HUMAN-INDUCED NOISE IMPACTS ON BOATERS AT WALDO LAKE, OREGON

By

JOSEPH KUHN

A THESIS PRESENTED TO THE GRADUATE SCHOOL
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Joseph Kuhn

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The purpose of this study was to identify the impacts of noise on boaters in the Waldo Lake area, and to determine if the presence of noise affected the individual boaters' outdoor experiences. In addition, this study examined the relationships and differences between the boaters based on their activity choice, experiences with noise, and overall feelings towards impacts and management actions towards motorized boating. Visitor perceptions and opinions were obtained through on-site, personal or face-to-face interview surveys conducted at various recreation sites at Waldo Lake, Oregon.

This study found that the presence of human-induced noise could significantly impact the experiences and satisfaction levels of boaters at Waldo Lake, Oregon. In addition, this study revealed that there were asymmetrical conflicts present between motorized and non-motorized boaters based upon noise and motor boating as a whole. Specifically it was concluded that non-motorized boaters are more sensitive to noise

impacts. Satisfaction levels among the non-motorized group were decreased by the presence of noise, and significant differences existed in the attitudes and opinions of boating impacts and management actions to reduce (control) motorized recreation.

Understanding the preferences, tolerances, and desires of varied recreationists can assist managers in developing more effective management strategies. These strategies could reduce the occurrence of conflict and lead to increased satisfaction among the multiple users of Waldo Lake. It is important for recreation managers to carefully assess issues that arise in natural settings, and to carefully choose management strategies that will produce the highest level of benefit for visitors to the area.

CHAPTER 1
INTRODUCTION

Background

Perhaps the landscape features that attract the most interest are lakes (Smith, 1992). Lakes are considered an important ecosystem, supplying subsistence, residence and recreation to millions of organisms. People, in particular, enjoy lakes for many reasons including: aesthetic qualities, commercial uses, and recreational uses (Miller, 1992; Smith, 1992). However, the popularity of these ecosystems for human use has led to an array of environmental impacts that can disrupt the overall health of the system and the other organisms within it (Asplund, 2000; Klessig, 2000; Miller, 1992). Due to the variety of impacts that can occur on lake systems, management of these areas is an on-going concern.

Proper lake management includes several important tasks that help maintain an attractive water-based recreation setting. Certain characteristics (e.g., healthy watersheds and landscapes, clean water, and undisturbed natural viewsheds and soundscapes) are essential to the quality of an outdoor recreation experience (National Recreation Lake Study, 1999). Multiple human activities affect certain environmental settings, such as natural soundscapes, and have led resource managers to evaluate the amount of regulation and management applied to these types of ecosystems (Larson & Hammitt, 1981). The balance between recreational use and management needs to assure the continued satisfaction of the various user groups without sacrificing the overall quality of the lake and its attributes.

Maintaining such a balance between the recreational use and management of lakes is particularly important in the U.S. A recent survey conducted by the American Recreation Coalition (2001) determined that nearly 17 million boats, operated by an estimated 76 million people, are in use across the United States today. Furthermore, more than half of all U.S. adults enjoy lakes for their multitude of activities (Mele, 1993; The National Recreation Lakes Study, 1999). These activities include hunting, fishing, hiking, boating, bird watching, wildlife photography, and a variety of other activities (The National Recreation Lakes Study, 1999). Some of these recreational activities can cause adverse effects to the natural soundscape of an area by allowing elevated levels of noise to infiltrate the natural environment thus, negatively impacting the experiences of others who also enjoy these recreational areas.

The Willamette National Forest (WNF) was originally established as part of the Cascade Range Forest Reserve in 1893 by President Grover Cleveland. The area has been under the supervision of the United States Forest Service (USFS) since 1905, but was not officially added to the National Forest System until 1933 (USDA Forest Service, 2004). Congress also added the forest to the Oregon Cascades National Recreation Area in 1984 in order to: "protect the natural area; and enhance the recreational value, as perceived by the many visitors to the area" (USDA Forest Service, 2004).

The WNF is comprised of 380,000 acres of wilderness, and it includes seven major peaks of the Cascades: Mt. Jefferson, Mt. Washington, Three-Fingered Jack, Diamond Peak, and The Three Sisters. The forest, itself, extends for 110 miles along the western side of the Cascade Mountain Range, extending from the Mt. Jefferson area (which is east of Salem) to the Calapooya Mountains (which are northeast of Roseburg, Oregon)

(USDA Forest Service, 2004). Moreover, the WNF is considered one of the most diverse and productive forests in the National Forest System, and it is comprised of approximately 1.7 million acres (USDA Forest Service, 2004). The landscape throughout the forest includes high, snow-capped mountains, narrow canyons, wooded slopes, streams and lakes. These various offerings, in turn, supply many recreational activities to visitors (USDA Forest Service, 2004). In particular, Waldo Lake, located within the boundaries of the WNF in central Oregon, administers many different recreational uses.

Resource managers in the WNF have identified the need to better understand: 1) the visitors to Waldo Lake within the context of the National Forest and; 2) the role that Waldo Lake plays in relation to other lakes in Central Oregon. Since Waldo Lake is considered one of the purest lakes on earth in terms of water quality and clarity (Williams, 2002), there is heightened interest to examine the impacts of various recreational activities and user groups. Specifically, area managers are beginning to research the potential conflicts that exist between user groups following the admittance of motorized activities on and around the lake. Besides decreasing water quality through pollution, motorized activities also generate noise pollution, which impacts other visitors and detracts from the overall experience to the area and the adjacent wilderness.

Past scientific research related to lakes and recreation has concentrated on the conflicts associated with motorized and non-motorized activities and their use in recreational areas. However, studies of different user groups in association with the occurrence of noise in the natural environment have not been as exhaustive. This study utilizes the concepts of conflict, tolerance, satisfaction and norms to determine if different perceptions of noise impacts exist between boating groups at Waldo Lake. A normative

approach employs impact indicators, and standards of quality, to identify and estimate threshold and tolerance levels visitors hold during their recreation experience (Manning, 1999). Past research has indicated that differences in tolerance levels and perceptions may exist between groups participating in different activities, such as motorized and non-motorized boating (Adelman, Heberlein & Bonnicksen, 1982).

Previous studies have used photographs, video clips, or questionnaires describing different levels of degradation, to determine what the typical acceptability level is for selected impact indicators (Freimund, Vaske, Donnelly & Miller, 2002). In this study, a survey instrument was used to determine the impacts of human-induced and motorized noise within the natural soundscape, as perceived by the different boater groups of the Waldo Lake area. Questions emphasized different types of noise as well as interference levels of noise on specific aspects of visitors' experience. By determining the effects of noise generated in natural environments (like Waldo Lake), resource and recreation managers can achieve a better understanding of how to manage multi-use areas.

Normative and conflict theories, including goal interference, were used as the theoretical framework for measuring the impacts caused by human-induced and mechanical noise. Information gathered using these theories has assisted in identifying different perceptions of noise between motorized and non-motorized boaters on Waldo Lake. This study examined the introduction of noise to natural soundscapes, and more specifically, the impacts of noise on boaters in the Waldo Lake area. Results can assist in future lake management by assessing the effects of recreational activities that cause excessive amounts of noise in outdoor settings.

Statement of Research Problem

Within the natural environment, the natural soundscape (or the sounds of nature) may be considered an integral aspect of visitors' outdoor experiences. Over the last few decades, population increases, advances in technology, and an increasing desire to recreate in wild places, have augmented sound pollution and recreational conflict. In particular, noise-based conflicts within the natural environment are becoming more and more frequent as access to motorboats, all terrain vehicles (ATVs), and automobiles increases. Furthermore, elevated occurrences of the use of aircraft for both commercial and recreational purposes are also contributing to these types of conflicts. As a result of these and other episodes, managers have become convinced of the need to make conflict reduction a priority. In sum, increasing noise pollution not only detracts from the experiences of some users, but it can also create tension between managers and the recreationists they are trying to serve.

Since boating is such a popular form of recreation in the Waldo Lake area, this project only examines noise perceptions held by motorized and non-motorized boating groups; it does not address the perceptions of terrestrial users. Moreover, for the purpose of this study, noise will be limited to types associated with humans, including the use of motorized items, the presence of loud pets, noise from electronic devices such as radios or televisions, and the incidence of loud voices within a natural environment.

Thesis Statement

There has not been much research conducted regarding the effects of human-induced noise on the outdoor experiences of both motorized and non-motorized boaters. The differences between the levels of noise present and the acceptability of noise in an outdoor recreation setting have also received little attention. Because natural sound

degradation can adversely affect outdoor experiences for recreational users, it is important to study the effects of noise pollution in the natural environment. Obviously, it is not possible to test all types of noise, either naturally occurring or human-induced, as they are too numerous and often unnoticeable. After reviewing a wealth of literature involving noise, conflict, recreational norms and satisfaction, this study has been narrowed to examine the most common and logical types of noise that may negatively affect one's overall experience in the natural environment. The following research questions are expected to further outdoor recreation literature regarding different types of users and noise in lake settings.

This thesis also attempts to determine if respondents' activity choice plays an important role on their perceptions of human-induced noise. These noises are often produced by motorized vehicles, but they can also stem from non-mechanized sources introduced by users. Additionally, this study examines the differences in opinions regarding motorized boating impacts and proposed management actions based upon activity style and prior noise experiences.

Hypotheses and Research Questions

The following questions and hypotheses were investigated in this study.

R1: Does the occurrence of noise affect boaters' overall experiences at Waldo Lake?

$H1_A$: Human-induced noise does not affect boaters' overall experiences at Waldo Lake.

$H1_B$: Motorized noise does not affect boaters' overall experiences at Waldo Lake.

R2: Does activity style affect overall experience differently?

$H2_A$: There is no difference in overall experience between motorized and non-motorized boaters.

R3: Does activity style affect boater opinions about noise?

$H3_A$: There is no difference between impacts and opinions of human-induced noise between boater groups.

$H3_B$: There is no difference between impacts and opinions of motorized noise between boater groups.

R4. Are the attitudes and opinions regarding impacts from motorized boating and select management actions different between boating groups?

$H4_A$: There is no difference in the attitudes regarding proposed management actions and the perception of motorized boating impacts based on activity style.

$H4_B$: Human-induced noise does not affect boaters' attitudes toward proposed management or their opinions about motorized boating impacts.

$H4_C$: Motorized noise does not affect boaters' attitudes toward proposed management or their opinions about motorized boating impacts.

Delimitations

Data were collected at the boat ramps, campsites, and day-use areas along the eastern, developed side of Waldo Lake, within the Willamette National Forest in central Oregon. Data were collected from June 20 to September 20, 2003, by means of an interview-styled questionnaire. All willing visitors above the age of 18 comprise the sample of respondents.

Limitations

Data collection occurred only within the Waldo Lake area, rather than several other multiple-use lakes within the Willamette National Forest or the State of Oregon. Accordingly, responses may be biased because of the strong relationships visitors had with Waldo Lake. Due to the relatively short timeframe of data collection, which only

occurred during the 2003 summer season, the responses may not be representative of all user groups who visit the Waldo Lake area throughout the year. In addition, only respondents who participated in boating activities were included in the statistical analyses of the study, even though all respondents were allowed to participate in the study. Finally, it was assumed that respondents answered survey questions accurately and honestly.

Definitions

The following definitions were used for the purpose of this study.

Activity style. This term is defined as the personal meanings attached to an activity such as range of experience, definitions of quality, and intensity of participation (Moore, Scott & Graefe, 1998). Within this study, activity style was operationalized as the primary power source of the boaters on Waldo Lake. Based on power source, respondents were divided into two activity style groups: motorized and non-motorized boaters.

Motorized boaters. For the purposes of this study, motorized boaters consist of those respondents that listed electric, diesel or gas as the primary power source for their vessel. This was discovered through a specific survey question (Appendix A) that asked respondents to identify their boat power source.

Non-motorized users. For the purposes of this study, non-motorized boaters consist of those respondents that listed wind, paddle or oar as the primary power source for their vessel. This was discovered through a specific survey question (Appendix A) that asked respondents to identify their boat power source.

Conflict. Conflict is defined as a case of competition over a resource by different users (Owens, 1985). It also has been defined as the result of incompatibilities between

different activities (Noe, Hull, & Wellman, 1982) and goal interference by another's behavior (Jacob & Schreyer, 1980). Furthermore, conflict can also be perceived as a type of user dissatisfaction. For the purpose of this study, the concept of conflict was limited to noise alone. This was operationalized by employing survey questions that explored the amount of interference caused by motorized noise and human-induced noise. The former was examined in relation to four distinct aspects of the respondents' outdoor experience. These aspects included: enjoyment of the area, appreciation of the sounds of nature, appreciation of the natural quiet, and appreciation of the historical and cultural significance of the area. These items were measured using a 5-point Likert scale with values ranging from 1 ("not at all interfering") to 5 ("extremely interfering"). Human-induced noise impacts were operationalized by asking participants if such noises impacted their overall experience of the area.

Tolerance. Tolerance has been viewed as the tendency to accept (or reject) lifestyles different than one's own (Carothers, Vaske & Donnelly, 2001; Jacob & Schreyer, 1980). Tolerance has also been described by Ivy, Stewart and Lue (1992) as one's willingness to share resources with activity groups other than one's own. Tolerance was not directly measured within the context of the survey, but can be determined by examining the differences between interference levels and satisfaction expressed by the different boating groups.

Recreational norms. For the purposes of this study, recreational norms are defined as shared standards of behavior for specific recreational areas (Patterson & Hammitt, 1990; Vaske, Shelby, Graefe & Heberlein, 1986). These norms can relate to: the acceptable number of people in an area; the amount of permissible environmental

degradation present in an area; and, for the purpose of this study, the appropriate level of human-induced noise (Ruddell & Gramman, 1994). By measuring how strongly respondents feel about the presence of noise, an overall normative level among the respondents can be determined.

Environmental impacts. Environmental impacts may be classified as any impact that causes environmental degradation to a system (Miller, 1992). The occurrence of human-induced noise, as utilized in this study, may be considered an environmental impact since it can disrupt behaviors of wildlife and detract from the overall natural soundscape, as experienced by outdoor recreationists (Ruddell & Gramman, 1994). For the purpose of this study, the occurrence of noise not normally found within the natural environment is considered an environmental impact. The questionnaire inquired as to the presence of different types of noise and measured the extent to which respondents' experiences were negatively affected by noise.

Noise. This term is defined as unwanted or annoying sound (Elvhammar, 2000). Gramman (1999) described noise as a psychological evaluation of sound that can be perceived differently by individuals. As such, noise is considered different than sound within the context of this study because noise tends to have a negative connotation attached to it. Often, noise is considered to be annoying or bothersome to individuals to a certain degree (Kariel, 1990). This study, then, examines specific types of noises created by humans in the natural environment. These noises can originate from the use of mechanical or motorized devices or they can be created in other forms by humans.

Human-induced noise. In conjunction with the previous definition, human-induced noise is defined as the occurrence of "unwanted sound in the natural

environment that is directly attributed to other users" (Gramman, 1999). As employed in this study, human-induced noise refers specifically to sounds generated by people, including mechanized sound caused by engines and other human-made devices. Sounds created in a natural area by brought items, such as loud dogs and loud stereos, were also included in this study. In particular, respondents were asked if the occurrence of human-induced noise interfered with their overall experience at Waldo Lake. In addition, specific types of human-induced noise were measured by asking respondents to choose the type(s) of noise that interfered with their experience; results were then combined to create a number of different types of noise variables, as described in Chapter four.

Motorized noise. Motorized noise, for the basis of this study, is any noise created by mechanization. This type of noise is considered a subcategory of human-induced noise since it is created by humans. Motorized noise impacts were determined by asking respondents if and how they were impacted by motorized noise during their trip. Results were based on four individual interference items, which were scaled from 1 ("not at all interfered") to 5 ("extremely interfered").

Natural soundscape. Gramman (1999:15) defined natural soundscape as "the sound environment created by ongoing and more or less continuous processes within the natural environment that is being measured. The natural soundscape is distinguishable from sounds that are produced by specifiable sources of interest, such as aircraft." The natural soundscape is also sometimes described as sound created by wind, flowing water, mammals, birds and insects. This definition is closely related to that of natural quiet (see below). A combination of these definitions is applied throughout this study to describe the natural area in its pristine condition, as opposed to when noise is present.

Self-noise. This term is defined by the National Park Service as any non-mechanical sound produced by park visitors (Gramman, 1999). Examples of self-noise include sounds created by human activities (such as running, hiking, talking, laughing and swimming) that can completely or partially mask other sounds. This term was not actually measured in the context of this study, but it is considered part of the human-induced noise variable.

Natural quiet. Natural quiet is defined as ambient sound plus any *self-noise* generated by visitors involved in non-intrusive, non-mechanical activities (National Park Service, 1995). To reiterate, natural ambient sounds include running rivers, the wind through the trees, the sound of birds and other wildlife, and natural silence.

Satisfaction. This term is defined in outdoor recreation research as the engagement in recreational activities that is expected to fulfill selected needs, motivations or other desired states (Manning, 1999). Within this study, a ten-point Likert scale (with 1 being "worst experience" and 10 being "best experience") was used to operationalize satisfaction. An additional satisfaction measure was developed by creating an index of four individual satisfaction items; then, combining them to create a descriptive satisfaction index based on the work of Graefe and others (Drogin, Graefe & Titre, 1990; Graefe & Fedler, 1986; Graefe & Drogin, 1989). Overall, satisfaction was one of the main determinants that were used to establish differences between boating groups in terms of their perception of noise impacts.

Dissatisfaction. This term is defined by Webster's dictionary as the condition or feeling of being displeased or unsatisfied. In past literature, dissatisfaction has been utilized to describe the impacts certain groups or activities have on individuals (Ramthun,

1995). For the purpose of this study, this term was used to describe a reduction in visitor satisfaction caused by human-induced noise. In particular, discontent was attributed to conflicts between groups as well as tolerance differences relating to noise.

CHAPTER 2
LITERATURE REVIEW

Introduction

This chapter introduces literature related to noise impacts in outdoor settings as well as the use of a normative approach in determining impact perceptions between boater groups in the Waldo Lake area. The literature review is divided into the following seven major sections:

1. Basic background literature on the importance of lake systems for society and recreation.
2. Description of normative theory and its role in conflict, especially as it pertains to the determination of acceptable levels of impacts and tolerance levels between different user groups.
3. Examination of conflict literature between different recreation groups.
    a. Goal interference
    b. Tolerance
4. Relevant literature on noise impacts in outdoor recreation settings.
5. Examination of satisfaction and management literature and its relationship to norms and conflict.
6. Summary of findings.
7. Description of the conceptual model.

Lakes

Lakes offer numerous benefits to society. Firstly, they represent an aesthetic locale for the public (Klessig, 2000; Kosk, 2001; Miller, 1992; Smith, 1992). In North America, Europe and Japan, aesthetic enjoyment is one of the most common uses of lakes (Klessig, 2000). In a study of Wisconsin lakefront property owners, Klessig (1973) found that subjects were attracted to and purchased lakefront property primarily for the natural beauty and solitude of those areas. Furthermore, Klessig (2000) concluded that aesthetic values, such as beauty and solitude, were considered more important than all outdoor recreation activities when purchasing lakefront properties. Within this study, over 60% of Wisconsin lakefront property owners indicated that they had purchased their property primarily for the solitude and beauty of the lake area. Other activities such as boating, fishing and swimming accounted for an additional 20% of the responses (Klessig, 2000). A follow-up to Klessig's 1973 study, conducted in 1997 by Shifferd and Palmer, produced similar conclusions, finding that the aesthetic values of lakes remained the primary reason for visiting lake areas.

A second benefit that lakes provide society involves economic opportunities (Klessig, 2000; Miller, 1992). In some parts of the world, lakes supply fish for both local consumption and export operations (Klessig, 2000). In other places, they also supply water for human consumption, industry, agricultural irrigation and hydroelectric power (Kosk, 2001; Mitsch & Gossellink, 1993). In larger lakes, transportation options, such as ferries, constitute additional economic importance (Klessig, 2000).

Moreover, lakes increase economic opportunities through tourism and recreation (Klessig, 2000). Major hospitality industries have developed around lake areas to

provide services for those who use the areas for recreation (Klessig, 2000; Miller, 1992). Communities can benefit from lakes by obtaining income through sales and services without directly harming the area (Klessig, 2000; Shifferd & Palmer, 1997). However, these tourism areas may lose some of their aesthetic or environmental qualities over time (National Recreation Lake Study, 1999). Problems such as crowding, noise pollution, litter, and other environmental degradation may occur due to over-use of these areas (Mitsch & Gossellink, 1993; Shifferd & Palmer, 1997).

