

American Kestrel (*Falco sparverius*)

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Fish and Wildlife Habitat Management Leaflet

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Ken Fernbach

General Information

The American kestrel is one of the most common and colorful birds of prey in North America. Because of its small size and colorful plumage, it can easily be mistaken for a songbird as it sits atop a utility pole or wire. However, once witnessed hovering over an open field in search of prey, the kestrel's predatory nature becomes apparent. A member of the falcon family, the American kestrel is closely related to the peregrine falcon and merlin. The bird is often referred to as the sparrow hawk because of its small size. Its scientific name, *Falco sparverius*, holds the Latin meaning, "falcon of the sparrows." Although its scientific name and the commonly used name "sparrow hawk" imply that the kestrel feeds exclusively on small birds, the majority of the kestrel's diet consists of insects and small mammals. As is the case with many beneficial predator species, the kestrel's value lies in the role it plays in

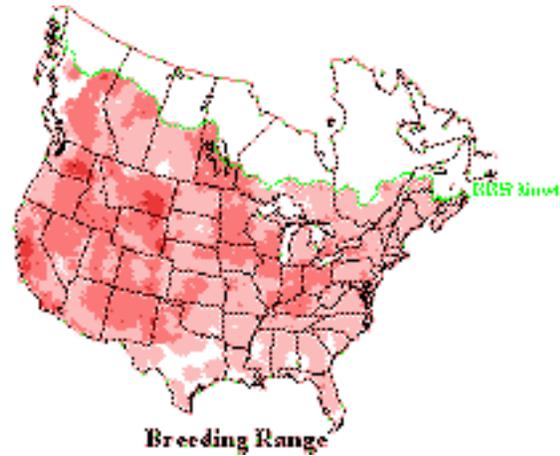
keeping insect and small rodent populations in check.

In the early and mid-1900s, American kestrel populations declined in many parts of North America as a result of the loss of nesting habitat in the form of tree and other natural cavities. A growing human population contributed to the loss of nesting habitat as fencerows and tree-lined field borders were removed to provide crop fields and make way for expanding urbanization. In recent years, the removal of dead standing trees, or snags, for firewood, and the continued clearing of fencerows and hedgerows has had a significant impact on the success of the American kestrel. A management practice that has helped to improve the kestrel's status is the placement of artificial nesting structures on road signs along highways and other areas of suitable kestrel habitat. Due in part to the provision of artificial nesting structures throughout North America, the American kestrel is once again a commonly seen bird of prey. The ongoing recovery of the American kestrel is an example of how sound wildlife management practices have been used to increase the survival success of an individual wildlife species.

This pamphlet is designed to serve as an introduction to the habitat requirements of the American kestrel and to assist land managers in the development of a comprehensive kestrel management plan. The success of any individual species management plan depends on targeting the specific needs of the desired species and analyzing the designated habitat area as a whole to ensure that all required habitat elements are present. This guide also provides monitoring guidelines to document success and to ensure that problems are addressed as they arise.

Range

The range of the American kestrel spans across nearly all of North America. Kestrels breed as far north as central and western Alaska, across northern Canada to Nova Scotia, and extend south throughout North America into central Mexico, Baja, and the Caribbean. Kestrels are local breeders in Central America and are widely distributed throughout South America as well. Most of the birds breeding in Canada and the northern United States migrate to the southern United States and Mexico in the winter.



The summer range of the kestrel is very similar to the bird's breeding range. Kestrels that summer in warmer regions remain as year-round residents.

Habitat Requirements

General

American kestrel habitat consists of open fields containing widely scattered trees, pastures adjacent to woodland borders, deserts, as well as rural, urban, and suburban settings consisting of buildings and other structures providing perching and nesting sites. Common foraging habitats used by kestrels include open grassy meadows and highway and power line rights-of-way. Foraging habitat is supplemented by nearby trees that can serve as perching or nesting sites. Perches in the forms of isolated trees and utility poles and wires are essential habitat components for the kestrel's hunting activities. Often, the lack of hunting perches is a limiting factor in local kestrel populations. Although American kestrel populations are on the rise, the largest threat to their future is the continued loss of nesting habitat. By protecting snags, and properly managing open areas, landowners can assist in the continued success of kestrels and other species that rely on similar habitat.

