



NJ Department of Environmental Protection and Energy  
Division of Science and Research  
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## RESEARCH PROJECT SUMMARY

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### Public Evaluations of Reservoir Protection

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#### ABSTRACT

New Jersey citizens indicated very strong support for preserving existing natural zones around water supply reservoirs, using the Wanaque-Monksville Reservoir system as a case study. These citizens also supported the acquisition of additional natural zones around reservoirs if needed to protect water quality, and regulation of land uses around water supply sources without such buffer zones. This support for control of lands around water sources was very strong, whether among users of reservoir water, residents around the reservoir, or people who fished on the reservoir.

#### INTRODUCTION

The primitive water treatment technologies available in the 19th century played a large role in the development of public water supply reservoirs in northern New Jersey and the northeastern United States. Water suppliers acquired reservoirs with large tracts of vegetated land around them; these lands served as natural buffer zones to prevent pollutants from reaching the reservoir.

As treatment technologies improved, engineers believed that technology could, at a cost, produce acceptable water quality regardless of the nature of any pollution that might occur. This belief reduced the apparent need for natural zones around reservoirs. Indeed, development of the natural zones might provide additional revenues for the utility and reduce customer bills.

At the same time as technology seemed to reduce the need for natural zones to maintain drinking water quality, the increasing population density of

New Jersey and the increasing value its citizens placed on the environment seemed to increase the need for the open space such zones provided. In an age when voters were supporting the sale of millions of dollars in bonds to purchase natural lands, the sale and development of natural zones around reservoirs seemed paradoxical. Attempts by utilities to develop parts of natural zones for golf courses, and residential and commercial uses, spurred conflict leading to a temporary ban on such development in New Jersey from the late 1980s to the present.

#### OBJECTIVES

Given this controversy, it seemed important that the New Jersey Department of Environmental Protection and Energy (NJDEPE) understand the views of the citizens of New Jersey on this topic before developing a policy on natural zones around water supply reservoirs. The purpose of the research reported on here was to plumb the views of New Jersey citizens who used reservoir water, lived near a

case study reservoir, or who fished in it. The study aimed at identifying whether they wanted to preserve the natural zone as is, how much they valued its preservation, what they thought its function was and should be (including allowable activities in and around the reservoir), and what state policy should be toward reservoirs and other public water supply sources.

## PROJECT DESIGN AND METHODS

Because of the scope of the study, it was necessary to use a case study rather than try to identify the views of the entire population of the state about all reservoirs. The Wanaque-Monksville Reservoir system in northern Passaic County, run by the North Jersey District Water Supply Commission (NJDWSC), was selected as the case. It provided a natural zone large enough to be developed, and distant user, near-resident, and angler populations to sample. No reservoir in New Jersey is "average," but this reservoir system came closest to providing the variety in uses and users necessary to extrapolate results from this study to the views of state citizens generally.

The NJDWSC provides water to over 100 municipalities, but most receive only part of their water from this source. Survey respondents might be confused about how a reservoir's natural zone affects them if most of their water comes from other sources. Therefore only municipalities receiving all or nearly all of their water from the Wanaque-Monksville system were targeted for the "users" sample. A random sample of residents from Glen Ridge, Cedar Grove, Kearny and Bayonne yielded 525 names, with half coming from Bayonne and the rest equally divided among the other three municipalities. These user respondents lived between 14 and 30 miles from the NJDWSC reservoirs.

A random sample of 525 households was selected from the municipalities of West Milford, Wanaque, and Ringwood located around the reservoirs, and thus near the natural zone. This group formed the "near-resident" sample for the project.

The NJDWSC provides free permits for people who wish to fish on the Wanaque Reservoir. The list of permittees for 1990, and randomly selected permittees for 1989, formed an "anglers" sample of 475 people. Although the original intent was to sample recreational users of the NJDWSC natural zone as well, no lists of these users were available from which random samples could be taken. Budget

and schedule restrictions prevented the alternative of on-site interviews with non-angler recreationists.

Focus groups were held with users and near-residents to gather data on their views that could be used to design the draft surveys for these groups. Budget restrictions prevented holding a focus group with anglers. Initial drafts of the surveys were reviewed by NJDEPE staff and by an external expert to ensure their ability to provide needed data without eliciting biased answers from respondents. The final versions of the surveys were pretested with 50 people from each of the three samples, and revised in the light of their responses.

A total of 525 surveys were sent to the water users; the response rate was 75% (excluding people who had moved from the sample area, had a private well, or died). The same number of surveys were sent to near-residents; their response rate was 81%. Anglers received 475 surveys, and provided a 76% response rate. These response rates suggest that the survey results can be extrapolated to other, non-surveyed members of these groups in New Jersey with a high degree of confidence.

