribed stipulations listed above will reduce many of these impacts. Adequate habitat will be available for

wintering and breeding waterfowl, birds of prey, and other wetland-dependent species because high wildlife use areas will be closed to boating during critical periods. Boating regulations will be maintained and enforced in order to minimize the impact of visitor use on wildlife and wildlife habitat. Thus, migratory birds will find sufficient food resources and resting places so their abundance and use of the Refuge will not be measurably lessened; their physiological condition and production will not be impaired; their behavior and normal activity patterns will not be dramatically altered; and their overall status will not be impaired. The Refuge will also implement a monitoring program to help assess disturbance effects on wildlife and habitat. The impacts associated with boating activities can be reduced through improved outreach and educational information for Refuge visitors involved in these activities.

Mandatory Reevaluation Date (provide month and year):

_____Mandatory 15-Year Reevaluation Date (for priority public uses)

February, 2017 Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X CCP Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

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Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: _____ (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: _____ (Signature) 2/28/07 (Date)

Compatibility Determination for Research on the Stone Lakes National Wildlife Refuge

Use: Research

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):
Stone Lakes National Wildlife Refuge (Refuge) periodically reviews proposals for scientific research to be conducted on the Refuge or may recommend possible research topics

to professors or students from nearby academic institutions. Although research is not identified as a priority public use by the National Wildlife Refuge System Improvement Act of 1997, scientific research can benefit Refuge resources and support the purpose of the Refuge and mission of the System. The Refuge proposes to give priority to studies that contribute to the conservation, enhancement, , management, or use of native Refuge fish and wildlife populations and their habitats. Research proposals would be reviewed by Refuge staff or other specialists, as appropriate. Research proposals that met the following criteria, would be given priority consideration for approval:

- Research that would contribute to Refuge conservation, enhancement, management, or visitor use programs;
- Research that would not conflict with other ongoing management, monitoring, or research programs;
- Research that could only be conducted on the Refuge;
- Research that did not result in undue disturbance to Refuge fish and wildlife and their habitats; and
- Research that could be monitored by the Refuge within existing staffing or logistical constraints.

Availability of Resources:
Adequate funding and staff exist to manage research at the Stone Lakes NWR. .

Anticipated Impacts of the Use(s):
Some level of disturbance is expected from many research activities since they commonly occur in areas normally closed to the public and may involve collecting samples or handling fish and wildlife. However, minimal impact to Refuge resources would be anticipated since research studies would be governed by a Special Use Permit (SUP) annually issued by the Refuge. SUP conditions would ensure that impacts to wildlife and habitats are minimized. All projects would be reviewed annually to assess compliance with SUP conditions. Prior to their approval, research proposals would be evaluated to ensure their study design resulted in the least possible level of disturbance to sensitive Refuge resources.

Public Review and Comment: No public comments were received related to research occurring on the Refuge.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:
Research applicants would be required to submit a proposal summarizing:
(1) Objectives of the study;
(2) Justification for the study;
(3) Description of study methodology and schedule;
(4) Description of potential impacts on Refuge fish and wildlife and/or habitats, including short-term and long-term disturbance, injury, or mortality;
(5) Summary of research personnel required and their qualifications/experience;
(6) Status of necessary permits (e.g., scientific collecting permits, endangered species permit),;

(7) Anticipated costs to the Refuge and any requests for Refuge staff assistance; and
(8) Planned deliverables and end products (e.g., reports, publications).

If proposed research methods adversely affect or have the potential to adversely affect Refuge resources, the researcher will be required to implement mitigation measures to minimize potential impacts. Mitigation measures will be included as conditions on the Special Use Permit. Refuge staff will monitor and inspect research projects to assess any unanticipated environmental effects and will have authority to terminate any research project, if necessary. All Refuge rules and regulations will be adhered to by researchers, unless specifically waived under a Special Use Permit issued by Refuge management.

Justification: Well-defined research projects developed in consultation with Service staff, would contribute directly to the conservation, enhancement, protection, management, and use of native Refuge fish and wildlife populations and their habitats. Adequate SUP conditions will be imposed on any research project to ensure that short and long-term impacts on Refuge resources are minimized, Only research that is compatible with the purposes of the Refuge and mission of the System would be permitted on the Refuge

Mandatory Reevaluation Date (provide month and year):

_____ Mandatory 15-Year Reevaluation Date (for priority public uses)

February, 2017 Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

Conducted with Comprehensive Conservation Plan

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X____Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

U.S. Fish and Wildlife Service (USFWS). 2006. Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment, 2006. U. S. Fish and Wildlife Service, Sacramento, California.

Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Plant Gathering on the Stone Lakes National Wildlife Refuge

Use: Plant Gathering

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "To administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):
The gathering of plants in and around Stone Lakes National Wildlife Refuge by Native Americans occurred historically and continues to be an ongoing use today. Plants are

gathered for a variety of uses; for medicinal uses, ceremonial uses, as food stuffs and for utilitarian or artistic purposes such as basket weaving or cord making. Plants gathered for traditional uses may include; willow bark and branches (*Salix* spp.), mugwort (*Artemisia douglasiana*), tule (*Schoenoplectus acutus* var. *occidentalis*, syn. *Scirpus acutus*), Santa Barbara sedge (*Carex barbarae*), wild rose (*Rosa californica*), indian hemp (*Apocynum cannabinum*), oak acorns (*Quercus* spp.) and others. Plants are gathered during various seasons; acorns, bulbs and berries are gathered in the late summer or fall, while medicinal or ceremonial herbs and basketweaving materials may be gathered in spring. The amount of plant material being harvested is traditionally low and is not expected to increase. Special Use Permits will be issued by the Refuge for plant gathering and access regulated to ensure protection of critical habitat during nesting or breeding periods. The use of Refuge lands for collections is considered to be of vital importance to Native American cultural groups such as the California Indian Basketweavers Association.

For additional details about this proposed use, please see the Environmental Assessment (Appendix B) for the Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan (USFWS 2006) which is herein incorporated by reference.

Availability of Resources: No additional resources will be needed to support this use.

Anticipated Impacts of the Use(s):
Impacts are also discussed in the Environmental Assessment (Appendix B) for the Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan (USFWS 2006) Impacts to habitat and wildlife associated with plant gathering on the Refuge are minimal. The amount of plant material being harvested is small enough not to constitute any meaningful impact on habitat. The level of disturbance to wildlife will vary depending on the season, but is considered to be low overall. The gathering of acorns, berries, bulbs and other plant materials that occurs from late summer through fall will have little or no impact on migratory or nesting birds. Gathering of new plant growth in springtime, herbs for medicinal/ceremonial purposes and willow twigs and bark for basket weaving may coincide with use of the refuge by migratory waterfowl, but as gathering activities are limited, impact is also expected to be limited.

Disruptions to Refuge management may occur if routine herbicide applications for invasive terrestrial weeds require modification due to plant gathering activities. Refuge staff avoid application of herbicides to plants known to be valuable for food, medicinal, ceremonial, and ornamental or other cultural uses. However, this adjustment of management practices is not considered burdensome and will not adversely affect control of invasive weeds or habitat restoration projects.

Federally listed species that may occur on the Refuge include the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole and fairy shrimp. No impacts to vernal pool species are anticipated from plant gathering since gathering activities will not be occurring on or near the vernal pool Wetland Preserve Unit of the Refuge. State listed species that inhabit the refuge include greater sandhill crane and Swainson's hawk. The primary disturbance season for Swainson's hawk is during the nesting season, typically mid-February through July. Prime nesting habitat would be closed to visitors during the nesting season.

Public Review and Comment: No public comments were received related to plant gathering on the Refuge.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:
In order to accommodate access to the Refuge for plant gathering, the following measurers will be taken:

Plant gathering activities will be reviewed as part of annual coordination with tribal representatives. If monitoring by the Refuge reveals that impacts from plant gathering have increased so the activity is adversely affecting wildlife or habitat, then permitees will be required to adjust their activities to avoid impacts. Adjustments may include reductions in harvest, changes in timing of gathering, or reductions in numbers of visitors or frequency of visitors.

The Refuge manager will have the authority to close areas within the Refuge during sensitive wildlife use periods and cancel any collecting activities deemed necessary to fulfill Refuge purposes or ensure visitor safety. Sensitive nesting areas will be protected from disturbance by visitors with signs and barriers. Visitors will be directed away from areas where major habitat restoration or management projects are under way.

Justification:
One of the goals of the National Wildlife Refuge System (System) is providing the public an understanding and appreciation of fish and wildlife ecology, wildlife habitat and the human role in the environment. The Service strives to provide priority visitor uses when compatible with the purpose and goals of the Refuge and the mission of the System. The National Wildlife Refuge System Improvement Act of 1997 identifies environmental education and interpretation as priority public uses for National Wildlife Refuges, along with hunting, fishing, wildlife observation and photography. Though plant gathering is not a wildlife-dependent recreational use, it is an activity that contributes to environmental education and awareness. An understanding of plant ecology is essential to successful plant harvesting, thus this activity helps to educate participants about Central Valley habitats, while sustaining cultural practices.

Mandatory Reevaluation Date (provide month and year):

_____ Mandatory 15-year Reevaluation Date (for priority public uses)

February, 2017 Mandatory 10-Year Reevaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

Conducted with Comprehensive Conservation Plan

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X____Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

U.S. Fish and Wildlife Service (USFWS). 2006. Stone Lakes National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment, 2006. U. S. Fish and Wildlife Service, Sacramento, California.

Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Mosquito Control on the Stone Lakes National Wildlife Refuge

Use: Monitor and Control Mosquitoes

Refuge Name:
Stone Lakes National Wildlife Refuge
Sacramento County, California

Establishing and Acquisition Authorities:
Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):
Stone Lakes NWR purposes include:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. § 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:
The mission of the National Wildlife Refuge System (System) is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:
Stone Lakes National Wildlife Refuge (Refuge) proposes to continue to collaborate with Sacramento-Yolo Mosquito Vector Control District (District) in monitoring and controlling

mosquitoes to address the human health concerns of neighboring communities. The Refuge is located within Sacramento County, 10 miles south of downtown Sacramento and bordered by the city of Elk Grove on the east. The potential for mosquito production in Refuge waters is worrisome to residents, and indeed, urbanized areas adjacent to the Refuge are within the flying range of many species of mosquitoes. Because of this, Refuge staff and SYMVCD (District) entered into a Memorandum of Understanding (MOU) in 1993, to establish a framework within which the District may continue to control and abate mosquitoes within the Refuge, consistent with the goals and objectives of the Refuge. Both the Refuge and the District agree that biological, cultural and physical mosquito control methods are preferred over chemical methods and that wetlands can be designed and managed to avoid or minimize mosquito breeding. In summary, the MOU provides for: 1) allowing the District to comment on planned Refuge wetland projects, 2) providing the District an annual summary of planned Refuge water management and notification of flood-ups and irrigations, 3) the District providing a proposed annual mosquito abatement operating plan to the Refuge, 4) the Refuge submitting pesticide use permits (PUP's) for mosquito control chemicals requested by the District, 5) providing access for mosquito monitoring and biological control measures such as mosquito fish planting as defined in a Special Use Permit (SUP) and 6) with notification and coordination, application of larvicides or adulticides, when specified thresholds are exceeded.

Many species of mosquitoes are known vectors of serious diseases in California. Although 12 mosquito-borne viruses are known to occur in California, only West Nile virus (WNV), western equine encephalomyelitis virus (WEE), and St. Louis encephalitis virus (SLE) are significant causes of human disease as of 2006 (CDHS 2006). As was learned with the recent (2005, 2006) WNV outbreaks, it is possible that new mosquito-borne diseases may cause outbreaks in the future. Since, each disease and associated vector has specific biological and ecological characteristics, a wide variety of control methods, in accordance with the principles of integrated pest management, must be kept available to prevent and respond to new outbreaks in a timely manner. WEE tends to be most serious in very young children, whereas elderly people are most at risk to SLE and WNV (CDHS 2003). California is also at risk for West Nile virus (WNV) which was first detected in the summer of 2003 in adult mosquitoes in Imperial County and in crows in Orange County. WNV was detected within Sacramento County in 2004, though it has principally affected birds and horses. In 2005, West Nile Virus (WNV) became established in Sacramento and Yolo counties, triggering aggressive and widespread mosquito control efforts. In August of 2005 the number of human WNV cases and rate of infected adult mosquitoes were so high that the District conducted aerial applications of pyrethrin over a major portion of Sacramento County (Sacramento County 2006). WEE and WNV can cause serious diseases in horses and emus and WNV kills a wide variety of endemic and imported birds. Mosquito control is the only known practical method of protecting people and animals from WEE, SLE, and WNV (CDHS 2003). With the exception of available vaccines to protect horses against WEE and WNV, there are no known specific treatments or cures for diseases caused by these viruses (CDHS 2003).

Mosquito control at the Refuge follows an ordered succession, using nonchemical treatments first (e.g., water control strategies, vegetation management, mosquitofish, etc.), resorting to chemical treatment only when necessary, as determined through standard mosquito monitoring procedures. Among chemical treatments, adulticides will be used as a last resort. For example, wetlands that have produced large mosquito populations in the past will be flooded as quickly as possible to minimize multiple emergencies that may cause a need for adulticiding. Refuge staff work closely with the District to reduce or eliminate mosquitoes on the refuge by means of biological controls and habitat management. The MOU signed

by the District and the Refuge outlines an effective biological mosquito suppression program that includes wetland design, water level management recommendations, research partnerships, and the introduction of native and non-native fish that prey on mosquito larvae.

The mosquito species identified by SYMVCD for monitoring and control are *Culex tarsalis*, *Anopheles freeborni*, *Aedes vexans*, *Aedes melanimon*, *Aedes nigromaculis*, and *Aedes increpitus*. *Culex tarsalis* is the primary vector of WEE and SLE in California and is also considered to be a significant vector of WNV (CDHS 2003). *Anopheles freeborni* can transmit the malaria parasite to humans and is common in the rice growing regions of California. *Aedes melanimon* is involved in the encephalitis virus (sleeping sickness) cycle and is a severe outdoor pest (SYMVCD 2004).

Mosquito Monitoring

The District's monitoring activities are designed to estimate the abundance of immature (larvae and pupae) and adult mosquito populations. Monitoring activities that may be conducted on the Refuge include, larval sampling, adult light traps and host-seeking traps, leg counts, wild bird sera testing and chicken sera testing (off the Refuge). The wild bird sera testing is part of an ongoing cooperative program between the District and the Refuge to assess populations of resident and migratory songbirds and their role in the transmission of disease.

Monitoring visits by District staff may occur as often as 3-4 times per week during the summer irrigation (May 1 - July 31) and fall flood-up (August 1 - October 15). If temperatures are above average beyond October 15, District staff may continue to require access to the Refuge for additional monitoring.

Dip counts are used to estimate the numbers of immature mosquitoes and to determine the need for mosquito control. The dipper method entails using a long-handled ladle (ca 500 ml) called a dipper to collect water samples from pools potentially serving as mosquito sources. Captured immature mosquitoes would be identified taxonomically by skilled technicians. All Refuge wetland units could potentially be monitored using the dipper method. However, the areas of Refuge wetland units that are potential mosquito habitat would be targeted. Target areas would include wetland margins, shorelines and riparian areas.

Light and carbon dioxide traps are used to capture adult mosquitoes for monitoring purposes. Light traps are cylinders with a light, fan and collecting jar. The mosquitoes are attracted to the light and enter the cylinder. The fan creates an air current that moves the mosquitoes into the collecting jar. Carbon dioxide (CO_2) baited traps are used to monitor density of adult mosquitoes and to identify adults to species. The trap used is baited with 1-2 kg (2.2–4.4 lbs.) of dry ice next to the trap. A motor and fan on the three inch diameter trap sucks mosquitoes down into a container like a modified gallon ice cream carton with tubular surgical stockinet attached to the bottom of the motor housing unit to retain the collected mosquitoes.

As part of monitoring conducted by the District for the presence of these viruses, a sentinel chicken flock is maintained in a pen nearby, but not on, Refuge lands. Sentinel chickens are exposed to the environment and to mosquitoes moving through the area that may choose to feed on them. Regular blood samples are periodically taken from the chickens to detect any mosquito-vector pathogen activity.

The monitoring activities described above are conducted under a SUP between the Refuge and SYMVCD. The Refuge proposes to allow the SYMVCD to continue these activities

under an annual SUP.

Mosquito Control with larvicides/pupacides:

The District proposes to control mosquitoes by treating areas infested with larval stages of *Culex tarsalis*; *Aedes melanimon, Aedes nigromaculis, Anopheles freeborni* and *Aedes* spp. Treatment thresholds as of 2006 were 0.1 mosquito larvae per 350-ml dipper of water for all species; however, this may change to respond to changes in mosquito populations, disease levels, or other factors that affect public health (Boyce 2005). The District would use the biological larvicides *Bacillus thuringiensis isrealensis* (Bti) and *Bacillus sphaericus* (Bsp) and the insect growth inhibitor methoprene. Use of the petroleum distillate GB1111 as a pupacide was discontinued after 2000 and has been replaced with the monomolecular film Agnique. These treatments would be applied via ground methods.

Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Bti produces protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently binds to protein specific receptors of susceptible insect species resulting in the lethal response (Lacey and Mulla 1990). Bti must therefore be ingested by the target insect to be effective. It is most effective on younger mosquito larval instars but does not affect pupae or adult mosquitoes. The District prefers to use Bti because of the low impacts to the environment and non-target organisms and its effectiveness in reducing the numbers of target pests. The Bti formulations Vectobac 12AS or Vectobac G would be employed at the Refuge by the District.

Like Bti, Bsp is a microbial insect pathogen with a similar mode of action (Walton, 1998). Formulated Bsp products used as mosquito larvicides consist of bacterial spores and protein endotoxins. The granular formulation of Bsp, Vectolex CG, would be applied by the District. Both Bti and Bsp may be applied as a spot treatment to small areas or broadcast over larger areas.

Methoprene is a synthetic insect growth regulator (IGR) that mimics juvenile hormones (Tomlin 1994). It interferes with the insect's maturation stages preventing the insect from transforming into the adult stage, thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars but does not affect pupae or adult mosquitoes (ETN 1996). Treated larvae will pupate, but will not emerge as adults. The District proposes to use the insect growth regulators, most commonly the formulated methoprene products such as Altosid™ Liquid, Altosid™ Pellets and Altosid™ XR-G.

The monomolecular film, Agnique, reduces water surface tension. This interferes with larval orientation at the air-water interface and/or increases wetting tracheal surfaces, thus suffocating the organism. As the film spreads over the water surface, it tends to concentrate mosquito pupae, which may increase mortality from crowding stress (Dale and Hulsman 1990).

Applications of larvicides may occur anywhere in the wetland and moist soil units of the Refuge. The potential wetland areas for mosquito breeding and consequently mosquito treatment include managed permanent wetlands (106 acres), irrigated pastures (490 acres) and occasionally perennial wetlands (193 acres), totaling approximately 790 acres. The shorelines of open water areas may be treated. In addition, the District will treat ditches, culverts and low areas not classified as wetlands.

The total area of the Refuge that is treated varies with the conditions of each year. Annual precipitation amounts have a direct effect on mosquito populations. During drought years mosquito populations tend to be low, and during wet years mosquito populations tend to be high. The range in area treated in the last five years varied from a low of 104 acres in 2000 to a high of 477 acres in 2004. The majority of the treatments occur from August to October, but applications of larvicides can begin as early as March and extend into November.

Mosquito control with adulticides

Treatment thresholds for adult control are based on multiple factors including: date, mosquito-borne virus response level, mosquito species, and meterological conditions. As with larval treatment thresholds, adult thresholds are subject to change to respond to changes in mosquito populations, disease levels, or other factors that affect public health (Boyce 2005).

If efforts to control immature mosquitoes fail to prevent the adult mosquito population from exceeding thresholds, and WNV and/or WEE or SLE are detected within or near the Refuge, the District proposes to treat infested areas with a mosquito adulticide. The District proposes to continue to use currently labeled adulticides containing active ingredients pyrethrin (ex. Pyrocide 7338™, Evergreen 60-6™), and phrethroids (ex. Scourge™). Though the District has also proposed usage of the adulticide Trumpet (Naled) if necessary, this particular chemical has not been used at the Refuge to date.

Pyrethrins are non-systemic contact poisons which quickly penetrate the nerve system of the insect and cause paralysis and subsequent death (ETN 1994, Tomlin 1994). A few minutes after application, the insect cannot move or fly away. But, a "knockdown dose" does not mean a killing dose. Pyrethrins are swiftly detoxified by enzymes in the insect. Thus, some pests will recover. To delay the enzyme action so a lethal dose is assured, commercial products are formulated with synergists such as piperonyl butoxide, which inhibit detoxification (Tomlin, 1994). Trumpet (Naled) is a non-systemic, broad-spectrum organophosphate insecticide which affects the nervous system of adult mosquitoes and other insects by cholinesterase inhibition. The products SYMVCD proposes, Pyrocide 7338, Scourge and Trumpet, are applied as an ultra-low volume (ULV) fog by ground. To minimize pesticide drift, dispersing vehicles will follow routes on existing roads set up to fog downwind or outside buffers of 300 feet from areas supporting listed or proposed special status species. All chemical applications will occur when wind speeds are between 2 and 8 mph.

Adult mosquito control measures were applied only once in 1998 to 5 acres (0.09 gallons of Scourge) and once in 1999 to 4 acres (0.05 gallons of Pyrocide 7338). Both adulticide applications were performed at the same location, at a drain in an agricultural field, due to the large population. In August of 2005 the number of human WNV cases and rate of infected adult mosquitoes were so high that SYMVCD initiated aerial applications of pyrethrin over significant portions of Sacramento County. The Refuge received ultra-low volume (ULV) ground applications of pyrethrin on 16 occasions between July 28 and October 12, 2005. As of August 18, 2006, 16 human cases of WNV have been documented in Sacramento and Yolo counties and the Refuge has had adulticides applied 12 times.

Availability of Resources: Monitoring and control will not require refuge personnel. The District is responsible for coordination of monitoring and control through the Refuge Manager or the Assistant Refuge Manager. In order to monitor treatment of wetland, moist soil and riparian areas, it is estimated that 5% of a full-time employee's time would be required. Monitoring of treatments would include observations of sprayed areas before and after treatment and coordination of permitting, documentation and record keeping.

Additional funding would be required if a detailed, long-term study were to be conducted to determine effects of mosquito treatment on Refuge resources.

Anticipated Impacts of the Use: The impacts of monitoring will be confined to pathways and to shorelines where dip net samples will be taken. Small areas of vegetation may be crushed in transit to pools of water, but the vegetation will likely spring back after it has been bent under foot. Placing and checking of light or CO_2 traps may also create a transient impact from footsteps on the vegetation going to and from the traps.

Toxicity and Effects to Non-target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. The possible effects of the larvicides *Bacillus* spp. and methoprene, the pupacide Agnique, and the adulticides will be discussed separately.

Bti

Bti has practically no acute or chronic toxicity to mammals, birds, fish or vascular plants (USEPA 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shadduck, 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians or crustaceans (Brown et al. 2002, Brown et al. 2000, Garcia et al. 1980, Lee and Scott 1989, Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar® HPD was attributed to xylene (Fortin et al. 1986, Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989, Jackson et al. 2002); no detectable adverse effects to breeding red-winged blackbirds using and nesting in Bti treated areas (Niemi et al. 1999, Hanowski 1997); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001).

In addition to mosquitoes (Family Culicidae), Bti affects some other members of the suborder Nematocera within the order Diptera. Also affected are members of the Family Simuliidae (black flies) and some chironomids midge larvae (Boisvert and Boisvert 2000, Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000, Lacey and Mulla 1990, Miura et al. 1980). In field studies, effects to target and susceptible nontarget invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; the Bti formulation used; the sample type (e.g., benthic, water column or drift); the sampling interval (e.g., from 48 hrs to one or more years after treatment); the habitat type (e.g., lentic or lotic); the biotic (e.g., aquatic communities), and abiotic factors (e.g., suspended organic matter or other suspended substrates, temperature, water depth); the mode of feeding (e.g., filter feeder, predator, scraper or gatherer); the larval development stage and larval density (Ali 1981, Boisvert and Boisvert 2000, Lacey and Mulla 1990). Bti activity against target and susceptible nontarget invertebrates is also related to Bti persistence and environmental fate which are in turn affected by the factors associated with field study results (Dupont and Boisvert 1986, Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* sp. and *Chlorella* sp. resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla, 1999). For these reasons, Bti effects to target and susceptible nontarget organisms and potential indirect trophic impacts in the field are difficult to predict.

Bsp
Bsp has slight to practically no acute mammalian toxicity, practically no acute avian toxicity, slight to practically no acute fish toxicity, and slight aquatic invertebrate toxicity (USFWS 1984, and FCCMC, 1998). Insecticidal activity may persist longer than 20 days because Bsp can reproduce and sporulate in larval cadavers and can retain its larvicidal properties after passing through the gut of a mosquito. Bsp is insoluble in water. Spores and toxin become suspended in the water column and retain insecticidal activity in water with high organic matter content and suspended solids. Because Bsp is a more recently developed larvicide than Bti, there are fewer studies that have examined the non-target effects of this pesticide. The data available, however, indicate a high degree of specificity of Bsp for mosquitoes, with no demonstrated toxicity to chironomid larvae at any mosquito control application rate (Mulla, 1984, Ali, 1986, Lacey, 1990). Therefore risks to sensitive wildlife resources resulting from direct exposure to a single Bsp application and indirect food chain effects are expected to be negligible. However, the ability for a population to re-colonize a wetland following multiple larvicide treatments would depend on the intensity and frequency of applications at different spatial scales.

Agnique (Monomolecular film)
Monomolecular film has practically no acute mammalian or avian toxicity, and slight acute fish toxicity (USEPA 2000, USFWS 1984). The risk quotient for mammals is well below the EPA endangered species level of concern (LOC) indicating negligible risk resulting from direct exposure, Table 1 (Urban and Cook 1986). Risk quotients for birds and fish exceed EPA endangered species LOCs indicating a hazard to those taxa resulting from direct exposure. Risk to fish will be limited by the insolubility of monomolecular film in water. Monomolecular film is insoluble in water, average persistence in the environment is 5 to 14 days (Borgerding 2001). Indirect effects to animals dependent on invertebrate food resources are possible resulting from a reduction of those resources caused by monomolecular film. The magnitude of the impact would depend on the aerial extent of the treatment, the number of treatments, treatment frequency and the location of the treatment relative to the areas used by invertebrate feeding animals.

Table 1. Monomolecular film risk quotients.

Animal	Acute tox (ppm)	EEC (ppm)	RQ	LOC (ES)
bird	> 5000 (8 D LC 50)	850 (short grass)	0.2	0.1
fish	98 (96 hr LC 50)	2600 (6" water)	26.5	0.05
mammal	>20,000 (LD 50)	850 (short grass)	0.004	0.1

EEC calculated using a rate of 0.5 gal/ac (3.6 lbs ai/ac)
LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

Methoprene
Methoprene has moderate acute fish toxicity, slight acute avian toxicity, and practically no acute mammalian toxicity (USEPA 2000, USFWS 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (USEPA 1991). This figure exceeds the estimated environmental concentration by a factor 10 (Table 2). Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (USEPA 1991). Up to 95 % of the residue in fish was excreted within 14 days (USEPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Table 1) (Urban et al. 1986). In field studies no detectable adverse effects to breeding red-winged

Table 2. Risk assessment for Methoprene.

Animal	Acute Tox (ppm)	*EEC (ppm)	RQ	LOC (ES)
Bird	> 4640 (8 D LC 50)**	3.0 (short grass)	0.0006	0.1
Fish	0.4 (96 hr LC 50)	0.01 (6 inches)	0.025	0.05
Mammal	> 34,000 (LD 50)	3.0 (short grass)	0.00001	0.1

*EEC calculated using a rate of 0.013 lbs ai/ac (1.0 fluid oz/ac Altosid 20 % methoprene)
**LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

Methoprene affects terrestrial and aquatic invertebrates and is used to control fleas, sciarid flies in mushroom houses; cigarette beetles and tobacco moths in stored tobacco; Pharaoh's ants; leaf miners in glasshouses and midges (Tomlin 1994). Methoprene may also be fed to livestock in a premix food supplement for control of hornfly (WHO 2006). Methoprene is highly toxic to aquatic invertebrates with a 48 hour EC50 of 0.89 ppm for Daphnia magna (USEPA 1991). Laboratory studies show that methoprene is acutely toxic to chironomids, cladocerans and some decapods (Horst and Walker 1999, Celestial and McKenney 1994, McKenney and Celestial 1996, Chu et al. 1997). In field studies, significant declines of aquatic invertebrate, mollusk and crustacean populations have been directly correlated to methoprene treatments for mosquito control (Breaud et al. 1977, Miura and Takahashi 1973, Niemi et al. 1999, Hershey et al. 1998).

Methoprene has a ten day half life in soil, a photolysis half life of ten hours, and solubility in water is 2 ppm (Zoecon 2000). Degradation in aqueous systems is caused by microbial activity and photolysis (USEPA 1991). Degradation rates are roughly equal in freshwater and saltwater systems and are positively correlated to temperature (USEPA 1991).

Adulticides

There are only two general classes of adulticides, organophosphates and pyrethroids. The pyrethroids include both natural products called pyrethrins and synthetic molecules that mimic the natural pyrethrins, such as permethrin, resmethrin, and sumithrin. One organophosphate, Trumpet (Naled), is proposed for use at the Refuge but has not been applied to date. The two pyrethroid products proposed for use at the Refuge, Pyrocide 7336 and Sourge, are both synthetic pyrethrins.

In general, pyrethroids have lower toxicity to terrestrial vertebrates than organophosphates. Although not toxic to birds and mammals, pyrethroids are very toxic to fish and aquatic invertebrates (Anderson 1989, Siegfried 1993, Milam et al. 2000). The actual toxicity of pyrethroids in aquatic habitats, however, is less than may be anticipated because of the propensity of these pesticides to adsorb organic particles in water (Hill et al. 1994). Pyrethrins are toxic to all invertebrates, but the method of application via ultra-low volume atomizer limits toxicity and contact with non-targets. To minimize pesticide drift, applications would take place during the evening hours, when wind speeds are reduced and temperatures decreased. The evening is also the period when mosquito activity is the greatest.

Naled is a fast acting, nonsystemic contact and stomach organophosphate insecticide used to control aphids, mites, flies and mosquitoes. Naled is highly to moderately toxic via the oral route. It is moderately toxic through skin exposure, may cause skin rashes and skin sensitization and may be corrosive to the skin and eyes. Naled is highly to moderately toxic to birds. The reported acute oral LD50 for naled is 52 mg/kg in mallard ducks, 65 mg/kg

in sharp-tailed grouse, 36-50 mg/kg in Canadian geese, 120 mg/kg in ring-neck pheasants. Naled is highly to moderately toxic to fish and may be very highly toxic to aquatic invertebrate species (ETN 1996).

However, Trumpet (Naled) is practically nonpersistent in the environment, with reported field half-lives of less than 1 day. It is not strongly bound to soils and is rapidly broken down if wet. Soil microorganisms break down most of the naled in the soil. It therefore should not present a hazard to groundwater (ETN 1996).

Threatened and Endangered Species

The Refuge provides potential habitat for the following endangered species: giant garter snake, Sacramento splittail, Delta smelt, valley elderberry beetle, vernal pool tadpole shrimp and vernal pool fairy shrimp.

Vernal Pools

The growth regulator Methoprene (Altosid or A.L.L) can have deleterious effects on vernal pool shrimp by delaying the development of adult shrimp and thus the number of eggs laid before the pools dry up (Lawrenz 1984). Because of the effects of Methoprene on fairy shrimp and a lack of information on how long the agent remains in the soil, use of the larvicide methoprene within vernal pools or swales at any time, in either wet or dry conditions, is prohibited (USFWS 2001).

The majority of vernal pools and seasonal swales will be dry during the main pesticide application period (June-October). In general, vernal pool habitats are not significant mosquito-producing habitat and should not require chemical treatments for control of mosquito larvae because they are sufficient predators in naturally functioning vernal pools to keep larval numbers below the treatment threshold. In the event that the use of a larvicide does become necessary in the vicinity of vernal pools, Bti, which is relatively specific to mosquitoes and flies, will be the agent of choice.

The majority of the vernal pools at the Refuge occur on the Wetland Preserve property which became part of the Refuge under a conservation easement in 2004. During the spring of 2004, before the conservation easement went into effect, numerous vernal pools were treated with Bti. Relatively warm spring temperatures in 2004 likely contributed to elevated larval populations, but other factors may also be involved. The mosquito abatement district had increased larval monitoring in the area because the Wetland Preserve property is adjacent to a housing development and WNV had recently arrived in Sacramento county. Many of the vernal pools in the Wetland Preserve property are man made mitigation pools that may not be functioning as a naturally occurring vernal pool would. The hydrologic regime and/or diversity and number of invertebrates in man made vernal pools may create more favorable conditions for mosquito larvae in that mitigation pools may hold water longer and may harbor fewer invertebrates that prey on mosquito larvae (Stan Wright pers. comm.). The increase in grazing that has occurred since the Service assumed management may reduce mosquito larvae populations by increasing water movement in the vernal pools due to wind action. Future mosquito abatement activities in the Wetland Preserve property will be closely monitored by Refuge staff to avoid conflicts between wildlife habitat improvement goals and mosquito control goals.

Giant Garter Snake

Mosquito control activities in giant garter snake habitat may affect giant garter snakes by harassment or injury from vehicle use. The District will only operate vehicles in existing roads; therefore, harassment or injury from vehicle use would occur only if snakes are in the roadway. Regarding the effects of the proposed pesticides, a Fish and Wildlife Service

sponsored study indicated that the short-term effects of adulticides approved for mosquito control on the Sacramento NWR Complex did not significantly reduce abundance or biomass of the snake's prey items, macro-invertebrates and fish, in treated wetlands (Lawler et. al. 1997). However, no information is available on the toxicity of the proposed pesticides directly to the giant garter snake. Without further information, it must be assumed that exposure of giant garter snakes to these chemicals could result in direct impacts, such as loss or sublethal effects to individual animals. Adverse effects to the giant garter snake from mosquito control activities will therefore be minimized by avoiding any wetland habitat suitable for giant garter snakes while applying chemical treatments for control of mosquitoes.

Valley Elderberry Longhorn Beetle
Adverse effects on the valley elderberry longhorn beetle are not likely since the main mosquito abatement period (June-September) does not coincide with the period of adult beetle emergence (late April through mid-May or early June). Also, the riparian corridors that house the valley elderberry longhorn beetle, generally do not require treatment with chemical control agents. If control measures are needed in these areas, some granular applications of Bti or Altocid (Methoprene) may be used during February or March when adult beetles are not present.

Delta Smelt and Sacramento Splittail
Both Delta smelt and Sacramento splittail are not likely to be adversely affected by mosquito abatement activities. Delta smelt and Sacramento splittail have never been recorded within Refuge waterways. In addition, the open water areas of the Refuge in which these species could occur are not considered mosquito production areas and would not be subject to any chemical treatment (USFWS 2001).

In general, species of concern will not be adversely affected by mosquito control activities provided the conservation measures detailed in the Intra-Agency Formal Section 7 Consultation on Pest Management Activities and the stipulations contained herein are followed (USFWS 2001).

Wetlands and Waterfowl
The Refuge was established to provide habitat for migratory birds, in particular waterfowl. The District will continue to minimize disturbance and non-target effects to wildlife by limiting mosquito abatement activities between October 15 and February 15 when the majority of migratory bird species would be arriving on the Refuge. However, since the District continues to treat until temperatures have dropped sufficiently to reduce the abundance of mosquitoes, in warmer years there may well be a longer period of overlap between the arrival of migrants and continued mosquito abatement activities. In addition, if mosquito thresholds are exceeded, or the presence of WNV is detected in or around the Refuge, then the District may need to extend mosquito surveillance and control into late fall.

In some years, most notably 2004, the District has applied Bti or planted mosquito fish as early as March when some migratory waterfowl may still be lingering before departing on their spring migration. However, Bti and Bsp have not been found to be toxic to birds (USFWS 2001). In addition, it has been found that birds are not negatively affected by utilizing foods exposed to Bti or methoprene (Niemi et al. 1999). Although physico-chemico data and environmental fate data are limiting, *Bacillus* spp. are virtually non-toxic to mammals, birds and fish. During the last 8 years methoprene has not been applied prior to June and was applied as late as October in only one instance. Thus, applications of methoprene have not directly or indirectly affected migratory birds utilizing the Refuge because migratory birds have not been present during mosquito abatement activities.

There is not likely to be much impact on geese and swans from pesticides because they are year round herbivores. Geese feed mainly on grasses and agricultural lands, while swans feed mainly on roots, tubers, stems, and leaves of submerged and emergent aquatic vegetation. In contrast, ducks are known to be opportunistic feeders on both plants and invertebrates, utilizing the most readily available food sources. Invertebrates, plants, and seeds compose the majority of their diet, varying with the season and the geographic location. A study in California's Sacramento Valley has shown that plant foods are dominant in fall diets of northern pintails, while invertebrate use increases in February and March (Miller 1987). Seeds of swamp timothy comprise the most important duck food in the summer, dry habitats of the San Joaquin Valley (Miller 1987). Waterfowl in general tend to feed on seeds when they reach their wintering areas, perhaps to regain energy lost during long flights (Heitmeyer 1988, Miller 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diet shifts to invertebrates after mosquito treatments are expected to be reduced in frequency, thereby allowing the invertebrate populations to recover.

Resident Waterfowl

Birds utilizing the Refuge during the summer months and early fall, when most of the mosquito abatement occurs, could have a greater risk of being affected by pesticide applications. These species include herons, egrets, white pelicans, mallards and wood ducks. The pesticides being applied at the Refuge have not been shown to be toxic to birds, but could potentially affect resident waterfowl indirectly by reducing invertebrate food sources. Shorebirds could also be of concern, since they feed on a wide variety of invertebrates all year, feeding which intensifies at the onset of spring migration. However, documentation of indirect food-chain effects have not come to light. Hanowski et al. (1997) studied 19 different bird species after collecting data on wetlands two years before treatment and three years after treatment of both Bti and methoprene applications and found no negative effects. Jensen et al (1999) found that no decreases were detected in the biomass or abundance of aquatic invertebrates in seasonal wetlands from ultra-low volume applications of pyrethrin, permethrin or malathion.

Public Review and Comment: If through monitoring it is determined that targeted mosquito species; 1) are known carriers of Encephalomyelitis viruses and 2) occur in densities that warrant control, the public will be notified. However, given the nature of potentially serious health risks and the rapid development of mosquito larvae, applications may occur simultaneously with public notification or before public notice.

Several written comments were received suggesting technical corrections to the CCP and the Integrated Pest Management (IPM) plan for mosquito associated threats. One oral comment suggested that vector control should be a higher priority in the CCP.

Response: All of the technical corrections recommended were made to the CCP and mosquito IPM plan. Control of mosquito associated threats continues to be a high priority on the Refuge as evidenced by the preparaton of the IPM plan for mosquito associated threats and the close working relationship between the Refuge and the Sacramento Yolo Mosquito Vector Control District.

Determination (Check One Below)

_____ Use is not compatible

___X___ Use is compatible

Stipulations Necessary to Ensure Compatibility:

1. The District will notify the Refuge manager as soon as possible when mosquito larval thresholds are exceeded and ground treatment is warranted by calling refuge headquarters.

2. When adult thresholds are exceeded, and in the event of a planned adulticiding or aerial application of any kind, the District will contact and personally coordinate with the Refuge Manager or Assistant Refuge Manager prior to conducting the treatment.

3. The District will notify the Refuge Manager in the event of detection of virus activity within or near the Refuge and the method of disease surveillance yielding positive results.

4. The District will provide the Refuge Manager with an annual report summarizing mosquito control activities during the previous year.

5. The District has and will continue to consider environmental conditions, including water temperature, density of mosquito larvae and presence of mosquito predators, when deciding mosquitoes on the Refuge pose a serious threat to human health and whether to treat.

6. Access will be prohibited in closed areas on Wednesdays and Sundays during the waterfowl hunt season.

7. Application of mosquito control measures is to be conducted in accordance with approved Pesticide Use Proposals.

8. Mosquito control will be authorized on an annual basis by a Special Use Permit (SUP). The SUP conditions will stipulate that all mosquito control work will be carried out under the guidance of pre-approved Pesticide Use Proposals.

Justification:

For many years the Refuge has worked cooperatively with the District and its associated mosquito control activities. After a review of these activities, the Refuge has determined that allowing these uses to continue would not interfere or derogate from the purpose for the Refuge, nor the mission of the National Wildlife Refuge System.

The Refuge is located within a 10 mile radius of various urban and rural communities. Species of mosquito like *Culex tarsalis, Anopheles freeborni, Aedes melanimon* and *Aedes nigromaculis*, are found on the Refuge and are capable of dispersing various miles to obtain a blood meal. With the exception of *Culex tarsalis*, the remaining fore mentioned species are capable of dispersing 5-10 miles; *Culex tarsali*s is known to disperse over 25 miles. All species are known to be vectors for Saint Louis encephalitis, California encephalitis and western equine encephalitis; additionally, *C. tarsalis* is particularly known to transmit West Nile virus. Mosquito control is conducted on Refuge lands to prevent populations of adult mosquitoes from rising to levels that could pose a public health hazard or significant nuisance to neighboring communities, following the guidance of the stipulations within this document. Cooperative efforts between the Refuge and the District have successfully controlled larval mosquito populations on the Refuge to the extent that adulticide applications have only been necessary twice over the last 8 years. Since the approved adulticides are generally more toxic to wildlife and wildlife food sources than larvicides, it is in the best interest of wildlife to minimize adulticide applications.

Because mosquito treatment occurs during the early weeks of fall flood-up before most migratory birds have arrived, and since the frequency of treatments are low and spaced apart on a per unit basis, overall effects to non-target organisms are not expected to be significant. In addition, the number of treatment days per year is fairly low, and if the applicator follows the stipulations previously outlined and within the SUP, mosquito abatement practices should not materially interfere with or detract from the Refuge purpose or the mission of the National Wildlife Refuge System. If additional biological monitoring of this activity documents substantial negative impacts to migratory birds or other wildlife, this determination would be re-analyzed on the basis on new evidence.

Mandatory Re-Evaluation Date (provide month and year):

_____Mandatory 15-year Re-Evaluation Date (for priority public uses)

February, 2017 Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

___X___ Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

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Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: (Signature) 2/28/07 (Date)

Compatibility Determination for Grazing Programs on the Stone Lakes National Wildlife Refuge

Use:

Grazing program to provide (1) suitable habitat for wintering sandhill cranes, arctic nesting geese such as Aleutian cackling geese, shorebirds and breeding habitat for nesting grassland birds such as Western meadowlark; (2) expand native grasses (3) reduce fire danger by reducing thatch layer (Alternative B, Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan Environmental Assessment).

Refuge Name:

Stone Lakes National Wildlife Refuge

Establishing and Acquisition Authorities:

Stone Lakes National Wildlife Refuge (NWR) was established in 1994 under the authority of the Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, and the Endangered Species Act of 1973. The approved refuge boundary contains about 18,000 acres, of which the Service owns or manages approximately 6,000 acres. Additional funding sources used to acquire land include: the California Environmental License Plate Fund, the Cigarette and Tobacco Product Surtax (California Proposition 99, 1988), the North American Wetland Conservation Act, the Land and Water Conservation Fund, the Sacramento County Environmental Mitigation Grant/ Packard Foundation, the Central Valley Improvement Act, the National Fish and Wildlife Fund, the Trust for Public Land Grant/Packard Foundation, the City of Sacramento and the CalFed Bay Delta Program.

Refuge Purpose(s):

Stone Lakes NWR purposes include the following:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.' (Migratory Bird Conservation Act of 1929)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ...@ (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the National Wildlife Refuge System (System) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

The Stone Lakes National Wildlife Refuge (Refuge) will administer a grazing program on the North Stone Lake (2,791 acres) and South Stone Lake (582 acres) Units of the Refuge. The North Stone Lake Unit is comprised of approximately 1,900 acres of mostly non-native grassland and 891 acres of open water, riparian and wetland habitat. The Gallagher tract of the South Stone Lake Unit is comprised of approximately 45 acres of irrigated pasture. The Sun River tract of the South Stone Lake Unit consists of 140 acres of irrigated pasture, and 397 acres of seasonal, permanent wetlands, open water and riparian habitats.

Grazing has been occurring on the properties for over 50 years. The Refuge will continue to administer this use as outlined in this Compatibility Determination. Although grazing is not identified as a wildlife dependent public use by the National Wildlife Refuge System Improvement Act of 1997, grazing will allow the Refuge to manage mostly non-native grassland habitats on the Refuge for the benefit of wildlife and native plants while reducing the fire danger to adjacent communities. This use will provide short grass foraging and loafing habitat to a variety of wintering migratory birds such as the greater sandhill crane (*Grus canadensis tabida*), arctic nesting geese including Aleutian cackling goose (*Branta hutchinsii leucopareia*) and white fronted goose (*Anser albifrons*), shorebirds including white faced ibis (*Plegadis chihi*), long billed curlew (*Numenius americanus*) and black bellied plover (*Pluvialis squatarola*). These grasslands also provide nesting and foraging habitat for western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), northern harrier (*Circus cyaneus*), white tailed kite (*Elanus leucurus*) and Swainson's hawk (*Buteo swainsoni*), and have the potential to provide habitat for nesting and wintering burrowing owls (*Athene cunicularia*), Savannah sparrows (*Passerculus sandwichensis*) and grasshopper sparrows (*Ammodramus savannarum*). Habitat consists of introduced (> 70% annual rye [*Lolium multiflorum*]) and native grasses (including creeping wildrye [*Leymus triticoides*], saltgrass [*Distichlis* spp.] and meadow barley [*Hordeum branchyntherum*])as well as other forbs and associated native plant food resources.

Only the grazing of cattle is to be considered on the Refuge; grazing by sheep (*Ovis aries*), goats (*Capra hircus*), or other creatures such as bison (*Bison bison*) will not be considered. During drought years or years of low rainfall, cattle will not be allowed to graze on the Refuge.

The timing of the placing of cattle on the Refuge are termed "turn in dates" (November 1 or slightly later) and are adjusted year to year based upon the date of the first effective germinating rainfall, and the amount of dry forage available in the fall (Stechman 1995). The timing of removing cattle from the Refuge is termed "turn out dates" and is determined solely on the amount of residual dry matter (RDM) within the unit, but will be no later than July 15th. If and when 800 lbs per acre, of RDM, or less is achieved cattle will be removed from the unit.

The unit of measure used to summarize the quantity of cattle grazing on the Refuge is termed Animal Unit Month (AUM). AUM is defined as the amount of forage needed by an "animal unit" (AU) grazing for one month (USDA-NRCS 2004). An AU is defined as one mature 1,000 pound cow and her sucking calf. An assumption in this definition is that a cow nursing her calf will consume about 26 pounds of dry matter per day. Other types of livestock are assigned AUM equivalents based on body size and consumption of dry matter.

The optimal time for grazing in the Central Valley begins in November and may continue through mid July depending on winter and spring rainfall. Prior to the beginning of the grazing season, an assessment is made to determine the amount of residual dry matter (RDM) available to the cattle. The number of cattle allowed to graze on the Refuge, for a

specific amount of time, varies with the amount of local rainfall. Because grazing on the Refuge supports various wildlife populations, this RDM level is linked to the needs of wildlife and not the needs of the cattle. The RDM is determined by clipping, drying, and then weighing the amount of RDM in representative samples from the unit cattle are to graze and varies upon temperature, monthly rainfall and the density of new grass/forb growth.

The Refuge has developed a 5-year grazing management plan with the assistance of the Natural Resource Conservation Service that promotes variability in grass height and density among the five dry pasture units to provide habitat for a suite of grassland dependent species. This plan rotates grazing pressure (low, medium and high) in five pastures (see Figure 1) resulting in a range of grass heights and densities (see Table 1). The rotational grazing should result in higher quality habitat for species that inhabit short grasses such as burrowing owls, without impacting other grassland dependent species. A monitoring program will be implemented to determine if increasing grazing rates and rotating grazing pressure through the units will have the desired effects of providing a variety of nesting, foraging and breeding cover for a variety of birds and other wildlife. If the RDM level drops below 800 lbs/acre, prior to or anytime during the grazing season, the Refuge manager may request that the grazing permit holder reduce the number of cattle grazing in that unit or remove them all together in order to prevent degradation of the resources in the unit.

Table 1. Residual Dry Matter (RDM) targets over a five year period on the North Stone Lake Unit of the Stone Lakes National Wildlife Refuge in California.

	RDM Value at the End of the Grazing Season (Nov – June)*				
Pasture	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
A	Medium	Low	Medium	High	Low
B	High	Medium	Low	Medium	Medium
C	Low	Medium	High	Low	Medium
D	Medium	High	Low	Medium	High
E	Low	Low	Medium	Low	Low
F**	Medium	Medium	Medium	Medium	Medium

*RDM values – Low(1200-1750 lbs/acre), Medium (1750-2500 lbs/acre), High (+2500 lbs/acre).

** Southwestern portion of South Irrigated Pasture (Fig. 1). Cattle will be in unit for 30-60 days from March-May to control weeds.

Grazing in the irrigated/wet meadow units (371 acres) on the North Stone Lake and South Stone Lake units begins in mid summer, corresponding to the removal of cattle from the dry pasture and continues until approximately November 1. Grazing rates typically range between 1.1 – 1.3 acres per AUM. These pastures, which are not grazed during the winter season, are heavily used by cranes, geese and shorebirds.

The grazing cooperator is chosen following guidance in U.S. Fish and Wildlife Service Refuge Manual under heading 5 RM 17. At the time of this writing, there are no anticipated changes to grazing on the Refuge.

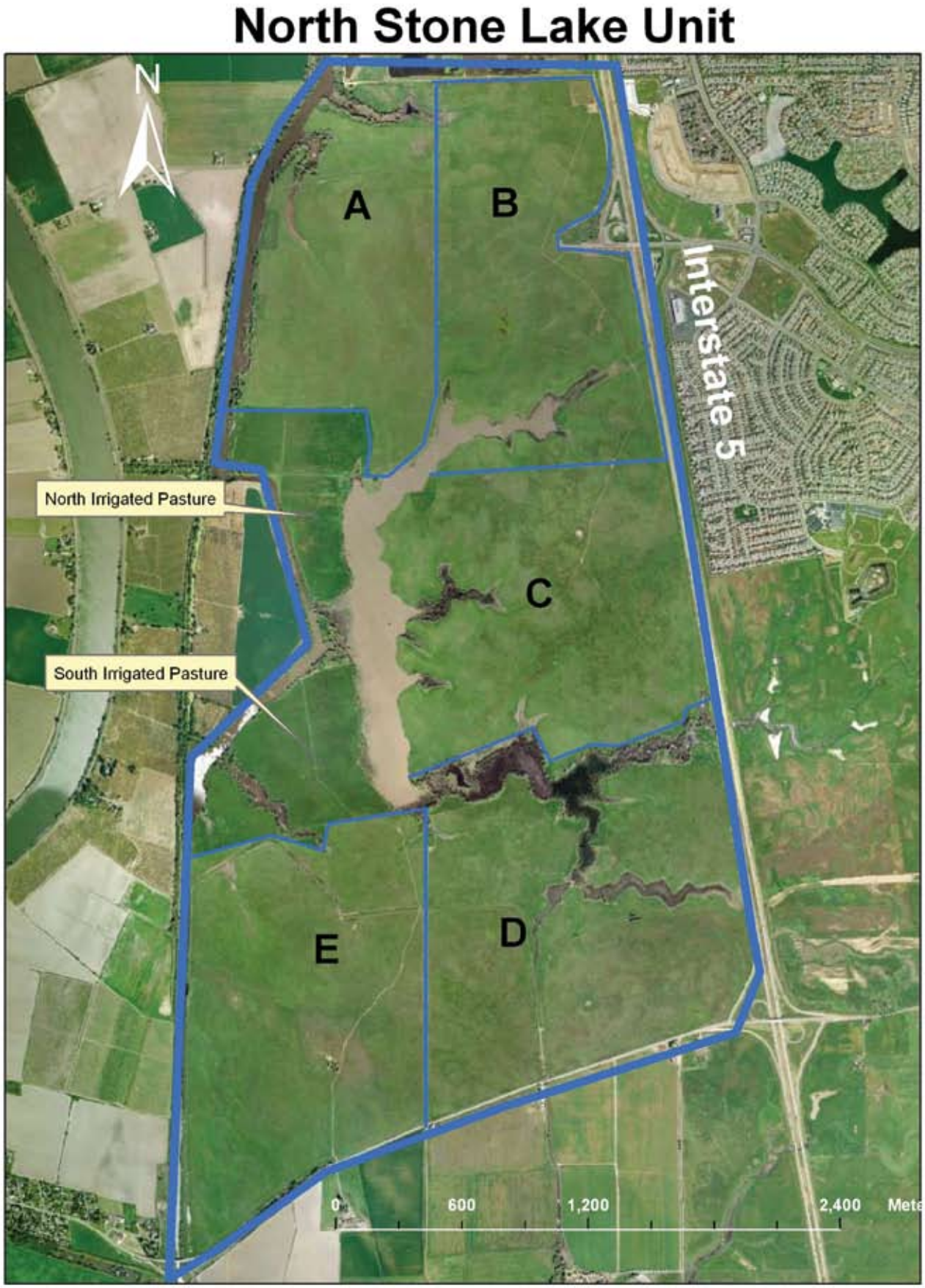

Figure 1. Map of the North Stone Lake Unit of the Stone Lakes National Wildlife Refuge showing the designation of pasture units and location of perimeter and cross fences in blue.

Availability of Resources:

The assistant refuge manager, under the direction of the project leader, will manage the grazing program. The permittee, working under a Cooperative Land Management Agreement, will accomplish certain facility management and improvement projects under the direction of the assistant manager. Accomplishments will be in direct support of the Refuge grazing program; these projects may include maintenance or improvements of existing facilities or installation of new facilities. Projects may include: deep well construction and maintenance; installing and/or maintaining water control structures, watering troughs; fence installation, repair, and/or removal; sign repair, removal, or installation; gate installation; noxious weed control; road building and maintenance; parking lot maintenance; and vegetation control around facilities. Facilities that are installed primarily for Refuge purposes are constructed or maintained at Refuge expense. All projects will be agreed upon before the beginning of the grazing season and will directly support the unit being grazed.

Rates charged per AUM are based on a survey of grazing rates in the area and were done on an upward sliding scale. Rates are now fixed until the end of the current grazing contract with the County of Sacramento which ends in 2008. Rates will then be renegotiated based on a survey of grazing rates in the area.

At the end of each grazing season, the permittee submits information that includes AUMs per month per grazing unit and the cost of various projects completed on the unit that year. The project list is then revised for the following year. Work contributions of this type will be associated with improvement projects for the particular grazed unit.

The Refuge receives adequate funding to cover the costs associated with management of the grazing program including the RDM assessment conducted at the end of every grazing season. Staff costs associated with this use emanates from the annual review of Special Use Permits, Cooperative Land Management Agreement and monitoring the impacts of this use as outlined in the grassland management plan. Annual costs to manage the grazing programs averages $25,000, which includes all costs associated with monitoring, weed control, law enforcement, improvements and planning activities.

Anticipated Impacts of the Use:

To provide this use, the Refuge has adequate staff which includes biological, administrative and managerial personnel. The grazing program results in both long and short term effects, both negative and positive. The following is a list of possible short and long-term negative impacts to wildlife resources from grazing: trampling of desirable vegetation, disturbances to ground nesting species, trampling of rodent burrows, soil compaction especially during wet periods and erosion of the bank along North Stone Lake. The following activities can minimize these negative impacts associated with grazing: fencing off sensitive habitats, development of alternative watering sources for cattle to drink from, allowing the use in years of adequate rainfall only and supporting grazing within the same unit areas and not moving animals to un-grazed or sensitive areas.

Conversely, short and long-term positive impacts of the grazing program include: an overall reduction of undesirable, non-native vegetation; re-establishment of native grass, forb, and shrub communities; reduced fire danger to surrounding communities; and increased habitat for grassland dependent species. Prior to reestablishment of a grazing program by the Refuge, the North Stone Lake Unit was left idle for approximately 12 years. Over that time, the grass became dense with vegetation reaching 6-8 feet tall. Bird surveys revealed no use by sandhill cranes, arctic nesting geese or shorebirds, although these birds used the area historically. Once the grazing plan was implemented, these birds returned within two years,

and the, California State Endangered Species Act, listed greater sandhill crane now number over 300 birds. Native grass stands have also benefited from the grazing program and are expanding (Huitt 2003). Adjacent landowners are also satisfied with the decrease in thatch and the fire break that further reduces the threat of fire spreading across the property and onto neighboring lands.

The impact of cattle to existing water supplies is negligible and being diminished as alternative watering sources are being developed. Alternative watering sources help keep cattle from watering in the lake where they can erode the bank in high use areas. A solar powered well now brings water to cattle in Pastures A and B, and a pipeline from the well at the HQ will bring water to cattle in Pasture E. A well already exists in Pasture D and plans are being finalized to construct an additional well in pasture C.

Much of the topography is flat with little sedimentation and erosion entering the two arms of North Stone Lake. The south arm of the lake which is surrounded by riparian vegetation has been fenced off to cattle, as have the other sensitive riparian zones on the property.

Bird surveys indicate the grazing program provides a significant benefit to various species of concern that winter in the Central Valley including the greater sandhill crane, white faced ibis, long billed curlew, Aleutian cackling goose and white fronted goose. Furthermore initial studies of nesting songbirds found that western meadowlarks nested in a wide range of grass heights below 3.5 feet, but were not found in areas where the grass exceeded this height.

Cowbirds (*Molothrus ater*) are found over the entire Refuge and parasitize nests of various species in riparian areas. Therefore 85% of existing riparian areas have been fenced off to decrease suitable habitat for cowbirds. Whether the grazing program will contribute to increases in the cowbird population by providing additional foraging areas is unknown. Large mixed flocks of blackbirds are seen in the spring and fall, but no cowbirds were recorded during point count surveys done the spring of 2006. Efforts to fence off riparian remaining riparian areas will continue.

Impacts to known cultural resources from this use are negligible. Tremaine and Associates (2006) completed a survey of the entire property in 2005, and all cultural resource sites that could be impacted by cattle were fenced off. Furthermore, the grazed units are closed to the public, further protecting these sites. Any ground-disturbing activities will be coordinated with the Service's Regional Archaeologist, in order to preserve the Refuge's archaeological and historic resources.

The Draft Comprehensive Conservation Plan (USFWS 2006) identifies the need to develop additional information relating to the effects of grazing on resident and migratory species. While the effects have been determined to be generally positive, additional research and evaluation will allow the Refuge to refine its management strategies and objectives for grassland management.

Public Review and Comment: One comment recommended that the CCP should indicate how NEPA requirements were met for a prior cooperative agreement related to grazing. Another comment suggested that horses would have less impact on Refuge lands and waters than long-term cattle grazing. Another comment observed that the fact that grazing is an approved refuge use demonstrates that not all Refuge uses have to be wildlife dependent uses.

Response: The environmental assessment, Appendix B of the draft CCP, applies only

to the current proposed action described in the draft CCP. Refuge land conservation efforts such as cooperative agreements are provided for under the 1992 Final EIS establishing the approved Refuge boundary (USFWS 1992). As stated in the justification below, the goals for grazing on the Refuge are to conserve, enhance, restore and manage Central Valley wetland, riparian, grassland and other native habitats to benefit their associated fish, wildlife, plants and special status species.

Determination: (Check One Below)

_____ Use is not compatible

__X__ Use is compatible, with Stipulations

Stipulations Necessary to Ensure Compatibility:
The Cooperator is operating under the terms and conditions of a Cooperative Land Management Agreement (2001), special use permit and a Refuge Grazing Plan. These documents provide the necessary information and assistance from the Refuge to determine start and end dates for cattle placement and removal.

Additional Stipulations are as follows:
- It is the responsibility of the Refuge Manager to determine fair market value of grazing, to issue special use permits, monitor permittee compliance and maintain up-to-date files on all grazing activities.
- All cattle grazing on the Refuge would be removed no later than July 15th.

Monitoring:
A monitoring program will be established to provide data on residual dry matter, cover density, bird use, and noxious weeds. These data will establish guidelines for making management decisions concerning the grazing program. Maps of RDM will be compiled using the comparative yield method (Dudley, pers. comm.) in September or October of each year. The comparative yield method measures the residual dry matter by clipping the grass in a 1 meter square and then weighing the dried sample. This is repeated until the observer can determine the residual dry matter by observation rather than clipping grass samples. Samples are still collected to ensure accuracy of the observations. Maps are then compiled from the data and visual observations. Data on grass height and density is collected during the nesting season (March-April) using the Robel Pole Method (Harmoney et al. 1997). These data will be used to guide grazing rates the following year. Photo plots for each grazing unit will also be established and photos will be taken each year at the end of the grazing season (July – August). Wildlife surveys will include bimonthly waterfowl and shorebird surveys (November – March), greater sandhill crane surveys (September – March), and rookery surveys (March – June). Noxious weed surveys will include mapping noxious weed infestations using a hand-help GPS unit and developing and implementing integrated pest management techniques to control and/or eliminate target species.

Justification:
The primary management goals guiding the grazing of the Refuge are to conserve, enhance, restore, and manage Central Valley wetland, riparian, grassland, and other native habitats to benefit their associated fish, wildlife, plants and special status species, and to conserve, enhance, and restore high quality migrating, wintering, and breeding habitat for migratory birds within the Sacramento-San Joaquin Delta of the Central Valley. The mission of the National Wildlife Refuge System also includes the conservation, management and restoration of wildlife resources. When evaluating the appropriate management direction for refuges, Refuge Managers are required to use sound professional judgment to determine

their refuge's contribution to biological integrity, diversity and environmental health at multiple landscape scales as called for in (601 FW 3[3.7B]). The grazing program is designed to enhance habitat for a variety of special status species including greater sandhill crane, Swainson's hawk and Aleutian cackling geese. The regulated use of grazing to benefit these and other species clearly supports both the System mission and the purpose for which the Refuge was established.

With the dramatic changes to the plant communities in California over the past 150 years, has come an increase in the density of ground cover due to the introduction of nonnative grasses and forbs (Kuchler 1988). A limited grazing season can benefit the recovery of native perennials by reducing annual plant biomass, increasing seed production and stimulating native perennial production (Huitt 2003).

Prior to the management of the property by the Refuge, the uplands were altered from their original native condition by the introduction of non-native grasses and intensive grazing practices. In order to maintain the biological integrity and diversity of the Refuge, species of special concern must be provided for. The use of moderate grazing to reduce the build-up of annual introduced grassland biomass is viewed as beneficial to species such as greater sandhill crane, Aleutian cackling geese and others. By restricting the intensity and duration of grazing, and by adhering to the stipulations for this use, the environmental health of the Refuge will be maintained.

Mandatory Re-evaluation Date (provide month and year):

_____Mandatory 15 year Re-evaluation Date (for priority uses)

February, 2017__Mandatory 10 year Re-evaluation (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

__X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

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Refuge Determination:

Prepared by: (Signature) 12/06/06 (Date)

Refuge Manager/ Project Leader Approval: Thomas E. Harvey (Signature) 12/07/06 (Date)

Concurrence:

Refuge Supervisor: (Signature) 2/27/07 (Date)

Assistant Manager, Refuges, California/Nevada Operations: Margaret J. Kolar (Signature) 2/28/07 (Date)

Appendix B. FONSI and Environmental Assessment

U. S. Department of the Interior
Fish and Wildlife Service
California/Nevada Operations Office

FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment for Management of
Stone Lakes National Wildlife Refuge
Sacramento and San Joaquin Counties, California

The U.S. Fish and Wildlife Service (Service) has completed a Comprehensive Conservation Plan (CCP) and the Environmental Assessment (EA) for Stone Lakes National Wildlife Refuge (Refuge). The CCP will guide Refuge management for the next 15 years. The CCP and EA (herein incorporated by reference) describe the Service's proposals for managing the Refuge and their associated effects on the human environment under three alternatives, including the No Action Alternative.

Decision

Following comprehensive review and analysis, the Service selected Alternative B for implementation because it is the alternative that best meets the following criteria:

- Achieves the mission of the National Wildlife Refuge System.
- Achieves the purposes of the Refuge.
- Will be able to achieve the Service's vision and goals for the Refuge.
- Maintains and restores the ecological integrity of the habitats and wildlife and plant populations on the Refuge.
- Addresses the important issues identified during the scoping process.
- Addresses the legal mandates of the Service and the Refuge.
- Is consistent with the scientific principles of sound fish and wildlife management and endangered species recovery.
- Facilitates priority public uses which are compatible with the Refuge purposes and the Refuge System mission.

Alternatives Considered

Following is a brief description of the alternatives for managing Stone Lakes National Wildlife Refuge, including the selected alternative (Alternative B). For a complete description of each alternative, see the draft EA. All three alternatives, including Alternative A, focus on wetland conservation, endangered species protection, and providing habitat for migratory birds.

Alternative A (No Action Alternative)

Alternative A was not selected because it could not reasonably be expected to meet the Service's vision and goals for the Refuge. Under Alternative A, the Refuge would continue to be managed as it has in the recent past. Currently the primary management focus of the Refuge is providing habitat for migrating, wintering and nesting migratory and resident birds with an emphasis on waterbirds, and a variety of special status species.

Restoration and management of seasonal and permanent wetland habitats has been a major emphasis since the inception of the Refuge. The Refuge promotes water management regimes involving specific water draw down dates, spring irrigations and fall flood-up periods to produce quality habitat, primarily for wintering waterbirds. Seasonal wetlands are irrigated in summer to stimulate the growth of high quality waterfowl foods. Wetland vegetation is also manipulated periodically to maintain desired habitat conditions for feeding, loafing and breeding waterfowl, waterbirds and other birds.

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This Alternative was not selected for implementation because it does not include needed improvements which have been identified for habitat restoration, management of migratory birds and special status species and it does not accommodate the growing demand for wildlife-dependent recreation.

Alternative B (Selected Alternative)
Alternative B was selected because, among the alternatives, it can be most reasonably expected to meet the Service's vision and goals for the Refuge. Under Alternative B, the Refuge would continue its current focus of providing wintering habitat for migratory birds and management for the benefit of special status species. Management programs for migratory birds and Central Valley wildlife habitats would be expanded and improved. Valley foothill riparian habitat would be restored or enhanced, seasonal and permanent wetlands would be enhanced, on the South Stone Lake Unit, and native grassland habitat would be restored. A no-wake zone would be established on all Refuge waters where boating occurs. Overall visitor use opportunities would be expanded. Opportunities for wildlife observation and environmental education would expand. Foot trails would be open to the public seven days per week and universally accessible trails would be constructed. Access for car top boating would be improved.

Alternative C
Alternative C was not selected because although it would enhance visitor services, it would be unlikely to meet the Service's vision and goals for the Refuge, related to habitat and wildlife management. Under Alternative C, the Service would continue to focus on providing wintering habitat for migratory birds and managing for endangered species while placing a greater emphasis on historic conditions in management and habitat restoration activities. Opportunities for the six priority public uses would be expanded. Valley foothill riparian habitat would be restored, seasonal wetlands, permanent wetlands and native grassland habitat would be restored or enhanced, but to a lesser degree than under Alternative B. Opportunities for wildlife observations would expand to a larger capacity than under Alternative B. The number of supported environmental education groups would expand to 80 per year. Foot trails would be open to the public seven days per week, with seasonal restrictions, and two and one-half miles of universally accessible trails would be constructed. Car top boating access would be improved.

Effects of management of the Refuge on the human environment
As described in the EA, implementing the selected alternative will have no significant impacts on any of the environmental resources identified in the EA. A summary of the impacts analysis and conclusions follows.