Food

The American kestrel's primary summer food consists of insects such as grasshoppers and crickets. Small mammals such as mice, rats, shrews, gophers, and young ground squirrels, and birds are sometimes eaten in summer as well. The absence of an abundant winter supply of insects in the northern reaches of the bird's winter range forces the kestrel to feed primarily on small mammals in the winter months. Other food items that are occasionally consumed by kestrels include frogs, small snakes, bats, and lizards. Kestrels will use perches, such as a branch or power line, to scout hunting areas. However, the bird typically feeds by gliding or hovering over an area before swooping to take its prey either on the wing or on the ground.

Important American kestrel food items. The following species are known to be important food items in the diet of American kestrels. Those species in bold print are of particular value for their usefulness as a winter food source.

Insects:

Grasshoppers, crickets, beetles, moths, and others

Small Mammals and Birds:

mice **rats** **shrews** **gophers** **ground squirrels** **small birds** frogs small snakes bats lizards

Cover – Nesting

The American kestrel is a cavity nesting species, but does not create its own nesting cavity. It relies heavily on the abandoned nesting cavities of woodpeckers, squirrels, and magpies. Common nesting sites include hollows in trees and cacti, holes in cliffs, crevices in barns, and building roofs, walls, and ledges. Nesting boxes are also readily accepted for nesting. Male kestrels typically will select cavities 15 to 30 feet above the ground in areas where abundant open space exists to provide an insect base on which to forage. The role of the nesting cavity remains important throughout nestling development, as young remain in the nest dependent upon parent kestrels for roughly 30 days before fledging. In areas where natural snags comprise the most common nesting habitat, optimal snag-to-acreage ratio is calculated for one acre of land. It is advised that on one acre of forested land, there should be one snag larger than 20 inches dbh (diameter at breast-height), four snags between 10 and 20 inches dbh, and two snags between 6 and 10 inches dbh. In areas managed for kestrels where snags or natural cavities are scarce, nest boxes can be placed to augment the availability of natural cavities.



Nest Box Design. -- Nest boxes should be constructed of a weather-resistant wood such as cedar. The wood can be painted or stained but only on the outside surface. The entrance hole should be 3 inches in diameter. Numerous nest box designs have been used with success; Fig. 1 provides one example. A good method of assisting fledglings in their climb from the nest to the entrance hole is to roughen up the inside wood surface under the hole with a chisel. It is recommended that the outside surface below the entrance hole be roughened as well. The bottom of the box should be lined with 2 to 3 inches of wood chips or shavings, straw, or pine straw. The lid or one side of the box should be removable or on a hinge to facilitate monitoring and cleaning. Three or four $\frac{1}{4}$ -inch drain holes should be drilled into the box bottom. Recessing the box floor $\frac{1}{2}$ -inch into the bottom edge of the walls will help protect the floor from weather rot. Ventilation and shade requirements are met by overhanging roofs and construction designs described in Fig. 1. All kestrel boxes affixed to poles should be fitted with a galvanized sheet metal predator guard (see Fig. 2). The predator guard should be placed on the pole 6 to 12 inches below the bottom of the box. Also, to help deter predation, an even coating of non-drying crankcase grease or carnauba wax can be applied to the pole from the ground to six inches below the box.

Cover – Winter

In areas where kestrels winter, habitat requirements differ very little from common nesting or summer cover types. Woodland edges, highway and power line rights-of-way, pastures, and farmlands where adequate ratios of snags exist with open grassy areas, provide adequate winter cover needs. In the bird's western range, cavities in cacti and holes in rock cliffs provide adequate roosting habitat. Nest boxes may provide some individuals with winter roosting sites as well. Due to the varying temperatures between the cooler, northern reaches and warmer, southern reaches of the kestrel's range, availability of common food sources may differ, but habitat requirements remain constant. Year-round availability of insects plays a key role in determining where kestrels winter.