Additionally, lakes are a source of both emotional and environmental security (Klessig, 2000). Emotionally, lakes *"touch"* people by providing a setting for many special occasions in life. Times spent at lakes are filled with emotional attachments through both solitude and socializing (Klessig, 2000). Environmental security, on the other hand, represents attention to society's environmental needs, including clean water, clean air, natural quiet and biodiversity (Klessig, 2000).

Lastly, lakes provide an abundance of recreation activities (Miller, 1992). More than half of all U.S. adults participate in recreational activities involving water-based systems such as lakes (National Recreation Lake Study, 1999). Fishing, boating, swimming, sunning, photography, wildlife-viewing, sightseeing and camping are some of the activities available in lake areas. These activities add satisfaction and enjoyment to one's life by providing natural beauty, solitude, opportunities for physical activity, and rich outdoor experiences (Klessig, 2000).

Previous research has shown that people recognize the diverse recreational opportunities that lakes offer. For instance, Cordell (1999, 2003) found that water-based recreation has been steadily increasing over the last twenty years. In particular, activities

such as motorized boating, non-motorized boating, swimming, fishing, water-skiing and wildlife viewing have all experienced increases in participation (Cordell, 1999, 2003). Within the United States, motorized boating is by far the most popular water-based activity among recreationists-increasing from approximately 47 million participants in 1994-1995 to over 51 million participants in 2000-2003 (Cordell, 2003).

As participation in water-based activities continues to increase in the United States, crowding and recreational conflict increase as well (Heywood, 2002; Manning, 1999). The following section discusses normative theory and its application within recreational conflict. Because of increases in water-based activities, normative theory is important in assessing: levels of acceptable change between visitors, user preferences, and behavior patterns of different recreational groups.

Normative Theory

Norms are defined as standards of behavior that individuals (either alone or as a group) hold for a particular activity; for instance, what is and what is not acceptable in an outdoor recreation setting (Hall & Shelby, 1996; Vaske et al., 1986). Most normative theory is derived from the work of Jackson (1965), who proposed a norms model based on an impact acceptability curve. This model describes social norms in terms of averages of individual evaluations (Jackson, 1965). Problems such as crowding and environmental impacts are displayed on a horizontal axis, while evaluations by users are displayed vertically. The plotted curve can then be analyzed for various norm characteristics including: optimum conditions; range of acceptable conditions in recreational settings; norm strength throughout the study group; and norm crystallization or the level of agreement about certain norms (Heywood, 2002).

Conceptually, ecological and social impact norms can be divided into three types: no tolerance, single tolerance, and multiple tolerances (Shelby et al., 1996). Specifically, these three types of impact norms describe the levels of tolerance present within a group. No-tolerance norms refer to those impacts that generally receive zero tolerance from all users of a particular area or resource (Whitaker and Shelby, 1988). A single-tolerance norm exhibits one specific level where tolerances begin to decrease; but overall there is consensus within the sample (Shelby et al., 1996). The third type, multiple-tolerance norms, refers to the presence of multiple tolerance levels, which are attributed to the existence of different user groups with different norms for a specific impact (Shelby et al., 1996; Whitaker et al., 1988). This final type of norm is normally present in conflict issues involving groups with different behavioral characteristics and activity preferences (Shelby et al., 1996). Thus, the purpose of norms is to measure collective tolerances within a group of individuals. Within this study, tolerances are related to conflicts that arise in outdoor recreation.

Previous studies of boaters on the Deschutes River demonstrated that all of the norms found fit one of the previously mentioned classifications (Whitaker and Shelby, 1988). This is important in understanding the different perceptions between recreational users in this study. Although the normative approach has been widely used in encounter research, most studies have focused on ecological factors (Shelby, et al., 1996). In order to determine the differences in acceptability levels of human-induced noise between boater groups, one can first evaluate different users' perceived standards of quality and limits of acceptable noise.

Previous studies have illustrated how this concept can be related to and utilized in measuring impacts. In 1988, Shelby, Vaske & Harris examined campsite impacts in the Mt. Jefferson Wilderness in Oregon. Data was collected by asking respondents what they thought of bare ground areas that were absent of vegetation and the size of fire rings at the campsites (Shelby, et al., 1988). The scale utilized in this study ranged from "totally unacceptable" to "totally acceptable." The results were then plotted and produced varied impact acceptability curves (Shelby, et al., 1988). Based on these findings, these authors postulated that there were definite differences in acceptability levels within the respondent group based upon a specific impact (Shelby, et al., 1988).

Normative behavior has been used in previous research as an indictor of recreational conflict (Hall & Shelby, 1996). This approach has great appeal in conflict research as it can assist in identifying users' determinations of regular patterns of behavior, as well as establishing standards of an individual's recreation experience that can be utilized by managers (McDonald, 1996). Recreational groups that do not share similar norms can experience some form of interpersonal or social conflict. The concept of norms has been the focus of a number of previous studies that sought to ascertain norm differences between groups and how norms affect experiences (Hall & Shelby, 1996; Heywood & Aas, 1999; Vaske, Shelby, Graefe & Heberlein, 1986).

In this thesis, normative theory will provide the conceptual basis by which to measure different boating groups' definitions of acceptable levels of human-induced noise in an outdoor setting. Norms have been developed as a useful tool to conceptualize, collect and organize evaluative judgments in resource management (Shelby, Vaske & Donnelly, 1996). The following discussion on conflict and tolerance in

recreational settings will elucidate the relationships that exist between normative behavior among recreationists, the occurrence of conflict, and the tolerance of other recreationists' behavior.

Due to the similarities between conflict and normative theory, it should be noted that the idea of normative conflict acts as an important a bridge between the two concepts. Individuals who experience normative conflict are generally not dependent on the specific resource in question; but their group's values they are connected to during their recreational pursuits (Bury, Holland & McEwen, 1983). The relationship between groups can be determined behaviorally rather than by resource specificity. For example, conflict may arise between hunter and non-hunter groups due to differences in normative values (Bury, Holland, & McEwen, 1983). The non-hunter group may experience social-value based conflict towards the hunter groups. This conflict type is due to individuals' dislike for others' activities; it is not due to goal interference during the recreational experience (Bury, Holland, & McEwen, 1983). Normative conflict and goal interference will be further elaborated within the context of conflict and tolerance.

Conflict

In recent years, the rapid growth of outdoor recreation has led to increased competition over limited land and water resources; subsequently, conflict, has risen between visitors participating in different types of recreation activities (Owens, 1985). The theory of conflict has been defined in previous studies in several different ways, with the same general idea that of incompatibilities between groups leading to different degrees of dissatisfaction.

Ramthun (1995) described conflict as a form of dissatisfaction in which an unsatisfied individual feels that the attainment of his/her goals is influenced directly by

the interference of another individual or group. Owens (1985), who looked mainly at mechanization differences, described conflict as a case of competition over a resource by different activities. Noe, Wellman and Buhyoff (1982) defined conflict as a result of incompatibilities between activities such as motorized versus non-motorized ventures. However, the more popular and widely accepted definition by Jacob and Schreyer (1980) states that conflict is goal interference by another's behavior. This final interpretation of conflict is considered an illustration of interpersonal conflict.

Within this definition of conflict, goal interference requires direct or indirect social contact between user groups. Direct contact refers to face-to-face encounters with another group, such as a motorized boater encountering a canoeist on a lake (Jacob & Schreyer, 1980). Indirect contact refers to the occurrence or evidence of certain unacceptable behaviors as viewed by one group. Examples include the sound of motorized activity in a wilderness setting or seeing snowmobile tracks in more remote areas. According to goal interference theory, when the conduct of one group is incompatible with the physical, social, or psychological goals of another individual or group, a state of conflict occurs (Gramman & Burdge, 1981). Although goal interference does not always lead to goal incompatibility, it is considered a major source of incompatibility between users (Hammitt, 1988). Outdoor recreationists may experience conflict due to the following factors: differences in the social acceptability of specific behaviors, desirability of encounters, and the affect of encounters on visitors' enjoyment.

While the definition of goal interference typically deals with conflicts caused by direct contact, some non-activity-based behaviors (such as those that produce noise, litter, and rowdiness) have also been described as serious conflict sources. These behaviors,

then, also adhere to the goal interference definition (Jackson & Wong, 1982; Jackson, Haider, & Elliot, 2002; Ruddell & Gramman, 1994). Conflict can be described as a type of user dissatisfaction in which certain expected goals are unmet. This is not only due to differences in the type of use, but also to differences in beliefs and behaviors between groups or individuals. Moreover, these differences lead to incompatible ways of achieving similar goals (Gibbons & Ruddell, 1995). Earlier research studies showed that recreational conflict seemed likely between users and non-users of mechanization because of: differences in activity styles; and an inability to achieve similar recreational goals across both groups (Owens, 1985).

Within the literature, a consistent conclusion is that conflict is often asymmetrical, meaning that one user group is more affected than another (Adelman, Heberlein & Bonnickson, 1982; Jackson & Wong, 1982; Knopp & Tyger, 1973; Lime, 1975; Shelby, 1980). This asymmetrical relationship between different user types can be influenced by the quality of experience desired as well as experience satisfaction. Asymmetrical conflict usually occurs when only one of the groups becomes frustrated by the inability to achieve their recreational goals due to the behavior of another individual or group. For example, Adelman et al. (1982) found that while non-motorized canoeists did not enjoy interactions with motorized boat users, motorized boaters did not mind seeing multiple canoeists. In a similar study, Jackson and Wong (1982) found that cross-country skiers disliked encounters with snowmobilers but that snowmobilers did not mind encounters with skiers.

Thus, asymmetrical conflict has been noted in studies of motorized versus non-motorized groups. However, it has also been detected between skiers and snowboarders

(Baird, 1994; Thapa & Graefe, 2004; Vaske et al., 2000), hikers and stock users (Watson, Niccolucci & Williams, 1994), and hikers and mountain bikers (Watson, Williams & Daigle, 1991). In sum, these findings show that conflict may also be linked to activity style and how users perceive each other in the outdoor setting. Furthermore, conflicts within a specific activity, such as boating, can also occur when visitors with different expectations and norms interact with each other (Confer, 1997).

Conflict has also been studied between members of the same activity type who use different propulsion. For example, researchers have discovered that paddling canoeists experienced an elevated amount of conflict with motorized canoeists (Adelman et al., 1982; Peterson, 1974; Peterson, Anderson & Lime, 1982). Asymmetrical conflict has also been found between groups participating in different activities, which are separated by the mode of propulsion utilized. The competition experienced between hikers and mountain bikers and the conflict experienced between skiers and snowboarders are two examples of recreational conflict influenced by activity styles (Ramthun, 1995; Thapa & Graefe, 2004; Vaske, Carothers, Donnelly & Baird, 2000).

However, symmetrical conflict can also occur between user groups in an outdoor recreational setting. In the study of skiers and snowboarders (Thapa, 1996; Thapa & Graefe, 2004), it was discovered that both groups conflicted with each other because of the presence and /or behavior of individuals from either group. Thapa (1996), in particular, discussed the influence of safety perceptions on conflicts between user groups. In this study, skiers felt that snowboarders interfered with their experience by increasing the risks of injury. Snowboarders, on the other hand, perceived the skiers as impeding their recreational goals, and they preferred not to encounter skiers, if possible, while they

participated in their own activity (Thapa, 1996; Thapa & Graefe, 2004; Vaske et al., 2000).

Within the theoretical concept of conflict, Jacob and Schreyer (1980) described four factors that can produce conflict in outdoor recreation areas. These factors are activity style, mode of experience, lifestyle tolerance, and resource specificity. Moore, Scott and Graefe (1998) defined each of these terms as follows: *Activity style* refers to the personal meanings attached to an activity, such as range of experience, level of skill required, definitions of quality, and intensity of participation. *Mode of experience* refers to different ways of experiencing and perceiving the natural environment. In this factor, participants may be involved in either a focused or unfocused mode. A focused mode of experience refers to participants who are extremely sensitive to the particular details of the environment and, thus, are more likely to encounter conflict when exposed to recreationists who are unfocused. *Lifestyle tolerance* refers to the user's propensity to accept or reject lifestyles and beliefs that differ from his/her own. This means that recreationists who are not willing to share the natural resources they use for certain activities and are intolerant towards different lifestyles, are more prone to experience conflict (Jacob & Schreyer, 1980). Similarly, individuals are more likely to be tolerant of others who they perceive to be similar to themselves (Jacob & Schreyer, 1980). Lastly, *resource specificity* refers to the significance attached to a specific resource for a given experience. In summary any one of the aforementioned factors can cause conflict; but, in a majority of cases, a combination of two or more factors usually creates conflict between user groups (Thapa, 1999).

Conflict between groups can also arise from a number of additional sources, including interpersonal and value differences. Firstly, it can arise when the physical presence of one group interferes with the goal(s) of another (Vaske, Donnelly, Wittmann & Laidlaw, 1995). For instance, wildlife viewers may experience conflict when noise, generated from motorized activities, scares away the area's birds. This example illustrates goal interference since the goals of the wildlife viewers are directly impacted by the presence of motorized users (Jacob & Schreyer, 1980). In addition, this example demonstrates interpersonal conflict because the direct interactions of the user groups lead to the perception of problem conditions (Vaske et al., 1995).

Secondly, conflicts can also occur between user groups that have differences in norms or values (Ruddell & Gramman, 1994; Vaske et al., 1995). This type of conflict is referred to as value or social conflicts (Vaske et al., 1995; Williams, 1993), and unlike interpersonal conflict, does not require direct interaction. Moreover, this form of conflict is related to the personal values a group places on an area or activity; thus, it is directed towards an "out-group" that does not share the same values or norms (Thapa & Graefe, 1999). This type of conflict is typified by the tension between hunters and anti-hunters. Instead of conflict being derived from competition over a resource or interference with recreational goals (as with interpersonal conflicts), it is due to differences in values between the two groups (Donnelly & Vaske, 1995; McShea, Wemmer & Stuwe, 1993).

In conclusion, the needs, attitudes, and values that recreationists bring to an outdoor recreation setting can impact the activity and preferences sought. Different users may have different recreational goals and tolerances, which can be expressed by differences in

either the value or presence of norms. In addition, these norms may lead to recreational conflicts and changes in tolerance levels (Jacob & Schreyer, 1980).

Tolerance

Directly linked to interpersonal and social-value conflicts is the idea of tolerance. Tolerance has been viewed as the tendency to accept (or reject) lifestyles different from one's own (Carothers, Vaske & Donnelly, 2001; Jacob & Schreyer, 1980). Tolerance has also been described by Ivy, Stewart and Lue (1992) as one's willingness to share resources with different activity groups. In a 1980 study conducted by Jacob and Schreyer, it was suggested that individuals would be tolerant of others who participated in activities that were perceived to be similar. In fact, tolerance is usually connected with beliefs about a particular group rather than reactions to specific behaviors (Ivy, Stewart & Lue, 1992). Differences in activities or lifestyles can often be communicated through visual signs, such as the equipment used in varied activities (Vaske et al., 1995). Generally, it has been found that users, who exhibit a low tolerance for individuals with different lifestyles, will be more likely to experience elevated conflict (Carothers, Vaske & Donnelly, 2001). Therefore, tolerance can be viewed as an antecedent to conflict. A lack of tolerance among visitors will more likely lead to an occurrence of conflict between participants.

Various levels of tolerance can be seen among individuals, and these levels are dependent on both situational and normative factors. Situational factors include: group size; motives; frequency of use; and when and where contact occurred (Vaske et al., 1986). Additionally, asymmetrical conflicts involve one group possessing a higher level of tolerance than another group (Adelman et al., 1982). For example, snowboarders have tended to be much more tolerant of the presence of skiers than vice-versa (Williams,

Dossa & Fulton, 1994; Thapa, 1996; Thapa & Graefe, 2004). Moreover, Ivy et al. (1992) found that canoeists possessed a lower tolerance level accompanied by a greater perception of conflict in water-based settings; while, motor boaters expressed a lower degree of conflict and a higher overall tolerance level toward non-motorized groups. All in all, tolerance towards a specific recreation behavior or activity choice can assist in determining the degree of conflict experienced by various user groups in outdoor recreational settings.

Furthermore, tolerance has recently developed within the greater context of group norms to address the limits of acceptable change (LAC) regarding specific impact parameters found in outdoor recreation settings (e.g., number of contacts, campsite impacts, environmental impacts dealing with litter and other types of pollution, and unacceptable behavior) (Ivy et al., 1992). In other words, tolerance is now viewed as a willingness to accept deviations from the preferred or ideal situation expected in a specific outdoor setting (Whittaker & Shelby, 1988).

In conclusion, after reviewing the concepts of norms, conflict, and tolerance, it is evident that the occurrence of noise in the natural environment can lead to conflict and lower satisfaction levels between user groups. The next section describes impacts on and conflicts between visitors in outdoor recreation settings that are derived from the occurrence of noise in the natural environment.

Noise Impacts and Conflicts

The occurrence of noise in a natural setting continues to be an ever-increasing problem. This is precipitated as a growing number of people who want to visit natural areas, such as forests, parks and lakes, combined with a decrease in the amount of land available for such activities (Kariel, 1991). Noise in a natural environment stems from a

wide variety of sources: some can be considered pleasing or relaxing; and some are annoying detractions from the overall recreational experience (Kariel, 1990; Mace, Bell & Loomis, 1998).

The difference between sound, noise, and natural quiet is important in understanding the issues involved with noise in natural areas (Gramman, 1999; Kariel, 1991; Krause, 1999, 2001). These three terms describe different dimensions of a larger concept. Sound is usually a physical science concept defined as fluctuations in atmospheric pressures that produce an audible sensation in one's ear (Gramman, 1999). Noise, on the other hand, tends to be more psychologically based-defined as unwanted sound (or a psychological evaluation of sound) that is normally considered to be annoying or otherwise irritating to listeners in certain settings (Fiddell, 1979; Gramman, 1999; Kariel, 1990; Mace, Bell, Loomis & Haas, 2003). To clarify, certain studies have shown that noise from automobiles, for example, is less annoying in an urban setting than in a natural one (such as a trail, forest, or primitive campground) (Anderson, Mulligan, Goodman & Regen, 1983; Fiddell et al., 1996, Green & Fiddell, 1991). This is because the occurrence of automobile noise is both expected and widely accepted in more urban areas; whereas, in a natural setting such noise is deemed out of place (Anderson et al., 1983; Driver, Nash and Haas, 1987; Fidell et al., 1996; Kariel, 1990, 1991).

The most in-depth definition of natural quiet was provided by the National Park Service during their report to Congress regarding aircraft flights over National Parks (Gramman, 1999; National Parks Service, 1995). The definition given was created specifically in reference to Grand Canyon National Park, where aircraft flights had become an increasingly difficult management problem for NPS staff (Gramman, 1999;

Miller, 2001). Natural quiet was described as natural ambient sound plus any *self-noise* generated by visitors involved in non-intrusive, non-mechanical activities (National Park Service, 1995). To elaborate, natural ambient sounds are considered sounds such as running rivers, the wind through the trees, the sound of birds and other wildlife, and sheer natural silence. The concept of *self-noise,* as added by the National Park Service (NPS), means any noise generated by visitors engaged in non-intrusive, non-mechanical activities. Moreover, *self-noise* can, indeed, create conflicts by disrupting the enjoyment of others, and it will be utilized in the current study.

Within the context of social science, the concept of noise and noise impacts has mostly been approached from a psychological perspective (Gramman, 1999). The basic assumption within this approach is that people differ in their perceptions of their environment and their acceptance of different types of sound (Gramman, 1999; Kariel, 1991; Mace, Bell and Loomis, 1998). This approach also examines variability in noise expectations based upon the actual setting in which noise occurs (Anderson et al. 1983; Kariel, 1990; Mace et al., 2003). For example, it has been noted that people's expectations of motorized noise are dependent on an area's level of development. In more undeveloped, natural areas, mechanical noise is more likely to be evaluated negatively; this is due to the fact that visitors do not expect to hear such noise in natural surroundings (Gramman, 1999; Tarrant, Haas & Manfredo, 1995). Yet in more developed and populated areas, a mix of motorized and non-motorized sounds is regarded as normal (Gramman, 1999). Due to this setting factor, people living in more urban areas seem to be more tolerant of mechanical noises in developed areas.

Apart from noise expectations, additional factors affect visitors' perceptions of sound and noise, including: involvement in activities that deflect attention away from the noise in question (foreground task); and whether a sound is perceived as preventable or necessary (Gramman, 1999; Kariel, 1990; Miller, 2002). An example of the first criteria revolves around the noticeability of aircraft noise to visitors involved in photography; such noise does not affect the quality of the activity in general. Moreover, Miller (1995) found that the noticeability of aircraft sounds is greatly minimized if it is less than ten decibels higher than that of non-aircraft sounds. For an illustration of the second criteria, Staples (1997) refers to wilderness hikers, who may be more tolerant of aircraft noise involved in fire suppression activities than tourism-based flybys over the natural area (Staples, 1997).