Soils
In addition to the potential soil impacts related to construction on the Headquarters Unit, Alternative B could also result in similar impacts due to restoration activities. Developing visitor facilities could result in impacts, as well. These impacts are expected to be minor and localized. Additional short-term disturbance would result from mechanical removal of nonnative weeds from the seasonal marsh, riparian and upland habitats.

Water Quality and Quantity
The conversion of 200 acres of former agricultural lands on the Headquarters Unit to wetlands would add to the region's floodwater storage capacity and help maintain water quality by trapping sediments and removing some excess nutrients.

Under the selected alternative, periodic flooding of irrigated pastures would begin earlier each fall, adding to groundwater recharge. The restoration and natural expansion of riparian vegetation would help to stabilize shorelines; this would reduce erosion and the resulting

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sediment loads in Refuge waters, improving water quality. The prohibition of gas-powered boats within the Refuge would contribute to better water quality by removing a source of turbidity, potential petroleum leaks and possibly inadvertently transported aquatic nuisance species.

Air Quality
Under all alternatives, soil disturbance and/or use of heavy equipment would cause short-term increases in dust (particulate matter less than 10 microns [PM10]) and tailpipe emissions of PM10, nitrogen oxide (NOX) and reactive organic gasses (ROG), including those activities associated with the restoration of wetland habitat on the Headquarters Unit. Minor short-term increases in PM10 and tailpipe PM10, NOX and ROG would result from restoring riparian habitat and constructing trails, parking areas and observation platforms. Tailpipe emissions (ROG, NOX, and PM10) would result from the use of combustion engines in construction equipment and employee vehicles during trips to and from the job sites. Dust emissions and generation (PM10) would result from the excavation, transport and grading of soil. Long-term increases in emissions would result from the increasing number of vehicular trips to and from the Refuge as visitation increases.

Plant Communities
Under the selected alternative discing, mowing, chemical treatments, and occasionally grazing would be periodically used to maintain cover of emergent vegetation in seasonal wetland impoundments. The Service would continue to use physical and chemical means to control undesirable plants, to manage vegetation in about 25 percent of the moist soil impoundments each year and would continue to mow and graze grassland habitat to reduce the cover of non-native annual grasses and promote native species. Control of invasive weeds would be part of an integrated pest management program that would include physical (e.g., mowing, discing, grazing, and burning) and chemical (herbicide) treatments.

In addition, the Service would increase the cover of native seasonal marsh plants on the Refuge, restore 65 acres of riparian and oak woodland habitat, enhance 40 acres of understory shrub and herbaceous vegetation in existing riparian areas, and restore 30 acres of native grasslands throughout the Refuge. This would have a beneficial effect on the Refuge's vegetation because it would restore a larger diversity of the Refuge's native plant cover.

Wildlife and Fish Resources
Under the selected alternative, the Service would continue to allow the Sacramento Yolo Mosquito Vector Control District (SYMVCD) to monitor and control mosquitoes on the Refuge. The SYMVCD would use the biological larvicides *Bacillus thuringiensis isrealensis* (Bti) and *Bacillus sphaericus* (Bsp) and the insect growth inhibitor methoprene. In the event, adulticide applications become necessay, SYMVCD will utilize synthetic pyrethrins or the organophosphate Naled, applied from an ultra-low volume ground rig.

All applications of aquatic herbicides will be from properly calibrated and maintained ground or boat-mounted spray apparatus. All applications will occur in compliance with best management practices identified in the Aquatic Pesticide Application Plan for the Statewide National Pollution Discharge Elimination System (NPDES) General Permit (No. CAG990005). Control of invasive weeds, particularly aquatic weeds such as water hyacinth, currently require the application of herbicides that could have short-term negative effects on aquatic wildlife and waterbirds, but removal of invasive weeds ultimately improves the quality of wildlife habitat. Herbicide applications are not expected to significantly affect wildlife.

Recreational use of the Refuge is expected to increase dramatically under the selected alternative. Most of these new users are expected to participate in wildlife observation. This

growth in recreational use could adversely affect birds using the Refuge wetlands, resulting in flushing, disruption of feeding and roosting, increased demands on the birds' available energy and reduced use of preferred habitat. Construction of new visitor use facilities could result in the temporary disturbance and/or displacement of wildlife.

Once established, new habitat would provide a long-term benefit to a variety of wildlife. In addition, existing grassland habitat would be maintained for the benefit of grassland dependent species. Riparian habitat would be further protected by further exclusion of cattle from riparian areas. Shorebirds would benefit from exploring reverse-cycle wetlands and by drawing down one permanent wetland until August to provide food. The Refuge would also enhance and create habitat for burrowing owls by reintroducing ground squirrels to the North Stone Lake and Wetland Preserve units and constructing artificial burrows, as needed.

The direct impact of recreational fishing on fish populations is not expected to be detrimental. Fishing may even benefit native fish by reducing competition from introduced species. Indirect effects of fishing and boating, such as disturbance to wildlife, would be controlled by restricting shoreline fishing, by allowing access only during the summer before winter migrants have arrived and by providing sanctuary to species that are present during the summer.

Special Status Species
No significant adverse effects on special status species are anticipated. Beneficial effects to special status species would result from expansion and enhancement of riparian, wetland and grassland habitats.

Cultural Resources
Under all alternatives Refuge management activities have the potential to disturb cultural resources. To preserve Refuge archaeological and historic resources, all undertakings will be coordinated with the Service's Regional Archaeologist. Under each alternative: a cultural resources overview would be prepared; baseline data on all cultural resource sites collected; an attempt made to locate and delineate all unrecorded cultural resource sites; appropriate buffers zones established to ensure their protection; and updated or new site records forwarded to the California North Central Information Center. Also, an attempt would be made to locate any human remains, covered under the Native American Grave Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq. or 43 CFR 10), removed in the past.

Visitor Services
Volunteer opportunities would be expanded, including at least one comprehensive volunteer training per year. Opportunities for wildlife observations would expand to a capacity of 10,500 visits per year. Four miles of foot trails would be open to visitors seven days a week, with seasonal restrictions. Two miles of universally accessible trails would be constructed. Two new photography blinds would be constructed. Two hundred feet of boardwalk would be constructed. One and one-half miles of foot trails would be constructed and would be open to visitors seven days a week, with seasonal restrictions. Parking facilities and a car top boat launch, for a maximum of ten cars, would be provided. The number of supported environmental education groups would expand to 80 per year. Two new interpretative programs would be developed within five years, including displays illustrating traditional dwelling and subsistence strategies on the Headquarter Unit. Within five years the Refuge would provide safe, boat only fishing with day use parking facilities that could accommodate up to 20 boats per day. Refuge staff would expand community outreach and presentations to local community groups.

Socioeconomics
The selected alternative is expected to have no significant affect on the local, regional or State economy. Under the preferred alternative, there will likely be a loss of benefits to local

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businesses from patronage by high speed boaters, but there will likely be a simultaneous gain in benefits for local businesses from added patronage by increasing numbers of other Refuge visitors. Actions under the preferred alternative are thus expected to have modest net benefits to the local economy once only uses found to be compatible are allowed on the Refuge.

As incompatible high speed boating is phased out, the local water skiing club, would be expected to lose benefits associated with this temporal, exclusive use of Refuge waters and to incur costs associated with finding alternative water skiing locations due to the water ski club's contractual obligation, until 2013, with a local landowner for the use of launch facilities that provides access to a waterway, partially located on the Refuge. The local land owner, who sells access to the water ski club, could incur opportunity costs after 2013 unless another profitable use of the property is substituted.

No projects proposed under any of the alternatives would have a disproportionate negative impact on low-income or minority populations.

Public Review

The planning process incorporated extensive public involvement in developing and reviewing the CCP. This included two public workshops, distribution of three planning updates, and public review and comment on the planning documents. The details of the Service's public involvement program are described in the CCP and the EA.

Conclusions

Based on review and evaluation of the information contained in the supporting references, I have determined that implementing Alternative B as the CCP for management of the Stone Lakes National Wildlife Refuge is not a major Federal action that would significantly affect the quality of the human environment, within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. Accordingly, the Service is not required to prepare an Environmental Impact Statement.

This Finding of No Significant Impact and supporting references are on file at the U.S. Fish and Wildlife Service, Stone Lakes National Wildlife Refuge, 1624 Hood-Franklin Road, Elk Grove, CA 95757, (916) 775-4421 and U.S. Fish and Wildlife Service, California/Nevada Refuge Planning Office, 2800 Cottage Way, Sacramento, California, 95825 (telephone [916] 414-6500). These documents can also be found on the Internet at: www.fws.gov/cno/refuges/planning.html. These documents are available for public inspection. Interested and affected parties are being notified of this decision.

Supporting References

U.S. Fish and Wildlife Service. 2007. Final Comprehensive Conservation Plan for Stone Lakes National Wildlife Refuge.

U.S. Fish and Wildlife Service. 2006. Draft Comprehensive Conservation Plan and Environmental Assessment for the San Joaquin River National Wildlife Refuge.

Manager, California/Nevada Operations
Sacramento, California

1/5/2007
Date

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Stone Lakes
National Wildlife Refuge
Comprehensive Conservation Plan Environmental Assessment

U. S. Fish and Wildlife Service
California/Nevada Refuge Planning Office
2800 Cottage Way, Room W-1832
Sacramento, CA 95825

December 2006

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Chapter 1. Purpose of and Need for Action

Introduction

This draft environmental assessment (EA) evaluates the environmental effects of three alternatives for managing the Stone Lakes National Wildlife Refuge (Refuge). The U.S. Fish and Wildlife Service (Service) will use this EA to solicit public involvement in the Refuge planning process and to determine whether implementation of the Comprehensive Conservation Plan (CCP) will have a significant effect on the quality of the human environment. This EA is part of the Service's decision-making process in accordance with the National Environmental Policy Act (NEPA).

Proposed Action

The Service proposes to implement Alternative B, as described in this EA. More information is provided about Alternative B in the CCP.

Purpose of and Need for the Proposed Action

The Refuge needs this CCP to guide Refuge management. In addition, the National Wildlife Refuge System Improvement Act of 1997 requires that within 15 years of its enactment, a CCP must be in place for all refuges established prior to 1997.

Project Area

The Refuge was established in 1994, becoming the 505th refuge in the National Wildlife Refuge System. The Refuge boundary encompasses about 17,640 acres, including a core Refuge of about 9,000 acres, and a 9,000-acre "Cooperative Wildlife Management Area" (USFWS 1992). The Service actively manages about 6,000 acres. The Refuge is located in the Sacramento/San Joaquin River Delta (Figure 1). It is in the Beach-Stone Lakes Basin, found within the Sacramento Valley in the southwestern part of Sacramento County. It lies about ten miles south of the city of Sacramento, straddling Interstate Five from the town of Freeport south to Lost Slough (Figure 2). The Refuge provides wintering habitat for migratory waterfowl and other waterbirds in the Pacific Flyway (Figure 1). It is surrounded by privately owned nonnative grassland used for pasture, agricultural croplands and dense urban development.

Decisions to be Made

Based on the analysis documented in this draft EA, the California/Nevada Operations Manager must determine the type and extent of management and visitor access that will occur on the Refuge and whether the selected management alternative would have a significant effect on the quality of the environment.

Issue Identification

The Service identified issues, concerns and opportunities through early planning discussions and the public scoping process. This process began with the mailing of the first planning update in July 2002. The public also provided comments in writing and through personal communications. For a discussion of the planning process and issues raised, please see Chapter 2 of the CCP.

The planning team helped to further define the issues. The planning team includes Service employees from the Stone Lakes National Wildlife Refuge Complex office and the California/Nevada Refuge Planning Office.

Oregon
Pacific Flyway
Area Enlarged
MODOC NWR
Redding
SACRAMENTO RIVER NWR
SACRAMENTO NWR
DELEVAN NWR
COLUSA NWR
SUTTER NWR
SAN PABLO BAY NWR
MARIN ISLANDS NWR
Sacramento
Stone Lakes National Wildlife Refuge
Morrison Creek
Sacramento/ San Joaquin Delta
Cosumnes River
Local Watersheds
San Francisco
SAN JOAQUIN RIVER NWR
Modesto
DON EDWARDS SAN FRANCISCO BAY NWR
ANTIOCH DUNES NWR
SAN LUIS NWR
MERCED NWR
Fresno
BLUE RIDGE NWR
KERN NWR
PIXLEY NWR
Bakersfield
BITTER CREEK NWR
Nevada
California
Pacific Ocean
Los Angeles
101
99
80
5
580
Figure 1. Watershed and Ecosystem Setting
Stone Lakes
National Wildlife Refuge
Sacramento River Watershed
Central Valley-San Francisco Bay Ecoregion
0 Miles 100
0 Kilometers 100

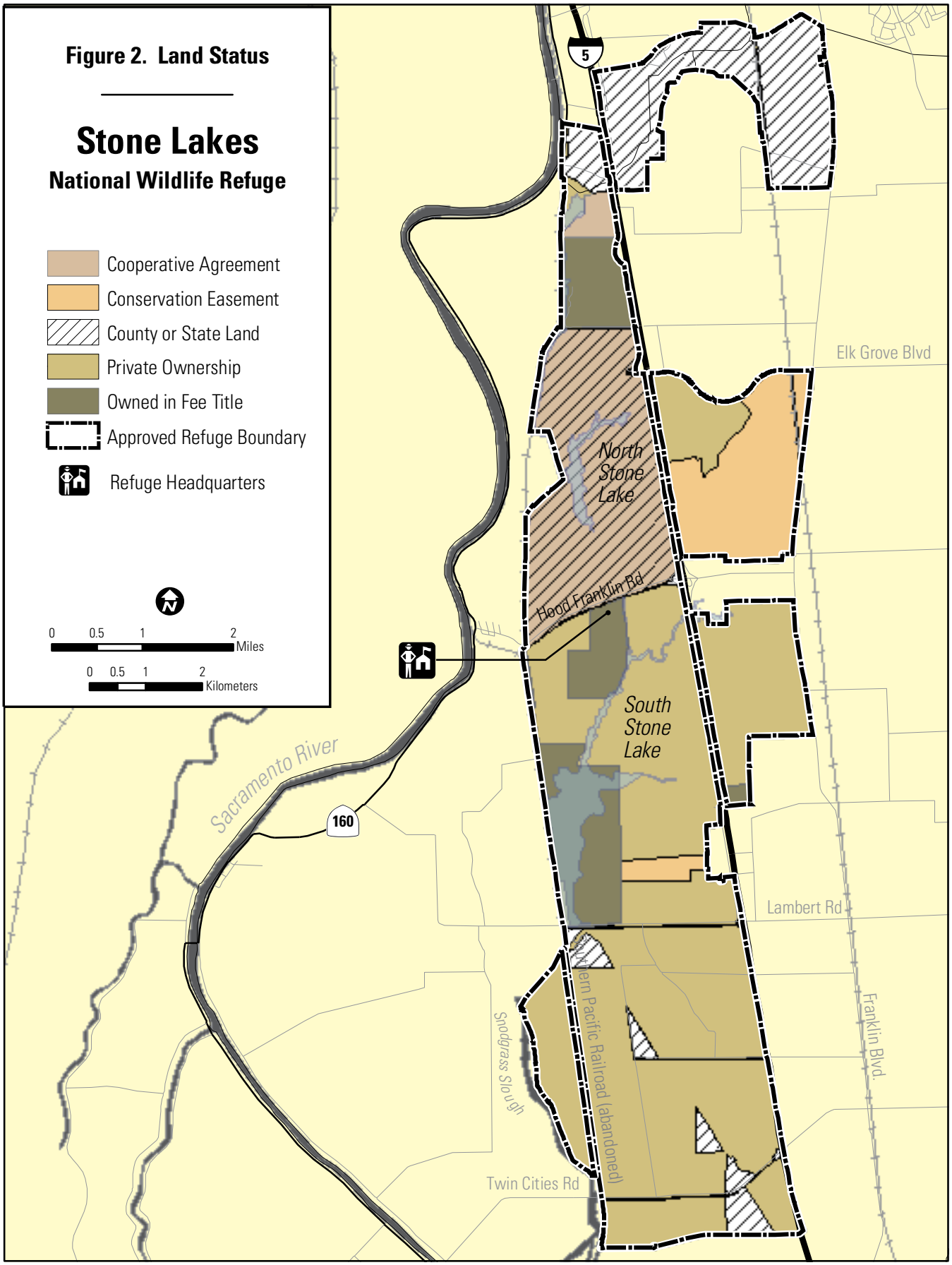
Figure 2. Land Status
Stone Lakes
National Wildlife Refuge
Cooperative Agreement
Conservation Easement
County or State Land
Private Ownership
Owned in Fee Title
Approved Refuge Boundary
Refuge Headquarters
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
5
Elk Grove Blvd
North Stone Lake
Hood Franklin Rd
South Stone Lake
Sacramento River
160
Lambert Rd
Snodgrass Slough
Western Pacific Railroad (abandoned)
Franklin Blvd.
Twin Cities Rd

Public Involvement

The planning team distributed three planning updates to a mailing list of about 210 individuals, groups and agencies in July 2002, September 2002 and December 2002. The team held four public workshops during August and September 2002, one each in; Elk Grove, Sacramento, Walnut Grove and Davis, California.

The planning staff has incorporated public input received in response to these updates and workshops into the CCP and EA; a summary of these comments is included in Chapter 2 of the CCP. The original comments are available for review in planning administrative files at the California/Nevada Refuge Planning Office in Sacramento, California.

U.S. Fish and Wildlife Service and the National Wildlife Refuge System

The mission of the Service is to conserve, protect, and enhance the nation's fish and wildlife and their habitats for the continuing benefit of the American people. The Service is the primary Federal agency responsible for migratory birds, endangered plants and animals, certain marine mammals and interjurisdictional fish. The responsibility to conserve our nation's fish and wildlife resources is shared with other Federal agencies, State and Tribal governments.

As part of this responsibility, the Service manages the National Wildlife Refuge System (Refuge System). The Refuge System is the only nationwide system of Federal lands managed and protected specifically for wildlife and their habitats. The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Refuge is managed as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, and other relevant legislation, Executive Orders, regulations, and policies. Chapter 1 of the CCP summarizes these major laws, regulations, and policies and describes the goals of the Refuge System.

Refuge Purposes

The Emergency Wetlands Resources Act of 1986, the Fish and Wildlife Act of 1956 and the Migratory Bird Conservation Act are the establishing authorities for the Refuge.

The primary Refuge purposes are:

"... for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. §§ 3901(b) (Emergency Wetlands Resources Act of 1986)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

Further refinements in the Refuge purposes can be found in the funding sources used to acquire land. Grants have been provided by: City of Sacramento, County of Sacramento, California Wildlife Conservation Board, California Environmental Enhancement Mitigation Fund, California Environmental License Plate Fund, Cigarette and Tobacco Product Surtax, Department of Transportation-TEA 21 Fund, CALFED Bay Delta Program, North American Wetlands Conservation Act, Land and Water Conservation Fund, Central Valley Project Improvement Act, National Fish and Wildlife Foundation, David and Lucille Packard Foundation, The Trust for Public Land and other private donations.

Refuge Goals

Goal 1. Conserve, enhance, restore, and manage Central Valley wetland, riparian, grassland and other native habitats to benefit their associated fish, wildlife, plants and special status species.

Goal 2. Conserve, enhance and restore high quality migrating, wintering and breeding habitat for migratory birds within the Sacramento San Joaquin Delta of the Central Valley.

Goal 3. Provide visitors with wildlife-dependent recreation, interpretation and education opportunities that foster an understanding of the Refuge's unique wildlife and plant communities in an urban setting.

Goal 4. In cooperation with tribal representatives, identify and protect cultural resources on the Refuge and educate the public regarding Native American people and the history of the region.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes three alternatives for managing the Refuge: Alternative A (No Action), Alternative B and Alternative C. These alternatives are described below. Figures 3 and 4 show a graphical representation of Refuge areas described in the alternatives. The Service's proposed action is Alternative B. Two of the three alternatives presented in this chapter are "action alternatives" that would involve a change in the current management of the Refuge. Under Alternative A, the No Action alternative, the Service would continue managing the Refuge as it currently does.

Current Management

The primary management focus of the Refuge is providing habitat for migrating, wintering and nesting migratory and resident birds with an emphasis on waterbirds, and a variety of special status species by restoring and maintaining wetland, riparian woodland, grassland habitats and valuable agricultural lands.

Restoration and management of seasonal and permanent wetland habitats has been a major emphasis since the inception of the Refuge due to loss or conversion of this habitat in the Central Valley. The Refuge promotes water management regimes on managed wetland impoundments involving specific water draw down dates, spring irrigations and fall flood-up periods to produce quality habitat, primarily for wintering waterbirds. Seasonal wetlands are irrigated in summer to stimulate the growth of high quality waterfowl foods. Wetland vegetation is also manipulated periodically to maintain desired habitat conditions for feeding, loafing and breeding waterfowl, waterbirds and other birds. These manipulations can include mowing, prescribed burning, discing and noxious weed control. The Refuge works cooperatively with local and State agencies and private landowners throughout open water aquatic habitat in the Stone Lakes Basin to control mosquitoes and water hyacinth (*Eichhornia crassipes*), a non-native invasive aquatic plant.

Riparian restoration has included planting riparian trees, such as Fremont cottonwood (*Populus fremontii*), willow species (*Salix* sp.), box elder maple (*Acer negundo* var. *californicum*), valley oak (*Quercus lobata*) and associated understory shrubs and grasses and irrigating restoration areas on the Beach, North Stone, and South Stone Lake, and Headquarters units for three to five years to establish the plants.

Large scale grassland management such as on the North Stone Lake Unit, includes promoting remnant native grasslands through use of cattle grazing, small scale prescribed burns, and invasive weed control. Increased use by sandhill cranes (*Grus canadensis*), long billed curlews (*Numenius americanus*), white fronted geese (*Anser albifrons*), burrowing owls (*Athene cunicularia*), and other raptors has been recorded on the unit since the grazing program was implemented in 1999.

The Refuge cooperative farming program on the Headquarters Unit benefits a variety of migratory birds, including waterfowl, shorebirds, and sandhill cranes, that depend on small grains, alfalfa, tomatoes and invertebrates for a significant portion of their diet. The farming program maintains approximately 80 acres in corn, wheat, or grass to provide wildlife habitat and reduce weeds until the Service can implement expanded restoration plans.

Service staff, cooperators, and volunteers periodically conduct biological surveys and monitoring within a variety of Refuge habitat, including surveys of: (1) colonial nesting waterbirds; (2) mistnetting of landbirds (in cooperation with the Sacramento-Yolo Mosquito and Vector Control District); (3) nesting success and survival of song sparrows; (4) wintering

(October-May) waterfowl populations; (5) invasive weed mapping; and (6) range monitoring through surveys of residual dry matter.

For a complete description of the current management practices, please see "Current Management" in Chapter 3 of the CCP. Table 1 summarizes the alternatives analyzed in this environmental assessment.

Features Common to All Alternatives

All of the alternatives contain some common features. These common features are presented in the following pages to reduce the length and redundancy of the individual alternative descriptions.

Mosquito Control

In 1993, the Service and Sacramento-Yolo Mosquito and Vector Control District (SYMVCD) signed a Memorandum of Understanding (MOU). According to the MOU, both parties agreed to cooperate to limit production and harboring of mosquitoes on Refuge habitats. The Service, in cooperation with SYMVCD, manages wetlands and other habitats on the Refuge to discourage mosquitoes by: adopting wetland design features, managing water regimes, planting mosquitofish (*Gambusia affinis*), and applying larvicides or adulticides, as needed. In addition, the Service and SYMVCD collaborate on other mutually beneficial projects, such as landbird monitoring and water hyacinth control. The Service will continue to participate in ongoing studies of Refuge landbirds, related to mosquito borne viruses, in cooperation with SYMVCD. When considering the burgeoning population immediately down wind of the Refuge and the recent establishment of West Nile Virus in the Central Valley, it is essential that the Refuge and SYMVCD continue to build on their successful partnership

Weed Control

Since 1995, the Refuge has adopted an active aquatic and terrestrial weed management program in the Beach-Stone Lakes Basin, particularly as a founding member of the Stone Lakes Water Hyacinth Control Group and the Sacramento Weed Management Area. The Refuge and the Sacramento Regional County Sanitation District conduct treatments for control of water hyacinth (*Eichhornia crassipes*) under a Statewide National Pollution Discharge Elimination System (NPDES) General Permit (No. CAG990005) for discharge of aquatic pesticides. The Refuge and SRCSD utilize Reward (Diquat) and Aquamaster (glyphosphate) to control water hyacinth in the basin. Another aquatic species, Brazilian elodea (*Egeria densa*), is also abundant in waterways and may emerge as a management concern as opportunities for recreational boating are developed on the Refuge.

The Integrated Pest Management methods that the Refuge uses to control weeds include burning, mowing, discing and herbicide application. The Refuge uses Transline® (clopyralid), Telar® (chlorsulfuron), Roundup (glyphosphate), and 2, 4-D, to control the upland weeds such as yellow starthistle (*Centaurea solstitialis*) and perennial pepperweed (*Lepidium latifolium*). To date, the Refuge has found chemical control to be the most effective method of managing water hyacinth and perennial pepperweed. Stone Lakes NWR is a member of the Sacramento County Weed Abatement Team.

Riparian Habitat Maintenance/Restoration on North Stone Lake Unit

Ongoing and planned improvements to the grazing program on the North Stone Lake Unit will continue under all alternatives and include developing alternative watering sources for the cattle in each pasture, bank stabilization along the SP Cut in the north irrigated pasture, invasive weed control, and continued monitoring of migratory bird responses.

Table 1. Summary of Alternatives

	Alternative A	Alternative B	Alternative C
	No Action/Current Management	**Wetland, Riparian and Grassland Restoration with Facilitated Public Use**	**Restore to Natural Conditions with Self-Directed Public Use**
HABITAT MANAGEMENT			
Riparian restoration and management	• 0 acres or riparian habitat restored	• Same as Alternative A but:	• Same as Alternative A but:
	• Maintain 360 acres of riparian and oak woodland habitat	• Maintain 425 acres of riparian and oak woodland habitat	• Maintain 385 acres of riparian and oak woodland habitat
	• 25 acres of riparian and oak woodland habitat actively restored	• 65 acres of riparian and oak woodland habitat actively restored	• 65 acres allowed to restore through natural process restoration
	N/A	• 40 acres of riparian understory restored	• 25 acres of riparian understory restored
	N/A	• Establish a native plant nursery at HQ office	• No native plant nursery
	N/A	• Intensify control efforts for perennial pepperweed in riparian areas using a variety of methods	• Same as Alternative B
	• Maintain existing fencing along SP Cut on the North Stone Lake Unit to exclude cattle from riparian areas	• Maintain and expand fencing along SP Cut on the North Stone Lake Unit to exclude cattle from riparian areas	• Same as Alternative A
Wetlands restoration and management	• 200 acres of wetland restored at Headquarters Unit	• Same as Alternative A	• Same as Alternative A
	• 452 acres of seasonal wetlands maintained	• 452 acres of seasonal wetlands manipulated to improve vegetation conditions	• 133 acres of seasonal wetlands manipulated to improve vegetation conditions
	• 136 acres of vernal pool seasonal wetlands manipulated to improve vegetation conditions	• Same as Alternative A	• Same as Alternative A
	• 715 acres of permanent wetlands managed to provide habitat for a variety of wetland dependent species	• Same as Alternative A	• Same as Alternative A
	N/A	• 50 acres wetlands enhanced on Beach Lake Unit	• Same as Alternative B
Grassland restoration and management	• 1,900 acres of non-irrigated grassland maintained and enhanced	• Same as Alternative A	• Same as Alternative A
	• 0 percent high residual dry matter	• 20 percent high residual dry matter	• Same as Alternative B

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
	• Implement a long term grazing management plan developed in collaboration with range management experts	• Same as Alternative A	• Same as Alternative A
	• 0 acres planted to restore the native grassland community	• 30 acres planted to restore the native grassland community	• Same as Alternative B
	N/A	• Enhance and create habitat for burrowing owls by reintroducing ground squirrels to the North Stone Lake Unit and constructing and maintaining artificial burrows	N/A
Wet meadow/pasture management	• 460 acres of irrigated pasture/wet meadow maintained	• Same as Alternative A.	• Same as Alternative A.
	N/A	• If feasible, sheet flood irrigated pastures to a depth of less than six inches every two weeks from November through March on the North Stone Lake Unit	• Same as Alternative B
	N/A	• Maintain grasslands by periodic disturbance (eg., mowing, grazing, burning, or discing)	• Same as Alternative B
Moist soil habitat management	• 529 acres of seasonal wetlands managed as moist soil habitat	• Same as Alternative A and:	• Same as Alternative A but:
	• Flood moist soil units early Sept – May	• Same as Alternative A.	• Begin floodup concurrent with first rainfall after Sept. 1
	• Stagger timing of drawdown starting in March	• Same as Alternative A.	• Drawdown beginning in mid-March to mimic natural rainfall conditions
	• Irrigate 1-2 times from May – Aug to promote desired vegetation	• Same as Alternative A	• No irrigation from May - Aug
	• Disc and/or mow 25-50% of units to stimulate plant growth and maintain equal ratio of open water to emergent vegetation	• Same as Alternative A	• Same as Alternative A
	N/A	• Drawdown one permanant wetland in August to provide shorebird habitat and flood again in September with other wetlands	• Begin flooding seasonal wetlands concurrent with the first rainfall

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
	N/A	• Explore reverse cycle wetlands management on an experimental basis to benefit shorebirds	• Same as Alternative B
Sandhill crane habitat management	• 2,500 acres of Refuge lands managed to support a population of 400 to 700 sandhill cranes	• 2,950 acres of Refuge lands managed to support a population of 400 to 700 sandhill cranes	• 2,700 acres of Refuge lands managed to support a population of 400 to 700 sandhill cranes
	N/A	• Periodically sheet-flood irrigated pastures on North Stone Lake Unit in winter	• Same as Alternative B
	N/A	• Maintain 40 to 60 acres of agriculture fields (eg., corn, winter wheat and other small grains) on the Headquarters Unit of the Refuge for foraging cranes	• Same as Alternative
Pest control	• Use integrated pest management techniques to control weeds	• Same as Alternative	• Same as Alternative A
	• Continue cooperative water hyacinth control efforts	• Survey for and control Brazilian elodea	• Same as Alternative B
	• Continue using prescribed fire, where appropriate	• Depending on restrictions, employ prescribed burns to reduce nonnative annual grasses and replicate the historical fire regime	• Same as Alternative B
	• Drawdown managed permanent wetlands every two to four years to control carp populations and improve germination of desirable wetland plants	• Same as Alternative A	• Same as Alternative A
	N/A	• Cooperate with other entities to conduct weed control	• Same as Alternative B
HYDROLOGY MANAGEMENT			
Water Quality	• Develop a long-term water quality monitoring plan	• Same as Alternative A and:	• Same as Alternative B
	N/A	• Within 10 years of CCP approval, work toward achieving the water quality supply standard set forth by the USEPA, CDFG and the RWQCB	• Same as Alternative B

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
	N/A	• Develop a water quality monitoring program to track contaminant concentrations, and water quality parameters resulting from current and future land use patterns around the Refuge within five years	• Same as Alternative B
	N/A	• Develop strategies to educate local landowners, businesses, and neighborhood organizations within the watershed about nonpoint sources of pollution	• Same as Alternative B
	N/A	• Expand outreach and education effort to inform upstream urban residents and businesses about the sensitivity of downstream water uses	• Same as Alternative B
Floodplain management	• Manage Refuge floodplain in a manner consistent with regional water quality objectives, as described in the EIS establishing the Refuge	• Same as Alternative A	• Same as Alternative A
	N/A	• Develop Refuge levee and flood control channel maintenance program	• Same as Alternative B
VISITOR USE			
Visitors	• 3,000 wildlife observation visits per year	• 10,500 wildlife observation visits per year	• 15,000 wildlife observation visits per year
Trails	• One trail	• 4.0 miles of foot trails open to the public 7 days a week with seasonal restrictions	• 6.0 miles of foot trails open to the public 7 days a week with seasonal restrictions
	N/A	• 2.0 miles of universally accessible trail to be constructed on the Headquarters Unit and named the Blue Heron Trails System	• 2.5 miles of universally accessible trail to be constructed on the Headquarters Unit and named the Blue Heron Trails System
	N/A	• 200 feet of boardwalk on Headquarters unit as part of the Blue Heron Trails System	• 140 feet of boardwalk on Headquarters unit as part of the Blue Heron Trails System
	N/A	• 40 vehicle parking capacity on Headquarters unit	• 40 vehicle parking capacity on Headquarters unit

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
	N/A	• 1.5 miles of foot trails to be constructed on the South Stone Lake unit open to the public seven days a week with seasonal restrictions	• Same as Alternative B
	N/A	• 200 feet of boardwalk to be constructed on the South Stone Lake Unit open to the public seven days a week with seasonal restrictions	• Same as Alternative B
	N/A	• Develop a boat-accessible haul-out site, walking trail, and viewing blind on the South Stone Lake Unit	• Same as Alternative B
	N/A	• Provide parking and boat launch capacity for approximately 10 cartop boats on the Beach Lake unit	• Same as Alternative B
	N/A	• Restrict land-based visitor use near habitat suitable for heron/egret rookeries, nesting Swainson's hawks, and other areas used by nesting migratory birds during sensitive periods	• Same as Alternative B
	N/A	• Minimize disturbance to sandhill crane habitats by restricting public access during October through March	• Same as Alternative B
	N/A	• Reduce potential spread of invasive species by visitors by restricting access to paved or graveled trails	• Same as Alternative B
	N/A	N/A	• Develop two mile trail system on Beach Lake and North Stone Lake tracts to be open to the public seven days a week, with seasonal closures, and improve associated parking
	N/A	N/A	• Resolve access issues and develop a parking area for five to ten cars and walking trails on Lodi Gun Club
Hunting	• The 912-acre South Stone Lake Unit open to waterfowl hunting for up to 22 hunters, 2-3 days per week	• Same as Alternative A	• Same as Alternative A

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
Fishing	• No legal fishing	• Within five years provide safe, boat-only fishing with day use parking facilities to accommodate approximately 20 boats on South Stone Lake and approximately ten boats on SP Cut from June through September	• Same as Alternative B
	N/A	• Fishing will be in accordance with all State regulations, will not include take of frogs or crayfish and will only be done with rod and reel	• Same as Alternative B
Wildlife Viewing and Photography	N/A	• Minimum of two photography blinds to be constructed	• Same as Alternative B
	N/A	• Construct a viewing platform on the Headquarters Unit	• Same as Alternative B
	N/A	• Construct a vehicular access point, parking area for 15 cars, a trail and a wildlife observation platform on southern North Stone Lake Unit	• Same as Alternative B
	N/A	• Provide parking for approximately 20 cars at the boat launch on the South Stone Lake Unit	• ame as Alternative B
Environmental Education and Interpretation	N/A	• Develop a self-guided trail as part of the Blue Heron Trails System with hands-on learning stations within two years	• Same as Alternative B
	N/A	• Develop a class/group staging area and 5 open air interpretive shelters with one kiosk and exhibits as part of the Blue Heron Trails System to accommodate approximately 40 children	• Same as Alternative B
	N/A	• Develop interpretive displays on the Headquarters Unit to illustrate traditional dwellings, various subsistence strategies, and the overall lifestyle of local American Indians	• Same as Alternative B

Table 1. (continued)

	Alternative A	Alternative B	Alternative C
	N/A	• Develop self-guided trail and interpretive displays for the Wetland Preserve Unit	N/A
	N/A	N/A	• Develop interpretive panels and exhibits on South Stone Lake Unit
Boating	• High speed boating occurs as a non-sanctioned use, but has been allowed to continue pending compatibility determination. High speed boats (waterskiers) launch from off the refuge and ski through the Refuge.	• No-wake speed limit	• Same as Alternative B
	N/A	• Develop and maintain a safe public parking lot and boat launch facilities to accommodate approximately 20 cartop boats on the South Stone Lake Unit	• Same as Alternative B
	N/A	• Provide a launch for pre-registered canoe/kayak groups in SP Cut on the Beach Lake Unit from June through September	• Same as Alternative B
	N/A	• Restrict water-based visitor use near habitat suitable for heron/egret rookeries and Swainson's hawks during sensitive periods	• Same as Alternative B
	N/A	• Develop facilities for mobility impaired persons to enter and exit canoes and kayaks	• Same as Alternative B
Cultural resources management	• Develop additional measures to protect, stabilize and/or remediate past damages if necessary	• Same as Alternative A and:	• Same as Alternative B
	• Meet annually with the Ione Band of Miwok Indians and other concerned tribal groups to discuss land management and restoration activities planned for the upcoming field season	• Within 15 years evaluate conditions of known cultural resource sites on Refuge managed lands and conduct seasonal monitoring of known sites	• Same as Alternative B
	N/A	• Develop a minimum of two interpretive panels and exhibits to be located on various units to share with the public the importance of cultural resources on the Refuge and American Indian cultural practices	• Same as Alternative B

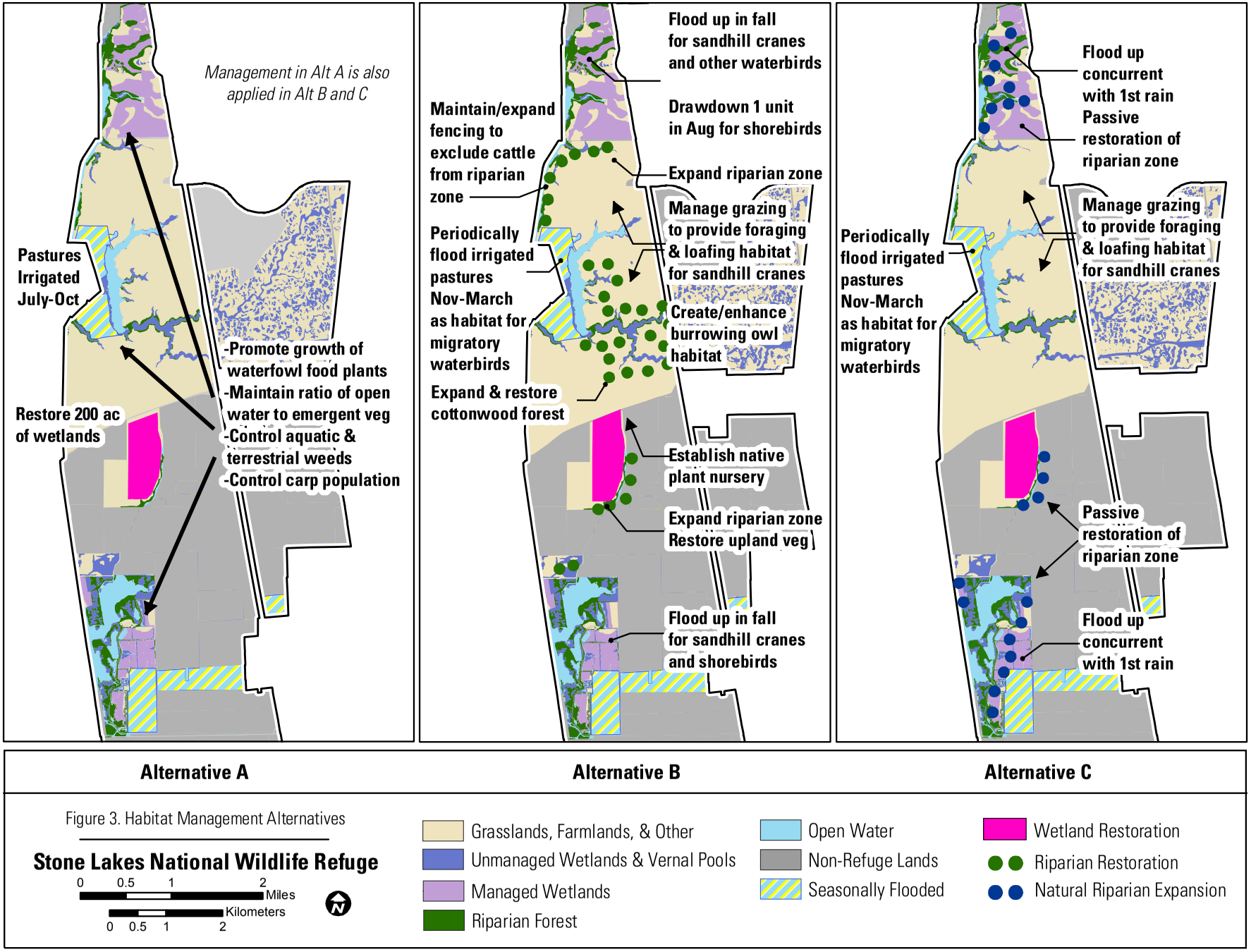

Figure 3. Habitat Management Alternatives

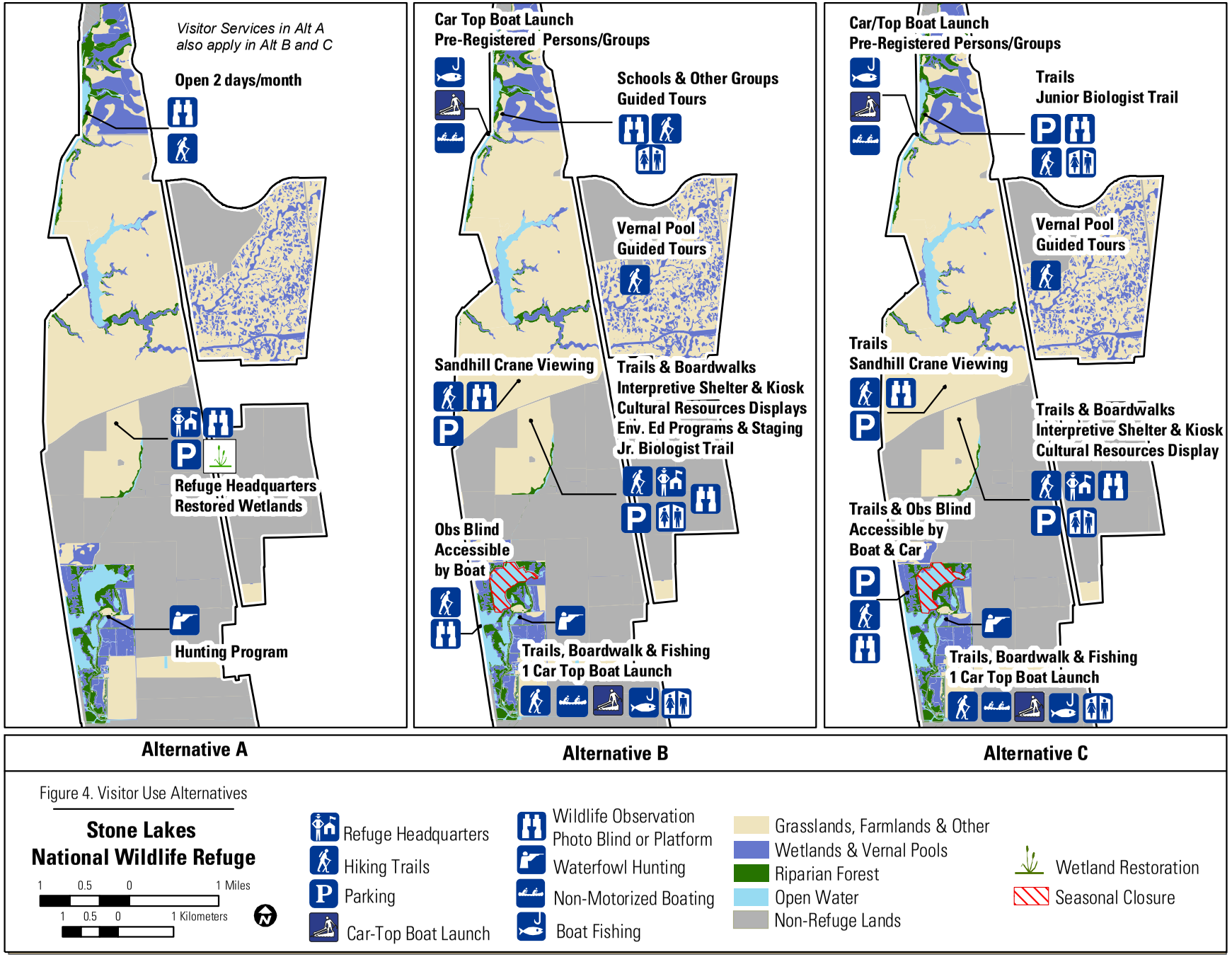

Figure 4. Visitor Use Alternatives

Vernal Pool Management
Vernal pools are present on the North Stone Lake and Wetland Preserve units. The Wetland Preserve Unit contains the highest concentration of vernal pools (98 percent of all Refuge vernal pools) that harbor the Federally-listed vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*) and many vernal pool plant and animal species of concern (USFWS 2005). Only 12 percent of the vernal pools located on the Refuge are naturally occurring. The majority have been created over the last 15 years as mitigation for vernal pool loses elsewhere.

Hunting
Through a separate planning process from the Refuge CCP, the Service has implemented a waterfowl hunting program on the Refuge that will remain in effect under all Alternatives. Currently, the program is offered two days per week on the South Stone Lake Unit and consists of seven spaced blinds, with an emphasis on youth and handicap hunters. Over the next five years, the program will expand to provide hunting opportunities for up to 22 hunters. Hunting occurs currently only on the Sun River property of the South Stone Lake Unit but as more resources become available for the Refuge, the program will expand to include more of South Stone Lake. The Service currently emphasizes youth hunting by reserving at least two blinds for youth hunters and by providing two youth hunts before and after the waterfowl season in accordance with State regulations. Currently, the entire program is operated by the Refuge but the California Department of Fish and Game may assume a more active role, in cooperation with the Service, as hunting expands.

Boating
A number of private landowners with property adjacent to the Refuge have allowed access to waterways in the Stone Lakes Basin for a variety of different boating activities (e.g., waterskiing, fishing, waterfowl hunting). The Service has allowed boating to continue on Refuge waters within the Beach Lake and North Stone Lake units pending finalization of compatibility determinations for visitor uses. Under all alternatives, the Service will continue to allow some boating on the Refuge.

Cultural Resources
To preserve and minimize disturbance to Refuge archaeological and historic resources, all undertakings, including but not limited to ground disturbance and prescribed burns, will be coordinated with the Service's Regional Archaeologist. In consultation with the State Historic Preservation Office and local tribal representatives, the Service will ensure that Refuge activities comply with all relevant cultural resource protection laws, including Section 10 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act. Any cultural resources overviews or site surveys for properties or monitoring of ground disturbing activities will be conducted by qualified professional archaeologists. The Refuge will continue to consult regularly with the Ione Band of Miwok Indians and other concerned tribal organizations on management and restoration projects, as well as plant-gathering activities and interpretive projects.

Alternatives Removed From Further Consideration

Auto Tour Route on North Stone Lake Unit and Associated Trails
The Service considered creating an automobile tour route and associated walking trails on the North Stone Lake Unit. Developing an auto tour route was rejected because since the entire unit lies within the 100-year floodplain, accommodating vehicle traffic would necessitate construction of new roads involving major grading and gravel placement on a unit where preservation of natural topography and hydrology and native grass communities are management priorities. Furthermore, greater sandhill cranes (*Grus canadensis tabida*) and white-fronted geese use the area for foraging during winter and are highly sensitive

to automobile and pedestrian traffic. An auto tour route would also further fragment the, already limited crane habitat on the Refuge. Walking trails and a viewing platform on the North Stone Lake Unit are still components of the alternatives considered in this CCP.

Equestrian Use
After receiving inquiries from selected members of the public, the Service evaluated accommodation of equestrian use on the Refuge. However, this is considered a non-wildlife-dependent use and there are no trails suitable for riding that would not conflict with other priority visitor uses. Moreover, there are no adequate parking facilities for horse trailers and the Service determined that the limited parking areas available should be primarily for priority visitor uses such as wildlife observation and fishing that do not require trailers. Horses traveling through the Refuge may be a source for the introduction and spread of exotic and invasive plants . Many trails are primarily on levees and use by horses, particularly after precipitation, could accelerate the erosion of these levees. Other nearby areas have more extensive horse trails and are better able to accommodate horse use. These areas include the American River Parkway and Auburn State Recreation Area.

Upland Game and Deer Hunting
Refuge Staff considered the inclusion of upland game and deer hunting in formulating the alternatives. However, since such a program would be limited to land that the Service owns in fee (1,740 acres in four isolated areas; only two of which support upland habitat), not enough acreage is in Refuge ownership to provide quality, safe upland game or deer hunting with a reasonable chance of hunter success. If additional lands are added to the Refuge, upland game and deer hunting could be reconsidered.

Fishing Derbies
Some of the public suggested the Service consider fishing derbies on the South Stone Lake Unit. Fishing derbies typically involve fast moving, gas powered boats that conflict with other non-motorized boats, such as canoes or kayaks, used for wildlife observation. Furthermore, South Stone Lake is a small body of water with underwater hazards and dense, submerged vegetation and is too small for a quality fish derby. Other nearby locations, such as reservoirs, are better suited for this activity.

Alternative A: No Action

Under this alternative, the Service would continue to manage Stone Lakes Refuge as it has in the recent past. Management would be consistent with the "Current Management" section in Chapter 3 of the CCP. Current staffing and funding needs would remain the same.

Habitat Restoration
Under this alternative, the 330-acre Headquarters Unit would be restored primarily to wetland habitat (200 acres), with 50 acres of native grassland habitat and 80 acres of farmed land.

Migratory Birds
Flood up, drawdown and summer irrigations will continue to be scheduled to provide habitat for migrating, wintering and breeding birds. These actions will occur on 840 acres of wetlands, 360 acres of riparian habitat, 3,320 acres of grassland habitat, 400 acres of open water/aquatic bed habitat, 460 acres of irrigated pasture and 305 acres of cropland. Seasonal wetlands will be managed to provide feeding and loafing habitat for wintering migratory waterbirds. Water would continue to be carefully managed to produce food and to create habitat for nesting waterbirds. The Service would continue to maintain water through most of the summer in permanent wetlands to provide rearing habitat for waterbirds and year-round habitat for other species, such as bitterns, herons and marsh wrens (*Cistothorus*

palustris). Drawdowns will continue to vary to stimulate production of a variety of plants and to provide habitat for nesting shorebirds. Wildlife friendly farming practices would be continued to supply grain and other forage for birds on about 320 acres.

Monitoring
The Service would continue its ongoing monitoring programs, including colonial waterbird nesting, landbird, song sparrow, weekly waterfowl, plant, noxious weed and residual dry matter (dry grass remaining after the growing season) surveys.

Special Status Species
Sandhill crane. Under this alternative, the Service would continue to manage the Refuge to benefit sandhill cranes by managing 460 acres of irrigated pasture, 540 acres of seasonally flooded wetlands, 305 acres of cropland, and 3,320 acres of grassland habitat.

Swainson's hawk. The Refuge would continue to provide breeding and foraging habitat for Swainson's hawks (*Buteo swainsoni*). However, there would be no increase in these habitats since no additional acres of riparian, grassland, or wetland habitat would be restored.

Valley elderberry longhorn beetle (VELB). Although there are no documented occurrences of the Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*, VELB) on the Refuge, suitable VELB habitat is present on the Refuge. All existing elderberry shrubs (*Sambucus* sp.), the host plant for the VELB, are mapped. Shrubs that may be affected by the water hyacinth control program are monitored during the water hyacinth control season to minimize disturbance during water hyacinth control operations.

Giant garter snake. The most recent documented occurrence of the giant garter snake (*Thamnophis gigas*) on the Refuge was in 1992 at Beach Lake. Recent surveys have not located any, although the snake is presumed to be present on the Refuge. Aside from avoidance, no specific measures have been taken to manage for the snake.

Wetland, Grassland, Riparian Habitats
Wetlands would continue to be managed for the benefit of migratory birds. Wetlands (moist soil units) would be flooded from September to May for the benefit of migratory waterbirds. Grassland habitat would continue to be mowed and grazed. Grazing would occur on about 1,900 acres of the Refuge on the North Stone Lake Unit. No attempts to restore native grassland would be pursued. The Service would continue to allow researchers to conduct research on the Refuge but would not actively encourage or support research.

The Service would continue to manage the existing riparian habitat and would continue, sporadically, to plant riparian vegetation up to one mile from the edge of the SP Cut and adjacent to lakes on the Refuge where soils are appropriate and as time and funding allow. Little or no active riparian restoration would occur.

New Lands
Additional lands within the approved Refuge boundary that come under Refuge management would be evaluated and either maintained in agriculture beneficial to wildlife or developed into natural habitats, such as wetlands, grasslands and riparian areas, depending on site-specific conditions.

Visitor Services
Under alternative A, the Refuge visitor services program would continue as described under "Visitor Services" in Chapter 3 of the CCP. The Refuge would continue its current

wildlife observation and photography program, limited to two Refuge tour days per month. Environmental education would not change on the Refuge. Twenty-five groups would continue to visit the Refuge at their current level, with a limited number of presentations by Refuge staff at schools, public service and conservation group meetings. The Refuge would continue to host Walk on the Wildside, an annual special event held on the Refuge. The Refuge would continue to offer a waterfowl hunting program on the South Stone Lake Unit. Sixteen hunters would be accommodated two days a week. Under this alternative, an emphasis would be placed on youth and disabled hunters. In addition to blinds reserved for youth and disabled hunters, the Refuge would hold two youth hunts before the hunting season and two after the season.

Alternative B

Alternative B is the preferred alternative because it meets the criteria described in the Proposed Action Criteria section at the end of this chapter. Under Alternative B, the Refuge would continue its current focus of providing wintering habitat for migratory birds and management for the benefit of special status species. Management programs for migratory birds and other Central Valley wildlife would be expanded and improved, as described below. Visitor use opportunities would also be expanded as described below.

Habitat Restoration

Alternative B would include the same elements as Alternative A. The Service would also restore Refuge lands based on the habitat requirements of migratory birds and special status species, which includes 65 acres of riparian habitat, 40 acres of wetland habitat and 30 acres of native grassland habitat.

Migratory Birds

Alternative B would include the same elements as Alternative A. Additional riparian and seasonal and permanent wetlands would be restored. Measures would be implemented to increase the food supply and provide additional migratory bird habitat, such as sheet flooding irrigated pastures, habitat manipulations, grazing to promote native grasses and forbs and exploring reverse-cycle wetland regimes. Reverse-cycle wetlands are flooded during the spring/summer and are dry during the fall/winter. Additional coordination is planned with other agencies and nongovernmental organizations under Alternative B. Visitor use would be restricted during heron and Swainson's hawk nesting and sandhill crane roosting. A portion of South Stone Lake would also be closed to boating seasonally to protect nesting waterbirds and giant garter snake habitat.

Monitoring

Under this alternative, monitoring would be the same as for alternative A. In addition, the Service would monitor wetland, riparian and oak woodland habitats each spring for invasive species, such as cocklebur, yellow starthistle and perennial pepperweed. The Service would develop a Refuge water-quality monitoring program, expand migratory bird monitoring and develop surveys on the South Stone Lake, Headquarters, Wetlands Preserve units and other lands as they come under Refuge management.

The Service would continue to collaborate with Sacramento-Yolo Mosquito Vector Control District (SYMVCD) on the ongoing landbird monitoring program and pursue funding for a seasonal employee or graduate students to assist with the banding program and data analysis to assess population trends and assist with developing associated habitat restoration and management plans. This expansion is not included in Alternative C.

Special Status Species
Sandhill crane. Under this alternative, the Service would continue to manage for cranes as in Alternative A. In addition, there would be an increase of 80 acres of foraging and resting habitat with 50 acres of wetland and 30 acres of native grasslands habitat restored. In addition, when possible, Refuge staff would begin flooding moist soil units in early September to provide shallow water for cranes earlier in the season.

Swainson's hawk. Under this alternative, there would be an increase in 65 acres of breeding habitat since 65 additional acres of riparian habitat would be restored. In addition, 30 acres of native grassland would be restored, adding to existing foraging habitat.

Valley elderberry longhorn beetle (VELB). The Refuge would continue to map and monitor elderberry shrubs as in Alternative A. In addition, the Service would restore 40 acres of riparian understory, to include elderberry shrubs, which would benefit the VELB.

Giant garter snake. Same as Alternative A.

Wetland, Grassland, and Riparian Habitats
Wetland habitat would be expanded on 50 acres of the South Stone Lake Unit. The Service would use the same tools and techniques to manage wetland units under Alternative B as it does under Alternative A. However, some fields would be flooded in early September to provide habitat for cranes earlier in the year. Under Alternative B, seasonal marsh management activities would be the same as described under Alternative A. In addition, one permanent wetland unit would be drawn down in August to provide habitat for migrating shorebirds. Vernal pools on the Wetland Preserve Unit would be grazed.

Portions of the Beach Lake, North Stone Lake, and South Stone Lake units would be closed as a sanctuary. The Lewis property of the Beach lake Unit and the Wetland Preserve and portions of the Headquarters units would be subject to seasonal closure to provide wildlife sanctuaries.

Grassland habitat would be restored on 30 acres. For this alternative only, burrowing owl habitat would be improved by reintroducing ground squirrels (*Spermophilus beecheyi*) and constructing artificial burrows. Irrigated pasture would be grazed from July through October to promote native grasses and forbs and shortgrass conditions.

Riparian habitat would be expanded along lower Morrison Creek on the Beach Lake Unit, the south arm of North Stone Lake and the Sacramento drainage canal and South Stone Lake on the Headquarters and South Stone Lake units. In addition, riparian habitat would be managed for a variety of different successional stages for the benefit of neotropical migrants, colonial nesting birds and raptors.

New Lands.
Same as alternative A.

Visitor Services
Visitor Services would be improved and expanded under alternative B. For example, the number of units open to visitors would increase from one to five. In addition, environmental education, interpretation, wildlife observation, wildlife photography, hunting and fishing programs would be expanded, as described below. Visitor Services would be offered on the South Stone Lake, Headquarters, Beach Lake, Wetland Preserve and North Stone Lake units. The South Stone Lake, Headquarters, and a portion of North Stone Lake units would be open to visitors seven days a week from sunrise until sundown.

Visitor services would be concentrated south of Hood-Franklin Road at the Headquarters and South Stone Lake Units. A trail system with boardwalks, interpretive displays, parking for 40 cars and an environmental education center would be constructed on the Headquarters Unit. A trail system and observation platform overlooking South Stone Lake would be constructed. The environmental education and interpretive programs would be facilitated by Refuge staff or volunteers.

A boat launching area would be provided on the Sun River property of the South Stone Lake Unit for fishing, wildlife observation and photography from boats. Only non-motorized, hand-launched boats (e.g., canoes, kayaks) or non-trailered boats with electric motors would be allowed. A no-wake zone with boat speeds of less than five mph will be enforced for all Refuge waters. All fishing would be from boats only. A boat haul-out site would be constructed on the Lodi Unit upstream from Sun River. Non-motorized boating by pre-registered groups, including commercial outfitters who engage in fishing, and wildlife observation, would also be allowed on SP Cut on the Beach Lake and North Stone Lake units at the west end of Elliott Ranch Road.

Safe access to the North Stone Lake Unit would be constructed to a parking area for 25 cars on the north side of Hood-Franklin Road. A short trail would lead to an observation platform overlooking North Stone Lake to provide visitors an opportunity to view sandhill cranes and other wildlife. Schools and other groups would use the Beach Lake Unit for guided tours only.

The Wetland Preserve Unit would be open to the visitors for guided tours and via a self-guided trail.

The volunteer and outreach programs would expand and become more defined.

The hunt program would be the same as alternative A.

Other major new visitor services projects under this alternative include: developing new interpretive signs, displays and interpretive brochures for the Wetland Preserve and Headquarters units; and constructing and making accessible on a daily basis, a kiosk, boardwalk, and four miles of walking trails on the Headquarters Unit; and constructing two photo blinds and additional hunting blinds on the South Stone Lake Unit.

Alternative C

Under this alternative, the Service would continue to focus on providing wintering habitat for migratory birds and managing for endangered species while placing a greater emphasis on historic conditions in management and habitat restoration activities as described below. Opportunities for the six priority public uses would be expanded from both alternatives A and B.

Habitat Restoration

Management of newly acquired Refuge lands would focus on the restoration of historic native plant communities rather than maintaining lands in agriculture or constructing wetlands. Under this alternative, 40 acres of riparian, 25 acres of understory shrub, 50 acres of wetland and 30 acres of native grassland habitat would be restored.

Migratory Birds

Alternative C would be similar to alternative B, however, more emphasis would be placed on restoration of natural conditions. Riparian restoration would be accomplished by natural process restoration. Flood up would not occur in early September as in alternatives A and B, but would begin with the first rainfall.

Monitoring
Same as Alternative B, except that there would be no expansion of the SYMVCD monitoring.

Special Status Species
Sandhill crane. Same as alternative B.

Swainson's hawk. Same as alternative B, except that restored breeding habitat would be increased by 40, rather than 65, acres. Restored foraging habitat would remain the same as in Alternative B.

Valley elderberry longhorn beetle (VELB). Same as alternative B, except with fewer acres of riparian understory shrubs planted. In alternative B, 40 acres of shrubs would be restored; under alternative C shrub habitat would increase naturally by approximately 25 acres.

Giant garter snake. Same as Alternative A.

Wetland, Grassland, Riparian Habitats
Grassland and wetland habitat will be restored as in alternative B. Although seasonal wetlands would still be managed to provide feeding and loafing habitat for waterbirds, they would not be managed as intensely as the moist soil units in alternatives A and B. would In addition, flood-up for seasonal wetlands would begin with the first rainfall in fall rather than beginning in early September.

Riparian habitat restoration would be through natural process-based restoration only. Vegetation would not be planted, but would be allowed to expand naturally. In addition, the Service would allow riparian habitat to expand naturally into managed seasonal and permanent wetland units.

New Lands
Under this alternative, new lands brought under the protection of the Refuge System would be restored to historic conditions, where feasible. Restoring new lands to natural historic conditions would probably result in restoration of grassland habitat and to a lesser extent, wetland and riparian habitats. By contrast, alternatives A and B would likely result in more wetland habitat than grassland habitat.

Visitor Services
Under this alternative, visitor service facilities would be expanded as in alternative B. In addition, the Beach Lake Unit would be open to visitors seven days a week from sunrise to sunset, subject to seasonal closure.

Visitor Services provided at the Headquarters Unit would be similar. However, the environmental education and interpretive programs would de-emphasize programs facilitated by Refuge staff or volunteers and tours would be self-guided.

Visitor services for the South Stone Lake Unit would be similar to those offered in Alternative B. In addition to the facilities for South Stone Lake described in Alternative B, the Service would create vehicle access to a parking area for up to ten cars. The parking area would be connected to the trail system.

Visitor services for the north side of Hood-Franklin Road would be the same as Alternative B.

In addition to the guided tours and canoe and kayak groups described in Alternative B, visitor services concentrated in the Beach Lake Unit would include environmental education, interpretation, wildlife observation and photography. The parking area near the corral on the North Stone Lake Unit would be improved and include restrooms, trails, interpretive displays, and an environmental education kiosk.

Visitor services for the Wetland Preserve Unit would be the same as alternative B.

The hunt program would be the same as alternative A.

The volunteer and outreach programs would be the same as alternative B.

Proposed Action Criteria

The planning policy that implements the Improvement Act of 1997 requires the Service to select a preferred alternative that becomes its proposed action, as required by the NEPA. The written description of this proposed action is effectively the draft CCP. Alternative B is the proposed action for the Refuge because it best meets the following criteria:

- achieves the mission of the National Wildlife Refuge System;
- achieves the purposes of the Refuge;
- provides guidance for achieving the Refuge's 15 year vision and goals;
- maintains and restores the ecological integrity of the habitats and populations on the Refuge;
- addresses the important issues identified during the scoping process;
- addresses the legal mandates of the Service and the Refuge; and
- is consistent with the scientific principles of sound fish and wildlife management and endangered species recovery.

The proposed action described in this EA is preliminary. The action ultimately selected and described in the final CCP will be determined, in part, by the comments received on this version of the EA. The proposed action presented in the final CCP may or may not be the preferred alternative presented in this version. The final CCP may propose a modification of one of the alternatives presented here or a combination of elements from more then one alternative. Alternative B is the preferred alternative.

Chapter 3. Affected Environment

Chapter 3 of the CCP provides a detailed description of the affected environment for Stone Lakes National Wildlife Refuge.

Chapter 4. Environmental Consequences

Overview of the NEPA Analysis Parameters

This chapter describes the direct, indirect and cumulative impacts of the three alternatives. The purpose of this analysis is to provide the context and intensity of the impacts of each action, such that a determination of significance can be made by the deciding official.

In 1978, the Council on Environmental Quality promulgated regulations for implementing the NEPA. These regulations include a definition of significantly as used in the NEPA (40 CFR 1508.27). The elements of this definition are critical to reducing paperwork through use of a Finding of No Significant Impact (FONSI) when an action will not have a significant effect on the human environment and is therefore exempt from requirements to prepare an environmental impact statement (EIS). Human environment is a comprehensive phrase that includes the physical and natural environments and the relationship of people with those environments. Many of the analyses focus on the different resource areas such as soils, air quality, water quality, plant communities, wildlife, visitor services and others. It is important to note that for each of these criteria all of these resources, or human environments, have been considered.

The significance of an action must be analyzed in several contexts, such as the whole of society; affected region; affected interests and locality. Significance varies with the setting. In the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

The regional context of the action alternatives is the Beach–Stone Lakes Basin. Even in a local context, the action alternatives would not pose significant short- or long-term effects. The action alternatives are designed to minimize and avoid adverse impacts to the extent that such impacts are less than significant, even a the local level.

Alternative A, the No Action Alternative, is a continuation of current management practices; it serves as the baseline against which Alternatives B and C are compared. Discussion of the action alternatives, Alternatives B and C, follow each discussion of No Action.

Soils

Common to all Alternatives. Under all alternatives the Refuge would continue to use, Service-approved aquatic herbicides, such as Aquamaster and Remedy and terrestrial herbicides such as Roundup and 2, 4-D, for weed control. Glyphosate, the active ingredient in Aquamaster and Roundup, is considered nonmobile in soils and sediments because it rapidly and strongly adheres to soil particles and degrades in the soil. Glyphosate is moderately persistent in the soil, with an estimated half-life of 47 days. Glyphosate has no known effect on soil microorganisms. The World Health Organization (1984) concluded that 2, 4-D does not accumulate or persist in the environment. The primary degradation mechanism is microbial metabolism, but mineralization and possibly photolysis may also play a role. The average half-life of 2, 4-D is ten days (Tu, M. et al 2001).

Alternative A. Under Alternative A, the Service would complete construction of wetlands and grasslands on the Headquarters Unit and would redesign the Headquarters entrance; as described in a previous draft environmental assessment (EA), issued March 4, 2005. Construction activities could result in large areas of bare soil that could be subject to erosion. Erosion is expected to be minor and localized because construction will occur only during the dry season, the terrain is flat and the Refuge will employ dust control measures.

Alternative B. In addition to the potential soil impacts related to construction on the Headquarters Unit, Alternative B could also result in similar impacts due to restoration activities, including restoration or enhancement of 105 acres of riparian and oak woodland habitat, 30 acres of grasslands and 50 acres of wetlands. Developing visitor facilities on the South Stone Lake, Headquarters, North Stone Lake, Beach Lake and Wetland Preserve Units could result in impacts, as well. These impacts are expected to be minor and localized for the same reasons described above. Additional short-term disturbance would result from mechanical removal of nonnative weeds from the seasonal marsh, riparian and upland habitats.

Alternative C. In addition to the soil impacts described under Alternative B, Alternative C also includes other Refuge improvements that could result in the same type of impacts. These improvements include natural process-based restoration of 65 acres of riparian habitat in addition to the same construction, weed removal and wetland and grassland restoration as in Alternative B.

