

CRATER LAKE NATIONAL PARK

SCENIC VALUES STUDY

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April 1999

NATIONAL PARK SERVICE
WATER RESOURCE DIVISION
FORT COLLINS, COLORADO
RESOURCE ROOM #1100

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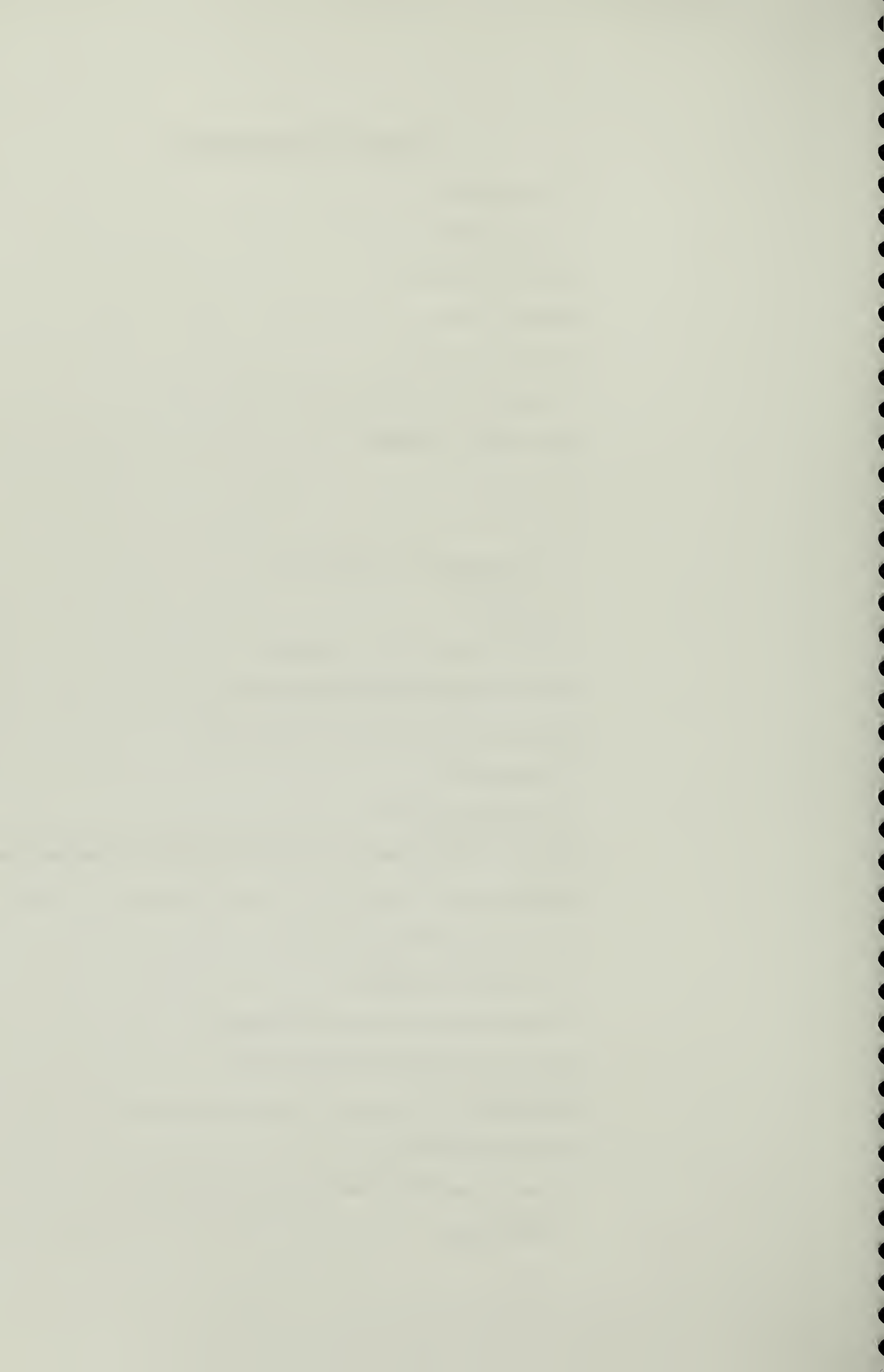


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TABLE OF CONTENTS

LIST OF TABLES	4
LIST OF FIGURES	5
EXECUTIVE SUMMARY.....	6
INTRODUCTION.....	8
HISTORICAL BACKGROUND	8
SCENIC QUALITY & VISUAL SIMULATION RESEARCH	10
OBJECTIVES & METHODS.....	13
STUDY PURPOSE	13
METHODS	14
<i>Study Participants & Survey Instrument.....</i>	<i>14</i>
<i>Data Collection.....</i>	<i>15</i>
<i>Lake Views, Image Choice and Calibration.....</i>	<i>17</i>
RESULTS: VISITOR CHARACTERISTICS.....	23
REPRESENTATIVENESS OF THE VISITOR CENTER SAMPLE	23
<i>Compliance Rates</i>	<i>25</i>
<i>Reasons for Non-compliance</i>	<i>25</i>
RESULTS: VISITOR PREFERENCES AND ATTITUDES TOWARD LAKE	
LEVELS.....	26
VISUAL PREFERENCES FOR LAKE LEVELS	26
<i>Mean Responses to Slide Pairs</i>	<i>26</i>
<i>The Mean Number of Times a View was Preferred.....</i>	<i>33</i>
ATTITUDES TOWARD USE OF CRATER LAKE WATER	35
CONCLUSIONS	38
LAKE LEVEL PREFERENCES	38
ATTITUDES TOWARD HUMAN USES OF CRATER LAKE WATER	39
<i>Visitor Comments</i>	<i>40</i>



REFERENCES.....	41
APPENDIX A.....	45
VISITOR CENTER AESTHETIC PREFERENCE SURVEY	46
APPENDIX B	51
RIM VILLAGE SAMPLE SURVEY	52
APPENDIX C.....	54
VISITOR SURVEY INSTRUCTIONS	55
APPENDIX D.....	57
VISITOR COMMENTS	58
TREATMENT GROUP 1 COMMENTS	58
TREATMENT GROUP 2 COMMENTS	61
TREATMENT GROUP 3 COMMENTS	64
TREATMENT GROUP 4 COMMENTS	66
APPENDIX E	69
CALENDAR OF SAMPLING DATES	70
APPENDIX F	71
SOCIAL & ECONOMIC COMPARISONS BETWEEN SAMPLE GROUPS.....	72
APPENDIX G.....	73
SLIDE IMAGE COPIES	73

LIST OF TABLES

Table 1.1 Slide Set Format.....	20
Table 3.1 View Preferences.....	34
Table F.1 Participant Characteristics.....	72
Table F.2 Participant Annual Household Income Levels.....	72
Table F.3 Participant Educational Background.....	72

LIST OF FIGURES

Figure 1.1 Location of Study Viewpoints.....	18
Figure 3.1 View 1 Rim Village.....	27
Figure 3.2 View 2 Discovery Point.....	27
Figure 3.3 View 3 Merriam Point.....	27
Figure 3.4 View 1 Rim Village.....	29
Figure 3.5 View 2 Discovery Point.....	29
Figure 3.6 View 3 Merriam Point.....	29
Figure 3.7 View 1 Rim Village.....	30
Figure 3.8 View 2 Discovery Point.....	30
Figure 3.9 View 3 Merriam Point.....	30
Figure 3.10 View 1 Rim Village.....	32
Figure 3.11 View 2 Discovery Point.....	32
Figure 3.12 View 3 Merriam Point.....	32
Figure 3.13 Visitor Attitudes Toward Use of Crater Lake Water.....	37

EXECUTIVE SUMMARY

Study Purpose

As part of the water rights adjudication process in Oregon's Klamath Basin, the National Park Service requested researchers at Oregon State University to develop a study of the scenic value of Crater Lake, and whether visitors' scenic evaluations change with changing water levels. As part of the National Park Service's mandate to preserve the natural values of the Park, the National Park Service is concerned about preserving the scenic quality of the park for current and future generations. Previous research has demonstrated that people's scenic preferences are affected by their knowledge of natural and human influence (Carls 1974; Hodgson and Thayer 1980; Anderson 1981; Amadeo, Pitt and Zube 1989). This survey was designed to assess whether visitors' enjoyment of scenery would be affected by changes in lake levels and to measure their attitudes toward potential causes of lake level change.

Visitor Sample

During the summer season of 1996 a random sample of 1168 visitors at Crater Lake National Park completed an on-site survey. The survey instrument involved gathering information from visitors regarding their visual preferences for lake vistas as well as exploring their attitudes toward human uses of the water in Crater Lake. The response rate for the scenic preference survey at the Visitor Center was 83%. Participants in the Visitor Center study were compared to visitors at selected overlook points on the rim of Crater Lake, and it was determined that characteristics of visitors at the two sites were not substantially different. Therefore,

researchers concluded that visitors sampled at the Visitor Center were highly typical of all visitors to Crater Lake National Park.

Visitor Preferences for Lake Levels

Results of the visual preference survey indicated that participants consistently preferred views of the lake level that reflect Crater Lake in its present state. This was true when visitors had no information about the slides they were viewing, and was more pronounced when visitors were told that the views depicted alternative lake levels. When mean responses to individual slide pairs were analyzed, those which specified human use of Crater Lake water were rated more negatively.

Visitor Attitudes Toward Crater Lake Water Use

Visitors were asked a series of questions regarding alternative human uses of Crater Lake water. The attitudes of study participants in regard to use of Crater Lake water are decidedly against human uses. Commercial, industrial, park visitor, and general human use were opposed by over three-fourths of the respondents in the study. While some of the uses (e.g. industrial use) were viewed more negatively than others (e.g. geothermal use), none of the uses presented were considered acceptable by more than 14% of respondents.

Both in their visual preferences and attitudes, visitors had a negative reaction to water withdrawals from Crater Lake. Even when no information about the reasons for changing lake levels was presented, visitors consistently preferred the higher lake levels shown. From the results of this study, it can be concluded that lowering lake levels at Crater Lake would negatively affect people's perceptions of the aesthetic and scenic quality of the lake.

INTRODUCTION

Outstanding scenic resources are the primary attraction at Crater Lake National Park. People travel from around the world to view the immense caldera and deep blue water of the lake. As part of its mandate to preserve the natural condition of the park, the National Park Service is concerned about preserving the scenic quality of Crater Lake for future generations. This study investigated whether changing lake levels would affect visitors' perceptions of the scenic value of Crater Lake.

Historical Background

Recognition of Crater Lake as a scenic resource is long standing. Reports of the first white explorers' visit to Crater Lake in 1853 account their amazement at the water's scenic beauty, which they first named "Deep Blue Lake." By the late 19th Century, Crater Lake was recognized as a site of national importance due in part to its scenic value (Cranson 1982).

By the late 1800's, increased appreciation for the nation's natural wonders involved both scenic and commercial values, creating conflicts over the preservation and use of national scenic treasures (Nash 1968). For example, in response to the conflict between commercial and preservation value, the federal government protected the natural wonders in northwest Wyoming by creating Yellowstone National Park in 1872. The enabling legislation of Yellowstone National Park included provisions for the preservation of the natural setting, insuring "their retention in their natural condition."

Efforts aimed at preserving Crater Lake had developed by the 1880's, with petitions appealing to President Cleveland for protection of

the area as a public park. In 1886, Cleveland temporarily withdrew from the public domain ten townships of land surrounding Crater Lake, “pending legislation looking to the creation of a public park which shall embrace Crater Lake.” In 1902, President Theodore Roosevelt signed a bill into law that designated Crater Lake National Park.

In establishing the National Park Service in the Organic Act of 1916, Congress made clear the fundamental purpose of the parks was to conserve scenery and natural and historic objects. The Park Service was called to

promote and regulate the use of the Federal areas known as national parks... by such means and measures as conform to the fundamental purpose of said parks...which purpose is to conserve the scenery and the natural and historic objects... therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

16 USC 1

The Organic Act of 1916 also reaffirmed the importance of providing for the use and enjoyment of park visitors as well as the preservation of park resources. The centrality of scenic opportunities at Crater Lake is illustrated in the fact that by 1918, a road had been completed around the rim of the lake for visitors to travel. Providing scenic opportunities for park visitors has remained one of the primary tasks of the National Park Service.

