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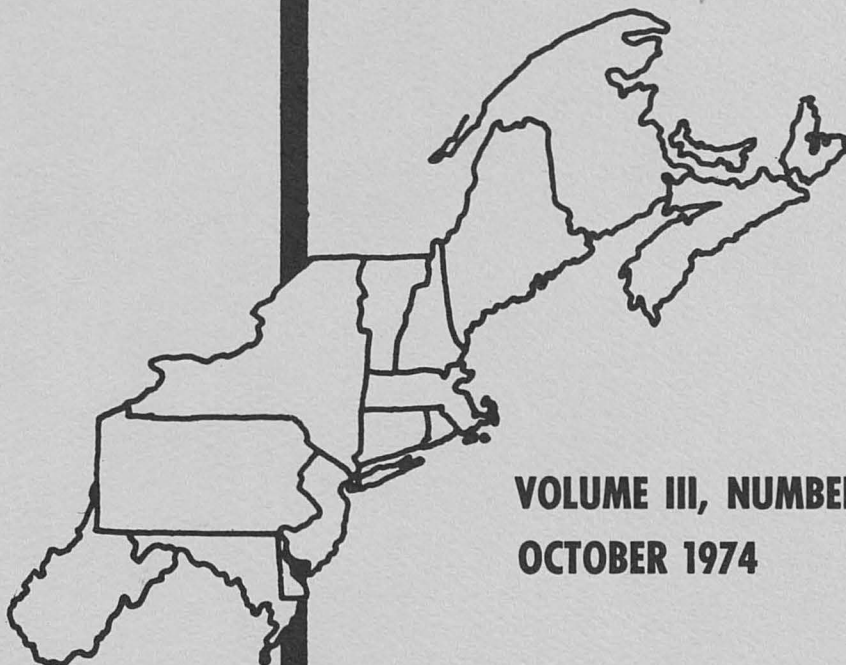
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EMPIRICAL EVALUATION OF ENVIRONMENTAL PREFERENCES:
A CASE STUDY^{1/}

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In the eyes of environmentally concerned citizens, Oregon has set a splendid example. Their "bottle bill" was instrumental in reducing can and bottle litter on beaches, highways, and recreational and camping sites by 49 percent [10]. A field burning ban becomes effective in 1975 to protect air quality. Legislation enacted in 1972 will remove billboards from its highways and interstate roads by 1975. A regulation to protect 820,000 acres of wilderness area from development was also adopted in 1972 [5]. Last year (1973) senators Robert Packwood and Mark Hatfield of Oregon and senators Frank Church and James McClure of Idaho jointly introduced a bill in the U.S. Senate to create a unique Hells Canyon National Recreation Area.

The Problem

Not all Oregonians, however, are in total agreement with these actions. Bitter debates over construction of hydroelectric power plants, airports, nuclear power plants, reservoirs, etc., are common place. The common characteristic of such debates is a surplus of emotionalism and a deficit of empirical evidence of people's preferences in a specific case.

The case discussed is a proposed reservoir on the South Santiam River in western Oregon, Figure 1.

^{1/} The research upon which this paper is based was supported by the Office of Water Resources Research, Department of the Interior, as authorized under the Water Resources Act of 1964 (PL-88-379).

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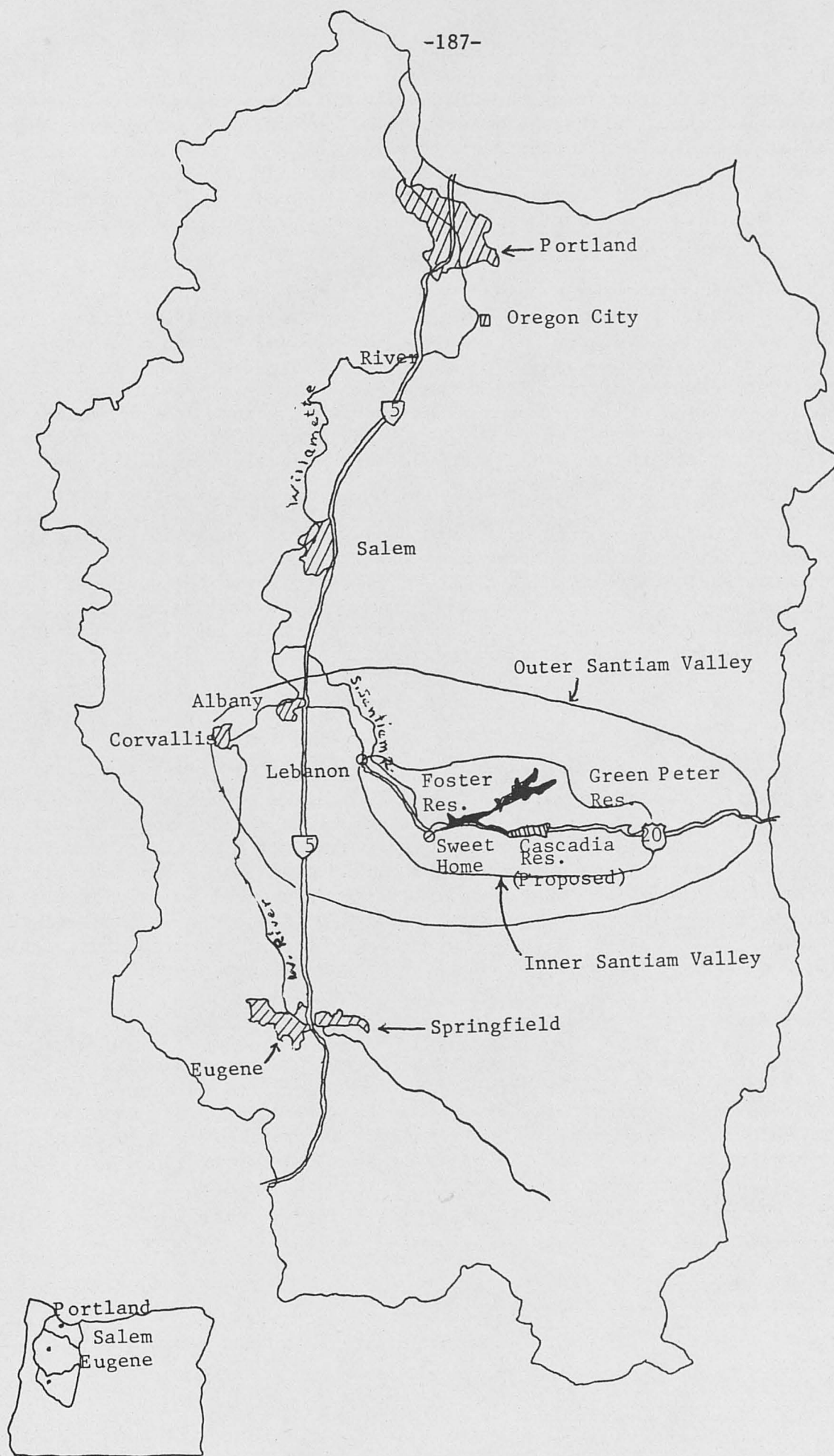