Water Quantity and Quality

Common to all Alternatives. Under all alternatives, the conversion of 200 acres of former agricultural lands on the Headquarters Unit to wetlands would add to the region's floodwater storage capacity and help maintain water quality by trapping sediments and removing some excess nutrients.

Alternative A. No impacts on water quality or quantity are anticipated under Alternative A. Under all alternatives, glyphosate will be used in the form of Roundup and Aquamaster to control aquatic and terrestrial weeds. In most cases, glyphosate will dissipate rapidly from natural water bodies through adsorption to organic substances and inorganic clays, degradation and dilution (Folmar et al. 1979, Feng et al. 1990).

Alternatives B and C. Under Alternatives B and C, periodic flooding of irrigated pastures would begin earlier each fall, adding to groundwater recharge. The restoration and natural expansion of riparian vegetation would help to stabilize shorelines; this would reduce erosion and the resulting sediment loads in Refuge waters, improving water quality. The prohibition of gas-powered boats within the Refuge under Alternatives B and C would contribute to better water quality by removing a source of turbidity, potential petroleum leaks and inadvertently transported aquatic nuisance species. As new lands come under Refuge management and are either converted from agricultural uses or removed from urban development pressures, further benefits to water quality would accrue through reductions in erosion, sedimentation and nonpoint source pollution.

Air Quality

Alternative A. Under all alternatives, soil disturbance and/or use of heavy equipment would cause short-term increases in dust (particulate matter less than 10 microns [PM10]) and tailpipe emissions of PM10, nitrogen oxide (NO_X) and reactive organic gasses (ROG), including those activities associated with the restoration of wetland habitat on the Headquarters Unit. However, implementation of Alternative A (No Action Alternative) would not substantially increase pollutant emissions related to Refuge management in the long term. Since no increase in the level of visitor services is proposed, visitor use levels and vehicle trips to and from the Refuge are expected to increase only moderately as the population of the surrounding region grows.

Alternatives B and C. In addition to the short-term impacts to air quality from wetland restoration on the Headquarters Unit, under Alternatives B and C, there would be both short and long-term increases in pollutant emissions. Short-term increases in PM10 and

tailpipe PM10, NO_X and ROG would result from restoring riparian habitat on the North Stone Lake, Headquarters, and South Stone Lake units and constructing trails, parking areas and observation platforms. Tailpipe emissions (ROG, NOX, and PM10) would result from the use of combustion engines in construction equipment and employee vehicles during trips to and from the job sites. Dust emissions and generation (PM10) would result from the excavation, transport and grading of large amounts of soil.

Long-term increases in emissions would result from the growing number of vehicular trips to, from and on the Refuge as visitation increases. This increase is expected to be similar under both action alternatives, at about 10,500 to 15,000 more visitors per year by 2012. However, there would be a slight decrease in emissions from gasoline powered boats since only non-motorized and electric motor boats would be allowed.

Plant Communities

Common to all Alternatives. Discing, mowing, chemical treatments, and occasionally grazing would be periodically used to maintain cover of emergent vegetation in seasonal wetland impoundments at 45-55 percent of total wetland surface area. The Service would continue to use physical and chemical means to control undesirable plants such as cocklebur and joint grass. These same techniques would be used to manage vegetation in about 25 percent of the moist soil impoundments each year to reduce the cover of emergent vegetation and encourage the growth of annuals that provide food for waterfowl, maintaining an equal ratio of open water to emergent vegetation. The Service would continue to mow and graze grassland habitat to reduce the cover of non-native annual grasses and promote native species.

All applications of aquatic herbicides (e.g., glyphosphate, diquate dibromide) will be from properly calibrated and maintained ground or boat-mounted spray apparatus. In keeping with product labels, no applications will occur when wind speeds exceed 10 miles per hour. All applications will occur in compliance with best management practices identified in the Aquatic Pesticide Application Plan for the Statewide National Pollution Discharge Elimination System (NPDES) General Permit (No. CAG990005) for discharge of aquatic pesticides administered by the Central Valley Regional Water Quality Control Board.

Alternative A. Under Alternative A (no action), current vegetation management would continue unchanged. Wetlands would be flooded from early September through May for the benefit of migratory waterbirds and would continue to be mowed, grazed, disced and sprayed with pesticides. In addition, under all alternatives, the Service would maintain 360 acres of riparian and oak woodland habitat, 529 acres of moist soil seasonal wetlands, 136 acres of vernal pool seasonal wetlands, 715 acres of permanent wetlands, 460 acres of irrigated pasture/wet meadow and restore 25 acres of riparian habitat on the Headquarters Unit.

Alternative B. Alternative B would include the same vegetation management measures as described under Alternative A. In addition, the Service would increase the cover of native seasonal marsh plants on the Refuge by controlling nonnative weeds. In addition, the Service would restore 65 acres of riparian and oak woodland habitat, along the North Stone Lake, Headquarters and South Stone Lake units, as well as enhancing 40 acres of understory shrub and herbaceous vegetation in existing riparian areas. Planting riparian vegetation and restoring seasonal wetland and grassland habitat would have a beneficial effect on local and regional biodiversity because the vast majority of the historic riparian vegetation in the Central Valley has been lost or degraded. Under both Alternatives B and C, 30 acres would be planted to restore native grasslands throughout the Refuge. This would have a beneficial effect on the Refuge's vegetation because it would restore a larger diversity of the Refuge's native plant cover.

Enhancement and restoration of native grasslands, wetlands, and riparian habitats on the Refuge would not exacerbate threats of weed infestations to adjacent properties because Refuge staff and cooperators would continue to promote desirable vegetation and control invasive weeds as part of ongoing management programs. Some weed species of concern that will require ongoing control include: perennial pepperweed or whitetop, yellow star thistle, Johnson grass, and fennel or anise. Control of invasive weeds would be part of an integrated pest management program that would include physical (e.g., mowing, discing, grazing, and burning) and chemical (herbicide) treatments.

Alternative C. Impacts under Alternative C would be similar to those described under Alternative B, with a few differences. Riparian habitat expansion would be allowed to proceed through natural succession and volunteering by riparian woody species. There would be no active planting of riparian vegetation. However, riparian vegetation would be allowed to expand into wetland habitat on the Beach Lake and South Stone Lake units. Under Alternative C, the Service would restore 65 acres of riparian vegetation as under Alternative B. This would have a beneficial effect on the Refuge's vegetation because it would restore a larger diversity of the Refuge's native plant cover.

Wildlife

Common to all Alternatives. Under all alternatives, the Service would continue to allow the Sacramento Yolo Mosquito Vector Control District (SYMVCD) to monitor and control mosquitoes on the Refuge. The typical monitoring and control period is March through October. The mosquito species identified by SYMVCD for monitoring and control at the Refuge are *Culex tarsalis, Anopheles freeborni, Aedes vexans, Aedes melanimon, Aedes nigromaculis,* and *Aedes increpitus*. The SYMVCD would use the biological larvicides *Bacillus thuringiensis isrealensis* (Bti) and *Bacillus sphaericus* (Bsp) and the insect growth inhibitor methoprene. The bacterium Bti is a microbial insecticide that, when ingested, is toxic to mosquitoes, black flies and several other members of the Nematocera suborder within the order Diptera. Methoprene is an insect growth regulator that interferes with the normal maturation process of mosquitoes. In the event, adulticide applications become necessay, SYMVCD will utilize synthetic pyrethrins or the organophosphate Naled, applied from an ultra-low volume ground rig.

See Appendix L, Integrated Pest Management Plan for Mosquito-Associated Threats and Appendix A, Compatibility Determination, Use: Monitor and Control Mosquitoes, for detailed descriptions of mosquito control on the Refuge and the potential impacts to target and non-target organisms.

Under all alternatives, control of invasive weeds, particularly aquatic weeds such as water hyacinth, currently require the application of herbicides (i.e., Diquat dibromide and Glyphosate). Glyphosate has low acute toxicity, is not a carcinogen, does not adversely affect reproduction and development, and does not bioaccumulate (build up) in mammals (Monsanto 2001). When applied properly, Glyphosate is of relatively low toxicity to birds, mammals and fish (Evans and Batty 1986). However, amphibians may potentially be negatively affected by Glyphosate that enters aquatic systems (Smith 2001).

All alternatives identify herbicide use to control invasive terrestrial or aquatic weeds. Glyphosate and Diquat dibromide herbicides could have short-term negative effects on aquatic wildlife and waterbirds, but removal of invasive weeds favors native plants and ultimately improves the quality of wildlife habitat. Refuge staff will continue to comply with National Pollution Discharge Elimination System general permit protocols and best management practices for aquatic herbicide applications and water quality monitoring that were developed by the Central Valley Regional Water Quality Control Board to avoid

adverse effects on water quality and aquatic wildlife. Glyphosate, found in both Roundup® and Rodeo®, does not bioaccumulate in fish. The Rodeo® formulation is practically non-toxic to freshwater fish and aquatic invertebrates, while the Roundup® formulation is moderately to slightly toxic to freshwater fish and aquatic invertebrate animals. However, in laboratory studies, Roundup® has been shown to cause high rates of mortality to juvenile North American tadpoles (Relyea 2005). Clopyralid is of low toxicity to fish, aquatic invertebrate animals, birds, and mammals, is not toxic to bees and has very low acute mammalian toxicity. It does not bioaccumulate in fish. Triclopyr is low in toxicity to fish, does not bioaccumulate in fish, and is slightly toxic or nontoxic to invertebrates; however, it has not been tested for chronic effects in aquatic animals. Triclopyr is slightly toxic to mammals, however, in mammals, most triclopyr is excreted unchanged in urine. Triclopyr and its formulations have very low toxicity to birds and is nontoxic to bees. Sethoxydim is practically nontoxic to birds, has low toxicity to wildlife, and is nontoxic to bees. It is moderately to slightly toxic to aquatic species. Only herbicides that are approved for use near water, such as Rodeo®, Reward ®, or Garlon 3a®, would be used on Refuge lands that are within 100 feet of surface waters. In addition, to prevent further water contamination and effects to aquatic species, the Refuge would not spray when wind velocities exceed five miles per hour, when vegetation is wet, or when precipitation is occurring or forecasted in the following 24 to 36 hours. Herbicide applications are not expected to significantly affect wildlife.

Some negative effects to reproductive success of late-nesting ground nesting birds, such as mallards (*Anas platyrhynchos*), and meadowlarks may occur during prescribed fires and mowing operations

Alternative A. Under Alternative A, current management of the Refuge would continue unchanged. The Refuge would continue to manage water for migratory waterfowl, shorebirds, water birds and other migratory birds. Grasslands and agricultural lands would continue to be managed to provide foraging and loafing habitat. Under this alternative, no new riparian or wetland habitat would be restored or created beyond the restoration of 25 acres of riparian habitat on the headquarters unit, but existing habitat would be maintained and fostered. Maintaining and fostering habitat would benefit the variety of wildlife that uses the Refuge, including birds of prey, songbirds, waterfowl and colonial nesting birds, such as egrets and herons as well as many species of mammals and reptiles..

Because visitor use is currently limited to bimonthly tour days and hunting for 16 hunters two days per week during waterfowl season, human disturbance to wildlife would be minimal under Alternative A. By contrast, Alternatives B and C both would increase visitor use and implement a recreational fishing program. Potential impacts of visitor use include: flushing of birds, disruption of feeding and roosting activity, reducing use of preferred habitat, and increasing bioenergetic demands (DeLong 2002).

Alternative B. Alternative B would result in mostly beneficial and some adverse impacts on wildlife. Recreational use of the Refuge is expected to increase dramatically under Alternative B. Most of these new users are expected to participate in wildlife observation. This growth in recreational use could adversely affect birds using the Refuge wetlands, resulting in flushing, disruption of feeding and roosting, increased demands on the birds' available energy and reduced use of preferred habitat (DeLong 2002).

Under Alternative B, visitor use facilities such as parking areas, kiosks, trails and new buildings would be developed. This could result in the temporary disturbance and/or displacement of wildlife due to construction activities. The riparian portion of the unit would not be directly affected by construction but wildlife would, nonetheless, experience

disruption because of the nearby construction activity. Once construction is completed, substantial numbers of waterfowl, shorebirds and other waterbirds would be expected to utilize the restored and enhanced wetlands of the Headquarters Unit.

Sixty-five acres of riparian vegetation would be restored throughout the Refuge, an additional 40 acres of riparian understory vegetation would be enhanced, 50 acres of wetlands near South Stone Lake would be enhanced and planting native grasses over 30 acres in various portions of the Refuge would begin. Once established, this new habitat would provide a long-term benefit to a variety of wildlife, including migratory songbirds and birds of prey. In addition, existing grassland habitat would be maintained through grazing, mowing and/or burning for the benefit of grassland dependent species. Riparian habitat would be further protected by further exclusion of cattle from riparian areas. Shorebirds would benefit from exploring reverse-cycle wetlands and by drawing down one permanent wetland until August to provide food. The Refuge would also enhance and create habitat for burrowing owls by reintroducing ground squirrels to the North Stone Lake and Wetland Preserve units and constructing artificial burrows, as needed.

Under Alternative B, the Refuge would be opened to fishing from non-motorized, hand-launched boats (e.g., canoes, kayaks) or non-trailered boats with electric motors only. A boat launching area would be provided on the Sun River property of the South Stone Lake Unit Non-motorized boating by pre-registered groups, including commercial outfitters who engage in fishing, and wildlife observation, would also be allowed on SP Cut on the Beach Lake and North Stone Lake units at the west end of Elliott Ranch Road.

No native game fishes remain in Refuge waters but introduced game fish species are abundant, so the direct impact of recreational fishing on fish populations is not expected to be detrimental. Fishing may even benefit native fish species by reducing habitat competition from introduced species. Indirect effects of fishing and boating, such as disturbance to waterfowl, reptiles and amphibians, would be controlled by restricting shoreline fishing, by allowing access only during the summer before winter migrants have arrived and by providing sanctuary to species that are present during the summer.

Alternative C. Alternative C would result in primarily beneficial impacts on wildlife and few adverse impacts. The effects on wildlife under this alternative would be similar to those described under Alternative B, with the following exceptions.

Implementation of Alternative C would have similar effects on the Headquarters Unit as would Alternative B. Under this alternative, riparian vegetation would be allowed to expand naturally into managed wetland units. Though some riparian restoration along North Stone Lake would occur, no new riparian restoration would take place in the Sun River, Headquarters or Beach Lake units. The more limited and gradual increase in riparian habitat would still benefit wildlife over a longer period than under Alternative B. The reduction in wetland restoration and construction under Alternative C would result in reduced disturbance for wildlife. The effects on wildlife from the hunting and fishing programs are similar to Alternative B.

Special Status Species

Suitable habitat exists on the Refuge for the federal ESA listed giant garter snake, valley elderberry longhorn beetle (VELB), vernal pool tadpole shrimp and fairy shrimp . Vernal pool tadpole and fairy shrimp are the only federal ESA listed species whose presence has been verified on the Refuge within the last 13 years. California Endangered Species Act listed species that inhabit the Refuge include greater sandhill crane and Swainson's hawk.

Alternative A. Under Alternative A, continuation of current management activities will have beneficial effects on special status species. The Service will continue to manage the Refuge to support sandhill cranes by providing irrigated pasture, seasonally flooded wetlands, grain crops and grasslands. Breeding and foraging habitat would also be provided for Swainson's hawks in the Refuge's riparian forests and grasslands. Though there are no documented occurrences of VELB on the Refuge, all existing elderberry shrubs are mapped and protected from herbicides intended to control invasive weeds.

Alternative B. No significant adverse effects on special status species are anticipated. Beneficial effects to special status species would result from expansion and enhancement of riparian, wetland and grassland habitats. However, increases in human disturbance due to the increased number of visitors may also occur. Human disturbance would most likely affect sandhill cranes and Swainson's hawks.

Swainson's hawks would benefit from increased riparian habitat under Alternative B, including the expansion of riparian vegetation along the North Stone Lake, Headquarters, South Stone Lake, and Beach Lake units and the Sacramento Drainage Canal. Access for recreational fishing allowed between June and September could affect nesting Swainson's hawks, because their nesting season typically lasts from mid-February through July. As a result, the Service will prohibit visitor access within a 0.25-mile radius of any occupied hawk nest until the young have fledged.

Under Alternative B, the Refuge would enhance habitat management for sandhill cranes by flooding earlier in the fall (mid-September) than under Alternative A, by periodically flooding irrigated pastures and by developing a grazing program near North Stone Lake to provide foraging and loafing habitat adjacent to roosting sites. The Refuge also plans to construct a new observation platform for viewing sandhill cranes north of Hood Franklin Road on the North Stone Lake Unit. Alternative B's net effect is expected to be beneficial for sandhill cranes because while visitor disturbance will increase, habitat will also increase and greater foraging opportunities will be available.

No impact to vernal pool species is anticipated under Alternative B. The majority of the vernal pools at the Refuge occur in the Wetland Preserve Unit. This area will be opened for guided tours and via a self-guided trail that will be routed to avoid impacts to wetlands. Therefore, visitor use is not expected to affect the vernal pool tadpole shrimp or fairy shrimp.

The VELB would benefit under Alternative B by planting early successional upland vegetation, including elderberry bushes, on the South Stone Lake Unit. Riparian and grassland restoration will also benefit the Swainson's hawk.

Alternative C. The effects of Alternative C on special status species are largely the same as in Alternative B except that less riparian habitat would be restored. The Refuge would continue its sandhill crane habitat management as in Alternative B. The natural expansion of riparian vegetation allowed under Alternative C would ultimately benefit Swainson's hawks.

Diseases and Toxins

Common to all Alternatives. Under each alternative, the Service would continue current botulism control practices, including keeping all units dry between June 1 and August 1; patrolling historically problematic wetlands on the Refuges and in the surrounding areas in cooperation with the California Department of Fish and Game; and removing sick birds and carcasses from wetlands. As a result of these coordinated activities, the potential for an outbreak of botulism would be minimized.

Increased wetland habitat under Alternative B, increases the potential for breeding mosquitoes and hence, could lead to an incremental increase in the potential spread of mosquito-borne diseases. In accordance with their 1993 Memorandum of Understanding, Refuge staff will continue efforts to minimize mosquitoes in cooperation with SYMVCD through wetland design, efficient water management, vegetation manipulations through mowing, discing, and burning, biological control such as planting of mosquitofish, and applying larvicides and adulticides, as needed. See Appendix L, Integrated Pest Management Plan for Mosquito-Associated Threats for a detailed description of mosquito control on the Refuge.

Under all alternatives, the Service would continue to prohibit lead shot for waterfowl hunting as it has been Refuge system policy for over 15 years.

Cultural Resources

Common to all Alternatives. Under all alternatives, including the No Action alternative, Refuge management activities have the potential to disturb cultural resources. To preserve Refuge archaeological and historic resources, all undertakings, including but not limited to ground disturbance and prescribed burns, will be coordinated with the Service's Regional Archaeologist. Under each alternative: a cultural resources overview would be prepared; baseline data on all cultural resource sites collected; an attempt made to locate and delineate all unrecorded cultural resource sites; appropriate buffers zones established to ensure their protection; and updated or new site records forwarded to the California North Central Information Center. Also, an attempt would be made to locate any human remains, covered under the Native American Grave Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq. or 43 CFR 10), removed in the past from within the Refuge boundary

When it is determined after consultation with the Service's Regional Archaeologist and local professional archaeologists, that a consultation with the State Historic Preservation Office (SHPO) under Section 10 of the National Historic Preservation Act is warranted for a planned undertaking, the Refuge will ensure that appropriate procedures to protect cultural resources and provide necessary mitigation are identified and implemented, in accordance with the Service Programmatic Agreement for cultural resources with the SHPO. All monitoring of ground-disturbance will be performed by a professional archaeologist who may request assistance from tribal representatives. The Refuge will provide copies of SHPO correspondence and monitoring reports to the Regional Archaeologist and any concerned tribal organizations.

A cultural resources survey may not be required if burning is proposed entirely within a flood zone, in a previously disced or plowed area, or if burning has been an ongoing practice on the site. However, cultural resources surveys will likely be necessary for all burns on upland sites, and for burns that require excavation (scraping, plowing, or discing) to establish a fire line. In some cases, it may be appropriate to conduct cultural resources survey work after a prescribed burn is completed, because the visibility of artifacts or other resources may be increased after burning and artifacts may be more vulnerable to vandalism or theft when exposed by burning.

As required by the NAGPRA, any construction or ground-disturbing activity with the potential to disturb human remains, burial objects, sacred objects, or objects of cultural patrimony will be planned and implemented in consultation with affected Tribes. If potentially significant artifacts are found during any activity, work will cease within 100 feet of the find and access will be restricted until a qualified archaeologist and members of local Tribes can assess the significance of the find and propose appropriate methods of treatment, as required by NAGPRA. If human remains are found during any activity, work will cease

within 100 feet of the find, access will be restricted and the Sacramento County Coroner will be informed of the discovery, as required under Public Resources Code Section 5050.5. If no investigation of the cause of death is required, remains will be treated in accordance with the requirements of NAGPRA.

With assistance from the Service's Regional Archaeologist and local professional archaeologists, the Refuge has identified the Ione Band of Miwok Indians as the nearest tribal organization with whom the Refuge should consult on management and restoration projects. As a result, the Refuge intends to meet with the tribal liaison at least annually to discuss any planned project that may result in ground disturbance of prehistoric or historic sites.

Visitor Services

According to California State Department of Finance projections, the population of the Delta Region (Sacramento, Solano, Yolo, San Joaquin and Contra Costa Counties) is expected to grow by about 19 percent between 2005 and 2020. The State as a whole is expected to grow by 24 percent over the same period. In the western states, participation in hunting is predicted to decline by 21 percent in the period between 1995 and 2020. For example, statewide hunter use days declined in four out of five years, through 2004 (USFWS 2004). The trend for non-consumptive recreation shows an opposite trend. Participation in non-consumptive recreation is expected to increase by 37 percent over the same period (Cordell et al. 1999).

Common to All Alternatives. Under each alternative, hunting on the South Stone Lake Unit is expected to continue at 16 hunters per day, for two days per week throughout the hunt season, with two youth only hunts held both before and after the regular hunt season. Non-consumptive recreation will increase at a rate proportional to the predicted population growth for the five county Delta/Sacramento metropolitan region. Currently, Stone Lakes receives about 3,500 visits per year consisting of 3,000 wildlife observation visitors and 25 environmental education groups of 20 each.

Alternative A. Under the No Action alternative, the Refuge is expected to receive 4,200 visits annually by 2020. This projected increase in visitor use under the no action alternative serves as a baseline against which to compare the action alternatives. Figure 5 shows the current visitor use levels and predicted use levels under each alternative. Under the No Action alternative, the Service would maintain current Refuge visitor services and facilities. However, overall Refuge use is expected to increase as the population of the Sacramento metropolitan area and the rest of the State continues to grow over the next 15 years.

Alternative B. Visitor services would be improved and expanded under Alternative B. Volunteer opportunities would be expanded, including at least one comprehensive volunteer training per year. Opportunities for wildlife observations would expand to a capacity of 10,500 visits per year. Four miles of foot trails would be open to visitors seven days a week, with seasonal restrictions. Two miles of universally accessible trails would be constructed on the Headquarters Unit and named the Blue Heron Trails System. Two new photography blinds would be constructed, on the North Stone Lake and Headquarters Units. Two hundred feet of boardwalk, on the Headquarters Unit, would be constructed as part of the Blue Heron Trails System. One and one-half miles on foot trails would be constructed on the South Stone Lake Unit and would be open to visitors seven days a week, with seasonal restrictions. Two hundred feet of boardwalk would be constructed on the South Stone Lake Unit and would be open to visitors seven days a week, with seasonal restrictions. Parking facilities and a car top boat launch, for a maximum of ten cars, would be provided on the Beach Lake Unit. The number of supported environmental education groups would

expand to 80 per year. Two new interpretative programs would be developed within five years, including displays illustrating traditional dwelling and subsistence strategies on the Headquarter Unit.

Within five years the Refuge would provide safe, boat only fishing with day use parking facilities that could accommodate up to 20 boats per day. Refuge staff would expand community outreach and would expand the number of presentations given to schools, conservation groups and public service organizations.

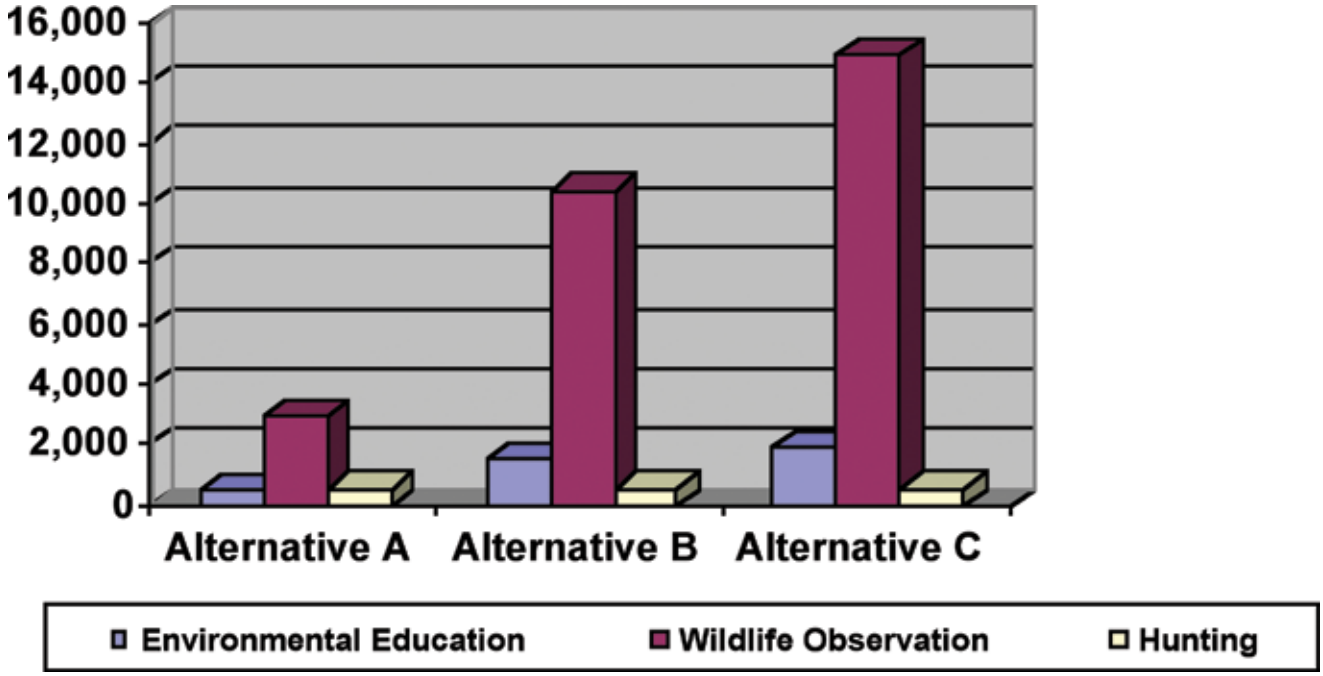

Figure 5. Current and Projected Visitation (15 years).

Alternative C. Under this alternative, visitor service facilities would be similarly expanded as in Alternative B. Opportunities for wildlife observations would expand to a capacity of 15,000 visitors per year. Six miles of foot trails would be open to visitors seven days a week, with seasonal restrictions. Less boardwalk would be constructed at the Headquarters Unit (140 feet). An additional two miles of trails would be developed on the Beach Lake and North Stone Lakes Units and would be open to visitors seven days a week, with seasonal closures. Four new interpretative programs would be developed within the next five years.

Socioeconomics

It is well known that Americans value recreational opportunities, although there is no general agreement on the best methodology to precisely measure the impact of recreational opportunities on local economies. Recreational use of the Refuge probably has indirect economic benefits to the local community, although given the limited resources available for the production of the draft CCP/EA, no formal economic study of these benefits has been conducted. However, it is probable that local use of Refuge recreational opportunities will approximate National trends to the extent that the uses are allowed on the Refuge.

As determined by a Compatibility Determination (see Appendix A), high-speed boating conflicts with paddle-based recreation (ex. canoeing, kayaking and fishing from non-motorized boats) and limits visitor services that can be offered on the Refuge. Many other proposed Refuge uses, that water skiing and high speed boating are incompatible with, are

actually more popular than water skiing nationally. According to USA Waterski, there are approximately 11 million water skiers in the U.S. (USA Waterski 2006). According to the Outdoor Industry Foundation other proposed Refuge visitor services enjoy much larger national popularity (see Figure 6) including: hunting at 12,800,000 participants, paddle-based recreation at 23,596,000 participants, fishing at 32,900,000 participants and wildlife viewing at 66,100,000 participants (OIF 2006).

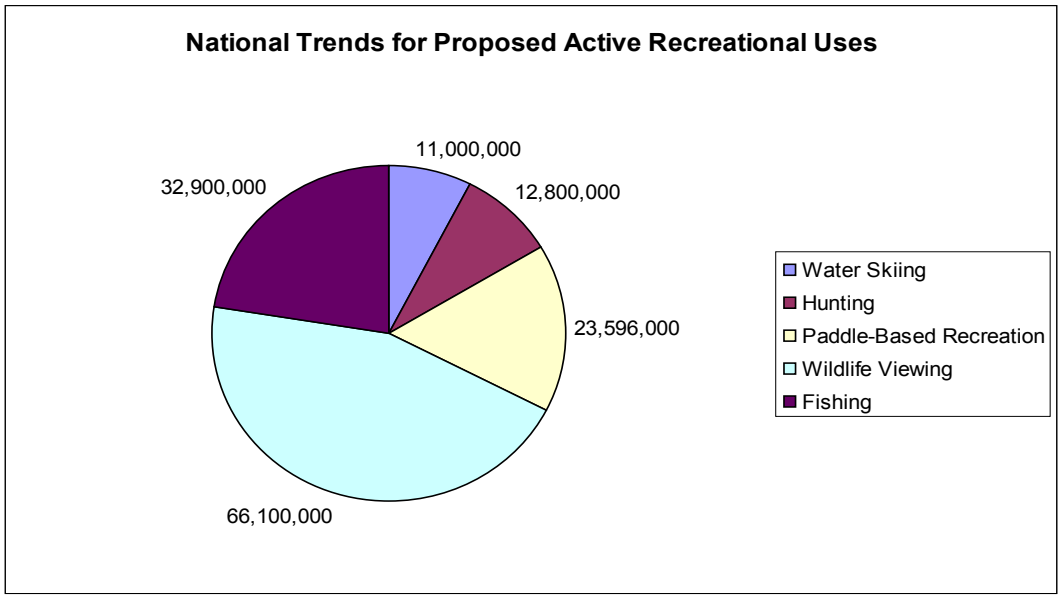

Figure 6. National Outdoor Recreation Totals for 2006.

As noted in a letter from the Beach Lake Ski Club dated October 23, 2006 (see Appendix G, Response to Public Comments) currently a private water ski club, consisting of 23 families, uses Refuge waterways for high speed boating for approximately four months each year. The water ski club estimates that weekly usage varies from a low of 8 families (boats) per week to a high of 12 families per week or an average of 10 families per week during the ski season. If high speed boating is discontinued on the Refuge, then other conflicting uses such as paddle-based recreation and wildlife observation and photography can increase as proposed, in the preferred alternative, by Objective 3.B. of the draft CCP.

Alternative A. Under the No Action alternative, current management practices would continue to be followed and no change in Refuge staffing would be required. Under the No Action Alternative, there would also be no change in visitor services and no changes in the indirect costs or benefits associated with visitor services to the local economy. The No Action alternative would thus have no impact on local employment conditions or the local economy.

Alternatives B and C. Actions proposed under Alternatives B and C are expected to have no significant affect on the local, regional or State economy. Under the preferred alternative, high speed boating will be phased out and several other uses, that high speed boating conflicts with, will be allowed to increase. Increases in Refuge visitation for activities such as wildlife observation and photography, environmental education and interpretation and recreational boating are expected under the preferred alternative.

Visitor services on the Refuge probably benefit the local economy and employment

conditions when Refuge visitors purchase goods from local businesses, such as gas stations, restaurants, hotels, photography stores, and sporting good stores. Under the preferred alternative, there will likely be a loss of benefits to local businesses from patronage by high speed boaters, but there will likely be a simultaneous gain in benefits for local businesses from added patronage by increasing numbers of other Refuge visitors. Actions proposed under Alternatives B and C are thus expected to have modest net benefits to the local economy once only uses found to be compatible are allowed on the Refuge. Table 2 displays the proposed net increases in Refuge visitor services, under Alternatives B and C.

The proposed expansion in visitor services programs may lead to increases in Refuge budget and staffing. Additional funding and staff proposals related to implementation of the CCP will be entered into the Service's agency budget systems, including Refuge Operating Needs System and Maintenance Management System. Additional Refuge staff required under these alternatives may be hired from local communities and would likely live in and contribute to the local communities.

Action	Estimated Annual Refuge Visitation	Annual Number of People Visiting	Annual Number of Families Visiting
Alternative A	Average Water Skiing Use	532	160
	Wildlife Observation	3,000	901
	Environmental Education	315	95
	Hunting	315	95
	Total Annual Use - Alternative A	**4,162**	**1,251**
Alternative B	Average Water Skiing Use	0	0
	Wildlife Observation	10,500	3,153
	Environmental Education	1,050	315
	Hunting	315	95
	Total Annual Use - Alternative B	**11,865**	**3,563**
	Increase from the No Action Alternative	**7,703**	**2,312**
Alternative C	Average Water Skiing Use	0	0
	Wildlife Observation	15,000	4,505
	Environmental Education	1,050	315
	Hunting	315	95
	Total Annual Use - Alternative C	**16,365**	**4,914**
	Increase from the No Action Alternative	**12,203**	**3,663**

Table 2. Estimated Visitor Services on the Refuge Under Alternatives A, B, and C. ** The average family size in Sacramento County is 3.33 persons (ACS 2004).

As incompatible high speed boating is phased out, the local water skiing club, would be expected to lose benefits associated with this temporal, exclusive use of Refuge waters and to incur costs associated with finding alternative water skiing locations if they choose to do so. The loss of benefits would be due to the water ski club's contractual obligation, until 2013

(see letter from the Beach Lake Ski Club dated October 23, 2006), with a local landowner for the use of launch facilities that provides access to a waterway, partially located on the Refuge. A local fishing club, that uses gas powered boats, also uses launch facilities provided by the same land owner. Since the Refuge has no authority to regulate high speed boating outside of Refuge boundaries, only a portion of the water course regularly water skied and fished via gas-powered boats will be lost to high speed boating as will commensurate benefits associated with access to those parts of the waterway. However, it is unclear if the parts of the waterway outside of the Refuge boundary would be considered viable for continued water skiing, by the club. If the local water ski club could not continue to water ski, within the waterway outside of the Refuge boundary, then the preferred alternative would result in a total loss of benefits associated with the use of the waterway. The private fishing club could continue to fish throughout the waterway, however without the use of high-speed boats. So there could be a small opportunity cost to the fishing club as travel times within Refuge waterways are increased, without the use of high speed boats.

If the water ski club finds that the waterway outside of the Refuge boundary is not viable for water skiing and therefore chooses not to renew a contract with the local land owner, who provides launch facilities, then the local land owner would incur opportunity costs after 2013 unless the local landowner substituted another profitable use of the property.

The expanded wildlife-dependent visitor use opportunities proposed under Alternatives B and C could result in increased instances of trespass, vandalism, and littering and some minor disruption of farming practices of adjacent to nearby landowners.

No projects proposed under any of the alternatives would have a disproportionate negative impact on low-income or minority populations.

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Appendix C. Wildlife Species Found on Stone Lakes National Wildlife Refuge

Stone Lakes NWR Reptiles

Common Name	Scientific Name	Habitat	Sp	S	F	W
Class AMPHIBIA (amphibians) Order ANURA						
Family BUFONIDAE (true toads)						
western toad	*Bufo boreas*	msrg	r	r	r	r
Family HYLIDAE (tree frogs and relatives)						
pacific treefrog	*Pseudacris regilla*	rm	c	c	c	r
Family RANIDAE (true frogs)						
bullfrog	*Rana catesbeiana*	omr	c	c	c	r
Class REPTILIA (reptiles) Order SQUAMATA (lizards and snakes)						
Family ANGUIDAE (alligator lizards and relatives)						
southern alligator lizard	*Elgaria multicarinata*	rg	r	r	r	r
Family COLUBRIDAE (Colubrids)						
western yellowbelly racer	*Coluber constrictor mormon*	rg	u	c	u	r
common kingsnake	*Lampropeltis getula*	sg	u	c	u	r
gopher snake	*Pituophis catenifer*	sg	u	c	u	r
elegant garter snake	*Thamnophis elegans*	sm	u	c	u	r
giant garter snake	*Thamnophis gigas*	msrg	r	r	r	r
common garter snake	*Thamnophis sirtalis*	sm	u	c	u	r
Family PHRYNOSOMATIDAE (North American spiny lizards)						
western fence lizard	*Sceloporus occidentalis*	sg	c	c	c	c
Order TESTUDINES (turtles)						
Family EMYDIDAE (box and water turtles)						
western pond turtle	*Clemmys marmorata* (syn. *Emys marmorata*)	om	u	u	u	r
red-eared slider	*Trachemys scripta*	om	u	u	u	u

Stone Lakes NWR Mammals

Common Name	Scientific Name	Habitat	Sp	S	F	W
Order ARTIODACTYLA (even-toed hoofed animals)						
Family CERVIDAE (deer, moose, reindeer, elk)						
black-tailed deer	*Odocoileus hemionus*	rsg	r	r	r	r
Order CARNIVORA (meat-eaters)						
Family CANIDAE (coyotes, dogs, foxes, jackals and wolves)						
coyote	*Canis latrans*	wide	c	c	c	c
gray fox	*Urocyon cinereoargenteus*	gr	o	o	o	o
Family FELIDAE (cats)						
feral house cat	*Felis catus*	rgu	c	c	c	c
Family MEPHITIDAE (skunks and stink badgers)						
striped skunk	*Mephitis mephitis*	wide	u	u	u	u
Family MUSTELIDAE (badgers, otters, weasels and relatives)						
river otter	*Lontra canadensis*	or	c	c	c	c
mink	*Mustela vison*	om	o	o	o	o
Family PROCYONIDAE (coatis, raccoons, lesser pandas)						
raccoon	*Procyon lotor*	mr	c	c	c	c
Order CHIROPTERA (bats)						
Family MOLOSSIDAE (free-tailed bats)						
guano bat	*Tadarida brasiliensis*	r	r	r	r	r
Order DIDELPHIMORPHIA (American marsupials)						
Family DIDELPHIDAE (opossums)						
virginia opossum	*Didelphis virgiana*	r	c	c	c	c
Order INSECTIVORA (insect-eaters)						
Family Soricidae (shrews)						
ornate shrew	*Sorex ornatus*	msg	r	r	r	r
Order LAGOMORPHA (pikas, hares and rabbits)						
Family LEPORIDAE (hares and rabbits)						
black-tailed jackrabbit	*Lepus californicus*	sg	c	c	c	c
desert cottontail	*Sylvilagus audubonii*	g	c	c	c	c
Order RODENTIA (gnawing mammals)						
Family CASTORIDAE (beavers)						
beaver	*Castor canadensis*	mr	a	a	a	a
Family CRICETIDAE (New World rats and mice, voles, hamsters and relatives)						
California vole	*Microtus californicus*	gr	c	c	c	c
muskrat	*Ondatra zibethicus*	om	c	c	c	c
deer mouse	*Peromyscus maniculatus*	rg	u	u	u	u
western harvest mouse	*Reithrodontomys megalotis*	msg	u	u	u	u

Common Name	Scientific Name	Habitat	Sp	S	F	W
Family GEOMYIDAE (gophers)						
Botta's Pocket Gopher	*Thomomys bottae*	g	u	u	u	u
Family MURIDAE (Old World mice, rats)						
house mouse	*Mus musculus*	sgru	u	u	u	u
Norway rat	*Rattus norvegicus*	sgru	u	u	u	u
black rat	*Rattus rattus*	sgru	u	u	u	u
Family SCIURIDAE (chipmunks, squirrels, marmots)						
western gray squirrel	*Sciurus griseus*	sg	u	u	u	u
Fox Squirrel	*Sciurus niger*	rg	u	u	u	u
California ground squirrel	*Spermophilus beecheyi*	rg	u	u	u	u

Stone Lakes NWR Birds

Common Name	Scientific Name	Habitat	Sp	S	F	W
Order ANSERIFORMES (waterfowl)						
Family ANATIDAE (ducks, geese and swans)						
wood duck*	*Aix sponsa*	osr	c	c	c	c
greater white-fronted goose	*Anser albifrons*	oga	o	-	u	c
northern pintail	*Anas acuta*	s	u	r	c	c
american wigeon	*Anas americana*	s	c	-	c	a
northern shoveler	*Anas clypeata*	s	a	r	u	a
green-winged teal	*Anas crecca*	s	c	-	c	c
cinnamon teal*	*Anas cyanoptera*	msg	c	o	o	c
blue-winged teal	*Anas discors*	s	r	-	r	r
eurasian wigeon	*Anas penelope*	s	-	-	-	r
mallard*	*Anas platyrhynchos*	msg	a	a	a	a
gadwall*	*Anas strepera*	msg	c	r	r	c
lesser scaup	*Aythya affinis*	os	u	-	-	u
redhead	*Aythya americana*	os	r	-	-	r
ring-necked duck	*Aythya collaris*	os	o	-	-	c
greater scaup	*Aythya marila*	os	-	-	-	#
canvasback	*Aythya valisineria*	os	r	-	-	c
bufflehead	*Bucephala albeola*	os	o	-	-	c
common goldeneye	*Bucephala clangula*	os	-	-	-	u
barrow's goldeneye	*Bucephala islandica*	os	-	-	-	#
canada goose*	*Branta canadensis*	osg	o	o	o	o
snow goose	*Chen caerulescens*	osga	-	-	-	r
ross' goose	*Chen rossii*	osga	-	-	-	r
tundra swan	*Cygnus buccinator*	osa	-	-	-	o
hooded merganser	*Lophodytes cucullatus*	os	r	-	-	o
common merganser	*Mergus merganser*	os	r	-	-	r
ruddy duck*	*Oxyura jamaicensis*	os	o	r	r	o
Order APODIFORMES (swifts and hummingbirds)						
Family APODIDAE (swifts)						
white-throated swift	*Aeronautes saxatalis*	a	r	r	r	r
Vaux's swift	*Chaetura vauxi*	a	r	-	r	-
Family TROCHILIDAE (hummingbirds)						
black-chinned hummingbird*	*Archilochus alexandri*	r	r	r	u	-
Anna's hummingbird*	*Calypte anna*	r	c	c	c	u
Rufous/Allen's hummingbird	*Selasphorus rufus*	r	-	-	r	-
Order CHARADRIIFORMES (shorebirds)						
Family CHARADRIIDAE (plovers and lapwings)						
semipalmated plover	*Charadrius semipalmatus*	s	r	-	r	-
killdeer*	*Charadrius vociferus*	wide	a	a	a	a

Common Name	Scientific Name	Habitat	Sp	S	F	W
black-bellied plover	*Pluvialis squatarola*	s	o	-	u	c
Family LARIDAE (gulls and terns)						
black tern	*Chlidonias niger*	osa	#	-	-	-
herring gull	*Larus argentatus*	osa	o	-	-	c
California gull	*Larus californicus*	osa	o	r	c	c
Mew Gull	*Larus canus*	osa	#	-	r	r
ring-billed gull	*Larus delawarensis*	osa	o	-	c	c
Thayer's gull	*Larus glaucoides*	osa	-	-	#	-
Bonaparte's gull	*Larus philadelphia*	osa	-	r	r	#
Caspian tern*	*Sterna caspia*	osa	o	r	o	-
Forster's tern	*Sterna forsteri*	osa	c	r	r	o
Family RECURVIROSTRIDAE (avocets and stilts)						
black-necked stilt*	*Himantopus mexicanus*	s	c	o	c	c
american avocet*	*Recurvirostra americana*	s	o	u	o	o
Family SCOLOPACIDAE (sandpipers and phalaropes)						
spotted sandpiper	*Actitis macularius*	s	o	r	o	o
ruddy turnstone	*Arenaria interpres*	s	#	-	-	-
sanderling	*Calidris alba*	s	#	-	-	-
dunlin	*Calidris alpina*	s	c	-	a	a
baird's sandpiper	*Calidris bairdii*	s	-	-	#	-
western sandpiper	*Calidris mauri*	s	c	-	c	o
pectoral sandpiper	*Calidris melanotos*	s	-	-	#	-
least sandpiper	*Calidris minutilla*	s	c	o	c	a
semipalmated sandpiper	*Calidris pusilla*	s	-	-	r	-
willet	*Catoptrophorus semipalmatus*	s	#	-	-	-
common snipe	*Gallinago delicata*	s	u	r	o	c
short-billed dowitcher	*Limnodromus griseus*	s	-	#	-	-
long-billed dowitcher	*Limnodromus scolopaceus*	s	c	-	c	c
whimbrel	*Numenius phaeopus*	sga	o	-	r	-
long-billed curlew	*Numenius americanus*	sga	o	r	o	o
red-necked phalarope	*Phalaropus lobatus*	s	r	-	r	-
wilson's phalarope*	*Phalaropus tricolor*	s	o	r	r	-
ruff	*Philomachus pugnax*	s	#	-	-	-
lesser yellowlegs	*Tringa flavipes*	s	o	-	o	o
greater yellowlegs	*Tringa melanoleuca*	s	c	r	c	c
solitary sandpiper	*Tringa solitaria*	s	#	-	#	-
Order CICONIIFORMES (storks, herons and relatives)						
Family ARDEIDAE (bitterns, herons and egrets)						
great blue heron*	*Ardea herodias*	wide	a	a	a	a
great egret*	*Ardea alba*	wide	a	a	a	a

Common Name	Scientific Name	Habitat	Sp	S	F	W
American bittern*	*Botaurus lentiginosus*	m	o	o	o	u
cattle egret	*Bubulcus ibis*	g	-	-	r	r
green heron*	*Butorides virescens*	mr	o	o	o	o
snowy egret*	*Egretta thula*	ms	c	u	c	c
least bittern	*Ixobrychus exilis*	m	r	r	r	-
black-crowned night-heron*	*Nycticorax nycticorax*	mr	o	o	o	o
Family CATHARTIDAE (vultures)						
turkey vulture*	*Cathartes aura*	a	a	a	a	a
Family THRESKIORNITHIDAE (ibises)						
white-faced ibis	*Eudocimus albus*	sg	o	o	o	-
Order COLUMBIFORMES (pigeons)						
Family COLUMBIDAE (doves and pigeons)						
rock dove*	*Columba livia*	u	c	c	c	c
mourning dove*	*Zenaida macroura*	wide	c	c	c	c
Order CORACIIFORMES (kingfishers and relatives)						
Family ALCEDINIDAE (kingfishers)						
belted kingfisher*	*Ceryle alcyon*	ra	c	c	c	c
Order FALCONIFORMES (diurnal birds of prey)						
Family ACCIPITRIDAE (osprey, kites, eagles and hawks)						
osprey	*Pandion haliaetus*	ra	r	r	r	-
cooper's hawk*	*Accipiter cooperii*	ra	u	u	c	c
sharp-shinned hawk	*Accipiter striatus*	ra	o	o	o	o
golden eagle	*Aquila chrysaetos*	sga	o	o	o	o
red-tailed hawk*	*Buteo jamaicensis*	wide	a	a	a	a
red-shouldered hawk*	*Buteo lineatus*	ra	a	a	a	a
rough-legged hawk	*Buteo lagopus*	mga	-	-	-	r
ferruginous hawk	*Buteo regalis*	sa	-	-	-	r
swainson's hawk*	*Buteo swainsoni*	rsga	o	c	u	-
northern harrier*	*Circus cyaneus*	msga	a	c	a	a
white-tailed kite*	*Elanus leucurus*	wide	c	c	c	c
bald eagle	*Haliaeetus leucocephalus*	a	-	-	-	#
Family FALCONIDAE (falcons)						
merlin	*Falco columbarius*	rga	r	-	-	o
prairie falcon	*Falco mexicanus*	msga	r	-	-	r
peregrine falcon!	*Falco peregrinus*	msga	r	-	r	r
american kestrel*	*Falco sparverius*	wide	a	a	a	a
Order GALLIFORMES (megapodes, curassows, pheasants, quails and relatives)						
Family PHASIANIDAE						
ring-necked pheasant*	*Phasianus colchicus*	rg	a	a	a	a
Family ODONTOPHORIDAE						

Common Name	Scientific Name	Habitat	Sp	S	F	W
california quail*	*Callipepla californica*	rg	c	c	c	c
Order GRUIFORMES (coots, cranes and rails)						
Family GRUIDAE (cranes)						
sandhill crane	*Grus canadensis*	sg	r	-	c	c
Family RALLIDAE						
American coot*	*Fulica americana*	ms	c	o	o	a
common moorhen*	*Gallinula chloropus*	m	o	o	o	o
sora*	*Porzana carolina*	m	o	o	o	o
Virginia rail*	*Rallus limicola*	m	o	o	o	o
Order PASSERIFORMES (perching birds)						
Family AEGITHALIDAE (bushtits)						
bushtit*	*Psaltriparus minimus*	r	a	a	a	a
Family ALAUDIDAE (larks)						
horned lark	*Eremophila alpestris*	g	o	-	c	c
Family BOMBYCILLIDAE (waxwings)						
cedar waxwing	*Bombycilla cedrorum*	r	u	-	u	u
Family CARDINALIDAE (grosbeaks and buntings)						
lazuli bunting*	*Passerina amoena*	r	u	u	-	-
blue grosbeak*	*Passerina caerulea*	r	u	u	-	-
black-headed grosbeak*	*Pheucticus melanocephalus*	r	c	c	-	-
Family CERTHIIDAE (creepers)						
brown creeper	*Certhia americana*	r	-	-	#	#
Family CORVIDAE (jays, magpies and crows)						
western scrub-jay*	*Aphelocoma californica*	rs	a	a	a	a
American crow*	*Corvus brachyrhynchos*	rsg	c	c	c	c
yellow-billed magpie*	*Pica nuttalli*	rsg	o	o	o	o
Family EMBERIZIDAE (towhees and sparrows)						
spotted towhee*	*Pipilo maculatus*	r	a	a	a	a
dark-eyed junco	*Junco hyemalis*	r	u	-	u	c
swamp sparrow	*Melospiza georgiana*	g	-	-	#	-
Lincoln's sparrow	*Melospiza lincolnii*	gs	u	-	-	o
song sparrow*	*Melospiza melodia*	mr	c	c	c	c
savannah sparrow	*Passerculus sandwichensis*	gs	a	-	a	a
fox sparrow	*Passerella iliaca*	r	o	-	r	o
California towhee*	*Pipilo crissalis*	r	u	u	u	u
vesper sparrow	*Pooecetes gramineus*	g	#	-	-	-
chipping sparrow	*Spizella passerina*	g	#	#	-	-
white-throated sparrow	*Zonotrichia albicollis*	gs	r	-	-	r
golden-crowned sparrow	*Zonotrichia atricapilla*	gs	r	-	c	a
white-crowned sparrow	*Zonotrichia leucophrys*	gs	r	-	c	a

Common Name	Scientific Name	Habitat	Sp	S	F	W
Family FRINGILLIDAE (finches)						
lesser goldfinch*	*Carduelis psaltria*	g	-	-	r	r
American goldfinch*	*Carduelis tristis*	g	c	c	c	c
house finch*	*Carpodacus mexicanus*	wide	a	a	a	a
pine siskin	*Carduelis pinus*	r	-	-	r	-
purple finch	*Carpodacus purpureus*	r	-	-	-	#
Family HIRUNDINIDAE (swallows)						
barn swallow*	*Hirundo rustica*	msra	c	c	c	-
cliff swallow*	*Petrochelidon pyrrhonota*	msra	a	a	o	-
northern rough-winged swallow*	*Stelgidopteryx serripennis*	msra	u	o	r	-
tree swallow*	*Tachycineta bicolor*	msra	a	a	o	r
violet-green swallow	*Tachycineta thalassina*	msra	-	-	r	-
Family ICTERIDAE (icterids)						
red-winged blackbird*	*Agelaius phoeniceus*	mg	a	a	a	a
tricolored blackbird	*Agelaius tricolor*	mg	o	o	r	r
Brewer's blackbird*	*Euphagus cyanocephalus*	us	a	a	a	a
bullock's oriole*	*Icterus bullockii*	r	u	u	-	-
hooded oriole	*Icterus cucullatus*	r	r	-	-	-
brown-headed cowbird*	*Molothrus ater*	wide	c	c	c	o
great-tailed grackle*	*Quiscalus mexicanus*	sg	r	r	r	r
western meadowlark*	*Sturnella neglecta*	g	a	a	a	a
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	m	r	r	-	-
Family LANIIDAE (shrikes)						
northern shrike	*Lanius excubitor*	gr	-	-	-	#
loggerhead shrike*	*Lanius ludovicianus*	gr	u	u	u	u
Family MIMIDAE (mockingbirds and thrashers)						
northern mockingbird*	*Mimus polyglottos*	rg	o	o	o	o
Family MOTACILLIDAE (wagtails and pipits)						
American pipit	*Anthus rubescens*	sg	c	-	u	c
Family PARIDAE (titmice)						
oak titmouse*	*Baeolophus inornatus*	r	u	u	u	u
Family PARULIDAE (warblers)						
yellow-rumped warbler	*Dendroica coronata*	r	c	-	c	a
black-throated gray warbler	*Dendroica nigrescens*	r	o	-	u	r
yellow warbler	*Dendroica petechia*	r	c	r	c	-
townsend's warbler	*Dendroica townsendi*	r	o	-	o	-
common yellowthroat*	*Geothlypis trichas*	mr	c	c	c	u
yellow-breated chat	*Icteria virens*	r	#	-	-	-
Macgillivray's warbler	*Oporornis tolmiei*	r	o	-	u	-

Common Name	Scientific Name	Habitat	Sp	S	F	W
northern waterthrush	*Seiurus noveboracensis*	m	#	-	-	-
orange-crowned warbler	*Vermivora celata*	r	c	r	c	r
Nashville warbler	*Vermivora ruficapilla*	r	r	-	r	-
Canada warbler	*Wilsonia canadensis*	r	-	#	-	-
Wilson's warbler	*Wilsonia pusilla*	r	c	-	c	-
Family PASSERIDAE (Old World sparrows)						
house sparrow*	*Passer domesticus*	u	c	c	c	c
Family REGULIDAE (kinglets)						
ruby-crowned kinglet	*Regulus calendula*	r	c	-	c	a
golden-crowned kinglet	*Regulus satrapa*	r	r	-	u	u
Family SITTIDAE (nuthatches)						
white-breasted nuthatch*	*Sitta carolinensis*	r	u	u	u	u
Family STURNIDAE (starlings)						
european starling*	*Sturnus vulgaris*	rs	a	a	a	a
Family SYLVIIDAE (gnatchatchers)						
blue-gray gnatcatcher	*Polioptila caerulea*	r	#	-	r	-
Family THRAUPIDAE (tanagers)						
western tanager	*Piranga ludoviciana*	r	u	r	u	-
Family TIMALIIDAE (babbler)						
wrentit*	*Chamaea fasciata*	r	c	c	c	c
Family TROGLODYTIDAE (wrens)						
marsh wren*	*Cistothorus palustris*	m	a	a	a	a
rock wren	*Salpinctes obsoletus*	g	#	#	#	#
house wren*	*Troglodytes aedon*	r	c	c	c	u
bewick's wren*	*Thryomanes bewickii*	mr	u	u	u	u
winter wren	*Troglodytes troglodytes*	r	-	-	-	r
Family TURDIDAE (thrushes)						
hermit thrush	*Catharus guttatus*	r	o	-	o	o
Swainson's thrush	*Catharus ustulatus*	r	o	-	o	-
varied thrush	*Ixoreus naevius*	r	-	-	r	r
mountain bluebird	*Sialia currucoides*	r	-	-	-	#
western bluebird	*Sialia mexicana*	rg	#	-	-	#
American robin*	*Turdus migratorius*	rg	c	u	c	c
Family TYRANNIDAE (flycatchers)						
olive-sided flycatcher	*Contopus cooperi*	r	r	-	o	-
western wood-pewee*	*Contopus sordidulus*	r	r	-	o	-
pacific-slope flycatcher	*Empidonax difficilis*	r	r	r	r	-
hammond's flycatcher	*Empidonax hammondii*	r	#	-	r	-
dusky flycatcher	*Empidonax oberholseri*	r	#	#	-	-
willow flycatcher	*Empidonax traillii*	r	r	-	o	-
ash-throated flycatcher*	*Myiarchus cinerascens*	rg	u	c	r	-

Common Name	Scientific Name	Habitat	Sp	S	F	W
black phoebe*	*Sayornis nigricans*	mr	a	a	a	a
say's phoebe	*Sayornis saya*	sg	-	-	u	u
tropical kingbird	*Tyrannus melancholicus*	rg	-	-	-	#
western kingbird*	*Tyrannus verticalis*	rg	u	c	-	-
Family VIREONIDAE (vireos)						
Cassin's vireo	*Vireo cassinii*	r	r	-	r	-
warbling vireo	*Vireo gilvus*	r	u	-	u	-
Hutton's vireo	*Vireo huttoni*	r	r	r	r	r
Order PELECANIFORMES (pelicans, tropicbirds, cormorants and relatives)						
Family PELECANIDAE (pelicans)						
American white pelican	*Pelecanus erythrorhynchos*	os	c	u	o	o
Family PHALACROCORACIDAE (cormorants)						
double-crested cormorant	*Phalacrocorax auritus*	o	c	c	o	c
Order PICIFORMES (woodpeckers and relatives)						
Family PICIDAE (woodpeckers)						
northern flicker*	*Colaptes auratus*	r	c	o	c	c
acorn woodpecker	*Melanerpes formicivorus*	r	-	-	-	#
Nuttall's woodpecker*	*Picoides nuttallii*	r	c	c	c	c
downy woodpecker*	*Picoides pubescens*	r	c	c	c	c
red-breasted sapsucker	*Sphyrapicus nuchalis*	r	-	-	r	r
Order PODICIPEDIFORMES (grebes)						
Family PODICIPEDIDAE (grebes)						
clark's grebe	*Aechmophorus clarkii*	o	r	r	o	o
western grebe	*Aechmophorus occidentalis*	o	r	r	o	o
horned grebe	*Podiceps auritus*	os	r	-	r	r
eared grebe	*Podiceps nigricollis*	oms	r	r	r	r
pied-billed grebe*	*Podilymbus podiceps*	oms	c	u	a	a
Order STRIGIFORMES (owls)						
Family TYTONIDAE (typical owls)						
long-eared owl	*Asio otus*	srg	-	-	-	#
short-eared owl	*Asio flammeus*	msg	-	-	-	r
burrowing owl*	*Athene cunicularia*	f	r	r	r	r
great horned owl*	*Bubo virginianus*	r	c	c	c	c
western screech-owl	*Megascops kennicottii*	r	r	r	r	r
barn owl*	*Tyto alba*	wide	c	c	c	c

Habitats: o - Open water, lakes, creeks, ponds; m - Marshes, tule and cattail stands; s - seasonal wetlands, mudflats, flooded fields; r - Riparian forests; g - Grasslands; a - Aerial, usually observed in flight; wide - Widespread, found in a variety of habitats; u - urban

Seasons: Sp - Spring, March through May; S - Summer, June through August; F - Fall, September through November; W - Winter, December through February

Abundance: a - Abundant, expected to be observed 80 to 100 percent of the time in appropriate habitat; c - Common: 60 to 80 percent; u - Uncommon: 30 to 60 percent; o - Occasionally: 10 to 30 percent; r - Rare: 0 to 10 percent; * - Birds known to nest locally; ! -Threatened/Endangered Species; # - Observed less than 10 times in the past 10 years

Appendix D. Fish Species Found on Stone Lakes NWR

Common name (scientific name)	North Stone Lake	South Stone Lake	SP Cut	Meadowlark Lake	Black-Crown Lake	Nicolaus Pond	Laguna Creek	Morrison Creek	Fishhead Lake	Lost Lake
Order ATHERINIFORMES (rainbow fishes and silversides)										
Family ATHERINIDAE (silversides)										
Inland Silverside (Menidia beryllina)	x			x	x	x	x	x	x	
Order CLUPEIFORMES (anchovies and herrings)										
Family CLUPEIDAE (herrings, menhadens, pilchards, sardines, shads and sprats)										
American shad (Alosa sapidissima)	x									
Threadfin shad (Dorosoma petenense)	x	x	x	x	x		x		x	x
Order CYPRINIFORMES (suckers and minnows)										
Family CYPRINIDAE (carps and minnows)										
California roach (Hesperoleucus symmetricus)					x			x		
Carp (Cyprinus carpio)	x	x	x	x	x	x	x	x	x	
Goldfish (Carassius auratus)	x	x			x	x			x	
Golden shiner (Notemigonus crysoleucas)	x	x	x							
Hardhead minnow (Mylopharodon conocephalus)				x	x		x	x		x
Sacramento blackfish (Orthodon microlepidotus)	x			x	x		x	x	x	
Sacramento pikeminnow (Ptychocheilus grandis)	x	x								
*Sacramento splittail (Pogonichthys macrolepidotus)										
Order CYPRINODONTIFORMES (killifishes)										
Family POECILIIDAE (livebearers and topminnows)										
Mosquitofish (*Gambusia* spp.)	x			x	x	x	x	x	x	
Order PERCIFORMES (perch-likes)										
Family MORONIDAE (temperate basses)										
Striped Bass (Morone saxatilis)			x							
Family CENTRARCHIDAE (sunfish and sunfishes)										
Black Crappie (Pomoxis nigromaculatus)	x	x	x	x	x		x	x	x	x
Bluegill (Lepomis macrochirus)	x	x	x	x	x		x		x	x
Crappie (Pomoxis spp.)				x	x		x		x	
Green sunfish (Lepomis cyanellus)	x									

Hybrid sunfish (Lepomis spp.)	x									
Largemouth bass (Micropterus salmoides)	x	x		x	x				x	
Redear sunfish (Lepomis microlophus)	x	x	x							
Warmouth (Lepomis gulosus)	x			x	x		x		x	
White Crappie (Pomoxis annularis)	x	x		x	x		x	x	x	x
Family PECIDAE (perches and true perches)										
Bigscale logperch (Percina macrolepida)	x			x	x		x	x	x	
Order SCORPAENIFORMES (scorpion fishes and sculpins)										
Family COTTIDAE (scaleless sculpins and sculpins)										
Prickly sculpin (Cottus asper)	x									
Sculpin (Cottus spp.)					x				x	
Order SILURIFORMES (catfishes)										
Family ICTALURIDAE (bullhead catfishes and North American freshwater catfishes)										
Black bullhead (Ictalurus melas)	x	x	x	x	x			x	x	
Brown bullhead (Ictalurus nebulosus)	x	x		x			x		x	
Bullhead (Ictalurus ssp.)				x	x	x	x		x	
Channel catfish (Ictalurus punctatus)	x	x		x	x					
Yellow bullhead (Ameiurus natalis)				x	x				x	
White catfish (Ictalurus catus)	x	x	x	x	x					

* presumed to be intermitently present after flooding events allow entry to the Refuge.

Appendix E. Wilderness Review

A wilderness review is the process used by the Service to determine whether or not to recommend lands or waters in the National Wildlife Refuge System to Congress for designation as wilderness. The Service is required to conduct a wilderness review for each refuge as part of the CCP process. Lands or waters that meet the minimum criteria for wilderness are identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System.

According to the Wilderness Act of 1964 (16 USC 1131-1136; 78 Stat. 890), "An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

Stone Lakes National Wildlife Refuge contains a total of 1,738.8 discontinuous acres owned in fee title, by the Service. In addition 2,617.9 acres are managed under cooperative agreements and 1,519.9 acres are under easements. The Refuge is adjacent to a residential subdivision and a major interstate highway. The largest contiguous portion of land in fee ownership is about 840 acres, which is smaller than the area required for designation as wilderness. Moreover, the Refuge contains much evidence of past and current human use, including roads, actively managed wetlands, and remnants of past and current ranching and farming activities. For these reasons, Stone Lakes National Wildlife Refuge does not meet the criteria for wilderness designation.

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Appendix F. Endangered Species Act, Section 7 Consultation

COPY FOR YOUR INFORMATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
1-1-06-F-0105

OCT 18 2006

Memorandum

To: Project Leader, Stone Lakes National Wildlife Refuge, Elk Grove, California

From: Acting Field Supervisor, Ecological Services, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Intra-agency Programmatic Formal Section 7 Consultation on the Comprehensive Conservation Plan for Stone Lakes National Wildlife Refuge, Sacramento County, California

This is in response to your request for formal consultation with the U.S. Fish and Wildlife Service's (Service) Sacramento Fish and Wildlife Office (SFWO) on Alternative B of the Comprehensive Conservation Plan (CCP) for Stone Lakes National Wildlife Refuge (Refuge), Elk Grove, California. Your request was received in our office on March 17, 2006. This document represents the Service's biological opinion on the effects of the action on the giant garter snake (*Thamnophis gigas*) (snake), valley elderberry longhorn beetle (*Desmocercus californicus dimorphus*) (beetle), vernal pool fairy shrimp (*Branchinecta lynchi*), and vernal pool tadpole shrimp (*Lepidurus packardi*) (vernal pool crustaceans), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

The Service has determined that the proposed action is not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), the delta smelt (*Hypomesus transpacificus*), the delta green ground beetle (*Elaphrus viridis*), the California red-legged frog (*Rana aurora draytonii*), and the California tiger salamander (*Ambystoma californiense*). In addition, the proposed action will not adversely modify or destroy proposed or designated critical habitat for any federally-listed species because no critical habitat for any species has been proposed or designated on the Refuge or adjacent to the Refuge that may be affected by on-site activities.

For the bald eagle, we have made this determination because there are no documented sightings of bald eagles on the Refuge and bald eagles likely fly over the Refuge only on rare occasions. In addition, proposed riparian plantings on the Refuge will likely enhance bald eagle habitat. For

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Health Unit have not recorded the Delta smelt within Refuge waterways. Due to the presence of the Lambert Road flood control structure, the Stone Lakes Basin has an unimpeded hydrologic connection with the rest of the Delta only during major flood events. For the Delta green ground beetle we have made this determination because the species has not been documented on the refuge and no suitable habitat for this species is present (Chris Nagano, pers. comm.). For the California red-legged frog we have made this determination because this species is believed to be extirpated in this area of the Sacramento Valley floor due to a number of factors. For the California tiger salamander, we have made this determination because surveys over the last ten years on the refuge have failed to document this species. In addition, the location of the refuge in the floodplain and the soil types present on the refuge are not compatible with the presence of this species.
The National Wildlife Refuge System Improvement Act of 1997 mandated that all National Wildlife Refuges (NWRs) prepare Comprehensive Conservation Plans (CCP). The purpose of this consultation is to determine potential effects of routine Refuge projects, activities, and programs on listed or proposed species, to authorize take incidental to those actions, and to expedite review of new acquisitions, restoration projects, programs, or management plans. The Refuge and the SFWO have determined that although management and restoration of habitats on the Refuge benefit listed species in the long term, some activities may adversely affect listed species and may result in incidental take, thus requiring consultation under the Act. Projects which exceed the scope of activities described in this biological opinion may require individual biological opinions. Significant projects will be reviewed on a case by case basis to determine the need for additional consultation.

