Chapter D6: Habitat Based Analysis

INTRODUCTION

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Aquatic species without primary or direct uses account for the majority of losses at cooling water intake structures (CWIS). These species are not, however, without value to society. It is important to consider the non-use benefits to the human population produced by the increased number of these fish under the final section 316(b) rulemaking.

An alternative way to consider impingement and entrainment (I&E) losses is to value the habitat necessary to replace the lost organisms. The value of fish habitat can then provide an indirect basis for valuing the fish that are supported by the habitat. Existing wetland valuation studies found that members of the general public are aware of the fish production services provided by eelgrass (submerged aquatic vegetation, SAV) and wetlands, and that they express support for steps that include increasing SAV and wetland areas to restore reduced fish and shellfish populations (Opaluch et al., 1995, 1998; Mazzotta, 1996).

EPA explored this approach for the Mid-Atlantic region. However, EPA did not include the results of this approach in the benefit analysis because of certain limitations and uncertainties regarding the application of this methodology to the national level. These limitations and uncertainties are discussed in Chapter A15. Thus, this chapter outlines the approach explored by EPA, but does not present benefit estimates.

The approach discussed here uses values that survey respondents indicated for preservation/restoration of habitat to evaluate losses of fishery resources in the Mid-Atlantic region. This analysis is not intended to value directly benefits provided by the lost fish, but to provide another perspective on the I&E losses by looking at values of habitat necessary to replace them. The method first estimates the quantity of wetland and eelgrass habitat required to replace fish and shellfish lost to I&E, and then assesses respondents' values for these habitats. These data would then be combined to yield an estimate of household values for improvements in fish and shellfish habitat, which provides an indirect estimate of the benefits of reducing or eliminating I&E. However, EPA does not present benefit estimates.

This benefit transfer approach involves four general steps, described in detail in Chapter A15:

1. Estimate the amount of restored wetlands needed to produce organisms at a level necessary to offset I&E losses for the subset of species for which potential production information is available.
2. Develop willingness-to-pay (WTP) values for fish production services of wetlands ecosystems.
3. Estimate the total value of baseline I&E losses by multiplying the WTP values for fish services of restored wetlands by the number of acres needed to offset I&E losses.
4. Estimate the total benefits of the final section 316(b) rule, in terms of the value of decreased I&E losses, by multiplying the WTP values for fish and shellfish services of restored habitat by the number of acres of each habitat type needed to offset decreased I&E losses.

The rest of this chapter describes EPA's exploratory application of this method to the Mid-Atlantic region.

D6-1 Data Summary

To estimate public WTP, EPA used information from two studies of public values for wetlands: a study of the Peconic Estuary, located on the East End of Long Island, New York (Johnston et al., 2001a, 2001b; Opaluch et al., 1995, 1998; Mazzotta, 1996); and a stated preference study from Narragansett Bay, Rhode Island (Johnston et al., 2002). These studies are discussed in detail in Chapter A15.

D6-2 Benefit Transfer for the Mid-Atlantic Region

D6-2.1 Estimating the Amount of Habitat Needed to Offset Losses for Specific Species

For the Mid-Atlantic region, the only data available to estimate habitat requirements is an estimate of wetland acreage developed by the Public Service Electric and Gas Company (PSEG) and the New Jersey Department of Environmental Protection (NJDEP) for Salem's 1999 Permit Renewal Application (PSEG, 1999, Appendix G; NJDEP, 2000). The scaling method involved estimating wetland production using an aggregated food chain model and then relating production directly to the estimated biomass of fish lost at Salem (PSEG, 1999, Appendix G; NJDEP, 2000). The food chain model estimated the production of fish biomass per acre based on the biological conversion of wetland plant productivity through the food chain to I&E fish species. The amount of acreage required to offset I&E losses was based primarily on estimates for bay anchovy (*Anchoa mitchilli*), the species requiring the maximum acreage (NJDEP, 2000). PSEG and NJDEP estimated that approximately 7,400 acres of restored tidal wetlands are required to offset I&E of fish species at the Salem facility (NJDEP, 2000).