The social implications of noise on visitors to the natural environment have only recently started to gain attention. Specifically, natural quiet, or the sounds of nature, is highly ranked by visitors as an important aspect of their recreational experience (Mace, Bell & Loomis, 1998). The National Park Service also found that natural quiet is considered as important as solitude, space, aesthetic values, enjoyment of history, and general enjoyment of the natural area itself (Gramman, 1999; Knoph, 1983; National Park Service, 1988). Part of the value of natural sound comes from: 1) the sheer aesthetic quality of extreme natural quiet that exists in contrast to most individuals' everyday life experience and; 2) the finding that natural soundscapes may have restorative properties in reducing stress in individuals (Gramman, 1999; Miedema & Vos, 2001).

Conflicts in terms of noise have been mounting as the outdoor recreation desires of visitors increase (Kariel, 1990). The conflict, itself, seems to arise between those who

desire to experience and preserve quiet areas, where natural sounds dominate, versus those who wish to utilize mechanized equipment in these quiet, natural environments. The aforementioned example of noise conflict in Grand Canyon National Park is an excellent illustration of this point. There, visitors are in conflict with tourism promoters who utilize aircraft in their tourism operations (Kariel, 1990; Miller, 2001). In this instance, the introduction of mechanized travel as a means of visiting the National Park, compromises some of the very reasons the park was established (Kariel, 1990). The overall satisfaction of an outdoor experience can also be compromised by loud parties, music, and excessive generator or ORV usage. Since it has been found that natural ambient sound is one of the main reasons for visiting natural areas, preservation efforts are needed to manage the existence of noise (Driver et al. 1987; Kariel, 1990).

Satisfaction

When referring to a visitor's experience, quality is a term that often surfaces in the outdoor recreation field. Visitors have come to expect quality in their recreation experiences, thus, making most managers strive to provide the highest quality recreational experiences possible. Within the context of outdoor recreation, the idea of quality has been traditionally measured by the amount of satisfaction reported by various users (Manning, 1999). Satisfaction, itself, has been defined in various ways. Manning (1999) defines satisfaction as the congruence between expectations and outcomes, implying that visitors' expectations for a recreational site or trip meet their overall standards. Mannell (1999), however, describes satisfaction as an indicator of the quality of leisure. And Vaske et al. (1982) states that satisfaction is dependent on the interaction between individual characteristics and the characteristics of the activity. Similarly,

Bultena and Klessig (1969) define satisfaction as a function of the degree of congruence between aspirations and the perceived reality of experiences.

As previously discussed in this chapter, the concepts of norms, conflicts, and tolerances are closely related to the concept of satisfaction. When conflicts occur, the chances of one group experiencing a decreased level of satisfaction is likely. They choose to redefine the experience to more closely reflect the reality, i.e. product shift, thereby reducing cognitive dissonance. Manning (1999) states that visitors to outdoor recreation areas often differ in ways that affect perceived quality and satisfaction. For example, visitors have widely ranging attitudes, motivations and norms. Also, several outdoor satisfaction studies have concluded that visitors report high levels of satisfaction regardless of impacts or crowding that may actually occur on the day of their visit (Heberlein & Shelby, 1977; Manning, 1999). However, Vaske, Fedler & Graefe (1986) found that environmental aspects such as weather can indeed affect satisfaction levels, which may be activity-specific in some cases. In addition, Bultena & Klessig (1969) described specific recreational goals, and environmental conditions (site quality) were good indicators of satisfying experiences. Overall, there is agreement between researchers that satisfaction is a function of both recreation settings and participant characteristics (Manning, 1999).

A satisfying experience generally occurs when a visitor engages in some form of recreational activity, be it relaxing, boating, swimming, camping etc. Involvement in certain types of activities may reflect individual social norms about a specific area. Along with actual participation in an activity, recreationists' experiences and satisfaction levels are tainted by norms or preferences. For instance, a previous conflict study by

Peterson (1974) found that different boater groups possessed different norms about the Boundary Waters Canoe Area, which caused varying conflicts.

A difference in satisfaction levels between users is a reoccurring theme. In a 1982 study by Vaske et al., differences in reported satisfaction levels by consumptive and non-consumptive recreationists were examined. In the context of this particular study, consumptive recreation relates to product gain such as a successful hunt, whereas non-consumptive recreation is based more on experiences (Vaske et al., 1982). Within the study, it was also found that non-consumptive users were largely more satisfied with their experiences than the consumptive group. In another study by Vaske, Fedler and Graefe (1986), it was similarly found that success in the consumptive behavior of waterfowl hunters did not always lead to increased satisfaction.

Recreational conflict literature has also focused on different satisfaction levels among users. Watson et al. (1991) determined that conflicts between bikers and hikers in the Rattlesnake National Recreation Area led to differing degrees of satisfaction between users based upon different crowding perceptions and norms. Moreover, Peterson detected satisfaction differences between the various boater groups in his 1974 study of the Boundary Waters Canoe Area. In his analysis of canoeists and motor boaters, perception and norm differences were responsible for a decreased level of overall satisfaction by canoeists.

As stated earlier in this section, the ultimate goal for recreation managers is to provide the high quality recreation settings to visitors (Hendee & Dawson, 2002). However to reiterate, decreases in satisfaction are often attributed to conflict issues and

norm differences. Thus, the management of outdoor areas plays a key role in understanding users and, subsequently, heightening their recreational experiences.

Since the recreational and aesthetic values of outdoor areas has increased rapidly over the last several decades, the amount of energy and time devoted to management and strategies will also have to increase (Hendee & Mattson, 1997). The two main issues facing outdoor recreation management today are: to provide opportunities for quality experiences; and to limit impacts, such as noise, that could lead to conflicts and dissatisfaction among different users (Hendee & Dawson, 2002).

In order to accommodate visitors' wishes while at the same time maintaining the highest possible level of environmental quality, managers must employ many different management styles (Hendee & Dawson, 2002). A disparity, however, exists between managers and visitors in terms of their perceptions of recreation quality and satisfaction (LaPage, 1983). Accordingly, many managers believe that a minimal amount of management is the best strategy when dealing with visitor perceptions (LaPage, 1983). On the other hand, many recreationists petition for management to provide services such as security, information, education, and advice (LaPage, 1983).

Management strategies can be broken down into direct and indirect management. Direct management, as described by Hendee and Dawson (2002), refers to the regulation of behavior through increasing restrictions and control over visitors and/or activities. This type of approach is sometimes necessary in areas where specific problems exist, but it should be carried out with care in order to grant visitors the most freedom possible (Hendee & Dawson, 2002). Examples of specific restrictions include temporal zoning, spatial zoning, activity restrictions, increased enforcement, and rationing. Again, since

one of the main objectives of managers is to maintain quality visitor experiences, direct management and regulation should be minimized as it has been found to diminish users' satisfaction (Hendee & Dawson, 2002).

The second management approach, indirect management, strives to modify behavior through subtle influence (Hendee & Dawson, 2002). This modification is accomplished: by utilizing education and information; or by making access difficult by design (Hendee & Dawson, 2002). This approach also tends to receive more acceptance from both management and visitors since it is generally cheaper to implement and less intrusive (Hendee & Dawson, 2002). Indirect management techniques would, for example, rely on the usage of signs, facilities, and access points to modify the type and distribution of recreation use in an area experiencing conflicts (Stankey & Schreyer, 1987).

Information and education also play key roles in indirect management (LaPage, 1983). While these tools can be used in direct management, they can also be used to expand visitors' understanding, explain the role of management apropos specific issues, reduce conflicts between groups, and encourage users' to follow no-trace tactics (Hendee & Dawson, 2002). For example, Lucas (1985) found that directional signs and information boards were deemed acceptable (or lacking) by various trail users. Thus, these signs were seen as an overall improvement to the recreational experience, adding education and safety features (i.e. directions) to the various trails.

In sum, a review of the management literature indicates that an indirect management approach should be the first step in resolving conflict and increasing visitors' satisfaction levels. This tactic would allow visitors the most freedom and would

be subtler than the direct approach (Hendee & Dawson, 2002). However, it should be noted that a combination of the two approaches generally brings about the greatest success in conflict management (such as the boater conflicts discussed in this study).

Summary

Based on the literature discussed in this chapter, the use of a normative approach for analyzing noise-related conflicts in outdoor recreation areas seemed very viable. After relying on past studies as guidelines for the creation of a survey, the normative approach should produce illuminating data on: 1) users' conflicts and acceptance levels regarding noise in a natural setting and; 2) satisfaction levels of the different boating groups. This study should be able to assist natural resource managers in the future to: 1) control noise-related damage to the environment; 2) regulate dissatisfaction levels related to noise issues and; 3) identify the optimum conditions recreational users expect in outdoor recreation settings. Because perceptions of impacts vary greatly between individuals, this study will only focus on the effects of human-induced noise on the different boater groups present at Waldo Lake, Oregon.

Conceptual Model

The model depicted in Figure 1 predicts that the participating boater groups' tolerance levels and noise perceptions will be influenced by activity style. Previous studies examined in this section have indicated a relationship between individuals' choice of activity and their overall perceptions of human-induced noise. This correlation should apply to the current Waldo Lake study. In this thesis, a focus will be placed on the conflict between motorized and non-motorized boater groups. For the purpose of this research, activity style is seen as a mediating variable between human-induced noise and its effects on boaters' overall experience. The conceptual model predicts that boaters' overall experience will be influenced by activity style (motorized/non-motorized boating). The presence of different types of noise is also expected to affect boaters' overall experience.

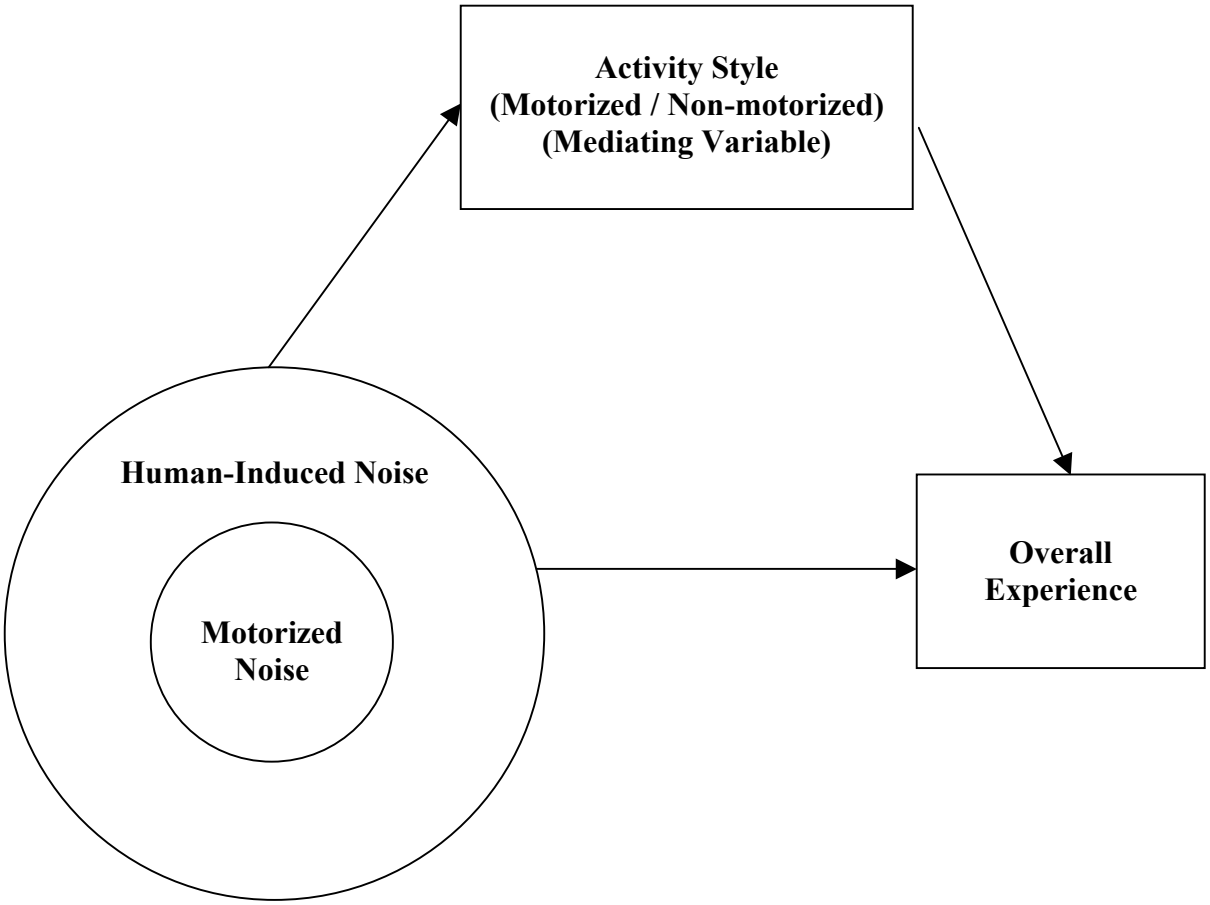


Figure 1: Conceptual Model.

CHAPTER 3
METHODOLOGY

This chapter introduces the research methods used in this study and is divided into six sub-sections. The first section addresses the general background of the study. The second describes the area where this study was performed. The third and fourth segments detail data collection and sampling procedures as well as selection of subjects, respectively. The fifth section describes the survey instrument used, including questions pertaining to noise. Finally, the last portion briefly outlines the statistical processes used to analyze data pertaining to the Waldo Lake study.

Background

The research in this study was collected as part of the larger National Visitor Use Monitoring (NVUM) study funded by the United States Forest Service (USFS). The NVUM study is currently being implemented throughout the country and focuses on understanding visitor use patterns, expectations, desires, and satisfaction levels within USDA Forest Service lands.

Thesis research was conducted using a quantitative research framework. The research instrument was an on-site, interview survey designed to investigate several aspects of recreational use at Waldo Lake as well as different user groups in the area. A survey refusal sheet (Appendix B) was completed by unwilling participants in order to collect general data on non-respondents. Data recorded on this sheet included information about apparent gender, apparent race, group size, boat length, boat power, boat type, and the reason for not participating in the survey (if given). This information

was used to better assess the types and numbers of different boat users in the area and, more importantly, to test for non-response bias. However, since the survey refusal sheet was rarely needed (N=6), the non-response bias was minimal.

The survey (Appendix A) included many relevant items from previous visitor use surveys. Yet, questions used in the survey were also modified specifically for Waldo Lake. For example, questions dealing with user satisfaction were also included in the body of the survey. Satisfaction measures were based on prior studies, which utilized similar satisfaction statements to create a satisfaction index (Graefe & Fedler 1986, Graefe & Drogin, 1989; Robertson, & Regula, 2001). Statements were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree"; statements were then combined to create the satisfaction index. Moreover, an additional ten-point, single-item, overall satisfaction measure was also utilized in this study, as was done by Graefe (1989) and others in previous work.

Site Description

Waldo Lake is located within the Willamette National Forest in Central Oregon. The terrain adjacent to the lake is characterized by moderate to steep slopes, numerous basins, small meadows, and rocky outcroppings (such as Mt. Yoran peaking at 7,144 feet) (Williams, 2002). Approximately 98% of the area is forested with Douglas fir, western hemlock, western fir, and some true fir (Williams, 2002). Waldo Lake, itself, covers an area of about ten square miles and is at an elevation of approximately 5,414 feet (Williams, 2002). Moreover, it is regarded as one of the largest olglitrophic lakes in Oregon, the second deepest natural lake in the state, and one of the three purest lakes on earth. Waldo Lake is adjacent to the Three Sisters Wilderness Area, and it is noted for the crystal clear water it receives from melting snow. As a result, the water chemistry of

this pristine lake is often compared to that of distilled water. On a clear day, the extreme transparency of the lake allows for visibility down to 100 feet. This is particularly remarkable when considering the lake's average depth – 128 feet. Its maximum depth is estimated at approximately 420 feet (Williams, 2002).

Recreational usage of Waldo Lake dates back to the late 1800's when five access trails from the neighboring town of Oakridge were established (Williams, 2002). The first campgrounds were established in the late 1930's by the Civilian Conservation Corp (CCC), and by 1960, Waldo Lake's recreational infrastructure included the same improved and upgraded facilities found today (Williams, 2002). Currently, Waldo Lake contains 205 developed campsites, equipped with bathrooms and information kiosks, spread throughout three main campgrounds. There are also three boat ramps and more than 50 primitive sites located around the lake. The lake can be reached by way of four paved access roads and numerous hiking, biking and horse trails. Although no specific visitor counts were available for Waldo Lake, the US Forest Service has experienced an increase in usage through the 1980's and 1990's (Williams, 2002). This increased use, in combination with natural events (such as the 1996 Waldo fire), has elevated concerns regarding the management of the area.

Data Collection & Sampling Procedures

Respondents were selected using a stratified sample in order to include the various different users of the Waldo Lake area. These groups included: boaters, campers, hikers, bikers, horseback riders, and other day visitors. Each sampling day of the thirty-day sampling period began by discerning the developed recreation site(s) that were experiencing the most use. Once this was determined, a high-volume location was surveyed for approximately two hours before another site was chosen. This was done to

insure that a maximum number of responses would be completed over the entire sampling period. During each two-hour sampling period, different types of visitor sites (e.g., campsites, boat ramps, trailheads, etc.) were observed. Sampling of the Waldo Lake area was dependent on several factors. First and foremost, access to the site was affected by the past winter's snow accumulation and subsequent melting rate. According to previous data collected by the US Forest Service, Waldo Lake is normally fully accessible around the last week of June. During this past winter, however, snow accumulation in the area was considerably lower than average; thus, leading to an earlier opening date than previous years. Past research has also shown that Waldo Lake's most popular months are between late-July and mid-September, and that the highest use days are Friday through Sunday.

Based on prior visitor data, sampling for this project began on June 21, 2003 and was only conducted on weekends until July 4, 2003. Sampling days were then increased through July to include random weekday sampling periods until the end of the sampling period on September 30, 2003. Breakdowns of the number of surveys per day, per day of the week, per month, and by survey locations, are described in Tables 1 through 4, respectively. Sampling days were approximately six to eight hours in length and were concentrated at various locations (Table 4) depending on use level (as mentioned earlier in this section). At a confidence interval of 0.05, it was estimated that a 5.4% margin of error could be achieved if 400-500 respondents, of the estimated 4000-5000 summer visitors during an approximate 30-day period, were sampled successfully.

Table 1: Surveys per Sampling Day.

Survey Date	n	%
6/20/2003	3	1.0
6/21/2003	5	1.6
6/22/2003	3	1.0
6/24/2003	4	1.3
6/25/2003	7	2.3
6/26/2003	4	1.3
7/3/2003	8	2.6
7/4/2003	15	4.8
7/5/2003	10	3.2
7/6/2003	7	2.3
7/8/2003	5	1.6
7/9/2003	3	1.0
7/10/2003	7	2.3
7/14/2003	11	3.5
7/15/2003	5	1.6
7/16/2003	9	2.9
7/18/2003	6	1.9
7/19/2003	15	4.8
7/20/2003	7	2.3
7/21/2003	8	2.6
7/22/2003	6	1.9
7/25/2003	12	3.9
7/26/2003	6	1.9
7/27/2003	8	2.6
7/30/2003	10	3.2
7/31/2003	7	2.3
8/1/2003	8	2.6
8/2/2003	17	5.5
8/3/2003	5	1.6
8/6/2003	11	3.5
8/8/2003	16	5.1
8/9/2003	28	9.0
8/10/2003	6	1.9
8/12/2003	9	2.9
8/15/2003	2	0.6
8/16/2003	2	0.6
8/17/2003	2	0.6
8/18/2003	1	0.3
8/21/2003	2	0.6
8/24/2003	1	0.3
8/27/2003	1	0.3

Survey Date	n	%
9/1/2003	1	0.3
9/2/2003	1	0.3
9/6/2003	3	1.0
9/7/2003	2	0.6
9/14/2003	1	0.3
9/20/2003	1	0.3

(n=311)

Table 2: Number of Surveys per Day of Week.

Day of Week	n	%
Monday	31	10.0
Tuesday	37	11.9
Wednesday	31	10.0
Thursday	21	6.7
Friday	62	19.9
Saturday	87	28.0
Sunday	42	13.5

(n=311)

Table 3: Number of Surveys per Month.

Month	n	%
June	26	8.3
July	165	53.1
August	111	35.7
September	9	2.9

(n=311)

Table 4: Number of Surveys per Location.