Consultation History

The SFWO has previously reviewed the Refuge Integrated Pest Management (IMP) Proposals for mosquito abatement and for water hyacinth control, as well as reviewed other proposed actions on the Refuge, and these consultations are incorporated by reference:

> March 27, 1995: The SFWO concurred with the determination that the use of the bacterium *Bacillus thuringiensis israelensis* (*Bti*) and Altocid® (methoprene) for mosquito control at the Stone Lakes NWR is not likely to adversely affect the vernal pool fairy shrimp, vernal pool tadpole shrimp, giant garter snake, valley elderberry longhorn beetle, Sacramento splittail, and delta smelt (SFWO file: 1-1-95-I-0680).
>
> NOTE: Although Altocid (methoprene) was authorized for use on the refuge in our March 27, 1995, letter, research has shown that this pesticide can have deleterious effects on vernal pool crustaceans. The use of methoprene, a growth hormone, may result in the delay of development of adult vernal pool crustaceans which may reduce the number of resting eggs (cysts) that are formed before the pools dry (Lawrenz 1984). Because of the effects of methoprene on vernal pool crustaceans and a lack of information on how long the agent remains in the soil, we wish to clarify that methoprene will not be used within vernal pools or swales at any time, in either wet or dry conditions. A buffer of at least 300 feet would separate vernal pools and swales from areas where methoprene would be used. As of this date, methoprene has never been used at the Refuge.
>
> May 25, 1995: The SFWO concurred with the determination that the use of Weedar 64® and Rodeo® to control water hyacinth was not likely to adversely affect the delta smelt, giant garter snake, and valley elderberry longhorn beetle, provided that mitigation measures identified in the letter were followed. These measures included: monitoring dissolved oxygen during water hyacinth die-off (for impacts to listed fish) and ceasing herbicide spray if the listed fish or giant garter snake were killed or harassed. For the valley elderberry longhorn beetle, if elderberry bushes were found in areas to be sprayed, the bushes would be flagged and avoided (SFWO file: 1-1-95-I-0903).
>
> July 26, 1995: The SFWO issued a biological opinion which resulted in a conservation

easement agreement to preserve and construct vernal pools as mitigation for the issuance of a 404 Permit for the Elliot Ranch South Project (AKT parcel). (SFWO file number 1-1-99-F-0118).

May 21 and June 10, 1996: The SFWO concurred that aerial spraying of the herbicide Rodeo for the control of water hyacinth was not likely to adversely affect the giant garter snake, valley elderberry longhorn beetle, delta smelt, or Sacramento splittail. To minimize drift of the herbicide, aerial applications were allowed only when wind speed was between 2 and 4 miles per hour. To prevent low dissolved oxygen levels caused by decomposing water hyacinth, no more than three contiguous acres would be treated at one time and 100 foot buffer strips would be left between treated sites. (SFWO files: FWS/EC96-040 and 1-1-96-I-640).

January 9, 1997: The SFWO concurred with the determination that the use of the bacterium *Bacillus sphaericus* for mosquito control, is not likely to adversely affect the vernal pool fairy shrimp, vernal pool tadpole shrimp, giant garter snake, valley elderberry longhorn beetle, delta smelt, or Sacramento splittail at the Stone Lakes NWR (SFWO file: 1-1-96-I-0639).

July 26, 1999: The SFWO amended biological opinion 1-1-99-F-0118, to further refine required mitigation measures for the Elliot Ranch South Project (AKT parcel).

More recently, the SWFO has reviewed the following routine Refuge operations:

January 31, 2001: The SFWO concurred that pest management activities at the Refuge are not likely to jeopardize the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole shrimp, or vernal pool fairy shrimp. (SFWO file:1-1-00-F-0162).
May 2, 2003: The SFWO concurred that the dredging of an existing channel that feeds water into permanent and seasonal wetlands on 457 acres would likely adversely affect, but would not jeopardize the giant garter snake. (SFWO file 1-1-03-F-0094).

July 16, 2003: The SFWO concurred that the mechanical shredding of water hyacinth was not likely to adversely affect the giant garter snake or the valley elderberry longhorn beetle. (SFWO file 1-1-03-I-2416).

January 3, 2005: The SFWO concurred that the Refuge waterfowl hunting program was not likely to adversely affect the giant garter snake, based on timing and monitoring efforts. (SFWO file 1-1-05-I-0323).

The Division of Endangered Species, Washington, D.C., consults annually on proposed Migratory Game Bird Hunting Regulations. The consultation addresses the effects to listed and proposed migratory birds of accidental shootings and potential lead poisoning through ingestion of lead shot. Listed migratory birds that occur on the Refuge that could be affected by Migratory Game Bird Hunting Regulations are the bald eagle.

August 24, 2005, the Service concluded that Migratory Game Bird Hunting Regulations are not likely to adversely affect the bald eagle. Because incidental take of listed migratory birds has already been addressed in the Migratory Game Bird Hunting Regulations consultation, the SFWO will only address the effects, if any, of the Refuge hunt program to other listed species.

Management Plans:

The National Wildlife Refuge System Improvement Act of 1997 mandates the preparation of CCPs for all wildlife refuges within 15 years, which is the purpose of this consultation.

Some projects or types of projects require more in-depth planning than the CCP process is designed

to provide. For these projects, the Refuge prepares step-down management plans. In essence, step-down management plans provide the additional planning details necessary to implement management strategies identified in a CCP. Refuge staff members have already completed a number of step-down plans. These include fire management, grazing, land protection, and the mosquito integrated pest management plans. The CCP proposes to include a volunteer and a comprehensive inventory and monitoring plan in the near future.

Programmatic Consultation Guidelines

This consultation covers the Refuges' CCP which includes habitat restoration, routine management, maintenance, and operations activities carried out by the Refuge. These activities and programs are described in the project description below. Those activities outside the scope described, such as further changes in refuge management plans or new refuge programs may require further review. Upon request of the Refuge, the SFWO may agree to append additional projects or activities to this consultation.

Implementing Procedure

Projects and activities covered under this opinion are those activities that are described in the CCP and include the day-to-day management of the Refuge. Such activities also include habitat manipulation and restoration, modifications of existing structures, and repair and maintenance of levees, roads, trails, utilities, etc. Projects that may require further review may include restoration plans for new acquisitions to the Refuge, significant changes in land use on refuges, or new programs proposed for implementation on the Refuge. The SFWO expects that such projects, new activities, or new programs would require review and documentation pursuant to the National Environmental Policy Act (NEPA), and believes it would be appropriate to review those projects to ensure they meet the scope of this consultation.

The following process will be used when reviewing additional proposed projects or programs for inclusion in this consultation:

1. The Refuge will submit a letter requesting that the proposed project be appended to this programmatic biological opinion and provide the SFWO with a biological assessment of the proposed action.

2. The SFWO will review the proposed project to determine: (1) the potential effects of the proposed project to listed species, (2) if it is appropriate to append the proposed project to this programmatic biological opinion, and/or (3) the proposed project should undergo a separate consultation.

3. Within 30 days, the SFWO will respond with an agreement to append the project to the programmatic consultation and/or with requests for information needed to complete a separate consultation. If additional consultation is necessary, the SFWO will initiate informal consultation upon receipt of a request from the Refuge and will contact the Refuge to request any additional information. Once the SWFO has received all the information necessary for consultation, we will initiate consultation.

BIOLOGICAL OPINION

Description of Management Area:

Introduction
Stone Lakes National Wildlife Refuge was established in 1994 becoming the 505th NWR. The refuge boundary encompasses 18,200 acres, including a core refuge of approximately 9,000 acres and a 9,000-acre "Cooperative Wildlife Management Area". Approximately 5,600 acres are currently managed by the Service. Stone Lakes NWR is located in the Sacramento Valley in the southwestern part of Sacramento County. The refuge lies about 10 miles south of Sacramento, straddling Interstate 5 from the town of Freeport south to Lost Slough.

Climate and Physiography
The Refuge lies between the Coast and Diablo Ranges to the west and the Sierra Nevada to the east. The Carquinez Strait provides a sea-level gap between the Coast Ranges and the Diablo Range. The Carquinez Strait is approximately 55 miles southwest of the refuge and the intervening terrain is mainly flat with rolling hills. Thus, this strait allows prevailing southerly winds from the coast to blow in. During winter, the sea breezes diminish and winds from the north occur more frequently. However, the winds from the south still predominate. Annual temperature in the area averages approximately 61.0 F degrees and annual precipitation averages approximately 17.93 inches. Tule fog is common in the winter.

Soils and Representative Vegetation
Seven general soil types are found within the Refuge: (1) Egbert clays and Valpac loams; (2) Gazwell mucky clays and Rindge muck and mucky loams; (3) Scribner clay loams, Sailboat and Cosumnes silt loams; (4) Columbia and Cosumnes sandy loams and silty loams; (5) Dierssen sandy clay loams and clay loams; (6) Clear Lake clays; and (7) San Joaquin sandy loams and silty loams.

The upland areas are dominated by introduced annual grasses interspersed with native perennial grasses and forbs. Valley oak savannah persists in well-drained alluvial soils which are not extensive within the refuge boundary. The understory typically supports annual grasses; however, moister soils support shrubs such as poison-oak and wild rose.

Riparian forests consist primarily of three types: (1) cottonwood riparian forests (2) mixed riparian forest, and (3) valley oak riparian forest. Cottonwood riparian forests occur along perennial streams where annual inundation occurs every spring, due to flooding. The forest canopy is dominated by Fremont cottonwood and Gooding's willow, typically draped with California grapevine. The understory often supports California box elder, California blackberry, white-stemmed raspberry, buttonbush, and elderberry. Mixed riparian forests occur where inundation frequency and duration are intermediate between cottonwood and valley oak riparian forests. Canopy dominants include Fremont cottonwood, valley oak, Gooding's willow, red willow, yellow willow, California black walnut, and California sycamore. Common understory dominants include California box elder, Oregon ash, poison-oak, and buttonbush. The California grape enveloping trees and shrubs often gives this forest a jungle-like appearance. The upper portion of the floodplain has less frequent inundation and supports the valley oak riparian forest. The dense forest canopy is dominated by valley oak with associated tree species of Oregon ash, California sycamore, and California black walnut. Understory vines and shrubs include California blackberry, poison-oak, and wild rose.

Description of the Proposed Action

Biological Surveys/Collections
Bird surveys including ground surveys of waterbirds, mist netting, banding and marking landbirds, sandhill crane surveys, and colonial water bird rookery counts may be conducted. Annual vegetation

monitoring, such as residual dry matter measurement, growing conditions, and surveys of vegetation type, is conducted in both managed wetlands and grasslands.

Scientific research on the Refuge is allowed on a case-by-case basis via a Special Use Permit (SUP). Historical research includes studies on the western pond turtle, yellow starthistle, sunflower parasitoids, and cattle grazing. Plant collections are allowed on the refuge for educational purposes (refuge herbarium), the California Indian Basketweavers Association, and for restoration and transplant purposes. Refuge staff is working on a proposal to do additional monitoring for the giant garter snake on the Refuge with the U.S. Geological Survey, Biological Resources Division.

Restoration Activities
Habitat restoration activities may include returning the land to its natural contours, installing water delivery and control structures, plantings, and removal or control of undesirable vegetation. Irrigation systems may be installed for riparian restoration. Native plant cultivation (native grasses, forbs, shrubs and trees) may be developed in refuge plant nurseries. Levee repair or levee and dike construction may be included in restoration activities. Wetland, riparian, and grassland restorations would be the most common type of restoration, although any suitable (Central Valley) natural plant community may be restored. Historical maps, aerial photographs, topography, hydrology, and soils will be assessed to determine the appropriate types of vegetation to be restored in a given area. Whenever possible, local plant strains (genotypes and phenotypes) will be used in restoration. A variety of heavy equipment (e.g., bottom scrapers, tractors, backhoes, etc.) could be used in the re-contouring of former agricultural lands, in the installation of pumps, pipelines, water control structures, and in the inundation of former agricultural land through pumping, weirs, and culverts.

Public Use
The Refuge will build and maintain facilities for hunting, fishing, wildlife observation, interpretation, education, and photography. Facilities will include hiking trails, parking areas, viewing platforms, boardwalks, boat-ramps, hunting and photo blinds, and interpretive structures. Boat-fishing and non-motorized boating is also permitted. Hunting will be allowed at South Stone Lake only on Wednesdays and Saturdays, the remainder of the Refuge will be reserved as a sanctuary.

Water Management Activities
Water management activities include managing the timing and duration of flood-up and drawdown for seasonal wetlands and summer irrigation to promote beneficial moist-soil vegetation. Water levels in permanent wetlands are maintained for resident wildlife and nesting bird species. Irrigation may occur to support riparian, grassland, and wetland restoration plantings.

Routine Maintenance
Routine maintenance includes the repair of levees, roads, ditches, and waterways; vegetation management by mowing, disking, burning, spraying, or grazing; and the maintenance of waterways, easements and roads by clearing silt, trees, and shrubs. Heavy equipment (e.g., tractors, backhoes, excavators, etc.) use may be required for routine maintenance, repairs, enhancement, and restoration projects.

Prescribed Livestock Grazing
Prescribed grazing may be used to promote native plant communities in vernal pools, seasonal wetlands, and on lakeshores, and to discourage the growth of non-native grasses, noxious weeds and other undesirable vegetation. Grazing related activities include installing and maintaining fences, gates, corrals, windmills, troughs, and irrigation systems. Pasture inspections via horse and/or ATV by the permit holder will occur on a regular basis. Grassland production estimates and residual dry matter will be assessed annually by Refuge staff to monitor grassland condition.

Animal Damage Control
Live trapping and euthanasia of beaver and muskrat will be conducted in selected areas where damage

to levees, roads, water control structures, and/or native plantings has occurred.

Special Use Permits
Research and other activities conducted by non-refuge personnel on the Refuge are governed by SUPs. SUPs are designed to allow appropriate activities while minimizing impacts to Refuge wildlife and habitats, with emphasis on avoidance of any sensitive areas or species. Research on listed species also requires a separate federal 10(a)(1)(A) recovery permit.

Herbicide/Pesticide Use
Invasive and noxious plant control efforts on the Refuge are a major part of habitat management. Current efforts include control and treatment of non-native aquatic and terrestrial vegetation such as water hyacinth, *Egeria densa,* and other submergents, perennial pepperweed, yellow starthistle, cocklebur, thistle species, giant cane, and others. Equipment used in the treatment of invasive plants includes boats, airboats, ATVs, truck-and-trailer, and handheld apparatus. Incidental take associated with these actions has been covered through the Section 7 process and this consultation and biological opinion is incorporated by reference. Various environmental data associated with this activity are collected for monitoring and management purposes (1-1-00-F-0162).

The Refuge is using the Weed Management Information System, developed by The Nature Conservancy. This information system is used to document the location of specific weed management treatments through the use of a Global Positioning System to determine the effectiveness of treatments.

All Refuge staff applying pesticides are required to have a California Qualified Applicator certificate. Refuge staff have received training in the identification of elderberry plants, the valley elderberry longhorn beetle, and the locations of vernal pools and giant garter snake habitat. Refuge staff have attended training held by the California Department of Boating and Waterways, which included training in the protocol to use if a giant garter snake is seen when applying herbicide.

Mosquito Abatement
The Refuge staff works closely with the Sacramento/Yolo Mosquito Vector Control District (SYMVCD) to reduce or eliminate mosquitoes on the Refuge. The Refuge entered into an MOU with SYMVCD in 1993. This MOU outlines an effective mosquito suppression program that includes biological and chemical controls to be used on the Refuge, wetland design and water level management recommendations, and research partnerships. The MOU is annually updated and renewed. Biological controls include the placement of mosquito fish and guppies in permanent and seasonal wetlands and the use of *Bti*, which is a very effective method for controlling mosquito larvae. All of the treatments over the past two years have been limited to biological control methods, although chemical controls are also an option if warranted. Chemicals to be used on the Refuge are approved by the Service prior to the mosquito season in early spring. These chemicals target larvae and adults and can include aerial applications, as well as ground application(s).

Fire Management
Prescribed burning of wetland and grassland habitats to remove excess vegetation, control non-native species, and maintain habitat value may occur. Brush pile burning and strip fires to reduce fuel load and the threat of wildfires and to reduce threats of fire along the urban interface may occur.

Goals of the Proposed Action

In addition to the management activities described above, the Refuge has identified a list of goals which are descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but do not define measurable units. Goals translate Refuge purposes into management direction. Each goal is supported by measurable, achievable objectives with specific strategies needed to accomplish them. These strategies are described in the CCP. Objectives are designed to

be accomplished within 15 years. Actual implementation, however, may vary as a result of available funding.

Goal 1. Conserve, enhance, restore, and manage Central Valley wetland, riparian, grassland, and other *native habitats to benefit their associated fish, wildlife, plants, and special status species.*

Objective 1.A. Within 15 years, plant a minimum of 65 acres of valley foothill riparian and oak woodland habitat with a canopy cover of 20-80% and a canopy height of 2-10 meters. These newly planted habitats would have a complex structure with a canopy, subcanopy, and understory shrub layer that would continue to mature after the lifetime of this CCP. An additional 40 acres of understory shrubs and herbaceous cover would be established in areas restored from 1995-1998. These restored habitats would provide breeding and migratory habitat for a variety of riparian dependent species which have been identified by the Central Valley Joint Venture as species of concern including: (1) yellow warbler, (2) song sparrow, (3) spotted towhee, (4) yellow breasted chat, (5) black headed grosbeak, and (6) common yellowthroat..

Objective 1.B: Maintain and manage on an annual basis, 425 acres of riparian and oak woodland habitat, consisting of 360 acres of existing habitat and 65 acres of restored habitat. This habitat encompasses riparian and oak woodland habitat in various successional stages comprising a complex structure with a canopy, subcanopy, and understory shrub layer (usually impenetrable). Restoration would occur through habitat manipulations, including vegetation control of invasive species and restoration of the subcanopy and understory shrub layer. These habitats provide breeding and migratory habitat for the following focal species for the Central Valley, as defined by the Central Valley Joint Venture (CVJV) (1) yellow warbler, (2) song sparrow, (3) spotted towhee, (4) yellow breasted chat, (5) black headed grosbeak, and (6) common yellowthroat. Furthermore, these riparian areas support heron and egret rookeries that vary in size from 10 to 50 nests.

Objective 1.C: Within five years, enhance and annually maintain approximately 50 acres of seasonal and permanent wetlands without water control structures on the 70-acre LIC tract of the South Stone Lake Unit by promoting the growth of wetland species such as swamp timothy, smartweeds, water grass, and associated invertebrate animals.

Objective 1.D.a: Manage on an annual basis, 529 acres as moist soil habitat, characterized by a plant composition of 50 percent or more moist soil, high-energy waterfowl plant foods (e.g. watergrass, swamp timothy, and smartweeds). Flood approximately 60 percent of the moist soil units to a depth of two to ten inches for dabbling ducks and shorebirds, and 40 percent to depths of six inches to three feet for diving ducks, grebes, pelicans, and other waterbirds.

Objective 1.D.b: Annually maintain 452 acres of seasonal wetlands with no water control structures, characterized by a plant composition of 50 percent or more of moist soil, high energy waterfowl plant foods interspersed with open water. Control undesirable vegetation such as cocklebur, pepperweed, and yellow starthistle, to benefit wintering and migratory waterfowl, as well as other wetland-dependent species.

Objective 1.D.c: Annually maintain 136 acres of vernal pool seasonal wetlands characterized by >70 percent native vernal pool vegetation.

Objective 1.E: Annually maintain 715 acres of deep-water wetlands (includes wetlands with and without water control capabilities), lakes, sloughs, and waterways, to provide breeding, foraging, and loafing habitat for waterfowl and other wetland dependent species, such as giant garter snakes and western pond turtles. Deep water wetlands are characterized by water depths of >3 feet with wetland plants species such as tules, cattails, burreed, and water primrose.

Objective 1.F: Manage and enhance approximately 1,900 acres of dry (non-irrigated) grasslands on

the North Stone Lake Unit on an annual basis, to provide a variety of grass heights and densities as measured by residual dry matter (RDM) at the end of the grazing season (Aug-Sept). The rotation of grazing pressure in the different pasture units will support a diversity of grassland dependent species including sandhill cranes, arctic nesting geese, raptors, shorebirds, and songbirds including the following species identified by the USFWS as species of conservation concern: sandhill crane, long-billed curlew.

Objective 1.G: Annually maintain 460 acres of irrigated pasture/wet meadow to provide habitat for a variety of grassland dependent species including sandhill crane, white faced ibis, long-billed curlew, and arctic nesting geese.

Objective 1.H: Restore approximately 30 acres to grassland habitat consisting of a minimum of 70 percent native grasses (*Stipa pulchra*, *Poa* spp., *Leymus* spp., *Elymus* spp., and *Mellica* spp.) on various Refuge units within ten years to promote biodiversity and improve the grassland communities on the Refuge.

Objective 1.I: Within 15 years, coordinate Refuge land conservation program to protect 75 percent of the land within the approved Refuge boundary to help achieve the CVJV regional habitat protection goals.

Objective 1.J: Coordinate Refuge habitat conservation with other private and public conservation efforts within the Sacramento-San Joaquin Delta to contribute to regional habitat conservation needs.

Objective 1.J.a: Manage Refuge floodplain lands in a manner consistent with local, State, and Federal flood management, sediment and erosion control, and water quality objectives as described in the Environmental Impact Statement associated with Refuge establishment.

Objective 1.J.b: Within 10 years of CCP approval, work toward achieving the water quality supply standard set forth by the U.S. Environmental Protection Agency, California Department of Fish and Game, and the Regional Water Quality Control Board, for wetlands and fish and wildlife resources.

Goal 2. Conserve, enhance, and restore high quality migrating, wintering, and breeding habitat for migratory birds within the Sacramento-San Joaquin Delta of the Central Valley.

Objective 2.A: Manage 2,950 acres of Refuge lands and work with adjacent landowners to protect agricultural lands and habitats that support a wintering population of 200-300 greater sandhill cranes and 200 lesser sandhill cranes from September through March. Shallow water will be maintained in irrigated pastures to provide roosting and foraging habitat; dry pastures, wheat, corn, and alfalfa fields will be sowed to provide foraging habitat.

Objective 2.B: Develop monitoring strategies for focal species identified in various regional bird conservation plans, to assess current and guide future habitat restoration activities. The regional plans include the following: *Central Valley Joint Venture Plan*, *Riparian Bird Conservation Plan*, *Grassland Bird Conservation Plan*, *Oak Woodland Bird Conservation Plan*, *North American Waterbird Conservation Plan*, *North American Waterfowl Management Plan,* and *North American Landbird Conservation Plan*. The Service's *Birds of Conservation Concern* are addressed within these various plans.

Goal 3. Provide visitors with wildlife-dependent recreation, interpretation, and educational opportunities which foster an understanding of the Refuge's unique wildlife and plant communities in an urban setting.

Objective 3.A: Recruit and maintain sufficient short and long term volunteers to accomplish habitat

restoration projects, wildlife surveys, and environmental education programs.

Objective 3.B: Construct adequate facilities and develop programs for the public to visit the Refuge seven days a week.

Objective 3.C: Within five years, develop an environmental education program with a target of providing 80 groups per year with an outdoor experience where visitors become aware of the Refuge's role in the conservation of Central Valley and Sacramento-San Joaquin Delta habitats and their fish and wildlife.

Objective 3.D: Within five years, develop two interpretive programs where visitors can learn of the Refuges' role in conserving the Central Valley and Sacramento-San Joaquin Delta habitats and their fish and wildlife with an emphasis on outdoor hands-on experiences.

Objective 3.E: Within five years, the Refuge will provide safe boat-only fishing with day-use parking facilities for approximately 20 boats on South Stone Lake, and approximately 10 boats on SP Cut from June through September.

Objective 3.F: Continue and expand the Refuge outreach program, targeting the local community and nontraditional users, by expanding partnerships for the annual "Walk on the Wildside" event. Participate in a minimum of four appropriate off-Refuge events to increase awareness of the Refuges' role in the conserving Central Valley and Sacramento-San Joaquin Delta habitats and their associated fish and wildlife.

Conservation Measures

Giant garter snakes

The Refuge will adhere to all guidelines listed in the Service's November 1997, *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (Thamnophis gigas) Habitat* and *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat*.

Avoidance measures for earth moving activities:

1. Earth moving activities will be restricted to May through October, during the majority of the giant garter snakes' active period when snakes are able to escape and avoid danger. During the giant garter snakes' inactive period (November 1 through April 1) some small-scale emergency levee repair may occur, but will usually be less than 20 linear feet.

2. All earth moving activities will occur within wetlands that have been drained. Because these drained wetlands will not provide foraging habitat, it is likely that giant garter snakes will not remain for extended periods after they are drained. This reduces the chance that any earth moving activities will harm or harass snakes. Drained areas will be dry for at least two weeks prior to earth moving activities. Drained areas also will be checked for ponded areas that may concentrate prey and become an attractant to giant garter snakes. Ponded areas will be avoided and surveyed for giant garter snakes before any activity occurs within them.

Avoidance measures for canal excavation/maintenance activities (including water control structure replacement):

1. Canal excavation will be performed only from May 1 to November 1.

2. Excavation will typically occur from only one side of the canal during a given year. When possible, one side of the canal will be left undisturbed indefinitely.

3. Excavation above the high flow watermark will be avoided whenever possible to minimize disturbance to burrows and retreat sites.

4. Vegetation on the tops and sides of canals will be left as undisturbed as possible.

Avoidance measures for vegetation management:

1. Roads adjacent to giant garter snake habitat will: a) not be mowed unless necessary for regular access; b) be mowed between March 1 and October 31; c) be mowed with mowers adjusted to leave no less than six inches of standing vegetation. These measures decrease the risk of injuring snakes and minimize loss and disturbance of vegetative cover.

2. Burning will be conducted during the spring, summer, and fall months on thoroughly dried wetlands or uplands. Where possible only one bank of vegetation will be subject to prescribed burns. Vegetation along canal banks will be left undisturbed as much as possible and fire crews will not reignite bank vegetation passed over by fire. Surveys for giant garter snakes will be conducted prior to burning, and any giant garter snakes observed within prescribed burn areas will be captured and relocated or attempts will be made to flush them away from areas where fire is likely to travel.

3. Disking will only take place during the giant garter snake active period. Disking will be conducted in dried wetlands or in uplands. Disking activities will be avoided directly adjacent to waterways and summer wetlands unless they have been allowed to dry. A 200 foot buffer between disking and wetlands or open water will be adhered to.

Habitat restoration and enhancement – The Refuge pursues fee title acquisition and cooperative management agreements for lands within or adjacent to existing refuge boundaries. Many restoration and enhancement projects have the potential to restore summer wetlands which provide giant garter snake habitat. The Refuge evaluates restoration projects to determine whether incorporation of essential habitat components for the giant garter snake is appropriate and feasible. Restoration activities generally require the same earth moving activities required for maintenance activities and would use the same conservation measures practiced for routine maintenance.

Maintenance and management changes – The Refuge is using several new techniques and materials to reduce the frequency of maintenance activities in wetlands and waterways. Over the next five years, the Refuge will replace corrugated metal water control structures with polyethylene and concrete structures. The new water control structures have a longer life expectancy (>30 years versus <10 years) and require less maintenance. Use of these structures will minimize the frequency of disturbance and risk of injury to giant garter snakes. In addition, rip-rap will be used to armor many of the structures, providing additional giant garter snake habitat and further minimizing maintenance needs.

Valley elderberry longhorn beetle

The Refuge will adhere to all guidelines listed in the Service's July 1999, *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*.

The Refuge avoids disturbance to elderberry shrubs whenever possible, trains field crews in elderberry plant identification, and follows the July 1999, *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* developed by the SFWO. When trimming elderberry shrubs that interfere with road and utility easements, trimming activities will be limited, whenever possible, to the dormant period for the beetle, November through mid February. The Refuge also actively plants elderberry plants as part of their riparian restoration activities.

Vernal pool species

Habitat management activities in vernal pool areas are limited to prescribed fire and grazing. The Refuge avoids intentionally flooding these areas and avoids/restricts equipment or vehicle traffic in these areas. Vernal pool fairy shrimp and vernal pool tadpole shrimp may be harmed, harassed, injured, or killed during surveys, monitoring, and management activities of vernal pool habitat. However, adherence to the April 1996, *Interim Survey Guidelines to Permittees for Recovery Permits Under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Brachiopods* will minimize the effects of surveys and monitoring activities on vernal pool crustaceans.
During prescribed burns, the following measures will be implemented: 1) vehicle traffic will not occur in vernal pool basins or within 20 feet of vernal pool basin perimeters; 2) only foot traffic and wheeled vehicles will be permitted in alkali meadow and vernal pool terrain; tracked equipment such as bulldozers will not be used in these areas; 3) firebreaks will not be disked or bladed in vernal pools. Fire breaks will be constructed in managed seasonal marshes bordering vernal pool areas, or at the edge of vernal pool areas (next to buildings, parking lots, levees, roads, or canals); 4) where possible, pre-existing or natural firebreaks will be used; and 5) wet lines and/or biodegradable foam will be used to create firebreaks where edge or natural features are absent.

Mosquito Control

Generally, naturally-functioning seasonal swales and vernal pools are not considered significant mosquito producing areas and should not require any chemical treatments. Furthermore, seasonal wetlands are usually dry by the onset of the primary mosquito production season (June 1). In the event mosquito control is necessary in any seasonal wetland, *Bti* would be used. The edge of man-made impoundments will be mowed and disked to discourage mosquito production. Mosquito fish are routinely introduced on the Lewis Property.

Mosquito control will follow an ordered succession, using nonchemical treatments first (i.e., water control strategies, *Bti*, etc.), resorting to chemical treatment only when necessary, as determined through standard mosquito monitoring procedures. Whenever possible, mosquito production areas will be treated with non-chemical treatments before larvacides or adulticides are applied. Wetlands that have produced large mosquito populations in the past will be flooded as quickly as possible to minimize multiple emergences that may cause a need for the use of adulticides. *Bti* will be used where it can be applied effectively. Dimilin (larvicide) would only be applied directly to water in actively-managed seasonal impoundments on the Lewis Property or the Beach Lake Mitigation Bank, not to vernal pool areas. The Sacramento-Yolo Mosquito and Vector Control District does not consider vernal pools to be mosquito production habitat because natural wetlands usually have enough natural predators (e.g., dragonfly larvae) to control mosquitoes without the use of larvicides.

If chemical treatments are necessary, adulticides will be used as a last resort after all larvicide options have been considered. The adulticide Trumpet EC will be applied by ultra-low volume (U.L.V.) cold-foggers from ground vehicles. To minimize pesticide drift when using adulticides and larvicides, dispersing vehicles will follow routes on existing roads set up to fog downwind or outside buffers of

91 meters (300 feet) from areas supporting listed or proposed special status species (vernal pool-alkali wetland habitats). All chemical applications will occur when wind speeds are between 2 and 8 mph. Specific information regarding application data for individual agents is provided in the current PUPs.

Habitat restoration programs

The Refuge participates in and implements the Central Valley Joint Venture Implementation Plan of the North American Waterfowl Management Plan; components of the Central Valley Project Improvement Act (CVPIA); and the Federal Native Plant Conservation Memorandum of Understanding. The Refuge participates in development and implementation of recovery plans for listed species.

Status of the Species/Environmental Baseline

Giant Garter Snake

The Service published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (56 **FR** 67046). The Service reevaluated the status of the snake before adopting the final rule. The snake was listed as a threatened species on October 20, 1993 (58 **FR** 54053). A draft giant garter snake recover plan was published in 1999 (Service 1999).

The giant garter snake is one of the largest garter snake species, reaching a total length of approximately 64 inches (162 centimeters). Females tend to be slightly longer and proportionately heavier than males. The weight of adult female snakes is typically 1.1-1.5 pounds (500-700 grams). Dorsal background coloration varies from brown to olive with a cream, yellow, or orange dorsal stripe and two light colored lateral stripes. Some individuals have a checkered pattern of black spots between the dorsal and lateral stripes. Background coloration and prominence of the checkered pattern and three yellow stripes are geographically and individually variable; individuals in the northern Sacramento Valley tend to be darker with more pronounced mid-dorsal and lateral stripes (Hansen 1980; Rossman et al. 1996). Ventral coloration is variable from cream to orange to olive-brown to pale blue with or without ventral markings (Hansen 1980).

Giant garter snakes formerly occurred throughout the wetlands that were extensive and widely distributed in the Sacramento and San Joaquin Valley floors of California (Fitch 1940; Hansen and Brode 1980; Rossman and Stewart 1987). The historical range of the snake is thought to have extended from the vicinity of Chico, Butte County, southward to Buena Vista Lake, near Bakersfield, in Kern County (Fitch 1940; Fox 1948; Hansen and Brode 1980; Rossman and Stewart 1987). Early collecting localities of the giant garter snake coincide with the distribution of large flood basins, particularly riparian marsh or slough habitats and associated tributary streams (Hansen and Brode 1980).

Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lake beds (Hansen 1980; Hansen and Brode 1980). By 1971, so much wetland habitat had been reclaimed, that the California Department of Fish and Game (CDFG) classified the giant garter snake as a rare animal and conducted a series of field surveys. The results of these surveys indicate that snake populations were distributed in marsh wetlands, tributary streams, and portions of the rice productions zones of the Sacramento Valley in Butte, Glenn, Colusa, Sutter, Yolo, and Sacramento Counties; in the Delta region along the eastern fringes of the Sacramento-San Joaquin River Delta in Solano, Contra Costa, Sacramento, and San Joaquin Counties; and in the San Joaquin Valley in San Joaquin, Stanislaus, Merced, Mendota, and Fresno Counties (Hansen 1988; Hansen and Brode 1980).

Upon federal listing in 1993, the Service identified 13 separate populations of giant garter snakes, with each population representing a cluster of discrete locality records (Service 1993). The 13 populations

largely coincide with historical flood basins and tributary streams throughout the Central Valley: (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin/Willow Slough, (6) Yolo Basin/Liberty Farms, (7) Sacramento Basin, (8) Badger Creek/Willow Creek, (9) Caldoni Marsh/ White Slough, (10) East Stockton--Diverting Canal & Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrel/Lanare.

A population is a group of organisms that interbreed and share a gene pool. The boundaries of a population, both in space and time, are generally not discrete and, in practice, as usually defined by the researcher (Krebbs 1994). The gene pool and breeding patterns of the 13 giant garter snake populations identified in the final rule remain unstudied and unknown. What was described as "13 populations" should therefore be described more accurately as sub-populations and occurrences that note observations of individuals about which much remains unknown (Service 1999).

Surveys over the last 25 years suggest that sub-populations of giant garter snake in the northern parts of its range (*i.e.,* Butte, Colusa, and Sutter Counties) are relatively large and stable (Wylie et al. 1997; Wylie et al. 2003a, 2004a). Habitat corridors connecting sub-populations, however, are either not present or not protected, and urban encroachment increases as a serious threat (Service 1999). Sub-populations in Yolo, Sacramento, Solano, and San Joaquin Counties areas are small, fragmented, and threatened by urbanization (Hansen 2004; Service 1999). Those sub-populations in the San Joaquin Valley, however, are most vulnerable having suffered near-devastating declines and possible extirpations over the last two decades (including populations in Stanislaus, Merced, Madera and Fresno Counties) (Dickert 2002, 2003; Hansen 1988; Williams and Wunderlich 2003). The southern sub-populations are extremely small, distributed discontinuously in isolated patches, and therefore are highly vulnerable to extinction by random environmental, demographic, and genetic processes (Goodman 1987a).

Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals, rice fields and the adjacent uplands (Service 1999). The snake feeds on small fishes, tadpoles, and frogs (Fitch 1941; Hansen 1988; Hansen and Brode 1980, 1993). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for over-wintering habitat with escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1988). Snakes are typically absent from larger rivers and other bodies of water that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen 1988; Hansen and Brode 1980; Rossman and Stewart 1987). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988).

Giant garter snakes are the most aquatic garter snake species and are active foragers, feeding primarily on aquatic prey such as fish and amphibians (Fitch 1941). Historically, giant garter snake prey likely consisted of Sacramento blackfish (*Orthodon microlepidots*), thick-tailed chub (*Gila crassicauda*), and red-legged frog (*Rana aurora*) (Rossman et al. 1996; Service 1999). Because these prey species are no longer available (chub extinct, red-legged frog extirpated from the Central Valley, blackfish declining) the predominant food items are now introduced species such as carp (*Cyprinus carpio*), mosquito-fish (*Gambusia affinis*), larval and sub-adult bullfrogs (*Rana catesbiana*), and Pacific chorus frogs (*Pseudacris regilla*) (Fitch 1941; Hansen and Brode 1993; Rossman et al. 1996).

The giant garter snake breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 individual young, with a mean of 23 individuals (Hansen and Hansen 1990). At birth, young average about 8.1 inches (20.6 centimeters) snout-to-vent length and 3 to 5 grams.

Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (Service 1993).

The giant garter snake is highly aquatic but also occupies a terrestrial niche (Service 1999; Wylie et al. 2004a). Aquatic habitat includes remnant native marshes and sloughs, restored wetlands, low gradient streams, and agricultural wetlands including rice fields and irrigation and drainage canals. Terrestrial habitat includes adjacent uplands which provide areas for basking, retreats, and over-wintering. Basking takes place in tules, cattails, saltbush, and shrubs over-hanging the water, patches of floating vegetation including waterweed, on rice checks, and on grassy banks (Service 1999). The snake typically inhabits small mammal burrows and other soil and/or rock crevices during the colder months of winter (*i.e.,* October to April) (Hansen and Brode 1993; Wylie et al. 1996; Wylie et al. 2003a). It also uses burrows as refuge from extreme heat during its active period (Wylie et al. 1997; Wylie et al. 2004a). While individuals usually remain in close proximity to wetland habitats, the Biological Resource Division of the U.S. Geological Survey (BRD) has documented snakes using burrows as much as 165 feet (50 meters) away from the marsh edge to escape extreme heat, and as far as 820 feet (250 meters) from the edge of marsh habitat for over-wintering habitat (Wylie et al. 1997). Snakes typically select burrows with sunny exposures along south and west facing slopes (Service 1993). In studies of marked snakes in the Natomas Basin, snakes moved about 0.25 to 0.5 miles (0.4 to 0.8 kilometers) per day (Hansen and Brode 1993). Home range (area of daily activity) averages about 0.1 mile^2 (25 hectares) in both the Natomas Basin and the Colusa National Wildlife Refuge (NWR) (Wylie 1998a; Wylie et al. 2002). Total activity, however, varies widely between individuals; individual snakes have been documented to move up to five miles (8 kilometers) over a few days in response to dewatering of habitat (Wylie et al. 1997) and to use up to eight miles (12.9 kilometers) of linear aquatic habitat over the course of a few months, and to have a home range as large as 14.5 miles^2 (3744 hectares) (Wylie and Martin 2004).

In agricultural areas, snakes were documented using rice fields in 19-20 percent of the observations, marsh habitat in 20-23 percent of observations, and canal and agricultural waterway habitats in 50-56 percent of the observations (Wylie 1998b). In the Natomas Basin, habitat used consisted almost entirely of irrigation ditches and established rice fields (Wylie 1998a; Wylie et al. 2004b). In the Colusa NWR, snakes were regularly found on or near edges of wetlands and ditches with vegetative cover (Wylie et al. 2003a). Telemetry studies also indicate that active snakes use uplands extensively; more than 31 percent of observations were in uplands (Wylie 1998b). Snakes observed in uplands during the active season were consistently near vegetative cover, particularly where cover exceeded 50 percent in the area within 1.6 feet (0.5 meter) of the snake (Wylie 1998b).

Snakes will move into restored habitat after two years. At the Colusa NWR, after two years, restoration area population estimates increased from 30 snakes per kilometer to 59-95 snakes per kilometer (Wylie et al. 2004a). At the Colusa Basin Drainage Canal, snakes were given three upland restoration treatments, 1) soil planted with native grasses over rock riprap, 2) soil planted with native grasses without rock, and 3) rock riprap only; snakes were most commonly found at the soil over rock riprap treatment (Wylie and Martin 2004).

Giant garter snakes are eaten by a variety of predators, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiansa*), bull frogs (*Rana catesbiana*), hawks (*Buteo* sp.), egrets (*Casmerodius albus, Egretta thula*), and great blue herons (*Ardea herodias*) (Dickert 2003; Service 1999; Wylie et al. 2003c). Many areas supporting snakes have been documented to have abundant predators; however, predation does not seem to be a limiting factor in areas that provide abundant cover, high concentrations of prey items, and connectivity to a permanent water source (Hansen and Brode 1993; Wylie et al. 1996).

The current distribution and abundance of the giant garter snake is much reduced from former times (Service 1999). Less than ten percent, or approximately 319,000 acres (129,000 hectares), of the historic 4.5 million acres (1.8 million hectares) of Central Valley wetlands remain (U.S. Department of

Interior 1994), of which very little provides habitat suitable for the giant garter snake. Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one-third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lakebeds (Hansen 1980; Hansen and Brode 1980). These lakebeds once supported vast expanses of ideal snake habitat, consisting of cattail and bulrush dominated marshes (Service 1999). Cattail and bulrush floodplain habitat also historically typified much of the Sacramento Valley (Hinds 1952). Prior to reclamation activities beginning in the mid- to late-1800s, about 60 percent of the Sacramento Valley was subject to seasonal overflow flooding providing expansive areas of snake habitat (Hinds 1952). Valley flood wetlands are now subject to cumulative effects of upstream watershed modifications, water storage and diversion projects, as well as urban and agricultural development.

The Central Valley Project (CVP), planned by the State of California, and built and operated by the Federal Bureau of Reclamation, is the largest water management system in California. CVP and the historic water development activities that preceded it have not only resulted in the loss of all but approximately ten percent of wetlands, they have created an ecosystem altered to such an extent that remaining wetlands, like agriculture, depend on managed water (U.S. Department of Interior 1994). The historic disturbance events associated with seasonal inundation that occur naturally in dynamic riverine, riparian, and wetland ecosystems have been largely eliminated. In addition to the highly managed water regimes, implementation of the CVP has resulted in conversion of native habitats to agriculture, and has facilitated urban development through the Central Valley (Service 1999). In 1992, Congress enacted the CVPIA, the concerns of which include pricing and management of Central Valley water and attempting to mitigate for project impacts on fish, wildlife, and associated habitat. CVPIA, however, has been largely ineffective thus far, addressing primarily only the water needs of publicly-owned wetlands, which account for less than one-fourth of the wetlands in the Central Valley (Service 1999).

Residential and commercial growth with the Central Valley is consuming an estimated 15,000 acres of Central Valley farmland each year (American Farmland Trust 1999). In the future, this transformation is expected to accelerate. Rice fields have become important habitat for giant garter snakes, particularly associated canals and their banks for both spring and summer active behavior and winter hibernation (Hansen 2004). While within the rice fields, snakes forage in the shallow water for prey, utilizing rice plants and vegetated berms dividing rice checks for shelter and basking sites (Hansen and Brode 1993). The loss of rice land resulting from residential and commercial growth compounds the impact of direct habitat loss resulting from development itself.

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminates or prevents the establishment of habitat characteristics required by snakes (Hansen 1988). Such practices can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the snake's food items (Hansen 1988; Brode and Hansen 1992). For example, tilling, grading, harvesting and mowing may kill or injure giant garter snakes (Service 1999; Wylie et al. 1997). Biocides applied to control aquatic vegetation reduce cover for the snake and may harm prey species (Wylie et al. 1996). Rodent control threatens the snake's upland estivation habitat (Wylie et al. 1996; Wylie et al. 2004a). Restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality (Wylie et al. 1997). Materials used in construction projects (e.g., erosion control netting) can entangle and kill snakes (Stuart et al. 2001). Livestock grazing along the edges of water sources degrades water quality and can contribute to the elimination and reduction of available quality snake habitat (Hansen 1988). Fluctuation in rice and agricultural production affects stability and availability of habitat (Wylie and Casazza 2001; Wylie et al. 2003b, 2004b).

Other land use practices also currently threaten the survival of the snake. Nonnative predators, including introduced predatory game fish, bullfrogs, and domestic cats, can threaten snake populations (Dickert 2003; Wylie et al. 1996; Wylie et al. 2003c). Nonnative competitors, such as the introduced water snake (*Nerodia fasciata*) in the American River and associated tributaries near Folsom, may also

threaten the giant garter snake (Stitt et al. 2005). Recreational activities, such as fishing, may disturb snakes and disrupt basking and foraging activities. While large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by the species. Degraded water quality continues to be a threat to the species both on and off refuges.

The disappearance of giant garter snakes from much of the west side of the San Joaquin Valley was approximately contemporaneous with the expansion of subsurface drainage systems in this area, providing circumstantial evidence that the resulting contamination of ditches and sloughs with drain water constituents (principally selenium) may have contributed to the demise of giant garter snake populations. Dietary uptake is the principle route of toxic exposure to selenium in wildlife, including giant garter snakes (Beckon et al. 2003). Many open ditches in the northern San Joaquin Valley carry subsurface drainwater with elevated concentrations of selenium. Green sunfish (*Lepomis cyanellus*) in this drainwater have been found to have concentrations of selenium ranging from 12 to 23 µp/g (Saiki 1998), within the range of concentrations associated with adverse affects on predator aquatic reptiles (Hopkins et al. 2002). Since 1996, subsurface drainwater has been discharged, via the Grassland Bypass Project into Mud Slough North, where selenium concentrations in small fish, including mosquito fish, frequently reach 10-15 µp/g (Beckon et al. 2003).

The Central Valley contains a number of endangered ecosystems due to its fertile soils, amiable climates, easy terrains, and other factors that historically have encouraged human settlement and exploitation (Noss et al. 2003). Environmental impacts associated with urbanization include loss of biodiversity and habitat, alternation of natural fire regimes, fragmentation of habitat from road construction, and degradation due to pollutants (Service 1999). Rapidly expanding cities within the snake's range include Chico, Yuba City, the Sacramento area, Galt, Stockton, Gustine, and Los Banos. The draft recovery plan for the snake subdivided its historic range into four recovery units (Service 1999). These are: (1) the Sacramento Valley unit, extending from the vicinity of Red Bluff south to the confluence of the Sacramento and Feather Rivers; (2) the Mid-Valley unit, extending from the American and Yolo Basins south to Duck Creek near the City of Stockton; (3) the San Joaquin Valley unit, extending south from Duck Creek to the Kings River; and (4) the South Valley unit, extending south from the Kings River to the Kern River Basin. The Refuge is located in the Mid-Valley unit.

Currently, only the Sacramento Valley Recovery Unit, at the northern end of the species' range, is known to support relatively large, stable populations of the snake. This unit contains three populations: Butte Basin, Colusa Basin, and Sutter Basin, which includes the Gilsizer Slough and Robbins area subpopulations. This recovery unit includes a large amount of suitable habitat, both in protected areas on state refuges and refuges of the Sacramento NWR Complex in the Colusa and Sutter Basins, and along waterways associated with rice farming (Service 1999). While populations within the unit have some protection on refuge and other public lands, such as the Colusa NWR, Delevan NWR, and Sutter NWR, snakes are subject to flooding and mortality from predatory fish and birds, vehicular traffic, agricultural practices, and maintenance of water channels. The populations within this unit are widely distributed and mostly restricted to unnatural agricultural delivery and drainage facilities associated with rice fields, and habitat corridors connecting populations or subpopulations are not present and/or protected.

The Mid-Valley Recovery Unit, directly to the south of the Sacramento Valley Recovery Unit, includes seven populations: American Basin, Yolo Basin-Willow Slough, Yolo Basin-Liberty Farms, Sacramento Area, Badger Creek/Willow Creek, Caldoni Marsh, and East Stockton. The status of the seven snake populations in the Mid-Valley Recovery Unit is very uncertain. The East Stockton population may be extirpated, and is not considered recoverable as a result of urban encroachment into habitat (Service 1999). Five of the remaining six populations within this recovery unit are very small, highly fragmented and isolated, and, except for the Badger Creek/Willow Creek population, are also threatened by urbanization. This latter population is within a small isolated area. Within this recovery unit, only the American Basin population supports a sizeable snake population, which is largely

dependent upon rice lands. The American
Basin population, although threatened by urban development, receives protection from the approved Metro Air Park HCP and the Natomas Basin HCP, which share a regional strategy to maintain a viable snake population in the basin.

The remaining two recovery units are located to the south in the San Joaquin Valley, where the best available data indicates that the snake's status is precarious. The San Joaquin Valley Recovery Unit contains three historic snake populations: North and South Grasslands; Mendota Area; and Burrell/ Lanare Area (Service 1999). This recovery unit formerly supported large snake populations, but numbers have declined severely in recent decades, and recent survey efforts indicate that numbers are very low compared to Sacramento Valley populations. No surviving snake populations are known from the fourth recovery unit, the South Valley Recovery Unit, at the southern end of the snake's historic range. This unit includes only extirpated populations, including the historic but lost habitats of Tulare Lake and Buena Vista Lake.

Since 1995, BRD has been studying life history and habitat requirements of the giant garter snake within a few of the 13 populations identified in the 1993 listing. BRD has studied snake sub-populations at the Sacramento, Delevan, and Colusa NWRs and in the Colusa Basin Drain within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Cosumnes River Preserve within the Badger Creek/Willow Creek area of the Delta Basin, and in the Natomas Basin within the American Basin (Hansen 2003, 2004; Wylie 1998a, 1998b, 2003; Wylie et al. 1996; Wylie et al. 2000; Wylie et al. 2002; Wylie et al. 2003a, 2004a; Wylie et al. 2003b, 2004b). These areas contain the largest extant giant garter snake sub-populations. However, outside of protected areas, snakes are still subject to all threats identified in the final rule. The other sub-populations are distributed discontinuously in small, isolated patches, and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes (Goodman 1987a).

Until recently, there were no post-1980 sightings of giant garter snakes from Stockton southward, and surveys of historic localities conducted in 1986 did not detect any snakes (Hansen 1988). Since 1995, however, surveys conducted by CDFG in cooperation with BRD around Los Banos and the Volta Wildlife Area in the Grasslands, and Mendota Wildlife Area in the Mendota Area have detected snakes, but in numbers much lower than those found in Sacramento Valley sub-populations (Dickert 2002, 2003; Williams and Wunderlich 2003; Wylie 1998a). The estimated total population size for the Volta Wildlife Area is 45 individuals, approximately only 5.6 snakes per mile (3.5 snakes per kilometer). Such low numbers are illustrative of a tenuously small snake population. Also, one-third of the giant garter snakes found had lumps on their bodies suggestive of a parasitic nematode infection (Dickert 2003); further study is underway. However, ten of the 31 snakes found in 2003 weighed less than 40 grams, indicating that giant garter snakes have been breeding at the Volta Wildlife Area. These results demonstrate that giant garter snakes are still extant in the northern San Joaquin Valley, but probably in extremely low numbers/densities. All sub-populations are isolated from each other with no protected dispersal corridors. Few opportunities for re-colonization of small sub-populations that may become extirpated exist given the isolation from larger populations and lack of dispersal corridors between them.

The draft recovery criteria require multiple, stable sub-populations within each of the three recovery units, with sub-populations well-connected by corridors of suitable habitat. This entails that corridors of suitable habitat between existing snake sub-populations be maintained or created to enhance sub-population interchange to offset threats to the species (Service 1999). Currently, only the Northern Sacramento Valley Recovery Unit is known to support relatively large, stable giant garter snake populations. Habitat corridors connecting sub-populations, even in the Northern Sacramento Valley Recovery Unit, are either not present or not protected. Overall, the future availability of habitat in the form of canals, ditches, and flooded fields are subject to

market-driven crop choices, agricultural practices, and urban development, and are, thus, uncertain and

unpredictable.

A number of State, local, private, and unrelated Federal actions have occurred within or near the action area, affecting the environmental baseline of the giant garter snake. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect effects to snake habitat within the region. Ongoing agricultural activities also affect the environmental baseline for the snake, and are largely not subject to section 7 consultation. Some agriculture, such as rice farming, can provide valuable seasonal foraging and upland habitat for the snake. Although rice fields and agricultural waterways can provide habitat for the snake, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and waterways can degrade snake habitat and increase the risk of snake mortality (Service 1999). Ongoing maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources for the snake, and can fragment existing habitat and prevent dispersal of snakes (Service 1999). Flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, and the rip-rapping of streams and canals (Service 1999). Numerous development projects have been constructed in or near snake habitat in this rapidly urbanizing area. Remaining populations are vulnerable to secondary effects of urbanization, such as increased predation by house cats and increased vehicular mortality. Most documented occurrences of giant garter snakes in this area of Sacramento County have been adversely impacted by development, including freeway construction, flood control projects, and commercial development.

Giant garter snakes have been documented on or adjacent to sites that will be affected by the proposed action. The snake has been documented at Beach Lake, South Stone Lake, Snodrass Slough, and along the Cosumnes River corridor, southwest of the refuge project boundary (California Natural Diversity Database 2005). These occurrences make up part of the Sacramento Basin subpopulation. A survey conducted by Dr. Glen Wylie, Biological Resources Division (BRD) of the U.S. Geological Survey, on SLNWR during the summer of 1997 and subsequent informal surveys by refuge staff have failed to document the presence of giant garter snake on the Refuge. However, these surveys were not conducted at a level of intensity sufficient to prove absence. Therefore, the current status of this species within the Refuge boundary and in the action area is unclear. Because the Refuge has little upland refugia, Dr. Wylie concluded that snake populations in the area may have been severely reduced by the prolonged flooding during January 1997, and that snake populations have not had sufficient time to recover. However, the Refuge contains suitable habitat to support the snake and provides the largest remaining parcel of snake habitat in this subpopulation.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle was federally listed as a threatened species on August 8, 1980 (Service 1980). Critical habitat for the beetle was designated on the same date. Two areas along the lower American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle–one along the American River at Goethe and Ancil Hoffman parks (American River Parkway Zone) about 10 miles upstream from the river's mouth and the second is at the Sacramento Zone, an area about 2 miles upstream from the river's mouth and about 0.5-mile northeast of the river's right-bank (downstream aspect) levee. In addition, an area along Putah Creek in Solano County and an area west of Nimbus Dam along the American River Parkway, Sacramento County are designated as essential habitat in the *Valley Elderberry Longhorn Beetle Recovery Plan* (Service 1984). Each of these areas is known to support large numbers of mature elderberry shrubs with evidence of beetle use.

The beetle depends on its host plant, the elderberry shrub (*Sambucu*s spp.). Elderberries are locally common components of the remaining riparian forest and savannah landscapes, and to a lesser extent the mixed chaparral-foothill woodlands, of the Central Valley. Use of elderberry shrubs plants by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by

the beetle is an exit hole created by the larva emerging just prior to the pupae stage. Observations of elderberry shrubs along the Cosumnes River and in the Folsom Lake area indicate that larval beetles can be found in elderberry stems with no apparent exit holes; the larvae either succumb prior to constructing an exit hole or are not developed sufficiently to construct one. Larvae appear to be distributed in stems which are one inch or greater in diameter at ground level and can occur within both living and dead stems. The *Valley Elderberry Longhorn Beetle Recovery Plan* (Service 1984) and Barr (1991) further describe the beetle's life history.

Beetle densities are probably naturally low (Service 1984); and it has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle is a poor disperser. Low density and limited dispersal capability result in high vulnerability to the negative effects of habitat fragmentation and the resulting isolation of small sub-populations.

When the beetle was initially listed as threatened, the species was known from less than ten localities along the American and Merced rivers, and Putah Creek. By completion of the *Valley Elderberry Longhorn Beetle Recovery Plan* in 1984, additional species localities had been found along the American River and Putah Creek. The California Natural Diversity Data Base (CNNDB 2005) records 191 occurrences for this species in 23 counties throughout the Central Valley, from a location along the Sacramento River in Shasta County southward to an area along Caliente Creek in Kern County. Although the beetle continues to be threatened by long-term habitat loss and fragmentation due to extensive urbanization and land-use conversions throughout its range, there are relatively new threats as well, including destruction by non-native Argentine ants (*Linepithema humile*), mortality due to pesticide drift, competition due to exotic plant invasions, and the various adverse effects arising from livestock grazing.

Habitat loss has been ranked as the single greatest threat to biodiversity in the United States (Wilcove et al. 1998). In the 1980 final rule to list the beetle as threatened, habitat destruction was cited as the primary factor contributing to the need to federally list the species. As described in the final rule, by the time the species was listed, its habitat had largely disappeared throughout much of its former range, due to such factors as agricultural conversions, levee construction, and stream channelization. The 1984 recovery plan reiterated the primary threats to the beetle as: loss and alteration of habitat by agricultural conversions; grazing; levee construction; stream and river channelization; removal of riparian vegetation; riprapping of shorelines; and recreational, industrial and urban development (Service 1984).

Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Katibah 1984; Thompson 1961; Roberts et al. 1977). Since human colonization, these forests have been "... modified with a rapidity and completeness matched in few parts of the United States" (Thompson 1961). As of 1849, the rivers and larger streams of the Central Valley were still largely undisturbed, supporting continuous bands of riparian woodland 4-5 miles in width along some major drainages such as the lower Sacramento River and generally about two miles wide along the lesser streams (Thompson 1961). Most of the riverine floodplains supported riparian vegetation to about the 100-year flood elevation level (Katibah 1984). A large human population influx after 1849, however, resulted in Central Valley riparian habitat being rapidly converted to agriculture and used as a source of wood for fuel and construction over a wide area (Thompson 1961). By 1868, riparian woodland had already been severely impacted in the Central Valley, as evidenced by the following excerpt:

> "This fine growth of timber which once graced our river (Sacramento), tempered the atmosphere, and gave protection to the adjoining plains from the sweeping winds, has entirely disappeared - the woodchopper's axe has stripped the river farms of nearly all the hard wood timber, and the owners are now obliged to rely upon the growth of willows for firewood." (Cronise 1868, *in* Thompson 1961).

The clearing of riparian forests for fuel and construction also made this land available for agriculture (Thompson 1977). Natural levees bordering the rivers, once supporting vast tracts of riparian habitat, became prime agricultural land (Thompson 1961, 1977). As agriculture expanded in the Central Valley, needs for increased water supply and flood protection spurred water development and reclamation projects. Artificial levees, river channelization, dam building, water diversion, and heavy groundwater pumping further reduced riparian habitat to small, isolated fragments (Katibah 1984). In recent decades, these riparian areas have continued in decline, as a result of ongoing agricultural conversion as well and urban development and stream channelization. As of 1989, there were over 100 dams within the Central Valley drainage basin and thousands of miles of water delivery canals and streambank flood control projects for irrigation, municipal and industrial water supplies; hydroelectric power; flood control; navigation; and recreation (Frayer et al. 1989). As a result, much of the riparian forests in the Central Valley have dwindled to discontinuous, unconnected narrow strips with widths measurable in feet compared to the former miles.

By some estimates the Sacramento Valley once supported about 775,000-800,000 acres of riparian forest as recently as 1848 (Smith 1977; Katibah 1984). No comparable estimates are available for the San Joaquin Valley. Based on early soil maps, more than 921,000 acres of riparian habitat are estimated to have been present throughout the Central Valley under pre-settlement conditions (Katibah 1984). Another source estimates that of approximately 5.0 million acres of wetlands in the Central Valley in the 1850s, about 1.6 million acres were riparian wetlands (Warner 1985; Frayer et al. 1989).

Based on a CDFG riparian vegetation distribution map, by 1979 there were about 102,000 acres of riparian vegetation remaining in the Central Valley. This represents a decline in acreage of about 89 percent as of 1979 (Katibah 1984). Significant losses were also estimated by Frayer et al. (1989), who reported that woody riparian forests in the Central Valley had declined to 34,600 acres by the mid-1980s (from 65,400 acres in 1939). These studies document the dramatic historic loss trend of riparian habitat in the Central Valley in general. Because elderberry shrubs are a key component of riparian habitat, it is a reasonable conclusion that loss of beetle habitat has been equally as dramatic.

A number of studies have focused on riparian loss along the Sacramento River, which supports some of the densest known populations of the beetle. About 98 percent of the middle Sacramento River's historic riparian vegetation is estimated to have been extirpated by 1977 (California Department of Water Resources, 1979). It has been estimated that native riparian habitat along the Sacramento River from Redding to Colusa decreased from 27,720 acres to 18,360 acres (34 percent) in just two decades from 1952 and 1972 (McGill 1975; Conrad et al. 1977). The average rate of riparian loss on the middle Sacramento River was 430 acres per year during this two-decade period and 410 acres per year from 1972 to 1977. In 1987, riparian areas as large as 180 acres were observed to have been converted to orchards along this river reach (McCarten and Patterson 1987).

There is no comparable information on the historic loss of beetle habitat in non-riparian situations, such as elderberry savanna and other vegetation communities where elderberry occurs (*e.g.*, oak or mixed chaparral-woodland, or grasslands, adjacent to riparian habitat). However, all natural habitats throughout the Central Valley have been heavily impacted within the last 200 years (Thompson 1961) and we can therefore assume that non-riparian beetle habitat also has suffered a widespread decline. This analysis focuses on loss of riparian habitat, because the beetle is primarily dependent upon riparian habitat. Nevertheless, adjacent upland areas are also likely to be important for the species, but this upland habitat typically consist of oak woodland or elderberry savanna bordering willow riparian habitat (Barr 1991). The riparian acreage figures given by Frayer et al. (1989) and Katibah (1984) included the oak woodlands concentrated along major drainages in the Central Valley and therefore probably included lands we would classify as upland habitat for the beetle adjacent to riparian drainages.

Between 1980 and 1995, the human population grew in the Central Valley by approximately 50 percent, while the remainder of California grew by 37 percent. The Central Valley's population totaled

4.7 million by 1999, and it is expected to more than double again by 2040. The American Farmland Trust estimates that by 2040 more than one million cultivated acres will be lost and 2.5 million more put at risk (Ritter 2000) through urbanization related to population growth. The rapidly expanding human population of the Central Valley will likely result in continued pressure on riparian habitat, related elderberry shrubs, and the beetle. As evidence, the SFWO presently receives a number of requests each month for consultation on the beetle under section 7 of the Endangered Species Act.

While habitat loss is clearly a large factor leading to the species decline, other factors may also pose significant long-term threats to the beetle's survival. Only about 20 percent of riparian sites with elderberries observed by Barr (1991) and Collinge et al. (2001) support beetle populations (Barr 1991; Collinge et al. 2001). Jones and Stokes (1988) found that only 65 percent of 4,800 riparian acres on the Sacramento River had evidence of beetle presence. The fact that a large percentage of apparently suitable habitat is unoccupied suggests that the beetle is limited by other factors such as its limited dispersal ability, habitat quality, or habitat fragmentation.

Massive destruction of riparian habitat in central California has clearly resulted in not only a loss of acreage, but severe habitat fragmentation. Fahrig (1997) indicated that habitat fragmentation becomes most important for those habitats that have suffered greater than 80 percent loss. Riparian habitat in the Central Valley, which has experienced greater than 90 percent loss by most estimates, exceeds this criterion. Existing data suggests that beetle populations are affected by such habitat fragmentation. Barr (1991) found that small, isolated habitat remnants were less likely to be occupied by beetles than larger patches, indicating that beetle sub-populations are often extirpated from small remaining habitat fragments. Moreover, Barr (1991) and Collinge et al. (2001) consistently found beetle exit holes occurring in clumps of elderberry bushes rather than isolated bushes, suggesting that isolated shrubs are less viable host habitat for this species.

Habitat fragmentation can be an important factor contributing to a species decline because: (1) it divides a large population into two or more small populations that become more vulnerable to direct loss, inbreeding depression, genetic drift, and other problems associated with small populations; (2) it limits a species potential for dispersal and colonization; and, (3) it makes habitat more vulnerable to outside influences by increasing the edge: interior ratio (Primack 1998).

Small, isolated sub-populations are susceptible to extirpation from random demographic, environmental or genetic events (Shaffer 1981, Lande 1988, Primack 1998). While a large area may support a single large population, the smaller sub-populations that result from habitat fragmentation may not be large enough to persist over the long-term. As a population becomes smaller, it tends to lose genetic variability through genetic drift, leading to inbreeding depression and a lack of adaptive flexibility. Smaller populations also become more vulnerable to random fluctuations in reproductive and mortality rates, and are more likely to be extirpated by random environmental factors.

Species that characteristically have small population sizes, such as large predators or habitat specialists, are more likely to become extinct than species that typically have large populations (Primack 1998). Also, a species with low population density (few individuals per unit area) tends to have only small populations remaining if its habitat is fragmented. Populations of species that naturally occur at lower density become extinct more rapidly than do those of more abundant species (Bolger et al. 1991). The species may be unable to persist within each fragment and thus gradually dies out across the landscape.

The beetle, a specialist on elderberry plants, tends to have small population sizes, and occurs in low densities (Barr 1991; Collinge et al. 2001). Collinge et al. (2001) compared resource use and density of exit holes between the beetle and a related subspecies, the California elderberry longhorn beetle (*Desmocerus californicus californicus*). The valley elderberry longhorn beetle tended to occur in areas with higher elderberry densities, but had lower exit hole densities than the California elderberry longhorn beetle. With extensive riparian habitat loss and fragmentation, these naturally small populations are broken into even smaller, isolated populations. Once a small population has been

extirpated from an isolated habitat patch, the species may be unable to re-colonize this patch. Insects with limited dispersal and colonization abilities may persist better in large habitat patches than small patches because small fragments may be insufficient to maintain viable populations and the insects may be unable to disperse to more suitable habitat (Collinge 1996).

Some studies suggest that the beetle is unable to recolonize drainages where the species has been extirpated, because of its limited dispersal ability (Huxel 2000; Barr 1991; Collinge et al. 2001). Huxel and Collinge (2001) used computer simulations of colonization and extinction patterns for the beetle based on differing dispersal distances and found that the short dispersal simulations best matched the 1997 census data in terms of site occupancy. This suggests that in natural-systems, dispersal recolonization is limited to nearby sites. At spatial scales greater than ten kilometers, such as across drainages, beetle occupancy appears to be strongly influenced by regional extinction and colonization processes, and colonization is constrained by limited dispersal (Collinge et al. 2001).

Except for one occasion, drainages examined by Barr (1991) that were occupied in 1991 remained occupied in 1997 (Collinge et al. 2001). The one exception was Stoney Creek, which was occupied in 1991, but not in 1997. All drainages found by Barr (1991) to be unoccupied in 1991 were also unoccupied in 1997. This data suggests that drainages unoccupied by the beetle remain unoccupied.

In addition, recent evidence indicates that the invasive Argentine ant poses a risk to the long-term survival of the beetle. Surveys along Putah Creek found beetle presence where Argentine ants were not present or had recently colonized, but the beetle was absence from otherwise suitable sites where Argentine ants had become well-established (Huxel 2000). The Argentine ant has already negatively impacted populations of other native arthropod species (Holway 1998; Ward 1987). Predation on eggs, larvae, and pupae are the most likely impacts these ants have on the beetle. In Portugal, Argentine ants have been found to be significant egg predators on the eucalyptus borer, a cerambycid similar to the beetle. Egg predation on the beetle could lead to local extirpations, as indicated by a population viability study suggesting that egg and juvenile mortality are significant factors affecting probability of extinction for the beetle (Huxel and Collinge, 2001). The Argentine ant has been expanding its range throughout California since its introduction around 1907, especially in riparian woodlands associated with perennial streams (Holway 1998; Ward 1987). Huxel (2000) concluded that, given the potential for Argentine ants to spread with the aid of human activities such as movement of plant nursery stock and agricultural products, this species may come to infest most drainages in the Central Valley along the valley floor, where the beetle is found.

Another potential harmful factor for the beetle is direct spraying with pesticides and related pesticide drift. A wide range of such spraying is done to control mosquitoes, crop diseases, and undesirable plants and insects. Although there have been no studies specifically focusing on the direct and indirect effects of pesticides on the beetle, evidence suggest that the species may be adversely affected by some pesticide applications. As of 1980, the prevalent land-use adjacent to riparian habitat in the Sacramento Valley was agriculture, even in regions where agriculture was historically not generally the most common land use (Katibah et al. 1984), therefore the species is likely vulnerable to pesticide contamination from an array of agricultural pesticide application practices. Recent studies of major rivers and streams documented that 96 percent of all fish, 100 percent of all surface water samples, and 33 percent of major aquifers contained one or more pesticides at detectable levels (Gilliom 1999). Pesticides were identified as one of the 15 leading causes of impairment for streams included on the Clean Water Act section 303(d) lists of impaired waters. Because the beetle occurs primarily in riparian habitat, the contamination of rivers and streams likely has affects on this species and its habitat. Pesticides have been identified as one of a number of potential causes of the decline of pollinator species and other insects beneficial to agriculture (Ingraham et al. 1996); therefore, it is likely that the beetle, typically occurring adjacent to agricultural lands, is adversely affected by the use of pesticides.

