

TABLE X-43.—EXAMPLES OF STUDIES THAT PROVIDE INFORMATION ABOUT USE AND NONUSE VALUES—Continued

Author	Year	Title	Source
Sanders <i>et al</i> .....	1990 .....	Toward Empirical Estimation of the Total Value of Protecting Rivers.	Water Resources Research. Vol. 26, No. 7. pp. 1345–1357.
Sutherland & Walsh	1985 .....	Effect of Distance on the Preservation Value of Water Quality.	Land Economics. Vol. 61, No. 3. pp. 282–291.
Walsh <i>et al</i> .....	1978 .....	Option Values, Preservation Values and Recreational Benefits of Improved Water Quality: a Case Study of the South Platte River Basin, Colorado.	EPA-600/5-78-001, Socioeconomic Environmental Studies Series, Office of Research and Development, U.S. Environmental Protection, Research Triangle Park, NC.
Welle .....	1986 .....	Potential Economic Impacts of Acid Deposition: A Contingent Valuation Study of Minnesota.	Dissertation, University of Wisconsin-Madison.
Whitehead & Groothuis.	1992 .....	Economic Benefits of Improved Water Quality: a case study of North Carolina's Tar-Pamlico River.	Rivers. Vol. 3. pp. 170–178.
Whitehead <i>et al</i> .....	1995 .....	Assessing the Validity and Reliability of Contingent Values: A Comparison of On-Site Users, Off-Site Users, and Non-users.	Journal of Environmental Economics and Management. Vol. 29. pp. 238–251.

The Agency is considering applying the results of this type of review and analysis to estimate nonuse value for aquatic resources potentially affected by impingement and entrainment for the final rule analysis, and recognizes that this approach requires careful accounting of factors that are likely to affect nonuse values of aquatic resources such as the geographic scale of environmental improvements, regional or national importance of the affected resources, and the magnitude of environmental quality changes. The Agency seeks comment on this general approach as well as the applicability and feasibility of estimating nonuse values that are based on (1) a percent or fraction of use values per household (see Section X B 4 of this preamble for summary of methods for assessing recreational use values) and/or (2) specific user and nonuser populations for this rule. The agency also solicits feedback about the studies reviewed by EPA as well as other studies that might be suitable.

#### b. Meta Analysis

In addition to simply reviewing available information about the relative magnitudes of nonuse and use values, EPA is also considering regression-based meta-analysis of nonuse WTP for water resources. Depending on the suitability of available data, a meta-analysis can provide information on the relative influence of various study, economic, and natural resource characteristics on nonuse willingness to pay. Economic literature characterize meta analysis as a rigorous alternative to the more casual, narrative discussion of research studies which typify many attempts to summarize available information about environmental values. The primary advantage of a regression-based approach is that it may account for differences among study

sites that may contribute to changes in nonuse values, to the extent permitted by available data. The following discussion briefly summarizes EPA's approach to this analysis. DCN 5-1011 provides further detail.

The dependent variable in the regression-based meta-analysis may be either the estimated nonuse value or the total value (including use and nonuse value) of aquatic habitat improvements. The total value can be modeled as a function of explanatory variables that include (1) core economic variables and (2) study design effects variables. The core economic variables are used to characterize specifics of the resource(s) valued (*e.g.* whether they are estuarine or freshwater); the geographic scale of resource improvements (*e.g.*, single water body versus multiple water bodies); the estimated use values for environmental quality improvement, quantitative or categorical measures of environmental quality improvements, and survey respondents' characteristics such as mean income of survey respondents. Study design effects characterize the year in which a study was conducted, the elicitation format of the survey (*e.g.*, telephone and mail); the elicitation method (*e.g.*, open ended WTP method). DCN 5-1011 provides information on key variables available from the 18 studies reviewed by EPA.

EPA also notes potential limitations of this approach. Limitations of the regression analysis approach specifically stem from the number of studies that meet criteria for inclusion, the number of variables that could be included in the regression analysis (which depends on the number of and information available from the original studies), as well as degrees of freedom and statistical significance. For example, study differences often prevent the use of a single measure of the degree of environmental quality

improvements. Prior meta-analyses of this type, including Woodward and Wui (2000) and Poe *et al.* (2001), lack a continuous and quantified measure of environmental quality improvement. The use of other economic variables that might be desirable from a theoretical perspective (*e.g.*, information on substitute goods) may complicate extraction of suitable data from the underlying studies. EPA also recognizes that clear and objective criteria are needed to determine which studies are suitable for inclusion in meta analysis; criteria should acknowledge issues related to potential bias associated with stated preference studies, and steps that the researchers should take to minimize bias, as noted in Section X B 1 of this preamble. One key challenge of both of the approaches discussed in this section is to determine the applicability of study results to the policy case of interest (*i.e.*, fish impacts due to impingement and entrainment in this rule) because of significant variations in study objectives and methodologies. The use (and interpretation) of the value estimates to predict WTP in specific cases will follow the methodologies from the benefits transfer literature (*e.g.*, Vandenberg *et al.* 2001; Desvousges *et al.*, 1998).

EPA seeks comments on appropriateness of the meta-analysis approach for calculating nonuse values for aquatic habitat improvements associated with reduced impingement and entrainment in this rule.

#### F. Regional-Level Benefit Cost Analysis

This section presents EPA's estimates of the total monetary value of the baseline impingement and entrainment losses at cooling water intake structures located in the North Atlantic and Northern California study regions. A comprehensive estimate of the value of the resource should include both use