Scenic Quality & Visual Simulation Research

Research in the 1990's indicates that *viewing scenery* is the most common recreational activity of people in the United States. The 1990 Federal Resource Planning Act *Program Update* (Galliano, et al. 1995) reported that 21% of the population participated in some form of viewing natural landscapes. Such high levels of participation in viewing scenery

suggest the importance of high quality scenic vistas, particularly as more leisure opportunities compete for people's free time.

Studying people's perceptions of natural settings becomes especially important when management decisions have potential impact on scenic views (Bishop and Leahy 1989). For example, understanding the visual impact of pollution haze at Grand Canyon National Park has been a concern for the National Park Service (Malm, et al. 1981). Indeed, Hodgson & Thayer (1980) noted that even implied human influence on a natural setting can reduce the perceived scenic quality of a natural landscape. Similarly, Anderson (1981) found that scenic quality ratings were consistently reduced when information was given to people suggesting the presence of human impacts, particularly in areas of resource extraction such as logging and mining. From these studies, it becomes clear that the favorability of scenic judgments can be heavily influenced by the natural quality of a vista. For land managers and policy makers, understanding the nature of the public's impressions of managed and natural landscapes has become an important part of making management decisions which are compatible with the scenic values of the public they serve (Magill 1992).

Exploring human responses to scenic changes has often involved simulating interaction with natural landscapes through artist impressions and photographic images (Daniel, et al. 1973; Daniel and Boster 1976; Shuttleworth 1980; Zube, et al. 1987; Magill 1990; Magill 1994; Williams and Patterson 1994). The use of visual representations in the evaluation of natural resources has become increasingly commonplace in the study of human perceptions of natural settings throughout the last three decades (Leopold 1969; Calvin, et al. 1972; Cook 1972). Repeated studies indicate that visual representations are valid substitutes for the human experience of a natural setting, such as wilderness campsites or roadside

scenic viewpoints (Stewart, et al. 1984; Shelby and Harris 1985; Zube, et al. 1987; Bateson and Hui 1992).

Visual assessment techniques have been utilized by researchers within the National Park Service setting for studying visitor perceptions and reactions to environmental conditions (Manning and Lime 1995). Visual perception studies have most commonly considered park air quality and visibility (Malm et al. 1981; Burdge, et al. 1983; MacFarland, Malm and Molenaar 1983; Rowe and Chesnut 1983), and crowding (Hof, et al. 1994). Taylor (1995) involved Rocky Mountain National Park visitors in a study of scenic preferences in which cameras were supplied to participants. Of all photographs taken by participants, water and scenic vistas were the most commonly photographed landscape elements. Scenic beauty evaluations have also been the focus of visual research with park visitors (Call, et al. 1981; Steinitz 1990). Studies of scenic beauty are often focused on the attitudes and perceptions of park visitors (Bromley 1980), particularly regarding potential changes in the visual resources in the park system (Johnson and Haspel 1983).

An advantage in using visual simulations of a particular natural scene rests in the ability of the researcher to standardize what the participants evaluate. Since each national park visitor may have a different interaction with a particular view, the control of potential confounding variables (e.g. air quality, weather, lighting, time of day, and season) is made more manageable.

Over the last decade, evaluative efforts involving scenic quality have focused on the development of computer aided techniques for simulating scaled changes in scenic views (Sime 1986; Orland 1988; Orland 1993). The increased availability of powerful computers and graphic software has given investigators the ability to create computer-generated visual depictions of environmental changes which are highly

realistic and accurate in terms of scale. The successful use of photographic depictions has made the utilization of visual images in studying scenic beauty a commonly employed approach in the resource management field (Orland and Daniel 1994; Orland, et al. 1996).

OBJECTIVES & METHODS

Study Purpose

As part of the water rights adjudication process in the Klamath Basin, the National Park Service requested a study of the scenic value of Crater Lake, and whether scenic value changes when water levels change. Oregon State University responded with a survey of Crater Lake visitors during the summer of 1996 to assess visitors' scenic values of the lake and their attitudes regarding water level changes. The objective of this study was to explore the effects of lake level changes on visitors' evaluations of lake views. The first part of the investigation involved determining if visitors would discern lake levels which were lower than average when they viewed photographs of the lake. Subsequently, the effects of lowered lake levels on visitors' evaluations of the scenic quality of the lake was examined, using computer generated images of Crater Lake depicting lowered water levels. The effects of information on visitors' scenic judgments were also investigated.

The second part of the study researched visitor attitudes toward uses of the Crater Lake water resource for purposes other than aesthetic reasons, that is, whether potential water withdrawals for human use could impact visitors' perceptions of the lake. Therefore, a goal of this study was to describe people's attitudes toward human uses of Crater Lake water. If those attitudes are negative, they could negatively influence visitors' perceptions of the scenic value of the lake. As noted earlier, previous research has indicated that implied human influence on natural resources can influence people's scenic evaluations of those resources. Therefore, visitor attitudes toward general human use of the water were explored as part of the study. Participants were asked to evaluate alternative uses of the water in the lake including industrial, agricultural,

domestic, geothermal, commercial, municipal, hydropower, park visitor, and general human use.

A final part of the survey assessed visitors' socioeconomic and trip characteristics. These variables were measured to check for representativeness of the study sample, and as possible variables that interact with visitor preferences and attitudes.

Methods

Scenic preferences were measured by showing paired slides to park visitors which depicted varying lake levels. The image sets used in the study were created using computer digitized photographs of Crater Lake manipulated to reflect changes in the levels of the lake. A survey was designed to measure visitors' evaluations of these image sets and to identify the factors contributing to people's scenic preferences.

Study Participants & Survey Instrument

Individuals participating in the study were visitors to Crater Lake National Park during the summer season of 1996. The study sample was comprised of 1168 park visitors.

An on-site visitor survey was developed for gathering information from park visitors on their scenic preferences for Crater Lake vistas as well as their attitudes toward park resources. This type of cross-sectional survey provides a description of a population at a single point in time from which observations and inferences can be drawn.

A pre-test of the survey instrument was conducted during the winter of 1996 utilizing students at Oregon State University, and again in July with visitors at Crater Lake National Park. From information gathered in these pretests, refinements were made in the photographic images, and

experimental design of the study. For example, adjustments were made to ensure the color balance and saturation in the computer-generated slide images. During the pre-tests, researchers also realized the importance of obtaining the same focal length of slide projector lenses for the two projectors used in the study.

Data Collection

Principal data collection for the study commenced on August 11 and concluded on September 14, 1996. The time frame for the survey included 16 randomly selected days for data collection. The Visitor Center at park headquarters (The Steele Center) and the area along the rim at Rim Village served as data collection sites. The scenic preference portion of the study was conducted in the auditorium at the Visitor Center. Administration of this part of the survey occurred between the hourly showing of an interpretive video. A total of 958 visitors participated in the Visitor Center portion of the study. A shorter visitor survey was conducted among visitors along the rim walkway at Rim Village with 210 visitors participating. The purpose of this more limited survey was to gather socio-economic and visitation data from individuals at the Rim to determine if the people participating in the survey at the Visitor Center were representative of all visitors to Crater Lake National Park.

From information provided by Park Service managers, it was resolved that sampling evenly throughout the day would give the best representation of daily visit distribution since no specific visitation frequencies were available for the current Visitor Center location (the last visitor studies were conducted before 1988 when the current interpretive center location was established). Hourly sampling of visitors began at 10:00 a.m. and concluded at 4:00 p.m. The scheduling of data collection was also designed to reflect the distribution of visitors during the park's high and low seasons. The sampling framework reflects this distribution,

with 80% of the data collection happening during the high season (before Labor Day) and 20% during the low season (after Labor Day). While sampling dates were determined randomly, each day of the week was represented at least once during the data collection. A calendar of sampling dates has been included in Appendix E.

Visitors at the interpretive center were requested to participate in the study through two means. An invitation was made to visitors at the conclusion of the 18-minute interpretive video. Visitors were also invited to participate in the study through a general announcement in the Visitor Center lobby. Both invitations explained that information gained in the study would aid Park Service managers by providing them with valuable information about visitors' attitudes toward Crater Lake National Park resources. In addition, the researcher explained that the study took approximately 20 minutes to complete. A participation incentive was offered to visitors in the form of a photographic viewbook of Crater Lake, *The Story Behind the Scenery* (Warfield, et al. 1996). Participants were assured verbally and in written form that their responses were completely voluntary and confidential. Participation in all parts of the study was limited to individuals who were 18 years of age and older.

Visitors in the Rim Village sample were approached individually by the study research assistant. During randomized sampling periods, participants were selected by the researcher approaching every other group that passed along the rim walk at Rim Village. The sampling area included the walk down to the Sinnott Overlook. Each group encountered using this sampling technique was invited to participate in a voluntary visitor study. No incentive was offered to visitors for this portion of the study. The total time used by visitors in filling out the Rim survey was approximately one minute. Visitors in the Rim Village sample were assured both verbally and on the survey form that the information they

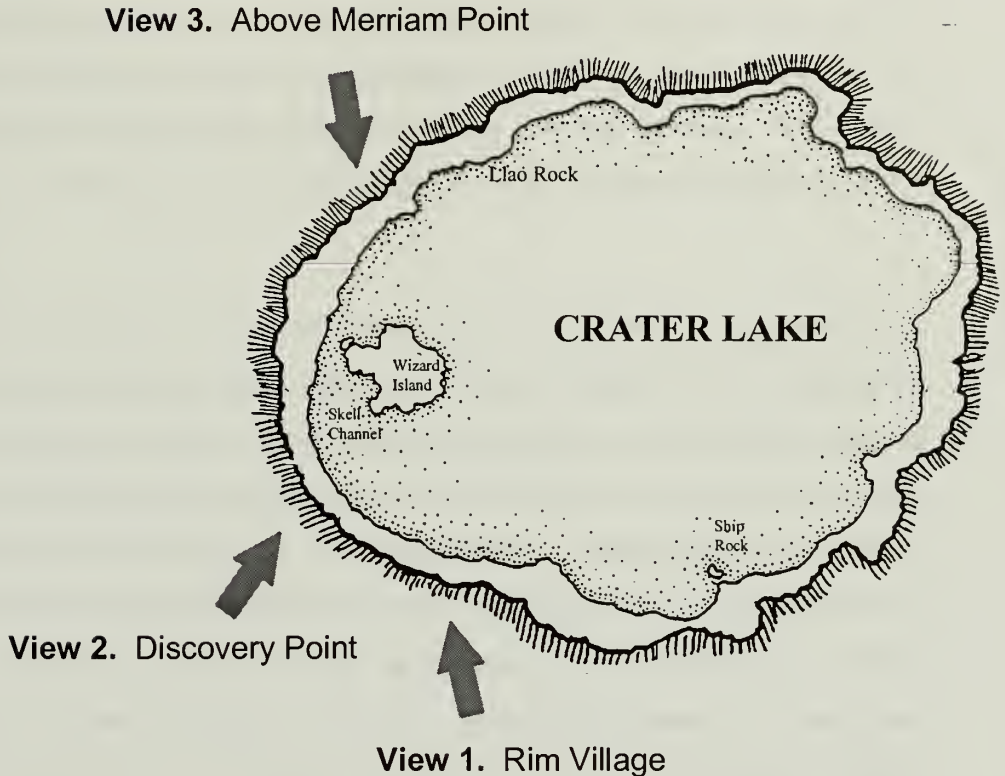
provided would be used only for research purposes and that their responses were anonymous and confidential.

Lake Views, Image Choice and Calibration

From a previous study of visitor traffic patterns at Crater Lake (Shelby and Wolf 1981), it was observed that 76% of visitors travel along the route between Rim Village and the northwestern corner of Crater Lake. Further, the report indicated that 90% of park vehicle traffic passed park headquarters at the Steele Center (the site of the present visitor center). This information was corroborated by present Park Service managers, who indicated that a large number of visitors enter from the south and then exit through the north, or vice versa. The most regularly traveled segments of Rim Drive were taken into consideration when selecting which viewpoints to use in the study.