Figure 1. Sampling Areas Within the Willamette Basin

Cascadia Dam is part of the Willamette Basin Project which includes 14 authorized multiple purpose reservoirs, 11 of which are completed and operating. It has been authorized and budgeted. The site chosen is believed to be exceptional from the engineering and technical point of view. The reservoir is designed primarily to reduce flood damage to agricultural land. Recreation, irrigation, and navigation benefits are present but negligible.

Those who oppose the proposed reservoir argue that, from the aesthetic and scenic point of view, the rolling grass land, the alpine meadows, the dense evergreen forest, and the mountains surrounding the Cascadia Valley have no parallel. The free-flowing South Santiam River further enhances the natural landscape. Since these attributes are deemed irreplaceable, it is argued that the South Santiam River should be classified as a Scenic Water Way under the Oregon Water Ways Act of 1970. Such a designation would preclude future development and preserve the scenery of the Santiam Valley.

Secondly, the dam, if constructed, would flood historical Cascadia State Park [12]. Finally, since the justification of the reservoir is based on averaging models which included benefits from other dams of the Willamette Basin Project, it is argued that it is economically unsound [12]. In effect the case against the reservoir rests on the perception that the benefits from preserving the river and the landscape in their natural form are greater than those gained by development to prevent tangible losses. The controversy thus resolves around the issue of opportunity cost.

This paper reports an empirical study designed to identify preferences, quantify trade-off values, and derive demand schedules for environmental goods [11]. Due to space limitations, the discussion here is limited to: 1) respondents' perceptions of the impact of the proposed reservoir, 2) whether the dam should be constructed, and 3) the relationships between demographic characteristics, environmental perceptions, and optimum preferences for 15 situations related to 5 aspects of water based environment, i.e., scenic vistas, water based recreational opportunities, camping and recreation park, flood control, and wilderness.^{2/}

Methodology

Three hundred residents of the Willamette Basin were sampled, using standard tables of random numbers. The sample included both rural and urban residents, communities close and distant from the South Santiam River, both males and females, and a balance between Portland (Oregon's major population center) and all other areas. The sampling areas ("communities") are shown in Figure 1. A team of professional interviewers administered all interviews during June and July of 1973.

^{2/} It is impossible to report all findings in this paper. The interested reader should see [8].

The interview questionnaire was designed to be administered in less than 45 minutes and had 2 parts. Part I was designed to obtain respondents' reflections on environmental and related community problems, their attitudes toward aesthetic, scenic, and historical aspects of a water based environment, their attitudes toward the proposed reservoir, and their perception of benefits from the reservoir.

Part II was designed to determine optimum environmental preferences and trade-off values. The Priority Evaluation Technique (henceforth referred to as PET) was used as the tool of analysis [2, 3, 4]. PET had capabilities beyond other techniques examined [6] and had performed well in a pilot study [7, 8]. Briefly, PET permits a respondent to evaluate present conditions in light of available alternatives, and allows the choice of a mix of alternatives providing maximum satisfaction. Once the respondent has arrived at the preferred mix of alternatives, no incentive remains for further trade-offs.^{3/}

The five aspects of water based environment (Scenic View, Water Recreation, Camping and Recreation Park, Floods, and Wilderness) considered were chosen in reference to the proposed reservoir. Each of the five variables was divided into three situations. Situation I represented pre-construction conditions. Situation II indicated moderate, and Situation III, full post-construction development changes in each one of the five variables.

Each environmental situation was depicted by a black and white drawing. These drawings were composites of main features rather than representations of specific views. They highlighted natural features such as the river, landscape, and wilderness, and such man-made features as dams, highways, commercial recreational facilities, tourist facilities, residential and vacation homes, etc.^{4/} The 15 environmental illustrations used provided a wide spectrum of alternative situations.

Respondents were given a standard verbal description of highlights of each illustration and were asked to identify the one illustration for each of the five variables that most nearly represented their perception of existing conditions. Respondents were then asked to visualize each environmental situation as a commodity they could "buy" independently. The "buying" process was simplified by assigning exchange rates to each

^{3/} For a mathematical presentation, see [6].

^{4/} The ability of people to discriminate preference via visual perception had previously been tested [1].

situation.^{5/} Initially each respondent was given a "budget" of \$1.50 (increased in stages to \$2.45, later), to be allocated to "buy" five situations (one for each variable) such that the total budget was exhausted, satisfaction was maximized, and the respondent was indifferent to further trade-offs. This "mix" of five situations was considered "optimum." Saving was allowed if the optimum mix of alternative situation necessitated it.

The budget simulation game served two purposes. First, it offered respondents an opportunity to reveal their real preferences. Second, it helped to determine trade-off values by comparing expected and actual choices.

Perceived Impact of the Proposed Reservoir on the Santiam Valley

It was hypothesized that opinions on the proposed reservoir would differ significantly among communities, age groups, environmental groups, educational groups, and by sex. Table 1 summarizes opinions on the impact of the proposed reservoir. As expected, respondents from the Santiam Valley (inner and Outer) foresaw the impact of the reservoir quite differently than respondents from the "rest" (Portland, Eugene, and Salem). Valley residents felt strongly that the dam would harm the natural beauty and environmental quality while reducing the occasional flood dangers but little. Respondents from "outside" felt water recreational activities would be increased and that flood damages would be significantly reduced.