Location	n	%
1. North Waldo Campground	106	24.7
2. Shadow Bay Campground	72	16.7
3. Shadow Bay Boat Ramp	69	16.0
4. Islet Campground	64	14.9
5. North Waldo Boat Ramp	63	14.7
6. Islet Boat Ramp	40	9.3
7. Harralson Horse Camp	6	1.4
8. North Waldo Picnic Area	3	0.7
9. Shadow Bay Parking & Trail Head	4	0.9
10. Shadow Bay Beach Area	2	0.5
11. Islet Beach	1	0.2

(n=311)

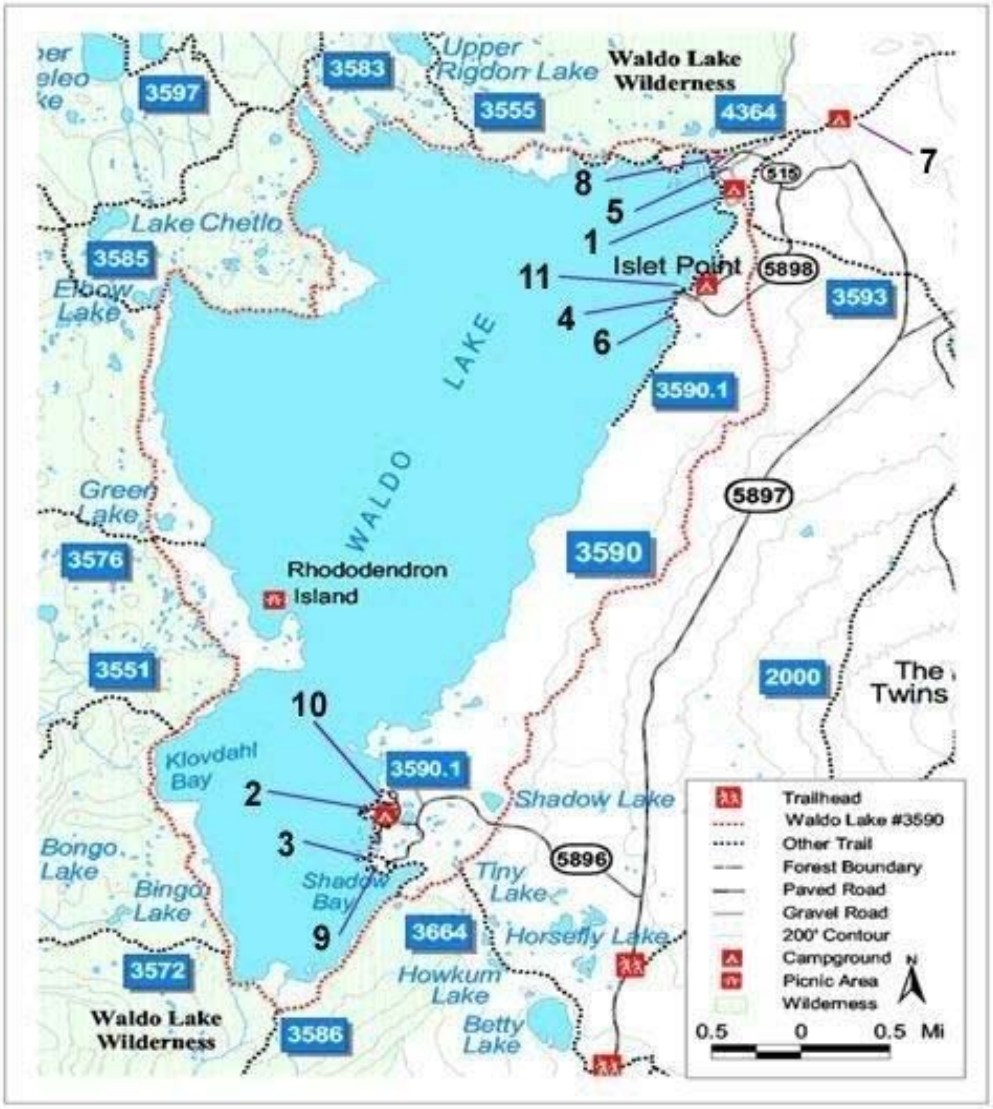


Figure 2: Waldo Lake and Vicinity Site Map (USDA Forest Service, 2004).

The map in Figure 2 illustrates the access routes and recreation sites that were used as intercept points by the surveyor. There were three main access routes to the lake in the east, and these points contained both boat ramps and developed camp areas. There were also trailheads and day-use areas in proximity to these locations. Dispersed campsites located on the western portion of the lake were not surveyed during the data collection process due to time and transportation constraints. Instead, the overnight parking areas

located adjacent to the Shadow Bay boat ramp, Islet Bay boat ramp, and the North Waldo boat ramp, were visited several times each sampling day in an attempt to survey dispersed campsite visitors as they returned to their vehicles. Sample points in Figure 2 are based on the numerical key established in Table 4.

Selection of Subjects

The sample population consisted of visitors using the area for both terrestrial and water-based recreation, including both motorized and non-motorized boating, hiking, camping, and other day-use activities. Survey locations were selected based on the amount of use observed at the different types of recreational areas per diem. Sampling days were selected as previously mentioned and were only altered during days of poor weather and extremely low visitor turnout. Surveying occurred during subjects' visit, or as visitors were exiting the area. Only respondents 18-years-old and older were interviewed in this study. Only boaters who agreed to participate in the survey were included in this study in order to achieve a maximum number of responses. Interview-style surveys were implemented and all surveys were completed, coded, and analyzed by the principal investigator of this project.

Instrumentation

An interview-style, visitor-use questionnaire was chosen over other data collecting methods because respondents had the opportunity to ask for clarification on any of the items within the survey instrument. This type of survey was also beneficial because the surveyor was able to include all types of recreationists who used the Waldo Lake area. Survey questions not previously used in other studies were pre-tested in March 2003 in a mail survey to boaters at the Timucuan Preserve area in Jacksonville, Florida.

The creation of the survey instrument was assisted by holding two focus groups in Springfield, Oregon. These meetings included the varied users of Waldo Lake as well as some United States Forest Service (USFS) officials. The purpose of the meetings was: 1) to obtain a better understanding of the role Waldo Lake plays in outdoor recreation in central Oregon and; 2) to determine the conflicts that existed between the user groups of Waldo Lake. During the two sessions, a common dislike for noise and motorized use was identified. Moreover, the majority of participants perceived the lake's ideal role as a place for non-motorized styles of recreation. Individuals chosen to participate in the meetings were from various motorized and non-motorized groups, and care was taken to hear arguments from both sides.

Following these focus-group meetings, survey questions were created to further examine some of the more pertinent issues at Waldo Lake. In particular, questions separating recreation types and questions pertaining to noise conflicts were partially derived from the results of these meetings. Two variables were used to measure the relationship between user groups and their perceptions (of the effects) of human-induced noise. These variables investigated: the effects of mechanical noise on the respondent's own outdoor experiences; and the effects of this noise on the environment around them. Questions about noise impact perceptions were presented in both Likert-styled format and as an itemized list of choices. A series of noise-related questions were used to determine the types and degrees of noise that was heard by respondents. One of these questions listed different noise types to determine what kinds of human-induced noise affected visitors. The next question in the survey was presented in a Likert-scale format and was used to determine the amount of interference these noises had on their overall recreation experience. Specifically, this was accomplished by asking respondents the

degree to which types of noise interfered with various aspects of their experience (including enjoyment of the area, appreciation of the natural quiet, appreciation of the sounds of nature, and the appreciation of the cultural significance of the area). This perception question was measured from one ("not at all interfering") to five ("extremely interfering").

In addition to a survey, previous studies (Burson, 2002; Krause, 2001) dealing with noise in outdoor recreation settings utilized high–tech equipment (e.g., sound level meters, laptop computers, and other sound recording equipment). However, these instruments were not used to measure sounds in outdoor settings in this project due to the expense and difficulty in obtaining these instruments. Instead, survey questions were used to determine the specific types of noise present in the Waldo Lake area and to what extent these noises negatively affected visitors' experiences.

Data Analysis

Data collected from the study site was entered into a statistical software program, SPSS 12.0, to be analyzed. A complete descriptive profile (e.g., mean, median, standard deviation, and frequency distribution) of respondents' demographic and trip characteristics (gender, noise types, usage type, experience levels, activity types, length of visit, boat size and type, primary power source, and preferred management opinions) was obtained to create a picture of the typical Waldo Lake user. A new variable was then created using SPSS to collapse boat users into two distinctive headings: motorized and non-motorized primary boat users. This distinction was later compared to other noise-based variables.

Next, a series of bivariate tests of correlation were conducted to confirm that all of the items in the satisfaction index were coded correctly and positively – so that the

"strongly agree" category was equivalent to a five. Then the satisfaction items were analyzed for reliability as a completed multi-item index. The same statistical analyses were repeated for the noise interference index, the motor boating management index, and the motor boating impact index.

Subsequently, t-tests compared both human-induced and motorized noise to the satisfaction index and the ten-point satisfaction scale, which was taken directly from the survey. In particular, the Pearson-product moment correlation tested the relationships between human-induced and motorized noise variables and the satisfaction index and the 10-point satisfaction scale. Additional t-tests were also used to detect differences between boater groups in terms of noise strength, activity style, and noise impacts. Furthermore, index items were analyzed to assure valid testing of the variables.

Following this, a crosstabulation was performed to examine the differences between the two different groups (motorized versus non-motorized boaters) with regards to whether or not overall experiences were negatively affected by human-induced noise. The significance of this comparison was then assessed by utilizing a Chi-Square test. This test was used to determine if there was a significant relationship between the user groups and perceptions of human-induced noise.

An additional series of crosstabulations were then performed on each of the individual types of noise to assess the relationships between motorized and non-motorized groups in relation to each specific type of noise. Attention was given to identifying the types of noise that detracted from visitors' overall experiences. Noise types included: dogs, cars/trucks/planes, loud music, motorboats, power generators, and other noise types. Chi-square analyses were again used to assess the significance levels of the user groups' responses to noise type.

CHAPTER 4
RESULTS

Introduction

This chapter describes the results of the on-site survey and is divided into six sections. The first section details the general user profile. In particular, concentration is placed on watercraft usage, gender, state of residence, miles traveled, visitor type, length of visit, and activity choice. The second segment presents the descriptive statistics of certain survey questions needed for hypothesis testing and is split into four subsections. Based on these results, the third portion, then, addresses the issues of satisfaction and noise, as outlined in the first research question (or hypothesis). Subsequently, section four analyzes the relationships between activity style and satisfaction levels, as described in this thesis' second research question. The third research question, regarding the relationships between activity style and noise opinions, is covered in section five. Finally, differences in users' opinions, in regards to motorized boating impacts and management, are highlighted; thus, investigating the fourth and final research hypothesis.

General User Profile

A total of 430 Waldo Lake recreationists were surveyed during the summer months of 2003 from June through September. The sample group consisted of various types of visitors with different recreational goals. For the purpose of this thesis, only boaters (n=311, see Table 5) were studied in order to better address "within user group" conflict. The rest of this chapter will only deal with boaters' responses. The general descriptive

profile of the respondents in this study is represented in tables five through thirteen below.

Table 5: Usage of Watercraft.

Usage of Boat	N	%
Yes	311	72.3
No	119	27.7

Note: n=430

Within the boaters' subset, individuals were divided by activity style (defined as motorized vs. non-motorized use). Activity styles were identified by asking boaters to indicate their primary boat power. Motorized users were defined as using gas, diesel, and electric power, and non-motorized users relied on paddles, sails, or oars. As seen in Table 6, the motorized boater group consisted of 27% of the boaters' subset, while the non-motorized boater group represented 73%.

Table 6: Boater Activity Style Based on Type of Power.

Primary Power	N	%
Gas	80	25.9
Diesel	0	0.0
Electric	4	1.3
Total Motorized boater group	**84**	**27.2**
Paddle/Oar	180	58.3
Wind/Sail	45	14.6
Non-motorized boater group	**225**	**72.9**

Note: n=309

Among the 311 boaters interviewed, two-thirds (67%) were males and one-third (33%) were females (Table 7). According to previous research by Cordell (1999), a 2:1 ratio is typical for boating and many other outdoor activities.

Table 7: Gender of Respondents.

Gender	n	%
Male	202	66.7
Female	101	33.3

Note: n=311

Respondents were also asked to indicate their state of residence. As depicted in Table 8, most of the boaters were from Oregon (94%). Only six participants were from California (2%), and five were from the state of Washington (2%). This shows that respondents were primarily from the western states surrounding Oregon.

Table 8: Respondents' State of Residence.

State	n	%
Oregon	290	93.9
California	6	1.9
Washington	5	1.6
Florida	2	0.6
Alaska	1	0.3
Arizona	1	0.3
New Jersey	1	0.3
Nevada	1	0.3
Ohio	1	0.3
Wisconsin	1	0.3

Note: n=309.

The next survey question asked individuals to estimate the distance traveled from their residence to Waldo Lake (Table 9). Results indicate that the average distance traveled to the lake was 251 miles with a standard deviation of 766. The median distance traveled was 110 miles, and the mode equaled 70 miles. Thus, it appears that boaters traveled from a range of distances. Obviously, these results (particularly that of average distance traveled) were positively skewed by the small number of boaters (n=13) that traveled more than 500 miles to reach Waldo Lake. Moreover, since Waldo Lake is located in a relatively unpopulated portion of the state, it is not surprising that 41% of respondents traveled between 101-200 miles to reach the site. These individuals are probably from the major metropolitan areas of Ashland, Portland, and Salem. In addition, approximately 50% of boaters traveled less than 100 miles to reach the lake, probably coming from the nearby urban centers of Bend, Eugene, Corvallis, and

Oakridge. These two previously described variables (state of residence and miles traveled) suggest that Waldo Lake is more of a local or regional attraction/destination.

Table 9: Miles Traveled to Waldo Lake.

Miles Traveled	**N**	**%**
< 50 miles	24	8.1
51-70 miles	47	15.8
71-100 miles	73	24.5
101-200 miles	121	40.6
201-500 miles	20	6.7
501+ miles	13	4.4

Note: n=298; Mean=251; Std Deviation=766.

A series of additional survey questions (e.g., estimated length of stay, first-time vs. repeat visit, and number of years visiting Waldo Lake) were used to further profile Waldo Lake users. In terms of trip duration (Table 10), a majority of interviewees (57%) indicated that they planned to stay at Waldo Lake for two to three days. An additional 22% of respondents intended on staying four to seven days, while less than one-tenth (9%) planned on remaining more than one week. Average length of stay was 3.8 days with a standard deviation of 3.32. As for visitor status (Table 11), over three-quarters (78%) of respondents indicated that they had visited Waldo Lake in the past, while about one-fifth (22%) were first-time visitors. It should also be noted that Waldo Lake currently has a 14-day maximum stay. Therefore it is not surprising that very few respondents reported staying longer (1%).

Table 10: Average Length of Stay.

Length of Stay	**n**	**%**
1 day or less	39	12.8
2-3 days	172	56.6
4-7 days	67	22.0
8-14 days	24	7.9
15+ days	2	0.7

Note: n=304; Mean=3.8; Std. Deviation=3.32.

Table 11: Waldo Lake Visitor Status.

First visit	n	%
Yes	68	21.9
No	243	78.1

Note: n=311

The average number of years respondents (repeat visitors only) had been visiting Waldo Lake was 8.2 years with a standard deviation of 9.70 (Table 12). Besides the 23% of boaters who were visiting Waldo Lake for the first time, 100 (or 33% of all boaters) had been coming to Waldo Lake to recreate for 4-15 years respectively.

Table 12: Amount of Years Visiting Waldo Lake.

Number of Years	n	%
First visit	68	23.3
1-3 years	76	24.9
4-15 years	100	32.8
16-25 years	33	10.8
26+ years	25	8.2

Note: n=302; Mean=8.2; Std. Deviation=9.70.

Respondents were, furthermore, asked to indicate the activities they participated in during their current trip (Table 13). Activity categories were not mutually exclusive, since visitors could have participated in multiple activities. Over 98% of respondents stated that they came to the lake to "relax, hang out, and escape the heat and noise of their everyday lives." Viewing natural features (97%) and wildlife (92%) were also extremely popular activities. In terms of boating activities, 78% of interviewees were involved in non-motorized water travel, which included the use of sailboats, rafts, canoes, rowboats, and kayaks. Other non-motorized activities (including swimming, games and sports) also attracted 76% of users.

Motorized recreation, on the other hand, appeared to be much less popular at Waldo Lake. Driving for pleasure (32%) seems to have been the most popular mechanized activity. Furthermore, motorized water travel was participated in by 30% of

respondents, while four wheelers and dirt bikes were used by only three percent of respondents.

Respondents were also asked to select a primary activity-their main reason for coming to Waldo Lake. In response, 40% of users selected "relaxing, hanging out, and escaping heat, noise etc.," as their primary activity. An additional 26% of individuals pointed to non-motorized water travel, while only eight percent reported motorized water travel as their primary activity. Thus, non-motorized activities appear to have garnered more interest and participation than motorized ones.

Table 13: Activities Participated in and Primary Activity While Visiting Waldo Lake.

	Activity type[1]		**Primary Activity[2]**	
Description of Activity	**n**	**%**	**n**	**%**
Relaxing, hanging out, escaping heat, noise, etc.	306	98.4	124	40.4
Non-motorized water travel	242	77.8	81	26.4
Camping in developed sites	235	75.6	46	15.0
Motorized water travel	92	29.6	24	7.8
Bicycling/mountain biking	85	27.3	8	2.6
Other non-motorized activities (swimming, games, sports)	238	76.5	6	2.0
Backpacking/Camping in unroaded areas	24	7.7	6	2.0
Viewing natural features	303	97.4	3	1.0
Picnic and family gatherings	224	72.0	3	1.0
Viewing wildlife, birds, fish, etc.	286	92.0	2	0.7
Hiking/walking	235	75.6	2	0.7
Gathering natural products (mushrooms, berries, firewood, or other)	180	57.9	2	0.7
Driving for pleasure	99	31.8	-	-
Fishing	98	31.5	-	-
Nature study	63	20.3	-	-
Visiting prehistoric/historic sites	60	19.3	-	-
Visiting a nature center/nature trail	17	5.5	-	-
Four wheeling/dirt bikes	8	2.6	-	-

Note: [1] Items were not mutually exclusive since respondents could choose more than one activity. [2] The primary activity was mutually exclusive.

Descriptive Analysis of Noise-Related Variables

This section includes the descriptive statistics that are later used in conjunction with various statistical tests to answer the research questions posed in this thesis. Descriptive statistics, including frequencies, percents, reliability analyses, means, and standard deviations, are described in detail as they relate to each of the following analyses. Results from this portion of the chapter are then elaborated upon as the thesis' four hypotheses are addressed.

Satisfaction

The survey participants were asked to rate their overall experience at Waldo Lake on a ten-point Likert scale, with one being "the worst possible experience" and ten being "the best possible experience." On average, respondents rated their experience as an 8.6 on the ten-point scale (Table 14). This indicates that most respondents were highly satisfied with their visit, which is further reinforced by the fact that only 2.6% of individuals rated their experience at or below six. In addition, no respondents rated their overall experience below four on the satisfaction scale.

Table 14: Ten-Point Overall Satisfaction Scale.

10-point Satisfaction Scale	**n**	**%**
1	0	-
2	0	-
3	0	-
4	1	0.3
5	3	1.0
6	4	1.3
7	33	10.7
8	116	37.5
9	76	24.6
10	76	24.6

Note: n=309; Mean=8.6; Std. Deviation=1.10. 1=Worst experience, 10=Best possible experience.

An additional indicator of satisfaction, the satisfaction index, was also created using multi-item scales. The satisfaction index is based on the work of Graefe (1986) and others. As depicted in Table 15, over 50% of respondents expressed (strong) satisfaction in each of the four index items. It appears, then, that most respondents enjoyed their time at Waldo Lake; and negative impacts from noise occurrences were not enough to lessen the degree of satisfaction. In fact, 95% of respondents agreed or strongly agreed with the statement: "*Thoroughly enjoyed my trip.*"

Table 15: Satisfaction Index Item Descriptives.

Satisfaction Index Items	**n**	**SD**	**D**	**Und**	**A**	**SA**	**Mean**	**Std Dev.**
1. Disappointed with some aspects of trip	307	55.4%	25.7%	6.8%	11.4%	0.70%	1.8	1.04
2. Trip not as enjoyable as expected it to be	309	65.4	23.3	6.1	3.9	1.34	1.5	0.87
3. Trip well worth the money spent	310	1.0	3.9	11.9	26.8	56.5	4.3	0.90
4. Thoroughly enjoyed trip	310	0.3	1.6	2.6	29.0	66.5	4.6	0.66

Note: SD=Strongly Disagree, D=Disagree, Und=Undecided, A=Agree, SA=Strongly Agree.