Also, competition from invasive exotic plants, such as giant reed (*Arundo donax*), negatively affects riparian habitat supporting the beetle. Giant reed, a native of Asia, has become a serious problem in

California riparian habitats, forming dense, homogenous stands essentially devoid of wildlife. Giant reed can grow up to 2.5 inches per day and yield 8.3 tons of oven-dry cane per acre; it also tolerates drought, floods, and extreme temperatures, and is not significantly affected by insects, disease, herbivory, fire, or mechanical disturbance. It has an extensive root system allowing it to resprout rapidly after any disturbance and it easily out-competes native riparian vegetation. Giant reed also introduces a frequent fire cycle into the riparian ecosystem, disrupting natural riparian dynamics and eventually forming homogenous climax communities. Although giant reed has become extensively distributed throughout the Central Valley and along its waterways, the extent to which it has negatively affected elderberries and the beetle is not specifically known.

Another potential factor in the decline of the beetle is the effects of adverse livestock grazing practices, which can result in the destruction of entire elderberry plants and inhibition of elderberry regeneration. Cattle, sheep, and goats readily forage on new elderberry growth, and goats will consume even decadent growth. Well-manicured stands of elderberries, which often occur due to livestock grazing, have generally been shown to have a relative absence of beetles (Service 1984). The effects on the beetle of both grazing and exotic plant invasions are likely significantly exacerbated by the problem of habitat fragmentation of elderberries. Such fragmentation increases the edge: interior ratio of habitat patches, thereby facilitating the adverse effects of these outside influences.

The beetle has been recorded adjacent to the Refuge boundary, along the Cosumnes River corridor (Tom Harvey, pers. comm.). The beetle occurs in elderberry shrubs in riparian habitats and in open savannahs with oaks and cottonwoods. Biannual surveys have been conducted on the elderberries on the Beach Lake Unit, and no exit holes have been confirmed to date. The majority of elderberries on the Refuge (95%) are less than 3 years old and are not of a sufficient size for the beetles. Elderberry shrubs have been introduced on the Refuge in two locations; on the Lewis property and near an abandoned homestead on the North Stone Lake property. To date, the beetle has not been recorded within the Refuge; however, suitable habitat exists within the boundary at the Bufferlands for the Sacramento Regional Wastewater Treatment Plant, at North and South Stone Lakes, and along Snodgrass Slough.

Vernal Pool Tadpole Shrimp and Vernal Pool Fairy Shrimp

The vernal pool tadpole shrimp and vernal pool fairy shrimp were listed as endangered and threatened, respectively, on September 19, 1994 (Service 1994). The final rule to designate critical habitat for 15 vernal pool species, including two crustaceans, was published on August 6, 2003 (Service 2003), with further clarifications on critical habitat designations for listed vernal pool species published in an August 11, 2005, final rule (Service 2005). Further information on the life history and ecology of the vernal pool fairy shrimp and vernal pool tadpole shrimp may be found in the final listing rule, the final rule to designate critical habitat, Eng et al. (1990), Helm (1998), and Simovich et al. (1992), and the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). Critical habitat for vernal pool crustaceans is not present on the Refuge.

The vernal pool tadpole shrimp has dorsal compound eyes, an approximately one-inch long large shield-like carapace that covers most of its body, and a pair of long cercopods at the end of its last abdominal segment (Linder 1952; Longhurst 1955; Pennak 1989). It is primarily a benthic animal that swims with its legs down. Vernal pool tadpole shrimp climb or scramble over objects, and plow along bottom sediments as they forage for food. Its diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Pennak 1989; Fryer 1987). The females deposit their eggs on vegetation and other objects on the pool bottom. Tadpole shrimp eggs are known as cysts, and during the dry months of the year, they lie dormant in the dry pool sediments (Lanaway 1974; Ahl 1991).

The life history of the vernal pool tadpole shrimp is linked to the environmental characteristics of its vernal pool habitat. After winter rains fill the pools, its dormant cysts may hatch in as little as four days (Ahl 1991, Rogers 2001), and the animals may become sexually mature within three to four weeks

after hatching (Ahl 1991; Helm 1998; King 1996). A portion of the cysts hatch immediately and the rest remain dormant in the soil to hatch during later rainy seasons (Ahl 1991). The vernal pool tadpole shrimp is a relatively long-lived species (Ahl 1991), and will generally survive for as long as its habitat remains inundated, sometimes for six months or more (Ahl 1991; Gallagher 1996; Helm 1998). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991; Gallagher 1996; Simovich et al. 1992).

Vernal pool tadpole shrimp are found only in ephemeral freshwater habitats, including alkaline pools, clay flats, vernal lakes, vernal pools, vernal swales, and other seasonal wetlands in California (Helm 1998). The vernal pool tadpole shrimp is known from 221 occurrences in the Central Valley (CNDDB 2005), ranging from east of Redding in Shasta County south to Fresno County, and from a single vernal pool complex located in the San Francisco Bay National Wildlife Refuge in Alameda County. It inhabits vernal pools containing clear to highly turbid water, ranging in size from 54 square feet in the Mather Air Force Base area of Sacramento County, to the 89-acre Olcott Lake at Jepson Prairie in Solano County; the potential ponding depth of occupied habitat ranges from 1.5 inches to 59 inches. Although vernal pool tadpole shrimp are found on a variety of geologic formations and soil types, Helm (1998) found that over 50 percent of vernal pool tadpole shrimp occurrences were on High Terrace landforms and Redding and Corning soils. Vernal pool tadpole shrimp are uncommon even where vernal pool habitat occurs (Service 2005). The largest concentration of vernal pool tadpole shrimp occurrences are found in the Southeastern Sacramento Valley Vernal Pool Region, as defined in the Service's *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (2005). In this vernal pool region, this species occurs on a number of public and private lands in Sacramento County, and from a few locations in Yuba and Placer Counties, including Beale Air Force Base.

Vernal pool fairy shrimp have delicate elongate bodies, large stalked compound eyes, no carapace, and 11 pairs of phyllopods, or gill-like structures that also serve as legs. Typically less than one-inch long, they swim or glide gracefully upside-down by means of complex, wavelike beating movements. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and detritus. The second pair of antennae in adult male fairy shrimp are greatly enlarged and specialized for clasping the females during copulation. The females carry eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The dormant cysts are capable of withstanding heat, cold, and prolonged desiccation, and they can remain viable in the soil for decades after deposition. When the pools refill in the same or subsequent seasons, some, but not all, of the cysts may hatch. The cyst bank in the soil may therefore be comprised of cysts from several years of breeding (Donald 1983). The early stages of the fairy shrimp develop rapidly into adults and may become sexually mature within two weeks after hatching (Gallagher 1996; Helm 1998). Such quick maturation permits populations to persist in short-lived shallow bodies of water (Simovich et al. 1992). In pools that persist for several weeks to a few months, fairy shrimp may have multiple hatches during a single season (Helm 1998; Gallagher 1996).

Vernal pool fairy shrimp are found only in ephemeral freshwater habitats, including alkaline pools, ephemeral drainages, rock outcrop pools, vernal pools, and vernal swales in California and Southern Oregon (Eriksen and Belk 1999). Occupied habitats range in size from rock outcrop pools as small as 11 square feet to large vernal pools up to 12 acres; the potential ponding depth of occupied habitat ranges from 1.2 inches to 48 inches.

The vernal pool fairy shrimp is known from 372 occurrences extending from the Stillwater Plain in Shasta County through most of the length of the Central Valley to Pinnacles in San Benito County (Eng et al. 1990; Fugate 1992; Sugnet and Associates 1993; CNDDB 2005). Five additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County; one in the mountain grasslands of northern Santa Barbara County; one on the Santa Rosa Plateau in Riverside County; one near Rancho California in Riverside County; and one on the Agate Desert near Medford, Oregon (CNDDB 2005; Helm 1998; Eriksen and Belk 1999; Service 2003). Three of these isolated populations each contain only a single pool known to be occupied by the vernal pool fairy shrimp. Although the vernal pool

fairy shrimp is distributed more widely than most other fairy shrimp species, it is generally uncommon throughout its range and rarely abundant where it does occur (Eng et al. 1990; Eriksen and Belk 1999). The greatest number occurrences of the vernal pool fairy shrimp are in the Southeastern Sacramento Vernal Pool Region (Service 2005), where it is found in scattered vernal pool habitats in Placer, Sacramento, and San Joaquin Counties, in the vicinity of Beale Air Force Base in Yuba County, and at a single location in El Dorado County.

Although the vernal pool fairy shrimp and the vernal pool tadpole shrimp are not often found in the same vernal pool at the same time, when coexistence does occur, it is generally in deeper, longer lived pools (Eng et al. 1990; Thiery 1991; Gallagher 1996). In larger pools, vernal pool crustacean species may be able to coexist by utilizing different physical portions of the vernal pool or by eating different food sources (Daborn 1978; Mura 1991; Thiery 1991), or by hatching at different temperatures or developing at different rates (Thiery 1991; Hathaway and Simovich 1996).

The primary historic large-scale dispersal method for the vernal pool tadpole shrimp and vernal pool fairy shrimp likely was large scale flooding resulting from winter and spring rains which allowed colonization of different individual vernal pools and other vernal pool complexes (King 1996). This dispersal is currently non-functional due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds may now be the primary dispersal agents for vernal pool tadpole shrimp and vernal pool fairy shrimp (King 1996; Simovich et al. 1992). The eggs of these branchiopods are either ingested (Krapu 1974; Swanson et al. 1974; Driver 1981; Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats. Cysts may also be dispersed by a number of other species, such as cattle and humans (Eriksen and Belk 1999).

At the local level, vernal pool crustaceans are often dispersed from one pool to another through surface swales that connect one vernal pool to another. These dispersal events allow for genetic exchange between pools and create a population of animals that extends beyond the boundaries of a single pool. These dispersal events also allow vernal pool crustaceans to move into pools with a range of sizes and depths. In dry years, vernal pool crustaceans may only hatch in the largest and deepest pools. In wet years, vernal pool crustaceans may be present in all pools. The movement of vernal pool crustaceans into vernal pools of different sizes and depths allows these species to survive the environmental variability that is characteristic of their habitats.

The genetic characteristics of these species, as well as ecological conditions, such as watershed continuity, indicate that populations of vernal pool crustaceans are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes. The pools and, in some cases, pool complexes supporting these species may be small. Human-caused and unforeseen natural catastrophic events such as long-term drought, non-native predators, off-road vehicles, pollution, berming, and urban development, threaten their extirpation at some sites. Vernal pool fairy shrimp and vernal pool tadpole shrimp continue to be threatened by all of the factors which led to the original listing of this species, primarily habitat loss through agricultural conversion and urbanization (Service 2005).

The vernal pool tadpole shrimp and vernal pool fairy shrimp are imperiled by a variety of human-caused activities. Their habitats have been lost through direct destruction and modification due to filling, grading, disking, leveling, and other activities. In addition, vernal pools have been imperiled by a variety of anthropogenic modifications to upland habitats and watersheds. These activities, primarily urban development, water supply/flood control projects, land conversion for agriculture, off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use can lead to disturbance of natural flood regimes, changes in water table depth, alterations of the timing and duration of vernal pool inundation, introduction of non-native plants and animals, and water pollution. These can result in adverse effects to vernal pool species. In addition to direct loss, the habitats of the vernal pool tadpole

shrimp and the vernal pool fairy shrimp have been and continue to be highly fragmented throughout their ranges due to conversion of natural habitat for urban and agricultural uses. Fragmentation results in smaller isolated shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soulé 1988; Goodman 1987a, 1987b). If an extirpation event occurs in a population that has been fragmented, the opportunities for re-colonization would be greatly reduced due to geographic isolation from other source populations.

Historically, vernal pools and vernal pool complexes occurred extensively throughout the Sacramento Valley of California. However, conversion of vernal pools and vernal pool complexes has resulted in a 91 percent loss of vernal pool resources in California (State of California 2003d). By 1973, between 60 and 85 percent of the area within the Central Valley that once supported vernal pools had been destroyed (Holland 1978). In subsequent years, threats to this habitat type have continued and resulted in a substantial amount of vernal pool habitat being converted for human uses in spite of Federal regulations implemented to protect wetlands. The U.S. Army Corps of Engineers (Corps) Sacramento District has several thousand vernal pools under its jurisdiction (Coe 1988), which includes most of the known populations of these listed species. Between 1987 and 1992, 467 acres of wetlands within the Sacramento area were filled pursuant to the Corps' Nationwide Permit 26 (Service 1992). A majority of those wetland losses involved vernal pools, the endemic habitat of the vernal pool tadpole shrimp and the vernal pool fairy shrimp. King (1996) has estimated that approximately 15 to 33 percent of the original biodiversity of Central Valley vernal pool crustaceans has been lost since the 1800s. It is estimated that within 20 years human activities will destroy 60 to 70 percent of the remaining vernal pools (Coe 1988).

Sacramento County represents important, high quality habitat for the vernal pool tadpole shrimp and vernal pool fairy shrimp by providing large, nearly contiguous areas of relatively undisturbed vernal pool habitat. Sacramento County contains the greatest number of occurrences of vernal pool tadpole shrimp and also is one of the two counties with the greatest number of occurrences of vernal pool fairy shrimp. Sacramento County contains 60 (16 percent) out of the total of 372 reported occurrences of vernal pool fairy shrimp, and 60 (27 percent) out of the total of 221 reported occurrences of vernal pool tadpole shrimp (CNDDB 2005). Sugnet and Associates (1993) reported that of 3,092 "discrete populations" checked, only 345 locations, or about 11 percent of all locations checked, were found to support the vernal pool tadpole shrimp. Of these 345 locations supporting the vernal pool tadpole shrimp, 219 (63 percent) were in Sacramento County. Further, of the 3,092 locations checked, 178 locations (6 percent) were found to support the vernal pool fairy shrimp. Of this total, 63 locations (35 percent) were within Sacramento County.

Throughout the Central Valley, approximately 13,000 acres of vernal pool habitats, including mitigation banks, have been set aside for the vernal pool fairy shrimp specifically as terms and conditions of section 7 consultations (Service 2005). In the Southeastern Sacramento Valley Vernal Pool Region, vernal pool fairy shrimp occurrences are protected from development at a number of private mitigation areas, compensation banks, private ranches with conservation easements, and the Beale Air Force Base in Yuba County. Very few actions have been taken specifically to benefit the vernal pool tadpole shrimp, although several Habitat Conservation Plans are developing vernal pool conservation plans in the region, including Sacramento and Placer Counties (Service 2005).

The vernal pool tadpole shrimp and vernal pool fairy shrimp are imperiled by a variety of human-caused activities. Their habitats have been lost through direct destruction and modification due to filling, grading, disking, leveling, and other activities. In addition, vernal pools have been imperiled by a variety of anthropogenic modifications to upland habitats and watersheds. These activities, primarily urban development, water supply/flood control projects, land conversion for agriculture, off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use, can lead to disturbance of natural flood regimes, changes in water table depth, alterations of the timing and duration of vernal pool inundation, introduction of non-native plants and animals, and water pollution. These indirect

effects can result in adverse effects to vernal pool species.

The actions listed above have resulted in both direct and indirect impacts to vernal pools within the region, and have contributed to the loss of vernal pool tadpole shrimp and vernal pool fairy shrimp populations. Although a reduction of the two shrimp populations has not been quantified, the acreage of lost habitat continues to grow. On-going residential and commercial developments within the Sacramento County also affect the listed vernal pool crustaceans and their habitats. Human population growth in Sacramento County has steadily increased. For the period between 1990 and 2000, population growth in Sacramento County increased 17.5 percent, with an average annual growth rate of 17.5 percent (State of California 2002). This annual growth appears to be increasing, as demonstrated by the 2.63 percent and 2.2 percent increases in population growth in 2001 and 2002, respectively (State of California 2003, 2003b). Increased housing demand and urban development accompany the population growth in Sacramento County. Between 1990 and 2000, housing units in Sacramento County increased by 1.37 percent annually (State of California 2000, 2003c). Population growth and concomitant housing demand and subsequent vernal pool resource development are projected to continue. Population projections for Sacramento County are expected to increase above 2000 levels by 19.7 percent in 2010, by 28 percent in 2015, and by 37.5 percent in 2020 (State of California 2001).

A number of State, local, private, and unrelated Federal actions have occurred within the project area and adjacent region affecting the environmental baseline of these species. Some of these projects have been subject to prior section 7 consultation. Based on an informal review, the Service has issued approximately 177 biological opinions to Federal agencies on proposed projects in Sacramento County that have adversely affected the shrimp species since the two species were proposed to be listed in 1994. This total does not reflect the formal consultations that were withdrawn, those that were suspended, and those that have insufficient information to conclude an effects analysis, those that were amended, or ones that the Service issued a conference opinion. No State of California actions that have taken place within Sacramento County have adversely affected the species in the action area. Although these proposed projects in Sacramento County have eliminated vernal pools and vernal pool complexes, the associated conservation measures are designed to minimize the effects of proposed projects to these species. Thus, the trend for the two vernal pool crustaceans within Sacramento County is most likely downward.

Of the 136.5 acres of vernal pools that exist on Refuge managed lands, 16.5 acres, (12%) of vernal pools on the Refuge are naturally occurring pools, the rest are man-made mitigation pools (88%). The Wetland Preserve Unit, formerly known as AKT, contains 133.5 acres or 98% of vernal pools, and is managed under a conservation easement (SFWO file number 1-1-99-F-0118). This easement has periodically been surveyed (as required in the biological opinion) for vernal pool and other species for ten years, and vernal pool tadpole shrimp and vernal pool fairy shrimp have been documented within the easement area. Vernal pool fairy shrimp and vernal pool tadpole shrimp have also been documented in swales on the north Stone Lakes Unit. However, vernal pool crustaceans and other vernal pools species could potentially occur in any of the vernal pools, sloughs, or other passive seasonal wetlands managed by the Refuge.

Effects of the Proposed Action

Giant garter snake

Refuge activities, particularly construction activities (e.g., facilities construction and maintenance, habitat restoration), occurring in giant garter snake habitat may disturb, harass, injure, or kill giant garter snakes. Construction activities may remove vegetative cover and basking sites, fill or crush burrows, and decrease the prey base. Temporary dewatering of portions of canals or fields may temporarily remove giant garter snake habitat and may obstruct movement. Snakes may be killed or

injured by construction equipment or other vehicles accessing the construction site. Disturbance from construction activities may also cause snakes to temporarily move into areas of unsuitable habitat where they may be more prone to higher rates of mortality from predation. Snakes may also be killed or injured by refuge, research, and visitor vehicles. Although operations and maintenance activities have the potential to harm individual giant garter snakes and cause short-term habitat alteration, there are long-term benefits to giant garter snakes due to increasing wetland acreage and riparian habitat and maintaining canals and wetlands.

Recreational activities, such as fishing and hunting, may disturb snakes and disrupt basking and foraging activities. Increased vehicle use in giant garter snake habitat may harass, injure, or kill giant garter snakes. Vehicles will be used primarily on existing roads; therefore, harassment, injury, or mortality from vehicle use would occur only if snakes are in the roadway. Regarding the effects of the proposed use of pesticides, a Service-sponsored study indicated that the short-term effects of adulticides approved for mosquito control on the Refuge did not significantly reduce abundance or biomass of the snake's prey items, macro-invertebrates and fish, in treated wetlands (Lawler *et al.* 1997). However, no information is available on the toxicity of pesticides directly to the giant garter snake. Without further information, it must be assumed that exposure of giant garter snakes to these chemicals could result in direct impacts, such as lethal or sub lethal effects to individual animals.

Valley elderberry longhorn beetle

The beetle has not been documented on the Refuge; however, it has been found adjacent to the refuge boundary along the Cosumnes River corridor and may be present in elderberry shrubs within the refuge boundary. The beetle and its habitat, the elderberry shrubs, may be affected by the proposed herbicides or pesticides if the chemicals come in contact with elderberry shrubs either by direct or indirect (drift, treated water inundation) contact.

Though there are no documented occurrences of the beetle on the Refuge, however elderberry bushes are present. All existing elderberry shrubs are mapped and avoided during application of herbicides intended to control invasive weeds. The number of elderberry shrubs on the Refuge is small and relatively easy to avoid during the proposed pest management activities. The Refuge has planted and/or maintained over 75 blue elderberries that may provide habitat for the Valley elderberry longhorn beetle. Plans for the Headquarters Unit include approximately 50 additional elderberry plants.

Management and restoration of riparian areas on the Refuge are expected to benefit the valley elderberry longhorn beetle. The SFWO expects that Refuge staff may remove or transplant a small number of shrubs. However, the Refuge has proposed to implement all guidelines listed in the Service's July 1999, *Conservation Guidelines for the Valley Elderberry Longhorn Beetle,* therefore, potential adverse effects to the beetle and elderberry shrubs will be minimized. Trimming of elderberry shrubs that interfere with road and utility easements will be limited to the dormant period for the beetle whenever possible, thus minimizing the potential for take of the beetle.

Vernal pool fairy shrimp and vernal pool tadpole shrimp

Vernal pool fairy shrimp and vernal pool tadpole shrimp may be harmed, harassed, injured, or killed during surveys, monitoring, and management activities of vernal pool habitat. However, adherence to survey guidelines for vernal pool crustaceans will minimize the effects of surveys and monitoring activities on vernal pool crustaceans. The Refuge expects that information on presence and distribution of vernal pool crustaceans will assist the Refuge in improving management of vernal pool habitats.

Management of vernal pools using prescribed fire and grazing is expected to benefit vernal pool

habitat by controlling proliferation of exotic plants. However, the effect of fire and grazing on vernal pool crustaceans is poorly known. It is expected that the use of fire and grazing may result in some disturbance and loss of cysts while benefiting and improving the long-term viability of vernal pool communities.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Our agency is aware of other projects currently under review by State, county, and local authorities where biological surveys have documented the occurrence of several listed species covered by this opinion. Projects under review include such actions as urban expansion, road improvement projects, water transfers that may not have a Federal nexus, and continued agricultural development. The cumulative effects of these known actions could pose a threat to the eventual recovery of the giant garter snake, valley elderberry longhorn beetle, and the vernal pool crustaceans.
An undetermined number of future land use conversions and routine agricultural practices are not subject to Federal permitting processes and may alter habitat or increase incidental take of giant garter snakes, valley elderberry longhorn beetles, vernal pool fairy shrimp, and vernal pool tadpole shrimp. These additional cumulative effects include 1) fluctuations in acres of aquatic habitat due to water management or acres of rice lands in production, 2) levee repairs, 3) dredging and clearing vegetation from irrigation canals, 4) mowing and clearing vegetation adjacent to canals and streams, 5) increased vehicular traffic on roads and levees, and 6) use of burrow fumigants.

The vernal pool habitat for the vernal pool tadpole shrimp and vernal pool fairy shrimp also has been and continues to be increasingly fragmented throughout their ranges by conversion of natural habitat to urban, industrial, commercial, and agricultural uses. For all of these species, fragmentation results in small isolated populations. Ecological theory predicts that such populations will be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1988, Goodman 1987a, b). Should an extirpation event occur in a population that has been fragmented, the opportunities for recolonization would be greatly reduced due to physical (geographical) isolation from other (source) populations.

Conclusion

After reviewing the current status of the following species; giant garter snake, valley elderberry longhorn beetle, vernal pool fairy shrimp, and vernal pool tadpole shrimp; the environmental baseline for the action area; the effects of Refuge management activities; and the cumulative effects, it is the Service's biological opinion that Refuge management activities, as proposed, are not likely to jeopardize the continued existence of the above species. Critical habitat for the valley elderberry longhorn beetle has been designated in two areas in Sacramento County, California; however, this action does not affect those areas and, therefore, no destruction or adverse modification of its critical habitat is anticipated. Critical habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp has been designated, but does not include the Refuge. No critical habitat has been designated for the remaining species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or

omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Refuge has a continuing duty to regulate activities covered by this incidental take statement. If the Refuge (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contract, agreement, or special use permit granted by the Refuge, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Giant garter snake

The SFWO anticipates incidental take of giant garter snakes will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, and other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that would be harassed or harmed by Refuge operational activities described in the CCP. In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or degraded as a result of the action. Considering all permanent water sources (water that persists through summer) with a buffer of 200 feet, the result is 2,069 acres of potential habitat. Permanent water sources include, lakes, sloughs, perennial marsh, managed permanent wetlands. Therefore, the Service anticipates that all snakes within the 2,069 acre area may be subject to harassment and harm as a result of implementation of the CCP. The SFWO anticipates that, while some take of giant garter snake may occur, the long-term results of the proposed management and restoration activities will benefit the snake and its habitat.

Valley elderberry longhorn beetle

The SFWO is unable to quantify incidental take of the beetle, because the potential number of beetle larvae contained within each elderberry bush is unknown. Because it is not known how many larvae each stem can support, the SFWO must quantify the amount of incidental take of the beetle in terms of the number of plants and stems that would be lost. The SFWO anticipates that the amount of take for the beetle would be small due to the small number of elderberry shrubs on the Refuge and the proposed conservation measures for the species. Therefore, the SFWO anticipates that all beetles inhabiting not more than one elderberry plant with at least one stem measuring 1.0 inch or greater in diameter at ground level will be taken annually through harm, harassment, or killing. The SFWO also anticipates that, while some take of the beetle may occur, the long-term results of the proposed management and restoration activities will benefit the beetle and its habitat, including the planting of over 50 elderberry shrubs during riparian restoration projects.

Vernal pool crustaceans

The SFWO expects that incidental take of the vernal pool tadpole shrimp and vernal pool fairy shrimp will be difficult to detect or quantify for the following reasons: the aquatic nature of the organisms and their very small body size make the finding of a dead specimen unlikely; losses may be masked by seasonal fluctuations in numbers or other causes; and the species occur in habitat that makes them difficult to detect. Due to the difficulty in quantifying the number of vernal pool crustaceans that will be taken as a result of implementation of the CCP, the SFWO is quantifying take incidental to the project as the number of acres of habitat that will be impacted as a result of the action. The SFWO anticipates that during the fifteen year life span of the management plan, take of vernal pool crustaceans may result from Refuge activities on a maximum of two acres of vernal pools and seasonal swales on the North Stone Lake property. However, due to the relatively minimal impacts of the proposed activities and the implementation of proposed conservation measures, the SFWO anticipates that relatively few vernal pool crustaceans and their cysts within these two acres will be killed, harmed, or disturbed by the proposed actions. The SFWO also anticipates that, while some take of vernal pool crustaceans will occur, the long-term results of the proposed management and restoration activities will benefit vernal pool crustaceans and their habitat.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the listed wildlife species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impact of take on listed species:

1. Assess over time the effects of management, operations, and maintenance on listed species.

2. Design/ incorporate/ follow measures that reduce or eliminate impacts to listed species.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Refuge must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following term and condition implements reasonable and prudent measure number one (Assess the effects of the proposed action on the listed species):

    Develop baseline information for the listed species addressed in this opinion. Information shall include, but is not limited to, acreage of occupied and potential habitat for each listed species occurring on the Refuge, distribution of habitat, and current status of the species. Update the baseline for each listed species when changes occur.

2. The following term and condition implements reasonable and prudent measure number two (Design/ incorporate/ follow measures that reduce or eliminate impacts to listed species):

    The Refuge shall implement all conservation measures described on pages 13 through 16 of this biological opinion.

Review Requirements

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation

of these measures, the Service believes that incidental take will not exceed for each covered species the amount discussed in the previous section - Amount or Extent of Take. If, during the course of the action, this minimized level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Refuge must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reporting Requirements

Refuge staff shall forward copies of all research, surveys, or monitoring results on the refuge for listed species addressed by this consultation to the SFWO.

The Sacramento Fish and Wildlife Office is to be notified within three working days of the finding of any dead listed wildlife species or any unanticipated harm to the species addressed in this biological opinion. The Service contact person for this is the Chief, Endangered Species Division at (916) 414-6600.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. Controlled grazing by goats (*Capra hircus*) may be used as a method to control the target species and thatch on SLNWR particularly within the buffer zones for vernal pools and swales.

2. As recommended in the preliminary draft recovery plan for the giant garter snake, conservation measures that could be undertaken by the Refuge include: (1) incorporate giant garter snake considerations into Refuge management guidelines, (2) build refugia for giant garter snakes that is protected from flooding, (3) expand giant garter snake habitat on the Refuge (Giant Garter Snake Recovery Plan, Recovery Task 1.3.5), and (4) conducting periodic surveys on the Refuge for the giant garter snake.

3. As recommended in the recovery plan for the valley elderberry longhorn beetle, conservation measures that could be undertaken by the Refuge include: (1) conducting periodic surveys within the Refuge for the beetle (Recovery Task 2), and (2) removal of exotic trees or shrubs such as Chinese tree-of-heaven (*Ailanthus altissima*), black locust *(Robinia pseudoacacia*), and scotch broom (*Cytisus scoparius*) that may compete with elderberry (Recovery Task 113). Currently tree-of-heaven and scotch broom are not known to occur on the Refuge, however; any plants that are discovered in the future should be removed. Other invasive species which may be a problem for the beetle and its habitat and should be removed when they are found include scarlet wisteria (*Sesbania punicea*), giant reed *(Arundo donax*), and pampas grass (*Cortaderia selloana*).

4. For vernal pool crustaceans, restoration of vernal pool habitat within the Refuge is encouraged to benefit the vernal pool fairy shrimp and vernal pool tadpole shrimp.

The SFWO requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the action(s) outlined in your request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if:
(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Please contact Mary Hammer or Holly Herod of this office at (916) 414-6645 if you have any questions. If you have any questions regarding environmental contaminants, contact Tom Maurer at (916) 414-6590.

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Personal Communications

Harvey, Tom. Manager, Stone Lakes National Wildlife Refuge

Nagano, Chris. Deputy Assistant Field Supervisor, Sacramento Field Office

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Appendix G. Response to Public Comments

Once the Draft CCP/EA was complete, a planning update was prepared and mailed out to 379 interested stakeholders on September 18, 2006. The planning update announced the availability of the Draft CCP/EA for review and comment as well as providing notice of the public comment meetings on October 4 and 5, 2006. On September 25, 2006 a Notice of Availability for the draft CCP/EA published in the Federal Register (Vol. 71, No. 185, p. 55801) announcing that the Draft CCP/EA was open to public comment for a 30 day period and noting the location and times for public comment meetings. Printed copies of the Draft CCP/EA were mailed to 65 interested stakeholders, including local libraries, state agencies, local landowners and others and electronic copies were posted for downloading on the Pacific Region Refuge Planning website and on the Refuge website.

Due to requests for an extension of the Draft CCP/EA comment period, the public comment period was extended for an additional 30 days ending on November 27, 2006. Supplemental notices announcing the 30 day comment period extension were mailed to 379 interested stakeholders. Many comments were received during public meetings and 25 written comments were also received during the comment period.

STONE LAKES REFUGE ALLIAN

1600 DAY DRIVE • CARMICHAEL, CA 95608 • (916) 486-9624

October 2, 2006

David Bergendorf
Refuge Planner
US Fish and Wildlife Service
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Dear Mr. Bergendorf:

Re: Stone Lakes NWR CCP

1 The Stone Lakes Refuge Alliance wishes to indicate its opposition to the continuation of the waterskiing which has been an historic use on the lake which fills the borrow pit that provided materials used for the levee on which the railroad track is situated. A small, private club has used this lake for waterskiing for the last three decades, during most of which the property was privately owned.

2 Now that this property is in public ownership, it is inappropriate for private group to enjoy its exclusive use, even on an occasional basis. This being the case, any relationship between the refuge and the waterskiing club should be terminated.

3 In a national wildlife refuge, all public use should be compatible with the refuge's purposes. While outdoor recreation is in general a valid use of a federal wildlife refuge, loud and clearly disruptive activities are not. The use of this body of water should be confined to slow and quiet activities, such as canoeing and kayaking. Around the edge of the lake, visitors need a calm and quiet atmosphere to enjoy the natural scene, for birding and nature observation.

4 The Alliance urges you to prepare a comprehensive conservation plan that contains no opportunity for waterskiing in the Stone Lakes NWR.

Sincerely

Bruce Kennedy
President

1) The comment is acknowledged.
2) There is no formal relationship between the Refuge and the waterskiing club. High-speed boating, primarily associated with waterskiing, reportedly has occurred on Refuge waterways since before lands and waterways were incorporated into the National Wildlife Refuge System as described on page 54 of the CCP/EA. Compatibility Determinations for existing and proposed visitor uses of the Refuge, including high-speed boating, are included as Appendix A of this CCP. Compatibility Determinations as described in the National Wildlife Refuge System uses compatibility policy (part 603 FW 2), of the U.S. Fish and Wildlife Service (Service) Manual, have been completed for high-speed boating on Refuge waters and will be used to determine if the described proposed and existing uses are determined to be compatible uses of the Refuge. In addition, the appropriate refuge uses policy (part 603 FW 1) provides the policy and procedure for refuge managers to follow when deciding if uses are appropriate on a refuge. Service Manual chapters, can be viewed on the internet at: http://www.fws.gov/policy/manuals/.
3) As stated in the National Wildlife Refuge System uses compatibility policy (part 603 FW 2)," …the Secretary shall not initiate or permit a new use of a refuge or expand, renew, or extend an existing use of a refuge, unless the Secretary has determined that the use is a compatible use…" As directed by this policy (part 603 FW 2), uses found to be incompatible, through a Compatibility Determination, will not be allowed on the Refuge whether the use is new or existing. As stated in the appropriate refuge uses policy (part 603 FW 1), "…the refuge manager will decide if a new or existing use is an appropriate refuge use. If an existing use in not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable."
4) The comment is acknowledged.

Gary Freglen
<calaveri@sbcglobal.net>
10/03/2006 01:40 PM

To David_Bergendorf@fws.gov
cc
bcc
Subject Public Use at Stone Lakes NWR

Mr. David Bergendorf
Refuge Planner
U.S. Fish & Wildlife Service CA/NV
Refuge Planning Office
2800 Cottage Way, W1916
Sacramento, CA 95825

Re: High Speed and Non-motorized Boating
Stone Lakes National Wildlife Refuge

Dear Mr. Bergendorf:

I request to have my comments on Stone Lakes NWR recorded in the official record for consideration of the subject proposal.

5 First and foremost, Let me state my opposition to high speed motorized boating within any portion of the Stone Lakes National Wildlife Refuge. There are numerous reasons for my opposition to high speed boating. Primary among them is that such an activity is incompatible within the Stone Lakes NWR specifically, and generally incompatible with the mission of the National Wildlife Refuge System. We are, after all, talking about a WILDLIFE refuge! Without question, high speed boating represents a high degree of disturbance to wildlife. There would also be numerous disturbances and adverse effects on the habitat and other elements of the natural community.

6 Secondly, I am a flat-water kayaker. I can tell you from personal experience that high speed boats and kayaks cannot safely coexist within such a confined area as the waterways of the Stone Lakes NWR. It is also very difficult to find quiet waters within Sacramento County and the Central Valley in general

7 where paddle boaters to not have to endure the noise and other conflicts with regard to power boaters. On the other hand, power boaters have numerous waterways open for their use, including water skiing.

8 To summarize, I am in favor of opening the waterways of the Stone Lakes NWR to paddle boaters and eliminating high speed powerboats and water skiing entirely.

Thank you for the opportunity to comment on the Service's risk assessment and visitor use activity proposal.

Sincerely,

5) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determination will be made for Refuge uses.
6) The comment is acknowledged.
7) The comment is acknowledged. The direct impact on visitors of noise associated with high-speed boating was not included in the draft Compatibility Determination for high-speed boating, but has been added to the final version.
8) The comment is acknowledged.

ALIFORNIA -- THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER,G

TMENT OF WATER RESOURCES
H STREET, P.O. BOX 942836
ENTO, CA 942360001
5791

October 3, 2006

David Bergendorf
U.S. Fish and Wildlife Service
2800 Cottage Way, W-1832
Sacramento, California 95825

Stone Lakes National Wildlife Refuge: Draft Comprehensive Conservation Plan/Environmental Assessment
State Clearinghouse (SCH) Number: 2006094003

The project corresponding to the subject SCH identification number has come to our attention. The limited project description suggests your project may be an encroachment on the State Adopted Plan of Flood Control. You may refer to the California Code of Regulations, Title 23 and Designated Floodway maps at http://recbd.ca.gov/. Please be advised that your county office also has copies of the
9 Board's designated floodways for your review. If indeed your project encroaches on an adopted food control plan, you will need to obtain an encroachment permit from the Reclamation Board prior to initiating any activities. The attached Fact Sheet explains
10 the permitting process. Please note that the permitting process may take as much as 45 to 60 days to process. Also note that a condition of the permit requires the securing
11 all of the appropriate additional permits before initiating work. This information is provided so that you may plan accordingly.

If after careful evaluation, it is your assessment that your project is not within the
12 authority of the Reclamation Board, you may disregard this notice. For further information, please contact Sam Brandon of my staff at (916) 574-0651.

Sincerely,

Mike Mirmazaheri, Chief
Floodway Protection Section

cc: Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

9) The comment is acknowledged.
10) Thank you for providing the fact sheet.
11) The comment is acknowledged.
12) The comment is acknowledged.

Friends of the Swainson's Hawk
915 L St., C-425
Sacramento, Ca. 95814
916-447-4956
www.swainsonshawk.org

October 3, 2006

David Bergendorf, Refuge Planner BY FAX: 414-6497
US Fish and Wildlife Service
2800 Cottage Way, W-1832
Sacramento, Ca. 95825-1846

Re: CCP for Stone Lakes NWR/ Waterskiing

Dear Mr. Bergendorf:

13 Friends of the Swainson's Hawk strongly urges you exclude waterskiing from the permitted activities in the Stone Lakes National Wildlife Refuge. This use is incompatible with the purpose of the wildlife refuge. Our native wildlife is facing numerous challenges, including rampant habitat destruction, and other disruptions from urbanization in the region. The wildlife refuge is a sanctuary which needs to be maintained in the best interests of wildlife.

Thank you for your consideration and your support of California's wildlife, particularly the state listed Swainson's Hawk.

Sincerely,

Jude Lamare

Jude Lamare, President, Friends of the Swainson's Hawk, 916-447-4956

13) The comment is acknowledged. See response #2 for a description of how Compatibility Determinations and Appropriate Use determination will be made for Refuge uses.

Anne Blandin
<bajafun@sbcglobal.net>
10/04/2006 06:12 PM

To David_Bergendorf@fws.gov
cc
bcc
Subject Public Use at Stone Lakes NWR

I am writing this for the comments by the public on
the uses of Stone Lakes NWR.

I have driven by the Stone Lakes for twenty
years,wondering if there was public access. Years ago
I heard that they were saved from the developers. Then
14 I heard that they were a National Wildlife Refuge with
no public access. Now I hear that the refuge will be
open to the public.
This is wonderful because I am a Birder,a kayaker,and
a supporter of open space and wildlife.

I was appalled when I heard that power boats were
15 allowed in the refuge. This use definitely is not
compatible with a wildlife refuge.
Not only is there lots of noise, but the motors are
16 dangerous to the animals in the water,and the wave
action, turbulance and gasoline are damaging to the
habitat of the water,the river bed and banks.

17 This area seems like a good area for paddleboats.
There are so few areas where we don't have to watch
18 out for motor boats. Hopefully It will be available
for us non-motorized boaters.

Please do not allow motor boats in the Stone Lakes Refuge.

from
Anne L. Blandin

14) The comment is acknowledged. Please note that more than 6,000 people currently visit the Refuge each year to participate in a variety of wildlife dependent recreational and educational activities, as described under Visitor Services beginning on page 53 of this CCP.
15) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
16) The comment is acknowledged. The direct impact on visitors of noise associated with high-speed boating was not included in the draft Compatibility Determination for high-speed boating, but has been added to the final Compatibility Determination.
17) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations will be made for Refuge uses.
18) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations will be made for Refuge uses.

Sacramento Audubon Society
P. O. Box 160694, Sacramento, CA 95816-0694

October 10, 2006

David Bergendorf, Refuge Planner
United States Fish &Wildlife Service
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Re: Support for Proposed No-Wake Boat Speed Limit at Stone Lakes National Wildlife Refuge.

Dear Mr. Bergendorf.

The Sacramento Audubon Society joins with Sierra Club and Friends of the Swainson's Hawk in support of USFWS' proposal, in its draft Comprehensive Conservation Plan and Environmental
19 Assessment ("CCP"), to limit boats to a no-wake speed limit at the Stone Lakes National Wildlife Refuge.

As the Appendix A Compatibility Determination for High-Speed Boating in the CCP explains, the present use of the refuge's waters for waterskiing is inconsistent with the refuge's
20 fundamental conservation purposes. High-speed boating creates noise and wakes that disturb the area's wildlife, erodes and degrades shoreline habitats, and adversely affects wildlife-dependent visitor uses. In addition, allowing high-speed boats on the refuge's waters necessitates the removal of navigational hazards that constitute valuable habitat for special status species and other fish and wildlife, and presents a safety hazard to non-motorized boaters using the same narrow waterway.

Now that the refuge has been dedicated as a wildlife preserve and for wildlife appreciation, boating activity at the refuge should be managed and conducted in a manner that is consistent
21 with those purposes. The Service has recognized this need by finding that existing, high-speed boating in the refuge is not compatible with the refuge's purposes, and, accordingly, proposing in both of its "action" alternatives in the CCP (Alternative B and Alternative C) to a establish a no-wake boating speed limit. Sacramento Audubon Society supports the prompt adoption of the proposed, no-wake boating speed limit at the Stone Lakes National Wildlife Refuge.

Sincerely,

Keith G. Wagner

Keith G. Wagner, President
Sacramento Audubon Society

19) The comment is acknowledged.
20) The comment is acknowledged. The direct impact on visitors of noise associated with high-speed boating was not included in the draft Compatibility Determination for high-speed boating, but will be added to the final version.
21) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

SIERRA CLUB
FOUNDED 1892

MOTHER LODE CHAPT
1414 K STREET, SUIT
SACRAMENTO, CA 9
TEL. (916) 557-1100
Fax: (916) 557
coordinator@sierraclub-s
www.motherlode.sierracl

October 17, 2006

David Bergendorf, Refuge Planner
United States Fish &Wildlife Service
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Re: Support for Proposed No-Wake Boat Speed Limit
at Stone Lakes National Wildlife Refuge

Dear Mr. Bergendorf.

22 The Sierra Club has over 9,000 members in Sacramento and San Joaquin counties, within an hour's drive of Stone Lake Wildlife Refuge. Many of these urban dwellers are grateful for the close access to nature, and others who have not visited the refuge are happy just knowing that wildlife and wildlife habitat are "safe" and can thrive here in the Sacramento Valley.

23 The Club has been an advocate for the Refuge from its very inception, and we have always found the continued use of waterskiing to be objectionable. This new CCP provides the perfect opportunity to address this inconsistent use, and eliminate it through the no-wake speed limit.

24 The Sierra Club supports the adoption of the proposed no-wake boating speed limit at the Stone Lakes National Wildlife Refuge as soon as it can be accomplished.

Thank you for considering our comments.

Sincerely,

Vicki Lee

Vicki Lee
Conservation Chair

22) The comment is acknowledged.
23) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations will be made for Refuge uses.
24) The comment is acknowledged.

Susan Fregien
<susanfregien@earthlink.net>

10/17/2006 09:55 PM

Please respond to
Susan Fregien
<susanfregien@earthlink.net>

To david_bergendorf@fws.gov
cc
bcc
Subject Stone Lakes NWR CCP

David Bergendorf
Refuge Planner
2800 Cottage Way
Sacramento, CA 95825

Mr. Bergendorf,

25 I am writing in support of the USFWS Compatibility Determination for High Speed Boating (i.e., Not Compatible), which has historically been in the form of waterskiing within what is now Refuge boundaries. High speed boating and
26 waterskiing do not meet any of the goals or objectives for which Stone Lakes NWR was established and for which the public visits the refuge. Conservation, protection, and restoration of wildlife and their habitats are the primary purpose of the Refuge. Additionally, compatible wildlife-dependent recreation
27 and environmental education are desired. High-speed boating does not contribute to the Refuge goals or its maintenance.

In my experience as an aquatic biologist I have worked on several NWRs along
28 the Pacific Flyway and have also visited many others for enjoyment. I have seen first-hand that birds and other wildlife are very sensitive to human disturbance, especially motorized boats. I understand that waterskiiers travel at speeds of about 35-45 mph and are in close proximity to riparian
29 habitat adjacent to the ski areas which are used by foraging, resting and breeding birds and other animals. The noise and disturbance created by this activity is not compatible with the goals of protecting and conserving these species. Additionally, the removal of woody snags and debris from the water
30 (which provide wildlife and aquatic habitat) is an interference with the purposes for which the refuge was established.

Waterskiing within the Stone Lakes NWR is clearly presents a use conflict with
31 the purpose and goals of the Refuge.
The USFWS should not change the determination of this use.

Sincerely,
Susan Fregien
8522 Hayden Way
Fair Oaks, CA 95628
916-967-8522

25) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations are made for Refuge uses. Please note that all Compatibility Determinations presented in the CCP are considered final when the Refuge Compatibility Determination and Concurrence have been signed by authorized representatives of the U.S. Fish and Wildlife Service.
26) The comment is acknowledged. Please note that the official Refuge purposes are described under the heading "Refuge Purposes" on page 13 of the CCP.
27) The comment is acknowledged.
28) The comment and personal experience is acknowledged.
29) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations are made for Refuge uses. The direct impact on visitors of noise associated with high-speed boating was not included in the draft Compatibility Determination for high-speed boating, but has been added to the final version.
30) The comment is acknowledged. Please note that the official Refuge purposes are described under the heading "Refuge Purposes" on page 13 of the CCP.
31) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses. Please note that all Compatibility Determinations presented in the CCP are considered final when the Refuge Compatibility Determination and Concurrence have been signed by authorized representatives of the U.S. Fish and Wildlife Service.

Mike and Cindi Whitehead
<tamangel36@sbcglobal.net>
10/19/2006 09:44 AM

To david_bergendorf@fws.gov
cc thomas_harvey@fws.gov
bcc
Subject Comments on the Draft Stone Lakes NWR C Conservation Plan...

David Bergendorf,
Refuge Planner,
2800 Cottage Way, W-1832,
Sacramento, CA 95825-1846

19 October 2007

Subject: Comments on the Boating/Vessel use element of the Draft Conservation Plan for Stone Lakes NWR

Good Day Mr. Bergendorf,

I applaud you and your staff, and your agency for your considered vision to protect and provide for the enjoyment of this ecological resource, in the document entitled, the "Draft Stone Lakes NWR Comprehensive Conservation Plan". Although not a local resident, I feel compelled as a user of this nation's refuge system during my many year's of travel, for bird watching, the seeking of solitude, hiking and other
32 environmental activities that I pursue, to be an active participant in this Draft Plan.

In reading through the, "Issues identified by the Public" section, I was taken a little by surprise, that the use of motorized watercraft (and waterskiing?) within the refuge was being considered. In my travels to various National Wildlife Refuge's administered by the United States Fish and Wildlife Service, the major feeling which strikes me the most, is that of the quiet and the solitude these area's provide, along with the interaction I feel, with the natural environment of that specific locale. As most people can surely recognize, it is most difficult in this day and age, to find such richness and diversity
33 in the out-of-doors, close to, what we refer to as, 'civilization'.

34 I wish to go on record as opposing the use, whether because of historical trends or in the consideration of future expansion, of any type of motorized vessel (boat or jet-ski or ?) operation within the designated refuge. This type of activity is not compatible with the mission of the National Refuge System and the goals of the Stone Lakes NWR as put forth in the "Comprehensive Conservation Plan" and the "Draft
35 Conservation Plan". Examine the last paragraph of the "Vision Statement" of the "Draft Conservation Plan" for the basic premise. Words like 'ecological importance, sanctuary, harmonizing, environmental

32) The comment is acknowledged.
33) The comment is acknowledged. See response # 20.
34) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
35) The comment is acknowledged.

education, and appreciative setting' stand out as guideposts.

36 Motorized vessels of any type, do not promote nor do they encourage the basic idea of a 'refuge' environment. There are many other opportunities and locations in nearby communities for this activity. As a power boater myself, my family and I accept the need for a variety of diverse settings to be limited for
37 the future enjoyment of the natural resource.

38 This is a National Wildlife Refuge, not a National Recreation Area!

Thank you very much for this opportunity to share my thoughts and to register my comments on this important Conservation Plan and its future impact for all, and especially those who have little or no voice in these type of proceedings: the fish and wildlife…

I have put the Stone Lakes NWR on my list to visit...

Sincerely,

Michael A. Whitehead
P.O. Box 1303
Eureka, California
95502-1303

cc: Thomas Harvey
Project Leader
Stone Lakes National Wildlife Refuge
1624 Hood-Franklin Road,
Elk Grove, CA 95757

36) The comment is acknowledged.
37) The comment is acknowledged.
38) The comment is acknowledged.

October 23, 2006

Thomas E. Harvey
Project Leader
FISH AND WILDLIFE SERVICE
Stone Lakes National Wildlife Refuge
1624 Hood-Franklin Road
Elk Grove, CA 95757

Dear Mr. Harvey:

39 On behalf of the Beach Lake Ski Club we want to thank you for the time extended to us during our meeting of October 10, 2006. We would also like to thank your supervisor, Dan Walsworth, Nevada & California Refuge Supervisor, David Bergendorf, National Wildlife Refuge Planner, Mr. Russell van Loben Sels (Reclamation District 744), and your staff members for joining our meeting.

40 Pursuant to our meeting we would like to go on public record and outline the club's position during the official 30-day comment period (September 28 – October 28, 2006), in response to the statement made in the Draft CCP: "Refuge staff will cooperate with high-speed boaters to seek alternative sites for waterskiing and to phase out the incompatible use."

41 The club is financially obligated to a 10-year contractual lease agreement with Mr. Harvey Collins for access purposes. We are currently finishing the third season (lease year 8) and our next season will put us with seven (7) more years remaining on our lease obligation expiring year end 2013.

42 Since the ski club has maintained a 35-year historical use of the facilities (circa 1971) we would propose that a plan be set forth that enables the club to co-exist with the future planned uses of the refuge during a "phase out" period of 7 years. We agree, in part, that "high speed boating" activities are best separated and limited to a portion of the waterway as to not conflict with smaller craft such as canoes and kayaks, although we have shared
43 the facility with a fishing club for many years without incident. We also understand that the implementation of such uses will not become reality until necessary facility
44 improvements and increases in staffing / funding are made. All of which may take some time to occur.

45 We would like to propose an agreement that would lessen the impact on our members in that the possible replacement site you made mention of would coincide with a scaling back of the area currently occupied by our club within the refuge. In other words, when the "car top" boats begin using the lake, we would have the alternative Thornton Rd site secured in a long-term lease so that our members from the south would have a place within reasonable proximity to their homes. Our members who live to the north could

39) The comment is acknowledged. The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.
40) The comment is acknowledged.
41) The comment is acknowledged.
42) The use of high-speed boats on the Refuge was found to be not appropriate through an Appropriateness Determination completed in September of 2006. As stated in the Appropriate Refuge Uses policy (part 603 FW 1), "…the refuge manager will decide if a new or existing use is an appropriate refuge use. If an existing use in not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable." However, since the Appropriateness Determination policy was finalized on July 26, 2006 a draft Compatibility Determination had already been prepared for high speed boating on the Refuge. Please note that the Compatibility Determination is considered final when the Refuge Compatibility Determination and Concurrence have been signed by authorized representatives of the U.S. Fish and Wildlife Service. As stated in the National Wildlife Refuge System Uses Compatibility policy (part 603 FW 2)," …the Secretary shall not …permit...an existing use of a refuge, unless the Secretary has determined that the use is a compatible use…" As directed by this policy (part 603 FW 2), no uses of the Refuge will be allowed unless the use is found to be compatible. Likewise, existing uses found to be not compatible, through a Compatibility Determination, will not be allowed on the Refuge. Furthermore the Compatibility policy (part 603 FW 2, 2.14) states "Existing uses determined to be not compatible will be expeditiously terminated or modified to make the use compatible. Except with written authorization by the Director (of the U.S. Fish and Wildlife Service), this process of termination or modification will not exceed 6 months from the date that the compatibility determination is signed." There is no provision in Refuge System policy to change findings in Compatibility Determinations or Appropriateness Determinations on the basis of the Club's financial obligation to a private party. There is no provision in Refuge System policy to allow a phase out period in excess of 6 months, for a use found to be not compatible, without written authorization by the Director. Therefore it is beyond the authority of the Refuge to permit a 7 year phase out period, for high speed boating on the Refuge, as recommended in the comment.
43) We agree with the comment that high speed boating is likely to conflict with smaller water craft such as kayaks and canoes. We acknowledge your comment regarding the fishing club.
44) We respectfully disagree with the comment's assertion that non-motorized boating will require facility improvements and increases in staffing and funding. Currently basic parking and car-top boat launch facilities exist, on the Beach Lake Unit near the end of Elliott Ranch Road, that can accommodate 10-15 vehicles. The rationale for Objective 3.B (page 89 of the CCP) states that boating would be allowed from June to September, with a no-wake zone in effect for the entire Refuge. Non-motorized boats could be launched, by reservation, on the Refuge beginning in June 2007, following signature of the final CCP. Please note that Objective 3.B also calls for enhancement of boating opportunities, to approximately 20 cars by 2009; requiring additional facility improvements and increases in staffing.
45) The Refuge will make a reasonable effort to assist the club with finding an alternative location for their high speed boating activities. However, the Refuge can not guarantee that an alternative location will be found that is acceptable to Club members.
46) Reducing the linear extent of high speed boating associated with waterskiing on the Refuge would not eliminate the impacts of high speed boating. Therefore,

46 maintain a much smaller portion of the existing site within the refuge starting at the point just north of the R.D. 744 pump going north to our launch ramp we maintain on Mr. Collin's property. As required, the club would relinquish over two miles of the waterway
47 to the newly established 5 mph zone that would be dedicated to non-motorized craft as well as the center of most wildlife dependent activities planned for the refuge. Over the
48 next year or two we would condense into the far northern area as the plans come to fruition and the demand for other uses increase. For the balance of our lease (2007-2013) we would keep to the northern most 10 acres or half mile of waterway for the duration of
49 our phase out. This half-mile stretch of waterway bordered mostly by private lands is the bare minimum space needed to facilitate most of our uses.

50 As mentioned in our meeting, we would not allow the weighting of boats designed to increase the size of the boats wake, recognizing this could have an impact on the R.D. 744 levee. Both barefoot waterskiing and slalom waterskiing require a boat casting a
51 minimum wake, which has caused no visible levee erosion. Our club Bylaws will include the following beginning in 2007:

52 ***Wake Enhancement:*** *The use of devices, equipment or placement of passengers on boats for the purpose of creating an enlarged wake is prohibited and will NOT be allowed on any boat used within The Stone Lake Wildlife Refuge Boundaries. Such devices and equipment include, but are not limited to; exterior panels or wings deployed underwater; rubberized, plastic or metal tanks or bags filled with any material; crowding of passengers to the rear; inside-the-hull water tanks; or boat hulls designed specifically to enhance the wake.*

We would continue to honor the current practice of leaving habitat along the shores "as
53 is" by only relocating loose floating debris from our usage area with no significant impact to habitat.

Our members appreciate your willingness to work with us in an effort to secure the new
54 site in Thornton to mitigate our waterway losses that we have enjoyed for over 35 years. We see this solution as an equitable trade-off for about half of our clubs' members.
55 However, in order to fulfill our lease we would strongly request the continued use of a small portion of the waterway for the remaining 7 years.

56 We ask that a resolution be adopted as a part of the CCP that places no undue hardship on any party. We hope that the citizens from the 23 families that currently make up our club
57 can continue to enjoy the recreational and natural beauty of this site for the remainder of our lease. The final 7 years of the clubs' lease related activities would be physically separated and buffered from all other uses that pose compatibility concerns. We are proposing to limit our usage area by 2 miles and reduce our temporal use to approximately a 4-month window outside the nesting season and influx of migratory birds. Furthermore, we feel the overall club usage would be reduced greatly with the introduction of the new Thornton site capturing at least half of the clubs' use while we conclude our phase out by 2014.

reducing the scale of high speed boating on the Refuge would not change the Compatibility Determination. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

47) The CCP does not propose to dedicate any zones exclusively to non-motorized watercraft. However, the CCP and EA do propose to restrict all Refuge waters to a no-wake zone, to prohibit gasoline powered motor boats, to close waters seasonally to all watercraft and to place limitations on the use of electric watercraft motors. Reducing the linear extent of high speed boating associated with waterskiing on the Refuge would not eliminate the impacts of high speed boating.

48) The comment is acknowledged. See response # 46.

49) The comment and the estimate of the minimum space needed to facilitate water skiing are acknowledged. However, as stated in the National Wildlife Refuge System Uses Compatibility policy (part 603 FW 2)," …the Secretary shall not …permit...an existing use of a refuge, unless the Secretary has determined that the use is a compatible use…" The Refuge can not allow a use found to be not compatible except with written authorization by the Director of the U.S. Fish and Wildlife Service (Service Manual, part 603 FW 2, 2.14).

50) The comment is acknowledged.

51) We can not assess the validity of what is meant by "visible levee erosion". Based upon available evidence, we believe that continued high-speed boat traffic on the Refuge could lead to the need for extensive levee repair or even levee failure. Information in support of the likelihood of high-speed boating impacting levees is presented in the Compatibility Determination for high speed boating, beginning on page 126, of Appendix A, in the CCP.

52) The comment is acknowledged.

53) The comment is acknowledged.

54) The comment is acknowledged. See response #45.

55) The comment is acknowledged. See response #42.

56) The Refuge will make a reasonable effort to assist the club with finding an alternative location for their high speed boating activities. However, the Refuge can not guarantee that an alternative location will be found that is acceptable to ski club members. The Refuge System can not allow the use of refuge resources for private economic activities when those uses are found to be not compatible with Refuge purposes or not appropriate uses. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

57) The CCP proposes many forms of recreation that citizens and families can enjoy on the Refuge. Compatibility Determinations conclude the following uses are compatible, with stipulations: fishing: wildlife observation and photography; environmental education and interpretation; recreational boating associated with hunting, fishing, wildlife observation and photography, and plant gathering. Please note that the Compatibility Determination are considered final when the Refuge Compatibility Determination and Concurrence have been signed by authorized representatives of the U.S. Fish and Wildlife Service as described in response #21.

maintain a much smaller portion of the existing site within the refuge starting at the point just north of the R.D. 744 pump going north to our launch ramp we maintain on Mr. Collin's property. As required, the club would relinquish over two miles of the waterway to the newly established 5 mph zone that would be dedicated to non-motorized craft as well as the center of most wildlife dependent activities planned for the refuge. Over the next year or two we would condense into the far northern area as the plans come to fruition and the demand for other uses increase. For the balance of our lease (2007-2013) we would keep to the northern most 10 acres or half mile of waterway for the duration of our phase out. This half-mile stretch of waterway bordered mostly by private lands is the bare minimum space needed to facilitate most of our uses.

As mentioned in our meeting, we would not allow the weighting of boats designed to increase the size of the boats wake, recognizing this could have an impact on the R.D. 744 levee. Both barefoot waterskiing and slalom waterskiing require a boat casting a minimum wake, which has caused no visible levee erosion. Our club Bylaws will include the following beginning in 2007:

Wake Enhancement: *The use of devices, equipment or placement of passengers on boats for the purpose of creating an enlarged wake is prohibited and will NOT be allowed on any boat used within The Stone Lake Wildlife Refuge Boundaries. Such devices and equipment include, but are not limited to; exterior panels or wings deployed underwater; rubberized, plastic or metal tanks or bags filled with any material; crowding of passengers to the rear; inside-the-hull water tanks; or boat hulls designed specifically to enhance the wake.*

We would continue to honor the current practice of leaving habitat along the shores "as is" by only relocating loose floating debris from our usage area with no significant impact to habitat.

Our members appreciate your willingness to work with us in an effort to secure the new site in Thornton to mitigate our waterway losses that we have enjoyed for over 35 years. We see this solution as an equitable trade-off for about half of our clubs' members. However, in order to fulfill our lease we would strongly request the continued use of a small portion of the waterway for the remaining 7 years.

We ask that a resolution be adopted as a part of the CCP that places no undue hardship on any party. We hope that the citizens from the 23 families that currently make up our club can continue to enjoy the recreational and natural beauty of this site for the remainder of
58 our lease. The final 7 years of the clubs' lease related activities would be physically separated and buffered from all other uses that pose compatibility concerns. We are
59 proposing to limit our usage area by 2 miles and reduce our temporal use to approximately a 4-month window outside the nesting season and influx of migratory birds. Furthermore, we feel the overall club usage would be reduced greatly with the
60 introduction of the new Thornton site capturing at least half of the clubs' use while we conclude our phase out by 2014.

58) There is no provision in Refuge System policy to allow a phase out period in excess of 6 months, for a use found to be not compatible, from the date that a Compatibility Determination is signed, without written authorization by the Director. Therefore it is beyond the authority of the Refuge to permit a 7 year phase out period, for high speed boating on the Refuge, as recommended in the comment.
59) See response #46.
60) The Refuge will make a reasonable effort to assist the club with finding an alternative location, however the Refuge can not guarantee that an alternative location will be found that is acceptable to ski club members. Furthermore, the Refuge can not allow a use found to be not compatible to continue except with written authorization by the Director of the U.S. Fish and Wildlife Service (Service Manual, part 603 FW 2, 2.14) as described in response #49.

61 We look forward to our continued cooperative and mutually beneficial working relationship with you and your staff over the coming years.

Sincerely,

Marshall D. Schoewe
President, Beach Lake Ski Club
Affiliated Member Club USA Water Ski

cc: G. David Robertson
Stacey McKinley
Leon Larson, USA Waterski
Harvey Collins
Eric Hintz

Proposed location of buoy course use area once alternative site is secured on Thornton Rd

61) The comment is acknowledged.

SOS Cranes
PO Box 22192
Sacramento, CA 95822
www.soscranes.org

October 26, 2006

David Bergendorf
Refuge Planner
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

RE: Stone Lakes NWR Draft Comprehensive Conservation Plan

Dear Mr. Bergendorf:

Save Our Sandhill Cranes is a Sacramento based 501(c)(3) non-profit
62 corporation which is concerned about the ongoing loss of open space habitat and agricultural lands that Sandhill cranes and other wildlife depend on for over-wintering in our area. (Please see our web page www.soscranes.org for a better description of our mission and work.)

Greater and Lesser Sandhill cranes have been spending the winter in our area each year for about eleven thousand years. In the last one hundred years or so their habitat has been reduced tremendously. In reviewing the Draft Comprehensive Conservation Plan for the Stone Lakes National
63 Wildlife Refuge we are pleased to see that there is actually an increase in the use of the Refuge by cranes. This success appears to be due to the improved and proper management of the Refuge which has increased the wildlife compatibility of the properties. We commend the staff and management for
64 this success and look forward to its continuation.

The draft plan is a visionary document that will improve the habitat for cranes, other wintering migratory birds, and many other wildlife that are
65 being pressured towards extinction due to urban development and conversion of agricultural lands to uses incompatible with healthy wildlife

62) The comment is acknowledged.
63) The comment is acknowledged.
64) The comment is acknowledged.
65) The comment is acknowledged.

66 populations. We are dismayed to see that the Refuge has, for the past few years, allowed a particularly egregious and incompatible use within its borders – highspeed boating and water skiing. We fully agree with the
67 plan's finding of incompatibility in Appendix A, page 127. We urge you to quickly put an end to this incompatible use within the bounds of the Refuge.

68 We look forward to the time when no motor driven craft, except staff operated, are allowed on any of the waters within the Refuge so that quiet, human powered canoes and kayaks can allow for improved public access.
69 The use of motor boats is not only incompatible with wildlife use, it is very incompatible with paddle boats, especially in the narrow and confined waters of the Refuge. As a member of the volunteer Paddle Team at the nearby Cosumnes River Preserve, which leads public paddle trips on the
70 Preserve, I can personally attest to this incompatibility. Furthermore, minimizing motor-powered craft to those necessary for Refuge staff and
71 emergencies only, results in overall improvements in air quality, water quality, and fuel energy conservation as well as reducing erosion from the wave wash of the faster vessels. The benefits may seem incremental but they are a positive step in the right direction for the future of the Refuge.

Thank you for the opportunity of reviewing and commenting on this forward-looking and visionary plan which, if fully implemented, will greatly enhance the local environment for wildlife.

Michael Savino, President
Save Our Sandhill Cranes

66) The comment is acknowledged.
67) The comment is acknowledged. See response #2 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
68) The comment is acknowledged.
69) The Refuge agrees that high-speed boating will likely not be feasible alongside non-motorized boats such as canoes and kayaks, as described in draft Compatibility Determination for high-speed boating beginning on page 124 of the draft CCP.
70) The comment is acknowledged and we appreciate you sharing your personal observations.
71) The comment is acknowledged.

[redacted]
[redacted]
10/26/2006 11:20 PM

To david_bergendorf@fws.gov
cc [redacted]
bcc
Subject Comments for US Fish and Wildlife Service on D
Comprehensive Conservation Plan and Environr
Assessment for Stone Lakes National Wildlife R

[redacted]

David Bergendorf, Refuge Planner
US Fish and Wildlife Service
Stone Lakes National Wildlife Refuge
2800 Cottage Way, W-1832, Sacramento, CA 95825-1846.

Dear Sirs:

I was pleased to meet Fish and Wildlife Service staff
and obtain information on the Comprehensive Plan and
Environmental Assessment for the Stone Lakes National
72 Wildlife Refuge during a public meeting in Elk Grove.
I would like to commend all staff involved in
preparation of the documents for excellent assessments
of exising biological conditions.

As I live nearby and have long awaited the opportunity
for improved recreation access for the public lands
73 and waters within the refuge near my home, I would
like to take this opportunity to comment on the draft
plan and EA on behalf of myself, my family and my
friends, who did not have the time to respond
separately, as follows:

Comments for US Fish and Wildlife Service on Draft
Comprehensive Conservation Plan and Environmental
Assessment for Stone Lakes National Wildlife Refuge:

Comment: Please clarify apparent discrepancies
throughout the draft plan and EA on the acreages of
lands that are managed under the draft plan:
74 Approved Project Boundary of 17,640 (p. 1), 1,7640.7
(p. 7) or 18,129 acres (p. 216);
8,283 natural biotic communities (p. 56) and 10,321
75 agricultural cover total 18,604 acres;
76 9,000 acres core refuge area (p. 1), or 9,146 acres
(p. 7);
9,000 acres cooperative wildlife management area (p.
77 1), or 9,066 acres (p. 7);
78 6,200 acres actively managed by the Service (p. 1, 8)
or 6,000 acres (p. 109, 174);
79 6,200 acres within the approved project boundary (p.
8) or 4,000 acres (p. 216);
80 2,000 discontinuous acres contained in the Refuge (p.
313), but

72) The comment is acknowledged and we appreciate your attendance at the public comment meeting in Elk Grove.
73) The comment is acknowledged.
74) The approved Refuge boundary for Stone Lakes National Wildlife Refuge totals 17,641 acres. The errors are noted and have been changed in the CCP.
75) The comment is acknowledged, and the correct figures have been added to the CCP. The entire Refuge consists of 8,740 acres of agriculture, 743 developed acres and 8,158 natural areas. These land use types total to 17,641 acres.
76) The core Refuge area consists of 9,146 acres as described on page 7 of the CCP. In the introduction, on page 1, the intent was to describe an approximate acreage figure for the core Refuge area. However, for clarity the core Refuge figure on page 1 will be corrected to 9,146 acres.
77) The cooperative wildlife management area totals 9,066 acres. In the introduction, on page 1, the intent was to describe an approximate acreage figure for the cooperative wildlife management area. However, for clarity the cooperative wildlife management area figure on page 1 will be corrected to 9,066 acres.
78) While both of the actively managed acre figures are approximate estimates, the figure on page 1 and 8 (6,200 acres actively managed) is more accurate. The figures on page 109 and 174 (6,000 acres) have been changed to the more accurate estimate of 6,200 acres.
79) The figure on page 8 (6,200 acres actively managed) is the most accurate estimate. The figure on page 216 in the Fire Management Plan (4,000 acres actively managed) was considered an accurate estimate in 2001, when the Fire Management Plan was written. When the Fire Management Plan is updated in the future, the figure of actively managed acres will be updated as well.
80) The precise acreage owned in fee title is 1,746.9 acres. The figure for acreage owned in fee title on page 8 (1,740 acres owned in fee title) was intended as an approximate figure and was preceded by the word "about" to indicate that the figure was an estimate. The figure on page 8 has been corrected to 1,746.9 acres for clarity. The figure on page 313 of the "Wilderness Review" (2,000 discontinuous acres) is inaccurate and has been corrected and clarified.