"To Construct" or "Not to Construct" the Reservoir?

A summary of respondents' attitudes on proposed construction of the reservoir is presented in Table 2. Fifty-four percent of those familiar with the Santiam Valley favored the reservoir, 41 percent opposed it, and 5 percent remained uncommitted. The proportion in favor of the reservoir among those not familiar with the Santiam Valley exceeded that against it. Chi square tests confirmed differences in opinions based on age, community, and environmental consciousness.^{6/}

The percentage of respondents opposing the dam was highest in the 18-25 age group and declined as age increased. It is interesting to note

^{5/} The exchange rates were per capita expenditures for maintaining and improving the quality of the Oregon environment. These expenditures were assumed to rise with moderate or full residential and/or industrial development. The budget level was based upon annual per capita state expenditures for maintenance and improvement of environmental quality and the estimated annual construction, operation and maintenance cost of the proposed reservoir.

^{6/} Statistical significance set at the .05 level.

Table 1
Opinions on Impact of the Proposed Reservoir on
South Santiam River, Cascadia, Oregon:
Santiam Community^{a/} and the Rest^{b/}

| Type of Impact | Positive ^{c/} | % of Santiam Negative ^{d/} | Do Not Know |
|---|------------------------|--|-------------|
| Reduce flood damage to agricultural land in the Valley | 25 | 60 | 15 |
| Reduce flood damage to agricultural land outside Valley | 18 | 64 | 18 |
| Reduce flood damage to life & property in Valley | 23 | 63 | 14 |
| Reduce flood damage to life & property outside Valley | 11 | 74 | 15 |
| Increase irrigation potential in Valley | 40 | 41 | 19 |
| Stimulate population growth in Valley | 29 | 66 | 5 |
| Stimulate road improvements in Valley | 45 | 52 | 3 |
| Increase tourist and roadside business in area | 44 | 49 | 6 |
| Increase water recreational activity in Valley | 47 | 47 | 6 |
| Damage scenic beauty of river and Valley | 60 | 35 | 5 |
| Damage wilderness area in Valley | 59 | 34 | 7 |

^{a/} Includes Inner and Outer Santiam

^{b/} Includes Portland, Eugene, and Salem

^{c/} Includes those who responded in terms of "A lot" and/or "Quite a bit"

^{d/} Includes those who responded in terms of "A little" and/or "None at all"

Table 1. Continued

| Type of Impact | % Rest | | |
|---|----------|----------|-------------|
| | Positive | Negative | Do Now Know |
| Reduce flood damage to agricultural land in the Valley | 51 | 25 | 24 |
| Reduce flood damage to agricultural land outside Valley | 28 | 43 | 29 |
| Reduce flood damage to life & property in Valley | 40 | 35 | 25 |
| Reduce flood damage to life & property outside Valley | 20 | 49 | 31 |
| Increase irrigation potential in Valley | 55 | 19 | 26 |
| Stimulate population growth in Valley | 36 | 46 | 18 |
| Stimulate road improvements in Valley | 58 | 31 | 11 |
| Increase tourist and roadside business in area | 55 | 34 | 11 |
| Increase water recreational activity in Valley | 69 | 21 | 10 |
| Damage scenic beauty of river and Valley | 28 | 56 | 16 |
| Damage wilderness area in Valley | 45 | 42 | 13 |

a/ Includes Inner and Outer Santiam

b/ Includes Portland, Eugene, and Salem

c/ Includes those who responded in terms of "A lot" and/or "Quite a bit"

d/ Includes those who responded in terms of "A little" and/or "None at all"

Table 2
Attitudes Toward Proposed Construction of Reservoir
on the South Santiam River, Oregon

| | Favor | | Oppose | | Do Not Know | | Total |
|---|-------|----|--------|----|-------------|----|-------|
| | No. | % | No. | % | No. | % | |
| <u>Community</u> | | | | | | | |
| Salem | 29 | 66 | 9 | 20 | 6 | 14 | 44 |
| Eugene | 31 | 67 | 9 | 20 | 6 | 13 | 46 |
| Portland | 66 | 55 | 43 | 36 | 11 | 9 | 120 |
| Inner Santiam | 18 | 41 | 25 | 55 | 2 | 4 | 45 |
| Outer Santiam | 14 | 32 | 29 | 64 | 2 | 4 | 45 |
| <u>Sex</u> | | | | | | | |
| Male | 85 | 56 | 57 | 37 | 10 | 7 | 152 |
| Female | 73 | 49 | 58 | 39 | 17 | 12 | 148 |
| <u>Age</u> | | | | | | | |
| 18-25 | 22 | 45 | 26 | 53 | 1 | 2 | 49 |
| 26-35 | 29 | 47 | 30 | 48 | 3 | 5 | 62 |
| 36-50 | 44 | 56 | 28 | 35 | 7 | 9 | 79 |
| 51 and over | 63 | 57 | 31 | 28 | 16 | 15 | 110 |
| <u>Income</u> | | | | | | | |
| 0-\$6,000 | 37 | 47 | 28 | 36 | 13 | 17 | 78 |
| \$6,001-\$12,000 | 61 | 53 | 47 | 41 | 7 | 6 | 115 |
| \$12,001-\$20,000 | 48 | 56 | 31 | 36 | 6 | 8 | 85 |
| \$20,001 and above | 12 | 54 | 9 | 41 | 1 | 5 | 22 |
| <u>Education</u> | | | | | | | |
| 8th grade/some high school | 41 | 59 | 21 | 30 | 8 | 11 | 50 |
| High school graduate/ technical school | 59 | 50 | 46 | 39 | 13 | 11 | 118 |
| Some college | 37 | 58 | 25 | 39 | 2 | 3 | 64 |
| College graduate | 10 | 45 | 10 | 45 | 2 | 10 | 22 |
| Post graduate | 11 | 42 | 13 | 50 | 2 | 8 | 26 |
| <u>Familiarity with Region</u> | | | | | | | |
| Familiar | 114 | 54 | 85 | 41 | 10 | 5 | 209 |
| Not familiar | 44 | 48 | 30 | 33 | 17 | 19 | 91 |
| <u>Environmental Group</u> | | | | | | | |
| Strong environmentalist | 40 | 53 | 51 | 42 | 5 | 5 | 96 |
| Moderate environmentalist | 59 | 58 | 38 | 37 | 5 | 5 | 102 |
| Weak environmentalist | 40 | 70 | 14 | 25 | 3 | 5 | 57 |
| Non-environmentalist | 19 | 42 | 12 | 27 | 14 | 31 | 45 |

that the percentage of respondents who "did not know" showed a rise as age increased.