In order to test the internal consistency of the four-item satisfaction index, a reliability analysis was performed. This analysis was conducted by having respondents indicate their level of agreement with each satisfaction index item on a five-point Likert scale (with one being "strongly disagree" and five being "strongly agree"). Index items that were worded in a negative context (i.e. items one and two) were recoded to match the direction of the positive statements. Table 16 displays the results of the reliability analysis along with the means and standard deviations of each individual item. Means for each item ranged from 4.2 to 4.6, indicating that most boaters were satisfied. Also, the standard deviations of each item were relatively low (SD≤1.04), signifying a moderate level of agreement within the sample.

Moreover, the standardized alpha for the satisfaction index was moderately reliable (α=0.66). Table 16 demonstrates that all index items strengthened the satisfaction index, except for item three ("Trip well worth the money spent"). Even though this particular item did not add to the overall value of the index, the difference was regarded as minor enough so as not to warrant removal of the item from the index.

Table 16: Reliability of Satisfaction Index.

	Mean	**Std Dev.**	**Corrected Item-Total Correlation**	**Alpha if Item Deleted**
Satisfaction index items				
1. Not disappointed with some aspects of my trip [1]	4.2	1.04	0.432	0.567
2 Trip was as enjoyable as I expected it to be[1]	4.5	0.85	0.529	0.488
3. Trip well worth the money spent	4.4	0.91	0.260	0.679
4. Thoroughly enjoyed trip	4.6	0.66	0.520	0.528
Standardized Alpha= 0.66				

Note: [1] Original items were negatively worded. Items as seen above were recoded to match existing positive statements. 1=Strongly Disagree, 5= Strongly Agree.

Human-Induced Noise

Descriptive statistics in this section begin by focusing on the impacts of human-induced noise on Waldo Lake users. Respondents were asked if their overall experience was impacted by human-induced noise (Table 17). In response, over one-third (35%) of all boaters affirmed that their experience had, indeed, been affected by human-induced noise. These individuals (n=108) were then asked to identify the types of noise that impacted their visit to Waldo Lake.

Table 17: Human-Induced Noise Impacts on Overall Experience.

Impacts by Human-Induced Noise	**n**	**%**
Overall experience was impacted	108	34.7
Overall experience was not impacted	203	65.3

Note: n=311.

Table 18 indicates that power generators (15%) were the most common type of noise to impact visitors' overall experiences at Waldo Lake. Motorboats (12%) and dogs (12%) also seemed to interfere with respondents' overall experiences. Also, cars/trucks/planes (5%) and loud music (7%) were identified by respondents, but to a lessened degree. This finding may be the result of respondents failing to identify these types of noise as impacts. It may also be related to user expectations by the respondents. Since most users have long associations with Waldo Lake, these noises may have become an expected and tolerated part of their experience. Finally, 15% of interviewees selected "other types of noise" as bothersome. Upon elaboration in a follow-up question, "other types" were defined as human yelling, rowdiness and late-night parties (see Appendix C for a list of open-ended responses).

Table 18: Human-Induced Noise Types that Impacted Overall Experience.

Noise Types	**n**	**%**
Power generators	47	15.1
Other types of noise	46	14.8
Motorboats	38	12.2
Dogs	37	11.9
Loud music	23	7.4
Cars/trucks/planes	15	4.8

Note: n=108. Items are not mutually exclusive and so do not equal 100%.

In analyzing the aforementioned human-induced noise variables, it was determined that it would also be important to examine the number of different types of noise chosen by individual respondents. Therefore, individuals were grouped based on the number of noises they listed as bothersome (Table 19). As stated earlier, 65% of respondents indicated that no human-induced noise affected their overall experience. However, 16% of participants indicated only one type of noise as negatively interfering with their experience, while nine percent reported two noise types and seven percent

chose three noise types. Only two percent of users viewed four to six noise types, in combination, as bothersome.

Table 19: Number of Human-Induced Noises Selected.

Number of Types.	**n**	**%**
0	203	65.3
1	51	16.4
2	28	9.0
3	22	7.1
4	4	1.3
5	1	0.3
6	2	0.6

Note: n=311; Mean=0.7; Std. Deviation=1.12.

Motorized Noise

Motorized noise was examined independently of the human-induced noise variable to assess any perception differences between the boater groups in terms of the types of noise that impacted their experiences. Question 20 from the survey was used to determine if motorized noise had impacted the respondents' trip to Waldo Lake (See Appendix A). This was done by selecting those respondents who chose mechanized forms of noise from the list of noise types presented in question 20 of the survey. The results of these frequencies are reported in Table 20, below.

As described in Table 20, three-fourths (74%) of respondents reported that they were not bothered by motorized noise while visiting Waldo Lake. This means that in general, respondents did not choose any forms of mechanized noise from the list of noise types listed within question 20 of the survey. This finding is similar to what was reported in Table 14, where a majority of the respondents (65%) were not bothered by human-induced noise. These findings will be described in further detail to explain the hypotheses of this study.

Table 20: Motorized Noise Impacts on Overall Experience.

Impacts of Motorized Noise	**n**	**%**
Not bothered by motorized noise	229	73.6
Bothered by motorized noise	82	26.4

Note: n=311.

A frequency analysis was performed to assess the number (0-3) of different motorized noises considered irksome by each respondent (Table 21). As mentioned previously, approximately 74% of respondents were not bothered by any motorized noises. However, 21% of respondents reported negative interference by just one type of motorized noise. A small minority (5%) identified two types of noise, and only two respondents (0.6%) were bothered by three different types of motorized noise.

Table 21: Number of Motorized Noises Selected.

Number of Types	**n**	**%**
0	229	73.6
1	66	21.2
2	14	4.5
3	2	0.6

Note: n=311; Mean=0.3, Std. Deviation=0.59.

Interference and Conflict

A noise interference index was created to assess the degree of interference experienced by the occurrence of motorized noise on four individual aspects of outdoor recreation and appreciation. These aspects included: "enjoyment of the area," "appreciation of the natural quiet," "appreciation of the sounds of nature," and "appreciation of the historical/cultural significance of the area." This index was considered an important part of this study in examining how motorized noise actually affected visitors to Waldo Lake, and to show the differences in how the different boater groups (motorized and non-motorized) felt about these noise impacts.

The noise interference descriptive table below examines the individual interference items used to create the noise interference index. These questions were only asked of boaters who reported that they were disturbed by motorized noise (n=82). However, all respondents (n=229) who were not bothered by motorized noise were given a one on each of the item scales. This signified that these users did not perceive interference from motorized noise. Each item was measured on a five-point Likert scale with one being "not at all interfered" and five being "extremely interfered." As Table 22 suggests, over 70% of respondents stated that the occurrence of motorized noise did not at all interfere with their enjoyment of the area. The majority of participants also reported that motorized noise did not at all interfere with their appreciation of the natural quiet (72%) or the sounds of nature (72%). Moreover, the average Likert value of these first three items was on average 1.6 to 1.7, indicating that many individuals were not terribly bothered by motorized noise. For the fourth variable, appreciation of the historical/cultural significance of the area, 85% of individuals stated that motorized noise was not at all interfering.

Table 22: Interference Index Item Descriptives.

Interference Index Items	**Not**	**S**	**M**	**VM**	**Ext**	**Mean**	**Std Dev.**
1. Enjoyment of area	72.7%	8.4%	11.3%	6.4%	1.3%	1.6	1.01
2. Appreciation of natural quiet	71.7	7.7	11.9	5.5	3.2	1.7	1.09
3. Appreciation of sounds of nature	72.3	6.8	11.3	5.5	4.2	1.7	1.14
4. Appreciation of the historical/cultural significance	84.6	4.5	7.1	1.6	1.9	1.3	0.83

Note: n=311; Not=Not at all, S=Slightly, M=Moderately, VM=Very Much, Ext=Extremely.

Once again, a reliability analysis was utilized to determine the internal consistency of each of the four items used in the interference index. Table 23 displays the results of

the reliability analysis along with the means and standard deviations of each individual item. Means for items in the index ranged from 1.3 to 1.6, implying that most respondents experienced only slight to no interference due to motorized noise. The standard deviations of each item were also generally low (SD ≤1.14), indicating a moderate level of agreement within the sample.

The standardized alpha for the interference index was also highly reliable (α=0.95). With the exception of item four, all items strengthened the reliability of the index. Since deleting item four did not change the reliability appreciably, it was retained.

Table 23: Reliability of Noise Interference Index.

	Mean	**Std Dev.**	**Corrected Item-Total Correlation**	**Alpha if Item Deleted**
Noise Interference Index Items				
1. Enjoyment of area	1.6	1.01	0.928	0.913
2. Appreciation of natural quiet	1.7	1.09	0.960	0.902
3. Appreciation of sounds of nature	1.7	1.14	0.952	0.905
4. Appreciation of the historical/cultural significance	1.3	0.83	0.681	0.983
Standardized Alpha= 0.95				

Note: n=311.

Motorized Boating Impacts

In order to measure the different opinions of motorized boating impacts among the respondents, the motorized boating impact index (MBI) was created. This index assists in developing a picture of what the boater groups (motorized / non-motorized) feel about the impacts of boating on Waldo Lake.

Table 24 presents the descriptive statistics for items related to the motorized boating impact index (MBI Index). Each of the four items in the index was measured on a five-point Likert scale, with one being “strongly disagree” and five being “strongly

agree." When asked about primitive recreational experiences (item one), respondents agreed (22%) or strongly agreed (51%) that motorized boating had a negative impact. Respondents also felt strongly (indicated by a mean Likert value of 4.6) that pollution by motorized vessels needed to be addressed (item two). In terms of impacts to wildlife (item 3) as well as effects on water resources (item four), respondents generally took a pro-environmental perspective. A majority of respondents (65%) strongly agreed that motorized activities negatively impacted wildlife; and the vast majority (93%) strongly disagreed that "motorized boating has no affect on water quality." This fourth and final variable was negatively worded in the original survey design, and was recoded for use in the MBI index. For the purposes of this table, however, the average response was 1.4 on the five-point scale. In its original form, this item illustrates that respondents believed that motorized boating does cause adverse damage to water resources.

Table 24: Motorized Boating Impact Index Item Descriptives.

MBI Index Items	**SD**	**D**	**Und**	**A**	**SA**	**Mean**	**Std Dev.**
1. Motor boating has a negative impact on primitive recreation	4.2%	9.0%	12.9%	22.5%	51.4%	4.1	1.17
2. Pollution from motorized boating needs to be controlled	1.0	1.6	3.2	29.3	65.0	4.6	0.73
3. Motorized activities negatively impacts wildlife	4.2	12.2	19.0	19.6	45.0	3.9	1.22
4. Motorized boating has no effect on water quality	67.8	24.8	5.5	1.6	0.3	1.4	0.70

Note: n=311; SD=Strongly Disagree, D=Disagree, Und=Undecided, A=Agree, SA=Strongly Agree.

Internal consistency of the index, as determined by a reliability analysis, is presented in Table 25. To reiterate, item 4 was reworded and recoded due to its original negative tone. The means for the four items included in the MBI index ranged from 3.9 to 4.6, indicating that most respondents tended to agree or strongly agree with MBI

statements. Standard deviations for each item were also low (SD≤1.22), implying a moderate level of agreement in the sample. In addition, the standardized alpha for the MBI index was highly reliable at 0.87.

Table 25: Reliability of Motorized Boating Impact Index (MBI).

	Mean	**Std Dev.**	**Corrected Item-Total Correlation**	**Alpha if Item Deleted**
MBI Index Items				
1. Motorized boating has negative impacts on primitive recreation	4.1	1.17	0.810	0.795
2 Pollution from motorized boating needs to be controlled	4.6	0.73	0.754	0.835
3. Motorized activities negatively impacts wildlife	3.9	1.22	0.784	0.814
4. Motorized boating has an affect on water quality[1]	4.6	0.70	0.674	0.860
Standardized Alpha= 0.87				

Note: [1] *Original items regarded as negative statements. Items reworded and recoded to match existing positive statements. 1=Strongly Disagree, 5= Strongly Agree. No items were deleted from index.*

Motorized Boating Management

Proposed management actions were also measured in this study to determine if differences existed between the boater groups (motorized / non-motorized) in terms of their opinions about motorized management plans. In order to accomplish this, the motorized boating management index (MBM Index) was created from four individual items from the survey.

Table 26 presents the descriptive statistics for the items in the motorized boating management index (MBM). Unlike previous index items, three of the MBM items were measured on a three-point scale (with one = “oppose,” two = “not sure,” and three = “favor”). The fourth item in the MBM index was originally based on a five-point scale ranging from one (“strongly disagree”) to five (“strongly agree”). However, it was

transformed into a three-point scale in order to match the other variables: negative responses ("strongly disagree" and "disagree") and positive responses ("strongly agree" and "agree") were re-categorized as "oppose" and "favor," respectively.

Within the MBM index, respondents were asked about management topics involving motorized boating. Approximately 67% of respondents favored permitting only non-motorized boats and electric motor access to the lake (2.4 mean Likert value with SD of 0.87). Moreover, 79% of interviewees supported zoning certain sections of the lake for non-motorized use. The mean Likert value for this item was 2.6 with a SD of 0.73. The next item in the index revealed that 88% of individual's advocated control over the level of noise generated by motorized recreationists. A high mean Likert value of 2.8 (with a SD of 0.55) further emphasized the level of group agreement on this issue. Finally, the last item in the MBM index demonstrated that a majority of respondents (73%) favored limiting motorized boating to four-cycle engines. Of note, this item garnered the highest percentage of "not sure" reactions (13%).

Table 26: Motorized Boating Management Index Item Descriptives.

MBM Index Items	Oppose	Not Sure	Favor	Mean	Std Dev.
1. Only permit non-motorized boats and electric motors in Waldo Lake	25.1%	7.7%	67.2%	2.4	0.87
2. Certain sections of the lake should be limited to non-motorized boating[1]	15.1	5.5	79.4	2.6	0.73
3. Control the level of noise from motorized recreation	7.1	5.5	87.5	2.8	0.55
4. Limit motorized boat motors to 4-cycle engines only	14.1	12.5	73.3	2.6	0.73

Note: n=311; [1] Original survey item was on a 5-point scale with 1=Strongly Disagree and 5=Strongly Agree. The item was transformed into a 3-point scale to match existing MBM items.

Results from the reliability analysis, including means and standard deviations of each individual item, are presented in Table 27. As already touched upon, the means for the MBM index ranged from 2.4 to 2.8, indicating that most of the respondents tended to favor the MBM statements. Since standard deviations of each item were also low (SD<0.87), there appears to have been a moderate level of agreement among the sample. Furthermore, the standardized alpha for the MBM index was considered moderately reliable at 0.71. All of the individual items strengthened the reliability of the scale.

Table 27: Reliability of Motorized Boating Management Index (MBM).

	Mean	Std Dev.	Corrected Item-Total Correlation	Alpha if Item Deleted
MBM Index Items				
1. Only permit non-motorized boats and electric motors in Waldo Lake	2.4	0.87	0.601	0.580
2 Certain sections of the lake should be limited to non-motorized boating	2.6	0.73	0.492	0.651
3. Control the level of noise from motorized recreation	2.8	0.55	0.442	0.686
4. Limit motorized boat motors to 4-cycle engines only	2.6	0.73	0.487	0.654
Standardized Alpha= 0.71				

Note: 1=Oppose, 2=Not sure, 3=Favor. No items were deleted from index.

Research Questions and Hypotheses Testing

R1: Does the occurrence of noise affect boaters' overall experiences at Waldo Lake?

$H1_A$: Human-induced noise does not affect boaters' overall experience at Waldo Lake.

Previous research has determined that noises which do not regularly occur in a natural area can be seen by many as an annoyance (Anderson, Mulligan, Goodman & Regen, 1983; Fiddell et al., 1996; Green & Fiddell, 1991). Thus, this study hypothesized that an increase in the number of noise types considered bothersome by visitors would be met by a proportional decrease in overall satisfaction. To test this idea, the relationships between noise and overall satisfaction were examined. In particular, an independent sample t-test was performed with the ten-point satisfaction scale and the impacts by human-induced noise question (see Table 14). The findings of this analysis (Table 28) show that those respondents who checked "yes" to being bothered by human-induced noise also reported a lower level of satisfaction, on average, than their counterparts ($t=-2.10$, $p<0.05$).

An additional independent sample t-test was also conducted with the satisfaction index, and it, too, revealed a significant difference in satisfaction scores between users ($t=-2.46$, $p<0.05$). Specifically, respondents who found human-induced noise interfering enjoyed significantly less satisfaction than those who were not affected by such noise (Table 28).

Table 28: Human-Induced Noise Impacts by Satisfaction Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
10-pt Satisfaction Scale[1]				
Yes	8.4	1.20	-2.10	0.037
No	8.7	1.04		
Satisfaction Index[2]				
Yes	4.3	0.59	-2.46	0.014
No	4.5	0.61		

Note: [1] 10-point satisfaction scale was coded from 1 to 10. 1=worst possible experience and 10=best possible experience; n=309.
[2] The satisfaction index ranged from 1, indicating low satisfaction, to 5, indicating high satisfaction; n=310.

Table 29 depicts the relationships between the number of bothersome human-induced noise, on the one hand, and the overall 10-point satisfaction scale and satisfaction index, on the other hand. A negative relationship was found to exist between the satisfaction scale variable and the number of negatively-impacting human-induced noises chosen by respondents (p=0.020). Although a Pearson's r-value of –0.13 indicates a weak inverse relationship between the variables, the relationship is still significant.

A significant relationship was also found to exist between the number of human-induced noises chosen by respondents and the satisfaction index. A Pearson's r-value of –0.20, again indicates a weak inverse relationship. In sum, these results demonstrate that as the number of bothersome noises increased, respondents' satisfaction (based on both the satisfaction scale and the satisfaction index) decreased.

Table 29: Number of Human-Induced Noise Types.

Variables	n	Mean	Std Dev.	Correlation (r)	Sig.
Number of types of HIN	311	0.7	1.12		
Overall satisfaction scale	309	8.6	1.10	-0.13	0.020
Satisfaction index	310	4.4	0.61	-0.20	<0.001

$H1_B$: Motorized noise does not affect boaters overall experiences at Waldo Lake.

Motorized noise is considered a subset of the human-induced noise variable. Based upon previous studies emphasizing conflicts between motorized and non-motorized users, motorized noise was analyzed as a separate entity. To determine if the occurrence of motorized noise really impacted satisfaction experience, independent t-tests were performed. Those respondents who did not consider motorized noise as negative impacts tended to have a higher mean satisfaction value (8.6 out of 10), while those respondents that were affected by motorized noises reported a mean score of 8.4 (Table 30). Although a slight reduction in satisfaction was observed, the difference was not significant ($t=1.23$; $p>0.05$).

An additional t-test was performed to determine if motorized noise had an impact on the satisfaction index. Again, a slight difference in mean satisfaction values was noted between those who were affected by motorized noise (4.3 out of 5) and those who were not (4.4 out of 5); but that difference was not significant ($t=1.55$, $p>0.123$).

Table 30: Motorized Noise Impacts by Satisfaction Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
10-pt Satisfaction Scale[1]				
Yes	8.4	1.13	1.23	0.222
No	8.6	1.09		
Satisfaction Index[2]				
Yes	4.3	0.56	1.55	0.123
No	4.4	0.62		

Note: [1] *10-point satisfaction scale coded from 1 to 10. 1=worst possible experience and 10=best possible experience; n=309.*
[2] *Satisfaction index created using four individual satisfaction items, measured on 5-point scales. 1=Strongly Disagree and 5=Strongly Agree. Cronbach's Alpha=0.66;n=310.*

Table 31 depicts the relationship between satisfaction (measured by the satisfaction scale and the satisfaction index) and the number of motorized noises found bothersome

by respondents. Results show that a significant relationship does not exist between the overall satisfaction scale variable and the number of different motorized noises identified as bothersome by respondents (p=0.257). However, a significant relationship was found between the number of negative motorized noise types and the satisfaction index. A Pearson's r-value of –0.128 implies a significant, but weak, inverse relationship between the variables. In summary, as respondents identified greater numbers of bothersome motorized noises, their satisfaction (as defined by the satisfaction index) decreased.

Table 31: Number of Motorized Noise Types Chosen.

Variables	**n**	**Mean**	**Std Dev.**	**Correlation**	**Sig.**
Number of types of MN	311	0.3	0.59		
Overall satisfaction scale	309	8.6	1.10	-0.06	0.257
Satisfaction index	310	4.4	0.61	-0.13	0.025

Based upon the results described within the context of the first research question and sub-hypotheses, it can be concluded that noise can affect the satisfaction levels of boaters visiting Waldo Lake. In the case of human-induced noise impacts, decreased levels of satisfaction were reported by those who were impacted by the occurrence of human-induced noise. However, it was revealed that overall satisfaction levels were still considerably high among all of the respondents in this study, indicating that human-induced noise impacts were present at Waldo Lake, but not to an alarming degree.