Nest Box Placement. -- Kestrel nest boxes should be placed on a tree, post, or the side of a barn or outbuilding with the entrance hole 15 to 20 feet above the ground. Boxes placed on posts should be equipped with a predator guard as shown in Fig. 2. The box entrance should face southeast to avoid direct winds and to take advantage of the sun's rays. Open fields, pastures, hedgerows, and highway and power line rights-of-way comprised of or surrounded by at least one acre of space within 20 yards of a tree with dead limbs, a utility pole, or other perch make up the best habitat in which to place nest boxes. These habitat types in close proximity to creeks and wet areas have proven to be very productive for kestrels as well. Place boxes well away from buildings and other human habitations that may harbor starling populations. Also, placing boxes more than 50 yards from woodland edges will help reduce competition for boxes with squirrels. Open areas will provide food for hunting and adjacent trees, utility poles, and fence posts are used as plucking perches by the male kestrel to dismember prey before the female feeds it to the young. Perches are also used for preening, courting, and by fledglings when learning to fly. Individual nesting pairs require an adequate territory in which to nest and forage. Therefore, nest boxes should be placed at least one-half mile from one another. Boxes placed near or along roadsides should be placed with the entrance hole facing away from the road.

In agricultural areas, it is important that nest boxes be located a distance away from fields that are heavily treated with pesticides since the birds feed primarily on insects. Overall, one should attempt to accommodate the bird's natural nesting instincts and requirements while still allowing for routine monitoring during the nesting season. If predators such as raccoons or snakes discover an occupied nest box, they likely will continue to return for eggs or nestlings in the future. If such predation becomes a problem, relocating troubled nest boxes after a few seasons may be beneficial.

Water

Water requirements for the American kestrel are assumed to be met when the bird inhabits areas containing suitable nesting and wintering habitat. The kestrel's foraging behavior and the types of food eaten provide it with an adequate amount of water.

Interspersion of Habitat Components

In order for successful kestrel reproduction and survival to occur, all required habitat components must be available in relative proximity to one another. Because some kestrels migrate, and most are highly mobile during winter, the most critical aspect of habitat interspersion, or the mix of different habitat types, is the proximity of suitable foraging habitat to spring nesting habitat. The highest-quality nesting habitat is of little use if the nearest open foraging habitat is not within close proximity. Likewise, the best foraging habitat will not support nesting pairs if there are no available nest cavities. Ideal interspersion of American kestrel habitat components consists of a complex of open grassy fields, pastures, highway and power line rights-of-way, woodland edges, perches in the form of trees, shrubs, utility wires or telephone poles, and numerous natural or artificial nesting cavities throughout.

Minimum Habitat Area

Minimum habitat requirements become an issue only when two or more nesting pairs desire to nest within one general area. Because kestrels are active territorial hunters, nesting pairs often prefer to nest in cavities that are either separated by some distance or by a natural geographic feature, such as a large hill or wide valley. Pairs may nest in close proximity to one another when space and territoriality requirements are met. Nest boxes should be placed at least one-half mile apart and in locations surrounded by at least one acre of open space. Lands outside the immediate planning area should be considered when making the determination of minimum habitat area for kestrel reproduction.

Fig. 1. American kestrel nesting box design.