## RESULTS AND DISCUSSION

Findings are reported for citizens' views of major policy issues and their willingness to pay to preserve or expand the natural buffer. Then additional findings on citizen views about water quality, open space, and water supply policy are discussed.

**Development of the Natural Zone Should Not Be Allowed.** All three groups objected to residential, commercial or industrial development of the natural zone around the reservoir. They were nearly unanimous on this point; between 95.8% and 99.7% of any group opposed a given type of development. Similar numbers (93.8%-97.6%) felt these developments would reduce the water quality in the reservoirs.

**Current Ban on Sales of Natural Zone Lands Should Be Made Permanent.** A similarly high proportion of each of the three samples (93.3%-94.8%) thought that the current temporary ban on sales of natural zone lands around reservoirs should become a permanent part of state policy.

**Reliance on Water Treatment Alone is Not Sufficient.** People were told that experts agree that water treatment technology could meet all water quality standards even if the natural zone was developed. They were then asked if they would

support development with increased water treatment if it would not increase their water bills, taxes or cost of fishing. Overwhelmingly they supported maintaining the natural zone over relying on treatment alone (see table below).

Percentage of Respondents Opposing Various Activities

NATURAL ZONE CHOICES	USERS	NEAR RESIDENTS	ANGLERS
Keep natural zone & current water treatment, if possible	97.8	93.4	96.3

in the natural zone, in that order. Again, however, the proportions of each group opposing a given activity in the natural zone differed. For example, a full third of surveyed water users opposed hiking, while only 14% opposed it among nearby residents who were surveyed.

Support for Natural Zone Management Alternatives

**Groups Disagreed About Permissible Activities on Reservoirs and in Natural Zones.**

Although agreeing to oppose major development of natural zones, these three groups were far less agreed on what other activities should or should not be allowed. Swimming, motorized boating and surf sailing were the top three activities all three groups thought should be banned from the reservoirs. Fishing and non-motorized boating were seen as allowable activities by each group, in that order. However, the proportions against each activity varied widely between groups (see table in next column): for example, over half of water users wanted fishing banned, while anglers supported it; nearby residents were far less likely than the other groups to oppose surf sailing.

**Control Activities Around Water Sources Without Natural Zones.** Given citizens' strong views about the importance of natural zones, questions were raised about how they would feel about the many New Jersey water sources (both reservoirs and rivers) that lack natural zones. Would they ban the use of these sources? Would they want a natural zone established there, too? Or would they support the status quo of using the water with treatment? A significant proportion of each group supported the latter two measures (see table below). However, the overwhelmingly most popular approach (supported by about three-quarters of each group) was to control the activities (e.g., land uses) that occur close to the water source, so as to reduce opportunities for pollution.

REGULATORY OPTIONS	USERS	NEAR RESIDENTS	ANGLERS
Control activities occurring close to the source	79.8	72.7	75.6
Use source as is	40.4	53.8	39.9

Similar results were found for the activities people felt should be banned from the natural zone around reservoirs (see table in next column). Rankings were similar across groups (with the exception of hunting). Off-road vehicles were opposed most strongly by all groups, followed by golf courses. Each group was least opposed to wildlife observation and hiking

Regulation Preferences for Water Sources without Natural Zones

RESERVOIR	USERS	NEAR RESIDENTS	ANGLERS
Motorized boating	95.9	90.5	76.9
Swimming	85.8	71.7	82.5
Surf sailing	72.7	38.6	60.4

**Citizens Put a High Value on Preserving the Natural Zone Around Reservoirs.** Each group showed overwhelming support for preserving the natural zone. To test how strong this support was, each group was asked to suppose that their personal costs would have to increase to maintain the natural zone without development. Water users would see their water bills go up; nearby residents would have a one-time increase in their property taxes; anglers would see their expenses for fishing rise. In other words, how much would people be willing to pay to preserve the natural zone if the alternative was to see it developed with residences and to have more chemical treatment of water? The method used to ask this question, called "contingent valuation," is described briefly in the Appendix.

As the table below shows, the willingness to pay was quite high, with water users expressing the highest value. Anglers' estimated loss of value per trip if the natural zone is developed is significant when multiplied over the average 15 days of fishing each had at Wanaque Reservoir in 1990. Willingness to pay for these three groups was lower, but still high, when they were asked about paying to buy additional lands to protect water quality.