As expected, environmental groups differed on the issue of the proposed reservoir, with opposition greatest (42 percent) among the strong environmentalists and least (25 percent) among the weak environmentalists. Seventy percent of the weak environmentalists, compared to 53 percent of the strong environmentalists, favored the dam. Among non-environmentalists, only 42 percent favored the dam, 27 percent opposed it, and a relatively large percentage (31 percent) remained uncommitted.

Sixty-four percent of the respondents from the Outer Santiam Valley and 55 percent from the Inner Santiam Valley opposed the proposed reservoir. In contrast, 66 percent from Salem, 67 percent from Eugene, and 55 percent from Portland favored the proposal. The strong opposition from the people of the Santiam Valley likely results from the knowledge that changes in their lifestyle will occur if the reservoir is constructed. The impact of the presence of the dam, new industry and real estate developments will be predominantly local.

Differences in Visual Environmental Perceptions

In the analysis, an understanding of the respondents' perception of existing conditions (in the context of the five environmental variables examined) was considered an essential step toward the final goal of determining the mix of variables preferred and the direction of change sought. It was anticipated that 1) while respondents from the Santiam Valley would perceive identical existing conditions, other communities would have different perceptions; and 2) the number of respondents choosing Situation I (Situation III) to represent existing conditions would be large (small).

Table 3 summarizes the respondents' perception of existing environmental conditions according to community, sex, age, income, education, and environmental group.^{7/} While 44 percent of the respondents chose Situation I to represent existing scenic conditions, 48 percent chose Situation II and 8 percent chose Situation III. Except for "Floods" (15 percent), not more than 10 percent of the respondents chose Situation III. Contrary to our expectations, between 33 percent and 44 percent of the respondents chose Situation I for three variables, i.e., "Scenic View" (44 percent), "Water Recreation" (43 percent), and "Floods" (33 percent). In the case of "Camping and Recreation" and "Wilderness," the empirical results supported our expectations. "Camping and Recreation" and "Wilderness" were chosen by 72 percent and 68 percent, respectively.

Among communities, the environmental perceptions of respondents from the Inner Santiam Valley came closest to our expectations. Four out of

^{7/} Thirty-five percent of the respondents provided inadequate responses or were not familiar with the area and were dropped from this analysis.

Table 3
Environmental Perceptions: Total, Community,
Sex, Age, Income, Education, and Environmental Group

| | Scenic View | Water Recrea- tion | Camping and Recrea- tion Park | Floods | Wild- erness |
|--|-------------------------|--------------------------|--|---------|-----------------|
| | ----- Situation I ----- | | | | |
| TOTAL | 86 (44) | 84 (43) | 141 (72) | 65 (33) | 133 (68) |
| <u>Community</u> | | | | | |
| Salem | 9 (37) | 12 (50) | 16 (67) | 4 (17) | 16 (67) |
| Eugene | 10 (37) | 6 (22) | 18 (67) | 4 (15) | 20 (74) |
| Portland | 29 (44) | 33 (50) | 48 (73) | 23 (35) | 40 (61) |
| Outer Santiam | 12 (34) | 7 (20) | 23 (66) | 10 (29) | 20 (58) |
| Inner Santiam | 26 (59) | 26 (59) | 36 (82) | 24 (54) | 37 (84) |
| <u>Sex</u> | | | | | |
| Male | 44 (43) | 45 (44) | 75 (73) | 34 (33) | 71 (69) |
| Female | 42 (45) | 39 (42) | 66 (71) | 31 (33) | 62 (67) |
| <u>Age</u> | | | | | |
| 18-25 | 8 (31) | 10 (38) | 17 (65) | 6 (23) | 17 (65) |
| 26-35 | 23 (51) | 20 (44) | 37 (82) | 19 (42) | 32 (71) |
| 36-50 | 23 (43) | 21 (40) | 37 (70) | 16 (30) | 36 (70) |
| 51-65 | 21 (45) | 21 (45) | 31 (66) | 15 (32) | 28 (60) |
| 66 and over | 11 (44) | 12 (48) | 19 (76) | 9 (36) | 20 (80) |
| <u>Income</u> | | | | | |
| 0-\$6,000 | 20 (47) | 17 (40) | 30 (70) | 13 (30) | 28 (65) |
| \$6,001-\$12,000 | 36 (47) | 34 (44) | 53 (69) | 26 (34) | 55 (71) |
| \$12,001-\$20,000 | 25 (45) | 26 (46) | 45 (80) | 21 (38) | 40 (71) |
| \$20,001 and above | 5 (25) | 7 (35) | 13 (65) | 5 (25) | 10 (50) |
| <u>Education</u> | | | | | |
| 8th grade/less | 8 (62) | 6 (46) | 9 (69) | 5 (38) | 8 (62) |
| Some high school/ high school graduate | 46 (47) | 43 (44) | 74 (75) | 37 (38) | 67 (68) |
| Technical school/ some college | 19 (39) | 22 (45) | 33 (67) | 14 (29) | 36 (73) |
| College graduate/ post graduate | 13 (36) | 13 (36) | 25 (69) | 9 (25) | 22 (61) |
| <u>Environmental Group</u> | | | | | |
| Strong environ- mentalist | 29 (44) | 25 (38) | 47 (71) | 22 (33) | 46 (70) |
| Moderate en- vironmentalist | 28 (39) | 27 (38) | 49 (69) | 19 (27) | 46 (65) |
| Weak environ- mentalist | 16 (46) | 19 (54) | 26 (74) | 14 (40) | 24 (69) |
| Non-environ- mentalist | 13 (54) | 13 (54) | 19 (79) | 10 (42) | 17 (71) |

NOTE: Bracketed figures indicate percent of respondents in the particular category.