Three images were chosen for the study representing commonly visited viewpoints of Crater Lake on the route along the lake's western rim (Figure 1.1). Common to all views was the presence of Wizard Island, a partially forested, 764 ft. cinder cone rising from the central-western side

Figure 1.1 Location of Study Viewpoints



of the lake. The first view faces north from Rim Village toward Lao Rock. The second view faces northeast from Discovery Point toward Lao Rock. From above Merriam Point, the third view faces south toward Rim Village at the northwestern edge of the rim. All three views have Wizard Island placed in the foreground. The viewpoints from Rim Village and Merriam Point are both 1.5 miles from the nearest shore of Wizard Island while the view from Discovery Point is 1 mile distant from the shore of the island. Slides taken from Merriam Point and Rim Village have prominent views of Skell Channel between Wizard Island and the caldera wall (channel water depth 20 feet at the time of slide exposure). The image from Discovery Point (View 2) does not show Skell Channel. These rim views are at an elevation of approximately 7100 feet over sea level, placing them just

under 1000 feet above the level of the lake. At the time the slides were taken, the elevation of the lake surface was 6168 feet. Crater Lake limnological studies (Redmond 1993) show that the historical variability of Crater Lake levels have ranged from approximately 3 meters below and 2 meters above the lake level on September 5, 1995. A mean of 6,175 feet has been established for the lake level over the last century. Therefore, the level of 6168 feet used in this study is within typical fluctuations of the lake level.

Slide exposures used in the study were taken on September 5, 1995 between 10:00 a.m. and 2:00 p.m. A Nikon N5005 with a 28-200mm Tamron lens was fixed on a high-angle Gitzo tripod. Velvia professional slide film was used for the images. After the slides were processed they were digitized and placed in CD-Rom format. Images in the CD-Rom were formatted at a high resolution (1536 X 1024 pixels) with a 24-bit color depth. Digitized versions of the lake views were edited with Adobe Photoshop software (Version 3) on a Macintosh PowerPC computer. Adobe Photoshop is a commonly utilized software for creating images reflecting environmental changes (Orland et al. 1996). Consultants in the creation of the image sets included an oceanographer (Dr. Robert Collier) and an aquatic biologist (Dr. Gary Larson) who are members of the faculty of Oregon State University involved in the lake research program at Crater Lake. Additionally, a computer graphic artist (Sandy Arbogast) was involved in the creation and editing of the image sets.

The elevation of Wizard Island and the contours surrounding the island were used as scale references in the creation of images reflecting lake levels dropping to 25, 75 and 125 feet below the original level shown in photos from September 5, 1995. Lake level changes were determined by using the height of Wizard Island as a reference point against the numeric scale on the top and bottom of the workspace in Adobe

Photoshop. Information regarding the bathymetric contours surrounding Wizard Island was used in combination with the known height of the island to determine the vertical change in lake level as well as change in shoreline on the island.

The three lake level changes were chosen after the pre-test of the survey showed the extent to which people noticed changes in lake levels. A 25 foot drop in lake level was generally not noticed in the pre-test, while most pre-test respondents noticed a 125 foot drop. Therefore, these levels became the low and high endpoints to be considered. No images taken from the surface of the lake were included in the study because the scale of changes up to 125 feet did not lend themselves to available surface-level images. Park managers also noted that only 5% of Crater Lake visitors walked down to the lake level for a boat ride. Therefore, researchers decided to use images taken from the elevation of Rim Drive, where the majority of park visitors view the lake.

The following table shows the arrangement of all slide views created for the study.

Table 1.1 Slide Set Format

Slide View 1 Rim Village	Slide View 2 Discovery Point	Slide View 3 Merriam Point
1. Average level	1. Average level	1. Average level
2. - 25 feet	2. - 25 feet	2. - 25 feet
3. - 75 feet	3. - 75 feet	3. - 75 feet
4. - 125 feet	4. - 125 feet	4. - 125 feet

Instructions to the respondents for the scenic preference portion of the survey are provided in Appendix C. The slide presentation format during data collection was organized so that each slide within the three

views was paired with the other slides in the same view set. For example, the slide showing the original lake level in View 1 was paired with every other level in the View 1 slide set, the -25 level slide was paired with -75 and -125, and the -75 level was paired with -125 (a total of 6 pairs). Analogous pairings were done for the View 2 and View 3 slide sets, resulting in 18 slide pair combinations.

Visitors were instructed to provide two pieces of information for each slide pair they viewed. First, they were asked if they saw a difference between the two views. Second, they were asked to indicate their preference for one view over the other. The right and left position of lower and higher lake levels was varied throughout the 18 slide pairs. The order of the slide pairs was also randomly changed between survey sessions. As part of the instructions (Appendix C), study participants were asked to rate the scenic quality of the view in the slides, not the slides' quality. Scenic preference was measured on a 5-point categorical scale: strongly prefer the left, prefer the left, no preference, prefer the right or strongly prefer the right. Each slide pair was shown for 20 seconds. After the slide portion of the survey, visitors were instructed to fill out the rest of the survey at their own pace. Assurances of the confidential and voluntary nature of the survey were made at the beginning and conclusion of the survey session. This agreement with survey participants was also written in the text of the survey instrument itself.

The effects of information on visitors' scenic judgments of the slide sets were also investigated. Respondents were randomly allocated to treatment groups throughout the sampling period and each group was exposed to a different amount of information about the slides they were rating. The first treatment group received no information about the fact that lake levels were changing in the slides they were rating. The second treatment group received verbal information which alerted them to the

changing lake levels (with no explanation of why the level was dropping). The third and fourth groups viewed slides that were labeled with the change in lake level in feet, as well as the reason for the change. The third group's labels stated that lake levels were changing due to "natural variation," while the fourth group's labels stated "lake level [25, 75, 125] feet lower due to human uses of lake water." Groups 2-4, therefore, knew that they were rating their visual preferences for alternative lake levels, while the first group knew only that they were rating their visual preferences for different slides of Crater Lake. From comments during the pretest as well as comments from on-site study participants, it became clear that many in the first treatment group probably realized after a few slide pairs were shown that they were rating different lake levels, but this was never explicitly stated by the interviewer.

RESULTS: VISITOR CHARACTERISTICS

Representativeness of the Visitor Center Sample

The strength of the inferences researchers are able to draw from a sample of a population is dependent on the representative nature of that sample. In this study, we examined the representative nature of the sample taken at the Visitor Center to determine whether the Visitor Center population is a good representation of all Crater Lake visitors.

In order to test the representativeness of Visitor Center respondents, they were compared to a random sample of visitors contacted at Rim Village during the study. First there was evidence that most visitors travel along the north-south route in the park. Based on this knowledge, it was assumed that most visitors travel near Rim Village and are likely to stop there. Concession services, Crater Lake Lodge, and an interpretive center make Rim Village the focal point of the park. Information in Shelby's 1981 study indicated that 90% of traffic coming into the park from the south entrance goes through Rim Village. The report also indicated that 74% of traffic coming from the north entrance continues to Rim Village. A large percentage of visitors to Crater Lake are likely to drive to Rim Village at some point while in the park. With this in mind, the most representative sample of visitors to Crater Lake would likely be found at Rim Village. For this study, a second survey, mostly focusing on socio-economic data, was conducted among visitors to Crater Lake at Rim Village. The socio-economic characteristics of the Rim Village sample were then compared to the Visitor Center sample.

Results indicate that in most respects the two samples were not significantly different from each other ($p < .05$). Percent male/female, average age, and income level were not significantly different, while level

of education was slightly different (the main difference was that a higher percentage of Visitor Center respondents had more than high school education). The two groups were not significantly different in terms of whether this was their first trip to Crater Lake, or whether Crater Lake was the primary destination of their trip. They did live different distances from Crater Lake, with Rim Village respondents reporting a mean of 836 miles and Visitor Center respondents 1105 miles. However, both of these distances represent a substantial distance from the Park. Our conclusion is that although statistical results from the sample at the Visitor Center can technically only be extrapolated to the Visitor Center population, we expect all Crater Lake visitors to have substantially similar socioeconomic characteristics as those who stop at the Visitor Center. Detailed results for visitor and trip characteristics are presented in Appendix F.

The second issue involving the study sample is whether the sample of Visitor Center respondents represents the population of people who stop at the Visitor Center. Since the characteristics of the overall population are not known, it is impossible to determine whether the study's sample represents the total population. However, by designing a random sampling strategy, estimates of the population parameters can be made with a certain statistical degree of confidence. With survey sampling, however, there is also the issue of nonresponse bias. Within our statistical sample some people chose not to participate in the survey. If those nonrespondents are "random," then we wouldn't expect any bias in the results. But if the nonrespondents are systematically different than the respondents, then our results would be biased. Again, without knowing the population characteristics, we cannot know whether our sample is biased, but we can rely on a high response rate to minimize the likelihood of nonresponse bias.

Compliance Rates

The total compliance rate for the Visitor Center portion of the survey was 83%. Other studies on-site at national parks and protected areas have obtained similar response rates of 81%-85% (Lee and Brown 1992; Hall and Shelby 1994; Hall and Shelby 1996; Hall, Dedrick and Shelby 1997). Considering the time requirement of the survey (20-25 minutes) and the average amount of time spent in the park (less than 4 hours as estimated by Park Service managers), the percentage of visitors assenting to the request to participate in the study was high. The compliance rate for the survey at Rim Village was even greater at 99%.

Reasons for Non-compliance

In order to understand any reasons people may have had for not participating in the study, a sample of 40 individuals (17% of the total number of non-compliance) who were asked to participate in the study but declined were interviewed briefly by the researcher. Results from this sample suggested two primary reasons for not participating in the survey. The visitors often reported that they had young children with them and generally felt the children would not be able to sit through the 20 minute survey. Other non-compliant visitors explained they were simply in a hurry to see the lake. Since no socio-economic or visitation data was collected from these individuals, a check for non-response bias in the Visitor Center survey was not possible. However, the relatively small number of non-respondents would tend to minimize any bias that might be present in the study. Indeed, Borg (1971) noted that if a sample attains at least an 80% response rate, the potential for nonresponse bias to be sufficiently great to alter the results is highly unlikely.

RESULTS: VISITOR PREFERENCES AND ATTITUDES TOWARD LAKE LEVELS

Visual Preferences for Lake Levels

The results from the paired slide comparisons can be analyzed in two different ways. One is to analyze the mean response to any of the slide pairs. The other is to analyze the mean number of times that any given slide was preferred to all the other comparator slides in the study.

Mean Responses to Slide Pairs

The data collected in the survey were recoded so that all higher lake levels corresponded to those on the left screen for the respondent.¹ If the respondent stated that they preferred or strongly preferred the higher lake level, their response would be coded as -1 or -2, respectively. If they preferred or strongly preferred the lower lake level, their response would be coded as +1 or +2, respectively. If they stated that they preferred neither, their response was coded as a zero. The null hypothesis was that there was no preference for higher or lower lake levels (mean response = 0), and a t-test was used to assess whether mean responses were significantly different from zero.

As discussed in the methodology section, the respondents were randomly divided into different treatment groups. Figures 3.1 through 3.3 show the mean responses for each pair of slides in the first treatment group. In all cases the mean response is negative, meaning that on

¹ Recall that lower and higher lake levels were randomly assigned to the left and right screens during the interview process. An example of the recoding would be for a lower lake level that was presented on the right screen with the response of preferring the right to be recoded to show the lower lake level on the left and the respondent preferring the left.