1,740 acres in fee title ownership (p. 8);
2,933 acres under cooperative agreement, "over 2,700
81 acres" (p. 216);
82 1,533 under agricultural easement (p. 8) - define
terms and relation to other lands;
1,900 acres annual or perennial grasslands (p. 59)
83 -define terms and how grasslands would be expanded,
presumably from other land types, in some
alternatives.
Also: About 5,000 acres publicly owned within the
Refuge and CWMA are managed by five local and state
84 agencies (p. 8). Comment: Identify more clearly
which agencies manage which properties, and the
specific terms and conditions of all cooperative
agreements for those properties. Colored maps do not
adequately describe what the cooperative agreements or
management conditions represent in terms of existing
or proposed federal policies or actions. Past actions
should have respective NEPA and other environmental
85 reviews summarized in this draft plan and EA.

P. 11 "The Service has finalized a cooperative
86 agreement with Sacramento County Department of
Regional Parks, Recreation and Open Space over
management of the North Stone Lakes Unit." Comment:
Such an agreement must be included in the draft plan
87 and EA as executed. Explain how the agreement applies
to the current draft plan. Appendix C.4 apparently
shows a 1998 draft without signatures or dates and
88 based solely on the 1992 plan that apparently is to be
superseded by the current draft plan and EA. Define
the terms and conditions in the Draft North Stone Lake
Management and Restoration plan to be incorporated in
the future Refuge plans (p. 82). Explain specifically
what draft county policies will become federal
policies and actions. Indicate how NEPA requirements
were met for the previous draft cooperative agreement
with the county and for the grazing cooperative land
management agreement, or how those agreements are
covered in this NEPA action. Explain how the hunting
programs, past and proposed, can be conducted under
provisions of Section 5.H. prohibiting hunting,
firearms and shooting "on the Refuge" and how the
agreement fits within the policies of the National
Wildlife Refuge System. Explain how the Service
complies with the county Flood Management Plan under
Section 7.A. and how that requirement directly affects
management options for the draft plan and indirectly
affects the environment. The cooperative agreement
contains many terms and conditions that may
significantly affect the environment of the region.

P. 14 "The 2,791 Acre North Stone Lake Unit consists
of two adjacent parcels owned by the DPR (1,224 acres)
and Sacramento County (1,567 acres). The goal of the
Service is to cooperatively manage both these parcels
with the County and the State, as a unit of the
Refuge." Comment: The preceding provides established
federal policy and programs and precludes management
options within the scope of the draft plan and EA.

81) The acres under conservation easements total 1,533.56. The acres under cooperative agreements total 1,567.00. The approximate estimate on page 8 has been corrected to reflect these, more accurate figures. The figure on page 216 in the Fire Management Plan (over 2,700 acres under cooperative agreement) was considered an accurate estimate of lands managed under cooperative agreements and easements in 2001, when the Fire Management Plan was written. When the Fire Management Plan is updated in the future, the figure of cooperatively managed acres and easement acres will be updated.
82) The general terms of easements and cooperative agreements that the Refuge will enter into are described under "Land Conservation Methods" and "Related Projects and Studies in the Area" on page 8 and 13 respectively of the CCP. The CCP describes the preferred alternative, which is consistent with the terms of all easements entered into or that would be entered into by the Refuge within the approved Refuge boundary. In addition, all individual easements and agreements are publicly-recorded documents that are available from the Refuge headquarters upon request.
83) Objective 1.H and the associated strategies describe how non-irrigated grasslands will be managed and enhanced on the North Stone Lake Unit. The CCP does not propose expansion of grasslands on the Refuge. The 30 acres planted to restore the native grassland community, described in the environmental assessment (alternatives table on page 190 of the CCP), will result in conversion of primarily non-native grasslands to primarily native grasslands and does not describe expansion of overall grassland acreage.
84) Lands described on page 8 as private lands and lands "managed for conservation purposes by five local and State agencies" are not all managed by the Refuge under cooperative agreements. However, lands owned by Sacramento County Parks (1,567 acres) and Caltrans (150 acres) are managed by the Refuge. Copies of these management agreements are available from the Refuge headquarters upon request. Lands owned by the California State Parks (1,073 acres), the California Department of Water Resources (410 acres) and the Sacramento Regional County Sanitation District (1,800 acres) are not managed by the Refuge, but may still be managed, by local and State agencies, for conservation purposes as indicated on page 8 of the CCP.
85) There is no requirement to provide a summary of environmental documentation for all prior actions on a Refuge in a CCP. The "History of Refuge Establishment and Acquisition" section summaries previous land conservation efforts on the Refuge. Specific inquiries regarding other previous actions should be referred to the Refuge and are beyond the scope of the CCP.
86) The comment is acknowledged. See response #82.
87) The cooperative agreement with Sacramento County Department of Regional Parks, Recreation and Open Space was finalized in 1999 and relates to joint management of grassland habitat on the North Stone Lake Unit and is consistent with the habitat restoration and management goals and objectives of the CCP.
88) The draft cooperative agreement is included for illustrative purposes only. See response #82 for a description of why actual cooperative agreements have not been included with the CCP. There are no changes to the Fire Management Plan proposed as part of the CCP process, although it will be updated outside of the CCP process in the future. The Fire Management plan is included in the appendices for informational purpose only.
89) A summary of the Draft North Stone Lake Management and Restoration Plan is provided on page 14 of the CCP. The proposed action to manage the Refuge according to the goals, objectives and strategies described beginning on page 73 of the CCP is consistent with the Draft North Stone Lakes Management and Restoration Plan.

1,740 acres in fee title ownership (p. 8);
2,933 acres under cooperative agreement, "over 2,700 acres" (p. 216);
1,533 under agricultural easement (p. 8) - define terms and relation to other lands;
1,900 acres annual or perennial grasslands (p. 59) -define terms and how grasslands would be expanded, presumably from other land types, in some alternatives.
Also: About 5,000 acres publicly owned within the Refuge and CWMA are managed by five local and state agencies (p. 8). Comment: Identify more clearly which agencies manage which properties, and the specific terms and conditions of all cooperative agreements for those properties. Colored maps do not adequately describe what the cooperative agreements or management conditions represent in terms of existing or proposed federal policies or actions. Past actions should have respective NEPA and other environmental reviews summarized in this draft plan and EA.

P. 11 "The Service has finalized a cooperative agreement with Sacramento County Department of Regional Parks, Recreation and Open Space over management of the North Stone Lakes Unit." Comment:
89 Such an agreement must be included in the draft plan and EA as executed. Explain how the agreement applies to the current draft plan. Appendix C.4 apparently
90 shows a 1998 draft without signatures or dates and based solely on the 1992 plan that apparently is to be superseded by the current draft plan and EA. Define the terms and conditions in the Draft North Stone Lake
91 Management and Restoration plan to be incorporated in the future Refuge plans (p. 82). Explain specifically what draft county policies will become federal
92 policies and actions. Indicate how NEPA requirements were met for the previous draft cooperative agreement with the county and for the grazing cooperative land management agreement, or how those agreements are covered in this NEPA action. Explain how the hunting
93 programs, past and proposed, can be conducted under provisions of Section 5.H. prohibiting hunting, firearms and shooting "on the Refuge" and how the agreement fits within the policies of the National Wildlife Refuge System. Explain how the Service complies with the county Flood Management Plan under
94 Section 7.A. and how that requirement directly affects management options for the draft plan and indirectly affects the environment. The cooperative agreement contains many terms and conditions that may significantly affect the environment of the region.

P. 14 "The 2,791 Acre North Stone Lake Unit consists of two adjacent parcels owned by the DPR (1,224 acres)
95 and Sacramento County (1,567 acres). The goal of the Service is to cooperatively manage both these parcels with the County and the State, as a unit of the Refuge." Comment: The preceding provides established federal policy and programs and precludes management options within the scope of the draft plan and EA.

90) No County policies will become Federal policies.
91) The environmental assessment, Appendix B of the CCP, applies only to the current proposed action described in the CCP. Refuge land conservation efforts such as cooperative agreements are provided for under the 1992 Final Environmental Impact Statement, establishing the approved Refuge boundary (USFWS 1992). The Refuge determined that re-establishing a livestock grazing program on the North Stone Lake Unit was an acceptable habitat management approach and not a significant Federal action necessitating individual NEPA documentation. Please contact the Refuge for more information on prior actions, not addressed in this CCP.
92) See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations will be made for Refuge uses. The section (5.F.) of the draft 1998 cooperative agreement (Appendix C.4) that you evidently refer to relates to Sacramento County not permitting hunting on their North Stone Lake property. The Refuge hunting program occurs in the South Stone Lake Unit on land owned in fee title by the Service and is consistent with policies of the National Wildlife Refuge System. For more informaion on refuge hunting, please refer to the Stone Lakes Waterfowl Hunting Plan, available on the internet at : http://www.fws.gov/stonelakes/Waterfowl%20Hunt%20Plan.pdf
93) The Service must obtain concurrence from Sacramento County Department of Water Resources that any earthwork proposed by the Service for the county-owned portion of the North Stone Lake property will not affect floodplain storage. Objectives and strategies for management of refuge floodplain lands are described on page 84 of the CCP.
94) The comment is acknowledged. The section referred to was completed in 2001 and is included for informational purposes only.
95) By definition, lands under joint management must be administered in a manner consistent with the goals of the cooperating parties signatory to the agreement. The Service has determined that the North Stone Lake Unit can be cooperatively managed consistent with the CCP and contribute to the mission of the National Wildlife Refuge System.

96 Define the terms and conditions of any existing or proposed cooperative management agreement or MOA. The acreage of the county property is given as 2,700 acres

97 on page 218, for a difference of 91 acres with the acreage given on page 14.

P. 14 The Sacramento Regional County Sanitation District (SRCSD) constructed the Sacramento Regional Wastewater Treatment Plant and purchased 2,650 acres to serve as a buffer between the plant and surrounding residential areas. About 1,800 acres lie within the approved refuge boundary. The Service and SRCSD have drafted a cooperative agreement for management of the lands as a unit of the Refuge. Comment: The terms

98 and conditions of such a cooperative agreement must be included in the daft plan and EA. Elsewhere in the draft plan, the term 'cooperative agreement' refers to grazing concessions.

P. 15. "The Wildlife Area lies approximately 15 miles northwest of the Refuge…" Comment: YBWA may be about 15 mile drive by vehicle, but it is about eight to 11

99 air miles northwest from the northern edge of the Refuge. There are several square miles of federal lands within the bypass and south of YBWA, directly west of the Refuge, that may present opportunities for co-management.

100 P. 15. The Cosumnes River Preserve seeks to preserve 20,000 acres. Comment: The preserve lands now total approximately 40,000 acres per BLM and TNC.

P. 34 "While irrigated agriculture is conducted within the approved Refuge boundary, it is not conducted on lands under the control (i.e., fee title ownership, cooperative management agreement, conservation easement) of the Refuge (p. 34)".

101 Comment: it is impossible to determine which forms of control apply to which lands as described in the draft plan and EA. Terms and conditions of each form of control must be explicitly described.

"…discharge from adjacent agricultural lands is ultimately the responsibility of the discharger." Comment: The landowner or management agency shares

102 responsibilities for water quality on its land under state and federal law, including liability for cleanup or remediation. Revise the characterizations of resource conditions and management options to

103 completely address water quality from all agricultural runoff within the Refuge boundaries. The Service apparently agreed to accept drainage from neighboring districts in Section 7.G. of the cooperative agreement

104 with Sacramento County (p. 254).

P. 57 Water management. The draft plan says that water is managed for "floodup, drawdown, and summer irrigations" and mentions uses of appropriative and riparian water rights as available. Under the Winters Doctrine (1908), the establishment of a refuge creates

96) See response #82 for an explanation regarding inclusion of specific easements and agreements as part of the CCP.
97) Page 14, of the CCP, describes the total SRCSD property as 2,650 acres only 1,800 of which lie within the approved Refuge boundary. The Fire Management Plan, describes the North Stone Lakes Unit as being 2,700 acres in size which includes the treatment plant and the surrounding 2,650 acres of "buffer lands". There is no contradiction in these acreage figures, but the reader should consider the figure of 2,650 as lands the Refuge would be interested in managing to fulfill Refuge purposes.
98) See response #82 for an explanation regarding inclusion of specific easements and agreements as part of the CCP. The precise acreage under a conservation easement is 1,533.56. The precise acreage under cooperative agreement is 1,567.00. The approximate estimate on page 8 has been corrected to reflect these more accurate figures.
99) The comment is acknowledged. The sentence has been edited to reflect accurate mileage.
100) The comment is acknowledged and the figure will be corrected to the current figure available from the Cosumnes River Preserve. The current total acreage of the Cosumnes River Preserve, at the time of CCP completion, was 46,000 acres (Jaymee Marty, pers. comm. Cosumnes River Preserve Biologist).
101) See response #82 for a description of the management that will be applied to lands within the Refuge under the proposed action. The manner in which Refuge lands have been conserved by the Service are illustrated in Figures 2, 3, and 4.
102) We agree that a landowner or management agency can be a discharger. On page 34 of the draft CCP the paragraph refers to adjacent irrigated lands that are not owned or managed by the Refuge. The paragraph has been clarified in the final CCP. The section referred to is under an introductory review of Refuge Resources and is not intended to be a definitive statement on discharged water quality laws, regulations or policies. Detailed questions about local water quality regulations should be referred to the Central Valley Regional Water Quality Control Board.
103) Given the limited resources available for preparation of the CCP, the Service believes it has adequately characterized issues related to water quality and agricultural drainage within the approved Refuge boundary.
104) The comment is acknowledged.

105 federal reserve water rights, outside of the system of state water rights except for date of priority, for the purposes for which the reservation of land was made. Federal reserve rights should thus be asserted to protect the uses of water on the Refuge for wetland habitat. All water sources, rights and management
106 actions should be quantified in the draft plan and EA.

107 P. 81-82, Strategies. Comment: Explain strategies more clearly and completely. How would Strategy 1.K.6
108 (p. 81) affect the environment, as the draft plan simply says that some sort of cooperative agreement would be finalized without providing any details on the nature of that agreement. How would Strategy
109 1.L.2 (p. 82) "…secure long-term management through cooperative agreements…" for 1,224 acres of state lands? What is the current term of management
110 agreement? What are the conditions or provisions of
111 that agreement and the proposed update? How is the
112 significance of any environmental impacts for such unexplained actions assessed? What does 'joint management" of DWR's 410 acres entail in terms of land
113 use, recreational opportunities, wildlife conservation, and changes to the environment? What is the "joint operating agreement" for the Cosumnes River Preserve and how would the incremental actions of
114 various agencies in each area interrelate to cumulatively affect the environment in the long term?

P. 57 "During large rainfall events, water enters SP Cut when floodwaters overtop the Morrison Creek dam at
115 the north end of Beach Lake." Comment: Limited public access has not adequately allowed public knowledge to engage in very specific discussion of the current management practices and their effects on the environment. While the safety of dams is an important
116 and significant issue of concern in the region and may be an issue with overtopped structures on the Refuge. The draft plan and EA do not provide sufficient information to evaluate the effects of current and
117 proposed water management practices and facilities on the surrounding environment. Operational details including responsibilities for dams and gates should be discussed in detail.

P. 91 Objective 4.E. and Strategy1. Comment: The goal of having a cooperative agreement does not suffice for the public review of the planning or for the assessment of environmental impacts under NEPA. NAGPRA agreements are positively described in terms of elements that they would entail, as required under NAGPRA, but still leave values neutral and actions open for creative interpretation in the mind of the reader and for implementation of the draft plan. Describe the management direction for policy or action supported by the draft plan and EA for each element as required by NEPA.

105) The comment is acknowledged. At this time the Service believes that the management of Refuge lands and waters described in the CCP is consistent with State water law, Refuge purposes, the National Wildlife Refuge System mission, and Service policies.

106) The comment is acknowledged. Given limited resources for plan development, the CCP can only describe the water resources necessary to achieve the action detailed in the CCP and does not seek to quantify all water sources, rights, and management actions.

107) Within the framework of the CCP an objective is a concise statement of what and how much is to be achieved, where it will occur and who is responsible for its completion. Objectives derive from goals and provide the basis for determining strategies. Strategies are a specific action, tool, technique, or combination of actions, tools, and techniques to meet unit objectives. Objectives and strategies are worded as specifically as possible. Any follow-up actions lacking sufficient detail in the CCP and associated NEPA document may require a separate analysis of potential impacts for compliance with the National Environmental Policy Act, the Endangered Species Act and other applicable laws and regulations.

108) Strategy 1.K.6. addresses a cooperative agreement with Sacramento Regional County Sanitation District for joint management of the Bufferlands surrounding the Regional Wastewater Treatment Plant. Finalization of this agreement would not necessitate additional NEPA documentation since the resulting inter-agency coordination and habitat management would not constitute a major new Federal action and would be consistent with the CCP.

109) Finalization of an agreement with California Department of Parks and Recreation would not necessitate additional NEPA documentation since the resulting enhanced inter-agency coordination and habitat management would not constitute a major new Federal action and would be consistent with the CCP.

110) See response #82 for an explanation regarding inclusion of specific easements and agreements as part of the CCP.

111) See response #109.

112) See response #109.

113) Preparation of a cooperative agreement with California Department of Water Resources for joint management of their 410 acres within the approved Refuge boundary (Strategy 1.L.3) would not necessitate additional NEPA documentation since the resulting inter-agency coordination and habitat management would not constitute a major new Federal action and would be consistent with the CCP.

114) The joint operating agreement for the Cosumnes River Preserve is the overall agreement defining the roles and responsibilities of the private and public cooperators participating in the Preserve. Addressing the cumulative environmental effects of this agreement was the responsibility of the signatories.

115) The comment is acknowledged.

116) The Morrisson Creek dam is actually a levee which is maintained by the City and County of Sacramento and does not currently lie within the Refuge. The City and County do no operate the levee other than passively allowing it to be overtopped as water surface elevations to the north or south increase. We believe that the environmental assessment (Appendix B) provides sufficient information to evaluate the effects of current and proposed Refuge water management practices on the environment as described under "Water Quantity and Quality" on page 208 of this CCP.

117) See response to #116.

118) Operational details of water control structures affecting the Refuge including gates and dams are discussed: under "Water Supply" beginning on page 37; under "Wetlands" beginning on page 58; and under "Basin Hydrology and

federal reserve water rights, outside of the system of state water rights except for date of priority, for the purposes for which the reservation of land was made. Federal reserve rights should thus be asserted to protect the uses of water on the Refuge for wetland habitat. All water sources, rights and management actions should be quantified in the draft plan and EA.

P. 81-82, Strategies. Comment: Explain strategies more clearly and completely. How would Strategy 1.K.6 (p. 81) affect the environment, as the draft plan simply says that some sort of cooperative agreement would be finalized without providing any details on the nature of that agreement. How would Strategy 1.L.2 (p. 82) "…secure long-term management through cooperative agreements…" for 1,224 acres of state lands? What is the current term of management agreement? What are the conditions or provisions of that agreement and the proposed update? How is the significance of any environmental impacts for such unexplained actions assessed? What does 'joint management" of DWR's 410 acres entail in terms of land use, recreational opportunities, wildlife conservation, and changes to the environment? What is the "joint operating agreement" for the Cosumnes River Preserve and how would the incremental actions of various agencies in each area interrelate to cumulatively affect the environment in the long term?

P. 57 "During large rainfall events, water enters SP Cut when floodwaters overtop the Morrison Creek dam at the north end of Beach Lake." Comment: Limited public access has not adequately allowed public knowledge to engage in very specific discussion of the current management practices and their effects on the environment. While the safety of dams is an important and significant issue of concern in the region and may be an issue with overtopped structures on the Refuge. The draft plan and EA do not provide sufficient information to evaluate the effects of current and proposed water management practices and facilities on the surrounding environment. Operational details
118 including responsibilities for dams and gates should be discussed in detail.

P. 91 Objective 4.E. and Strategy1. Comment: The
119 goal of having a cooperative agreement does not suffice for the public review of the planning or for the assessment of environmental impacts under NEPA. NAGPRA agreements are positively described in terms of elements that they would entail, as required under NAGPRA, but still leave values neutral and actions open for creative interpretation in the mind of the
120 reader and for implementation of the draft plan. Describe the management direction for policy or action
121 supported by the draft plan and EA for each element as required by NEPA.

Water Quality" beginning on page 66.

119) The comment is acknowledged.

120) The comment is acknowledged.

121) The Service believes there is adequate description of the policies and actions proposed by the CCP to satisfy NEPA requirements.

122 P. 216 An agreement with Elk Grove Community Services
District for fire suppression is shown in Appendix D.
As indicated, the public supports prescribed burning.
123 The cooperating agency should be clarified, as it
perhaps changed names and is listed variously in the
plan as Elk Grove CSD, Elk Grove Fire Protection
District, and Elk Grove. This emergency agreement,
124 although important in itself, is probably of less
interest to the public and less relevant to the
assessment of environmental impacts of the draft plan
that the cooperate management agreements for the
125 various lands within the area. Show all existing and
proposed agreements.

Environmental Assessment Comments: The Refuge
purposes and goals expressed in Chapter 1 of the EA
126 were extended with specific terms of management
agreements executed over the years. Those terms
should be specifically included in the base and
proposed conditions and evaluated for incremental and
cumulative impacts.

P. 190 Boating Comment: The State Lands Commission
127 may own land in Snodgrass Slough in fee title as a
navigable waterway of the Delta since statehood,
including areas within the Refuge boundary. Federal
management jurisdiction for boating in the slough and
128 other navigable waterways under any ownership is
limited and probably does not extend to control of
water skiing. Planners should formally inquire of the
129 State Lands Commission regarding ownership of the bed
and banks of navigable waterways including Snodgrass
Slough.

130 P. 191. Hunting Comment: Deer are resident and move
within one to two square miles in valley habitats, so
deer hunting would not impact populations or public
131 safety under state regulations. State regulations are
protective of the environment and the public. If any
132 restrictions must be applied specifically for federal
lands, then archery, shotgun and muzzleloader hunting
should be allowed due to the limited ranges for those
methods of take. The fact that lands in federal fee
133 ownership are in several parcels provides an excellent
opportunity for dispersing hunters safely and
providing for quality experiences. The likelihood of
134 success should be judged by the hunters in terms of
their personal values, rather than presumptively by
the planners on behalf of the hunters. Horses
135 Comment: Trails for horses can be readily built into
levees, existing service routes, and recreational
trails to provide low-impact access opportunities.
There are no real conflicts between equestrian and
136 other recreational uses such as boating, observing and
photographing wildlife, hiking or hunting. On public
lands throughout the West, horses are often used as
137 part of other wildlife-dependent recreational
activities. Equestrians may enjoy better views of
138 wildlife over high tules than pedestrians, and some
species of wildlife are often less disturbed by

122) The comment is acknowledged.
123) The comment is acknowledged. Any cooperating fire management agency or agencies will be clarified in future agreements.
124) The comment is acknowledged.
125) The comment is acknowledged. The Service believes there is sufficient background information provided in the CCP regarding existing and proposed agreements.
126) As defined in the National Wildlife Refuge System Improvement Act of 1997, the terms " 'purposes of the refuge' and 'purposes of each refuge' mean the purposes specified in or derived from the law…establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit." The purpose(s) of a refuge unit do not change over time. We respectfully disagree with the statement that the "Refuge purposes and goals…were extended …over the years." The goals presented in the CCP and associated NEPA document are unique to the CCP. Prior management agreements were in accord with the Environmental Impact Statement finalized in 1992, prior to Refuge establishment in 1994.
127) The comment is acknowledged.
128) There is no proposal in the CCP to control waterskiing on the Refuge. See response #2 for a discussion of compatible and appropriate uses of Refuge lands, including waterskiing associated with high speed boating. There is well-established legal precedent under the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884) and the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) as amended for the Service to regulate boating on navigable and non-navigable waters of the U.S. when these waterways are under the ownership of the Service.
129) The comment is acknowledged. The Service has adequately determined the extent of property boundaries to be able to administer visitor activities on lands and waters within the Refuge.
130) The comment is acknowledged. Deer do not occur on the Refuge in sufficient numbers to warrant consideration of a deer hunting program.
131) The comment is acknowledged.
132) See response #130.
133) The comment is acknowledged.
134) The comment is acknowledged.
135) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
136) We respectfully disagree. See response #3 for a description of how Compatibility Determinations and Appropriate Use determinations are made for Refuge uses.
137) The comment is acknowledged.
138) The comment is acknowledged.

persons on horses than by persons on foot. Horses for
intermittent recreational use will have less impact
139 lands and waters than long-term cattle grazing. The
incidence of horse use is likely to be insignificant
140 under any circumstances due to limitations of trailer
access, weather, mosquitos, and other natural
conditions.

141 Overall Comments: 1. An Environmental Impact
Statement should be prepared due to the potential
significance of the proposed actions to the local area
and migratory waterfowl, even though the impacts are
142 mostly beneficial. That would enable future
site-specific projects (such as pending management
agreements or parking areas and trails developments)
to tier from it by Environmental Assessment, but an EA
143 cannot tier to an EA. 2. Favor Alternative D with
additional trails for hiking and boating, and other
wildlife-oriented recreational opportunities to be
planned for minimal impact to the environmental
values. Public lands with even 1,760 acres should
have at least 15 miles of trails open to the public,
144 as occurs for example on 1,418 acres at BLM's new
Cronan Ranch near Coloma under agreements that protect
natural values. Alternative D has the least
environmental impact and is most sustainable due to
145 less long-term dependence on limited water resources
for wetlands, and more emphasis on native grasslands
for newly acquired lands. For that reason and for
improved recreation access with low chance of
146 significant impacts to other resources, I favor the
adoption of Alternative D for the plan.

My family and I appreciate the opportunity to learn
more about the refuge planning and to comment on the
draft documents. Thank you for your consideration of
the above comments which are intended solely to
encourage strong refuge planning. Please withhold my
name, email address and residential address from
publication.

Sincerely,

[redacted]

Do You Yahoo!?
Tired of spam? Yahoo! Mail has the best spam protection around
http://mail.yahoo.com

139) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses. Grazing has been found to be a compatible use with stipulations in the Compatibility Determination for grazing on the Refuge, which is included in Appendix A. As stated in the Compatibility Determination's justification, the goals for grazing on the Refuge are to conserve, enhance, restore and manage Central Valley wetland, riparian, grassland and other native habitats to benefit their associated fish, wildlife, plants and special status species.

140) The comment is acknowledged; however see response #3 for a description of how Compatibility Determinations and Appropriate Use Determination will be made for Refuge uses.

141) We respectfully disagree. The Service has found no evidence to suggest that there would be any significant impacts to the environment from the proposed action.

142) Any future projects or actions lacking sufficient detail in the CCP and associated NEPA document will receive separate analyses of potential impacts in compliance with the National Environmental Policy Act, the Endangered Species Act and other applicable laws, policies, and regulations.

143) There is no Alternative D in the Environmental Assessment for the CCP.

144) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses. Lands managed as part of the National Wildlife Refuge System are managed to fulfill the Refuge purpose(s), the mission of the National Wildlife Refuge System and Service policies. Policies for the management of National wildlife refuges may or may not coincide with the management policies for other federal lands. The Service does not prescribe to a formulaic acreage-based approach to determine the extent of public trails on a refuge unit.

145) There is no Alternative D in the environmental assessment for the CCP.

146) There is no Alternative D in the environmental assessment for the CCP.

15069 Robles Grandes Dr.
Rancho Murieta, CA 95683
October 27, 2006

Mr. David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Dear Mr. Bergendorf:

The National Wildlife Refuge Association (NWRA) appreciates the opportunity to comment on the Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) for Stone Lakes National Wildlife Refuge. The NWRA is a national membership organization whose mission is to protect, enhance and expand the National Wildlife Refuge System (NWRS) ---lands and waters set aside by the American people to conserve our diverse wildlife heritage.

147 Overall, we feel that the draft CCP/EA is extremely well done and wish to complement those responsible for its preparation.

We found the background information provided quite detailed and very useful to understanding the context of the plan. Likewise, we
148 were impressed with the quality of the thought that went into the analysis and recommendations contained in Section 5, Refuge Vision, Goals and Objectives. We endorse those as written.

We were especially pleased to see the continued emphasis on coordination and collaboration with other private and public conservation efforts in addressing regional habitat conservation

147) The comment is acknowledged.
148) The comment is acknowledged.

needs. This is clearly essential for any unit of the NWRS, but especially one located in an environment undergoing the kind of
149 intense urban development pressures that face the Stone Lakes NWR and adjacent diminishing wildlife habitats. We applaud those efforts.

We are very supportive of Goal 3 in Section 5, concerning the commitment to providing compatible wildlife-dependent recreation, interpretation and education opportunities for refuge visitors. Such programs can have far reaching benefits in terms of
150 fostering public understanding and appreciation for the importance of wildlife and wildlife habitats to society in general, but especially to those living in an urban environment.

In that vein, we were pleased to see that the high speed boating and associated waterskiing that has occurred in the Beach Lake and North Stone Lake units since prior to when the refuge was established was found to be Not Compatible. We have long felt
151 that this non-wildlife oriented activity was not compatible with refuge purposes and strongly support the decision to phase out and terminate such use. The basis for our position on this issue are clearly and accurately reflected in the Justification section of the Compatibility Determination.

In terms of Section 6, Implementation and Monitoring, given the inter-relatedness of wildlife, fisheries and habitat management, we would suggest that you consider one, comprehensive step down
152 management plan that incorporates and integrates all three aspects. We suspect that from a practical management standpoint, this could provide some very real benefits in terms of the ease of plan preparation, the effectiveness of integrating the various considerations involved with each, and the comparative simplicity of plan implementation. We also believe that one, comprehensive step down management plan that integrates wildlife, fisheries and

149) The comment is acknowledged.
150) The comment is acknowledged.
151) The comment is acknowledged. However, please note that the Compatibility Determination will be considered final when the Refuge Compatibility Determination and Concurrence have been signed by authorized representatives of the U.S. Fish and Wildlife Service.
152) The Refuge has attempted to include sufficient detail related to wildlife and habitat management in this CCP such that a step down habitat management plan may not be necessary. In the event that more site or species-specific planning becomes necessary and as more staffing and resources become available, the Refuge will consider preparation of further step-down plans. We agree with the comment's suggestion that fisheries, wildlife, and habitat management are inter-related and the Refuge will consider integrating these plans.

habitat management would be much easier for the public (and future refuge staff) to understand.

We appreciate the obvious effort that went into this excellent document, and the opportunity to comment on it.

While our comments are being e mailed to you on this date, our original letter will be mailed under separate cover.

Sincerely,

Joseph P. Mazzoni
California/Nevada Representative

Cc: Evan Hirsche, President

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October 27, 2006

Mr. David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Dear Mr. Bergendorf:

SUBJECT: Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) for Stone Lakes National Wildlife Refuge

The staff of the Delta Protection Commission (Commission) has reviewed the subject document dated September 27, 2006. Staff has determined that the habitat restoration and public access actions proposed in the document are located within the Primary Zone of the Legal Delta. The Commission therefore offers the following comments regarding consistency of the CCP/EA with the Land Use and Resource Management Plan for the Primary Zone of the Delta (Management Plan).

153 The Delta Protection Act (Act) was enacted in 1992 in recognition of the increasing threats to the resources of the Primary Zone of the Delta from urban and suburban encroachment having the potential to impact agriculture, wildlife habitat, and recreation uses. Pursuant to the Act, the Commission's Management Plan was completed and adopted by the Commission in 1995.

154 The Management Plan sets out findings, policies, and recommendations resulting from background studies in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs. As mandated by the Act, the policies of the Management Plan are incorporated in the General Plans of local entities having jurisdiction within the Primary Zone, including Sacramento County. Both the Act and the Management Plan are available for your reference at the Commission's website, www.delta.ca.gov.

155 The policies and recommendations from the Management Plan that are relevant to this project include, but are not limited to, the following:

Environment

- Policy 1: The priority land use of areas of prime soil shall be agriculture. If commercial agriculture is no longer feasible due to subsidence or lack of adequate water supply or water quality, land uses which protect other beneficial uses of Delta resources, and which would not adversely affect agriculture on surrounding lands, or

153) The comment is acknowledged.
154) The comment is acknowledged.
155) The comment is acknowledged.

viability or cost of levee maintenance, may be permitted. If temporarily taken out of agriculture production due to lack of adequate water supply or water quality, the land shall remain reinstateable to agricultural production for the future.

- Policy 3: Lands managed primarily for wildlife habitat shall be managed to provide several inter-related habitats. Deltawide habitat needs should be addressed in development of any wildlife habitat plan. Appropriate programs, such as "Coordinated Resource Management and Planning" and "Natural Community Conservation Planning" should ensure full participation by local government and property owner representatives.
- Recommendation 1: Seasonal flooding should be carried out in a manner so as to minimize mosquito production. Deltawide guidelines outlining "best management practices" should be prepared and distributed to land managers.
- Recommendation 2: Wildlife habitat on the islands should be of adequate size and configuration to provide significant wildlife habitat for birds, small mammals, and other Delta wildlife.
- Recommendation 5: Publicly-owned land should incorporate, to the maximum extent feasible, suitable and appropriate wildlife protection, restoration and enhancement as part of a Deltawide plan for habitat management.
- Recommendation 6: Management of suitable agricultural lands to maximize habitat values for migratory birds and other wildlife should be encouraged. Appropriate incentives, such as conservation easements, should be provided by nonprofits or other entities to protect this seasonal habitat through donation or through purchase.
- Recommendation 7: Lands currently managed for wildlife habitat, such as private duck clubs or publicly-owned wildlife areas, should be preserved and protected, particularly from destruction from inundation.

Land Use

- Policy 2: Local government general plans and zoning codes shall continue to strongly promote agriculture as the primary land use in the Primary Zone; recreation land uses shall be supported in appropriate locations and where the recreation uses do not conflict with agricultural land uses or other beneficial uses, such as waterside habitat.
- Policy 3: New residential, recreational, commercial, or industrial development shall ensure that appropriate buffer areas are provided by those proposing new development to prevent conflicts between any proposed use and existing agricultural use. Buffers shall adequately protect integrity of land for existing and future agricultural uses. Buffers may include berms and vegetation, as well as setbacks of 500 to 1,000 feet.
- Policy 7: Structures shall be set back from levees and areas which may be needed for future levee expansion.

Recommendation 1: A program by non-profit groups or other appropriate entities should be developed to promote acquisition of wildlife and agricultural conservation

easements on private lands with the goal of protecting agriculture and wildlife habitat in the Delta.

- Recommendation 2: Public agencies and non-profit groups have or propose to purchase thousands of acres of agricultural lands to restore to wildlife habitat. Lands acquired for wildlife habitat should also be evaluated for recreation, access, research and other needed uses in the Delta. Habitat restoration projects should not adversely impact surrounding agricultural practices. Public-private partnerships in management of public lands should be encouraged. Public agencies shall provide funds to replace lost tax base when land is removed from private ownership.
- Recommendation 3: Multiple use of agricultural lands for commercial agriculture, wildlife habitat, and, if appropriate, recreational use, should be supported, and funding to offset management costs pursued from all possible sources. Public agencies shall provide funds to replace lost tax base when land is removed from private ownership.

Agriculture

- Policy 7: Local governments shall encourage acquisition of agricultural conservation easements as mitigation for projects within each county, or through public or private funds obtained to protect agricultural and open space values, and habitat value that is associated with agricultural operations. Promote use of environmental mitigation in agricultural areas only when it is consistent and compatible with ongoing agricultural operations and when developed in appropriate locations designated on a countywide or Deltawide habitat management plan.
- Policy 8: Local governments shall encourage management of agricultural lands which maximize wildlife habitat seasonally and year-round, through techniques such as sequential flooding in fall and winter, leaving crop residue, creation of mosaic of small grains and flooded areas, controlling predators, controlling poaching, controlling public access, and others.

Water

- Policy 2: Local governments shall ensure that design, construction, and management of any flooding program to provide seasonal wildlife habitat on agricultural lands shall incorporate "best management practices" to minimize mosquito breeding opportunities and shall be coordinated with the local vector control districts.

Recreation and Access

- Policy 3: Local governments shall develop siting criteria for recreation projects which will ensure minimal adverse impacts on: agricultural land uses, levees, and public drinking water supply intakes, and identified sensitive wetland and habitat areas.
- Policy 6: Local governments shall support multiple uses of Delta agricultural lands, such as seasonal use for hunting, or improved parking and access sites.

- Policy 7: Local governments shall support improved access for bank fishing along State highways and county roads where safe and adequate parking can be provided and with acquisition of proper rights-of-access from the landowner. Adequate policing, garbage cleanup, sanitation facilities, and fire suppression for such access shall be provided.
- Policy 9: Local governments shall encourage new recreation facilities that take advantage of the Delta's unique characteristics.
- Recommendation 7: Local governments should develop design guidelines for new or enlarged recreation facilities to protect adjacent agricultural land uses.

Stone Lakes NWR personnel has participated in meetings of the Commission's Recreation Citizens' Advisory Committee, providing information for both the Delta Boating Needs Assessment (CA Dept. of Boating and Waterways, 2002) and the Commission's Aquatic Recreation Component of the Delta Recreation Strategy Plan (Dangermond, 2005). The Commission is pleased to see that some of the unmet recreational needs in the Delta identified in both documents (i.e., hunting and fishing
156 access, restrooms, non-motorized boating trails, and wildlife observation and interpretation areas) may be funded and implemented at Stone Lakes NWR. One
157 suggestion Commission staff offers for the CCP (Figure 7) is the addition of picnic areas along some of the restored riparian zones slated for public access.

Thank you for the opportunity to review and comment on this proposal. Please contact me at (916) 776-2292 or lindadpc@citlink.net if you have any questions about the Commission or the comments provided herein.

Sincerely,

Linda Fiack
Executive Director

156) The comment is acknowledged.

157) Construction of picnic areas has not been considered on the Refuge due, in part, to limited Refuge staff for the maintenance of picnic facilities. Picnicking is also not identified as a priority wildlife-dependent use in the National Wildlife Refuge Improvement Act of 1997. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

Comments and Suggestions

Pages 31-35, 66. Water Quality

Morrison Creek receives up to 6.5 mgd (9.9 cfs) of remediated water from Aerojet facilities upstream under permit by the Central Valley Regional Water Quality Control Board. Numerous wells to the east have been closed due to contamination from various chemicals. The California Dept. of Health Services (DHS) recently proposed water quality standards of 6 mg/L for perchlorate, which bioaccumulates and adversely impacts the food chain. The past and future discharges upstream will likely impact wildlife and may incur liability for cleanup on federal lands and water downstream. Fish kills on Morrison Creek (p. 45) indicate that more investigation is needed to specifically identify the source(s) of the water and contaminants or other water quality problems there. The Sacramento County Water Agency, a groundwater regulatory authority, has acquired the rights to groundwater and partly remediated surface waters in areas upstream which discharge into the Morrison Creek watershed. Needing clarification: "Before the turn of" which century were levees constructed that divide Upper and Lower Beach Lakes (p. 35)? **Suggestions:** Plans should explore and mitigate impacts to wildlife from additional contaminants. Perchlorate, NDMA, TCE, and other post-remediation constituents should be considered as constituents of concern and added to the water quality monitoring program for both surface and ground waters. Planning should coordinate with other responsible agencies including County of Sacramento, Sacramento County Water Agency, EPA, Regional Water Quality Control Board, and DHS for monitoring, mitigation, and remediation. Provide data on the quantities of estimated streamflows in each stream or watercourse in more detailed discussions of hydrology including maps. Discuss water rights in and around the project area in detail. Distinguish among quantities, sources and dispositions of stormwater runoff, treated water runoff, tailwater, groundwater springs and adsorptions, tidal flows, standing water bodies, floodwaters backing up from the Cosumnes and Mokelumne Rivers, and natural accretions and streamflows to the extent possible. Determine the source(s) of groundwater assumed to be coming from the river (p. 35). Provide data on output from the seven pumps. Acquire water rights where available for beneficial uses. Define the role of the federal lands and waters as mitigation for upstream releases of contaminants in direct benefit to local agencies. Monitor groundwater quality, especially for saltwater intrusions as found elsewhere around the Delta. Engage the services of water modeling consultants if necessary to characterize the hydrology and water quality.

Pages 50 – 86 Strategy

Boating occurs under existing programs and opportunities can be expanded. Public rights to navigation exist on all navigable streams and tidal channels under state and federal laws and the Public Trust Doctrine, and thus boating on nonflood waters in the area is legal (p. 51, 52). Boating can be considered wildlife dependent as it would generally involve fishing, hunting and/or wildlife observation and photography. **Suggestions:** Expand recreation opportunities greatly. Do not consider recreation as a threat to 'moist soil impoundments' (mud) or most other habitats. Allow access roads to serve multiple uses for hiking, biking, and horse riding as are public roads in most of the Central Valley in the vicinity of agricultural areas and wetlands. Revise strategy 1.G.1. to be consistent with Goal 3 and to reflect the very limited impacts from dispersed recreation on nesting

158) The comment is acknowledged.
159) The sentence will be corrected to the turn of the 20th century, for clarification.
160) The Refuge agrees that it would be desirable to monitor for Perchlorate, NDMA, TCE and other constituents, however additional staff and project funds will be required to implement such a monitoring program.
161) The comment is acknowledged. With the staff resources available, the Refuge seeks and will continue to seek opportunities to work with partners, including those mentioned to fulfill the Refuge purpose, to fulfill the mission of the National Wildlife Refuge System and to comply with Service policies.
162) The comment is acknowledged. Obtaining and providing the data requested would be an unreasonable burden in the completion of the CCP and could only be obtained with great cost, particularly given the need for complex modeling to estimate highly variable stream flows and hydrology.
163) The comment is acknowledged. Obtaining and providing complete water rights information for areas around the Refuge would be an unreasonable burden in the completion of the CCP and could only be obtained with great cost.
164) See response #162.
165) See response #162.
166) See response #162.
167) The comment is acknowledged.
168) Generating the data requested regarding mitigation would be an unreasonable burden in the completion of the CCP and could only be obtained at great cost.
169) The comment is acknowledged, but we disagree with the suggestion. Within Refuge staff and monitoring resources, the ground water monitoring described is not considered feasible. The Refuge's highest priorities are to fulfill the Refuge purpose and to fulfill the mission of the National Wildlife Refuge System.
170) The comment is acknowledged, however given limited project funds the Refuge's highest priorities are to fulfill the Refuge purpose and to fulfill the mission of the National Wildlife Refuge System.
171) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
172) The comment is acknowledged.
173) The comment is acknowledged
174) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations will be made for Refuge uses.
175) The comment is acknowledged.
176) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
177) We disagree that strategy 1.G.1. is inconsistent with Goal 3. We believe visitors can be provided with wildlife recreation, interpretation, and education opportunities which foster an understanding of the Refuge's unique wildlife and plant communities in an urban setting (Goal 3) while at the same time reducing wildlife disturbance by limiting access to certain locations (strategy 1.G.1.).
178) The comment is acknowledged. Please note that the Refuge supports an adaptive management approach.

178 birds and other wildlife in deep water habitats, particularly because access is limited naturally by mud, water, vegetation, and other environmental conditions. Monitor recreation use and adapt management to circumstances as they are identified objectively.

Page 86 - 110 Objectives

179 Objective 3.B. (p. 86) places an arbitrary and capricious quota of 10,500 'visit
180 opportunities' on the recreational uses of the lands. The term 'visit opportunities' is not defined and is confusing or misleading. Most recreation activities are normally limited in
181 quantity by external conditions, and inherently timed and spaced for minimal conflict with other uses and with the environment. Use limits still allow adverse behaviors that
182 can better be prevented by management programs. **Suggestions:** Revise all discussions of recreation to remove pejorative approaches and, instead, support and guide beneficial
183 recreation activities. Specifically, the prescription for boating only with undefined trolling motors is inconsistent with 3.B.7, and is also confusing and inappropriate as many boaters would prefer not to use motors out of consideration for the wildlife and
184 other visitors. Boating trails should be defined for much more effective reduction of impacts to wildlife than would occur with seasonal restrictions or the imposition of 'no
185 wake' zones. Remove seasonal restrictions due to natural limitations on use in cold weather with short days and poor fishing conditions. Separate the strategies for parking
186 lots, fishing access, and boating provisions in Objectives 3.B and 3.E where they are partly intertwined and confusing, or make one objective for all water-oriented access.

187 **P. 115-116 Compatibility Determinations**

Assessments of compatibility misconstrue impacts from recreational use for spurious
188 reasons (p. 110) such as for **bank fishing** impacts on vegetation. In reality, vegetation is a natural barrier to fishing access and tends to regulate impacts to banks and to limit the amounts of use. Bank fishing is less likely to impact shorelines than carrying or dragging cartop boats across banks for access between parking areas and the water, for example.
189 Less effort is needed for staff to monitor bank fishing than for boat fishing.
190 Requirements that encourage fishing from boats contradict goals for protection of deep
191 water habitats. Requirements for use of boats unreasonably remove opportunities for
192 lower-income persons or youth who do not have special skills or access to boats. Physical requirements for cartop boats are excessive for most persons. **Suggestion:**
193 Bank fishing is a safe, standard recreation activity with minimal impacts to the shoreline environment in both type and extent, and it should be allowed where substantial impacts
194 to wildlife would not likely occur (not near rookeries).
Compatibility determination for **wildlife observation and photography** inappropriately assumes trail construction and related impacts are necessary for these activities.
195 **Suggestions:** The plan should rather recognize that wildlife observation is an implicit part of all legal recreation likely to occur in this area under many forms of access,
196 including vehicle, boat, and on foot or horseback. Existing roads and the railroad easement should be used to the extent possible for recreation access. The former rail route and trestles provide a unique but unrecognized opportunity for an elevated trail for wildlife observation and photography, needing simple improvements in surface and
197 protective railings. Unprofessional references to highly unusual behaviors of photographers or other recreationists (e.g., Dobb 1998) are misinterpreted and should be removed (p. 116). Educational materials should be developed and employed to define
198 and promote low-impact styles of recreation for the wildlife resources present.

2

179) The target of 10,500 visit opportunities per year is not a limit, but rather a target number of opportunities to offer to the public.
180) The term visit opportunities can be defined as "An opportunity for a member of the public to visit the Refuge for a staff guided or self-guided wildlife-dependent recreation or other event." This definition has been added to the glossary.
181) The comment is acknowledged. See response #3.
182) The comment is acknowledged. See response #3.
183) There is no prescription in the draft CCP for boating only with undefined trolling motors. Please see the Compatibility Determination for Recreational Boating, in Appendix A, for a full discussion of boating, other than high-speed boating, on the Refuge.
184) It is not clear how the comment defines boating trails. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
185) The comment is acknowledged. See response #3.
186) The comment is acknowledged. It is not clear from the comment which sections are considered by the author to be partly intertwined and confusing.
187) We disagree that the CCP or Compatibility Determinations misconstrue impacts. The Compatibility Determinations reflect the sound professional judgment of the Refuge Manager.
188) We disagree that vegetation is a barrier to access, particularly along roadways where vegetation is regularly mowed. Proposed car top boating access on the Refuge would only occur at specific improved access sites and therefore would have no incremental or cumulative impacts.
189) Given currently available staff and project funds, we disagree that bank fishing requires less staff effort, based largely on the need for regular trash removal and public safety associated with bank fishing on the Refuge. Please note that a step-down fisheries management plan is proposed for completion in 2008, which will address management of fishing on the Refuge, possibly including bank fishing.
190) We disagree, and the comment offers no evidence to support this statement.
191) The comment is acknowledged but it is unclear what if any opportunities are being removed. While boating may require special skills and access to boats, it is not clear how this would remove opportunities from others without boats and special skills as suggested in this comment.
192) The comment is acknowledged.
193) The comment is acknowledged. See response # 189.
194) The Compatibility Determination for wildlife observation and photography describes facilities and materials to support the level of uses as described in the CCP, which would require additional project funds and staff.
195) The Compatibility Determination for wildlife observation and photography found that the use is compatible with stipulations, as can be seen in Appendix A. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.
196) The comment is acknowledged. Improvements to the railroad right-of-way would be at the discretion of the landowner, since the alignment does not currently lie within the Refuge. With available resources the Refuge's highest priorities are to fulfill the Refuge purpose and to fulfill the mission of the National Wildlife Refuge System.
197) The comment is acknowledged, but we disagree with your conclusion. The author does not offer any evidence to contradict findings in the cited reference.
198) We agree and content related to environmentally-friendly recreation already is and will continue to be a part of the educational programs proposed for the Refuge in the CCP.

CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGG

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Flex yo
Be energy

October 27, 2006

Mr. David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

Dear Mr. Bergendorf:

Thank you for the opportunity to review the *Draft Comprehensive Conservation Plan and Environmental Assessment* (CCP/EA) for Stone Lakes National Wildlife Refuge. Because Caltrans currently owns the Beach Lake Mitigation Bank property within Stone Lakes National Wildlife Refuge, it is important that we are able to review your conservation plans for the future
199 of the Refuge. Alternative B documents sound management principles, is a feasible alternative, and is consistent with Caltrans goals for Beach Lake Mitigation Bank.

As stated in your purpose and need, "the refuge will be managed in a way that ensures the long-term conservation of fish, wildlife, plants, and their habitats and provide for compatible wildlife-dependent recreation." In addition, the "Service's management priorities will be communicated with their conservation partners, neighbors, and visitors." Furthermore, that the maintenance of
200 biological integrity, diversity and environmental health are ensured." These aspects of the CCP/EA are important to Caltrans and consistent with the plans for Beach Lake Mitigation Bank. The following paragraphs outline specific comments I have on the CCP/EA.

According to the map on page 27 (Figure 4), the Lewis Unit and Beach Lake appear to be separate units. On page 39, the CCP states that valley oak woodland can be found on the Lewis Unit. If the Lewis Unit incorporates the Beach Lake unit, then no correction is needed. However,
201 if the two are separate units, it should be noted that valley oak woodland habitat can also be found on the Beach Lake Unit (as is found on the Beach Lake Mitigation Bank property).

It is also noted on page 194 that "portions of the Beach Lake, North Stone Lake, and South Ston Lake units would be closed as a sanctuary. The Lewis property of the Beach Lake Unit and the
202 Wetland Preserve and portions of the Headquarters unit would be subject to seasonal closure to provide wildlife sanctuaries." While Caltrans makes no recommendations for sanctuary status regarding the Beach Lake Mitigation Bank property, we like the idea.

203 On page 41, the CCP references Appendix E as a detailed list of birds found on the refuge. This should be corrected to Appendix D.

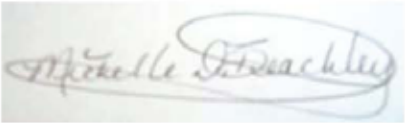
Page 44 states that "amphibians such as the California Tiger Salamander" are found when standing water is available. No where else in the document are CTS called out, even in the discussion on threatened and endangered species or in Appendix D. Is this in error? Are CTS

199) The comment is acknowledged.
200) The comment is acknowledged.
201) The comment is acknowledged.
202) The comment is acknowledged.
203) The comment is acknowledged and a correction has been made.

204 found on the refuge? Referencing this so casually may create complications and would certainly raise questions regarding Section 7 consultation.

Again, thank you for the opportunity to review the CCP/EA. I would appreciate a copy of the final document when it becomes available. If you have any questions or comments regarding my comments, please feel free to contact me.

Sincerely,



MICHELLE D. BEACHLEY
Associate Environmental Planner, Natural Science
Office of Environmental Management

c: John Webb, Chief, Office of Environmental Management
Japtej Gill, Senior Environmental Planner, Office of Environmental Management

204) The statement regarding the California tiger salamander was intended as a general statement and should not be interpreted as applying to the Refuge since there have been no documented sightings of California tiger salamander on the Refuge. The statement has been clarified.

BEACH LAKE STABLES

ey F. Collins, Ph.D.
ois Ruth Collins

October 27, 2006

Thomas E. Harvey
Project Leader
FISH AND WILDLIFE SERVICE
Stone Lakes National Wildlife Refuge
1624 Hood-Franklin Road
Elk Grove, CA 95757

Dear Mr. Harvey:

Re: Stone Lakes National Wildlife Refuge (SLNWR)

To the extent that time allowed, I have reviewed the Draft Comprehensive Conservation Plan and Environmental Assessment for the SLNWR that was provided at the public hearing on October 4, 2006. I have also reviewed the letter to you dated 10/23/06 from the Beach Lake Ski Club regarding the finding that water skiing is an incompatible use of the SLNWR waterways.

In my opinion some of the justification points regarding that incompatible finding, e.g., high-
205 speed boating erodes shorelines and levees, is site specific and erosion may not occur in the presence of dense growths of wild blackberry vines etc. such as found growing along the levees and shorelines of the SLNWR. Be that as it may, the overall finding of incompatibility is
206 understandable. As discussed below, however, the prohibition of high-speed boating can be "phased-in" and concomitantly minimize the hardship on the Beach Lake Ski Club and the financial impact on Beach Lake Stables.

Beach Lake Stables is a privately-owned equestrian and recreation business located approximately 1.2 miles south of Freeport that has been in business since 1971. My wife and I own several acres of Beach Lake as well as land adjacent to the old SP cut which was excavated during construction of the railroad embankment. As with all small businesses, we are hard-
207 pressed to stay afloat financially. In order to supplement our income, we have rented access to Beach Lake and the SP cut waterway to fishermen and to the Beach Lake Ski Club for many years.

In view of the fact that the Beach Lake Ski Club has a long historic use (approximately 35 years) of these waterways, I trust that the Fish and Wildlife Service will work with the club in developing a plan to allow the club to co-exist with the planned uses of the refuge during a phase-out period of 7 years as proposed in their letter to you. That period would also provide my
208 wife and me with some much-needed time to try and develop another source of income to make up for loss of revenue from the club.

209 On a different subject, I also urge you to reconsider allowing horseback riding on designated trails of the refuge (see page 20 of the SLNWR Comprehensive Conservation Plan). As pointed

205) The comment is acknowledged.
206) The comment is acknowledged. See response #42.
207) The comment is acknowledged.
208) The comment is acknowledged. See response #42.
209) According to the Beach Lake Ski Club (see response #41), the Club is "… financially obligated to a 10-year contractual lease agreement with Mr. Harvey Collins for access purposes…expiring year end 2013." If this statement, from the Beach Lake Ski Club, is accurate then the author would have in excess of 7 years to find alternative uses for the property described. In addition, the Refuge is bound to follow federal policies for allowing use on Refuge lands and waterways as described in response #3.

210 out in that document, equestrians have gone on record of historic use (since 1970) of lands now controlled by the refuge. We have been told by your staff that such use is not compatible with the uses identified in the National Wildlife Refuge System Act of 1997. In my opinion,
211 however, that is strictly a policy decision. For example, the SLNWR Comprehensive Conservation Plan, pp 163 *et seq.,* proposes the continued use of refuge lands for grazing even though such use is "not identified as a wildlife dependent public use by the National Wildlife Refuge System Act of 1997." Thus it appears that uses may be permitted on the refuge even though such uses are not identified in the 1997 Act. Couldn't equestrian trails be developed on refuge lands that would allow equestrians to "observe the wildlife" of the refuge which is a
212 compatible use? Riding trails strategically located on the refuge would be of immense benefit to equestrians who keep their horses at Beach Lake Stables. Such trails would also benefit other equestrians by providing them with the opportunity of riding the trails and enjoying the benefits of observing the varying species of wildlife in their natural habitat. I recommend that you
213 provide the leadership necessary to bring this plan to fruition.

Thank you for the opportunity to comment on the Draft Comprehensive Conservation Plan and Environmental Assessment for the SLNWR.

Sincerely,

Harvey F. Collins

Harvey F. Collins

cc: Marshall D. Schoewe
President, Beach Lake Ski Club
Congressman Lungren
Congressman Pombo

210) The comment is acknowledged. See response #3.

211) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations will be made for Refuge uses. Grazing has been found to be a compatible use, with stipulations, in the Compatibility Determination for grazing on the Refuge, found in Appendix A. As stated in the Compatibility Determination justification, the goals for grazing on the Refuge are to conserve, enhance, restore, and manage Central Valley wetland, riparian, grassland and other native habitats to benefit their associated fish, wildlife, plants, and special status species.

212) The comment is acknowledged. See response #195.

213) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

"Bud Getty"
<bud@midtown.net>
10/28/2006 03:07 PM

To <David_bergendorf@fws.gov>
cc
bcc
Subject Draft Comprehensive Conservation Plan

Mr. Bergendorf:

Thank you for giving me the opportunity to respond to the subject plan. I attended both public meetings and made comments at those times. My comments now will be similar.

214 The presence of high speed boating and water-skiing is not compatible with the missions of Stone Lake National Wildlife Refuge. It contributes to many problems of the refuge. Water, air, and noise pollution all diminish the habitat quality. Erosion of the levee banks also is accelerated by these activities.

215 Good management practices have resulted in the production of better habitat and the increase of bird nesting and increases of refuge use by target species such as the Sandhill Crane. I predict that removal of high speed boating from the present use area will enhance the quality of the habitat and further favor the wildlife uses of the refuge.

216 One of the arguments that the people favoring the continuation of high speed boating seems to rely on a study done in the everglades area of Florida which purports to see this activity as beneficial because it stirs up the water and lessens the stagnation. There is a myriad of variations between the two areas which would question the validity of this study in our area.

Stone Lakes National Wildlife Refuge – IS for the birds.

Maurice H Getty

Sacramento, California

214) See response #42.
215) The comment is acknowledged.
216) The comment is acknowledged, however we are not aware of the study referenced by the comment's author, nor was the citation offered. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

Dorene Clement
<dorenecomm@yahoo.com>
10/29/2006 08:37 AM

To david_bergendorf@fws.gov
cc
bcc
Subject Stone Lakes

I appreciate the opportunity to comment on the Stone Lakes NWR draft plan, as I have visited Stone Lakes a number of times. I would therefore like to submit the following comments for consideration:

I am very concerned about the negative impact of high-speed boating, waterskiing, or other noisy motorized sports in an area that should be set aside for wildlife and quiet pursuits. I am strongly
217 in favor of closing Stone Lakes to all activities that are incompatible with the core values of a wildlife refuge. It's not a refuge for wildlife--or a place I'll want to visit again--if power boats are blasting through it. Please close the refuge to such incompatible activities.

Thank you for considering my comments.

Dorene Clement
Sacramento

We have the perfect Group for you. Check out the handy changes to Yahoo! Groups.

217) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

California Regional Water Quality Control Board
Central Valley Region
Robert Schneider, Chair

S. Adams
etary for
ronmental
otection

Sacramento Main Office
11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Arno
Schwarze
Gover

27 October 2006

Mr. David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

STONE LAKES NATIONAL WILDLIFE REFUGE DRAFT COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT

Thank you for the opportunity to review the draft Comprehensive Conservation Plan (CCP) and Environmental Assessment for the Stone Lakes National Wildlife Refuge. Activities in the CCP include increasing the acreage of riparian and oak woodland habitat, manipulating seasonal wetlands, increasing wetland acreage, and constructing a boat ramp, parking area, and trails. These activities may be regulated under a number of Regional Water Board
218 programs. We are pleased that you recognize your obligation to seek coverage under the irrigated lands conditional waiver. Please note that there is a deadline of 31 December 2006 for enrollment under the Coalition Group Conditional Waiver.

The following programs may also apply to discharges from the planned activities:

The discharge of dredge or fill material to waters of the United States, or waters of the State, is subject to Section 401 of the Clean Water Act and the California Water Code (CWC). Section 401 requires that you obtain a Water Quality Certification from the State before the Corps of Engineers may issue a Section 404 permit. Any person discharging dredge or fill materials to waters of the State must file a report of waste discharge pursuant to Sections 13376 and 13260 of the CWC. You may meet both the requirement to submit a report of waste discharge and apply for a water quality certification by using the same application form. If waters on the
219 project site are not under federal jurisdiction, the Discharger will still need to submit a Report of Waste Discharge (Form 200) to the Regional Water Board. However, the Regional Water Board recommends that the Discharger submit a 401 Water Quality Certification application rather than a Report of Waste Discharge because a 401 application can be processed more quickly than proceeding with Regional Water Board adopted waste discharge requirements.

Dischargers of storm water to surface waters associated with construction activity, including clearing, grading, and excavation activities of one-acre or more, must obtain coverage under
220 the State Water Resources Control Board, Order No. 99-08-DWQ, National Pollutant Discharge Elimination System, General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity (General Permit). Dischargers must also implement Best Available Technology Economically

218) The comment is acknowledged.
219) The comment is acknowledged.
220) The comment is acknowledged.

Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate storm water pollution.

To obtain authorization for proposed storm water discharges to surface waters, the Discharger must submit a Notice of Intent (NOI) with a vicinity map and the appropriate fee to the State Water Resources Control Board prior to commencement of construction activities. Coverage under the General Permit shall not occur until the applicant develops a Storm Water Pollution
221 Prevention Plan (SWPPP). The SWPPP must identify Best Management Practices that utilize the BAT/BCT performance standard to control pollutant discharges. These controls must reduce pollutants and implement any more stringent controls necessary to meet water quality standards contained in the Regional Water Board's Basin Plan.

In addition, it is not apparent that you evaluated the potential impacts of your activities in regards to methymercury. The Stone Lakes National Wildlife Refuge is located in the Sacramento-San Joaquin Delta Estuary, which is on the Federal Clean Water Act list of
222 impaired water bodies due to elevated concentrations of methylmercury in fish. Recent data suggest that methylmercury created and discharged from seasonal and permanent wetlands may be responsible for increasing methylmercury levels in fish tissue.

Regional Water Board staff is working on a Delta methylmercury control program to protect Delta beneficial uses. The methylmercury control program will be formalized through amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin
223 River Basins (Basin Plan). The current draft Basin Plan amendment includes requirements for control actions to reduce methylmercury loads and concentrations in the Delta, including recommending control actions for existing and proposed native and managed wetlands. A draft staff report was released in June 2006 for scientific peer review.

The environmental assessment should recognize these potential impacts and the CCP should
224 include actions consistent with the Basin Plan.

If you have any questions on these matters, please feel free to contact me at (916) 464-4643 or byee@waterboards.ca.gov.

Betty Yee

BETTY YEE
Senior Water Resources Control Engineer

221) The comment is acknowledged.

222) The Refuge recognizes that wetlands may contribute to biomagnifications of methylmercury through the food web. What is known about methylmercury and other contaminants on the Refuge is summarized under “Contaminants and Water Quality” beginning on page 32 of the CCP. Objective 1.N., beginning on page 85 of the CCP, specifies that the Refuge will monitor for mercury and other contaminants and work toward achieving the water quality standard for wetlands and fish and wildlife resources set forth by the USEPA, the DFG and the Regional Water Quality Control Board. Furthermore, as stated on page 210 of the environmental assessment " Refuge staff will continue to comply with National Pollution Discharge Elimination System general permit protocols and best management practices for aquatic herbicide applications and water quality monitoring that were developed by the Central Valley Regional Water Quality Control Board to avoid adverse effects on water quality and aquatic wildlife."

223) The comment is acknowledged.

224) The comment is acknowledged. We believe that nothing in the CCP is inconsistent with the draft Basin Plan. No actions proposed in the CCP should be interpreted to suggest violation of the water quality supply standard for wetlands and fish and wildlife resources set forth by the USEPA, the DFG or the Regional Water Quality Control Board. For additional information, please contact Refuge staff.

October 24, 2006

Sandra Witwick
9634 Mardelle Way
Elk Grove, CA 95624
916/ 685-8611

David Bergendorf
Refuge Planner
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846
Fax 916/ 414-1832

Dear Mr. Bergendorf,

I am writing this letter in regards to the Stone Lakes NWR Draft Comprehensive Conservation Plan and Environmental Assessment. First of all, I would like to comment on the Water-skiing proposal. I don't feel it's compatible or in the best interest of Stone Lakes NWR. Being a Docent for the refuge I have witnessed and experienced negligent behavior concerning water-skiing and have seen how its effect on Stone Lakes as a whole. It is noisy, unhealthy, and dangerous to wildlife, the environment, causes wake erosion and interferes with observation and group education. I happen to know there is plenty of other places that water-skiing is allowed that would not produce these negative effects, as it would have on the refuge. Because of the encounters that have already taken place I feel this is a very important issue. The definition of a refuge is shelter or protection from danger or distress: a place that provides protection. Water-skiing does
225 not provide this. I realize that the community is important but not all groups can be completely accommodated for the sake of Stone Lakes. Mr. Bergendorf your deep consideration in this matter and the rest to follow is appreciated, as I know I am only one voice of many who feel this way.

Secondly, on the issue of Kayaking and Canoeing, this would be great for Stone Lakes NWR. Many people would love to get the opportunity to see the refuge up close and personal. This being a quiet sport, they'll experience Stone Lakes, the wildlife and get exercise all in one. As it is now a lot of people, in the community, do not know that the refuge exists. This would also help in creating more support and publicity for Stone
226 Lakes. However I do think it should be regulated and restricted, such as: boat and motor size (if any), days and times (to give wildlife and environment a break) and fishing (if allowed and limits) so the refuge wouldn't be over fished. If boats with motors are let in then everyone will expect to bring in whatever they would like. As you know, motors and larger boats can cause damage so kayaking and canoeing would be perfect for the refuge.

Lastly, there have been many discussions on how nice it would be to have the
227 Miwok Indians more involved at the refuge especially with education. Personally I would like to see them put a village over by the old ramp and the SP Cut. Maybe even

225) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

226) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses. The Compatibility Determination for recreational boating on the Refuge, contained in Appendix A, found that recreational boating was compatible with stipulations.

227) Please see some actions related to your suggestions under Goal 4 and the related objectives, beginning on page 92 of this CCP. While there is no plan to construct a village on the Refuge, the CCP does propose to work with the Ione Band of Miwok Indians or with other involved tribal organizations to meet some of the educational goals that the author suggests.

hold classes and demonstrations on how they lived, their customs and survival tactics. Maybe they could also cultivate some of the plants that are used for food and medicine to make Stone Lakes more abundant again. Many of us would be willing to assist with this.

So upon closing this letter I would like to thank you for encouraging those who are not actually with the service to voice their opinion. We all go through life trying to make correct decisions that will benefit others or us. In this case, each proposal has the
228 question of whether or not Stone Lakes will benefit environmentally from it. I hope this letter will assist you in any of the decisions that are as hand. If you have any questions, please call me.