Table 3. Continued

| | Scenic View | Water Recrea- tion | Camping and Recrea- tion Park | Floods | Wild- erness |
|--|--------------------------|--------------------------|--|----------|-----------------|
| | ----- Situation II ----- | | | | |
| TOTAL | 95 (48) | 93 (47) | 53 (27) | 102 (52) | 58 (30) |
| <u>Community</u> | | | | | |
| Salem | 14 (59) | 9 (37) | 8 (33) | 14 (58) | 8 (33) |
| Eugene | 12 (44) | 14 (52) | 8 (30) | 16 (60) | 5 (18) |
| Portland | 34 (51) | 31 (47) | 17 (26) | 36 (54) | 24 (36) |
| Outer Santiam | 19 (54) | 24 (69) | 12 (34) | 20 (58) | 15 (42) |
| Inner Santiam | 16 (36) | 15 (34) | 8 (12) | 16 (36) | 6 (14) |
| <u>Sex</u> | | | | | |
| Male | 49 (48) | 49 (48) | 27 (26) | 57 (55) | 29 (28) |
| Female | 46 (49) | 44 (47) | 26 (28) | 45 (48) | 29 (31) |
| <u>Age</u> | | | | | |
| 18-25 | 15 (58) | 13 (50) | 8 (31) | 13 (50) | 7 (27) |
| 26-35 | 17 (38) | 22 (49) | 8 (18) | 17 (38) | 12 (27) |
| 36-50 | 30 (57) | 30 (57) | 16 (30) | 29 (55) | 17 (39) |
| 51-65 | 22 (47) | 16 (34) | 15 (32) | 30 (64) | 17 (36) |
| 66 and over | 11 (44) | 12 (48) | 6 (24) | 13 (52) | 5 (20) |
| <u>Income</u> | | | | | |
| 0-\$6,000 | 18 (42) | 20 (47) | 12 (28) | 23 (53) | 14 (31) |
| \$6,001-\$12,000 | 34 (44) | 34 (44) | 23 (30) | 37 (48) | 19 (25) |
| \$12,001-\$20,000 | 29 (52) | 27 (48) | 11 (20) | 28 (50) | 15 (27) |
| \$20,001 and above | 14 (70) | 12 (60) | 7 (35) | 14 (70) | 10 (50) |
| <u>Education</u> | | | | | |
| 8th grade/less | 4 (31) | 6 (46) | 4 (31) | 5 (38) | 5 (38) |
| Some high school/ high school graduate | 43 (44) | 41 (42) | 23 (24) | 48 (49) | 29 (30) |
| Technical school/ some college | 27 (55) | 24 (49) | 15 (31) | 27 (55) | 11 (23) |
| College graduate/ post graduate | 21 (58) | 22 (61) | 11 (31) | 22 (61) | 13 (36) |
| <u>Environmental Group</u> | | | | | |
| Strong environ- mentalist | 28 (42) | 34 (52) | 19 (29) | 33 (50) | 18 (27) |
| Moderate en- vironmentalist | 38 (54) | 34 (49) | 21 (30) | 41 (58) | 23 (32) |
| Weak environ- mentalist | 19 (54) | 15 (43) | 8 (23) | 19 (54) | 11 (31) |
| Non-environ- mentalist | 10 (42) | 10 (42) | 5 (21) | 9 (37) | 6 (25) |

NOTE: Bracketed figures indicate percent of respondents in the particular category.

Table 3. Continued

| | Scenic View | Water Recrea- tion | Camping and Recrea- tion Park | Floods | Wild- erness |
|--|---------------------------|--------------------------|--|---------|-----------------|
| | ----- Situation III ----- | | | | |
| TOTAL | 15 (8) | 19 (10) | 2 (1) | 29 (15) | 5 (2) |
| <u>Community</u> | | | | | |
| Salem | 1 (4) | 3 (13) | -- | 6 (25) | -- |
| Eugene | 5 (19) | 7 (26) | 1 (3) | 7 (25) | 2 (8) |
| Portland | 3 (5) | 2 (3) | 1 (1) | 7 (11) | 2 (3) |
| Outer Santiam | 4 (12) | 4 (11) | -- | 5 (13) | -- |
| Inner Santiam | 2 (5) | 3 (7) | -- | 4 (10) | 1 (2) |
| <u>Sex</u> | | | | | |
| Male | 10 (9) | 9 (8) | 1 (1) | 12 (12) | 3 (3) |
| Female | 5 (6) | 10 (11) | 1 (1) | 17 (19) | 2 (2) |
| <u>Age</u> | | | | | |
| 18-25 | 3 (11) | 3 (12) | 1 (4) | 7 (27) | 2 (8) |
| 26-35 | 5 (11) | 3 (7) | -- | 9 (20) | 1 (2) |
| 36-50 | -- | 2 (3) | -- | 8 (15) | -- |
| 51-65 | 4 (8) | 10 (21) | 1 (2) | 2 (4) | 2 (4) |
| 66 and over | 3 (12) | 1 (4) | -- | 3 (12) | -- |
| <u>Income</u> | | | | | |
| 0-\$6,000 | 5 (11) | 6 (13) | 1 (2) | 7 (17) | 1 (2) |
| \$6,001-\$12,000 | 7 (9) | 9 (12) | 1 (1) | 14 (18) | 3 (4) |
| \$12,001-\$20,000 | 2 (3) | 3 (6) | -- | 7 (12) | 1 (2) |
| \$20,001 and above | 1 (5) | 1 (5) | -- | 1 (5) | -- |
| <u>Education</u> | | | | | |
| 8th grade/less | 1 (7) | 1 (8) | -- | 3 (24) | -- |
| Some high school/ high school graduate | 9 (9) | 14 (14) | 1 (1) | 13 (13) | 2 (2) |
| Technical school/ some college | 3 (6) | 3 (6) | 1 (2) | 8 (16) | 2 (4) |
| College graduate/ post graduate | 2 (6) | 1 (3) | -- | 5 (14) | 1 (3) |
| <u>Environmental Group</u> | | | | | |
| Strong environ- mental | 9 (14) | 7 (10) | -- | 11 (17) | 2 (3) |
| Moderate en- vironmentalist | 5 (7) | 10 (13) | 1 (1) | 11 (15) | 2 (3) |
| Weak environ- mental | -- | 1 (3) | 1 (3) | 2 (6) | -- |
| Non-environ- mental | 1 (4) | 1 (4) | -- | 5 (21) | 1 (4) |