GROUPS (TIMING OF PAYMENT)	MAINTAIN ZONE	BUY MORE LAND
Users (per year)	\$3500	\$900
Near residents (one payment)	\$2500	\$380
Anglers (per trip)	\$ 46	not asked

Best Estimates of Willingness to Pay

Water users were more likely to vote to preserve the natural zone, regardless of cost, if they felt it was important to preserve open space and protect water quality. They were less likely to vote for preservation if they suspected their water bills might go up as a result of their answer to the survey. Users were more likely to vote to add land to the natural zone if they felt open space was important, were dissatisfied with current water quality, and were definitely willing to pay the specified amount.

Nearby residents' willingness to pay also decreased if they suspected their tax bill might increase because of their answer. Their willingness to pay increased with concern over preserving open space, concern that activities in the natural zone would harm water quality, and with distance of their residence from the natural zone. This effect of distance on willingness to pay was not due to

differences among residents of different near-reservoir towns, nor whether the zone could be seen during their typical day or from home. Nearby residents, like users, were willing to add land to the natural zone if they were concerned about development impacts on water quality and about open space, and were confident about their answers.

Anglers' estimates of the value of a fishing trip to Wanaque Reservoir under current conditions decreased only if they suspected that their response might make the North Jersey District Water Supply Commission start charging for permits to fish at the Reservoir.

**Citizens Were Concerned About Water Quality.** Of several criteria of home water quality (e.g., odor, clarity), water users were least satisfied with the taste and perceived safety of their tap water. A third of those surveyed used bottled water most or all of the time, primarily due to taste; 44% never used bottled water. Only 20% of users had a water filter or purification system in their homes. These data suggest some safety concerns occurred even with the existing natural zone and level of treatment, and that few people were protecting their water quality in other ways. One inference from these survey results is that part of water users' strong support for maintaining natural zones around reservoirs might have stemmed from distrust of treatment technology as their only means of ensuring safe water quality. Some nearby residents also used bottled water frequently for perceived safety and taste reasons; because wells provide their water, the effect of such concerns on their attitudes toward natural zones cannot be inferred. Overall, 61-71% of those surveyed felt the state was doing an adequate job of protecting drinking water in general.

**Open Space and Other Personal Impacts Beyond Reduced Water Quality Were of Concern.** For example, 94% of the surveyed anglers fished at Wanaque Reservoir in 1990, averaging 15 days each (nearly half of their total time fishing in fresh water that year). Its scenery and lack of crowds were the most important reasons for fishing there. Two-thirds of all anglers said development would make a trip to the reservoir no longer worthwhile to them.

Nearby residents also felt any development would affect them personally, primarily through increased traffic, loss of scenic views, and loss of open space. Other negative effects cited included decreased property values, loss of wildlife, and lower air quality. Positive perceived effects included lower property taxes, but this was cited by fewer than 10%

of nearby residents for any type of development.

Overall a slight majority felt the state was doing an adequate job preserving open space (64% among nearby residents, about 50% for the other two groups).

**Knowledge About Water Supply and Water Policy Varied.** Two-thirds of water users felt they knew where their water came from, and 91% of those correctly identified its source as a water supply reservoir in northern New Jersey. However, only a quarter of users knew the North Jersey District Water Supply Commission maintained a natural zone around the reservoir before receiving the survey. In contrast, nearby residents knew they did not get water from the reservoirs (only 11.5% believed they did), and 68% knew about the natural zone (compared to 63% among anglers).

When asked what purposes were served by the natural zone, over 90% of each group cited protection of reservoir water quality. While about half of anglers cited maintaining open space as a secondary purpose, the same proportion of users and nearby residents cited compliance with state regulations on reservoirs. Between 40% and 64%, with the highest proportions among water users, said they did not know whether four statements about state policy on reservoirs and natural zones were true or false (these statements were false). Nearly half of all groups (40%-47%) believed that the state regulates allowable activities in natural zones. A quarter to a third thought that all reservoirs are required to have a natural zone, and 8-11% believed the same was true for river sources of water. Twelve to twenty percent believed water supply utilities are free to sell natural zone land. If the survey respondents had known how little the state regulates natural zones beyond the current sales moratorium, their support for natural zones might have been even greater.

## SUMMARY AND POLICY IMPLICATIONS

The results of this study have implications in several areas: state policy on natural zones around reservoirs, water quality protection and open space, and how citizens can help develop these and other environmental protection policies.

Study implications for state policy include the following:

- The public is likely to support a permanent

ban on the sale or development of natural zones, even if the proposed use involves intensive recreation, such as golf courses.