Sincerely

Sandra Witwick

228) The comment is acknowledged. The U.S. Fish and Wildlife Service's mission is: "Working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." We always appreciate hearing from those outside of the Service.

Comments on the Stone Lakes National Wildlife Refuge draft Comprehensive Conservation Plan and Environmental Assessment by Grant Lynes
- received by telephone on November 22, 2006 by David Bergendorf (USFWS).

229 • The Refuge should be open to hunting by the general public and not just youth and disabled hunters. The general public should be given first priority, youth should be given second priority and disabled should be given tertiary priority in access for hunting.

230 • The noise from shot guns should not be excessively disruptive to the surrounding community.

231 • I would like to see Stone Lakes NWR be a showcase refuge for the surrounding area and be connected up with surrounding refuges such as the Cosumnes River Preserve and the Sacramento NWR.

229) The comment is acknowledged. The current Refuge waterfowl hunting program offers the greatest number of hunting blinds to the general public and secondarily to youth and disabled hunters.
230) The comment is acknowledged.
231) The comment is acknowledged.

Stone Lakes National Wildlife Refuge
Draft Comprehensive Conservation Plan and Environmental Assessment

Reviewer's Name: B. Young, Natural Resource Supervisor, Sacramento Regional County Sanitation District	Date: Nov. 27, 2006
Preparer: U.S. Fish and Wildlife Service	
Project Title: SLNWR CCP and EA	

	NO.	DRAWING OR PAGE.	COMMENTS	REVIEWER INITIALS
232	1	Figure 5	Figure 5 "Land Cover" inaccurately reflects the SRCSD Demonstration Wetlands as Upland Forrest. It also depicts the managed area of Upper Beach Lake as Passive Seasonal Wetlands.	BY
233	2	Page 45	SRCSD hydrology information in the "Fish" section is dated. Nicolaus Pond no longer receives water from the Captein Dairy as the dairy is no longer operable. The aquaculture facility on the Bufferlands is no longer the Laguna Creek Fish Farm. The current operator is Stolt Sea Farms. Because this is a leased facility, I recommend referring to it as "a leased aquaculture facility on the Bufferlands."	BY
234	3	Page 79 - 80	Objective 1. H and 1.I should incorporate language regarding the conservation, restoration, and/or enhancement of native grassland communities. The strategies for 1. H should include strategy #4 from 1.I (Develop a monitoring plan to survey native grasses...)	BY
235	4	Page 79 - 80	Mention of native grass efforts in Objectives 1.H, 1.I, and 1.J should be broadened to encompass native grassland species. This would include native forbs that are an important component of the grassland ecosystem.	BY

232) The comment is acknowledged. Figure 5 has been corrected in this CCP.
233) The text has been changed to reflect the current situation.
234) The text has beem clarified for strategy 1.H.6.
235) The comment is acknowledged. Please note that strategy 1.J.4. calls for using local expertise in developing native grassland restoration plans. When restoration plans are finalized, it is possible that native forbs and other components of native grasslands will be included as a part of the restoration plan. However, resources for restoration are limited and while the complete restoration of native grassland habitats including native forbs is desirable, it may not be possible within the life of the CCP given limited resources available for grassland restoration.

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916.643.4607 *phone* · 916.643.4682 *fax* · www.our

November 25, 2006

Mr. David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

RE: Stone Lakes NWR CCP

Dear Mr. Bergendorf:

On behalf of the California Waterfowl Association (CWA), I would like to take this opportunity to provide input on the U.S. Fish and Wildlife Service's Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment for the Stone Lakes National Wildlife Refuge (NWR).

236 As a 20,000-member nonprofit organization dedicated to the protection of California's waterfowl, wetlands and hunting heritage, CWA generally urges the Service to adopt management efforts at Stone Lakes NWR which restore and enhance habitat for migratory and resident waterfowl populations while providing much needed hunting and other wildlife-dependent recreational opportunities for the public. As you are aware, California has lost over 90% of its historical wetlands, which has contributed to a significant drop in waterfowl and other wildlife populations. In addition, many lands and waters that were previously available for hunting have been lost or degraded, particularly in the Sacramento area where many of the California's waterfowl hunters reside. CWA therefore supports Alternative B, which would continue the waterfowl hunting program established last season and maximize the amount of riparian, wetland and upland habitat that is conserved at Stones Lakes NWR.

Specifically, CWA would like to offer the following comments on the Draft CCP:

1. 237 Opening Additional Lands/Waters to Waterfowl Hunting – CWA generally supports the current waterfowl hunt program at Stone Lakes NWR, and urges that additional opportunities be provided as soon as new lands are available, such as the Lodi Gun Club and Lewis Investment Company properties. However, recognizing that the hunt program currently only offers hunting from fixed blind sites and emphasizes opportunities for juniors, we also urge the Service to consider diversifying its program to serve the 238 broadest possible constituency of hunters. Free roam and/or assigned pond hunting should therefore be offered as new lands become available, as many waterfowl hunters favor these types of hunting. In addition, any new hunting opportunities should be available to hunters of all ages, not just juniors.

   239 The Service should additionally permit hunting by boat on navigable waters of the refuge, particularly portions of Snodgrass Slough and South Stone Lake where hunting has occurred for decades. As you may be aware, navigable waters are burdened by public 240 trust obligations, regardless of whether they flow over public or private lands, and the California Attorney General has determined that hunting is a Constitutionally protected use of navigable waters (Opinion # 85-602). Please also note, as required by the 1997 241 NWR System Improvement Act, hunting is a "priority use" of the refuge system.

236) The comment is acknowledged.
237) The comment is acknowledged.
238) The comment is acknowledged. Please see response #229 for a discussion of current hunt opportunities on the Refuge.
239) See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations will be made for Refuge uses.
240) The comment is acknowledged. There is well-established legal precedent under the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884) and the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) as amended for the Service to regulate boating on navigable and non-navigable waters of the U.S. when these waterways are under the ownership of the Service.
241) The comment is acknowledged.

242 2. Upland Hunting Program – An upland hunting program for small game (rabbits, squirrels), deer and especially game birds (doves, quail, pheasants, snipe) should be implemented even prior to the acquisition of additional lands. We believe the Refuge's fee-title lands are, in fact, large enough (1,740 acres) to safely support hunting with shotguns and/or archery equipment. Although the Draft CCP mentioned that only about
243 half of the Service's fee-title acreage consists of upland areas, many other types of habitat that are found on Stone Lakes NWR support these game species. Please also note that, according to the Department of Fish and Game, approximately 190,000 upland game bird
244 stamps are purchased in California each year, making upland game bird hunters one of the largest hunting constituencies in California. Thus, we believe that considerable demand exists for this type of hunting at Stone Lakes NWR.

3. Breeding Waterfowl Habitat – As you are aware, the management of wetlands in the Central Valley has traditionally focused on meeting the habitat needs of migrating waterfowl and other waterbirds each fall and winter through the moist soil management of seasonal wetlands to encourage the growth of waterfowl food plants. In fact, moist soil management remains the most important tool for providing wintering waterfowl food resources. In addition, due to legally mandated reductions in rice straw burning,
245 Sacramento Valley rice farmers must now necessarily flood their post-harvest fields for rice straw decomposition purposes, providing hundreds of thousands of additional acres of wintering waterfowl habitat each year. While the habitat needs for migrating waterfowl have thus been fairly well addressed in the Central Valley, the habitat requirements for breeding waterfowl, particularly resident mallards, have not. Therefore, CWA urges the Service to create additional summer water sources as waterfowl brood
246 habitat on the refuge, while taking necessary steps to increase and enhance associated upland nesting cover.

4. Mosquito Abatement – CWA has strong concerns that some mosquito abatement activities on managed wetlands are excessive, unnecessarily depriving waterfowl broods
247 of important invertebrate food sources and removing vegetative cover vital for thermal cover and food. While many mosquito abatement districts, including Sacramento-Yolo Mosquito Vector Control District, have partnered with the Department of Fish and Game, Central Valley Joint Venture and others to develop best management practices (BMPs) to control mosquito populations on managed wetlands, such BMPs are not supposed to degrade waterfowl habitat conditions or limit food resources for waterfowl. We therefore urge the Service to insist on the use of only the most waterfowl and wildlife-friendly
248 BMPs when mosquito control efforts become necessary, and to ensure that any BMPs are not causing more ecological harm than good.

Thank you for the opportunity to provide input. If you have any questions or need further clarification regarding CWA's comments, please call me at 916-643-4607.

Sincerely,

Mark Hennelly

Mark Hennelly, Vice President
California Outdoor Heritage Alliance

Cc: Robert McLandress, President, CWA
CWA's Unattached Hunters Committee

242) The comment is acknowledged, however we disagree. In the sound professional judgment of the Refuge manager there is not enough land owned in fee title to provide a safe and quality upland game hunting experience on the Refuge.
243) The comment is acknowledged.
244) The comment is acknowledged.
245) The comment is acknowledged.
246) The comment is acknowledged. Many strategies associated with objectives under Goal 1 detail the proposed enhancements of wetland and associated upland habitats.
247) Mosquito control on the Refuge was found to be a compatible use in the Compatibility Determination, contained in Appendix A, of this CCP with the stipulations listed.
248) The comment is acknowledged.

Reclamation District 813
P.O. Box 557
Courtland, Calif. 95615
Ph (916) 871-4060
Fax (916) 775-4101

November 27, 2006

David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, Ca 95825-1846

Dear David:

249 We want to thank you for extending the comment period on the draft comprehensive conservation and environmental assessment of the SLNWR. Comments: (1) As an alternative to
250 the South Stone Lakes area we would like to see this area a sanctuary whereas no public to enter. You are bringing people into this area which will be disturbing the environment and the wildlife
251 of this area. (2) Again to comment on buffer zones. We would like to see any wetland projects have a self contained buffer zone whether from your development, purchase of another party's property or developed by another party. (3) As for natural escaping of species during flooding we
252 would like to see either an incidental taking plan or a plan for removal of these species back to the better environment in the refuge.

Thank You,

Thomas Herzog
President

CC:
Congressman Dan Lungren
Tom Harvey , Refuge manager
Christopher Lee, Attorney at law

249) The comment is acknowledged.

250) The comment is acknowledged. See response #3 for a description of how Compatibility Determinations and Appropriate Use Determinations are made for Refuge uses.

251) The comment is acknowledged. The Service has and will continue to abide by commitments made as part of the 1992 Final Environmental Impact Statement (EIS) and subsequent Record of Decision establishing the Stone Lakes NWR approved boundary. For example as cited on page FJ-52, of the 1992 Final EIS, the Service will establish adequate internal buffers "...whenever sensitive wildlife habitat areas are developed adjacent to any farmlands other than range or pasture."

252) As we have previously communicated, Refuge staff are willing to assist the author and other interested landowners to secure an "incidental taking plan" (i.e., Safe Harbor Agreement) that addresses routine land management operations on nearby privately-owned properties.

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

David Bergendorf
CA/NV Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

November 30, 2006

Dear Mr. Bergendorf:

I am submitting the following comments and recommended changes to the Draft *Compatibility Determination for Mosquito Control on the Stone Lakes National Wildlife Refuge* on behalf of the Sacramento-Yolo Mosquito and Vector Control District. Please feel free to contact me by email (jbbuettner@sac-yoloMVCD.com) or by phone at (916) 405-2085 if you have any questions or require further supporting material.

Sincerely,

Joel Buettner, Water Management Specialist
SYMVCD

Recommended Changes to the DRAFT *Compatibility Determination for Mosquito Control on the Stone Lakes National Wildlife Refuge*

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253 1. Page 46; paragraph 2; sentence 2 reads:
Although 12 mosquito borne viruses are known to occur in California, only western equine encephalomyelitis virus (WEE)… … (CDHS 2003)
Replace this sentence with the following more current statement:
Although 12 mosquito-borne viruses are known to occur in California, only West Nile virus (WNV), western equine encephalomyelitis virus (WEE) and St. Louis encephalitis virus (SLE) are significant causes of human disease as of 2006. (CDHS 2006)

254 Also add:
As we learned with the recent WNV outbreak, it is possible that new mosquito-borne diseases may cause outbreaks in the future. Since, each disease and associated vector has specific biological and ecological characteristics, a wide variety of control methods, in accordance with the

Member of the Mosquito and Vector Control Association of California

253) The comment is acknowledged, and the text has been updated.
254) The comment is acknowledged, and the text has been updated.

principles of integrated pest management, must be kept available to prevent and respond to new outbreaks in a timely manner.

Reference:
California Department of Health Services, CALIFORNIA MOSQUITO-BORNE VIRUS
SURVEILLANCE AND RESPONSE PLAN, 2006 url:
http://www.dhs.ca.gov/ps/dcdc/pdf/2006_CA_Mosquito_Response_Plan_June.pdf

255 2. Throughout the Compatibility Determination for Mosquito Control on the Stone Lakes National Wildlife Refuge section pages 145-161.

The mosquito genus referred to as *Ochlerotatus* has been changed to *Aedes*. Please replace all reference to *Ochlerotatus* abbreviated *Oc.* to *Aedes* abbreviated *Ae.*

3. page 148; paragraph 4; last sentence:

256 *The District proposes to use the formulated methoprene product Altosid in pellets or A.L.L. Growth Regulator.*

Replace this sentence with the following:

The District proposes to use the insect growth regulators, most commonly the formulated methoprene products such as Altosid® Liquid, Altosid® Pellets, and Altosid® XR-G.

3. page 147 very last sentence:

257 *The threshold for initiating a larval control response will be a density of 0.1 mosquito larva [sic] per 350-ml dipper of water for all species.*

Replace this sentence with the following:

Treatment thresholds as of 2006 were 0.1 mosquito larvae per 350-ml dipper of water for all species; however, this may change to respond to changes in mosquito populations, disease levels, or other factors that affect public health. (Boyce 2005)

Reference:
Boyce, K.M. Mosquito and Mosquito-Borne disease Management Plan revised 2005, Sac-Yolo MVCD, url:
http://www.fightthebite.net//download/Mosquito_Management_Plan.pdf

4. Page 149; entire first paragraph:

The thresholds for adult control are…Adult mosquito thresholds are generally determined through historical levels of adult mosquitoes in the area.

Replace this paragraph with the following:

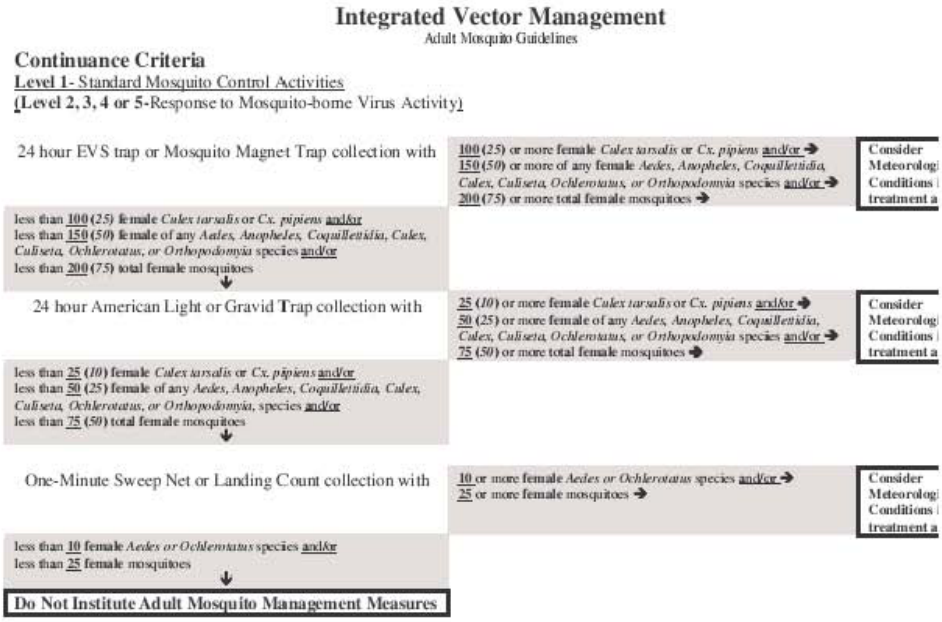
258 **Treatment thresholds for adult control are based on multiple factors including: date, mosquito-borne virus response level, mosquito species, and meteorological conditions. As with larval treatment thresholds, adult threshold are subject to change to respond to changes in mosquito populations, disease levels, or other factors that affect public health [See figure below] (Boyce 2005)**

255) The comment is acknowledged, and the text has been updated.
256) The comment is acknowledged, and the text has been updated.
257) The comment is acknowledged, and the text has been updated.
258) The comment is acknowledged, and the text has been updated.

Reference:

Boyce, K.M. Mosquito and Mosquito-Borne disease Management Plan revised 2005, Sac-Yolo MVCD, url: http://www.fightthebite.net//download/Mosquito_Management_Plan.pdf

Figure 1 Treatment thresholds based on surveillance data as of 2006 (Boyce 2006). Note threshold values in bold refer to Level 1 or Standard Control Activities; values in parentheses refer to Level 2-5 Mosquito-borne Virus Response.



259 . Page 149; paragraph 2; second sentence:

The district proposes to continue to use the adulticides Pyrocide 7338 or Scourge(resmethrin), which have synthetic pyrethrins as the active ingredient.

Replace this sentence with the following:

The District proposes to continue to use currently labeled adulticides containing active ingredients pyrethrin (e.g. Pyrocide® 7338, Evergreen® 60-6), pyrethroids (e.g. Scourge®).

260 . Page 154; very first sentence:

~~*The application of adulticides... permanent emergent wetlands*~~

Please delete this sentence. This has been already stated in context on page 149 at the end of the third paragraph. We feel that the page 149 location more clearly reflects our agreement in the larger context of adulticide operations.

259) The comment is acknowledged, and the text has been updated.
260) The comment is acknowledged, and the text has been updated.

7. Page 154; second paragraph in the Wetlands and Waterfowl section; fourth sentence:

Though methoprene has not been shown to pose a threat to birds from direct exposure, ~~it may affect insectivorous species by decreasing the invertebrate food source.~~

Please make the indicated change, or cite data to support the second assertion.

261 Based on the relatively slow action of juvenile hormone mimics such as methoprene, the larvae remain alive and in the aquatic food chain during immature stages. JH mimics disrupt the metamorphosis process from pupae to the adult stage, causing mortality.

261) The comment is acknowledged, and the text will be updated.

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Appendix H. Plant Species Found on Stone Lakes National Wildlife Refuge

Stone Lakes NWR Plants

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
ACERACEAE (maple family)					
Acer negundo var. *californicum*	box elder	native	perennial	tree	dicot
ALISMATACEAE (water plantain family)					
Alisma lanceolatum	water plantain	introduced	perennial	forb/herb	monocot
Echinodorus berteroi	burhead	native	perennial	forb/herb	monocot
Sagittaria latifolia	arrowhead	native	perennial	forb/herb	monocot
ANACARDIACEAE (sumac family)					
Toxicodendron diversilobum	poison oak	native	perennial	shrub/vine	monocot
APIACEAE (carrot family)					
Daucus carota	wild carrot	introduced	biennial	forb/herb	dicot
Foeniculum vulgare	fennel	introduced	biennial, perennial	forb/herb	dicot
Scandix pecten-veneris	Venus' needle	introduced	annual	forb/herb	dicot
APOCYNACEAE (dogbane family)					
Apocynum cannabinum	indian hemp	native	perennial	forb/herb	dicot
ASCLEPIADACEAE (milkweed family)					
Asclepias fascicularis	narrow leaf milkweed	native	perennial	forb/herb	dicot
Asclepias incarnata	milkweed	native	perennial	forb/herb	dicot
ASTERACEAE (aster family)					
Achyrachaena mollis	blow-wives	native	perennial	forb/herb	dicot
Acroptilon repens	russian knapweed	introduced	perennial	forb/herb	dicot
Ambrosia psilostachya	western ragweed	native	perennial	forb/herb	dicot
Anthemis cotula	chamomile	introduced	annual	forb/herb	dicot
Artemisia douglasiana	mugwort	native	perennial	forb/herb	dicot
Aster subulatus var. *ligulatus*	southern annual saltmarsh aster	native	annual, biennial	forb/herb	dicot
Baccharis pilularis	coyote bush	native	perennial	subshrub, shrub	dicot
Bidens frondosa	nodding beggarticks	native	annual	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Carduus pycnocephalus	italian thistle	introduced	annual	forb/herb	dicot
Centaurea solstitialis	yellow star thistle	introduced	annual	forb/herb	dicot
Matricaria discoidea (syn. *Chamomilla suaveolens*)	pineapple weed	introduced	annual	forb/herb	dicot
Cichorium intybus	chicory	introduced	biennial, perennial	forb/herb	dicot
Cirsium vulgare	bull thistle	introduced	biennial	forb/herb	dicot
Conyza canadensis	horseweed	native	annual, biennial	forb/herb	dicot
Coreopsis wrightii	tickseed	native	annual	forb/herb	dicot
Euthamia occidentalis	grass-leaved goldenrod	native	perennial	forb/herb	dicot
Gnaphalium luteo-album	cudweed, weedy	introduced	annual	forb/herb	dicot
Gnaphalium palustre	cudweed, everlasting	native	annual	forb/herb	dicot
Gnaphalium stramineum	cudweed, everlasting	native	annual, biennial	forb/herb	dicot
Grindelia camporum	gum plant	native	perennial	subshrub, forb/herb	dicot
Helianthus annuus	sunflower	native	annual	forb/herb	dicot
Hemizonia fitchii	fitch's tarweed	native	annual	forb/herb	dicot
Centromadia pungens (syn. *Hemizonia pungens*)	spikeweed	native	annual	forb/herb	dicot
Hesperevax caulescens	dwarf dwarf-cudweed	native	annual	forb/herb	dicot
Heterotheca grandiflora	telegraph plant	native	annual, biennial, perennial	forb/herb	dicot
Holocarpha virgata	holocarpha	native	annual	forb/herb	dicot
Hypochaeris glabra	smooth cats ear	introduced	annual	forb/herb	dicot
Hypochaeris radicata	rough cat's-ear	introduced	perennial	forb/herb	dicot
Lactuca serriola	prickly lettuce	introduced	annual, biennial	forb/herb	dicot
Lasthenia californica	California goldfields	native	annual, perennial	forb/herb	dicot
Lasthenia fremontii	Fremont's goldfields	native	annual	forb/herb	dicot
Lasthenia glaberrima	smooth goldfields	native	annual	forb/herb	dicot
Layia chrysanthemoides	tidy tips	native	annual	forb/herb	dicot
Madia elegans ssp. *vernalis*	common madia	native	annual	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Picris echioides	bristly ox-tongue	introduced	annual	forb/herb	dicot
Psilocarphus brevissimus	wooly heads	native	annual	forb/herb	dicot
Psilocarphus oregonus	Oregon wooly-heads	native	annual	forb/herb	dicot
Senecio vulgaris	common groundsel	introduced	annual, biennial	forb/herb	dicot
Silybum marianum	milk thistle	introduced	annual, biennial	forb/herb	dicot
Sonchus asper ssp. *asper*	prickly sow thistle	introduced	annual	forb/herb	dicot
Sonchus oleraceus	annual sowthistle	introduced	annual	forb/herb	dicot
Xanthium spinosum	spiny cocklebur	introduced	annual	forb/herb	dicot
Xanthium strumarium	cocklebur	native	annual	forb/herb	dicot
BORAGINACEAE (borage family)					
Amsinckia menziesii var. *intermedia*	fiddleneck	native	annual	forb/herb	dicot
Heliotropium curassavicum	heliotrope	native	annual, perennial	subshrub, forb/herb	dicot
Plagiobothrys greenei	popcorn flower	native	annual	forb/herb	dicot
Plagiobothrys leptocladus	alkali popcorn flower	native	annual	forb/herb	dicot
Plagiobothrys stipitatus var. *micranthus*	stalked popcornflower	native	annual	forb/herb	dicot
Plagiobothrys stipitatus var. *stipitatus*	stalked popcornflower	native	annual	forb/herb	dicot
Plagiobothrys trachycarpus	roughfruit popcornflower	native	annual	forb/herb	dicot
BRASSICACEAE (mustard family)					
Brassica nigra	black mustard	introduced	annual	forb/herb	dicot
Brassica rapa	field mustard	introduced	annual, biennial	forb/herb	dicot
Capsella bursa-pastoris	shepherd's purse	introduced	annual	forb/herb	dicot
Cardamine oligosperma	little western bittercress	native	annual, biennnial, perennial	forb/herb	dicot
Cardaria chalepensis	lens-podded hoary-cress	introduced	perennial	shrub	dicot
Lepidium latifolium	perennial peppergrass	introduced	perennial	forb/herb	dicot
Lepidium latipes var. *heckardii*	Heckard's peppergrass	native	annual	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Lepidium nitidum var. *nitidum*	shining pepperweed	native	annual	forb/herb	dicot
Raphanus raphanistrum	jointed charlock	introduced	annual, biennial	forb/herb	dicot
Raphanus sativus	wild radish	introduced	annual, biennial	forb/herb	dicot
Rorippa curvisiliqua	yellow cress	native	annual, biennial	forb/herb	dicot
CALLITRICHACEAE (water-starwort family)					
Callitriche trochlearis	water starwort	native	annual	forb/herb	dicot
CAMPANULACEAE (bellflower family)					
Downingia bicornuta var. *bicornuta*	downingia	native	annual	forb/herb	dicot
Downingia ornatissima var. ornatissima	folded calicoflower	native	annual	forb/herb	dicot
Legenere limosa	legenere	native	annual	forb/herb	dicot
CAPRIFOLIACEAE (honeysuckle family)					
Sambucus nigra (syn. *Sambucus mexicana*)	elderberry	native	perennial	shrub, tree	dicot
Symphoricarpos albus var. *laevigatus*	snowberry	native	perennial	subshrub, shrub	dicot
CARYOPHYLLACEAE (pink family)					
Cerastium glomeratum	sticky chickweed	introduced	annual	forb/herb	dicot
Silene gallica	catchfly	introduced	annual, biennial	forb/herb	dicot
Spergula arvensis ssp. *arvensis*	starwort	introduced	annual	forb/herb	dicot
Spergularia bocconii	sand-spurry	introduced	annual	forb/herb	dicot
Stellaria media	common chickweed	introduced	annual	forb/herb	dicot
CHENOPODIACEAE (goosefoot family)					
Chenopodium album	lamb's quarters	native, introduced	annual	forb/herb	dicot
Chenopodium ambrosioides	Mexican tea	introduced	annual, perennial	forb/herb, subshrub	dicot
Chenopodium multifidum	chenopodium	introduced	annual	forb/herb	dicot
Salsola tragus	russian tumbleweed	introduced	annual	forb/herb	dicot
CONVOVULACEAE (morning-glory family)					
Convolvulus arvensis	bindweed	introduced	perennial	vine, forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
CRASSULACEAE (stonecrop family)					
Crassula aquatica	water pygmyweed	native	annual	forb/herb	dicot
CUCURBITACEAE (cucumber family)					
Marah fabaceus	manroot	native	perennial	vine, forb/herb	dicot
CUSCUTACEAE (dodder family)					
Cuscuta pentagona	dodder	native	annual, perennial	vine, forb/herb	dicot
CYPERACEAE (sedge family)					
Carex praegracilis	carex	native	perennial	graminoid	monocot
Cyperus eragrostis	sedge	native	perennial	graminoid	monocot
Cyperus erythrorhizos	redroot flatsedge	native	annual, perennial	graminoid	monocot
Cyperus esculentus	yellow nut sedge	native, introduced	perennial	graminoid	monocot
Eleocharis macrostachya	spike rush	native	perennial	graminoid	monocot
Schoenoplectus acutus (syn. *Scirpus acutus var. occidentalis*)	hardstem bulrush	native	perennial	graminoid	monocot
Schoenoplectus mucronatus (syn. *Scirpus mucronatus*)	bog bulrush	introduced	perennial	graminoid	monocot
Scirpus robustus	alkali bull rush	native	perennial	graminoid	monocot
Schoenoplectus glaucus (syn. *Scirpus tuberosus*)	scirpus	introduced	perennial	graminoid	monocot
EUPHORBIACEAE (spurge family)					
Chamaesyce maculata	spotted sandmat	native	annual	forb/herb	dicot
Eremocarpus setigerus	turkey mullin, doveweed	native	annual	forb/herb	dicot
FABACEAE (pea family)					
Glycyrrhiza lepidota	wild licorice	native	perennial	forb/herb	dicot
Lotus corniculatus	trefoil	introduced	perennial	forb/herb	dicot
Lotus unifoliolatus var. unifoliolatus (syn. *Lotus purshianus* var. *purshianus*)	lotus	native	annual	forb/herb	dicot
Lupinus albifrons var. *albifrons*	lupine	native	perennial	subshrub, shrub	dicot
Lupinus bicolor	annual lupine	native	annual	forb/herb	dicot
Medicago polymorpha	California burclover	introduced	annual, perennial	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Medicago sativa	alfalfa	introduced	annual, perennial	forb/herb	dicot
Melilotus alba	white sweetclover	introduced	annual, biennnial, perennial	forb/herb	dicot
Melilotus indica	yellow sweetclover	introduced	annual	forb/herb	dicot
Trifolium depauperatum var. *depauperatum*	balloon clover	native	annual	forb/herb	dicot
Trifolium dubium	hopclover, shamrock	introduced	annual	forb/herb	dicot
Trifolium fucatum	bull clover	native	annual	forb/herb	dicot
Trifolium hirtum	rose clover	introduced	annual	forb/herb	dicot
Trifolium microdon	thimble clover	native	annual	forb/herb	dicot
Trifolium variegatum	whitetip clover	native	annual	forb/herb	dicot
Trifolium willdenovii	tomcat clover	native	annual	forb/herb	dicot
Vicia sativa ssp. *nigra*	common vetch	introduced	annual	vine, forb/herb	dicot
Vicia villosa	hairy vetch	introduced	annual, biennnial, perennial	vine, forb/herb	dicot
FAGACEAE (beech family)					
Quercus douglasii	blue oak	native	perennial	tree	dicot
Quercus lobata	valley oak	native	perennial	tree	dicot
Quercus wislizenii	live oak	native	perennial	tree	dicot
Centaurium muehlenbergii	centaury	native	annual, biennial	forb/herb	dicot
Erodium botrys	broad leaf cranes bill	introduced	annual, biennial	forb/herb	dicot
Erodium cicutarium	red stemmed filaree	introduced	annual, biennial	forb/herb	dicot
Erodium moschatum	white-stemmed filaree	introduced	annual, biennial	forb/herb	dicot
GERANIACEAE (geranium family)					
Geranium carolinianum	Carolina geranium	native	annual, biennial	forb/herb	dicot
Geranium dissectum	geranium	introduced	annual, biennial	forb/herb	dicot
HYDROPHYLLACEAE (waterleaf family)					
Nemophila menziesii	baby blue-eyes	native	annual	forb/herb	dicot
Nemophila pedunculata	nemophila	native	annual	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
IRIDACEAE (iris family)					
Sisyrinchium bellum	blue-eyed grass	native	perennial	forb/herb	monocot
JUGLANDACEAE (walnut family)					
Juglans californica var. *hindsii*	black walnut	native	perennial	tree	dicot
JUNCACEAE (rush family)					
Juncus arcticus ssp. *littoralis* (syn. *Juncus balticus*)	baltic rush	native	perennial	graminoid	monocot
Juncus bufonius	toad rush	native	annual	graminoid	monocot
Juncus patens	rush	native	perennial	forb/herb	monocot
Juncus phaeocephalus	rush	native	perennial	graminoid	monocot
Juncus xiphioides	irisleaf rush	native	perennial	graminoid	monocot
LAMIACEAE (mint family)					
Lamium amplexicaule	henbit	introduced	annual, biennial	forb/herb	dicot
Lycopus americanus	bugleweed	native	perennial	forb/herb	dicot
Marrubium vulgare	white horehound	introduced	perennial	subshrub, forb/herb	dicot
Mentha pulegium	pennyroyal	introduced	perennial	forb/herb	dicot
Pogogyne douglasii	Douglas' mesamint	native	annual	forb/herb	dicot
Pogogyne ziziphoroides	Sacramento mesamint	native	annual	forb/herb	dicot
Stachys ajugoides	hedge nettle	native	perennial	forb/herb	dicot
Trichostema lanceolatum	vinegar weed	native	annual	forb/herb	dicot
LAURACEAE (laurel family)					
Umbellularia californica	California bay tree	native	perennial	tree, shrub	dicot
LILIACEAE (lily family)					
Asparagus officinalis ssp. *officinalis*	asparagus	introduced	perennial	forb/herb	monocot
Brodiaea elegans ssp. elegans	harvest brodiaea	native	perennial	forb/herb	monocot
Chlorogalum pomeridianum	soap root	native	perennial	forb/herb	monocot
Dichelostemma capitatum ssp. *capitatum*	blue dicks	native	perennial	forb/herb	monocot
Triteleia hyacinthina	white brodiaea	native	perennial	forb/herb	monocot
Triteleia laxa	Ithuriel's spear	native	perennial	forb/herb	monocot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
LYTHRACEAE (loosestrife family)					
Ammannia coccinea	ammannia	native	annual	forb/herb, subshrub	dicot
Lythrum hyssopifolia	hyssop loosestrife	introduced	annual, biennial	forb/herb	dicot
Lythrum tribracteatum	threebract loosestrife	introduced	perennial	forb/herb	dicot
MALVACEAE (mallow family)					
Abutilon theophrasti	velvetleaf	introduced	annual	forb/herb	dicot
Malva neglecta	cheeses	introduced	annual, biennnial, perennial	forb/herb	dicot
Malvella leprosa	alkali mallow	native	perennial	forb/herb	dicot
OLEACEAE (olive family)					
Fraxinus latifolia	Oregon ash	native	perennial	tree	dicot
ONAGRACEAE (evening primrose family)					
Epilobium brachycarpum	willowweed	native	annual	forb/herb	dicot
Epilobium canum	zauschneria	native	perennial	subshrub, forb/herb	dicot
Epilobium ciliatum	willow weed	native	perennial	forb/herb	dicot
Epilobium pygmaeum	epilobium	native	annual	forb/herb	dicot
Ludwigia peploides ssp. *peploides*	water primrose	native	perennial	forb/herb	dicot
PAPAVERACEAE (poppy family)					
Eschscholzia californica	California poppy	native	annual, perennial	forb/herb	dicot
PLANTAGINACEAE (plantain family)					
Plantago coronopus	buckhorn plantain	introduced	annual, biennial	forb/herb	dicot
Plantago elongata	little plantain	native	annual	forb/herb	dicot
Plantago lanceolata	English plantain	introduced	annual, biennnial, perennial	forb/herb	dicot
PLATANACEAE (plane-tree family)					
Platanus racemosa	California sycamore	native	perennial	tree	dicot
POACEAE (grass family)					
Alopecurus saccatus	foxtail	native	annual	graminoid	monocot
Avena fatua	wild oats	introduced	annual	graminoid	monocot
Briza minor	quaking grass	introduced	annual	graminoid	monocot
Bromus carinatus	California brome	native	annual, perennial	graminoid	monocot
Bromus diandrus	ripgut brome	introduced	annual, perennial	graminoid	monocot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Bromus hordeaceus	soft chess	introduced	annual	graminoid	monocot
Bromus madritensis ssp. *rubens*	foxtail chess	introduced	annual	graminoid	monocot
Crypsis schoenoides	swamp grass	introduced	annual	graminoid	monocot
Crypsis vaginiflora	swamp timothy	introduced	annual	graminoid	monocot
Cynodon dactylon	bermuda grass	introduced	perennial	graminoid	monocot
Deschampsia cespitosa	tufted hairgrass	native	perennial	graminoid	monocot
Distichlis spicata	salt grass	native	perennial	graminoid	monocot
Echinochloa crus-galli	water grass	introduced	annual	graminoid	monocot
Elymus glaucus	blue wild rye	native	perennial	graminoid	monocot
Elymus trachycaulus	wheat grass	native	perennial	graminoid	monocot
Eragrostis mexicana	Mexican lovegrass	native	annual	graminoid	monocot
Schedonorus phoenix (syn. *Festuca arundinacea*)	tall fescue	introduced	perennial	graminoid	monocot
Festuca brevipila (syn. *Festuca trachyphylla*)	hard fescue	introduced	perennial	graminoid	monocot
Hordeum brachyantherum	meadow barley	native	perennial	graminoid	monocot
Hordeum jubatum	foxtail barley	native	perennial	graminoid	monocot
Hordeum marinum ssp. *gussonianum*	mediterranean barley	introduced	annual	graminoid	monocot
Hordeum murinum ssp. *leporinum*	foxtail barley	introduced	annual	graminoid	monocot
Koeleria macrantha	junegrass	native	perennial	graminoid	monocot
Leymus triticoides	creeping wild rye	native	perennial	graminoid	monocot
Leptochloa uninervia	Mexican sprangletop	native	annual, perennial	graminoid	monocot
Lolium perenne ssp. *multiflorum* (syn. *Lolium multiflorum*)	annual rye grass	introduced	annual, perennial	graminoid	monocot
Melica californica	California melic	native	perennial	graminoid	monocot
Muhlenbergia rigens	deer grass	native	perennial	graminoid	monocot
Nassella cernua	nodding needlegrass	native	perennial	graminoid	monocot
Nassella pulchra	purple needle grass	native	perennial	graminoid	monocot
Paspalum dilatatum	dallis grass	introduced	perennial	graminoid	monocot
Phalaris californica	California canarygrass	native	perennial	graminoid	monocot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Phalaris minor	canary grass	introduced	annual	graminoid	monocot
Phalaris paradoxa	hood canarygrass	introduced	annual	graminoid	monocot
Phleum pratense	cultivated timothy	introduced	perennial	graminoid	monocot
Poa annua	annual bluegrass	introduced	annual	graminoid	monocot
Poa bulbosa	bulbous bluegrass	introduced	perennial	graminoid	monocot
Polypogon monspeliensis	rabbit foot grass	introduced	annual	graminoid	monocot
Setaria pumila	bristly foxtail	introduced	annual	graminoid	monocot
Sorghum halepense	johnsongrass	introduced	perennial	graminoid	monocot
Taeniatherum caput-medusae	medusahead	introduced	annual	graminoid	monocot
Vulpia myuros	rat tail fescue	introduced	annual	graminoid	monocot
POLYGONACEAE (buckwheat family)					
Polygonum amphibium var. *emersum*	water smartweed	native	perennial	forb/herb	dicot
Polygonum arenastrum	common knotweed	introduced	annual, perennial	forb/herb	dicot
Polygonum lapathifolium	willow smartweed	native	annual	forb/herb	dicot
Polygonum persicaria	thumbprint smartweed	probably introduced	annual, perennial	forb/herb	dicot
Polygonum punctatum	annual smartweed	native	annual, perennial	forb/herb	dicot
Rumex conglomeratus	clustered dock	introduced	perennial	forb/herb	dicot
Rumex crispus	curly dock	introduced	perennial	forb/herb	dicot
Rumex maritimus	golden dock	native	annual, biennial	forb/herb	dicot
Rumex pulcher	fiddle dock	introduced	perennial	forb/herb	dicot
POLEMONIACEAE (phlox family)					
Linanthus montanus	mustang clover	native	annual	forb/herb	dicot
Navarretia leucocephala	whitehead navarretia	native	annual	forb/herb	dicot
PONTEDERIACEAE (water-hyacinth family)					
Eichhornia crassipes	water hyacinth	introduced	perennial	forb/herb	dicot
PORTULACEAE (purslane family)					
Calandrinia ciliata	red maids	native	annual	forb/herb	dicot
Claytonia parviflora	miners lettuce	native	annual	forb/herb	dicot
Claytonia perfoliata ssp. *mexicana*	miners' lettuce	native	annual	forb/herb	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Montia fontana	water chickweed	native	annual	forb/herb	dicot
PRIMULACEAE (primrose family)					
Anagallis arvensis	scarlet pimpernel	introduced	annual, biennial	forb/herb	dicot
RANUNCULACEAE (buttercup family)					
Clematis ligusticifolia	virgin's bower	native	perennial	vine	dicot
Ranunculus bonariensis var. *trisepalus*	buttercup	native	annual	forb/herb	dicot
Ranunculus muricatus	spiny-fruited buttercup	introduced	annual, biennnial, perennial	forb/herb	dicot
Rosa californica	California rose	native	perennial	subshrub	dicot
Rubus armeniacus (syn. *Rubus discolor)*	himalayan blackberry	introduced	perennial	subshrub	dicot
Rubus ursinus	California blackberry	native	perennial	subshrub	dicot
RUBIACEAE (madder family)					
Cephalanthus occidentalis var. *californicus*	California button willow	native	perennial	tree, shrub	dicot
Galium tricornutum	rough corn bedstraw	introduced	annual	forb/herb	dicot
SALICACEAE (willow family)					
Populus fremontii	Fremont's cottonwood	native	perennial	tree	dicot
Salix exigua	sandbar willow	native	perennial	tree, shrub	dicot
Salix gooddingii	Goodding's willow	native	perennial	tree	dicot
Salix laevigata	red willow	native	perennial	shrub	dicot
Salix lasiolepis	arroyo willow	native	perennial	tree, shrub	dicot
Salix lucida ssp. *lasiandra*	yellow willow	native	perennial	tree, shrub	dicot
SCROPHULARIACEAE (figwort family)					
Castilleja attenuata	valley tassels	native	annual	forb/herb	dicot
Castilleja campestris ssp. *campestris*	owl's clover	native	annual	forb/herb	dicot
Castilleja campestris ssp. *succulenta*	succulent owl's clover	native	annual	forb/herb	dicot
Castilleja exserta	purple owl's clover	native	annual	forb/herb	dicot
Kickxia spuria	sharppoint fluellin	introduced	annual	forb/herb	dicot
Diplacus aurantiacus ssp. aurantiacus (syn. *Mimulus aurantiacus*)	orange bush monkeyflower	native	perennial	subshrub, shrub	dicot

Scientific name	Common name	U.S. nativity	Duration	Growth habit	Group
Mimulus glaucescens (syn. *Mimulus guttatus*)	shieldbract monkeyflower	native	annual	forb/herb	dicot
Mimulus latidens	broadtooth monkeyflower	native	annual	forb/herb	dicot
Mimulus tricolor	tricolor monkeyflower	native	annual	forb/herb	dicot
Triphysaria eriantha ssp. *eriantha*	ohnny jump-up	native	annual	forb/herb	dicot
Triphysaria pusilla	dwarf owl's-clover	native	annual	forb/herb	dicot
Veronica peregrina ssp. *xalapensis*	purslane speedwell	native	annual	forb/herb	dicot
Veronica persica	persian speedwell	introduced	annual	forb/herb	dicot
SOLANACEAE (potato family)					
Nicotiana quadrivalvis	coyote tobacco	native	annual	forb/herb	dicot
Physalis lanceolata	ground cherry	native	perennial	forb/herb	dicot
TYPHACEAE (cat-tail family)					
Typha angustifolia	cattail	introduced	perennial	forb/herb	monocot
Typha latifolia	narrow leaf cattail	native	perennial	forb/herb	monocot
URTICACEAE (nettle family)					
Urtica dioica	stinging nettles	native and introduced	perennial	forb/herb	dicot
Urtica urens	dwarf nettle	introduced	annual	forb/herb	dicot
Phyla nodiflora	phyla	native	perennial	forb/herb	dicot
VERBENACEAE (Verbena family)					
Verbena bonariensis	verbena	introduced	annual, biennnial, perennial	subshrub, forb/herb	dicot
VISCACEAE (Christmas mistletoe family)					
Phoradendron macrophyllum ssp. *macrophyllum* (syn. *Phoradendron tomentosum* ssp. *macrophyllum*)	mistletoe	native	perennial	subshrub, shrub	dicot
VITACEAE (grape family)					
Vitis californica	wild grape	native	perennial	vine	dicot
ZYGOPHYLLACEAE (Creosote-bush family)					
Tribulus terrestris	puncturevine	introduced	annual	forb/herb	dicot

All plant scientific names confirmed by: USDA, NRCS. 2006. The PLANTS Database (http://plants.usda.gov, August 2006). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Appendix I. Glossary

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels.

Alkalinity. Refers to the extent to which water or soils contain soluble mineral salts. Waters with a pH greater than 7.4 are considered alkaline.

Alluvium. Clay, sand, or other sediment that is gradually deposited by moving water (see also alluvial-fan).

Alternatives. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (1) A reasonable way to fix the identified problem or satisfy the stated need. (40 CFR 150.2) (2) Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (Draft Service Manual 602 FW 1.5).

Animal Unit Month (AUM). The amount of forage necessary to maintain one 1,000-pound animal for one month.

Aquatic. Pertaining to water, in contrast to land. Living in or upon water.

Aquatic Habitat. The physical, chemical, and vegetative features that occur within the water of lakes, ponds, reservoirs, rivers, irrigation canals, and other bodies of water.

Aquifer. An underground layer of porous rock, sand, or gravel containing large amounts of water.

Artifact. An object made by humans; usually in reference to primitive tools, vessels, weapons, etc.

Basin. A depressed area with little or no surface water; an area where water flows in, but where surface water does not flow out.

Biodiversity (biological diversity). Refers to the full range of variability within and among biological communities, including genetic diversity, and the variety of living organisms, assemblages of living organisms, and biological processes. Diversity can be measured in terms of the number of different items (species, communities) and their relative abundance, and it can include horizontal and vertical variability. The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Biological Control. The use of organisms or viruses to control weeds or other pests.

Biological Integrity. Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

Carnivore. An animal that kills and eats other animals.

Categorical Exclusion (CE, CX, CATEX, CATX). A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR. Code of Federal Regulations.

Community. The combined populations of all organisms in a given area, and their interactions. For example, the frogs, fish, algae, cattails, and lily pads in a backyard pond make up a community.

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Draft Service Manual 603 FW 3.6).

Comprehensive Conservation Plan (CCP). A document that describes the desired future conditions of the refuge or planning unit; and provides long-range guidance and management direction to accomplish the purposes of the refuge, helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates.

Concern. See Issue.

Cultural Resource. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples) of an area. It includes historical, archaeological and architectural significant resources.

Cultural Resource Inventory. A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview. A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Easement. A privilege or right that is held by one person or other entity in land owned by another.

Ecosystem. The sum of all interacting parts of the environment and associated ecological communities within a particular area; an ecological system. Many levels of ecosystems have been recognized. Very few, if any ecosystems are self-contained; most influence, or are influenced by, components or forces outside the system. For administrative purposes,

we have designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

Effect. A change in a resource, caused by a variety of events including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

Emergent Vegetation. Rooted, aquatic plants that have most of their vegetative (nonroot) parts above water.

Endemic Species. Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Endangered Species. Any species that is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. Endangered species are afforded protection under the Act as amended and under various State laws for State-listed species.

Environmental Assessment (EA). A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Environmental Health. Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment

Ethnography. The branch of anthropology that deals descriptively with specific cultures, especially those of non-literate peoples.

Evapotranspiration. The collective processes by which water is transferred from the surface of the earth, including from the soil and the surface of water-bodies (through evaporation) and from plants (through transpiration).

Exotic and Invading Species (Noxious Weeds). Plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Unite States and to the public health.

Fallow. Allowing land that normally is used for crop production to lie idle.

Finding of No Significant Impact (FONSI). A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Flyway. A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

Foraging. The act of feeding; another word for feeding.

Forbs. Herbaceous dicotyledonous plants.

Fragmentation. The process of reducing the size and connectivity of habitat patches.

GIS. Geographic Information System. Refers to such computer mapping programs as ArcView, ArcInfo, ERDAS, etc.

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Grain. A single, hard seed of a cereal grass.

Habitat. Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Integrated Pest Management (IPM). Methods of managing undesirable species, such as weeds, including education; prevention, physical or mechanical methods or control; biological control; responsible chemical use; and cultural methods.

Invertebrate. Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

Irrigation Drainwater. Ideally, subsurface water which flows from irrigated land and generally transports higher concentrations of dissolved salts than the water applied to the land.

Irrigation Return Flow. Water which reaches surface drainage by overland flow or through groundwater discharge as a result of applied or natural irrigation.

Issue. Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition.

Lethal Dose 50 (LD50). The LD50 or colloquially, semi-lethal dose of a particular substance is a measure of how much constitutes a lethal dose. The related units of an LD50/30 or an LD50/60 are used to refer to a dose that without treatment will be lethal to 50% of the population within (respectively) 30 or 60 days.

Mitigation. To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

Moist-Soil. A process where water is drawn down intentionally or naturally to produce mudflats (i.e., moist soil) that are required for germination of many desirable plants.

National Environmental Policy Act (NEPA). An act which encourages productive and enjoyable harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and atmosphere, to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality (CEQ). Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Wildlife Refuge (Refuge or NWR). A designated area of land or water or an interest in land or water within the system, including national wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas (except coordination areas) under the Service jurisdiction for the protection and conservation of fish and wildlife. A complete listing of all units of the Refuge System may be found in the current "Report of Lands Under Control of the U.S. Fish and Wildlife Service."

National Wildlife Refuge System, Refuge System, or System. Various categories of areas that are administered by the Secretary for the conservation of fish and wildlife, including species that are threatened with extinction; all lands, waters, and interest therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management or waterfowl production areas.

Native Species. Species that normally live and thrive in a particular ecosystem.

NEPA. National Environmental Policy Act of 1969.

No Action Alternative. An alternative under which existing management would be continued.

Objective. A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Make objectives attainable, time-specific, and measurable.

Plant Community. An assemblage of plant species of a particular composition. The term can also be used in reference to a group of one or more populations of plants in a particular area at a particular point in time; the plant community of an area can change over time due to disturbance (e.g., fire) and succession.

Playa. A shallow basin where water collects and is evaporated.

Population. All the members of a single species coexisting in one ecosystem at a given time.

Preferred Alternative. This is the alternative determined (by the decision maker) to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management. The Service's selected alternative at the Draft CCP stage.

Prescribed Fire. The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, , etc., that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

Priority Public Uses. Compatible wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

Proposed Action. The Service's proposed action for Comprehensive Conservation Plans is to prepare and implement the CCP.

Public Involvement. A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public Scoping. See public involvement.

Purposes of the Refuge. "The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit." For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge.

Raptor. A bird of prey, such as a hawk, eagle, or owl.

Refuge. Short of National Wildlife Refuge.

Refuge Operating Needs System (RONS). The Refuge Operating Needs System is a national database that contains the unfunded operational needs of each refuge. We include projects required to implement approved plans and meet goals, objectives, and legal mandates.

Refuge Purposes. The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, a refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

Salinity. An expression of the amount of dissolved solids in water.

Shorebirds. Long-legged birds, also known as waders, belonging to the Order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Sound Professional Judgment. A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act and other applicable laws.

Species. A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Step-Down Management Plan. A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives.

Strategy. A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

Threatened Species. Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a threatened species in the Federal Register by the Secretary of the Interior. Threatened species are afforded protection under the Endangered Species Act of 1973.

Upland. An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

Vernal Pool. Seasonally flooded depressions found on ancient soils with an impermeable layer such as a hardpan, claypan, or volcanic basalt. The impermeable layer allows the pools to retain water much longer then the surrounding uplands; nonetheless, the pools are shallow enough to dry up each season. Vernal pools often fill and empty several times during the rainy season. Only plants and animals that are adapted to this cycle of wetting and drying can survive in vernal pools over time.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates.

Visit Opportunity. An opportunity for a member of the public to visit the Refuge for a staff guided or self-guided wildlife-dependent recreation or other event

Waterfowl. A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Watershed. The entire land area that collects and drains water into a river or river system.

Wilderness Review. The process we use to determine if we should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the refuge to identify lands and waters that meet the minimum criteria for wilderness. The study evaluates all values (ecological, recreational, cultural), resources (e.g., wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not we will recommend the area for designation as wilderness.

Wildfire. A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildlife. All nondomesticated animal life; included are vertebrates and invertebrates.

Wildlife-Dependent Recreational Use. "A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation." These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. We also

will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence.

Appendix J. Summary of Public Involvement/ Comments and Consultation/ Coordination

The initial public scoping process for this CCP is described in Chapter 2, The Planning Process.

Once the Draft CCP/EA was complete, a planning update was prepared and mailed out to interested stakeholders on September 18, 2006. The planning update announced the availability of the Draft CCP/EA for review and comment as well as providing notice of the public comment meetings on October 4 and 5, 2006. On September 25, 2006 a Notice of Availability for the draft CCP/EA published in the Federal Register (Vol. 71, No. 185, p. 55801) announcing that the Draft CCP/EA was open to public comment for a 30 day period and noting the location and times for public comment meetings. Printed copies of the Draft CCP/EA were mailed to interested stakeholders, including local libraries, and electronic copies were posted for downloading on the Pacific Region Refuge Planning website and on the Stone Lakes NWR website.

Due to requests for an extension of the Draft CCP/EA comment period from the public and an elected official, the public comment period was extended for an additional 30 days ending on November 27, 2006. Supplemental notices announcing the 30 day comment period extension were mailed to interested stakeholders.

Responses to written comments on the Draft CCP/EA can be found in Appendix G, Response to Comments.

A summary of public comments from the Stone Lakes NWR Draft CCP/EA public meetings held on October 4 & 5, 2006 follows. Public comments received during the public comment period represented a sub-set of the overall written comments received during the open comment period. Appendix G displays responses to all of the written comments received and those respondes are incorporated into this Appendix by reference.

Public comments noted during public comment meetings on 10/4/06

<u>Biological Resources Management Comments</u>

- Because of good management in some areas, species such as sand hill cranes, ravens and other birds are back in the area, but these are away from areas of human disturbance such as water skiing.
- (I) expect that other wildlife such as turtles, otter, beaver, nesting herons would return to SP cut (if high speed boating ceased).
- Stone Lakes NWR is for the birds.

<u>Visitor Services Comments</u>

- In order to maintain biological integrity and fulfill biological goals in the preferred alternative, there should be no high speed boating on any portion of the Refuge.
- Supports banning of high-speed boating because of deleterious effects on

wildlife.

- Refuge does not have other inappropriate uses such as OHV (off highway vehicles) use, rifle ranges, model planes or jet skis.
- (Want) more fishing access, non-boat pier (access).
- Any public access on Southern Pacific Rail Road should ensure no trespass/ vandalism occurs
- (Want) increased opportunities for visitor use. (Should) allow bank fishing.
- High speed boating should continue on all or a portion of refuge waterways.
- Motor boats cause noise pollution as well as oil and air pollution.
- High speed boating in the SP cut constitutes an exclusive use and prevents other uses.
- Levee berm erosion has occurred (in the SP cut) and the only wave action in the channel is from high speed boating since there is no east wind.

General Comments

- Supports the preferred alternative.
- (Should) put cooperative agreements in (the) conservation plan.
- Should have a more detailed description of the planning process.
- Should clarify how comments on NEPA document and CDs will be addressed.
- A 60 day comment period would be more appropriate than a 30 day comment period (the document is long and difficult to read through in 30 days).
- Questioned designation of SP cut as navigable waters since the throughway was created by dredging.
- Environmental health should be a priority (ex. water quality, vector control).
- Environmental health should not be at the bottom of the pyramid (figure used in power point presentation by Refuge Planner). (He is) concerned about vector control and environmental health.

Public comments noted during public comment meetings on 10/5/06

Biological Resources Management Comments

- Sand hill cranes need a large amount of space and are very sensitive to noise disturbance.
- Sand hill cranes tend to go to the same area every year regardless of the crop type there.
- There is (poor) bad roosting in agricultural areas, (whereas) wetlands allow good roosting.
- Sand hill cranes eat corn, wheat, California voles and may start at tomato fields. It is unknown why they start at the tomato fields, but it may be related to the alkali soils in those areas.

Visitor Services Comments

- Concern was expressed about water skiing on the Refuge. (The person commenting) feels that it (water skiing) is not compatible and is disruptive to wildlife. Water skiing is noisy, polluting (gas, fumes, noise) and is unhealthy for wildlife.
- (The person commenting) thinks that kayaks & canoes are o.k. since they provide people with another way to see the Refuge and they are less noisy

and slower moving, which allows wildlife to escape.

- It is not a good experience to kayak in the SP cut with high speed boats passing at speeds of 15-45 mph.
- (The person commenting) has seen water skiers scare away wildlife and almost hit an otter. Also wildlife refuge visitors who were observing wildlife were disrupted by the water skiers.
- (The water skiing use) is inconsistent because the skiers use is uncontrolled. The Refuge would control the numbers of canoes and kayakers to ensure quality of their visit. We do not know when or who comes and goes with the water skiers.
- (The Refuge) is also a Refuge for city dwellers to think, be quiet and contemplate. (Visitors) should not come to the Refuge and encounter more noise (such as boat engines). Areas with quiet places are becoming rarer.
- (The person commenting would like to see) removal of skiing because of wake erosion, particularly on the west side. (The person commenting) has seen (negative) effects on native vegetation such as oaks. In many cases (the) water-side berm has been completely eroded away.
- Today (a visitor) can see many trees that used to be anchored on the bank (that) are now in the water.
- Waves created by high-speed boats (are the) primary cause of erosion. Erosion is worse on the west side where (the) levee is and (there are) cattails, etc. on (the) east side that may dissipate waves. (The) SP cut run(s) north to south, so winds do not come directly from east to west. Therefore winds are not the cause of (levee) erosion.
- The addition of paddle tours on the Refuge would be a good addition, to educate (the) public and provide wildlife viewing opportunities. But, in the narrow channel of (the) SP cut, canoeing and kayaking would not be compatible with high speed boating, which could swamp boats and would flush all of the wildlife.
- (The person commenting) has experience with personal (high speed) watercraft disrupting (the) experience of paddlers.
- In order to encourage canoes and kayakers, (the Refuge) would need to eliminate high speed boating.
- (The compatibility determinations) should explore all non-motorized types of watercraft.
- Any non-motorized craft should be allowed.
- Paddling is like having a trail in the water.

<u>General Comments</u>

- (The Refuge) should increase outreach to groups. ECOS is a local umbrella organization that should be contacted.
- (The Refuge) should add Yolo Audubon to the mailing list.

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Appendix K. Preparer List

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Appendix L. Integrated Pest Management Plan for Mosquito-Associated Threats

Integrated Pest Management Plan for Mosquito-Associated Threats
Stone Lakes National Wildlife Refuge
August, 2006

I. Introduction

Stone Lakes National Wildlife Refuge (Refuge) collaborates with the Sacramento-Yolo Mosquito Vector Control District (District) in monitoring and controlling mosquitoes to ensure the human health concerns of neighboring communities are addressed. The Refuge is located within Sacramento County, 10 miles south of downtown Sacramento and bordered by the city of Elk Grove on the east. The potential for mosquitoes to be produced or harbored on the Refuge is a concern to nearby residents and urbanized areas immediately adjacent to the Refuge are well within the flying range of many species of mosquitoes. Because of this and commitments made by the U.S. Fish and Wildlife Service (Service) in the Final Environmental Impact Statement (1992) establishing the Refuge approved boundary, the Service entered into a Memorandum of Understanding (MOU) in 1993, to ensure the public health and well-being of residents would not be adversely affected by mosquitoes from the Refuge. This Integrated Pest Management (IPM) Plan for Mosquito and Associated Threats will facilitate implementation of the MOU and ensure mosquito management practices are consistent with Service IPM policies and regulations regarding management of the national wildlife refuge (NWR) system.

Refuge Description

Stone Lakes National Wildlife Refuge was established in 1994 becoming the 505th NWR. The approved Refuge boundary encompasses 17,640 acres, of which approximately 6,200 acres are currently managed by the Service. Stone Lakes NWR lies between the Coast and Diablo Ranges to the west and the Sierra Nevada to the east. Most of the Refuge lies within the 100-year floodplain of the Mokelumne and Cosumnes rivers. Interstate highway 5 roughly bisects the Refuge north to south. Annual temperature in the area averages approximately 61.0 F degrees and annual precipitation averages approximately 17.93 inches; virtually all of the precipitation occurs during the winter months. Summer is typically hot (>100 °F) and dry; winter temperatures are generally moderate (50-60 °F). Habitats on the Refuge consist of upland grasslands (55 percent), riparian forest and associated shrublands (7 percent), open water (7%), seasonal and permanent wetlands including vernal pools and irrigated pastures (26 percent), and croplands (5 percent). Land uses adjacent to the Refuge include farming (vineyards, orchards and row crops), grazing, and suburban housing developments.

Memorandum of Understanding (MOU)

The 1993 MOU between the District and the Refuge outlines a mosquito management program that includes consultation on wetland design and water management, use of physical, biological and chemical control agents to control mosquito larvae and adults, and cooperative research on landbird populations. Both the Refuge and the District agree that

biological, cultural and physical control methods are preferred over chemical measures and that wetlands can be designed and managed to minimize mosquito production. In summary, the MOU provides for: 1) allowing the District to review planned Refuge wetland construction projects; 2) providing the District an annual summary of the upcoming Refuge water management program and notification of flood ups and irrigations; 3) the District providing a proposed annual mosquito abatement operating plan to the Refuge, 4) the Refuge submitting pesticide use proposals (PUP's), as needed, for any chemical mosquito control agents requested by the District; 5) providing access to the District for mosquito monitoring and control as defined in an annual Special Use Permit (SUP); and 6) with notification and coordination, application of larvicides or adulticides by the District, when treatment thresholds are exceeded.

II. Mosquito Borne Disease

Disease History

Due partly to its climate, California has a history of serious arboviral disease problems that are not expected to diminish. Western equine (WEE) and St. Louis encephalitis (SLE) viruses are endemic and intermittently represent significant public health threats throughout the state. St. Louis encephalitis, historically a rural disease in the western USA, has now moved into the expanding metropolitan areas of southern California. Several international arboviral diseases have recently been introduced to the United States, such as dengue, Venezuelan equine encephalitis, and West Nile virus (WNV). WEE tends to be most serious in very young children, whereas elderly people are most at risk to SLE and WNV (CA Dept. of Heath Services 2003). WEE and WNV can also cause diseases in horses and emus, and WNV kills a wide variety of endemic and imported birds. Mosquito control is practically the only known method of protecting people and animals from WEE, SLE, and WNV. With the exception of available vaccines to protect horses against WEE and WNV, there are no known specific treatments or cures for the diseases caused by these viruses (CA Dept. of Health Services 2004).

West Nile virus was introduced into New York City during 1999 and has subsequently expanded its occurrence dramatically throughout North America. It was first documented as becoming established in California in 2004 when a total of 822 human cases were verified, primarily in southern California (Table 1). Of the 58 counties in the state, 23 reported virus activity during 2004, based on a range of monitoring methods, including: mosquito pools, sentinel chicken flocks, wild birds, or equine and human cases (CA Dept. of Heath Services 2004, CA West Nile Virus website 2006). During 2005, 54 counties were documented as supporting virus activity as it moved northward into the Central Valley and the northern state. In 2005, Sacramento County was recognized as a focus of WNV activity in the state.

Table 1. West Nile virus human cases in California (2004-2006). Numbers in parentheses are totals for Sacramento and Yolo counties.

Year	Human Cases	Human Fatalities
2004	822	25
	(4)	(0)
2005	935	19
	(189)	(1)
2006	50	1
(as of 08/18/06)	(16)	(0)

A number of characteristics of the Sacramento region may have contributed to this,

including: (1) number of days per year temperatures exceed 95 degrees Fahrenheit., (2) abundance of mosquito production habitat particularly rice fields, irrigated pasture, dairies, and wetlands, (3) abundance of local migratory bird populations, (4) burgeoning human population interfacing with nearby agricultural lands, (5) heavy spring rains, and (6) the relative abundance of the primary WNV vector, *Culex tarsalis* (P. Sanders, SYMVCD, pers. comm.). During 2004-2005, human cases were documented in the state from approximately the first week of July through the first week of November. To date, there have been 16 human WNV cases in Sacramento and Yolo counties and one mortality in Butte County. WNV activity has been detected in a total of 43 counties. The five major species of birds most commonly found dead and testing positive for WNV in the state have been American crow, Western scrub-jay, yellow-billed magpie, American robin, and house finch.

A statewide encephalitis virus surveillance program has been in place since the 1960s that tracks mosquito abundance and enzootic transmission (transmission within the same geographic area) to provide an early warning of the potential for human infection. WEE and SLE have been recorded in the Central Valley since the 1940s reappearing intermittently after periods of apparent extinction. Though SLE has been rare since 1972, WEE enzootic transmission in the Sacramento Valley appears to be cyclic, recurring at 10 year intervals (Reisen et al. 1995). WEE is transmitted enzootically during the summer between wild birds and *Culex tarsalis*, while *Ocheloratus melanimon* is involved in a secondary cycle with rabbits in the Central Valley during the late summer (Reeves 1990). The mechanisms by which the viruses overwinter and are able to persist despite periods of apparent extinction are still unclear though they have been the subject of intense study for over 50 years (Kramer 1999). There are currently two main hypotheses, one, that WEE overwinters by chronic infection of one or more species of birds, and two, that the virus persists between seasons in adult mosquitoes. Humans and horses are infected tangentially by mosquitoes but are dead-end hosts for the virus. Data collected from county health clinics by the Encephalitis Virus Surveillance indicating a low rate of infection in humans even during periods of elevated enzootic transmission may reflect a lowered rate of mosquito-human contact. This reduction in the exposure of humans to mosquito bites is likely due to cultural factors like the prevalence of televisions and air conditioners that encourage the population to spend more time indoors during dusk, the main period of mosquito activity. Expanded mosquito control and water management programs have also reduced *Culex tarsalis* populations.

Mosquitoes

The mosquito species identified by the District for monitoring and control at the Refuge are *Culex tarsalis*, *Anopheles freeborni, Aedes vexans, Aedes melanimon, Aedes nigromaculis,* and *Aedes increpitus*. *Culex tarsalis* is the primary vector of WEE and SLE in California and is also considered to be a significant vector of WNV (CA Dept. of Health Services 2003). *Anopheles freeborni* can transmit the malaria parasite to humans and is common in the rice growing regions of California. *Aedes melanimon* is involved in the encephalitis virus (sleeping sickness) cycle, and is considered a secondary vector for WNV (SYMVCD 2004).

Mosquito Biology

Mosquitoes are dipterans with aquatic immature stages and an aerial adult stage. Eggs must come in contact with water in order to hatch. Mosquitoes have four aquatic larval stages (instars) plus an aquatic pupal stage. The aerial adult emerges from the pupal stage onto the surface of the water, expands its wings, hardens its exoskeleton, and flies off. It takes from three to 12 days for a mosquito to complete its life cycle in northern California, depending on seasonal and environmental factors and the particular mosquito species involved. In general, the warmer the ambient temperature, the fewer days are required from hatching to emergence.

Ochlerotatus (floodwater) mosquitoes (*O. melanimon, O. nigromaculis, O. vexans*)
The *Aedes* life cycle is initiated with the flooding of ground that has undergone a dry

period. In the Sacramento Valley, the dry period may occur at any time from May through September. Once flooded, eggs that had been laid during the previous wet cycle hatch, pupate, and emerge as adults. Gravid females lay their eggs singly on damp soil, in leaf litter, in cracks in the soil, at the edges of drying ponds, or at the bases of grasses and other plants. Each female lays approximately 150 eggs per ovarian cycle. These eggs are very drought resistant, which allows them to survive during the summer. These mosquito species overwinter in the egg stage and to a much lesser extent in the larval stage. *Aedes* mosquitoes (primarily *A. melanimon*) are the most abundant produced on Refuge habitats, primarily during late summer and fall flooding. Numerous *A. melanimon* can also be produced as a result of wetland irrigations in late spring through early summer. During these times, mosquito eggs hatch, pupate, and reach the adult stage rapidly. *Ochlerotatus* are most numerous on Refuges during the fall when the majority of wetlands are flooded. Multiple hatchings of eggs commonly occur due to the timing of the different broods of eggs and differences in flooding schedules for individual areas. During the warmer months, it generally takes 3-10 days for these mosquitoes to develop from egg to adult (i.e., after initial flooding). Adult females of the three species of *Aedes* mentioned above are all aggressive, relative to other species, and are biters of primarily mammals. During the day, females will bite if disturbed or if a host presents itself, but generally are more active at dusk. Biting and swarming (mating) activities are typically crepuscular (occurring at twilight). When newly emerged, these mosquitoes do not readily move away from their emergence sites. As they age, however, they will move about much more freely. Although all three species of *Aedes* are produced in this area, *A. melanimon* has consistently been the most numerous and the cause of most concern as both as a nuisance and a public health risk. *Aedes* mosquitoes have been documented as secondary vectors for California Encephalitis and WNV.

