

analysis of human health benefits are presented in section IX.B.5. Additional details on methodology and the uncertainties and limitations of EPA's analysis of reduced human health risk from the final effluent guidelines are presented in Chapter 13 and 14 of the EEBA report.

The case study analysis of recreational benefits combines water quality modeling with a random utility model (RUM) to assess how changes in water quality from the regulation will affect consumers' valuation of water resources. The RUM analysis addresses a wide range of pollutant types and effects, including water quality measures not often addressed in past recreational benefits studies. In particular, the model supports a more complete analysis of recreational benefits from reductions in nutrients and toxic pollutants (*i.e.*, priority pollutants and nonconventional pollutants with toxic effects).

EPA subjected this study to a formal peer review by experts in the natural resource valuation field. The peer review concluded that EPA had done a competent job, especially given the available data. As requested by the Agency, peer reviewers provided suggestions for further improvements in the analysis. Since the proposed rule analysis, the Agency made changes to the Ohio model and conducted additional sensitivity analyses suggested by the reviewers. The peer review report and EPA's response to peer reviewers' comments, along with the revised model, are in the docket for the rule.

2. Benefits for Ohio Case Study

The use of an original RUM in this case study allows the Agency to address limitations inherent in benefits transfer used in the analysis of recreational benefits at the national level. The use of benefits transfer often requires additional assumptions because water quality changes evaluated in the available recreation demand studies are only roughly comparable with the water quality measures evaluated for a particular rule. The RUM model estimates the effects of the specific water quality characteristics analyzed for the final MP&M regulation, such as presence of AWQC exceedances and concentrations of the nonconventional pollutant Total Kjeldahl Nitrogen (TKN). EPA estimates that this direct link between the water quality characteristics analyzed for the rule and the characteristics valued in the RUM analysis reduces uncertainty in benefit estimates and makes the analysis of recreational benefits more robust.

The final MP&M regulation affects a broad range of pollutants, some of which are toxic to human and aquatic life but are not directly observable (*i.e.*, priority and non-conventional pollutants). These unobservable toxic pollutants may degrade aquatic habitats, decrease the size and abundance of fish and other aquatic species, increase fish deformities, and change watershed species composition. Changes in toxic pollutant concentrations may therefore affect recreationists' valuation of water resources, even if consumers are unaware of changes in ambient pollutant concentrations.

The study used data from the National Demand Survey for Water-Based Recreation (NDS), conducted by U.S. EPA and the National Forest Service, to examine the effects of in-stream pollutant concentrations on consumers' decisions to visit a particular water body. The analysis estimated baseline and post-compliance water quality at recreation sites actually visited by the surveyed consumers and at all other sites within the consumers' choice set, visited or not. The RUM analysis of consumer behavior then estimated the effect of ambient water quality and other site characteristics on the total number of trips taken for different water-based recreation activities and the allocation of these trips among particular recreational sites. The RUM analysis is a travel cost model, in which the cost to travel to a particular recreational site represents the "price" of a visit.

EPA modeled two consumer decisions: (1) How many water-based recreational trips to take during the recreational season (the trip participation model); and (2) which recreation site to choose (the site choice model). Combining the trip frequency model's prediction of trips under the baseline and post-compliance scenarios and the site choice model's per-trip welfare measure provides a measure of total welfare. EPA calculated each individual's seasonal welfare gain for each recreation activity from post-compliance water quality changes, and then used Census data to aggregate the estimated welfare change to the State level. The sum of estimated welfare changes over the four recreation activities yielded estimates of total welfare gain.

EPA estimated other components of benefits in Ohio using similar methodologies to those used for the national-level analysis. In addition to the RUM study of recreational benefits, other analytical improvements included the following: (1) Use of more detailed data on MP&M facilities, obtained from the 1,600 additional surveys; (2) use of

data on non-MP&M discharges to estimate current baseline conditions in the State; and (3) use of a first-order decay model to estimate in-stream concentrations in the Ohio water bodies in the baseline and post-compliance.

Appendix H of the EEBA Report describes the water quality model used in this analysis and the approach and data sources used to estimate total pollutant loadings from all industrial and municipal sources to Ohio's water bodies. The Agency has concluded that the added level of detail results in more robust benefit estimates.

Summing the monetary values over all benefit categories yields total monetized benefits of \$930,400 (2001\$) annually for the final rule, as shown in Table IX-7. Although more comprehensive than the national benefits analysis, the case study benefit estimates still omit important mechanisms by which society is likely to benefit from the final rule. Examples of benefit categories not reflected in the monetized benefits include non-cancer health benefits (other than lead-related benefits) and reduced costs of drinking water treatment.

TABLE IX-7.—ESTIMATED BENEFITS FROM REDUCED MP&M DISCHARGES FROM OHIO FACILITIES
[Annual benefits—thousands of 2001\$]

Benefit category	Selected option
1. Reduced Cancer Risk:	
Fish Consumption:	\$14.5
Water Consumption:	\$0.00
2. Reduced Risk from Exposure to Lead:	
Children:	\$422.11
Adults:	\$117.39
3. Avoided Sewage Sludge Disposal Costs	\$0.00
4. Enhanced Fishing	\$153.10
5. Enhanced Swimming	\$9.78
6. Enhanced Boating	\$0.00
7. Enhanced Wildlife Viewing	\$88.05
8. Non-Use benefits (½ of Recreational Use Benefits)	\$125.47
Total Monetized Benefits	\$930.4

3. Social Costs for Ohio Case Study

EPA also estimated the social costs of the final rule for MP&M facilities in Ohio. EPA relied on the results of the national analysis to predict the number of Ohio facilities that would close in the baseline and due to the final rule.

The MP&M regulations will not affect facilities that are baseline closures. Predicting the number of regulatory closures is necessary to estimate the costs and impacts of the regulation on industry and water quality. The screener