NOTE: Bracketed figures indicate percent of respondents in the particular category.

every five respondents from the Inner Santiam chose Situation I for "Camping and Recreation" and "Wilderness"; three out of five chose Situation I for "Scenic View" and "Water Recreation"; and one out of every two chose Situation I for "Floods."

However, respondents of the Inner and Outer Santiam differed in their environmental perception. Since all of these respondents have lived in and around the Valley, they were presumed to be familiar with existing conditions. Yet they differed on almost every category. As expected, respondents from the "outside" communities differed in environmental perceptions despite the standard explanation given to each respondent. One can attribute these differences to several factors, including their exposure to the area, general knowledge of the surroundings, relative accuracy of illustrations, and possible vagueness of terms used, respondents' interest in our research, demographic and socioeconomic characteristics, and physical distance from the area.

Overall, respondents consider the pre-construction conditions of the Santiam Valley to be scenic, to have extensive wilderness area and little commercial exploitation of its water recreational activities. Also, respondents perceived that under the existing conditions, flood dangers in the Valley were not very serious.

Direction of Changes Sought by Respondents

Once respondents had indicated their visual perception of the prevailing environmental conditions, the constrained, simulated game plan provided them an opportunity to reveal the mix of environmental conditions that would give them maximum satisfaction. It was expected that the optimum mix of environmental conditions chosen by respondents would differ significantly among communities, age groups, environmental groups, income groups, people with different levels of education, and by sex.

Table 4 summarizes optimum preferences for each of the five variables. The general profile that emerges is:

- (1) Sixty-four respondents (33 percent) preferred the scenic vista depicted in illustration I. Among these were 40 from the Santiam Valley, 11 from Salem, 8 from Eugene, and 5 from Portland. Chi square tests confirmed community differences in preference for Situations I and II of scenic vista. Males significantly preferred Situation I as compared to females' preference for II (Scenic View). No other demographic characteristics significantly affected scenic preference.

In comparison with their visual perceptions, respondents were willing to trade-off some degradation of scenic surroundings for improved flood control.

Table 4
Optimum Environmental Preferences: \$2.00 Budget

| | Scenic View | | Water Recreation | | Camping and Recreation Park | | Floods | | Wilderness | |
|--|-------------------------|------|------------------|------|-----------------------------|------|--------|------|------------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| | ----- Situation I ----- | | | | | | | | | |
| TOTAL | 64 | (33) | 53 | (27) | 121 | (62) | 25 | (13) | 115 | (59) |
| <u>Community</u> | | | | | | | | | | |
| Salem | 11 | (46) | 11 | (46) | 15 | (62) | 3 | (12) | 18 | (75) |
| Eugene | 8 | (30) | 8 | (30) | 16 | (59) | 1 | (4) | 8 | (30) |
| Portland | 5 | (8) | 3 | (4) | 30 | (45) | -- | | 29 | (44) |
| Outer Santiam | 15 | (43) | 14 | (40) | 24 | (69) | 8 | (23) | 22 | (63) |
| Inner Santiam | 25 | (59) | 17 | (39) | 36 | (82) | 13 | (30) | 38 | (86) |
| <u>Sex</u> | | | | | | | | | | |
| Male | 36 | (35) | 31 | (30) | 64 | (62) | 13 | (13) | 57 | (55) |
| Female | 28 | (30) | 22 | (24) | 57 | (61) | 12 | (13) | 58 | (62) |
| <u>Age</u> | | | | | | | | | | |
| 18-25 | 10 | (38) | 7 | (27) | 18 | (69) | 6 | (23) | 21 | (81) |
| 26-35 | 17 | (38) | 13 | (29) | 30 | (67) | 5 | (11) | 31 | (69) |
| 36-50 | 13 | (25) | 10 | (19) | 27 | (51) | 5 | (9) | 29 | (55) |
| 51 and over | 24 | (33) | 23 | (32) | 46 | (64) | 9 | (12) | 34 | (47) |
| <u>Income</u> | | | | | | | | | | |
| \$0-\$6,000 | 13 | (30) | 12 | (28) | 23 | (53) | 4 | (9) | 27 | (63) |
| \$6,001-\$12,000 | 26 | (34) | 18 | (23) | 49 | (64) | 11 | (14) | 41 | (53) |
| \$12,001-\$20,000 | 18 | (32) | 17 | (30) | 41 | (73) | 8 | (14) | 37 | (66) |
| \$20,001 and over | 7 | (35) | 6 | (30) | 8 | (40) | 2 | (10) | 10 | (50) |
| <u>Education</u> | | | | | | | | | | |
| 8th grade/less | 2 | (15) | -- | | 10 | (77) | 1 | (8) | 5 | (38) |
| Some high school/ high school graduate | 35 | (36) | 25 | (25) | 61 | (62) | 14 | (14) | 59 | (60) |
| Technical school/ some college | 15 | (31) | 15 | (31) | 30 | (61) | 2 | (4) | 32 | (65) |
| College graduate/ post graduate | 12 | (33) | 13 | (36) | 20 | (55) | 8 | (22) | 19 | (53) |
| <u>Environmental Group</u> | | | | | | | | | | |
| Strong environ- mentalist | 20 | (30) | 20 | (30) | 43 | (65) | 8 | (12) | 45 | (68) |
| Moderate environ- mentalist | 26 | (37) | 21 | (30) | 45 | (63) | 11 | (15) | 41 | (58) |
| Weak environ- mentalist | 10 | (29) | 9 | (26) | 18 | (51) | 3 | (9) | 21 | (60) |
| Non-environ- mentalist | 8 | (33) | 3 | (12) | 15 | (62) | 3 | (12) | 8 | (12) |