Also, when looking at the motorized noise impacts on satisfaction levels, no significant differences between the groups was reported. Again, respondents generally reported high levels of satisfaction in both the single-item scale and the satisfaction index, indicating that this type of noise (motorized) was not perceived as a problem for the recreational boaters at Waldo Lake. It should be noted for this sub-hypothesis that a relationship was discovered with the number of motorized noises chosen by respondents

and the satisfaction index. As the number of noises increased, satisfaction levels were negatively affected. This relationship was only evident within the index, and not the other satisfaction measure.

R2: Does activity style affect overall experience differently?

$H2_A$: There is no difference in overall experience between motorized and non-motorized boaters.

The second research question of this thesis investigates the possibility that activity style (motorized boating vs. non-motorized boating) impacts respondents' reported levels of satisfaction. Results in Table 32 demonstrate that there are, indeed, significant differences in satisfaction (based on the satisfaction index and the satisfaction scale) based on respondents' activity choice. For example, the non-motorized group reported a mean satisfaction value of 4.5 as compared to 4.2 by motorized users. The ten-point satisfaction scale depicted similar results with the non-motorized boaters, again, reporting higher levels of satisfaction (mean=8.7) than motorized users (mean=8.2). Both of these differences were significant ($p \leq 0.002$). Thus, it appears that activity style does play a significant role in the satisfaction of respondents.

Table 32: Activity Style and Satisfaction Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
10-pt Satisfaction Scale[1]				
Motorized Boaters	8.2	1.0	-3.74	<0.001
Non-Motorized Boaters	8.7	1.1		
Satisfaction Index[2]				
Motorized Boaters	4.2	0.71	-3.09	0.002
Non-Motorized Boaters	4.5	0.57		

Note: [1] *10-point satisfaction scale coded from 1 to 10. 1=worst possible experience and 10=best possible experience; n=309.*

[2] Satisfaction index created using four individual satisfaction items, measured on 5-point scales. 1=Strongly Disagree and 5=Strongly Agree. Cronbach's Alpha=0.66; n=310.

R3: Does activity style affect boater opinions about noise?

$H3_A$: There is no difference between impacts and opinions of human induced noise between boater groups.

The third research question in this thesis addresses the relationships between activity style and opinions regarding noise. Crosstabulation analyses with chi-square tests of significance were performed to assess significant relationships between respondent groups (motorized vs. non-motorized users) based on their reactions to certain noises (Table 33). Both activity groups were first analyzed based on whether or not respondents were negatively impacted by human-induced noise. Subsequently, activity groups were examined based on their evaluation of certain noise types (e.g., generator, motorboat, dog, car/truck/plane, loud music, other) as irksome. Among the seven previously mentioned categories, only two showed significant differences based on activity style. Approximately 40% of the non-motorized group was affected by human-induced noise as opposed to 21% of their motorized counterpart. Moreover, this difference was found to be significant ($p = 0.003$); thus, showing that there is a significant difference between boater groups regarding their opinions of human-induced noise.

The second noise category that was statistically significant involved motorboat noise. Thirty-six non-motorized respondents complained of motorboat noise; a statement that was echoed by only one motorized user. Thus, the difference between groups was found to be significant ($p < 0.001$). The five other noise categories were not statistically significant by activity style.

Table 33: Cross-tabulation of Boater Groups and Impacts of Human Induced Noise.

Boater Groups	Yes *n* %	No *n* %	X^2	Sig.
Human-Induced Noise Overall Experience Impacts				
Motorized Boaters	*18* 21.4	*66* 78.6	8.88	0.003
Non-Motorized Boaters	*89* 39.6	136 60.4		
Individual Human-Induced Noise Types				
Generator Noise Impacts				
Motorized Boaters	*8* 9.5	*76* 90.5	2.62	0.106
Non-Motorized Boaters	*38* 16.9	187 83.1		
Motorboat Noise Impacts				
Motorized Boaters	*1* 1.2	*83* 98.8	12.73	<0.001
Non-Motorized Boaters	*36* 16.0	189 84.0		
Dog Noise Impacts				
Motorized Boaters	*6* 7.1	*78* 92.9	2.55	0.110
Non-Motorized Boaters	*31* 13.8	*194* 86.2		
Car/Truck/Plane Noise Impacts				
Motorized Boaters	*1* 1.2	*83* 98.8	3.35	0.067
Non-Motorized Boaters	*14* 6.2	*211* 93.8		
Loud Music Impacts				
Motorized Boaters	*9* 10.7	*75* 89.3	1.79	0.181
Non-Motorized Boaters	*14* 6.2	*211* 93.8		
Other Noise Impacts				
Motorized Boaters	*11* 13.1	*73* 86.9	0.29	0.589
Non-Motorized Boaters	*35* 15.6	190 84.4		

Differences between the number of human-induced noise types identified as bothersome by respondents and activity style was further examined (Table 34). Non-

motorized boaters found more noises bothersome (mean=0.8) than the motorized group (mean=0.4). Moreover, this difference between the two boater groups was found to have a *t-value* of 2.46 and to be significant (p = 0.026). These results indicate that non-motorized boaters were more sensitive to human-induced noise impacts.

Table 34: Number of HIN Types and Activity Style Independent t-tests.

Variables	**Mean**	**Std Dev.**	**t**	**Sig.**
Number of HIN Sources				
Motorized Boater	0.4	0.95	-2.46	0.026
Non-Motorized Boater	0.8	1.16		

Note: n=309.

$H3_B$: There is no difference between impacts and opinions of motorized noise between boater groups.

Beyond looking at the different perceptions of human-induced noise held by different activity groups, this study specifically examined evaluations of motorized noise. In so doing, emphasis was placed on the multi-item Interference Index (see Table 22), which used four variables to assess the levels of interference experienced by users. Incorporation of this index in an independent sample t-test revealed a significant difference between boater groups regarding the amount of interference experienced from motorized noise (Table 35). Specifically, non-motorized users reported higher levels of interference (mean=1.4-1.8) than the motorized group (mean=1.1-1.3). This finding supports the stipulation that those involved in motorized recreational activities may have a higher tolerance for motorized noise, even when they, themselves, are not involved in said activity (Ivy et al., 1992). Differences between activity groups were all significant at <0.01.

Table 35: Interference Index and Activity Style Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
Noise Interference Index				
Motorized Boaters	1.2	0.65	-4.10	<0.001
Non-Motorized Boaters	1.6	1.02		
1. Enjoyment of area				
Motorized Boaters	1.3	0.73	-3.695	<0.001
Non-Motorized Boaters	1.7	1.08		
2. Appreciation of natural quiet				
Motorized Boaters	1.3	0.76	-4.136	<0.001
Non-Motorized Boaters	1.7	1.17		
3. Appreciation of sounds of nature				
Motorized Boaters	1.3	0.76	-4.237	<0.001
Non-Motorized Boaters	1.8	1.22		
4. Appreciation of the historical/cultural significance				
Motorized Boaters	1.1	0.49	-3.018	0.003
Non-Motorized Boaters	1.4	0.92		

Note: n=309.

An additional independent sample t-test was performed to determine the mean differences between boating groups (motorized vs. non-motorized) in regards to the number of motorized noises labeled as irritating by respondents (Table 36). Results indicated significant differences between the motorized and non-motorized boater groups ($t=-4.90$, $p<0.001$). Specifically, the non-motorized boater group chose more motorized noises (mean=0.39) than their motorized boater counterparts (mean=0.12). This finding indicates that the non-motorized group was more susceptible to motorized noise impacts than the motorized boater group.

Table 36: Number of Motorized Noise Types and Activity Style t-tests.

Variables	Mean	Std Dev.	t	Sig.
Number of motorized noises chosen				
Motorized Boaters	0.12	0.33	-4.90	<0.001
Non-Motorized Boaters	0.39	0.64		

Note: n=309.

From the analyses presented in this research question, it can be concluded that activity style does affect the opinions of noise between the respondents at Waldo Lake. The sub-hypotheses describe opinion differences between the boater groups by revealing that non-motorized boaters tended to be more susceptible to impacts from human-induced and motorized noise. The results also indicated that non-motorized boaters chose more individual noise types in both the human-induced and motorized noise categories, thus showing the increased susceptibility of non-motorized boaters experiencing impacts from the occurrence of noise.

R4. Are the attitudes and opinions about impacts from motorized boating and select management actions different between the boating groups?

$H4_A$: There is no difference in the attitudes about proposed management and the perception of motorized boating impacts based on activity style.

The fourth and final research question of this thesis looks at the possible discrepancies between the two boater groups (motorized vs. non-motorized) in terms of motorized boating impacts and proposed management actions. In general, this research question evaluates the relationships between noise, impacts, and proposed boating management. In order to accomplish this, results from the Motorized Boating Impact Index (MBI; see Tables 24 and 25) and the Motorized Boating Management Index (MBM; see Tables 26 and 27) were examined by activity style. Independent t-tests were utilized to describe the mean differences between the motorized and non-motorized boating groups based on their opinions (Table 37).

Within the MBI index, the non-motorized boater group reported a much higher mean Likert value (mean=4.6) compared to the motorized group (mean=3.5). The difference between the boater groups in terms of this index was found to have a *t-value* of –14.60 and to be significant ($p < 0.001$). This finding indicates that non-motorized boaters tended to agree or strongly agree with the opinion that motorized boating can create negative impacts; whereas, the motorized group was more neutral in their beliefs.

As for the MBM index, the non-motorized boater group, again, reported an increased mean Likert value (mean=2.8) compared to the motorized group (mean=2.0). The difference between the boater groups was found to have a *t-value* of –12.49 and to be significant ($p < 0.001$). From this statistical analysis, it can be determined that, on average, non-motorized boaters tended to favor more motorized boating regulations than the motorized group.

Table 37: MBI/MBM Index and Activity Style Independent Sample t-tests.

Variables	**Mean**	**Std Dev.**	**t**	**Sig.**
MBI Index				
Motorized Boaters	3.5	0.72	-14.60	<0.001
Non-Motorized Boaters	4.6	0.57		
MBM Index				
Motorized Boaters	2.0	0.56	-12.49	<0.001
Non-Motorized Boaters	2.8	0.31		

Note: n=309.

In addition to the independent-sample t-tests used on the complete MBI and MBM indices, each of the four individual items in both indices was evaluated by activity style. These additional t-tests were used to distinguish the individual significance of each of the items in the MBI and MBM indexes. For the MBI index (Table 38), each individual item was significant ($p < 0.001$), further demonstrating differences between the two boating groups. In fact, mean scores indicate that non-motorized boaters tended to (strongly)

agree that motorized boating poses negative impacts; while, motorized boaters, understandably, were more neutral.

Table 38: MBI Index items and Activity Style Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
1. Motorized boating has no affect on water quality[1]				
Motorized Boaters	4.0	0.74	-9.00	<0.001
Non-Motorized Boaters	4.8	0.54		
2. Motorized boating has a negative impact on primitive recreation				
Motorized Boaters	2.8	1.0	-13.74	<0.001
Non-Motorized Boaters	4.6	0.83		
3. Pollution from motorized boating needs to be controlled				
Motorized Boaters	4.0	0.89	-8.09	<0.001
Non-Motorized Boaters	4.8	0.49		
4. Motorized activities negatively impacts wildlife				
Motorized Boaters	2.6	1.1	-14.18	<0.001
Non-Motorized Boaters	4.4	0.91		

Note: [1] Original items regarded as negative statements. Items reworded and recoded to match existing positive statements. 1=Strongly Disagree, 5= Strongly Agree.

The individual items of the MBM index were also evaluated by activity style. Differences between the motorized and non-motorized boating groups were identified in terms of users' opinions towards motorized boating management actions. However, unlike the MBI variables, the MBM items were measured on a three-point Likert scale. Nonetheless, each of the four statements was individually tested using a crosstabulation and a chi-square analysis - to show the significance of existing differences between the two boater groups (Table 39). Based upon the table, each item was found to be significant ($p < 0.001$). Moreover, non-motorized users tended to favor additional management than their motorized counterparts. For instance, 87% of non-motorized boaters (vs. 14% of motorized users) favored limiting access to non-motorized boats and electric motors (see item one). Similar results are evident for the remaining three items.

Table 39: Cross-tabulation of Boater Groups and Motor Boating Management Opinions.

Boater Groups	Oppose *n* %	Not Sure *n* %	Favor *n* %	χ^2	Sig.
1. Only permit non-motorized boats and electric motors					
Motorized Boaters	*61* 72.6	*11* 13.1	*12* 14.3	154.63	<0.001
Non-Motorized Boaters	17 7.6	13 5.8	195 86.7		
2. Certain sections of the lake should be limited to non-motorized boating[1]					
Motorized Boaters	*29* 34.5	*9* 10.7	*46* 54.8	42.74	<0.001
Non-Motorized Boaters	18 8.0	8 3.6	199 88.4		
3. Pollution from motorized boats needs to be controlled					
Motorized Boaters	*17* 20.2	*12* 14.3	*55* 65.5	50.40	<0.001
Non-Motorized Boaters	5 2.2	5 2.2	215 95.6		
4. Limit motors to 4-cycle engines only					
Motorized Boaters	*32* 38.1	*18* 21.4	*34* 40.5	70.02	<0.001
Non-Motorized Boaters	*12* 5.3	*21* 9.3	*192* 85.3		

Note: [1] Original survey item was on a five-point scale with 1=Strongly Disagree and 5=Strongly Agree. The item was transformed into a 3-point scale to match existing MBM items.

$H4_B$: Human-induced noise does not affect boaters' attitudes about proposed management and opinions of motorized boating impacts.

MBI and MBM results were also broken down by reaction to human-induced noise (Table 40). Independent sample t-tests revealed that significant differences in opinion (concerning motorized boating impacts and management) existed between those respondents that were impacted by human-induced noise and those that were not. Within the MBM index, respondents that were bothered by human-induced noise reported a higher mean score (mean=2.8) than those that were not (mean=2.5). The differences between the groups had a reported *t*-value of 4.02 and were significant ($p < 0.001$). This

analysis, therefore, demonstrates that individuals who reported experiencing impacts from human-induced noise tended to favor greater management of motorized boaters.

Within the MBI index, respondents that were disturbed by human-induced noise reported a higher mean (mean=4.5) than their counterparts (mean=4.2). The differences in the mean scores were also significant ($p < 0.001$), suggesting that those respondents impacted by noise, agreed more strongly that motorized boating produces impacts.

Table 40: MBM/MBI Index and Human-Induced Noise Independent Sample t-tests.

Variables	**Mean**	**Std Dev.**	**t**	**Sig.**
MBM Index (n=309)				
Bothered by HIN	2.8	0.40	4.02	<0.001
Not bothered by HIN	2.5	0.57		
MBI Index (n=309)				
Bothered by HIN	4.5	0.71	3.71	<0.001
Not bothered by HIN	4.2	0.87		

Once again, each of the individual items in the MBI and MBM indexes were tested; this time in relation to human-induced noise perceptions. These additional tests were used to show the individual significance of each of the items used in the two indexes. Independent sample t-test results show that each individual MBI item was significant at the 0.001 level, except for the water quality variable, which was significant at the 0.05 level. Respondents that were bothered by human-induced noise displayed higher mean Likert scores than their counterparts, signifying that the former group (strongly) agreed that motorized boating poses negative impacts.

Table 41: MBI Index items and Human-Induced Noise Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
1. Motorized boating has no affect on water quality[1]				
Bothered by HIN	4.7	0.59	2.23	0.026
Not bothered by HIN	4.5	0.75		
2. Motorized boating has a negative impact on primitive recreation				
Bothered by HIN	4.4	1.05	3.70	<0.001
Not bothered by HIN	3.9	1.20		
3. Pollution from motorized boating needs to be controlled				
Bothered by HIN	4.7	0.53	3.37	0.001
Not bothered by HIN	4.5	0.80		
4. Motorized activities negatively impacts wildlife				
Bothered by HIN	4.2	1.09	3.29	0.001
Not bothered by HIN	3.7	1.27		

Note: [1] Original items regarded as negative statements. Items recoded to match existing positive statements. 1=Strongly Disagree, 5= Strongly Agree.

The four MBM items were also evaluated. Yet since this index consisted of three-point Likert scale statements, each statement underwent cross-tabulation to show the descriptive statistics. Chi-square analyses were also implemented to test the significance of those differences (Table 42). Index item one ("only permit non-motorized boats and electric motors in Waldo Lake") generated significant opinion differences between groups (p = 0.001). Moreover, item two (limiting sections of the lake to non-motorized boating) and item four (limiting boating to four-cycle engines) were both found to have significant differences (p = 0.04). Item three (addressing pollution from motorized vehicles), however, did not generate significant responses. All in all, results depict greater support for motorized boating management by respondents that were affected by human-induced noise.

Table 42: Cross-tabulation of HIN and Opinions of Motor Boating Management.

Variables	Oppose *n* %	Not Sure *n* %	Favor *n* %	X^2	Sig.
1. Only permit non-motorized boats and electric motors					
Affected by HIN	*11* 10.2	*8* 7.4	*89* 82.4	20.35	0.001
Not Affected by HIN	67 33.0	16 7.9	120 59.1		
2. Certain sections of the lake should be limited to non-motorized boating[1]					
Affected by HIN	*9* 8.3	*5* 4.6	*94* 87.0	6.45	0.040
Not Affected by HIN	38 18.7	12 5.9	153 75.4		
3. Pollution from motorized boats needs to be controlled					
Affected by HIN	*3* 2.8	*8* 7.4	*97* 89.8	5.56	0.062
Not Affected by HIN	19 9.4	9 4.4	175 86.2		
4. Limit motors to 4-cycle engines only					
Affected by HIN	*9* 8.3	*18* 16.7	*81* 75.0	6.26	0.044
Not Affected by HIN	*35* 17.2	*21* 10.3	*147* 72.4		

Note: [1] Original survey item was on a five-point scale with 1=Strongly Disagree and 5=Strongly Agree. The item was transformed into a 3-point scale to match existing MBM items.

$H4_C$: Motorized noise does not affect boaters' attitudes about proposed management actions and opinions of motorized boating impacts.

MBI and MBM indexes (as well as their individual items) were also examined in relation to perceptions of motorized noise (Tables 43 and 44). Similar t-tests, crosstabulations, and chi-square analyses were performed as before. Within the MBM index, respondents that were affected by motorized noise reported a higher mean Likert score (mean=2.8) than those who were not (mean=2.5). The differences between the groups had a *t*-value of -5.01 and were significant below 0.001. Interpretation of these

results reveal that individuals impacted by motorized noise tended to favor greater motorized boating management.

Similarly, within the MBI index, respondents that were affected by motorized noise agreed more intensely that motorized boating produced negative impacts. To illustrate, t-tests revealed that those respondents that reported being disturbed by motorized noise, reported a higher Likert score (mean=4.6) than their counterparts. This difference in mean scores was found to be significant ($p < 0.001$) as shown in Table 43.

Table 43: MBM/MBI Index and Motorized Noise Independent Sample t-tests.

Variables	**Mean**	**Std Dev.**	**t**	**Sig.**
MBM Index				
Bothered by Motorized Noise	2.8	0.34	-5.01	<0.001
Not bothered by Motorized Noise	2.5	0.57		
MBI Index				
Bothered by Motorized Noise	4.6	0.60	-5.24	<0.001
Not bothered by Motorized Noise	4.2	0.87		

Note: n=309

Again, each item in the MBI and MBM indexes was tested against the perception of motorized noise. These additional t-tests were used to show the individual significance of each of the items used in creating the MBI index (Table 44). Each individual MBI item was significant ($p < 0.001$) and, unsurprisingly, individuals who were irritated by motorized noise, were also more strongly in agreement that motorized boating produces negative impacts on water quality, primitive recreation, pollution, and wildlife.

Table 44: MBI Index Items and Motorized Noise Independent Sample t-tests.

Variables	Mean	Std Dev.	t	Sig.
1. Motorized boating has no affect on water quality[1]				
Bothered by Motorized Noise	4.8	0.38	-5.12	<0.001
Not bothered by Motorized Noise	4.5	0.76		
2. Motorized boating has a negative impact on primitive recreation				
Bothered by Motorized Noise	4.6	0.87	-5.46	<0.001
Not bothered by Motorized Noise	3.9	1.2		
3. Pollution from motorized boating needs to be controlled				
Bothered by Motorized Noise	4.8	0.47	-4.15	<0.001
Not bothered by Motorized Noise	4.5	0.78		
4. Motorized activities negatively impacts wildlife				
Bothered by Motorized Noise	4.3	1.1	-3.59	<0.001
Not bothered by Motorized Noise	3.8	1.3		

Note: [1] *Original items regarded as negative statements. Items recoded to match existing positive statements. 1=Strongly Disagree, 5= Strongly Agree.*

Crosstabulation and chi-squared analyses of each of the MBM three-point items, produced somewhat analogous results. Two of the four management items garnered greater "favor" from users that had been impacted by motorized noise. For instance, index item one ("only permit non-motorized boats and electric motors in Waldo Lake") produced significantly different responses ($p < 0.001$): 87% of bothered recreationists favored this action as opposed to 60% of unbothered individuals. Likewise, 92% of impacted respondents agreed that "certain sections of the lake should be limited to non-motorized boating" (item two); versus 75% of their counterparts ($p = 0.007$). The remaining two variables (i.e. items three and four) did not generate statistically significant replies.