Figure 3.1 View 1 (Rim Village)

No Information on Lake Levels

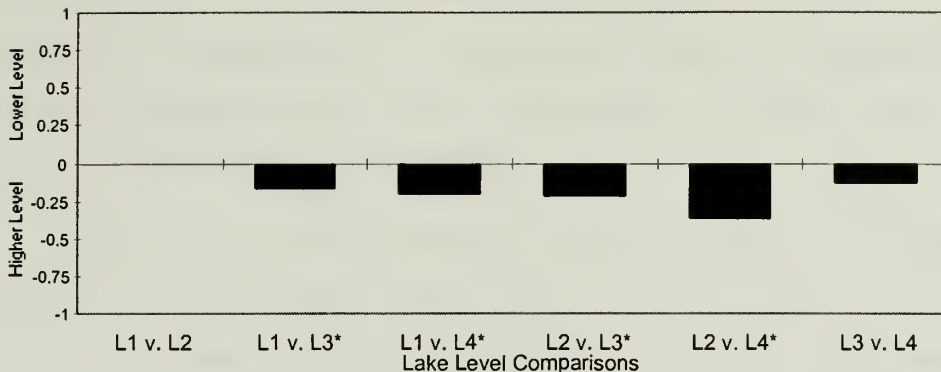


Figure 3.2 View 2 (Discovery Point)

No Information on Lake Levels

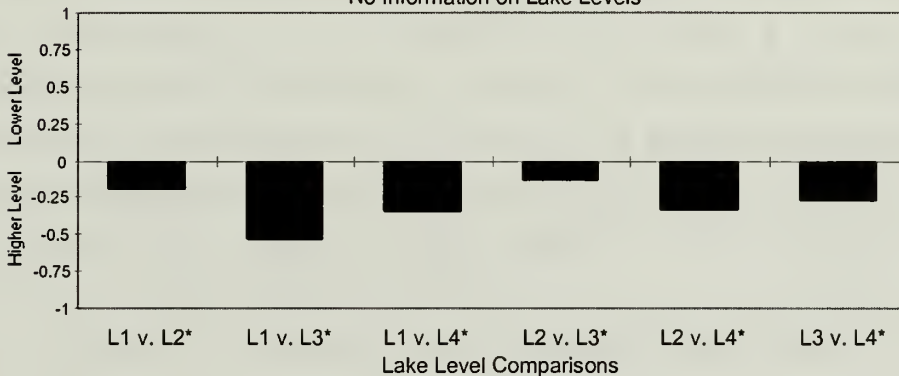
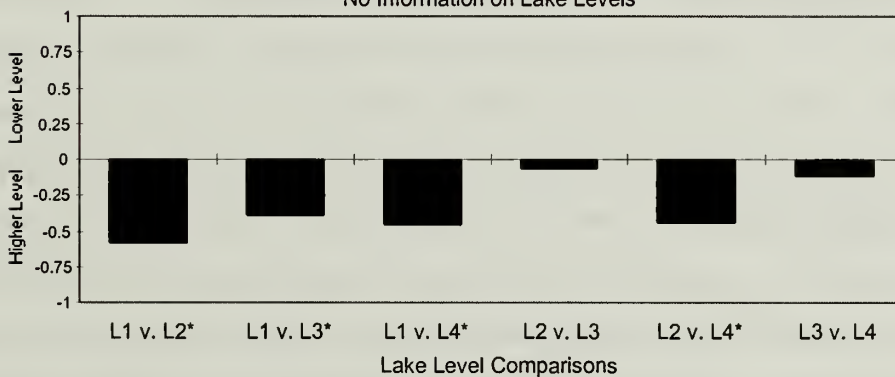


Figure 3.3 View 3 (Merriam Point)

No Information on Lake Levels



* denotes statistically significant difference ($p < .05$)

average, respondents preferred the higher lake levels. In 14 of the 18 cases the results are significantly different from zero ($p < .05$). All of the nonsignificant results are for comparisons of lake levels *adjacent* to each other, i.e., average level (L1) vs. -25 feet (L2), -25 feet (L2) vs. -75 feet (L3), -75 feet (L3) vs. -125 feet (L4).

Four of the ratings without information were not significantly different from each other. These were: L1 v. L2 in View 1, L3 v. L4 in View 1 and View 3, and L2 v. L3 in View 3. In these cases, we cannot say with 95% confidence that visitors preferred the higher lake level. However, note that all comparisons are significantly different in at least one of the views (L1 v. L2 is significant for View 2 & 3, L2 v. L3 is significant for View 1 and View 3, and L2 v. L3 is significant for View 2). Therefore, since visitors see the lake from all of these viewpoints, they would perceive the difference in lake levels from at least one of the viewpoints and would prefer the higher level.

Figures 3.4 - 3.6 show the mean responses from treatment group 2 in which participants received verbal information telling them that some of the slides depicted lowered lake levels in Crater Lake (see instructions in Appendix C). Consistent with treatment group 1, these results are also all negative showing a preference for higher lake levels. In 17 of the 18 cases the results are significantly different from zero ($p < .05$). The only nonsignificant result is the comparison of the original lake level with the minus 25 feet level in View 1. In all cases, the mean responses for treatment 2 are more negative than those for treatment 1. Using a paired t-test to see if the means across treatments are equal showed that only 5 of those differences are statistically significant ($p < .05$). Significantly more negative responses for treatment 2 would indicate that verbal information describing the lake levels had affected respondents' preferences. In most cases, the information did not have a significant effect.

Figure 3.4 View 1 (Rim Village)

Verbal Information

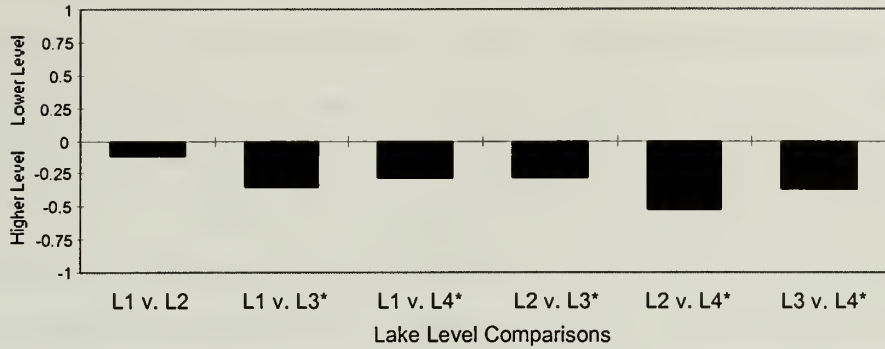


Figure 3.5 View 2 (Discovery Point)

Verbal Information

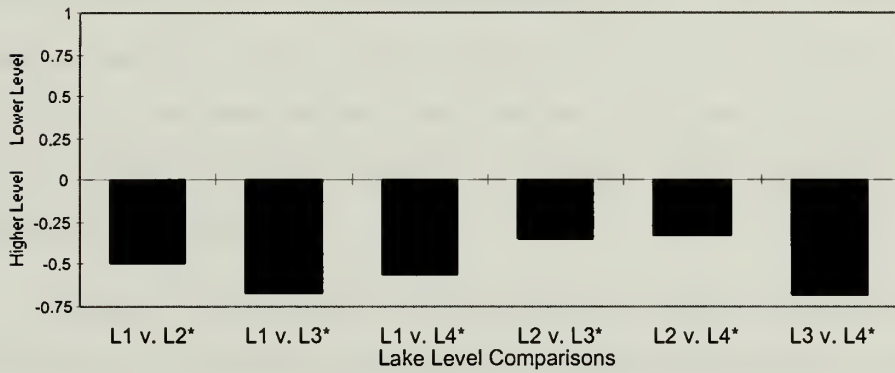
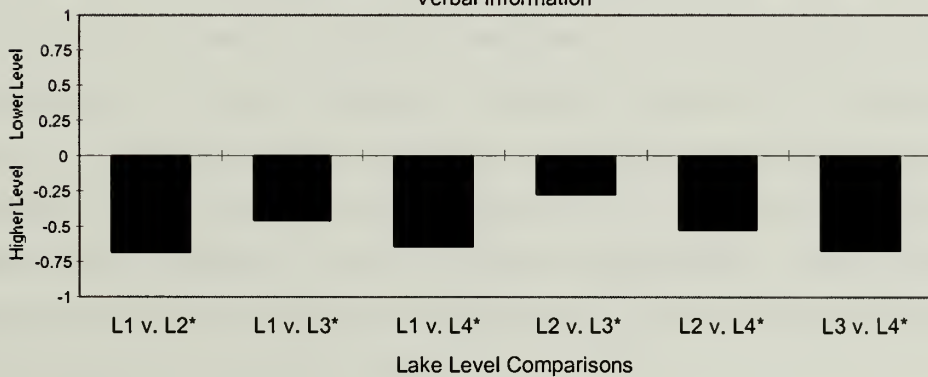


Figure 3.6 View 3 (Merriam Point)

Verbal Information



* denotes statistically significant difference ($p < .05$)

Figures 3.7 through 3.9 show the mean responses from treatment 3 which had slides labeled with the lake level depicted (see photos in Appendix D), and stated that the drop in lake level was due to natural variation. All mean responses were again negative, showing a preference for higher lake levels. All 18 of the results are significantly different from zero ($p < .05$). Thirteen of the 18 responses from treatment 3 were more negative than responses from treatment 2, but only 2 of these differences were statistically significant. Sixteen of the 18 responses were more negative than those from treatment 1, and 12 of those differences were statistically significant. This shows that the effect of information printed on the slides stating that lake levels had dropped by 25, 75, or 125 feet due to natural variation is not much different from verbal information telling respondents that lake levels had changed. However, the information printed on the slides has more of an effect when compared to no information (treatment 1).

Figures 3.10 through 3.12 depict the mean responses from treatment 4 which included slide labels that attributed the lower lake levels to human uses of the lake water (see photos in Appendix G). As will be discussed in a later section on attitudes toward human uses of Crater Lake water, the majority of people find these uses unacceptable. All mean responses were again negative, showing a preference for higher lake levels. All 18 of the mean responses are significantly different from zero ($p < .05$). When compared to treatment 3, 17 of the 18 mean responses were more negative, and 14 of those differences were statistically significant. When compared to treatment 2, 17 of the 18 mean responses were again more negative, and

Figure 3.7 View 1 (Rim Village)

"Natural Variation" Slide Text Information

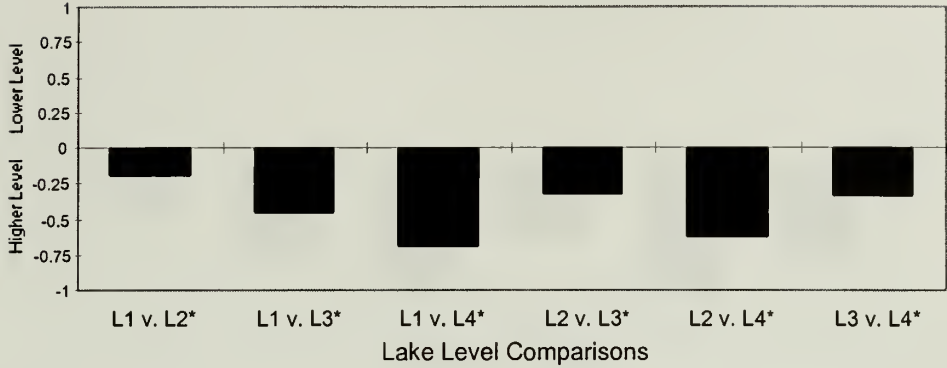


Figure 3.8 View 2 (Discovery Point)

"Natural Variation" Slide Text Information

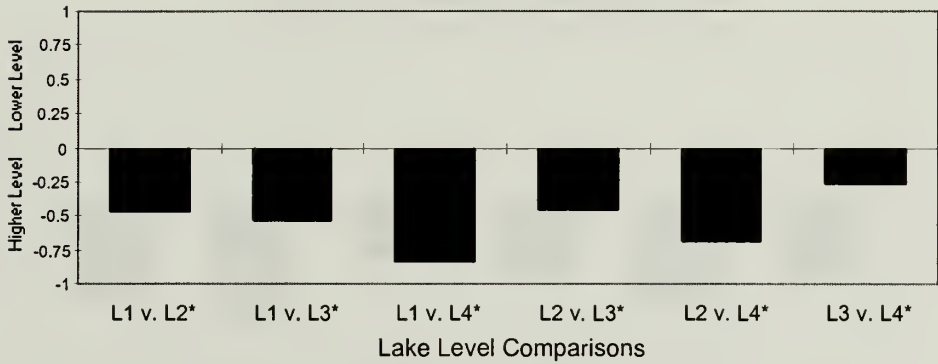
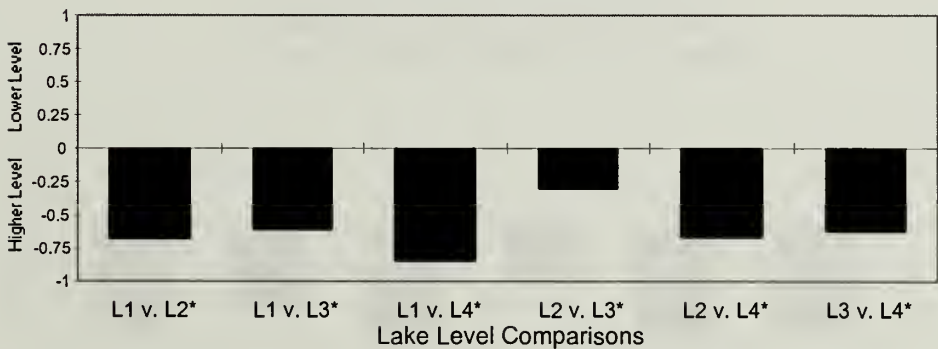