Table 4. Continued

| | Scenic View | | Water Recreation | | Camping and Recreation Park | | Floods | | Wilderness | |
|----------------------------|--------------------------|------|------------------|------|-----------------------------|------|--------|------|------------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| | ----- Situation II ----- | | | | | | | | | |
| TOTAL | 82 | (42) | 112 | (57) | 45 | (23) | 85 | (43) | 50 | (26) |
| <u>Community</u> | | | | | | | | | | |
| Salem | 8 | (33) | 9 | (38) | 6 | (25) | 10 | (42) | 6 | (25) |
| Eugene | 12 | (44) | 16 | (59) | 3 | (11) | 9 | (38) | 10 | (37) |
| Portland | 34 | (52) | 49 | (74) | 21 | (32) | 26 | (39) | 18 | (27) |
| Outer Santiam | 14 | (40) | 16 | (46) | 10 | (29) | 20 | (57) | 12 | (34) |
| Inner Santiam | 14 | (32) | 22 | (50) | 5 | (11) | 20 | (45) | 4 | (9) |
| <u>Sex</u> | | | | | | | | | | |
| Male | 38 | (37) | 52 | (50) | 24 | (23) | 46 | (45) | 28 | (27) |
| Female | 44 | (47) | 60 | (64) | 21 | (23) | 39 | (42) | 22 | (24) |
| <u>Age</u> | | | | | | | | | | |
| 18-25 | 9 | (35) | 15 | (58) | 7 | (27) | 7 | (27) | 4 | (15) |
| 26-35 | 20 | (44) | 28 | (62) | 8 | (18) | 17 | (38) | 8 | (18) |
| 36-50 | 26 | (49) | 35 | (66) | 14 | (26) | 23 | (43) | 15 | (28) |
| 51 and over | 27 | (37) | 34 | (47) | 16 | (22) | 38 | (53) | 23 | (32) |
| <u>Income</u> | | | | | | | | | | |
| \$0-\$6,000 | 21 | (49) | 24 | (56) | 16 | (37) | 21 | (49) | 12 | (28) |
| \$6,001-\$12,000 | 28 | (36) | 44 | (57) | 14 | (18) | 36 | (47) | 19 | (25) |
| \$12,001-\$20,000 | 22 | (39) | 31 | (55) | 6 | (11) | 21 | (37) | 11 | (20) |
| \$20,001 and over | 11 | (55) | 13 | (65) | 9 | (45) | 7 | (35) | 8 | (40) |
| <u>Education</u> | | | | | | | | | | |
| 8th grade/less | 6 | (46) | 9 | (69) | 2 | (15) | 4 | (30) | 7 | (54) |
| Some high school/ | | | | | | | | | | |
| high school | | | | | | | | | | |
| graduate | 44 | (45) | 57 | (58) | 22 | (22) | 46 | (47) | 26 | (26) |
| Technical school/ | | | | | | | | | | |
| some college | 17 | (37) | 28 | (57) | 10 | (20) | 23 | (47) | 5 | (10) |
| College graduate/ | | | | | | | | | | |
| post graduate | 15 | (42) | 18 | (50) | 11 | (30) | 12 | (33) | 12 | (33) |
| <u>Environmental Group</u> | | | | | | | | | | |
| Strong environ- | | | | | | | | | | |
| mentalist | 36 | (55) | 35 | (53) | 15 | (23) | 26 | (39) | 16 | (24) |
| Moderate environ- | | | | | | | | | | |
| mentalist | 23 | (32) | 41 | (58) | 15 | (21) | 30 | (42) | 21 | (30) |
| Weak environ- | | | | | | | | | | |
| mentalist | 15 | (43) | 20 | (58) | 9 | (26) | 17 | (49) | 6 | (18) |
| Non-environ- | | | | | | | | | | |
| mentalist | 8 | (33) | 16 | (67) | 6 | (25) | 12 | (50) | 7 | (29) |