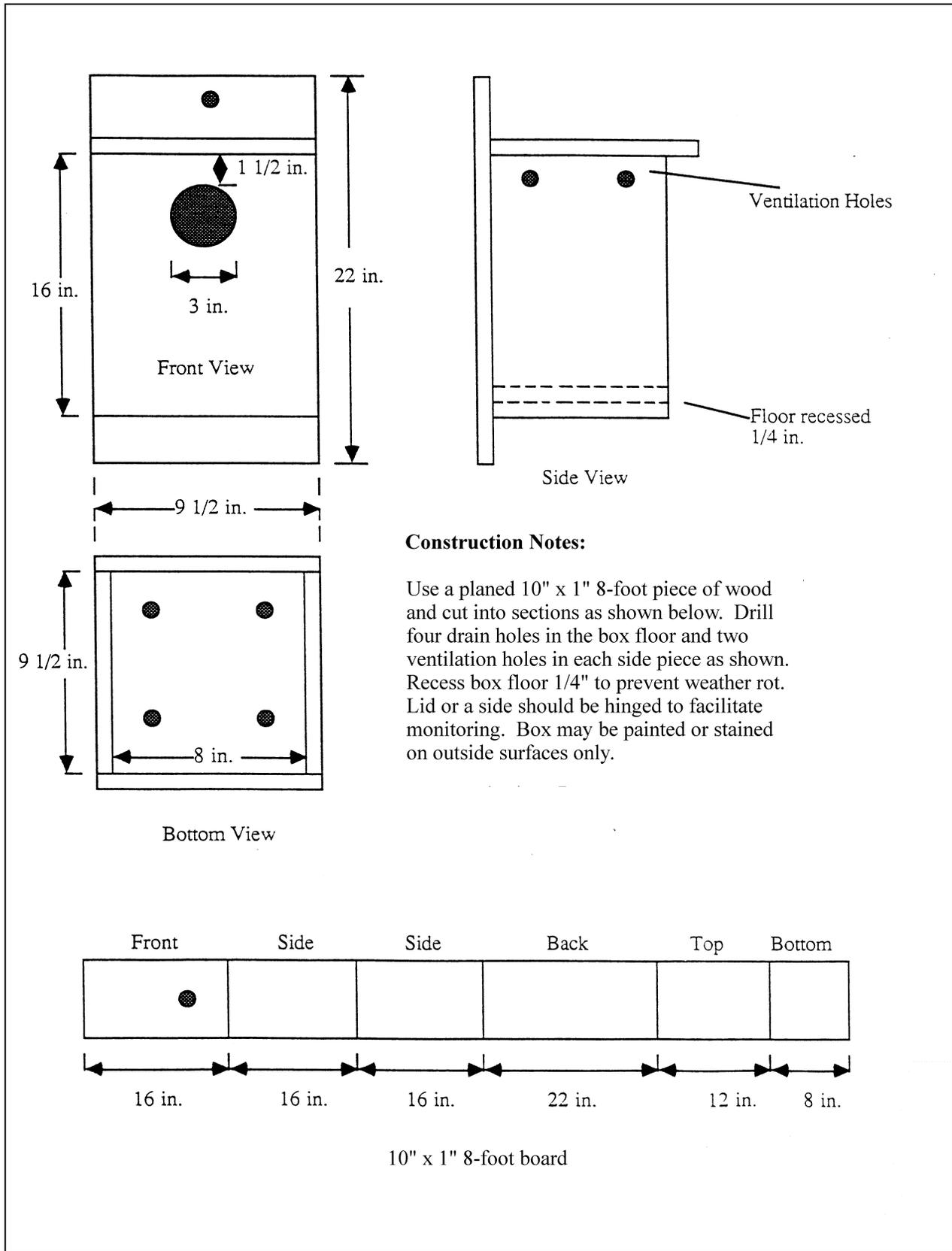


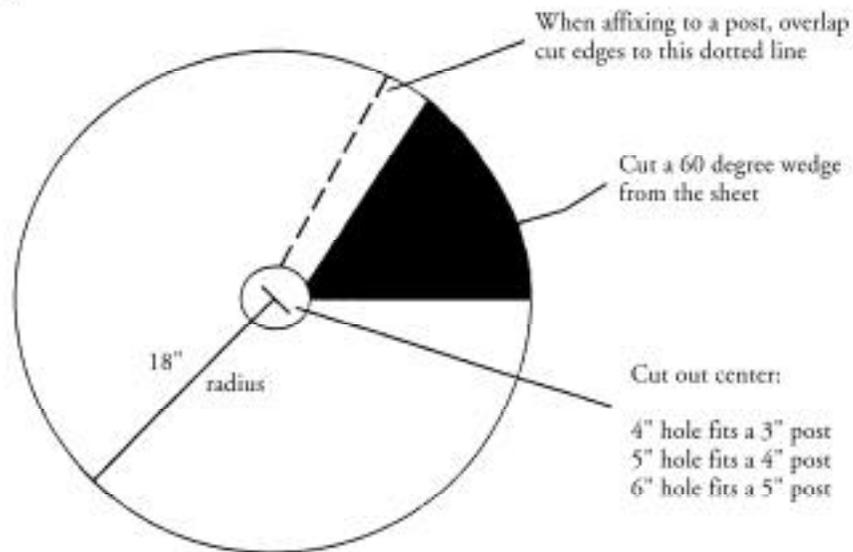
Fig. 2. Standard cone-shaped predator guard.