Culex tarsalis (Encepalitis Mosquito)

Culex tarsalis occur in northern California in very large numbers during the summer. Females lay their eggs on the water surface in bunches called rafts. Each raft contains around 100-150 eggs, hatching about 24 hours after being laid. The immature stages can be found in almost any source of water except treeholes. During the summer, development from egg to adult takes about 9 days in the Sacramento Valley. This species is dramatically multivoltine (producing several broods), with adults emerging continuously throughout the summer. Abundant larva are commonly found in rice fields, poorly drained pastures, wetlands, sewer treatment plants, log decks, dairy farms, and seepages. Within Refuge habitats, *C. tarsalis* can be abundant in seasonal marsh and watergrass production units that have been flooded for more than two weeks during the fall. Adults spend daylight hours resting in secluded places such as cellars or animal burrows. Biting and swarming activities are crepuscular. Peak populations occur in late June or early July. *C. tarsalis* are primarily biters of birds, but will bite humans, livestock, and other mammals if the opportunity presents itself. *C. tarsalis* are strong fliers. Mark-release-recapture studies conducted in Sutter County in 1989 and 1990 showed that adult *C. tarsalis* could move up to 3 miles in just one night. *C. tarsalis* are the primary vector for Western Equine Encephalitis, St. Louis encephalitis, and WNV in humans.

Anopheles freeborni

A. freeborni also occur in northern California and are numerous during the summer. Rice fields are the primary production areas for this species although the immature stages are also found in ditches, seepages, sloughs, and wetlands. Females lay their eggs singly on the surface of the water where they hatch approximately 24 hours later. On the average, it takes 12 days for *A. freeborni* to develop from egg to adult in the Sacramento Valley. *A. freeborni* are most abundant in persistent wetlands, thus Refuge perennial marsh can produce *A. freeborni* during the summer months. However, relatively stable water levels and a relative abundance of mosquito predators (fish, dragonflies, and aquatic beetles) tend to minimize

adult mosquito emergence from these habitats.

This species is also multivoltine, with the ability to produce a continuous supply of newly emerged adults under the right habitat conditions. Adults rest during the day and engage in biting and swarming activities during crepuscular periods. In the fall, females go into diapause (overwintering stage) until January, February, or March when they come out of diapause and seek blood meals on warm days. After obtaining a blood meal, many females resume their overwintering stage until April or May. *A. freeborni* populations peak in late July or August. The females will readily bite humans and livestock. Area-wide, they are the most common nuisance mosquito for humans. Studies on *A. freeborni* in California have indicated long flight ranges from source areas. Work done in Sutter County found that this species could fly 2-3 miles in one night. This species is considered to be the most important vector of malaria in the Western United States.

III. Monitoring Mosquito Populations

District monitoring activities are designed to assess the abundance of immature (larvae and pupae) and adult mosquito populations. Monitoring activities conducted on the Refuge may include: larval sampling, adult light and host-seeking traps and adult leg counts. Monitoring by District staff may occur as often as 3-4 times per week during the summer irrigation (May 1st-July 31st) and fall flood up (August 1st-October15th). If temperatures are above average beyond October 15, District staff may continue to require access to the Refuge for monitoring.

Light and carbon dioxide traps are used to capture adult mosquitoes for monitoring purposes. Dip counts are used to estimate the numbers of immature mosquitoes and to determine the need for larval mosquito control. The dipper method entails using a long-handled ladle (ca 500 ml) called a dipper to collect water samples from possible mosquito sources. Captured immature mosquitoes are identified taxonomically as precisely as possible. All Refuge units supporting wetlands or irrigated land potentially may be monitored using the dipper method. However, units supporting managed wetlands would be targeted. Sampling locations for larvae may include wetland margins and shorelines and riparian habitats for adults.

As provided for in the MOU, the monitoring activities described above are conducted under a Special Use Permit (SUP) that the Refuge intends to continue issuing annually to the District.

1. Larval Mosquito Thresholds

Guidelines for control of immature or larval mosquitoes follow integrated pest management principles and are defined in a District Mosquito and Mosquito-Borne Disease Management Plan (Appendix I), available on their website (http://www.fightthebite.net) (Boyce 2005). In keeping with the MOU, the District requests annual approval from the Refuge to control mosquitoes by treating areas where larval stages of *Culex tarsalis*, *Aedes melanimon*, *A. nigromaculis, Anopheles freeborni* or other *Aedes* spp. may exceed thresholds. According to the District Management Plan, the threshold for initiating a larval control response will be a density of 0.1 mosquito larvae per 350-ml dipper of water for all species.

2. Adult Mosquito Thresholds

The District Management Plan defines criteria for five possible levels of adult mosquito activity and control responses (Appendix II). The thresholds for Level 1 (Standard or

Routine) adult mosquito control are 10 *Culex tarsalis* female mosquitoes per light trap night or 100 per CO_2 baited trap per night. For *Aedes* spp. the thresholds for Level 1 control are 50 female mosquitoes per light trap night or 150 per CO_2 baited trap per night. Under Level I, the thresholds for landing (leg) count collections are exceeded when two or more *Aedes* or *Ocheloratus* spp. land on an individual during a one-minute interval. Level 1 control in the District Management Plan is consistent with Level 1 (Normal Season) in the California Department of Health Services Mosquito-Borne Virus Surveillance and Response Plan (CA Dept. of Heath Services 2004).

The District Management Plan calls for a Level 2 control response when a mosquito-borne virus is confirmed from a dead bird or mosquito pool within District boundaries. The threshold for levels 2-5 adult control is 10 *Culex tarsalis* or *Cx. Pipiens* female mosquitoes per light trap night or 25 per CO_2 baited trap per night. For *Aedes* spp. the thresholds for Level 2-5 control responses are 25 female mosquitoes per light trap night or 50 per CO_2 baited trap per night. Level 2 control in the District Management Plan is equivalent to Level 2 (Epidemic Conditions) in California Department of Health Services Mosquito-Borne Virus Surveillance and Response Plan (CA Dept. of Heath Services 2004). According to the District Management Plan, levels 2-5 adult treatment thresholds remain at the reduced level until control activities are terminated for the mosquito season. The thresholds used by the District are based on historical monitoring that indicate all mosquitoes have the potential to transmit a wide range of diseases. Thresholds also minimizes annoyance levels to nearby communities from adult mosquitoes.

IV. Surveillance of Mosquito-Borne Disease

Vectorborne disease surveillance and associated health threat determinations are made by the California Vectorborne Disease Surveillance System (CVDS), a cooperative project of the Mosquito and Vector Control Association of California, the California Department of Health Services (CDHS), and the University of California at Davis. The UC Davis Center for Vectorborne Diseases (CVEC) analyzes samples collected from mosquito pools, sentinel chickens and dead birds and publishes results in the California Arbovirus Surveillance Bulletins. The samples are collected by the District.

The District arbovirus surveillance program includes testing of mosquito populations, sentinel chickens and wild birds for WEE, SLE and WNV. The information generated by the encephalitis program provides an early indication of local arboviral activity. Small populations of mosquitoes from sites that have a history of disease activity are sampled and tested by the mosquito abatement district. Carbon dioxide traps attract and capture mosquitoes which are subsequently identified, sorted and grouped into pools. The pools are sent to the CVEC where they are tested for encephalitis viruses. Mosquitoes are collected annually from March to November.

As part of monitoring conducted by the District for the presence of mosquito borne public health diseases, a sentinel chicken flock is maintained on private property adjacent to the Refuge Headquarters Unit. Service Region 1 policies prevent placement of sentinel chicken flocks on wildlife refuges because of the risk of avian diseases passing from chickens to migratory birds. Sentinel chickens are exposed to the environment and to mosquitoes moving through the area that may choose to feed on them. Regular blood samples are periodically taken from the chickens to detect any mosquito-vector pathogen activity. Once the flock exhibits positive viral titers and sero-conversion occurs, the California Department of Health Services is alerted to the potential threat to public health due to mosquito borne diseases.

For approximately the last ten years, Refuge staff and the District have conducted a collaborative research effort to collect blood samples from resident and migratory birds captured on the Refuge. The wild bird sera samples are processed and tested for the presence of WEE, SLE and WNV virus antibodies at the District laboratory. These cooperative efforts also provide the Service with important data regarding the status of migratory bird populations occurring on the Refuge.

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Reporting

1. The District will notify the Refuge Manager in the event of detection of virus activity within or near the Refuge and the method of disease surveillance yielding positive results.

2. Refuge staff will participate in collections of wild bird sera for testing and will monitor any unusual bird die-offs that may be caused by WNV or other diseases. Wild bird mortality due to WNV can provide an early warning of the risk of transmission to the public via mosquitoes.

V. Treatment Options

Mosquito control at the Refuge follows an ordered succession, using nonchemical treatments

first (i.e., wetland and water delivery system design, water control strategies, vegetation management, mosquitofish, guppies, and other biological agents, etc.), resorting to chemical treatment only when necessary, as determined through standard mosquito monitoring procedures. Among chemical treatments, adulticides will be used as a last resort. Refuge staff work with the District to minimize production of mosquitoes on the Refuge by means of habitat management and biological controls and are mindful of abiotic sources of mosquito production (e.g., tanks, buckets, equipment holding water) and promptly eliminate them if discovered.

Habitat Management

Refuge habitat management techniques that support mosquito abatement consist of: (1) design of managed wetlands, (2) efficient water management, and (3) physical manipulation of vegetation. These are mostly preventative measures to eliminate or reduce mosquito breeding habitat or conditions before it develops. If habitats were managed entirely for mosquito abatement, wildlife habitat values would be compromised. Therefore, Refuge staff strive to incorporate management techniques for mosquito abatement into ongoing wildlife habitat efforts. In an officially determined health emergency, mosquito abatement would become a higher priority than habitat management.

Wetland Design and Water Management

Water management techniques for minimizing mosquito production include timing and duration of flooding, the speed at which individual units are flooded up, irrigated, or drawn down and the stability of water levels. The Refuge is only able to conduct efficient water management on managed wetlands impoundments with pumps and water control structures where they can be manipulated to reduce mosquito production. These occur on the Beach Lake, Headquarters, and South Stone Lake units. Elements incorporated into the design of these wetlands that promote minimizing mosquito breeding include contouring of wetland margins, construction of drainage swales, and sizing of water control structures for relatively rapid flood up and de-watering. Steeper sloped wetlands support narrower perimeter margins where warm, shallow, vegetated conditions provide optimal breeding habitat for many species of mosquitoes.

Managed permanent and summer water wetlands produce the fewest numbers of mosquitoes and pose the least concern for the District. Permanent wetlands are flooded to a depth of approximately three feet which minimizes their use by floodwater mosquitoes and encourages abundant populations of mosquito predators (e.g., fish, dragonflies). Deep, open water provides water circulation and generates wave action that reduces micro-habitats suitable for mosquito breeding.

Seasonal wetland impoundments with water control structures are managed to provide wildlife habitat while minimizing the potential for mosquito production. Water delivery infrastructure is sized for rapid flood up, irrigations, and draw down, providing at least two means by which mosquito production is reduced. Slow irrigations, especially over large units, usually result in multiple hatches of adult mosquitoes. For example, if it takes five days to inundate a unit, a new hatch of eggs (i.e., typically *Aedes melanimon*) could be produced every day resulting in five separate cohorts of larvae/pupae and subsequent adult mosquitoes emerging over a five day period. The alternative is to flood up rapidly, covering the entire unit within one day if possible. This will not reduce the overall amount of mosquitoes produced but it will result in a more synchronous egg hatch and adult emergence. This will facilitate a more efficient control effort, requiring fewer applications for the same objective.

The timing of the fall flood up can substantially affect both mosquito production and wildlife habitat values. Delaying the initial fall flood up also delays associated initial mosquito production and may reduce the need for mosquito abatement if temperatures have already dropped sufficiently to discourage mosquitoes. Historically, Sacramento Valley wetlands

flooded naturally and much later, in the fall or early winter, based largely on the Sacramento River overflowing its banks. However, current managed wetland flooding regimes are dictated largely by water availability through irrigation districts and the need to provide wetlands for early migrating waterbirds during August-September. For example, providing roosting habitat for sandhill cranes is a priority at the Refuge which requires flooding up by mid-September, when they first arrive in the valley. Though this practice conflicts with District abatement recommendations, sandhill crane habitat considerations are given precedence over mosquito control. In the event of a threat to public health and/or unusually warm fall temperatures that would encourage mosquito production, delaying fall flood up remains an option.

Effective communication between Refuge staff and the District remains a critical requirement for coordinated mosquito management. In addition to submitting an annual summary of planned water management to the District, Refuge staff provide advance notifications of flood ups and irrigations so mosquito monitoring and possible treatments can be scheduled at an optimal time. Such notifications can result in applications of adulticides not being required since the District then has an opportunity to control larval populations, thus controlling adult emergence rates. For example, the Refuge attempts to flood wetlands early in the week so that mosquito hatches do not occur over the weekend when District staff are not in the field.

Physical Manipulation of Vegetation

Vegetative structure in wetlands provides habitat features that generally favor mosquito production. The benefits of vegetation include egg-laying sites, protection from the elements, and escape cover. The literature suggests that reduction of vegetation by burning or mowing (Batzer and Resh 1992) can reduce mosquito production significantly.

Mowing, herbicide applications, disking, or burning are the most common methods of reducing accumulations of vegetation in wetlands on the Refuge. Depending on the extent of vegetation they support, managed wetlands may be manipulated during the dry season to support a target mix of open water to emergent vegetation: approximately 50% vegetation to 50% open water. These manipulations improve wildlife habitat by promoting wetland plants of more food value for migratory waterfowl, increasing edge habitat, and the overall openness of wetland units, making them more attractive to shorebirds and species such northern pintail, green-winged teal, and sandhill crane. These treatments also reduce the extent of mosquito breeding habitat and improve accessibility to mosquito larvae by mosquito fish and other natural predators. Seasonal wetlands lacking in water control structures cannot be as easily managed but wetland perimeters may be mowed or disced both to improve conditions for mosquito fish and as well as to increase their value for waterbirds.

Major portions of Refuge waterways (e.g., South Stone Lake, SP Cut) have been invaded by the invasive aquatic plants, water hyacinth and Brazilian elodea (Egeria densa). Left unchecked, these continuous floating or submerged mats of vegetation can encourage mosquito production by providing harborage from predation, concentration of organic foods, and interference with wave action and water circulation. The Refuge was a founding member and has the lead role in the Stone Lakes Basin Water Hyacinth Control Program, along with the District and the Sacramento Regional County Sanitation District. This program contributes to both mosquito abatement and wildlife habitat improvement goals. In summary, habitat management techniques promoting mosquito abatement include:

- Construct wetland impoundments with appropriate slopes and adequate water management capacities
- Flood up/irrigate quickly to discourage multiple hatches

- Maintain a depth of 2-3 feet of water in permanent wetlands
- Control emergent vegetation to maintain 50 percent open water in managed wetlands
- Disc/mow pond perimeters in seasonal wetlands to maintain open water and access by fish
- Control invasive aquatic weeds
- Notify the District of planned flood up/irrigation events

Biological Controls

Reducing production of mosquitoes in a wetland ecosystem is partially dependant upon maintaining a diversity of habitats that support various predators and parasitic species that can then control mosquito populations. Predators and parasites can take sizable numbers of mosquitoes but if conditions support the rapid development of mosquitoes, then natural predation can be augmented by the addition of insectivorous (insect eating) fishes. The District has introduced three species of insectivorous fish to the Refuge, mosquito fish (*Gambusia affinis*), guppies (*Poecilia reticulata*) and the native threespine stickleback (*Gasterosteus aculeatus*).

Mosquitofish

Mosquitofish have played an active role in mosquito larvae control at refuges within California's Sacramento Valley over the last twenty years. Mosquitofish exhibit a tremendous tolerance for a wide range of water temperatures. Previously acclimated fish may tolerate minimum and maximum temperatures of 33° and 104°F (0.6° and 40°C), although sudden drastic changes of temperature are often lethal. Preferred temperatures appear to lie between 77° and 86°F (25° and 30°C). When surface water temperatures approach higher lethal limits, mosquitofish usually swim down to cooler water strata. Conversely, in the cooler seasons mosquitofish will move into shoal areas to reach the sun-warmed shallow waters. Other environmental factors that influence mosquito fish survival include densities of mosquito larvae, aquatic vegetation, availability of alternative forage organisms, presence of predaceous bird and fish populations, water depth and flow patterns, and several water quality criteria. For the fish to be effective, there must be no limitations to their normal distribution, rapid reproduction, and population recruitment. In general, mosquitofish are stocked in very small numbers because they quickly reproduce to the maximum population levels that a particular habitat may sustain.

Mosquitofish are transported by tanker truck directly to mosquito sources. Primary stockings of fish in semi-permanent wetlands are usually conducted at a minimal initial rate of 0.1 lb per acre. When necessary, these applications are augmented up to 1.0 lb per acre, based on larval dipping data. The District has stocked Refuge waters with mosquitofish every year since 1996. Most of the mosquitofish have been planted in the Beach Lake Unit, but some have also been placed in small ponds on the Sun River and Beach Lake properties.

Guppies and Threespine Sticklebacks

The District is evaluating the use of guppies and threespine sticklebacks for mosquito larvae control. Literature suggests that guppies will do an excellent job of controlling mosquitoes during the summer months but will not survive the cold winter months. Using this species in areas that are prone to winter flooding will ensure that these fish will not impact threatened or endangered species occurring within the floodplain. Threespine sticklebacks prefer to feed on benthic organisms rather than on the surface where mosquito larvae are found, but where the benthic community is insufficient, the Sticklebacks will expand their feeding range to the surface. Sticklebacks were only planted at the Refuge in 2001, while guppies were used in 2002 and 2003.

Chemical Controls

Larvicides/Pupacides

The District proposes to control mosquitoes by treating areas infested with larval stages of *Culex tarsalis*; *Aedes melanimon*, *A. nigromaculis*, *Anopheles freeborni* and *Aedes* spp.

The District would use the biological larvicides *Bacillus thuringiensis isrealensis* (Bti) and *Bacillus sphaericus* (Bsp) and the insect growth inhibitor methoprene. Use of the petroleum distillate Golden Bear (GB1111) as a pupacide was discontinued after 2000 and has been replaced with the monomolecular film Agnique. These treatments would be applied via ground methods. Based on December 2005 Service Delegation of Approval Authority for the California Nevada Operations (CNO) area, refuge managers now have authority to approve use of Bti, Bsp, methoprene, and Agnique.

Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Bti produces protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently bind to protein specific receptors of susceptible insect species resulting in the lethal response (Lacey and Mulla 1990). Bti must therefore be ingested by the target insect to be effective. It is most effective on younger mosquito larval instars but does not affect pupae or adult mosquitoes. The District prefers to use Bti because of the low impacts to the environment and non-target organisms and its effectiveness in reducing the numbers of mosquito larvae. The Bti formulations Vectobac 12AS or Vectobac G would be employed at the Refuge by the District. Bti may be applied at the Refuge between March and October.

Like Bti, Bsp is a microbial insect pathogen with a similar mode of action (Walton 1998). Formulated Bsp products used as mosquito larvicides consist of bacterial spores and protein endotoxins. The granular formulation of Bsp, Vectolex CG, would be applied by the District. Both Bti and Bsp may be applied as a spot treatment to small areas or broadcast over larger areas. Use of Bsp is permitted between June 1 and September 30 and applications would likely be made within 7-10 days of initial flooding to control third and fourth instar larva.

Methoprene is a synthetic insect growth regulator (IGR) that mimics juvenile hormones (Tomlin 1994). It interferes with the insect's maturation stages preventing the insect from transforming into the adult stage, thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars but does not affect pupae or adult mosquitoes (ETN 1996a). Treated larvae will pupate, but will not emerge as adults. The District proposes to use the formulated methoprene product Altosid in pellets or A.L.L. Growth Regulator. Use of methoprene is permitted between June 1 and September 30.

The monomolecular film, Agnique, reduces water surface tension. This interferes with larval orientation at the air-water interface and/or increases wetting tracheal surfaces, thus suffocating the organism. As the film spreads over the water surface, it tends to concentrate mosquito pupae, which may increase mortality from crowding stress (Dale and Hulsman 1990). Use of Agnique is permitted between June 1 and September 30.

Area Subject to Larvicides

Applications of larvicides may occur in managed permanent wetlands (106 acres), irrigated pastures (490 acres) and occasionally perennial wetlands (193 acres), totaling approximately 790 acres. The shorelines of open water areas may be treated. In addition, the District will treat ditches, culverts and low areas not classified as wetlands.

As a result of IPM practices and cooperation between the Refuge and the District, larval control applications on the Refuge have been limited to small acreages during any single treatment (less than five acres). The total Refuge acreage that may be treated varies with rainfall conditions each year. During drought years mosquito populations tend to be low, and during wet years mosquito populations tend to be high. From 2000-2004, the range in total

acreage treated varied from a low of 104 acres in 2000 to a high of 477 acres in 2004. The majority of the treatments occur from August to October, but in some years applications of Bti have begun as early as March and have extended into November.

Adulticides

If efforts to control immature mosquitoes fail to prevent the adult mosquito population from exceeding thresholds, and a documented historical or current health threat exists, the District proposes to treat infested areas with a mosquito adulticide. The District has requested annual approval for use of liquid formulations of synthetic pyrethrins, such as Pyrenone 25-5 or Pyrocide 7338. The District also requests and has received approval for use of the adulticide Trumpet (Naled) but it has not been used on the Refuge to date. Use of all adulticides is limited to June 1 through September 30, with a possible extension if unusually hot weather occurs together with a documented public health threat. Based on the December 2005 Service Delegation of Approval Authority for the CNO area, refuge managers have authority to approve use of pyrethrins for controlling mosquitoes near facilities used by staff and visitors and in terrestrial sites (not aquatic sites or wetlands). Approval of use of pyrethrins in aquatic or wetland settings or Trumpet necessitates submittal of Pesticide Use Proposals to the CNO and Washington offices.

Pyrethrins are non-systemic contact poisons which quickly penetrate the nerve system of the insect and cause paralysis and subsequent death (ETN 1994, Tomlin 1994). A few minutes after application, the insect cannot move or fly away. But, a "knockdown dose" does not mean a killing dose. Pyrethrins are swiftly detoxified by enzymes in the insect. Thus, some pests will recover. To delay the enzyme action so a lethal dose is assured, commercial products are formulated with synergists such as piperonyl butoxide, which inhibit detoxification (Tomlin, 1994). Trumpet (Naled) is a non-systemic, broad-spectrum organophosphate insecticide which affects the nervous system of adult mosquitoes and other insects by cholinesterase inhibition. When treatments occur, Pyrethrins and Trumpet, would be applied as an ultra-low volume (ULV) mist by ground. To minimize pesticide drift, dispersing vehicles follow routes on existing roads set up to fog downwind or outside buffers of 300 feet from areas supporting listed or proposed special status species. All chemical applications occur when wind speeds are between 2 and 8 mph.

Between 1994 when then Refuge was established and 2004, adult mosquito applications only occurred once in 1998 to five acres (0.09 gallons of Scourge) and once in 1999 to four acres (0.05 gallons of Pyrocide 7338). Both treatments were ULV ground applications at the same location, a drainage channel on the Headquarters Unit. That adulticides were utilized so infrequently, attests to the level of cooperation between District and Refuge who initiated water management and larval control measures to discourage mosquito production and adult emergence.

In 2005, West Nile Virus (WNV) became established in Sacramento and Yolo counties, triggering more aggressive and widespread mosquito control efforts. In August of 2005 the number of human WNV cases and rate of infected adult mosquitoes were so high that SYMVCD initiated aerial applications of pyrethrin over significant portions of Sacramento County. The Refuge received ultra-low volume (ULV) ground applications of pyrethrin on 16 occasions between July 28 and October 12, 2005. As of August 18, 2006, 16 human cases of WNV have been documented in Sacramento and Yolo counties (Table 1) and the Refuge has had adulticides applied 12 times beginning on June 27.

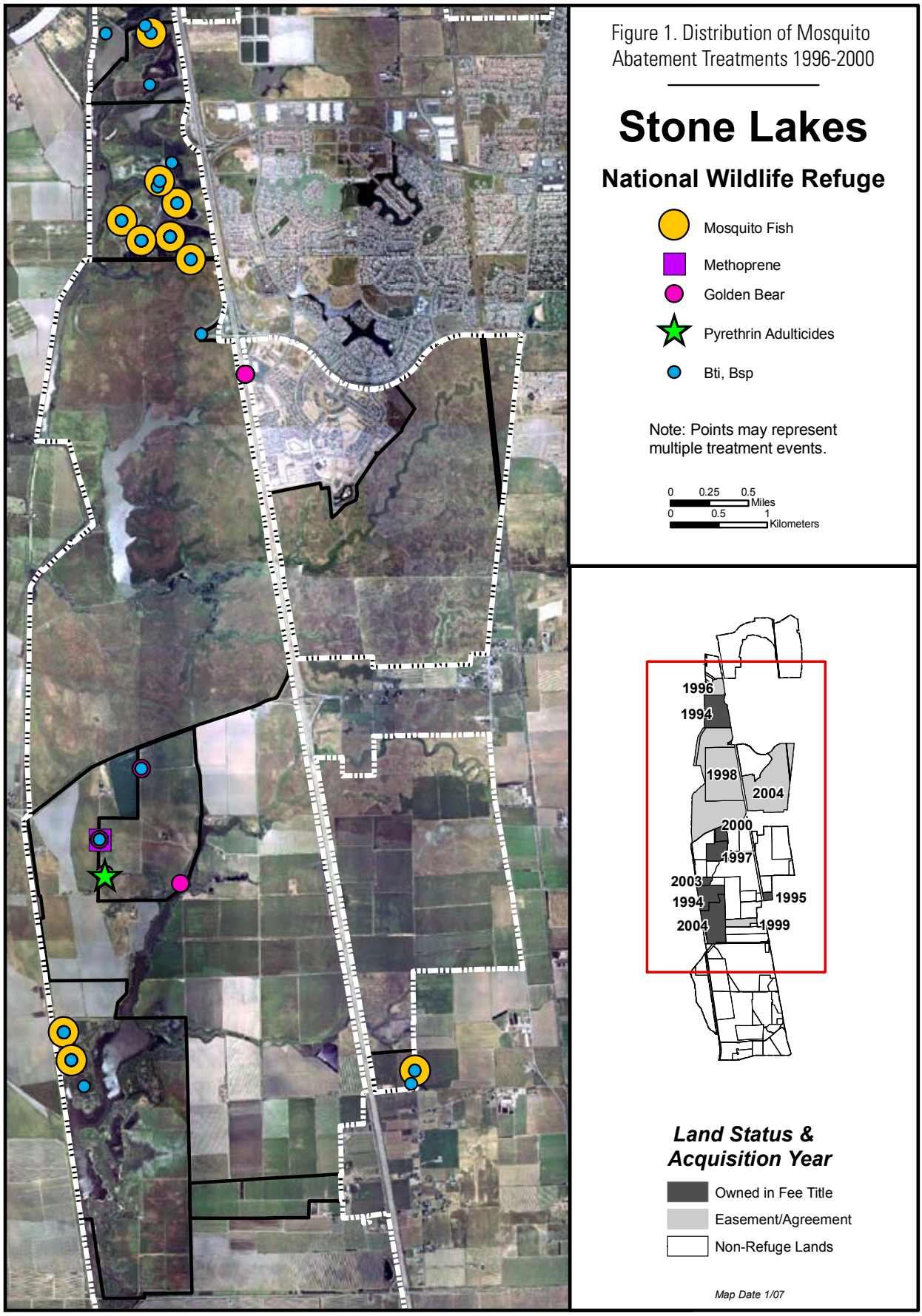


Figure 1. Distribution of Mosquito Abatement Treatments 1996-2000
Stone Lakes
National Wildlife Refuge
Mosquito Fish
Methoprene
Golden Bear
Pyrethrin Adulticides
Bti, Bsp
Note: Points may represent multiple treatment events.
0 0.25 0.5 Miles
0 0.5 1 Kilometers
1996
1994
1998
2004
2000
1997
2003
1994
2004
1995
1999
Land Status & Acquisition Year
Owned in Fee Title
Easement/Agreement
Non-Refuge Lands
Map Date 1/07

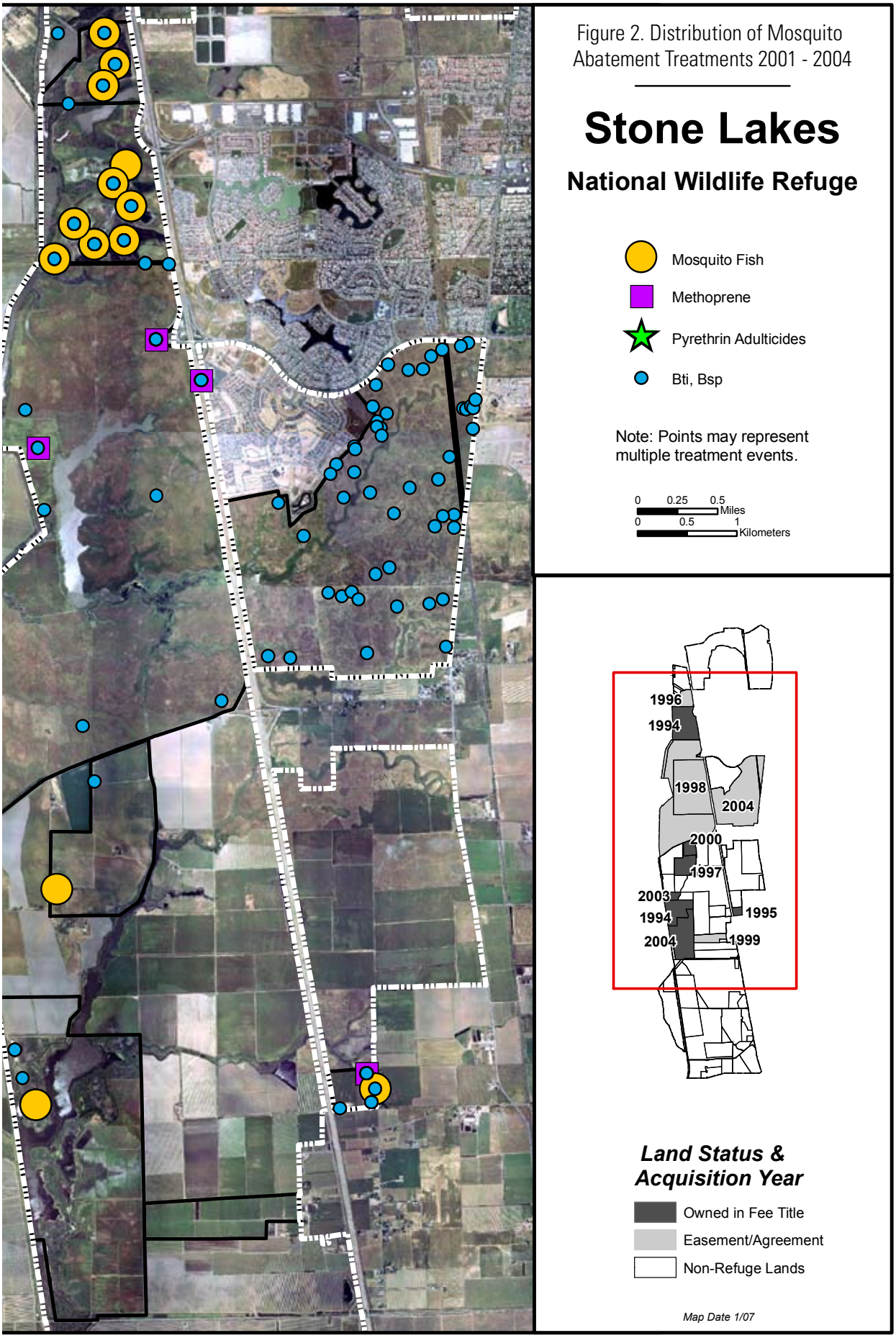


Figure 2. Distribution of Mosquito Abatement Treatments 2001 - 2004
Stone Lakes
National Wildlife Refuge
Mosquito Fish
Methoprene
Pyrethrin Adulticides
Bti, Bsp
Note: Points may represent multiple treatment events.
0 0.25 0.5 Miles
0 0.5 1 Kilometers
1996
1994
1998
2004
2000
1997
2003
1994
2004
1995
1999
Land Status & Acquisition Year
Owned in Fee Title
Easement/Agreement
Non-Refuge Lands
Map Date 1/07

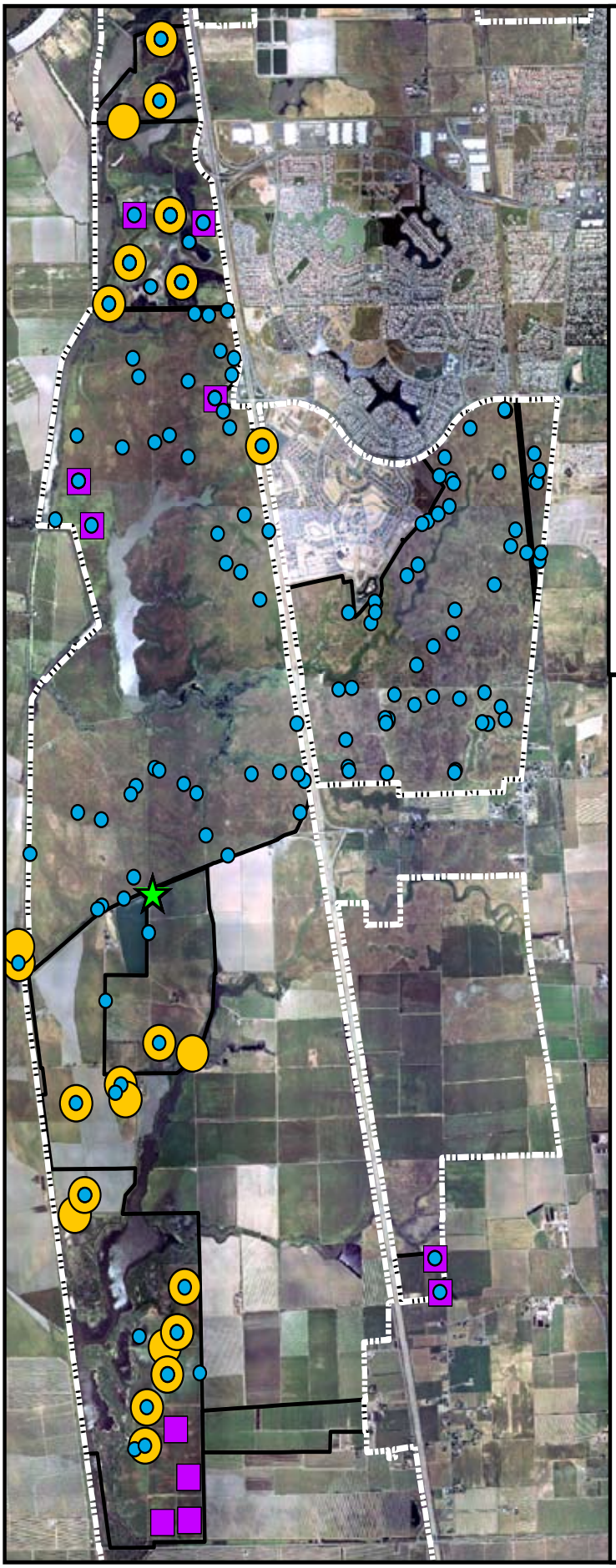


Figure 3. Distribution of 2005 Mosquito Abatement Treatments

Stone Lakes

National Wildlife Refuge

Mosquito Fish

Methoprene

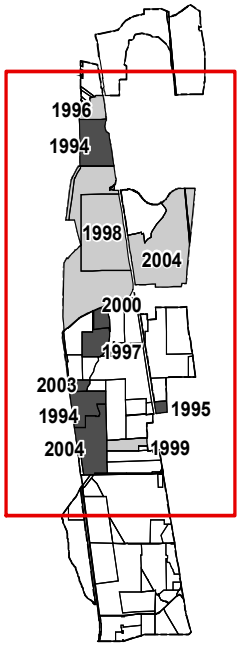
Pyrethrin Adulticides

Bti, Bsp

Note: Points may represent multiple treatment events.

0 0.25 0.5 Miles

0 0.5 1 Kilometers



Land Status & Acquisition Year

Owned in Fee Title

Easement/Agreement

Non-Refuge Lands

Map Date 1/07

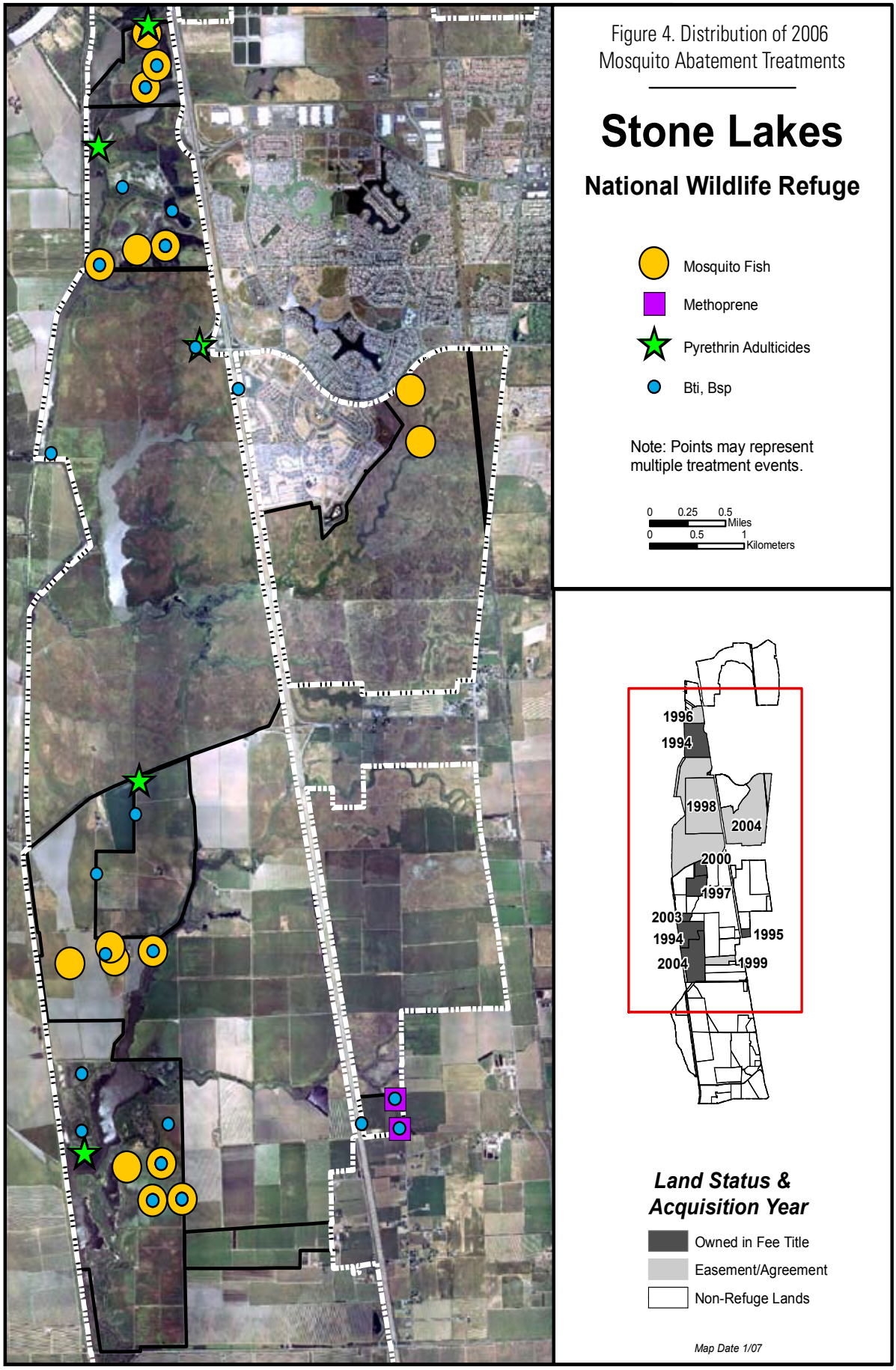


Figure 4. Distribution of 2006
Mosquito Abatement Treatments
Stone Lakes
National Wildlife Refuge
Mosquito Fish
Methoprene
Pyrethrin Adulticides
Bti, Bsp
Note: Points may represent
multiple treatment events.
0 0.25 0.5 Miles
0 0.5 1 Kilometers
1996
1994
1998
2004
2000
1997
2003
1994
2004
1995
1999
Land Status &
Acquisition Year
Owned in Fee Title
Easement/Agreement
Non-Refuge Lands
Map Date 1/07

VI. Toxicity and Effects to Non-Target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. The possible effects of the larvicides *Bacillus* spp. and methoprene, the pupacide Agnique, and the adulticides will be discussed separately.

Larvicides

Bacillus thuringiensis isrealensis (Bti)

Bti has practically no acute or chronic toxicity to mammals, birds, fish, or vascular plants (U.S. EPA 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shadduck 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians or crustacaceans (Brown et al. 2002, Brown et al. 2000, Garcia et al. 1980, Lee and Scott 1989, and Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar® HPD was attributed to xylene (Fortin et al. 1986, Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989, Jackson et al. 2002); no detectable adverse effects to breeding red-winged blackbirds using and nesting in Bti treated areas (Niemi et al. 1999, Hanowski 1997); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001).

In addition to mosquitoes (Family Culicidae), Bti affects some other members of the suborder Nematocera within the order Diptera. Also affected are members of the Family Simuliidae (black flies) and some chironomids midge larvae (Boisvert and Boisvert 2000, Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000, Lacey and Mulla 1990, Miura et al. 1980). In field studies, effects to target and susceptible nontarget invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; the Bti formulation used; the sample type (e.g., benthic, water column or drift); the sampling interval (e.g., from 48 hrs to one or more years after treatment); the habitat type (e.g., lentic or lotic); the biotic (e.g., aquatic communities), and abiotic factors (e.g., suspended organic matter or other suspended substrates, temperature, water depth); the mode of feeding (e.g., filter feeder, predator, scraper or gatherer); the larval development stage and larval density (Ali 1981, Boisvert and Boisvert 2000, Lacey and Mulla, 1990). Bti activity against target and susceptible nontarget invertebrates is also related to Bti persistence and environmental fate which are in turn affected by the factors associated with field study results (Dupont and Boisvert 1986, Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* sp. and *Chlorella* sp. resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla 1999). For these reasons, Bti effects to target and susceptible nontarget organisms, and potential indirect trophic impacts in the field are difficult to predict.

Bacillus sphaericus (Bsp)

Bsp has slight to practically no acute mammalian toxicity, practically no acute avian toxicity, slight to practically no acute fish toxicity, and slight aquatic invertebrate toxicity (USFWS 1984, and FCCMC 1998). Insecticidal activity may persist longer than 20 days because Bsp can reproduce and sporulate in larval cadavers (Becker et al, 1995) and can retain its larvicidal properties after passing through the gut of a mosquito. Bsp is insoluble in water. Spores and toxin become suspended in the water column and retain insecticidal

activity in water with high organic matter content and suspended solids. Because Bsp is a more recently developed larvicide than Bti, there are fewer studies that have examined the non-target effects of this pesticide. The data available, however, indicate a high degree of specificity of Bsp for mosquitoes, with no demonstrated toxicity to chironomid larvae at any mosquito control application rate (Mulla, 1984, Ali, 1986, Lacey, 1990, and Rodcharoen, 1991). Therefore risks to sensitive wildlife resources resulting from direct exposure to a single Bsp application and indirect food chain effects are expected to be negligible. However, the ability for a population to re-colonize a wetland following multiple larvicide treatments would depend on the intensity and frequency of applications at different spatial scales.

Agnique (Monomolecular film)

Monomolecular film has practically no acute mammalian or avian toxicity, and slight acute fish toxicity (USEPA 2000, USFWS 1984). The risk quotient for mammals is well below the EPA endangered species level of concern (LOC) indicating negligible risk resulting from direct exposure, Table 2 (Urban and Cook 1986). Risk quotients for birds and fish exceed EPA endangered species LOCs indicating a hazard to those taxa resulting from direct exposure. Risk to fish is limited by the insolubility of monomolecular film in water. Monomolecular film is insoluble in water, average persistence in the environment is 5 to 14 days. Indirect effects to animals dependent on invertebrate food resources are possible resulting from a reduction of those resources caused by monomolecular film. The magnitude of the impact would depend on the aerial extent of the treatment, the number of treatments, treatment frequency, and the location of the treatment relative to the areas used by invertebrate feeding animals.

Table 2. Monomolecular film risk quotients.

Animal	Acute toxicity (ppm)	EEC (ppm)	RQ	LOC (ES)
bird	> 5000 (8 D LC 50)	850 (short grass)	0.2	0.1
fish	98 (96 hr LC 50)	2600 (6" water)	26.5	0.05
mammal	>20,000 (LD 50)	850 (short grass)	0.004	0.1

EEC calculated using a rate of 0.5 gal/ac (3.6 lbs ai/ac)
LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

Methoprene

Methoprene has moderate acute fish toxicity, slight acute avian toxicity, and practically no acute mammalian toxicity (USEPA 2000, and USFWS 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (USEPA 1991). This figure exceeds the estimated environmental concentration by a factor 10 (Table 1). Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (USEPA 1991). Up to 95 percent of the residue in fish was excreted within 14 days (USEPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Table 3) (Urban et al. 1986). In field studies no detectable adverse effects to breeding red-winged blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

Methoprene affects terrestrial and aquatic invertebrates and is used to control fleas, sciarid flies in mushroom houses; cigarette beetles and tobacco moths in stored tobacco; Pharaoh's ants; leaf miners in glasshouses; and midges (Tomlin 1994). Methoprene may also be fed to livestock in a premix food supplement for control of hornfly (WHO undated). Methoprene is

Table 3. Risk assessment for Methoprene.

Animal	Acute Tox (ppm)	EEC (ppm)	RQ	LOC (ES)
Bird	> 4640 (8 D LC 50)	3.0 (short grass)	0.0006	0.1
Fish	0.4 (96 hr LC 50)	0.01 (6 inches)	0.025	0.05
Mammal	> 34,000 (LD 50)	3.0 (short grass)	0.00001	0.1

EEC calculated using a rate of 0.013 lbs ai/ac (1.0 fluid oz/ac Altosid 20 % methoprene)
LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

highly toxic to aquatic invertebrates with a 48 hour EC50 (the concentration of a compound where 50 percent of its effect is observed) of 0.89 ppm for *Daphnia magna* (USEPA 1991). Laboratory studies show that methoprene is acutely toxic to chironomids, cladocerans, and some decapods (Horst and Walker 1999, Celestial and McKenney 1994, McKenney and Celestial 1996, Chu et al. 1997). In field studies, significant declines of aquatic invertebrate, mollusk and crustacean populations have been directly correlated to methoprene treatments for mosquito control (Breaud et al. 1977, Miura and Takahashi 1973, Niemi et al. 1999, and Hershey et al. 1998).

Methoprene has a ten day half life in soil, a photolysis half life of ten hours, and solubility in water is 2 ppm (Zoecon 2000). Degradation in aqueous systems is caused by microbial activity and photolysis (USEPA 1991). Degradation rates are roughly equal in freshwater and saltwater systems and are positively correlated to temperature (USEPA 1991).

Adulticides

There are only two general classes of mosquito adulticides, organophosphates and pyrethroids. The pyrethroids include both natural products called pyrethrins and synthetic molecules that mimic the natural pyrethrins, such as permethrin, resmethrin, and sumithrin. One organophosphate, Trumpet (Naled), is approved for use at the Refuge in the past but not applied to date. The two pyrethroid products approved for use at the Refuge, Pyrenone 25-5 and Pyrocide 7336 are both synthetic pyrethrins.

In general, pyrethroids have lower toxicity to terrestrial vertebrates than organophosphates. Although not toxic to birds and mammals, pyrethroids are very toxic to fish and aquatic invertebrates (Anderson 1989, Siegfried 1993, Milam et al. 2000). The actual toxicity of pyrethroids in aquatic habitats, however, is less than may be anticipated because of the propensity of these pesticides to adsorb organic particles in water (Hill et al. 1994). Pyrethrins are toxic to all invertebrates, but the method of application via ultra-low volume atomizer limits toxicity and contact with non-targets. To minimize pesticide drift, applications would take place during the evening hours, when wind speeds are reduced and temperatures decreased; this is also the period when mosquito activity is the greatest. Naled is a fast acting, nonsystemic contact and stomach organophosphate insecticide used to control aphids, mites, flies, and mosquitoes. Naled is highly to moderately toxic via the oral route. It is moderately toxic through skin exposure, may cause skin rashes and skin sensitization and may be corrosive to the skin and eyes. Naled is highly to moderately toxic to birds. The reported acute oral LD50 (lethal dose 50, the dose of a substance which is fatal to 50% of the test animals) for naled is 52 mg/kg in mallard ducks, 65 mg/kg in sharp-tailed grouse, 36-50 mg/kg in Canadian geese, 120 mg/kg in ring-neck pheasants. Naled is highly to moderately toxic to fish and may be very highly toxic to aquatic invertebrate species (ETN 1996). However, Trumpet (Naled) is practically nonpersistent in the environment, with reported field half-lives of less than 1 day. It is not strongly bound to soils and is rapidly broken down if wet. Soil microorganisms break down most of the naled in the soil. It therefore should not present a hazard to groundwater (ETN 1996).

Threatened and Endangered Species

The Refuge provides potential habitat for the following federally-listed species: giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole, and vernal pool fairy shrimp. Potential impacts to these species from mosquito control activities were addressed in a number of previous Intra-Service Section 7 Consultations conducted with the Sacramento Fish and Wildlife Office (SFWO):

March 27, 1995: The SFWO concurred with the determination that use of the bacterium *Bacillus thuringiensis israelensis* (Bti) and Altocid® (methoprene) for mosquito control at Stone Lakes NWR is not likely to adversely affect the vernal pool fairy shrimp, vernal pool tadpole shrimp, giant garter snake, valley elderberry longhorn beetle, Sacramento splittail, and delta smelt (SFWO file: 1-1-95-I-0680).

January 9, 1997: The SFWO concurred with the determination that the use of the bacterium *Bacillus sphaericus* for mosquito control, is not likely to adversely affect the vernal pool fairy shrimp, vernal pool tadpole shrimp, giant garter snake, valley elderberry longhorn beetle, delta smelt, or Sacramento splittail at the Stone Lakes NWR (SFWO file: 1-1-96-I-0639).

January 31, 2001: The SFWO concurred that pest management activities at the Refuge are not likely to jeopardize the giant garter snake, valley elderberry longhorn beetle, vernal pool tadpole shrimp, or vernal pool fairy shrimp. (SFWO file:1-1-00-F-0162).

Giant Garter Snake (Thamnophis gigas)

Mosquito control activities in giant garter snake habitat may affect giant garter snakes by harassment or injury from vehicle use. The District will only operate vehicles in existing roads; therefore, harassment or injury from vehicle use would occur only if snakes are in the roadway. Regarding the effects of the proposed pesticides, a Fish and Wildlife Service-sponsored study indicated that the short-term effects of adulticides approved for mosquito control on the Sacramento NWRC did not significantly reduce abundance or biomass of the snake's prey items, macro-invertebrates and fish, in treated wetlands (Lawler et al. 1997). However, no information is available on the toxicity of the proposed pesticides directly to the giant garter snake. Without further information, it must be assumed that exposure of giant garter snakes to these chemicals could result in direct impacts, such as loss or sublethal effects to individual animals. Adverse effects to the giant garter snake from mosquito control activities will therefore be minimized by avoiding any wetland habitat suitable for giant garter while applying chemical treatments for control of mosquitoes. The application of adulticides by dispersal vehicles will be planned to fog downwind of and outside a buffer of 300 feet away from permanent emergent wetlands.

Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)

Adverse effects on the valley elderberry longhorn beetle are not likely since the main mosquito abatement period (June-September) does not coincide with the period of adult beetle emergence (late April through mid-May or early June). Also, the riparian corridors that house the valley elderberry longhorn beetle, generally do not require treatment with chemical control agents. If control measures are needed in these areas, some granular applications of Bti or Altocid (Methoprene) may be used during February or March when adult beetles are not present.

Vernal Pools

The growth regulator Methoprene (Altosid or A.L.L) can have deleterious effects on vernal pool shrimp by delaying the development of adult shrimp and thus the number of eggs laid before the pools dry up. Because of the effects of Methoprene on fairy shrimp and a lack of information on how long the agent remains in the soil, use of the larvicide methoprene within

vernal pools or swales at any time, in either wet or dry conditions, is prohibited (USFWS 2001).

The majority of vernal pools and seasonal swales will be dry during the main pesticide application period (June-October). In general, naturally functioning vernal pool habitats are not significant mosquito-producing habitat and should not require chemical treatments for control of mosquito larvae. A study of vernal pools in Sacramento County suggested that when mosquito larvae were present in the pools, productivity was limited to a narrow time period just prior to drying in late spring. Therefore, vernal pools do not contribute at all to mosquito productivity in winter and early spring. In the event that the use of a larvicide does become necessary in the vicinity of vernal pools, Bti, which is relatively specific to mosquitoes and flies, will be the agent of choice.

The majority of the vernal pools at the Refuge occur on the Wetland Preserve property which became part of the Refuge under a conservation easement in 2004. During the spring of 2004, before the conservation easement went into effect, numerous vernal pools were treated with Bti. Relatively warm spring temperatures in 2004 likely contributed to elevated larval populations, but other factors may also be involved. The mosquito abatement district had increased larval monitoring in the area because the Wetland Preserve property is adjacent to a new housing development and WNV had recently arrived in Sacramento County. Many of the vernal pools in the Wetland Preserve property are man-made mitigation pools that may not be functioning as naturally occurring vernal pools would. A study of naturally occurring and constructed vernal pools conducted by the District showed that while natural vernal pools produced very few mosquitoes throughout most of the wet season and then produced a spike in numbers in late April, the constructed vernal pools produced significantly more mosquitoes throughout the wet season as well as a spike in numbers in April (Wright 1997). In addition, the data suggested that natural vernal pools may pose a greater threat of mosquito productivity when associated with constructed pools. For these reasons, the mosquito abatement district policy is to dip-sample constructed vernal pools and adjacent natural vernal pools. Mosquito abatement treatments near vernal pools will be limited to Bti to reduce effects on endangered vernal pool species. Future mosquito abatement activities in the Wetland Preserve property will be closely monitored by Refuge staff to avoid conflicts between wildlife habitat improvement goals and mosquito control goals.

Wetlands and Waterfowl

The Refuge was established to provide habitat for migratory birds, in particular waterfowl. The District will continue to minimize disturbance and non-target effects to wildlife by limiting mosquito abatement activities between October 15 and February 15 when the majority of migratory bird species arrive on the Refuge. However, since the District continues to treat in fall until temperatures have dropped sufficiently to reduce the abundance of mosquitoes, in warmer years there may well be a longer period of overlap between the arrival of migratory birds and continued mosquito abatement activities. In addition, if mosquito thresholds are exceeded, or the presence of WNV or other arboviruses are detected in or around the Refuge, then the District may need to extend mosquito surveillance and control into late fall.

In some years, most notably 2004, the District has applied Bti or planted mosquito fish as early as March when some migratory waterfowl may still be lingering before departing on their spring migration. However, Bti has not been found to be toxic to birds (USFWS 2001). In addition, it has been found that birds are not negatively affected by utilizing foods exposed to Bti or methoprene (Niemi et al. 1999). Although physico-chemico data and environmental fate data are limiting, *Bacillus* spp. are virtually non-toxic to mammals, birds and fish. Though methoprene has not been shown to pose a threat to birds from direct

exposure, it may affect insectivorous species by decreasing the invertebrate food source. However, during the last 8 years methoprene has not been applied prior to June, and was applied as late as October in only one instance. Thus, applications of methoprene have not directly or indirectly affected migratory birds utilizing the Refuge because migratory birds have not been present during mosquito abatement activities.

There is not likely to be much impact on geese and swans from pesticides because they are year round herbivores. Geese feed mainly on grasses and agricultural lands, while swans feed mainly on roots, tubers, stems, and leaves of submerged and emergent aquatic vegetation. In contrast, ducks are known to be opportunistic feeders on both plants and invertebrates, utilizing the most readily available food sources. Invertebrates, plants, and seeds compose the majority of their diet, varying with the season and the geographic location. A study in California's Sacramento Valley has shown that plant foods are dominant in fall diets of northern pintails, while invertebrate use increases in February and March (Miller 1987). Seeds of swamp timothy comprise the most important duck food in the summer-dry habitats of the San Joaquin Valley (Miller 1987). Waterfowl in general tend to feed on seeds when they reach their wintering areas, perhaps to regain energy lost during long flights (Heitmeyer 1988, Miller 1987). Thus any food chain impacts resulting from larvicide and adulticide treatments will have limited impacts to the mainly seed diet of newly arriving ducks. Their diet shifts to invertebrates after mosquito treatments are expected to be reduced in frequency, thereby allowing the invertebrate populations to recover.

Birds utilizing the Refuge during the summer months and early fall, when most of the mosquito abatement occurs, could have a greater risk of being affected by pesticide applications. These species include herons, egrets, white pelicans, mallards and wood ducks. The pesticides being applied at the Refuge have not been shown to be toxic to birds, but could potentially affect resident waterfowl indirectly by reducing invertebrate food sources. Shorebirds could also be of concern, since they feed on a wide variety of invertebrates all year, feeding which intensifies at the onset of spring migration. However, documentation of indirect food-chain effects have not come to light. Hanowski et al. (1997) studied 19 different bird species after collecting data on wetlands 2 years before treatment and 3 years after treatment of both Bti and methoprene applications and found no negative effects. Jensen et al. (1999) found that no decreases were detected in the biomass or abundance of aquatic invertebrates in seasonal wetlands from ultra-low volume applications of pyrethrin, permethrin, or malathion.

VII. Health Threat Determination

For the purpose of allowing the use of certain pesticides or bio-rational pesticides to control mosquitoes, a mosquito-borne public health emergency is defined as:

Actual or threatened, imminent outbreak of western equine encephalitis, St. Louis encephalitis, West Nile encephalitis, malaria, or other mosquito vector-borne public health disease. The presence of WEE, SLE, WNV or malaria viral titers or mosquito pool titers in the mosquito population or in sentinel chickens (in accordance with test protocols developed by the CDHS Environmental Management Branch, and the U.S. Department of Health and Human Services, Center for Disease Control) will confirm that a public health emergency exists or is imminent. This threshold will have been met when the mosquito abatement district notifies the Refuge manager of a laboratory test that is positive for any of the above viruses.

The recurring presence of arboviruses in the Central Valley since the 1940s has been well documented (Reeves 1987) such that the baseline health threat level at the Refuge is 2-3, depending on monitoring. Occurrences of WNV within Sacramento County in humans, domestic animals and wildlife are expected to increase in 2005 relative to 2004 (see Disease

History above) based on observed arboviral disease cycles. The health threat level for the Refuge is therefore 4-5 (see Table 4) for 2005 and may be elevated to 6-7 if an officially determined health emergency is declared due to WNV. Historically, the mosquito abatement response has been the same at threat levels 2-3 as in threat levels 4-5, that is, adulticides and pupacides have been approved for use by the Service based on the historical health threat rather than being reserved for use only when an existing health threat has been documented. As a result, mosquito larval control activities since 1994 have been largely limited to localized (less than five acres) applications of larvicides and until 2005, only three applications of adulticides.

Table 4. Example of Mosquito-Borne Disease Health Threat and Response Matrix

Current Conditions			Refuge Response
Health Threat Category[1]	**Refuge Mosquito Populations [2]**		
No documented existing or historical health threat/ emergency	No action threshold	1	Remove/manage artificial mosquito breeding sites such as tires, tanks, or similar debris/containers.
Documented historical health threat/emergency	Below action threshold	2	Response as in threat level 1, plus: allow compatible monitoring and disease surveillance. Consider compatible nonpesticide management options to reduce mosquito production.
	Above action threshold	3	Response as in threat level 2, plus: allow site-specific compatible larviciding of infested areas as determined by monitoring.
Documented existing health threat (specify multiple levels, if necessary; e.g., disease found in wildlife, disease found in mosquitoes, etc.)	Below action threshold	4	Response as in threat level 2, plus: increase monitoring and disease surveillance.
	Above action threshold	5	Response as in threat levels 3 and 4, plus: allow compatible site-specific larviciding, pupaciding, or adulticiding of infested areas as determined by monitoring.
Officially determined existing health emergency	Below action threshold	6	Maximize monitoring and disease surveillance.
	Above action threshold	7	Response as in threat level 6, plus: allow site-specific larviciding, pupaciding, and adulticiding of infested areas as determined by monitoring.

1 Health threat/emergency as determined by Federal and/or State/local public health authorities with jurisdiction inclusive of Refuge boundaries and/or neighboring public health authorities.

2 Action thresholds represent mosquito population levels that may require intervention measures. Thresholds will be developed in collaboration with Federal and/or State/local public health authorities and vector control districts. They must be species and life stage specific.

VIII. Stipulations and Reporting

1. Every attempt will be made to minimize mosquito production through wetland design, habitat (water level and vegetation) management techniques, mosquito fish or other non-chemical treatments, before larvicides or adulticides are applied. Among chemical treatments, adulticides will be considered a last resort.

2. In keeping with the MOU, the Refuge will provide the District with an annual summary of planned Refuge water management and with notification of timings of flood ups and irrigations.

3. As required under the MOU, the District will provide the Refuge Manager with an annual operating plan for anticipated mosquito monitoring and control activities that may be needed on the Refuge during the upcoming year. The plan will provide for Refuge access requirements, control thresholds, and proposed larvicides and adulticides.

4. Mosquito control will be authorized on an annual basis by a Special Use Permit (SUP) issued by the Refuge. SUP conditions will reflect any applicable restrictions required under approved Pesticide Use Proposals or Section 7 Consultations.

5. The Refuge will submit to the CNO Office all required Pesticide Use Proposals to maximize likelihood of PUP approval prior to onset of upcoming mosquito season.

6. The District will notify the Refuge manager as soon as possible when mosquito larval thresholds (see IPM Plan, Figure 5) are exceeded and ground treatments are warranted.

7. When adult thresholds are exceeded, and in the event of a planned adulticiding, the District will contact and personally coordinate with the Refuge Manager or Assistant Refuge Manager prior to conducting the treatments to ensure control efforts do not conflict with routine Refuge operations.

8. The District will continue to consider environmental conditions, including water temperature, density of mosquito larvae, and presence of mosquito predators, when determining mosquitoes on the Refuge pose a threat to public safety and whether treatments are required.

9. To minimize pesticide drift, dispersing vehicles will follow routes on existing roads set up to fog downwind or outside buffers of 300 feet from areas supporting listed or proposed special status species, including vernal pools.

10. All chemical applications will occur when wind speeds are between 2 and 8 mph.

11. Any applications of mosquito adulticides will occur outside a buffer of 300 from any permanent emergent wetlands.

12. Application of mosquito control measures is to be conducted in accordance with approved Pesticide Use Proposals.

13. Mosquito control will be authorized on an annual basis by a Special Use Permit (SUP) issued by the Refuge. SUP conditions will reflect any applicable restrictions required under approved Pesticide Use Proposals or Section 7 Consultations.

14. At the end of the season and as required under the MOU, the District will provide the Refuge Manager with an annual report summarizing mosquito control activities during the previous year.

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Personal Communications

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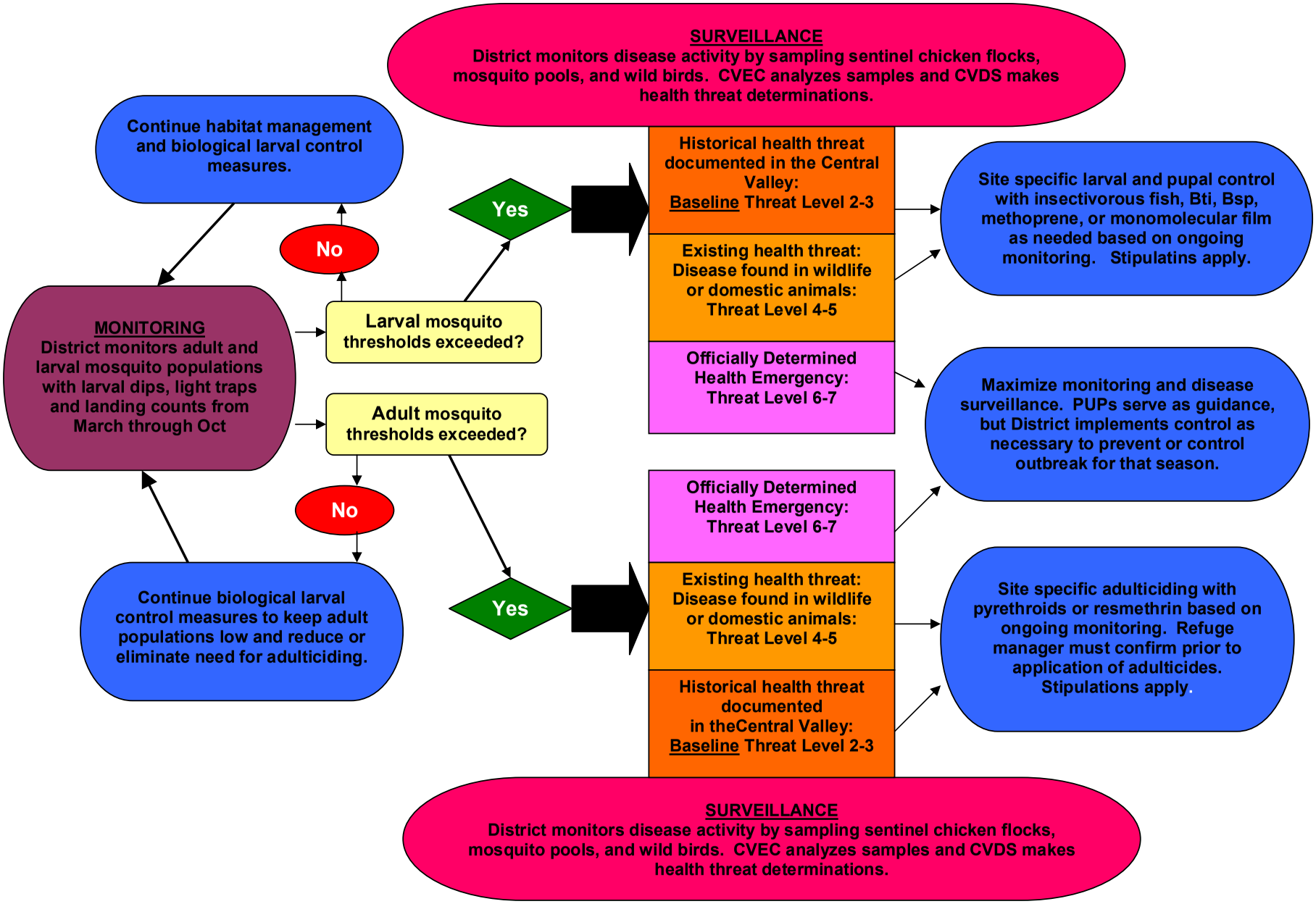
Figure 5. Mosquito Monitoring and Control Protocol



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