Table 4. Continued

| | Scenic View | | Water Recreation | | Camping and Recreation Park | | Floods | | Wilderness | |
|----------------------------|---------------------------|------|------------------|------|-----------------------------|------|--------|------|------------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| | ----- Situation III ----- | | | | | | | | | |
| TOTAL | 50 | (25) | 31 | (16) | 30 | (15) | 86 | (44) | 31 | (15) |
| <u>Community</u> | | | | | | | | | | |
| Salem | 5 | (24) | 4 | (17) | 3 | (13) | 11 | (46) | -- | |
| Eugene | 7 | (26) | 3 | (11) | 8 | (30) | 17 | (63) | 9 | (33) |
| Portland | 27 | (41) | 14 | (22) | 15 | (23) | 40 | (61) | 19 | (29) |
| Outer Santiam | 6 | (17) | 5 | (14) | 1 | (2) | 7 | (20) | 1 | (3) |
| Inner Santiam | 5 | (11) | 5 | (11) | 3 | (7) | 11 | (25) | 2 | (5) |
| <u>Sex</u> | | | | | | | | | | |
| Male | 29 | (28) | 20 | (20) | 15 | (15) | 44 | (42) | 18 | (18) |
| Female | 21 | (23) | 11 | (12) | 15 | (16) | 42 | (45) | 13 | (14) |
| <u>Age</u> | | | | | | | | | | |
| 18-25 | 7 | (27) | 4 | (15) | 1 | (4) | 13 | (50) | 1 | (4) |
| 26-35 | 8 | (28) | 4 | (9) | 7 | (15) | 23 | (51) | 6 | (13) |
| 36-50 | 14 | (26) | 8 | (15) | 12 | (23) | 25 | (48) | 9 | (17) |
| 51 and over | 21 | (30) | 15 | (21) | 10 | (12) | 25 | (35) | 15 | (21) |
| <u>Income</u> | | | | | | | | | | |
| \$0-\$6,000 | 9 | (21) | 7 | (26) | 4 | (10) | 18 | (42) | 4 | (9) |
| \$6,001-\$12,000 | 23 | (30) | 15 | (20) | 14 | (18) | 30 | (39) | 17 | (22) |
| \$12,001-\$20,000 | 16 | (29) | 8 | (15) | 9 | (16) | 27 | (49) | 8 | (14) |
| \$20,001 and over | 2 | (10) | 1 | (5) | 3 | (15) | 11 | (55) | 2 | (10) |
| <u>Education</u> | | | | | | | | | | |
| 8th grade/less | 5 | (39) | 4 | (31) | 1 | (8) | 8 | (62) | 1 | (8) |
| Some high school/ | | | | | | | | | | |
| high school | | | | | | | | | | |
| graduate | 19 | (19) | 16 | (17) | 15 | (16) | 38 | (39) | 13 | (14) |
| Technical school/ | | | | | | | | | | |
| some college | 17 | (34) | 6 | (12) | 9 | (19) | 24 | (49) | 12 | (25) |
| College graduate/ | | | | | | | | | | |
| post graduate | 9 | (25) | 5 | (14) | 5 | (15) | 16 | (45) | 5 | (14) |
| <u>Environmental Group</u> | | | | | | | | | | |
| Strong environ- | | | | | | | | | | |
| mentalist | 10 | (15) | 11 | (17) | 8 | (12) | 32 | (49) | 5 | (8) |
| Moderate environ- | | | | | | | | | | |
| mentalist | 22 | (31) | 9 | (12) | 11 | (16) | 30 | (43) | 9 | (12) |
| Weak environ- | | | | | | | | | | |
| mentalist | 10 | (28) | 6 | (16) | 8 | (23) | 15 | (42) | 8 | (22) |
| Non-environ- | | | | | | | | | | |
| mentalist | 8 | (34) | 5 | (21) | 3 | (13) | 9 | (38) | 9 | (59) |

- (2) Nearly 84 percent of respondents preferred the water recreational developments implied in Situations I or II. Differences were statistically significant among communities and other socio-economic groups. The choice for development of water recreational facilities was consistent with two other observations: a) a large percentage of respondents regularly participated in outdoor activities, and b) respondents generally visited nearby water recreational sites more often than the distant ones. Respondents did not want significant changes in perceived conditions.
- (3) For Camping and Recreation Park, 6 of every 10 respondents preferred Situation I and 84 percent preferred either Situation I or II. Respondents associated these illustrations with the historical Cascadia State Park. Their strong preferences to maintain the status quo implies that: 1) people do care for historical and cultural sites, as they had previously indicated, and 2) people preferred to have the park in their community. Thus, it was not surprising that respondents from Portland could care less about the existence of the Park. Differences in preferences for Situations I and II were significant among communities and income groups, but not the other socio-economic characteristics.
- (4) Respondents showed a strong preference to preserve wilderness areas surrounding the Santiam Valley. Eighty-five percent opted for Situations I and II. Differences in preferences were statistically significant among communities with 86 percent of the respondents from the Santiam Valley opting for Situation I compared to 30 percent from Eugene and 40 percent from Portland. In contrast, none from Salem and only 3 percent from the Inner Santiam opted for Situation III, compared to 33 percent from Portland and 29 percent from Eugene.
- (5) Although the Santiam Valley does not frequently flood, respondents strongly preferred safety from floods. Eighty-seven percent chose either Situation II or III. Chi square tests confirmed that community differences existed in preferences for Situations I and II for floods. While none from Portland and only 1 from Eugene opted for Situation I, 21 from Santiam Valley chose this situation. Residents of the Valley perceive flooding to be less serious than those residing downstream. Differences in preferences due to demographic characteristics were not statistically significant.

- (6) From the general profiles discussed above, the conclusion is that if the optimum preferences revealed in the constrained, simulated experiment are true indicators of demand, respondents prefer the following changes in natural environment in the Santiam Valley: a) safety from flood dangers, (b) preservation of historical Park and wilderness areas, and c) moderate development changes in water recreation facilities and scenic vista.

Summary and Conclusions

It is recognized that there are many variables and many values involved in environmental and aesthetic issues. We have considered a few variables which we considered important in this study. Our empirical findings show that differences in opinions on the proposed reservoir were statistically significant among communities, age groups, and environmental groups. The results indicate that the people living nearest the proposed development would be willing to put nondevelopmental aspects (especially preservation of a historical site, nonreplaceable wilderness areas and scenic landscape) before developmental aspects. However, those living further from the site prefer development if it provides increased flood control and water recreational benefits. Alternatives to dams and inundation as a means to control floods might enhance preferences for all.

Except for water recreation, preferences for different situations were not statistically significant among sexes, age groups, income groups, educational groups, and environmental groups. On the other hand, findings support the hypothesis that communities differ significantly in their preference for accepting environmental degradation. This finding has an important bearing on policy decisions related to development of natural resources. It raises the basic question: Who should be involved in decisions on the development of natural resources? The local community? Neighboring communities? The state as a whole? Users of natural resources?

Our findings suggest that: a) the direction of changes sought depends upon one's perception of prevailing conditions, and b) preferences are susceptible to alternation when alternative situations are presented. This latter point implies that attitude surveys, commonly used in arriving at public decisions, which do not offer alternative solutions may not reflect an individual's or a group's true preference.

Many communities face the problem of deciding upon proposals to construct dams, airports, canals, nuclear plants, and power plants. Bitter debate among different interest groups will evolve. In this atmosphere, understanding environmental preferences is vital for making correct decisions on future uses of our resources. Simulated market experiments provide a useful and reliable methodology that conceivably could be used to a) provide insights on environmental perceptions, b) chart the direction of changes desired by the people, c) identify different environmental goods that are potentially beneficial or critical in nature, and d) provide guidelines to preserve and protect environmental quality in the short run and the long run.

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