Below is a top view layout for cutting a predator guard from a 3 ft. x 3 ft. sheet of 26-gauge galvanized metal. The first cut is to remove a 60-degree wedge from the sheet. The center hole is then cut.

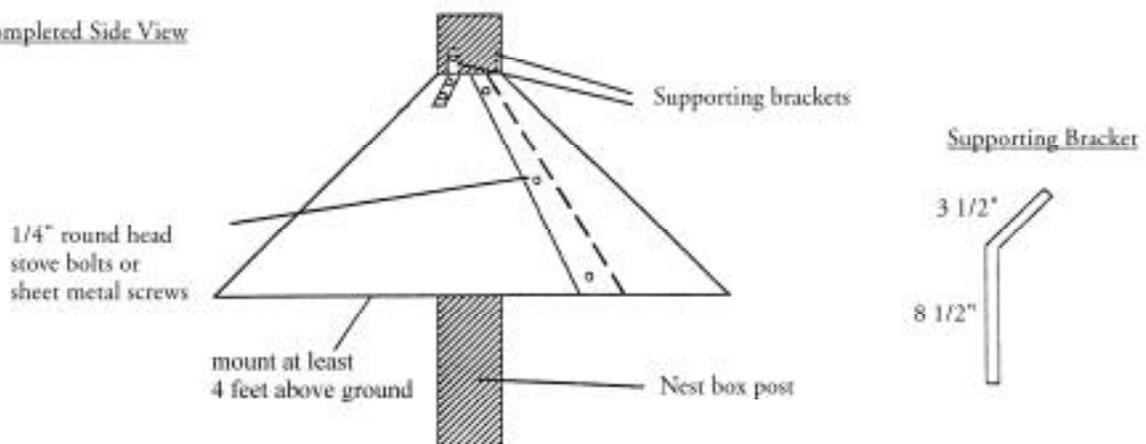
The side view shows a guard affixed to a nest box post. This is done by overlapping the edges of the 60-degree wedge to the shown dotted line. Bolts or screws are then used to form the sheet into a cone. Fasten the guard to the post with supporting brackets.

Note: 3 wooden mounting blocks can also be placed on the underside of the guard to fasten it to the post. Fasten the blocks to the guard and post with screws. The predator guard should be placed on the post so that the bottom of the guard is at least 4 feet from the ground.

Top View



Completed Side View



Exotic Species Control – Exotic species, specifically the European starling, compete with American kestrels for nesting cavities. Simple steps can be taken, however, to reduce nest box use by starlings. If starlings are found to be nesting in a box, remove and dispose of the nest and its contents. The actual trapping and elimination of the adult bird in the box is more effective than simply removing the nest. Trapping with inside-the-box traps or bait-type traps such as those made by Trio and Hav-a-hart is recommended. If relocation of trapped birds is preferred over disposal, the birds should be taken a distance of at least three miles from the trapping area and released in similar habitat. However, the significant drawback of this management technique is that it simply may move the problem birds from one location to another. If you are uncomfortable with removing the birds or nests, another option is to vigorously shake the eggs, or addle them, for 60 seconds and leave them in the nest so that the female will continue to expend reproductive energy without hatching success. This also prevents the starling from attempting to take over another nest box. Other native cavity-nesting birds, such as eastern screech owls and eastern bluebirds may use and are welcomed in nest boxes. Because they are federally protected, it is illegal to destroy them, their nests, or their eggs. Therefore, nest monitors must be certain of the bird species nesting in a box before control measures are implemented. Two aids, *Guide to Nests, Eggs, and Nestlings of North American Birds*, and *Birds' Nests* (in the Peterson Field Guide Series) are recommended (complete citations included in the reference section). **Note:** Box placement is the best means of controlling exotic species. Careful box placement will also reduce competition from squirrels. Placing boxes a good distance from buildings and human habitation and orienting them with a southern exposure will help prevent starlings from using kestrel boxes. Placing boxes in open grassy areas away from woodland edges will help to reduce over-use of boxes by non-target native bird species and squirrels.