Table 45: Motorized Noise and Opinions of Motor Boating Management Actions.

Variables	Oppose *n* %	Not Sure *n* %	Favor *n* %	χ^2	Sig.
1. Only permit non-motorized boats and electric motors					
Bothered by Motorized Noise	*6* 7.3	*5* 6.1	*71* 86.6	20.61	<0.001
Not bothered by Motorized Noise	*72* 31.4	*19* 8.3	*138* 60.3		
2. Certain sections of the lake should be limited to non-motorized boating					
Bothered by Motorized Noise	*5* 6.1	*2* 2.4	*75* 91.5	9.89	0.007
Not bothered by Motorized Noise	*42* 18.3	*15* 6.6	*172* 75.1		
3. Pollution from motorized boats needs to be controlled					
Bothered by Motorized Noise	*2* 2.4	*3* 3.7	*77* 93.9	4.58	0.101
Not bothered by Motorized Noise	*20* 8.7	*14* 6.1	*195* 85.2		
4. Limit motors to 4-cycle engines only					
Bothered by Motorized Noise	*8* 9.8	*10* 12.2	*64* 78.0	1.87	0.393
Not bothered by Motorized Noise	*36* 15.7	*29* 12.7	*164* 71.6		

Research question four asks if the attitudes and opinions about impacts from motorized boating and select management actions are different between the boating groups. Based upon the results from the aforementioned analyses, it can be concluded that differences between the groups do actually exist based on activity style, human-induced, and motorized noise.

The findings from the sub-hypotheses indicate that non-motorized boaters tended to favor more motorized boating regulations, and also felt more strongly about the impacts at Waldo Lake created from motorized boating. Analyses describing noise impacts on these opinions also revealed that those respondents who were impacted by noise (human-induced / motorized) reported elevated levels of agreement in both the proposed

management actions, and motorized boating impacts. It should also be noted that to a lessened degree, some of the motorized boaters did agree with management actions, and also were aware of some of the impacts that their recreational pursuits created. This indicates that motorized boaters to a degree are aware of their impacts, and do agree that something needs to be done to rectify the issues pertaining to motorized boating at Waldo Lake.

CHAPTER 5
CONCLUSION/DISCUSSION

Introduction

The purpose of this study was to expand the body of knowledge pertaining to both satisfaction and conflict literature. Specifically, this study looked at the impacts of noise and how it affects visitor satisfaction and inter-group conflict among boaters at Waldo Lake. Understanding the impacts of noise on various user groups in outdoor recreation settings is important in determining alternative methods of management that may lessen the adverse effects of noise in these areas. Noise, itself, has been defined in many different ways. For the purposes of this study, the concept of human-induced noise was used to include any such noise created by humans that was unnatural in the outdoor environment. Motorized noise was also singled out in this study due to previous research that suggested that certain types of conflict between users can arise from the presence of mechanized noise.

This study examined the relationships and differences between the boating groups based upon their activity choice, experiences with noise, overall feelings towards impacts, and proposed management actions towards motorized boating. It was hypothesized that noise would not affect boaters' overall experiences at Waldo Lake. In addition, the study also hypothesized that activity style does not affect boaters' opinions about noise, nor does it affect the overall experiences of boaters while recreating in the area. This final chapter discusses and interprets the results of the analyses and presents conclusions based on those findings as well as recommendations for future research.

Summary of Findings

Each of the research questions and the accompanying hypotheses, as listed in Chapter 1, are discussed here.

Research Question 1: Does the Occurrence of Noise Affect Boaters' Overall Experiences at Waldo Lake?

$H1_A$: Human-induced noise does not affect boaters' overall experiences at Waldo Lake.

Hypothesis 1(a) was rejected, indicating that human-induced noise does affect the overall experiences of the boaters at Waldo Lake. Under this hypothesis, decreased levels of satisfaction were related to the occurrence of noise and by increases in the number of noises chosen by the sample group. For this hypothesis, overall experience was operationalized by using a single-item, ten-point scale rated from the worst possible experience to the best possible experience, as utilized in many similar studies. Overall experience was also measured by creating a satisfaction index based on previous research conducted by Graefe (1986). The index was comprised of four individual attributes that describe satisfaction among the boaters. These items were tested for reliability and combined to create the satisfaction index as described in previous chapters.

Through the use of an independent sample t-test, it was discovered that differences existed between boaters reporting being negatively impacted by the occurrence of human-induced noise and the extent to which the noise affected them. On average, boaters visiting the Waldo Lake area that were affected by the occurrence of human-induced noise, reported decreased levels of satisfaction. However, only one-third of the sample (35%) reported suffering any negative effects due to the occurrence of noise. Also, the levels of satisfaction reported among those respondents were still considerably

high on the single item satisfaction scale and the multi-item satisfaction index, describing a population of boaters that were only mildly disturbed by the occurrence of noise.

In terms of the relationship between the number of different noise types chosen and overall experience levels, a correlation analysis showed that as the number of individual noise types increased among respondents, their overall experience levels were diminished. In both the single-item and multi-item satisfaction indexes, weak inverse relationships were found to be significant among the boaters.

These findings concur with research conducted by Gramman (1999), who discovered that the occurrence of non-natural noise created impacts (including annoyance, interference with natural quiet, interference with the sounds of nature, and interference with the enjoyment of the area) among visitors to National Parks. Kariel (1991) also found in his study that sounds that interfere with conversation, sleeping, relaxing or other activities in the natural environment could detract from the enjoyment of a visit. In addition, Mace, Bell and Loomis (1998) found that the existence of natural quiet and uninterrupted sounds of nature are highly ranked by outdoor visitors as important aspects of their recreational visits. These collective findings solidify the rejection of this hypothesis, showing that the occurrence of noise created by humans can have adverse impacts on visitors' overall experiences.

$H1_B$: Motorized noise does not affect boaters' overall experiences at Waldo Lake.

Hypothesis 1(b) was supported. Analysis of these results indicates that the presence of motorized noise at Waldo Lake did not significantly affect boaters' overall experiences to the area. For this hypothesis, overall experience (or satisfaction) was operationalized in the same manner as hypothesis one (a), by using a single-item, ten-point scale rated from the worst experience possible to the best experience possible.

The overall experience (or satisfaction level) of the boaters was also measured by creating a multi-item index consisting of four individual satisfaction items. These items included: “I thoroughly enjoyed my trip,” “my trip was not as enjoyable as I had expected it to be,” “my trip was well worth the money I spent to take it,” and “I was disappointed with some aspects of my trip.” The individual items within the index were all rated on a one to five scale from strongly disagree to strongly agree. Moreover, the satisfaction index was tested for reliability before combining the individual items. The only difference between this hypothesis and hypothesis one (a) was that the type of noise measured was limited to only those that were generated from a mechanized source.

When looking at the proportion of boaters who were affected by the presence of motorized noise, only 26% (n=82) stated that motorized noise impacted their experiences while recreating at Waldo Lake. From this finding, an independent sample t-test revealed that there was no significant difference between those reporting noise impacts and those who were not impacted. In addition, boaters, reported elevated levels of satisfaction on both the single-item (8.4-8.6) and multi-item (4.3-4.4) satisfaction measures - regardless if they were impacted by the occurrence of motorized noise or not. This finding implies that the impact of motorized noise on boaters at Waldo Lake is not a significant impacton boaters satisfaction levels.

When the number of different types of motorized noise was examined using correlation analysis, significant relationships were found only between the multi-item satisfaction index ($p<0.05$) and the number of motorized noises chosen by respondents. The single-item satisfaction measure, however, did not show any significant relationships between the number of noises chosen and satisfaction levels among boaters.

These findings agree with the aircraft overflight impact study by Fidell et al. (1996): motorized noise in the form of aircraft overflights was found to insignificantly diminish respondents' overall enjoyment of their outdoor recreational visits. However, this result is not supported by Gramman's (1999) research, in which expectations of motorized noise were dependent on the level of development; particularly mechanized noises were more likely to be evaluated negatively in natural areas compared to more developed or urban locations.

Research Question 2: Does Activity Style Affect Overall Experience Differently?

$H2_A$: There is no difference in overall experience between motorized and non-motorized boaters.

Hypothesis 2(a) was rejected. The non-motorized boaters reported higher mean scores in terms of satisfaction levels than that of the motorized group, describing significant differences in satisfaction based on boating type at Waldo Lake. This finding could be attributed to the increased restrictions on motorized activities, and the lack of activities and facilities better suited for motorized watercraft at Waldo Lake.

From the original sample, two distinct boating groups were created (motorized and non-motorized) by dividing the groups by the power source of their primary vessel. The activity style variable was then operationalized by using these newly created boating groups. Satisfaction, or overall experience, was operationalized by a single-item, ten-point scale rated from the worst possible experience to the best possible experience as utilized in many similar satisfaction and conflict studies (Burns, 2000, Graefe, 1986).

The relationship between the activity style chosen by the respondent and their reported satisfaction levels as measured by the satisfaction index was examined using an independent sample t-test. The results showed that non-motorized boaters reported

significantly higher levels of satisfaction during their experience at Waldo Lake than motorized boaters. Non-motorized boaters reported satisfaction levels of 4.5 on the five-point scale index and 8.7 on the ten-point satisfaction scale. It should be noted, however, that the motorized users also reported relatively high levels of satisfaction. The motorized boaters reported satisfaction scores of 4.2 on the five-point index and 8.2 on the ten-point scale.

These findings are similar to that of Adelman (1982), who found that different user groups have different norms about impacts, inappropriate behaviors, etc. The study found that non-motorized boaters tended to have a more purist attitude, and it can be assumed that this purist attitude would favor motorized activity restrictions as well as stronger feelings about motorized impacts. Adelman (1982) also concluded that there is no mutual rewarding interaction between groups with differing norm values. Thus, boaters, in having their satisfaction lessened, would experience conflict and could inevitably desire increased control to reduce such conflicts. In addition, Ruddell and Gramman (1994) stated that visitors who encounter persons using unacceptable modes of backcountry travel, such as motorboats in an outdoor recreation setting, are more likely to experience some level of dissatisfaction compared to those using that particular mode of transportation at that time.

Research Question 3: Does Activity Style Affect Boater Opinions about Noise?

$H3_A$: There is no difference between impacts and opinions of human induced noise between boater groups.

Hypothesis 3(a) was rejected, based upon the results indicated in Chapter Four. There were significant differences found between the boater groups regarding impacts and opinions of human-induced noise. In addition, the non-motorized group reported

higher levels of impacts due to human-induced noise than the motorized group. Also, it should be noted that over 60% of the respondents indicated that the individual noise types and noise overall did not bother them during their recreation visit.

Opinions of human-induced noise were operationalized by using one dichotomous question from the survey instrument (Appendix A) that asked boaters if their experience was impacted by the occurrence of human-induced noise. In addition to this measure, each individual noise type was examined to determine if different opinions existed between the boating groups. To determine the relationship between opinions of human-induced noise and boater type, the number of different noises chosen by respondents was utilized to examine which activity style (motorized, non-motorized) chose more types of noise as the source of their conflict.

A simple crosstabulation was performed on each individual noise type and the single dichotomous question, "Has your overall experience to Waldo Lake been negatively impacted by human-induced noise." From this analysis, it was discovered that only 20% of the motorized group were impacted by the presence of noise, as compared to 40% of non-motorized boaters. In addition, of the six individual human-induced noise types tested, only motorboat noise resulted in significant opinion differences (non-motorized=16%; motorized=1%) between the groups. For this noise type, however, over 80% of both boating groups (motorized, non-motorized) indicated that motorboat noise did not impact their experiences. Therefore, even though motorboat noise produced opinion differences between the two boating groups, only a relatively small percent of the sample group was impacted by this noise type.

The results describing differences between the boater groups and their opinions of human-induced noise coincides with findings from research examining asymmetrical conflict between two groups. In the 1982 study by Adelman et al., it was found that non-motorized canoeists experienced conflicts with the motorized boaters, while the motorized boaters did not mind their encounters with the canoeists. Since the non-motorized group within this study reported higher levels of human-induced noise conflict as compared to the motorized group, it has been shown that an asymmetrical conflict exists.

In another study conducted by Ivey et al. (1992), it was suggested that non-motorized users tended to have a lower level of tolerance and a greater perception of conflict in water-based settings; while, motorized boaters had a higher tolerance level and a lower degree of conflict perception. This finding suggests that non-motorized users are less tolerant of impacts such as noise in an outdoor recreation setting. In addition, Ruddell and Gramman (1994) concluded that goal orientation influenced perceptions of noise-induced conflict. This indicates that visitors participating in motorized activities would tend to not experience conflict from the noise of their activity, whereas the non-motorized group would experience elevated conflict and dissatisfaction due to the occurrence of noise.

$H3_B$: There is no difference between impacts and opinions of motorized noise between boater groups.

Hypothesis 3(b) was rejected. The findings of this study showed that there were significant differences between the boater groups concerning the impacts and opinions of motorized noise. Although this hypothesis was rejected, it should be noted that both the reported levels of interference and the number of motorized noise types chosen by

boaters, were low thus revealing that the impacts experienced from motorized noise at Waldo Lake is a minor concern to the sample group.

For this hypothesis, the interference variable was operationalized by creating a multi-item index describing the levels of interference experienced by boaters due to the occurrence of motorized noise. This interference index consisted of four individual items. These items included: "enjoyment of the area," "appreciation of the natural quiet," "appreciation of the sounds of nature," and "appreciation of the historical/cultural significance of the area." The individual items within the index were all rated on a one to five scale from "not at all interfered" to "extremely interfered." These items were tested for reliability and combined to create the interference index. For this sub-hypothesis, the only difference between this test and previous hypotheses was that the type of noise measured was limited to only those generated from a mechanized source.

In addition to the index described above, the number of different motorized noises chosen by respondents was also examined. The number of different noise types chosen by respondents was utilized to examine which activity style (motorized, non-motorized) selected more types of motorized noise as sources of their conflict.

The differences in interference levels between the boater groups were analyzed using an independent sample t-test. From the analysis, a significant difference in the level of interference due to motorized noise was found between the respondent groups, with non-motorized users indicating higher levels of interference than the motorized group. However, descriptive statistics revealed that over 72% of the respondents stated that motorized noise did not interfere with their experience at Waldo Lake at all. This was apparent in each of the individual interference index items as well.

Through the use of an additional t-test, it was also discovered that there were differences in the number of motorized noises chosen by the individual boating groups. Specifically, non-motorized boaters, on average, chose more types of motorized noise than their motorized boating counterparts. This result indicates that non-motorized boaters were more prone to experience noise impacts than the motorized group.

Previous literature by Gramman (1999) suggests that perception of noise is influenced by activity style: particularly, motorized activities are not viewed as conflict issues to those participating in them. In the same study, Gramman also reported that visitors on motorized trips down the Colorado River were less likely to be impacted by aircraft overflights than those involved in non-motorized activities; again, solidifying differences in motorized noise perception between the boater groups. In addition, Kariel (1990) discovered that there was a close relationship between ownership of certain noise-producing items and annoyance at their sound - meaning that ATV users, for example, were less annoyed by ATV noise than non-owners.

Research Question 4: Are the Attitudes and Opinions Regarding Impacts from Motorized Boating and Select Management Actions Different Between Boating Groups?

$H4_A$: There is no difference in the attitudes regarding proposed management actions and the perception of motorized boating impacts based on activity style.

Hypothesis 4(a) was rejected. There are significant differences in attitudes about proposed management actions and motorized boating impacts based upon activity style. In sum, non-motorized boaters tended to favor management actions, while they also agreed with the statements regarding negative impacts caused by motorized boating at higher levels than their motor boating counterparts.

The boating impacts and proposed management variables were operationalized by creating the motorized boating management (MBM) index and the motorized boating impact (MBI) index, as described in Chapter Four. These indices were both created by using individual items taken directly from the survey instrument (See Appendix A). The items in the motorized boating impact (MBI) index were all five-point, Likert scale questions, with one being "strongly disagree" and five being "strongly agree". The motorized boating management (MBM) index items were based on three-point, Likert scale statements, with one being "oppose" management actions, two being "unsure" of management actions, and three being "support" of proposed management actions.

The relationship between activity style (motorized or non-motorized boating) and the MBM and MBI indexes were examined by using independent sample t-tests. Crosstabulation analysis was used to compare percentages and prove relationships between the boating groups. Based upon the analyses, significant mean differences were found between the groups in reference to their opinions in both the MBI and MBM indices. The analyses showed that non-motorized boaters were more likely to agree with proposed management actions, and they were also more likely to agree that motorized boating caused negative impacts to the area.

These findings are related to the idea that conflict relationships between groups can often be described behaviorally rather than by resource specificity. In the study of hunter and non-hunter groups by Bury, Holland & McEwen (1983), it was found that conflicts arose based on norm values. This conflict type occurred because of one groups' dislike for the specific activity being participated in by the other. This, in turn, could lead to one group favoring management actions as well as the strengthening of negative opinions

about the problem activity (in this case hunting). Also, non-motorized users have been found to have a more "purist" or environmentally grounded attitude (Manning, 1999), meaning they possess a lower tolerance for conflicts with motorized groups. This decreased tolerance may eventually lead to a desire for increased management actions in order to diminish the amount of inter-group conflict (Stankey & Schreyer, 1987).

$H4_B$: Human-induced noise does not affect boaters' attitudes toward proposed management or their opinions about motorized boating impacts.

Hypothesis 4(b) was rejected. Boaters who reported being bothered by human-induced noise tended to be in favor of increased management actions, and they also tended to agree that motorized boating negatively impacts the area.

In this hypothesis, human-induced noise was examined to determine if its occurrence in an outdoor recreation experience affected respondents' opinions about proposed management actions and motorized boating impacts. The motorized boating management (MBM) and motorized boating impact (MBI) variables were operationalized by creating indices, which are described in detail in Chapter Four. The human-induced noise variable was operationalized through the use of a single dichotomous question taken directly from the survey instrument (See Appendix A).

A series of independent sample t-tests and crosstabulations were used in the analysis of this hypothesis. In the case of proposed management actions, it was revealed that respondents who had been affected by human-induced noise were more likely to favor management actions to reduce the presence of noise conflicts. In addition, those respondents who were bothered by human-induced noise also tended to agree that motorized boating caused the impacts at Waldo Lake.

The fact that those respondents who were bothered by the occurrence of human-induced noise also tended to have stronger opinions on boating impacts and management actions, is not surprising. In relation to the idea of asymmetrical conflict, the group who experienced impacts from human-induced noise generally experienced more conflict and dissatisfaction than that of the other group. This in turn would lead to a lower level of tolerance as described by Adelman et al. (1982).

$H4_C$: Motorized noise does not affect boaters' attitudes towards proposed management or opinions about motorized boating impacts.

This hypothesis was rejected. Significant differences were found between boaters who were impacted by motorized noise and those who were not in regards to how each felt about proposed management actions and impacts from motorized boating. The respondents who were bothered by the presence of motorized noise during their visit, tended to experience increased conflicts and decreased satisfaction, as described in detail in Chapter Four. These findings indicate that these individuals would favor increased management actions since they would target motorized use above all else.

This finding is related to the prior hypothesis in which individuals who were bothered by human-induced noise had different opinions of management actions and impacts from motorized boating. If certain recreationists are bothered by the noise produced from motorized recreation, they will experience decreased satisfaction and will inevitably have elevated feelings against motorized activities. In addition, it should be noted that Kariel (1990) found that individuals involved in motorized recreation often had higher tolerance levels towards noise and a lower perception that their motorized activity did any harm to others; thus, those respondents produced lower mean scores as they were not as bothered by the occurrence of motorized noise.

Conclusions

This study documented conflict issues between motorized and non-motorized boater groups at Waldo Lake. Most conflicts were caused by decreases in individuals' overall experiences, the presence of noise, and opposing opinions regarding potential management actions. The conflicts assessed within this study were found to be limited and asymmetrical, meaning that one user group (non-motorized boaters) experienced slightly more impacts than the other (motorized boaters). Overall, non-motorized boaters reported lower satisfaction levels due to noise and the presence of motorized activities. However, the existing conflict between boaters brings to light underlying facts that make it necessary to exercise caution when formulating conclusions based on the data collected.