Figure 3.9 View 3 (Merriam Point)

"Natural Variation" Slide Text Information



* denotes statistically significant difference ($p < .05$)

Figure 3.10 View 1 (Rim Village)
 "Human Use of Lake Water" Slide Text Information

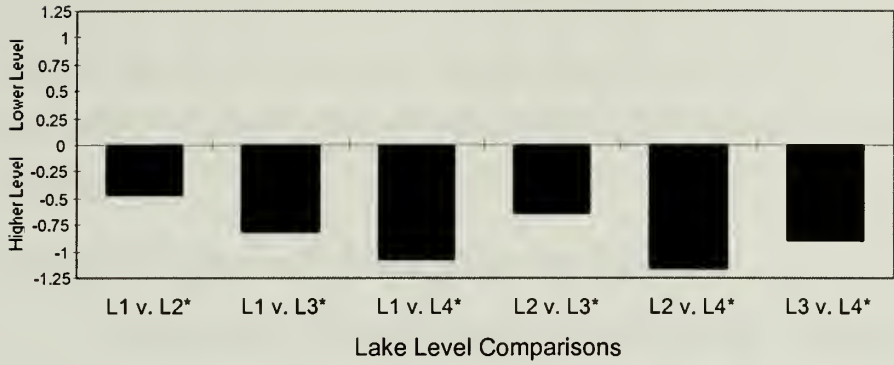


Figure 3.11 View 2 (Discovery Point)
 "Human Use of Lake Water" Slide Text Information

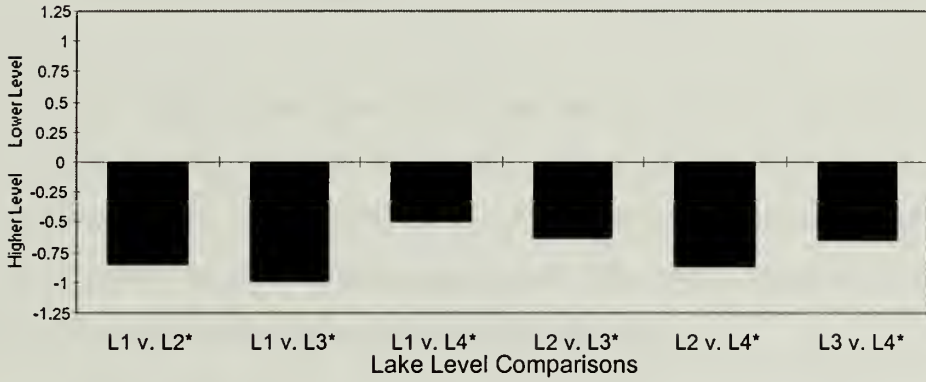
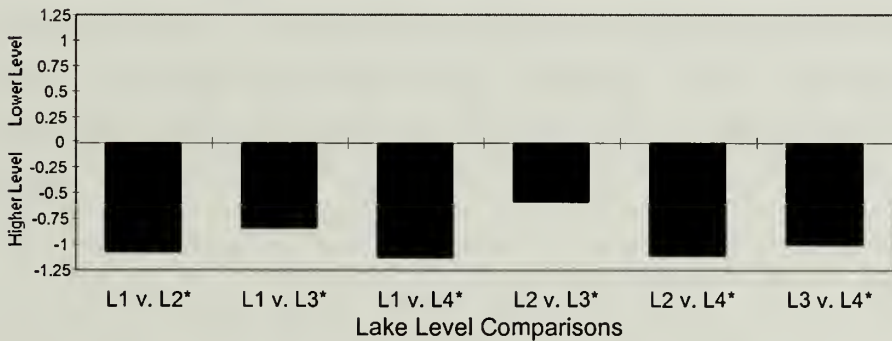


Figure 3.12 View 3 (Merriam Point)
 "Human Use of Lake Water" Slide Text Information



* denotes statistically significant difference ($p < .05$)

all of those differences were significant. When compared to treatment 1, all of the mean responses from treatment 4 were more negative, and 17 of the 18 were significant. These results indicate that information which told respondents that lake levels were changing due to human uses of Crater Lake water had more effect on respondents' preferences than other types of information.

The Mean Number of Times a View was Preferred

A second way to analyze the results of the slide preference ratings is to calculate the mean number of times that any given slide was preferred to all other slides in its set. Within each view, each lake level was compared with three other lake levels (e.g., average level vs. -25 feet, average level vs. -75 feet, average level vs. -125 feet). If the average level (the original lake level) was preferred to the other three levels by all of the respondents, then the mean number of times that level one was preferred would be equal to three. At the other extreme, if level one was never preferred to the other lake levels, the mean number of times that level one was preferred would be equal to zero.

Table 3.1 shows the mean number of times each lake level was preferred within each treatment group. The results show that the lower lake levels were preferred less often over their higher lake level comparison slides. In other words, the slides depicting levels closer to the existing average lake level were preferred more frequently. The differences between these four means are all statistically significant ($p < .05$).

Table 3.1 View Preferences

Numbers represent the mean number of times (3 possible) each view was preferred.

View Set	Treatment 1 No information	Treatment 2 Verbal Information	Treatment 3 Natural Variation Information	Treatment 4 Human Use Information
Slide View 1 Rim Village				
1. Average	2.43	2.47	2.69	2.79
2. - 25 feet	1.85	1.76	1.73	1.94
3. - 75 feet	1.20	1.15	1.17	1.18
4. - 125 feet	1.01	0.91	0.70	0.34
Slide View 2 Discovery Point				
1. Average	2.09	2.32	2.40	2.42
2. - 25 feet	1.64	1.73	1.88	1.80
3. - 75 feet	1.42	1.19	1.16	1.13
4. - 125 feet	0.94	0.74	0.61	0.60
Slide View 3 Merriam Point				
1. Average	2.30	2.33	2.45	2.60
2. - 25 feet	1.74	1.74	1.72	1.83
3. - 75 feet	1.08	1.26	1.23	1.23
4. - 125 feet	0.85	0.58	0.61	0.36

To understand whether the information treatment had an effect on the mean number of times any lake level was preferred, the means were compared across treatment groups. Based on the earlier results, we would expect that information on lake levels, especially the information that changing lake levels were caused by human uses of lake water (treatment 4), would cause the highest lake level (level 1) to be preferred more often and the lowest lake level (level 4) to be preferred less often. The expectation for the two intermediate lake levels is indeterminate because sometimes they are compared to higher lake levels and

sometimes to lower lake levels. When being compared to the higher lake levels, we would expect the information to lead to lower means, and when being compared to lower lake levels, we would expect the information to lead to higher means. The opposite effects can cancel each other out.

For the two cases where the effect of information should be consistent (level 1 and level 4), the results show that in all cases except one, the mean number of times a slide was preferred went up for level 1 and down for level 4 as we moved from treatment 1, to 2, to 3, to 4. The only exception was the comparison of treatment 2 with treatment 3 for the slide with View 3, level 4. In this case the mean number of times this slide was preferred was .58 in treatment 2 and .61 in treatment 3, a difference which is not statistically significant. The comparison between treatment 1 and 2 showed that 5 of 12 of the means were significantly different between the two groups. When treatment 1 was compared to 3, 7 of the 12 means were significantly different. The comparison of treatment 1 and 4 showed 9 of 12 means significantly different. The comparison of treatment 2 with 3 had only 2 means significantly different, while the comparison of treatment 2 with 4 showed 5 significant differences. Finally, the comparison of treatment 3 with 4 had 3 means which were significantly different. These results show that there is a greater effect from going from no information (treatment 1) to any of the types of information than from going from one type of information to another.

Attitudes Toward Use of Crater Lake Water

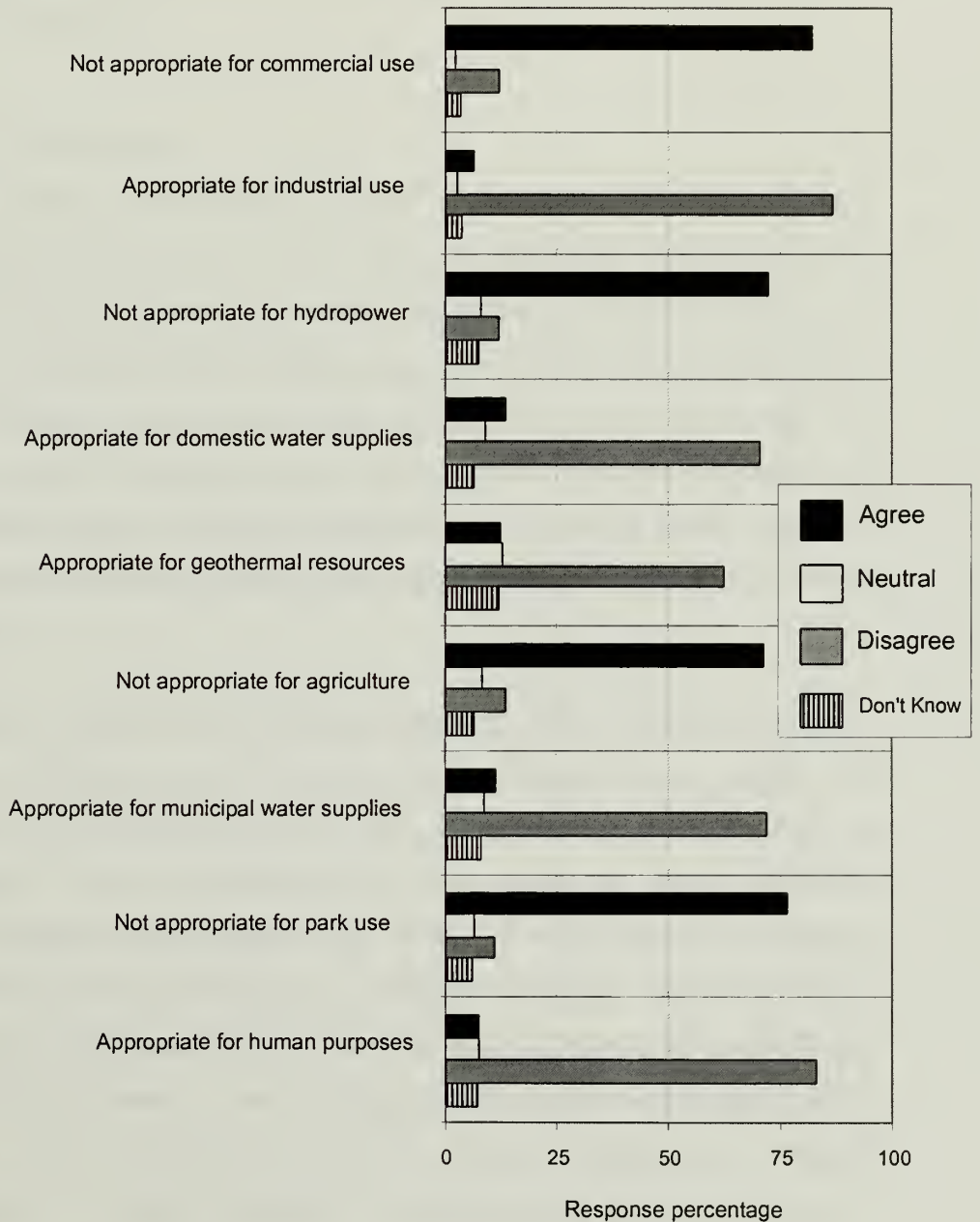
Respondents were asked a series of attitudinal questions regarding alternative uses of Crater Lake water. The alternative uses included commercial, industrial, hydropower, domestic, geothermal, agricultural, municipal, park visitors, and generally stated human purposes. A series of statements were made regarding the acceptability of alternative uses of Crater Lake water and respondents were asked to state whether they

agreed or disagreed. In order not to bias respondents into thinking that all uses were either acceptable or not acceptable, the statements for each use varied (Figure 3.13). The response frequencies are also provided in Appendix A, question 7.