American Kestrel Habitat Requirements Summary Table.

Habitat Component	Habitat Requirements
Food – Young	<ul style="list-style-type: none"> Insects - primarily grasshoppers.
Food – Adult	<ul style="list-style-type: none"> Insects - primarily grasshoppers and crickets. Mammals, birds, reptiles, and amphibians (mice, rats, shrews, gophers, ground squirrels, sparrow-size birds, frogs, small snakes, bats, lizards).
Nesting Cover	<ul style="list-style-type: none"> Natural tree cavities or nesting boxes in open fields, along woodland edges, pastures, hedgerows, and highway and power line rights-of-way within 20 yards of a tree with dead limbs, a utility pole, or other perch. Cavities in cacti, cliffs, crevices in barns, and building roofs, walls, and ledges.
Brood-Rearing Cover	<ul style="list-style-type: none"> Same requirements as nesting cover. Nestlings remain in the nest dependent upon parent kestrels for roughly 30 days before fledging.
Winter Cover	<ul style="list-style-type: none"> Woodland edges, highway and power line rights-of-way, pastures, and farmlands where adequate ratios of snags exist with open grassy areas that support small-mammal populations. Cavities in cacti and holes in rock cliffs.
Water	<ul style="list-style-type: none"> Water requirements for kestrels are met through daily food intake.
Interspersion	<ul style="list-style-type: none"> Prefer a complex of open grassy fields, pastures, and highway and power line rights-of-way, either mown or of low growth, woodland edges, widely scattered trees, snags, and perches in the form of trees, shrubs, utility wires or telephone poles.
Minimum Habitat Size	<ul style="list-style-type: none"> Adequate distance to allow for territoriality or the presence of a natural geographic feature, such as a large hill or wide valley, that allows for two or more nesting pairs in an area. Likewise, nest boxes should be placed a distance of at least one-half mile apart in locations surrounded by at least one acre of open space.

Limiting Factors

For planning purposes, use the inventory table of limiting factors on the next page to inventory the site to determine the availability of each of the basic habitat components, based on the above narrative habitat requirement descriptions. Habitat components that are absent or rated low are limiting habitat quality for American kestrels.

Inventory of Limiting Factors

Habitat Component	Availability/Quality			
	High	Medium	Low	Absent
Food				
Nesting cover				
Brood-rearing cover				
Winter cover (may not be applicable if kestrels do not winter in the area)				
Interspersion of habitat components				
Minimum habitat size				

Management Prescriptions

Management treatments should address the habitat components that are determined to be limiting American kestrel habitat potential. For planning purposes, select among the possible action items listed below to raise the quality or availability of each habitat component determined to be limiting. A list of programs that may provide financial or technical assistance to carry out specific management practices is given, when applicable.

Habitat Component	Management options for increasing habitat quality or availability	Assistance Programs
Food	• Maintain grassy and open field areas by conducting rotational mowing and managed grazing where appropriate.	WHIP, EQIP, PFW, CRP
	• Preserve snags and widely scattered trees and other perches in close proximity to open field areas.	N/A
Nesting and brood-rearing Cover	• Install nesting boxes in open field areas.	WHIP, PFW
	• Preserve large live and dead-standing hardwood and softwood trees conducive to natural cavities in and adjacent to open field areas.	N/A
	• Preserve snags, building structures, and cacti conducive to nesting cavities.	N/A
Winter cover	• Preserve snags and widely scattered trees and other perches in close proximity to open field areas.	N/A
	• Preserve large live and dead-standing hardwood and softwood trees conducive to natural cavities in and adjacent to open field areas.	N/A
	• Preserve snags, building structures, and cacti conducive to nesting cavities.	N/A
	• Leave nesting boxes in open field areas year-round.	WHIP, PFW
Interspersion & minimum habitat size	• Combine above prescriptions to increase interspersion of habitat components or amount of suitable kestrel habitat.	WHIP, CRP, PFW, EQIP

Landowners interested in making their individual efforts more valuable to the community can work with WHC and NRCS to involve school and scout groups and their families in habitat projects. A kestrel management project is an easy way to provide fun, hands-on learning opportunities, especially for children. If the land is corporate owned, encourage interested employees to become involved. Involve students or scouts in building and monitoring nest boxes. The educational benefits can greatly increase the value of your individual kestrel management project.