- The public is likely to support a decision to protect water supply through regulation of land use and other activities around water sources without natural zones.
- The public is likely to support bans on reservoir and natural zone activities such as motorized boating and off-road vehicles. Policy on such activities as fishing and hiking will require more debate to reach resolution.
- Moves to expend public monies on, or seek public approval of a bond for, preservation or expansion of natural zones may receive strong public support.

--The most conservative projection of willingness to pay for all water users in the four municipalities surveyed (not just for the survey respondents in those towns) is \$63 million for preserving the natural zone, and \$15 million for adding land to it.

--Similarly cautious projections of total willingness to pay for all residents in the three towns surveyed around the Wanaque and Monksville reservoirs are \$16 million and \$3 million, respectively.

--The total value of fishing at the Wanaque Reservoir to anglers is about \$322,000 per year in willingness to pay to avoid development of the natural zone. These numbers do not indicate how much it would cost to preserve or add to the natural zone around this single reservoir system. Nor do they guarantee that voters would vote to support use of these particular sums for such purposes, although these estimates accounted for survey respondents who were unsure if they would actually pay such sums. However, these estimates can inform state government about the importance voters place on preserving open space and water quality in New Jersey.

Study results also have implications for the value of NJDEPE seeking public opinion before promulgating policy on environmental issues:

- The agency can use such surveys to identify public perceptions of environmental issues, and how well citizens understand these issues. This information can be used to design

informational programs to meet public information needs and wants; this includes explaining why the agency takes the action it does.

- The agency can use contingent valuation, as applied here, as part of a strategy to determine the value the public places on environmental resources and amenities that do not have values placed upon them by the marketplace. This information, with other data, can be used to help set environmental protection policies that meet public needs and preferences.

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This project was funded by the Natural and Historic Resources Element, and the Office of Environmental Health Assessment in the Division of Science and Research (DSR), both of the New Jersey Department of Environmental Protection and Energy, under Contract P32243.

### **ADDITIONAL INFORMATION**

For a copy of the final report of this project, which also includes recommendations for further research and uses of study results, call (609)292-1088, or write to the address on the first page of this summary. A fee to cover the cost of reproducing the report may be charged. For general information on DSR's research program, call (609)984-6070. DSR Reference No. 92004.

### **ACKNOWLEDGEMENTS**

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## APPENDIX

Contingent valuation studies provide survey respondents with scenarios on the choices they are asked to make. They are then asked, in the dichotomous choice method used in this study, to answer "yes" or "no" to whether they would accept that scenario for a given price. Each person receives only one price, with the entire survey sample receiving several different prices. Individual answers are combined for the entire sample to yield an overall estimate of public willingness to pay for a given natural commodity: in this case, preservation or expansion of the natural zone.

This appendix provides an example of such a scenario, one for water users' willingness to pay for preserving the natural zone. The randomly assigned price is inserted in the blank space in Question 28 (see next column):

You were selected to participate in this survey because your local water utility gets most (if not all) of the water it delivers to your house from the Wanaque and Monksville Reservoirs.

Property taxes paid by the Water Supply Commission, as well as other costs of maintaining the natural zone around the Wanaque and Monksville Reservoirs, are reflected in your water bills. The next questions focus on whether the natural zones are worth what they cost you.

To explore this issue, suppose that property taxes on the natural zone were going to increase and that the Water Supply Commission had two choices:

- 1 The Water Supply Commission could keep the natural zone and increase the price it charges your local water utility for water to cover the increase in taxes. As a

result your water bills would increase.

- 2 Or, the Water Supply Commission could sell the land in the natural zone to a developer and require the developer to pay the Water Supply Commission for any additional water treatment that might be needed as a result of the development.

When answering the next two questions, please assume that if the Water Supply Commission decides to keep the land, your water bill would go up, but the amount of water treatment would remain the same. Assume that if the land is sold, your water bill would remain the same, but the amount of water treatment might increase.

28. Now suppose that you and others who use water from the Wanaque and Monksville Reservoirs could vote in a special election to decide whether the natural area could be preserved or sold to developers. If a majority of water users vote "yes," the natural area will be preserved, but your water bill will be \$\_\_\_\_\_ per year more than it otherwise would have been for as long as you live in the area. If a majority vote no, the land currently in the natural area will be sold and made into a residential development. How would you vote? (CIRCLE ONE NUMBER)

- 1 Yes--I would vote to preserve the natural zone at the Wanaque and Monksville Reservoirs even though I would have to pay more for water
- 2 No--I would vote to allow residential development of the natural zone, even though the amount of water treatment might increase