In all cases, over 60% of the respondents disagreed that any of these uses were appropriate for Crater Lake water. Commercial, industrial, park visitors, and general human purposes were all opposed by over 75% of respondents. The alternative with least opposition (63%) was to use Crater Lake water for geothermal purposes, but this use also had the most “don’t know” responses (12%). None of the uses was considered acceptable by more than 14% of respondents.

Figure 3.13 Visitor Attitudes Toward Use of Crater Lake Water

Visitors were asked to state whether they thought lowering the lake level is or is not appropriate for the following activities



CONCLUSIONS

This study addressed two main issues. The first was whether visitors to Crater Lake would perceive a difference in the level of Crater Lake if it was lowered, and whether they had preferences for alternative levels. The second was whether visitors would find human uses of Crater Lake water acceptable.

Lake Level Preferences

The results of this study showed that participants consistently preferred views of the lake level that reflect Crater Lake with water levels unchanged from the present (or average level as depicted on September 5, 1995). This was true when visitors had no information about the slides they were viewing, and was more pronounced when visitors were told that the views depicted alternative lake levels. These results suggest that when informed about changes in the lake from present levels, visitors' attitudes toward lake level changes can interact with and affect their visual preferences.

Results indicated that when respondents were informed that lake levels were changing due to human uses of Crater Lake water, the information had more effect on respondents' preferences than other types of information. This is consistent with the results on visitor attitudes toward alternative uses of Crater Lake water. Since Crater Lake visitors found human uses inappropriate, it follows that being informed that a lower lake level was caused by human use would cause lower preference ratings for that lake level. These findings are similar to Hodgson's (1980) conclusions, which indicated that implied human influence on a natural setting reduced the scenic quality of that setting. He noted that when a

landscape photograph implied human influence on the setting (such as calling a lake a reservoir), the setting is judged to be less beautiful.

Attitudes Toward Human Uses of Crater Lake Water

A primary purpose for which Crater Lake National Park was established was to conserve the scenery and natural features within the Park to provide for the public enjoyment therein, and to leave the Park unimpaired for future generations. In this study, we assessed whether alternative actions affecting the level of Crater Lake would be acceptable to park visitors. Management actions which change the natural character of the park, and which visitors perceive to be inappropriate, will impact visitors' scenic evaluations. The findings of this study confirm earlier research which found that information about human-induced changes in scenic views negatively affected observers' scenic evaluations (Carls 1974; Hodgson and Thayer 1980; Anderson 1981; Amadeo et al. 1989).

The attitudes of study participants in regard to use of Crater Lake water are decidedly against human uses. Commercial, industrial, park visitor, and general human use were opposed by over three-fourths of the respondents in the study. While some of the alternative uses (e.g. industrial use) were more negatively viewed than others (e.g. geothermal use), none of the alternatives presented were considered acceptable by more than 14% of respondents.

Visitor Comments

Strong sentiments opposing any use of Crater Lake water were also evident from the comments visitors provided at the end of the scenic preference survey (included in Appendix D). While the comments provided by these visitors do not comprise a representative sample of study participants, they are a measure of some visitors' attitudes toward the issues discussed in the survey. Approximately 65% of the 162

comments received at the end of the survey indicated opposition to human use of Crater Lake water while 4% indicated support of extractive uses of the water.

Both in their visual preferences and attitudes, visitors had a negative reaction to water withdrawals from Crater Lake for human uses. Even when no information about the reasons for changing lake levels was presented, visitors consistently preferred the higher lake levels shown. However, when information was given that indicated human uses were causing the change in lake level, people's perceptions were more negative. From the results of this study, it can be concluded that human-induced changes in Crater Lake water levels would negatively affect people's perceptions of the aesthetic and scenic quality of the lake.

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APPENDIX A

VISITOR CENTER AESTHETIC PREFERENCE SURVEY

N = 960

Oregon State University
CRATER LAKE NATIONAL PARK
SCENIC SURVEY

PART ONE

For each set of slides, please tell us two things:

1. If you see a difference between the views shown (check ✓ one box).
2. Which view you *prefer personally* by marking ✓ in the corresponding box.

Slide Set	First		Second				Which do you prefer?			
	Is there a difference to you?		Strongly prefer the left	Prefer the left	No Preference	Prefer the right	Strongly prefer the right			
NO	YES									
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
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18.										
19.										
20.										
21.										
22.										
23.										
24.										

PART TWO

1. Have you been to Crater Lake National Park before this visit? (check ✓ one)

66% No

34% Yes

↳ If yes, please indicate how many times you've been to Crater Lake before this visit

51.1% Once before

18.7% 2 times

20.3% 3-5 times

4.8% 6-10 times

5.1% 10 or more times **What year was your first visit?** 19 __

The following frequencies are the breakdown of the 34% who reported visiting Crater Lake previously.

1922-1929	1930-1939	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1996
1.8%	2.2%	6.5%	9.8%	27.7%	17.3%	16.1%	18.6%

2. Have you ever been up to the rim to see Crater Lake itself?

57% Yes

43% No

3. Have you taken the boat tour on Crater Lake? (check ✓ one)

11.3% Yes

88.7% No

4. Do you plan to take the boat tour on Crater Lake? (check ✓ one)

22.7% Yes

49.7% No

27.6% Unsure

5. Have you attended an interpretive presentation (other than the video) at Crater Lake? (check ✓ one)

22.4% Yes

77.6% No

6. Do you plan to attend such an interpretive presentation on your visit to Crater Lake? (check ✓ one)

40.5% Yes

24.5% No

35% Unsure

7. The lake level of Crater Lake fluctuates naturally. It is also possible that human activities in and surrounding the park could affect Crater Lake water levels.

Please state whether you think lowering the lake level **is** or **is not** appropriate for each of the following activities.

Circle the **number** that reflects your level of disagreement or agreement with each statement. If you haven't thought about it much, circle *Don't Know* (DK).

Statement	Level of Disagreement or Agreement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is appropriate to lower the lake level in Crater Lake for human purposes.....	51%	26.9%	7.6%	6.1%	1.4%
It is not appropriate to lower the lake level in Crater Lake for Park visitor use.....	3.7%	7.3%	6.5%	29.7%	46.9%
It is appropriate to lower the lake level in Crater Lake to increase municipal water supplies.....	45.8%	26.3%	8.814 %	9.5%	1.7%
It is not appropriate to lower the lake level in Crater Lake for agricultural use.....	4.9%	8.8%	8.3%	26.9%	44.5%
It is appropriate to lower the lake level in Crater Lake to make use of geothermal resources.....	37.9%	24.7%	12.8%	10.4%	2.2%
It is appropriate to lower the lake level in Crater Lake to increase domestic water supplies.....	40.5%	29.9%	9.2%	9.7%	4.1%
It is not appropriate to lower the lake level in Crater Lake to develop hydropower resources..	5.6%	6.5%	8%	22.6%	49.8%
It is appropriate to lower the lake level in Crater Lake for industrial use.....	67.6%	19.3%	2.7%	2.4%	4.2%
It is not appropriate to lower the invited lake level in Crater Lake for commercial use.....	8.2%	3.9%	2.3%	20.6%	61.7%

While answering the following questions, please remember that your responses are **confidential**.

1. How far do you live* from Crater Lake National Park?

Range: 10 - 3000 miles

Average: 1105 miles

*foreign visitors were not included in this measure

2. Is Crater Lake the primary destination of your trip? (check ✓ one)

35% Yes

65% No

3. What is your gender? (check ✓ one)

54% Female

46% Male

4. What is your age? _____ years.

Average: 49.5 years

Range: 18 - 89 years

5. What is the highest level of education you have completed?

(check ✓ one)

1% Less than 9th grade

3% 9th to 12th grade, no diploma

8.8% High school graduate (or equivalent)

22.3% Some college

6.8% Associate degree

21.5% Bachelor's degree

11.1% Some graduate school, no degree

25.5% Completed graduate or professional degree

6. Into what group does your **total household** income fall? (before taxes)

(check ✓ one)

5.7% Less than \$15,000

7.4% \$15,000 to \$24,999

4.8% \$25,000 to \$29,999

8.8% \$30,000 to \$34,999

21.7% \$35,000 to \$49,999

25.4% \$50,000 to \$74,999

11.7% \$75,000 to \$99,999

14.6% \$100,000 or more

7. In what size of community did you grow up? (check ✓ one)

13.2% farm or rural area

4.4% semi-rural

12.6% small town (under 5,000 people)

24.5% small city (5,000-50,000 people)

.9% suburb of large city

17.8% city (more than 50,000 but less than 1 million)

12.6% large city (over 1 million people)

8. What size of community do you live in presently? (check ✓ one)

7.3% farm or rural area

5.9% semi-rural

8.7% small town (under 5,000 people)

25.6% small city (5,000-50,000 people)

20.7% suburb of large city

22.5% city (more than 50,000 but less than 1 million)

9.3% large city (over 1 million people)

9. At the end of the summer, we will be continuing this study with a brief mail survey. Please provide us with your address in the spaces provided. Your address will only be used for this important mail follow-up.

89% of the survey participants complied with this request for their addresses

- **95.9% of participants reported addresses in the United States**

- **4.1% reported living outside the U.S.**

Your name _____

Street _____

City _____ State ____ Zip Code _____

↳ If not in the U.S., what is your home country?

ADDITIONAL COMMENTS:

**THANK YOU
FOR YOUR TIME WITH OUR SURVEY!**

Dr. Rebecca Johnson
David Rolloff
Forest Resources Department
OREGON STATE UNIVERSITY

APPENDIX B

RIM VILLAGE SAMPLE SURVEY

N = 210

OREGON STATE UNIVERSITY
CRATER LAKE NATIONAL PARK VISITOR SURVEY

Your responses are confidential and only for use in this visitor study.

1. Have you visited Crater Lake National Park before this visit?

40% Yes 60% No

2. Have you been to the Visitor Center (at Park Headquarters) or do you plan on going as part of your visit?

65.8% Yes 13.8% No 20.4% Unsure

3. How far do you live* from Crater Lake National Park?

Range: 60 - 3000 miles

Average: 836 miles

*foreign visitors were not included in this measure

4. Is Crater Lake the primary destination of your trip? (check ✓ one)

39.6% Yes 60.4% No

5. What is your gender? (check ✓ one)

52% Female 48% Male

6. What is your age? _____ years

Average: 46 years

Range: 18 - 82 years

7. What is the highest level of education you have completed? (check ✓ one)

0.5% Less than 9th grade

4.3% 9th to 12th grade, no diploma

17.1% High school graduate (or equivalent)

20.4% Some college

5.7% Associate degree

17.5% Bachelor's degree

9% Some graduate school, no degree

25.6% Completed graduate or professional degree

8. Into what group does your **total household** income fall? (before taxes)

Mode: \$50,000 to \$74,999

6.3%	Less than \$15,000	23.4%	\$35,000 to \$49,999
7.8%	\$15,000 to \$24,999	26%	\$50,000 to \$74,999
2.6%	\$25,000 to \$29,999	16.7%	\$75,000 to \$99,999
6.3%	\$30,000 to \$34,999	10.9%	\$100,000 or more

9. Please provide the following information about where you live.

- **91.8% of participants reported addresses in the United States**
- **8.2% reported living outside the U.S.**

City _____ State ____ Zip Code _____

↳ If not in the U.S., what is your home country? _____

THANK YOU FOR YOUR TIME WITH OUR SURVEY!

Dr. Rebecca Johnson David Rolloff

OREGON STATE UNIVERSITY

APPENDIX C

VISITOR SURVEY INSTRUCTIONS

The following is the text used by the research assistant during the scenic preference survey conducted at the Visitor Center. Bold type indicates what was read to visitors.