D6-2.2 Developing WTP Values for Fish Production Services Provided by Wetlands

Because coastal wetlands provide a number of services (e.g., habitat, water purification, storm buffering, and aesthetics), EPA attempted to separate values for fish habitat from values for other wetland services. Given survey data available from the Peconic Study, however, there is no direct means to estimate the proportion of total wetland value associated with fish habitat services alone. EPA therefore used the stated preference study from Narragansett Bay, Rhode Island, described in detail in Chapter A15, to adjust wetland values to reflect fish habitat services (Johnston et al., 2002). Based on the Agency's calculations, 25.64 percent of total wetland restoration value is attributable to gains in fish habitat services, given representative, mean values for other wetland services. Therefore, values per acre of wetlands were multiplied by 25.64 percent to estimate the value per acre attributable to fish habitat services.

Chapter C6 provides estimates of value per acre for fish habitat services of wetlands and eelgrass.

D6-2.3 Applicability of Study Area to Policy Area

In the Peconic study, corrections were made to WTP values to account for differences in demographics between survey respondents and the general population of the East End of Long Island. EPA compared demographics of the affected population for one Mid-Atlantic facility — the Salem Station — to demographics of the East End of Long Island. Demographics of the affected population in the Salem region (New Castle County, DE, and Salem County, NJ) are quite similar to those of the general population of the East End. Table D6-1 compares survey respondent demographics to residents of the East End and residents of the Salem region, based on education and income categories used to estimate WTP. The Salem region has very similar education levels, and slightly lower income levels, on average, than the Peconic region. While values presented in the analysis were adjusted to the Peconic levels, they could be easily re-adjusted to reflect Salem levels. However, based on the small differences in demographics between the regions, the effect is likely to be negligible.

Table D6-1: Comparison of the Demographics of the Salem Area with the Peconic Area

Population	% of Population, by Highest Level Educational Achievement Attained				% of Population, by Household Income (in 2000$)			
	Did Not Complete High School	High School	Some College	College Graduate	< $25,000	$25,000 - $49,999	$50,000 - $149,999	> $150,000
Population in abutting counties (Salem)[a]	15%	31%	19%	35%	21%	27%	47%	5%
Population in 32.4 mile radius (Salem)[b]	16%	32%	19%	33%	21%	27%	46%	6%
Population in Peconic region[c]	14%	31%	19%	35%	15%	21%	54%	9%

[a] Includes populations in the following counties: New Castle (DE); and Salem (NJ).
[b] Includes populations in the following counties: New Castle and Kent (DE); Atlantic, Cumberland, Gloucester, and Salem (NJ); Caroline, Cecil, Harford, Kent, and Queen Anne's (MD); and Chester and Delaware (PA).
[c] Includes population in Suffolk County (NY).

Source: U.S. Census Bureau, 2000.

D6-2.4 Determining the Affected Population

Evaluating the total value per acre of wetlands for the coastal population of the region requires a definition of the geographical extent of the affected population. The Peconic study defined the affected population as the total number of households in the towns bordering the Peconic Estuary. Similarly, as described in Chapter A15, EPA defines the affected population as households residing in the counties that abut the affected water bodies. These households are likely to value gains of fish in the affected water body, due to their very close proximity to the affected resource. As discussed further in Chapter A15, households in counties that do not directly abut the affected water body will also likely value the water body's resources.

D6-2.5 Habitat Values per Acre for the Affected Population

The total value per acre for the affected population is calculated by multiplying the value per acre per household by the total number of affected households.

D6-2.6 Estimating the Value of Habitat Needed to Offset I&E Losses for the Region

Due to limitations and uncertainties that make this valuation approach difficult to implement on a regional scale, EPA does not present aggregate values for I&E losses. These values would be calculated by multiplying the total number of acres of each habitat required to offset losses by the value per acre for the affected population.

D6-3 Limitations and Uncertainty

A number of issues are common to all benefit transfers. Benefit transfer involves adapting research conducted for another purpose in the available literature to address the policy questions at hand. Because benefits analysis of environmental regulations rarely affords enough time to develop original stated preference surveys that are specific to the policy effects, benefit transfer is often the only option to inform a policy decision. Specific issues associated with this approach are discussed in Chapter A15.