Nest Box Monitoring. -- Before nesting boxes are erected, a maintenance, monitoring, and data collection plan should be developed to maximize program success. Unmonitored boxes may be counter-productive by helping to increase populations of exotic competitor species such as European starling. It is essential to erect only as many boxes as can be properly monitored. To avoid discouraging nesting kestrels, boxes should not be visited more often than four or five times each year. Because the kestrel has such an expansive range throughout North America, the time period in which nesting activity begins in various regions differs. In southern, western, and other warm regions in which the kestrel is a year-round resident, eggs are typically laid by the first week of March. Colder, more northern reaches typically see eggs laid in mid to late April. The establishment of nesting territories generally begins three to four weeks prior to egg laying; therefore, the first visit to nest boxes should occur before this date. **First visits** should clear nest boxes completely of all materials, as well as make any necessary repairs to boxes. Two inches of wood chips or shavings should be placed in boxes at this time. Observation of nest boxes from a distance of 50 to 75 yards is necessary to determine if nesting activity is taking place. Observations should be made between mid-morning and late afternoon for 15 to 30 minutes, three to four times a week, from mid-March through late June depending on the region. Activity common to nesting kestrels consists of frequent entering and exiting of nest boxes by both the male and female bird. **Second visits** to nest boxes should occur 10 to 14 days after the male kestrel is seen bringing food into the nest box. Opening boxes before this time may prevent the female from laying her entire clutch of eggs or discourage her from using the box. Second visits should document the eggs, being careful not to unnecessarily disturb the nest. **Third visits** should be made about two weeks prior to the expected fledging date of the nestlings. Approximate fledging dates can be determined by adding 46-50 days to the estimated date that the last egg was laid. A count of nestlings in the box should be recorded. Monitors should use extreme caution when opening boxes at this time to prevent nestlings from prematurely exiting the box. Banding of nestlings should occur during the third visit if part of the nest box program. Banding activities should be done in cooperation with a bird expert and licensed bander. The **fourth visit** should occur one month after the nestlings have fledged to clean nest boxes of all nesting materials. Boxes should remain out during the winter to provide winter cover for kestrels, screech owls, and other resident birds. European starling nests should be removed and disposed of when found to be the sole contents of a box and no sign of kestrel use is apparent. Wildlife Habitat Council member organizations can enroll their monitoring program in WHC's Nest Monitoring Program, useful in WHC's Corporate Wildlife Habitat Certification Program. Enrollment can be accomplished by contacting the WHC Nest Monitoring Program Coordinator at (301) 588-8994.

Programs that provide technical and financial assistance to develop fish and wildlife habitat on private lands.

Program	Land Eligibility	Type of Assistance	Contact
Conservation Reserve Program (CRP)	Highly erodible land, wetland, and certain other lands with cropping history. Stream-side areas in pasture land	50% cost-share for establishing permanent cover and conservation practices, and annual rental payments for land enrolled in 10 to 15-year contracts. Additional financial incentives are available for some practices	NRCS or FSA State or County Office
Environmental Quality Incentives Program (EQIP)	Cropland, range, grazing land & other agricultural land in need of treatment	Up to 75% cost-share for conservation practices in accordance with 5 to 10-year contracts. Incentive payments for certain management practices	NRCS State or County Office
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/or wildlife habitat	Up to 100% financial and technical assistance to restore wildlife habitat under minimum 10-year cooperative agreements	Local office of the U.S. Fish and Wildlife Service
Waterways for Wildlife	Private land	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals	Wildlife Habitat Council (301-588-8994)
Wildlife at Work	Corporate land	Technical assistance on developing habitat projects into a program that will allow companies to involve employees and the community	Wildlife Habitat Council (301-588-8994)
Wildlife Habitat Incentives Program (WHIP)	High-priority fish and wildlife habitats	Up to 75% cost-share for conservation practices under 5 to 10-year contracts	NRCS State or County Office
State fish and wildlife agencies and private groups such as state Audubon societies, American Birding Association, Hawk Mountain Sanctuary, and others may have assistance programs or other useful tools in your state.			State or local contacts