Introduction:

Good morning/afternoon. My name is David Rolloff and I'm a grad student at Oregon State University. OSU and the National Park Service are working together this summer to gather information from Crater Lake visitors like yourselves. Information gained from visitors is important to the future management of the park resource, and we appreciate your taking time with this survey. The survey consists of two parts and takes a total of about 15-20 minutes.

It's important to us that you know all information you provide in the survey is strictly confidential, all your answers are voluntary, and will only be used for the purposes of this study. There are a few other important things to remember when completing our survey:

First, there are no right or wrong answers. This is not a test. I just want your opinions, regardless of what anyone else thinks.

Second, please answer all of the questions. If you want to make any comments, do so in the margins or on the last page of the survey. Your comments are important to me and I do pay attention to them.

Okay, lets begin with Part One--the slides.

All of the slides you're going to be shown are of Crater Lake. I want to find out what aspects of scenic beauty people prefer the most when they come to see Crater Lake. **

Treatment 2: Some of these slides are depictions of varying changes in the levels of the lake Some of the changes reflect larger drops in the level of Crater Lake than others.

Treatment 3: Some of these slides are depictions of what the lake might look like with natural variations in the level of Crater Lake. Some of the changes reflect larger drops in the lake level than others.

Treatment 4: Some of these slides are depictions of what the lake might look like if humans used the water in Crater Lake. Some of the changes reflect larger drops in the lake levels than others.

For each pair of slides, I need you to do two things: First tell me if you see a difference between the two views. Then continue by

telling me if you prefer one view over the other--whether you strongly prefer the left, prefer the left, have no preference, prefer the right, or strongly prefer the right. When deciding which slide you prefer, please be sure to pay attention to the view depicted in the slide, not the quality of the slide itself.

There are 24 pairs of slides in this survey, and each set will be shown for Preferences 20 seconds. So that you don't have to worry about keeping track of which slide, I will announce the number of each one when they change.

When slides are finished:

That's it for the slides. Now I have one follow-up question, which is at the top of page 2. For those of you who did not have a preference for the last set, check the last item in Part Two just above the beginning of "Section 3."

For those of you who did have a preference, I'd like to know how strong your preference is. For example, these views may occur in different seasons. Crater Lake National Park may also charge different fees in different seasons. If it cost you ___ dollars per person in addition to the park entrance fee to experience your preferred view than to experience the other one, would you be willing to pay this amount? After you have indicated yes or no, briefly explain your reason for that response.

Conclusion:

Then continue with the rest of the questions on the survey. Remember the information you give is completely confidential. When you're finished, hand your survey and clipboard to me. On your way out, remember to take a book home with you.

Thanks again for your time and I hope you enjoy your visit to Crater Lake.

APPENDIX D

VISITOR COMMENTS

RESEARCH NOTE: These comments were provided by visitors at the end of the Visitor Center survey. It is important to keep in mind while considering these comments is that they do not constitute a representative sample of visitors who participated in the survey. These are comments made by those who took time and effort to comment in written form at the end of the survey. However, remarks such as these can be intuitively useful: they provide a insight into overall visitor impressions and attitudes in reaction to the issues in the survey. The following comments provided by study participants have been edited for grammar and spelling and are included in the following section.

Treatment Group 1 Comments

I'm happy to do these types of surveys whenever possible. It is good to be asked about our parks. Often I feel that as citizens it is far too infrequent that we are asked about our concerns.

Interesting survey. I also majored in psych in Japan and have done similar surveys.

I have been to many of the National Parks and am very concerned about the trend towards using park resources for business or tourist consumption. Leave them alone!

I almost put don't know for all question 7 because I am really lacking information to assess the appropriateness (which I would base on whether or not it would harm or endanger the wild life or natural beauty).

Participation in survey made me feel useful and glad. Points of interest were re-emphasized for better memory.

For research purposes, I would think it best to allow the lake's level to fluctuate naturally without human interference.

Any way in which we can reserve our water supply to help the environment, I applaud.

Enjoyed doing the survey. I believe that all National Parks should be left as untouched as possible, but with the use of common sense.

Don't mess with Crater Lake! Keep the politicians out!
Limit access to the public to preserve natural beauty.

I believe Crater Lake is quite exploited as is now.

Don't lower/alter the lake level for the temporary purpose/use of humans.

Public input from visitors is useful; however, impact on local people matters as well. The importance of our national parks and their value to all citizens must be highest priority to how they are managed.

The parks belong to the people and have been set aside for the people. Let's enjoy them in their natural state.

Please help preserve nature the way it is.

I haven't visited the lake, based on slides, the current water level looks good! If nothing has been done so far, leave it the way it is!

Leave nature's treasures to be observed, not exploited!

Crater Lake needs to stay as it is!

Please keep Crater Lake as natural as possible.

I would like to see Crater Lake be preserved in its unique, miraculous state. The boat ride enhanced my appreciation and understanding of the lake. I would hate to see any further human use of the lake.

As unique as this lake is, it should not be used for development around it. It should be protected, not viewed as a usable resource, especially for city growth or corporate consumption.

I hope they leave Crater Lake as it is.

National Parks are to enjoy undisturbed with minimal interference. I agree strictly with this.

This is an national park and shouldn't be exploited for uses other than recreation.

I don't think the lake should be used for anything but its beauty and splendor it provides naturally.

Crater Lake is gorgeous--don't change it in any way!

The lake and park should be preserved in their natural state.

Very difficult to perceive differences between slide pairs.

I judged some of the pictures based on overall view (forest as opposed to flowers in foreground). Nice job on computer rendering.

Not under any circumstances should the lake level be altered by human activity!!!
My 5 and 13 year old kids agree.

Keep it natural with less human intervention.

We've seen Mono Lake and other parks where water has been drained for other uses. I feel that area should be left naturally--water levels should not be altered.

Don't make improvements, just maintain the existing facilities in a more usable state.

Regarding the agree/disagree questions. Good answers would require knowledge of quantitative alternatives. (I have done a lot of survey work.)

This seems to me to be a very limited survey. How about more views of the lake?

Good luck keeping it's wizardry.

The best views would only be available to those who could afford it and therefore separate it into two parks. Maybe not at first but eventually.

I'm an artist so my views are based on aesthetically pleasing views.

Crater Lake is nature at its best and in my opinion should be left alone. Once it is altered it will never be put back to its natural state.

Loved our visit - Most beautiful lake I have seen.

Young narrator was very effective and helpful.

The natural wonders and resources of our country should be left as is--an example, Lake Cekechobee that was changed and now is being restored to its original nature.

Great place--leave it alone.

Great place--Do not change it!

Do not mess with nature.

Wonderful presentation--articulate speaker. I'm an agriculturist, but I feel that the water should be left alone.

Natural areas should not be corrupted in the name of progress; once lost, they cannot be revived!! Remember Hetch-Hetchy!

Treatment Group 2 Comments

Crater Lake is a tremendous, beautiful, and natural place. It would be a shame to change or endanger it in any way.

An amazing place, thanks for taking the time to help it stay that way.

It is very important to conduct surveys and out of all the seven National Parks I have visited so far, this is the first. Thanks.

I would love to see the lake and park kept natural as possible without impact of man's greed.

Please leave it alone. Haven't we done enough to our natural resources already?

Close rim drive to traffic. Use trams and bikes. Keep cars at either end or have loop road the base. I realize this a radical view but vehicles are ruining places like Yellowstone.

I think the level of Crater Lake should remain as it is--it shouldn't be intentionally lowered for any reason.

Please don't let Crater Lake become another battle like Mono Lake. Leave nature alone.

I hope they keep funding national parks. They are treasures that cannot be replaced.

Look at Mono Lake in California as a damaged natural wonder. Do not mess with Crater Lake!

This is a natural resource and should be preserved as such. If protected resources are now going to be tapped for uncontrolled human and economic growth, where does it stop?

Though the look of the view of the lake with higher or lower water does not bother me, I do not feel we should mess with its natural level in any way.

Please leave the lake in as natural a state as possible.

Don't mess with Crater Lake!

Crater Lake is a beautiful and unique natural place and should not be changed in any way. I always marvel at how special a place is when I come and would be extremely disappointed if it were changed for any reason.

Leave the lake untouched. Keep private and municipal interests out. Please don't alter or disturb the lake or its surroundings.

I have a general reluctance toward tampering with Mother Earth.

I always feel that the fewer changes to natural environments, the better. We desperately need to preserve our wilderness spaces, flora, and fauna and our biodiversity.

National parks need protection and park fees are necessary for maintenance. I am willing to pay more to see proper care and that repairs are able to take place.

I am strongly in favor of preserving natural resources untouched, as far as possible, in order to preserve what we came to see and marvel at.

The initial purpose of the national parks was to preserve the natural area. Keep it that way.

I have enjoyed the park immensely and plan to come again sometime.

The NPS has a mandate to protect and preserve the cultural, historical and natural resources within each park boundary. I strongly oppose any form of development that is not in line with this mandate.

Other federal and state energies should be considered before experimenting with Crater Lake!

My approval of the purposes all depends on how desperate the surrounding communities need the water supply--in agriculture, geothermal, domestic uses.

I think that the national parks in the US are excellent and should be preserved and supported as much as possible. The are invaluable for conservation and wilderness is very hard to find and threatened.

Good job.

Awe inspiring. Beautiful even on a smoky day.

We need to preserve our wilderness areas and save our planet. No industrial use of national parks!

I grew up hearing references to Crater Lake because of a trip my parents took before I was born. I came 40-50 years later and see a natural beauty unparalleled by any I have seen before. I want my children, grandchildren and their children to see this preserved the way it is with only natural fluctuations

Water conservation and birth control are answers not adequately explored!

I believe our national natural treasures should be preserved as was the intention in creating the National Park System: for aesthetic enjoyment and only diverted to other purposes for reasons of urgent human need, such as domestic water needs.

Whatever is used should be replenished.

To the extent resources (property of any kind) are used for public purposes (through laws, regulations, restrictions or otherwise) the owners thereof should be compensated by the public. For the purposes, I have an element of "it depends."

There are no absolutes; circumstances may change answers.

National Parks belong to the entire nation, not local people. There is never enough pure fresh water. Using this water will result in more development which will lead to more demand. It will only end when the lake is empty. While it seems increasingly difficult to do, as we move through the last half of the century, I'd kind of wish people could just leave a few things in the country alone. Maybe starting with the national parks and forests would be a good place to start!

Protect the lake level!

In the past few years, we have visited several national parks and I've learned quite a bit about the negative and positive impacts of human interaction with nature.

I hope that we never lose sight of the beauty of creation and its natural (untouched) form, although I am grateful that the parks have been created.

I would hope that the water level in Crater Lake would be limited. Surely there are trade offs, but a high value must be placed on some things such as national parks.

Don't mess with the lake!

Money is no object--preservation is a concern and will generate dollars via tourism. I would be willing to contribute money to view, help conserve and protect this natural setting.

People, as far as hydro resources and water consumption go, should emphasize conservation of water, use less, use wisely.

Is it about conservation or commercial exploitation? I hope this survey has nothing to do with using (or possible use) of the lake water for industry or agriculture!

Preservation is a great idea.

Too many of our national treasures are sacrificed for human convenience.

Please allow this one to remain as natural as possible for my great grandchildren!

A truly magnificent place.

Remember Mono Lake in California. The human and commercial usage/drainage has ruined that lake.

In the absence of other information, my preference would be to maintain the water at his highest level. I think I'm influenced by the fate of Mono Lake and other alpine lakes whose waters have been receding.

Man should stop manipulating natural resources for his advantage.

Treatment Group 3 Comments

The park is a beautiful gift of nature. Please don't let anyone tamper with it.

LEAVE IT ALONE! IT'S GREAT AS IT IS!

I would be very interested to know of any information concerning potential development of energy resources at Crater Lake. I am an Earth Science teacher and would like to share this information with my class.

I was very impressed. This is a lovely area. Quite different from back east.

I feel strongly that the U.S. National Park scene should remain untouched - in wilderness areas.

I believe that natural parks need to be preserved as they have been for historically for thousands of years and not tampered with for commercial purposes.

Good project idea.

Best of luck with your thesis ! Survey is well done.

Leave the lake to nature! Keep greedy hands off!

As is is best!

I believe it is not appropriate to alter this spectacular resource for any reason, that is why we made it into a Nat Park. Once the level is changed it will never be the same.

I feel it is not appropriate to lower the water level for any reason.

The pristine lake should not be used for ear washing, toilet flushing, field irrigation, and or industrial uses.

I believe people's visits are based on schedule and season and not so much on lake level. Only a repeat visitor will plan according to lake level.

I don't have any visual preferences but I am opposed to the pumping of water out of the lake for big industrial purposes.

With all the lakes in this area why bother this one that was set aside?

I don't have problems with using the water for electrical purposes or for human consumption. I would object to development like what has happened in the Lake Tahoe area and similar situations.

I'm shocked that altering the lake level is even a consideration; the view is God's gift, altering it is unacceptable.

Concessionaires should have a very stringent contract so restoring National Parks isn't such a burden to the tax payer.

In question #7 I found it difficult to give answers because there wasn't any information as to the pros/cons of changing water level or the importance of the changes to the communities affected.

I don't like the idea of taking beautiful natural resources for short term commercial gain.

Keep park and lake as it is. Don't increase the numbers of people coming to the park and/or build more motels, etc. Definitely do not increase commercialism.

I think this unique nature should not be changed by humans. Places like this should change only by nature. As a person coming from an overpopulated country I know what it means to see places like Crater Lake.

I hope that this unique place will not be changed by humans. To people who come from Europe it is a spectacular place; it's great.

Giving the levels on the slides may lead to preferred, popular answers.

The lake is special because of its creation by nature; therefore it should be left in its natural state!

Do not vary the lake level. Let nature take its course.

Leave it alone we've messed up enough of God's creations.

I think it's a bit of a jewel and needs to be preserved as it is.

Keep it all as natural as possible.

The survey made acutely aware of the possible differences to be experienced visually. I much prefer the natural pictures.

Leave the lake in its natural state.

Treatment Group 4 Comments

I think the term due to human use will bias the respondents answers.

To use the lake and its water for park development is a reasonable approach.

The park has natural features that should be seen and enjoyed by people with reasonable access.

Would be interested in a bibliography of work related to human reaction to science or ecological values.

Avoid as much human intervention in the Crater Lake area as much possible to preserve its beauty.

Please leave the lake alone.

Let industry find other water sources. Let's work on finding other sources of fresh water and keep it clean so we don't need Crater Lake for water.

Please don't let bad things happen to this lake. There is too much to learn from it to let it go to other uses. I take the long-term view on this-the lake will follow its course and we can watch it happen without interfering with it.

Lake has value in this state for research purposes as well as other reasons. It's hard to separate the view issue from the point of view issue.

History should show you not to do anything to this NP

Why didn't you ask about using the lake for firefighting purposes (refills for water drops from helicopters)?

Your slides are very subtle in their differences but effectively weigh the outcome.

I don't think the water level should be allowed to change due to human use.

I believe students in President Clinton's program should work in our national parks to help maintain them. Also, volunteers should be actively recruited.

I'm afraid I'm not much help on the various water uses in #7 of part three. I just don't know that much about it.

Crops and some drinking water is OK. Keep the natural beauty and splendor.

This lake has been here for thousands of years and humans haven't used it for these purposes, why should we start?

Slides changed too fast. I got left and right mixed up. I strongly prefer those with the highest water level.

Leave Crater Lake alone.

I hope that the resources at Crater Lake are used to upkeep the lake and not destroy it or misuse it.

Don't let them suck this water out like they did to Mono Lake and Owens Valley. We have to learn to conserve the few resources we've got left.

I think it is important to keep our parks in their natural condition and not to use the resources of the park for commercial individual benefit.

If agriculture is allowed to use the water it should be a fair and reasonable price, not a give away...not a break.

We have really enjoyed the park.

Good luck on your survey

We have spent most of the day enjoying Crater Lake mostly from the great viewpoints.

No National Park, historic site etc., should ever be used for commercial, industrial, or municipal purposes and this door should never be opened.

You have plenty of water, do not use Crater Lake as a source. I am a strong believer of water use and water transport but not Crater Lake.

Crater Lake should be preserved as a historic site and not used for other purposes.

I may be prejudiced for clean water reserves because I deal with sewage every day for a city. People will not conserve until it hits \$ charge for showers and laundry.

Crater Lake should remain a sacred protected area as the Indians felt it was (this may be because of my heritage and spiritual feelings).

In the slides, lowering the lake 25 feet didn't make that much of a difference. Lowering it 50-75 feet made quite a difference. When the lake was lowered 125 ft, Wizard Island looked more barren and ugly.

Hard to believe Crater Lake could be formed like this.

You have a view that makes a person glad to be alive, to enjoy!

Please preserve this incredibly beautiful place. I agree with the Indians...we are one!

Crater Lake is beautiful just the way it is.

APPENDIX E

CALENDAR OF SAMPLING DATES

August 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3 PILOT
4 PILOT	5 PILOT	6	7	8	9	10
11 SAMPLE	12	13	14	15 SAMPLE	16 SAMPLE	17 SAMPLE
18	19	20 SAMPLE	21 SAMPLE	22	23	24
25 SAMPLE	26 SAMPLE	27	28 SAMPLE	29 SAMPLE	30	31

September 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 SAMPLE Labor Day	3	4	5	6 SAMPLE	7 SAMPLE
8 SAMPLE	9 SAMPLE	10	11	12	13	14 SAMPLE

APPENDIX F

SOCIAL & ECONOMIC COMPARISONS BETWEEN SAMPLE GROUPS

Table F.1 Participant Characteristics

Category	Percentage of Respondents	
Respondent Age	<i>Visitor Center</i>	<i>Rim Village</i>
Mean	49.5 years	46 years
18-29	11.6%	11.7%
30-39	16.2%	25.5%
40-49	24.8%	48.3%
50-59	15.8%	20.7%
60-69	36.3%	34.4%
70-79	9.5%	4.8%
80+	1.5%	0.5%
Gender	<i>Visitor Center</i>	<i>Rim Village</i>
Female	54%	52%
Male	46%	48%

Table F.2 Participant Annual Household Income Levels

Income Level		<i>Visitor Center</i>	<i>Rim Village</i>
	Mean	\$50,000	\$50,000
Less than \$15,000		5.7%	6.3%
\$15,000 to \$24,999		7.4%	7.8%
\$25,000 to \$29,999		4.8%	2.6%
\$30,000 to \$34,999		8.8%	6.3%
\$35,000 to \$49,999		21.7%	23.4%
\$50,000 to \$74,999		25.4%	26%
\$75,000 to \$99,999		11.7%	16.7%
\$100,000 or more		14.6%	10.9%

Table F.3 Participant Educational Background

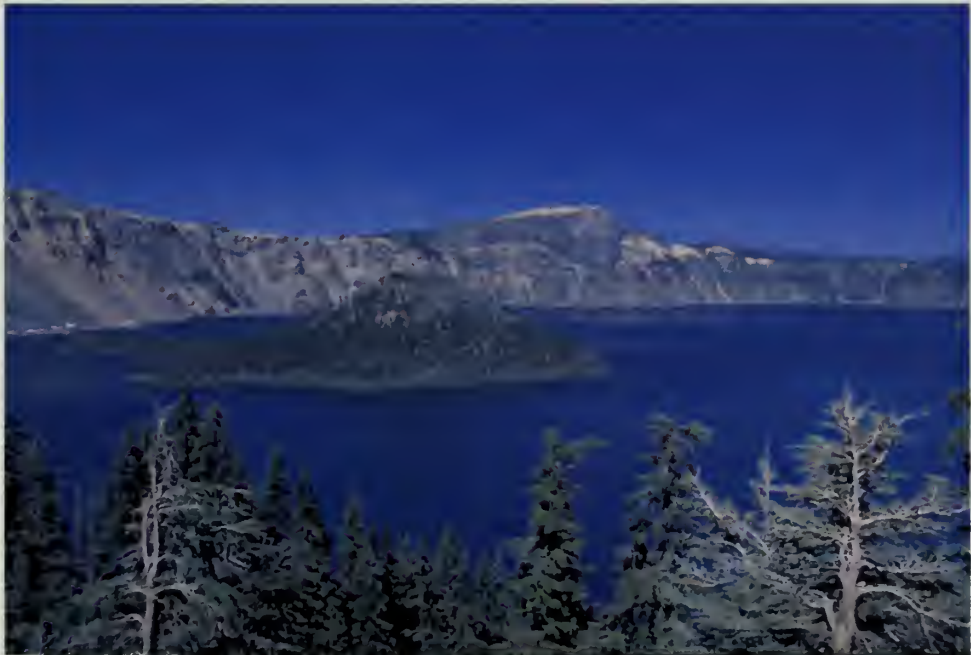
Educational Level	<i>Visitor Center</i>	<i>Rim Village</i>
1. Less than 9th grade	1%	0.5%
2. 9th to 12th grade, no diploma	3.0%	4.3%
3. High school graduate (or equivalent)	8.7%	17.1%
4. Some college	22.3%	20.4%
5. Associate degree	6.8%	5.7%
6. Bachelor's degree	21.5%	17.5%
7. Some graduate school, no degree	11.1%	9%
8. Completed graduate or professional degree	25.5%	25.6%

APPENDIX G

SLIDE IMAGE COPIES



View 1 Level 1, Rim Village, average level.



View 1 Level 2, Rim Village, -25 feet.



View 1 Level 3, Rim Village, -75 feet.



View 1 Level 4, Rim Village, -125 feet.



View 2 Level 1, Discovery Point, average level.



View 2 Level 2, Discovery Point, -25 feet.



View 2 Level 3, Discovery Point, -75 feet..



View 2 Level 4, Discovery Point, -125 feet.



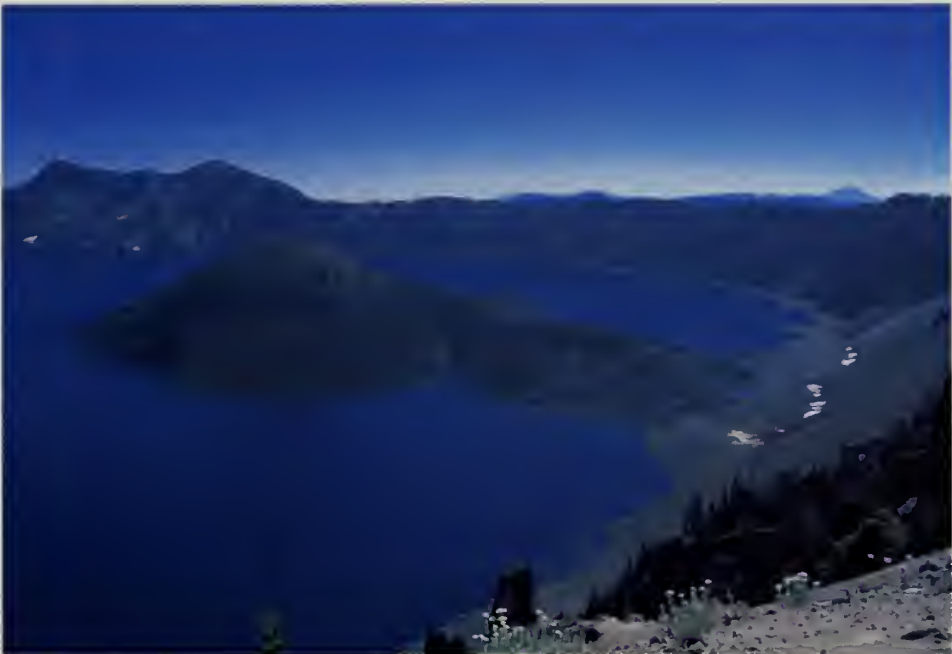
View 3 Level 1, Merriam Point, average level.



View 3 Level 2, Merriam Point, -25 feet.



View 3 Level 3, Merriam Point, -75 feet..



View 3 Level 4, Merriam Point, -125 feet.



Information Treatments 3 and 4, example of label for average lake level.



Information Treatment 3, example of natural variation label.



Information Treatment 4, example of human uses label.