Nest Box Data Sheet

Landowner, Company, or Site Name _____

Location _____

Year _____

Monitor _____

Box Number _____

	First Brood	Second Brood
Species	_____	_____
Eggs Laid	_____	_____
Young Hatched	_____	_____
Young Fledged	_____	_____
Hatch Date	_____	_____
Cause of Nest Failure	_____	_____

Notes/Observations:

Date _____

Year _____

Monitor _____

Box Number _____

	First Brood	Second Brood
Species	_____	_____
Eggs Laid	_____	_____
Young Hatched	_____	_____
Young Fledged	_____	_____
Hatch Date	_____	_____
Cause of Nest Failure	_____	_____

Notes/Observations:

Date _____

References

- Baicich, P. and C. Harrison. 1997. Guide to Nests, Eggs, and Nestlings of North American Birds. Academic Press and Harcourt Brace. 347 pp.
- Bookout, T.A., Editor. 1994. Research and Management Techniques for Wildlife and Habitats. Fifth ed. The Wildlife Society, Bethesda, MD. 740 pp.
- Brewer, R., G. McPeck, R. J. Adams, Jr. 1991. Breeding Birds of Michigan. Michigan State University Press. East Lansing, Michigan. 570 pp.
- Chambers, R. 1983. Integrating Timber and Wildlife Management. State University of New York College of Environmental Science and Forestry. Syracuse, New York. 150 pp.
- Ehrlich, P. R., D. Dobkin, and D. Wheye. 1988. The Birder's Handbook. Simon and Schuster, Inc., New York, New York. 780 pp.
- Heintzelman, D.S. 1964. Spring and summer sparrow hawk food habits. Wilson Bulletin. 76:323-330.
- Henderson, C.L. 1987. photograph. Landscaping for Wildlife. Minnesota Department of Natural Resources.
- Henderson, C. L. 1992. Woodworking for Wildlife. Minnesota Department of Natural Resources. St. Paul, Minnesota. 112 pp.
- Peterson, R. T. 1980. Eastern Birds. Houghton Mifflin Press, Boston, Mass. 377 pp.
- Rudolph, S.G. 1982. Foraging strategies of American kestrels during breeding. Ecology. 63:1268-1276.
- Sauer, J. R., J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn. 1997. The North American Breeding Bird Survey Results and Analysis. Version 96.4. Patuxent Wildlife Research Center, Laurel, MD.
- Terres, J. K. 1991. The Audubon Society Encyclopedia of North American Birds. Wings Books, New York. 1110 pp.

NRCS

Wildlife Habitat Management Institute

100 Webster Circle, Suite 3
Madison, MS 39110
(601) 965-5886

In cooperation with partners, the mission of the Wildlife Habitat Management Institute is to develop and disseminate scientifically based technical materials that will assist NRCS field staffs and others to promote conservation stewardship of fish and wildlife and deliver sound habitat management principles and practices to America's land users.

Wildlife

Habitat Council

1010 Wayne Avenue, Suite 920
Silver Spring, MD 20910
(301) 588-8994

The Wildlife Habitat Council's mission is to increase the amount of quality wildlife habitat on corporate, private, and public land. WHC engages corporations, public agencies, and private, non-profit organizations on a voluntary basis as one team for the recovery, development, and preservation of wildlife habitat worldwide.



Peer reviewed by:

Hawk Mountain Sanctuary
1700 Hawk Mountain Road
Kempton, PA 19529
(610) 756-6961
fax: (610) 756-4468
www.hawkmountain.org

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