Currently, the USFS is considering changing the recreation opportunity spectrum (ROS) at Waldo Lake to include only non-motorized recreation. Since Waldo Lake is surrounded by designated wilderness areas and the majority of users are currently participating in non-motorized forms of recreation, this idea seems viable. Not only would limiting the use of motorized boats on Waldo Lake provide visitors with continued enjoyment, but it would also protect such a rare and beautiful ecosystem. In so doing, non-motorized recreationists would be guaranteed a large area to enjoy nature to its fullest extent and experience a truly wonderful place.

When looking at the sample, it is evident that non-motorized boaters are less satisfied due to the occurrence of noise. Non-motorized boaters did favor more motorized boating regulations, and they felt that motorized boating caused some negative impacts. However, upon closer scrutiny of the sample, only about one-third of the non-motorized boaters were impacted by noise (motorized or human-induced). Moreover,

boaters, overall, reported elevated levels of satisfaction whether they were impacted by noise or not. Therefore, noise may have had a slight impact on some boaters, but probably not to the point where their recreational experience at Waldo Lake was irreversibly damaged.

Of the two categories of noise studied, human-induced noises caused greater dissatisfaction among the boaters than motorized one. These findings may be due to: (1) the limited amount of motorized recreation at Waldo Lake; (2) the location of Waldo Lake; (3) the sampling being conducted during peak season; or (4) crowding issues. For example, human-induced noises, such as loud people, music, or generators, often occur throughout the day and then into the night when most respondents would desire a quieter, more relaxing setting. Noise from recreational activities, such as motor boating, normally occurs only during the busier daylight hours when most respondents are involved in their own recreational pursuits; thus, decreasing their awareness of specific types of noise.

In addition, the size of Waldo Lake plays a key role in the degree of noise impact as experienced in this study. Often, annoyance from noise must occur within close proximity for it to impact the respondents' levels of satisfaction. With an approximate area of ten miles, recreational noise is frequently too far away to have any influence. It should also be noted that tolerance could cause visitors to become accustomed to certain types of noise in water-based settings. In Oregon, most large-sized lakes allow large numbers of visitors and motorized recreation. Visitors who frequent these areas for extended periods of time can develop tolerances to certain noise types, thus reducing the amount of conflict they experience.

Activity style was also examined as a variable for affecting satisfaction levels. Previous research has suggested that visitors who participate in a particular activity enjoy encounters with others involved in the same activity. Similar results were found in this study. The non-motorized group, which accounts for almost two-thirds of the sample, was more satisfied with their overall experiences as compared to the motorized respondents. This could be because Waldo Lake is known as an exceptional place for non-motorized activities and the non-motorized group was able to encounter several others participating in non-motorized activities and few involved in motorized ones. However, both groups showed high levels of satisfaction regardless of their activity style.

Waldo Lake boaters have differing opinions about potential management actions and motorized impacts. Prior to analyzing the data collected, the findings suggested that non-motorized boaters favored more regulations against the use of motorized watercraft and were in agreement that motorized boating caused specific impacts on Waldo Lake. Upon examining the data, however, some surprising trends were also discovered among motorized boaters. First, the management index showed that a large number of motorized users actually agreed with some of the proposed actions for Waldo Lake, including separating activity groups and reducing pollution. Second, the motorized boating impact index demonstrated that motorized users tended to agree that they caused pollution and negatively affected water quality. These findings describe a motorized group that is sensitive to the impacts caused by their activities. While they want to retain their rights of access to and use of Waldo Lake, they also appear willing to compromise in order to alleviate conflicts.

Based on the data described above, the conceptual model discussed in Chapter Two, the noise / conflict model, holds true for the findings of this study. The model predicted that the perceptions and tolerances for noise impacts would be influenced by activity style. Also, the model predicted that activity choice would act as a mediating variable on the amount of noise that impacted satisfaction levels. It also correctly predicted that the perception of noise would affect boaters' overall experiences directly. All of these theoretical relationships were displayed within the context of this research to a limited degree.

This study incorporated the use of multi-item indices to describe differences in satisfaction, noise impacts, and proposed management actions. All of these indices proved valuable to this study since the measurements provided detailed results. These detailed results led to a greater understanding of the conflict and noise impact situations currently occurring at Waldo Lake. Utilizing noise as an indicator of satisfaction and conflict between groups has proven to be important in understanding the perceptions and desires of the visitors to the area.

Some unexpected and interesting insights into the perceptions of noise were also discovered from the results of this study. Overall, it seems that the main underlying issue may not be the impacts of noise but the current activities allowed at one of the purest lakes in the world. From the results, it can be concluded that noise is only a small portion of the current activity conflicts experienced at Waldo Lake. Non-motorized boaters from this study were only slightly impacted by the occurrence of noise, but they still wanted motorized recreation removed from the area; thus, leading to the conclusion that other variables may be needed to further describe the conflict issues between boaters.

Future Research

Additional study is certainly justified for the impacts of noise on boaters in lake-based settings. While results have shown that noise has a limited effect on the satisfaction levels of boater groups, the existence of noise conflicts should be evaluated in future studies to determine if similar results are consistently experienced at other recreational lakes. Additionally, it may be appropriate to measure noises that are created by visitors alone–absent from the presence of any mechanized device-to see if impacts and conflicts develop between the boating groups.

Also, to further the understanding of noise impacts in outdoor areas, future research should include other user groups such as terrestrial and wilderness users. Implications found in this study as well as in previous research describe conflicting issues among multiple user groups, not just boaters as depicted in this study. It would be interesting to assess the different perceptions of noise and other environmental impacts between groups that are involved in totally different types of recreational experiences. Are the differences between terrestrial- and aquatic-based users more defined or apparent than that of the activity-based differences defined in this study?

The use of noise as an indicator of conflict should, furthermore, be added to other conflict measures to create a clearer image of what preferences exist among visitors to water-based recreation areas. Previous conflict research has utilized other environmental factors, such as litter, to determine if conflicts exist among users and if these conflicts detract from the overall experiences of individuals. Moreover, additional noise types should be added to similar studies in order to provide participants more choice in the types of noise that impacted their experiences. In addition, other environmental

indicators could be added to future noise impact studies in an attempt to better understand the environmental attitudes of boaters in water-based studies.

Due to the special nature of Waldo Lake, future studies should also attempt to test the noise impact variable at other locations that have better represented groups of motorized and non-motorized recreationists. Since the Waldo Lake areas surveyed in this thesis already contained many restrictions towards the use of motorized activities and consisted mostly of non-motorized users, future studies should include areas that do not exhibit these characteristics. In areas without such restrictions, the occurrence of noise may be more apparent; areas where motorized recreation is currently the norm might include visitors that have increased levels of impacts due to this type of recreational activity. Moreover, it is also recommended that future studies on user preferences, in accordance with the occurrence of noise in lake-based settings, be expanded to include several lakes within a relatively close proximity of each other. In Oregon, recreational lakes abound, with several large-sized, multi-use lakes existing within a short distance of each other. By including these other lakes in the survey process, an overall picture of user preferences and desires could be more fully understood, and any differences between motorized and non-motorized lakes would become more apparent.

Future research in this area should attempt to increase the quality of the scales used to measure interference, impacts, management, and satisfaction. The four items used to create the previously mentioned indices are too small, and these indices could benefit from being refined by other researchers. Also, the interference index contained an item that did not seem to be well understood by the respondents. The item asking if motorized noise interfered with respondent's appreciation of the cultural/historical aspects of the

area did not seem to fit the Waldo Lake area since historical sites were limited. Hence, better indicators of noise interference could prove helpful in examining these impacts.

Moreover, an additional measure of noise in outdoor settings should include an objective measure, meaning that the actual audible levels of noise should be measured using recording equipment and decibel meters to assess the levels of acceptable change and tolerance levels of noise among different user groups. Along with this type of measurement, additional survey questions dealing with noise impacts and preferences could have been added to enhance the understanding of how Waldo Lake area users really felt about the occurrence of noise. The current study did not include this "objective" measure due to cost and equipment constraints. In areas where motorized noise is not usually present, audible measurements of this type may uncover more drastic differences between visitors to these areas.

Lastly, future research should include additional demographic information about the visitors of these areas. Variables such age, ethnicity, and income would be interesting variables to analyze: not only to clarify the picture of the general Waldo Lake user, but also to determine if these demographic variables determine certain values and preferences in term of noise impacts, activity choice, and satisfaction levels.

As stated in Chapter One, there has not been much research regarding the effects of noise on outdoor experiences of boaters and differences in the acceptance levels of noise in an outdoor recreational setting. Because sound degradation can adversely affect visitors' overall experiences to an area, continued research in the field of noise impacts is pertinent in understanding the preferences of outdoor recreationists.

Management Implications

The desire to recreate in a pristine natural setting is an ever-increasing demand that managers must face. Due to the wide variety of activities, preferences, and expectations among visitors, the goal of recreational management becomes even more difficult as does the task of reducing conflict between all of the various users of natural areas. Conflicts arise due to activity incompatibilities, norm differences, perceived impacts, and lifestyle tolerances. The occurrence of noise in the natural environment is an increasingly difficult issue to control due to crowding, development encroachment, and motorized activities (including aircraft flights, ORVs, chainsaws and motorboats). The intention of this study was not to detail the negative aspects of any one recreational activity, but to describe current issues involving noise and motorized water travel as seen by the various users of Waldo Lake. The first step in attempting to control, understand, and prevent impacts and conflicts due to noise and user conflicts is to determine the differences that exist between conflicting groups and activities.

This study utilizes a survey to attempt to understand the different perceptions of noise and satisfaction between the boating groups present at Waldo Lake. The results of this study can assist managers of other water-based recreation sites by describing user preferences and perceived impacts of noise and certain motorized activities. This study also can assist in determining exactly what types of noise are most damaging to the overall experiences of the varied users to lakes and other water-based recreation areas.

As discussed in the management literature (Hendee & Dawson, 2002) and as witnessed during the data collection, indirect management seems to be the most viable approach in decreasing conflicts and noise impacts at Waldo Lake. By utilizing education and information practices, managers can assist users in understanding: why

certain restrictions need to be implemented, why conflicts exist between specific users and activity styles, and why it is important to understand the needs and desires of all those who wish to recreate in outdoor areas (Hendee & Dawson, 2002).

Several management strategies come to light as a result of this study that may assist in decreasing the current issues at Waldo Lake and other recreational lakes. First, locational or temporal zoning for activity use may decrease conflicts, as shown in this study through agreement from both motorized and non-motorized boaters of this management action. Also, there seems to be a special attachment to Waldo Lake based particularly upon its aesthetic beauty and its adjacent location to wilderness areas. Due to these findings, managers may want to reassess the current recreation opportunity spectrum (ROS) for Waldo Lake and consider that there are several other multi-use lakes in close proximity to the area.

Currently there are no larger-sized lakes set aside for primary use by non-motorized users. As a result, motorized impacts and activity-based conflicts are increasingly common at Waldo Lake. Managers have already placed several restrictions on motorized use at Waldo Lake, but conflicts persist. Even though these restrictions have lowered the overall number of motorized vessels on Waldo Lake, additional management is needed to further decrease conflicts and lower the occurrence of noise in this area.

APPENDIX A
SURVEY INSTRUMENT

Waldo Lake Visitor Survey

Survey ID#_____ Interviewer_____# of people at site_____
Date_____ Location_____ # of watercrafts at site_____
Time_____ Gender_____ Background level _____

Interviewer Script Hello, I am (name and affiliation, i.e. University student, etc.). Have you already been approached and interviewed? **Yes – Thank you for your time No - Continue**
We are conducting a study for the US Forest Service of visitors to the Waldo Lake recreation areas. The information visitors give us will be used to help managers better serve the visiting public and protect Waldo Lake's natural and cultural resources. You have been selected as part of a random sample of visitors to participate in this survey. Participation is voluntary and if you choose to participate, everything you tell us will be kept strictly confidential. The survey will take about 10 minutes to complete. May we proceed with the interview?
Yes - Go to question If NO - Thank you for your time

1. Is this your first visit to Waldo Lake? _____ Yes _____ No
   [If no], In what year did you make your first visit to Waldo Lake? _____year

2. How many days did you spend at Waldo Lake in 2002? _____ Days

3. How many days do you plan to spend at Waldo Lake during this trip? _____ Days ____ Not Sure

4. In what activities on this list did you participate (or do you plan to participate in) during this recreation visit at Waldo Lake?		5. Which of those is your primary activity for this recreation visit to Waldo Lake?
Question 4 answers		Question 5 answer
	Camping in developed sites (family or group sites)	
	Backpacking, camping in unroaded areas	
	Picnicking and family day gatherings in developed sites (family or group sites) (circle all that apply)	
	Viewing wildlife, birds, flowers, fish, etc. on NF lands (circle all that apply)	
	Viewing natural features such as scenery, flowers, etc. on NF lands (circle all that apply)	
	Visiting historic and prehistoric sites/areas (circle all that apply)	
	Visiting a nature center or nature trail (circle all that apply)	
	Nature study	
	General/other-relaxing, hanging out, escaping heat, noise, etc.	
	Fishing—all types	
	Hunting—all types	
	4-wheelers, dirt bikes, etc. (circle all that apply)	
	Driving for pleasure on roads	
	Motorized water travel (boats, ski sleds, etc.)	
	Other motorized land/air activities (plane, other)	
	Hiking or walking	
	Horseback riding	
	Bicycling, including mountain bikes (circle all that apply)	
	Nonmotorized water travel (sailboarding, kayaking, rafting, canoe, etc.) (circle all that apply)	
	Other nonmotorized activities (swimming, games, and sports)	
	Gathering mushrooms, berries, firewood, or other natural products (circle all that apply)	

5a. What areas of the lake did you visit on this trip? (ASK REPONDENT TO DRAW ROUTE FOLLOWED ON MAP)

5b. Where did you spend the most time on this trip
_____ Name of location(s)
(CIRCLE LOCATION(S) ON MAP AND LABEL **MOST)**

6. Where is your permanent home? Country_____/State____/County_____ /Zip code_____

7. About how many miles is it from your permanent home to Waldo Lake? _____ miles

8. How many people are in your group on this trip to Waldo Lake? _____ people

8a. Are you part of an organized group? _____Yes _____No
8b. If yes, please list the name of the group:_____

This section of the survey asks you about your use of watercraft on this trip to Waldo Lake.

9. _____Yes _____No Did you/will you use some sort of watercraft on this trip to Waldo Lake?
(IF YES, ask the rest of the questions on this page)

10. What type of watercraft did you use on this trip? [Check the type of each boat]

11. What is the length of this boat? [Write length of each boat next to the type]

____/____	Canoe or Kayak	____/____	Sailboat
____/____	Fishing/Bass Boat	____/____	Cruiser (≥ 25ft)
____/____	Inflatable boat	____/____	Pontoon Boat
____/____	Runabout (<24 feet)	____/____	Sailboard
____/____	Other_____	____/____	Other_____

12. What is your primary boat power?
___ Gas ___ Paddle/Oar
___ Diesel ___ Wind/Sail
___ Electric ___ Other, _____
What is the horsepower of your primary power source? _____ hp
(If motorized) Is your primary power source:
_____ 2 cycle _____ 4 cycle

What is your secondary boat power?
___ Gas ___ Paddle/Oar
___ Diesel ___ Wind/Sail
___ Electric ___ Other, _____
What is the horsepower of your secondary power source? _____ hp
(If motorized) Is your secondary power source:
_____ 2 cycle _____ 4 cycle

ASK ONLY FOR ELECTRIC MOTOR USERS:
13. What type of battery source do you use? (How many batteries)
_____ 12 volt battery _____ 24 volt battery _____Other Battery type: _____

14. How do you charge your battery(ies)?
_____ Electric charger at home _____ Solar charger
_____ Electric charger on site _____ Other
_____ Gas powered charger on your vessel

15. Would you support a solar powered recharge station at the surrounding boat ramps that would be funded by a user fee? ___ yes ___no
16. If yes, how often would you use it?
___ Not Sure ___ Never ___ Sometimes ___ Often ___ Always
17. Following are some statements about this visit to Waldo Lake. For each statement, please circle the response that best describes your feelings about your visit to this area. If the statement does not apply, do not answer the question.

	SD	D	Undec	A	SA	NA
I avoided my favorite parts of Waldo Lake because there were too many people	1	2	3	4	5	
I thoroughly enjoyed my trip	1	2	3	4	5	
My trip was not as enjoyable as I expected it to be	1	2	3	4	5	
There were too many watercraft on the lake	1	2	3	4	5	
I thought the recreation area and its surroundings were in good condition	1	2	3	4	5	
I stayed off the lake during parts of the day because there were too many boats on the lake	1	2	3	4	5	
I wish there were more watercraft on the lake during my visit	1	2	3	4	5	
I did not participate in some boating activities because of crowded conditions at the lake	1	2	3	4	5	
My trip was well worth the money I spent to take it	1	2	3	4	5	
There were too many people at the lake	1	2	3	4	5	
I was disappointed with some aspects of my trip	1	2	3	4	5	
The number of people at the recreation area reduced my enjoyment	1	2	3	4	5	
The behavior of other people at the recreation area lowered the quality of my experience	1	2	3	4	5	
(*If agree or strongly agree with above statement*) How did other people's behavior reduce your enjoyment?						

18. Would you favor or oppose each of the following management actions for Waldo Lake:

	FAVOR	OPPOSE	NOT SURE
Establish "Off Limit" Zones to protect sensitive areas	1	2	3
Zoning the waters to provide for specific uses at specific places	1	2	3
Only permit non-motorized boats and electric motors in Waldo lake	1	2	3
Limit the size and power of boats using Waldo Lake	1	2	3
Restrict boat use in certain areas	1	2	3
Limit the number of boats on the lake at one time	1	2	3
Control the level of noise from motorized recreation	1	2	3
Limit motorized boat motors to 4-cycle engines only	1	2	3
Zone activities to provide for different boat uses at different times	1	2	3

19. For each item below please circle the response that is closest to the way you feel about Waldo Lake.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Motorized boating has a negative impact on primitive recreation experiences	1	2	3	4	5
Certain sections of the lake should be limited to non-motorized boating	1	2	3	4	5
Motorized boating has no affect on water quality	1	2	3	4	5
Pollution from motorized boating needs to be controlled	1	2	3	4	5
Motorized activities negatively impact wildlife	1	2	3	4	5
Litter is not a problem at Waldo Lake	1	2	3	4	5
I am aware of visible plant destruction along the shores of Waldo Lake	1	2	3	4	5
The shorelines are in good condition at Waldo Lake	1	2	3	4	5

20. Has your overall experience to Waldo Lake been negatively impacted by human-induced noise?

___ yes ___ no

If yes, which types of noise (check all that apply)

_____ Power generators

_____ Motorboats

_____ Dogs

_____ Cars/trucks/planes (circle all that apply)

_____ Loud music

_____ Other (please list) _____

21. How much did the sounds of motorized human activity (cars, airplanes, boats, etc.) interfere with the following aspects of your trip to Waldo Lake?

Did motorized sounds interfere with your:	Not at all	Slightly	Moderately	Very much	Extremely
Enjoyment of the area	1	2	3	4	5
Appreciation of the natural quiet	1	2	3	4	5
Appreciation of the sounds of nature	1	2	3	4	5
Appreciation of the historical/cultural significance	1	2	3	4	5

For repeat visitors only:	Circle answer below			
22. Within the past few years, do you think the amount of boating use has been:	Increasing	Not changing very much	Decreasing	Don't know
	Circle answer below			
23. Within the past few years, do you think the environmental quality (water quality, noise pollution, litter, etc.) at Waldo Lake has been:	Improved	Not changing very much	Degraded	Don't know

24. On a scale of one to ten, how would you rate your overall experience at Waldo Lake, with a rating of 10 being the best possible experience, and a rating of 1 being the worst possible experience you can imagine? _____

25. If you could ask resource managers to improve some things about the way people experience the Waldo Lake area, what would you ask them to do?

_____

_____

26. How did the number of people you saw during this visit to Waldo Lake compare with what you expected to see?

_____ A lot less than you expected
_____ A lot more than you expected
_____ You didn't have any expectations
_____ A little more than you expected
_____ A little less than you expected
_____ About what you expected

27. During this visit how crowded did you feel at Waldo Lake? [Circle one number]

1	2	3	4	5	6	7	8	9
Not at all Crowded		Slightly Crowded		Moderately Crowded			Extremely Crowded	

28. How acceptable was the number of other people you saw at the lake on this trip? [Circle one number]

+4	+3	+2	+1	0	-1	-2	-3	-4
Very Acceptable		Neither acceptable nor unacceptable					Very Unacceptable	

29. On this trip, would you say that the number of other people at the lake? [Circle one number]

+4	+3	+2	+1	0	-1	-2	-3	-4
Enhanced your enjoyment			Neither enhanced nor detracted from your enjoyment			Detracted from your enjoyment		

30. Overall, on this trip, would you like to have seen: [Circle one number]

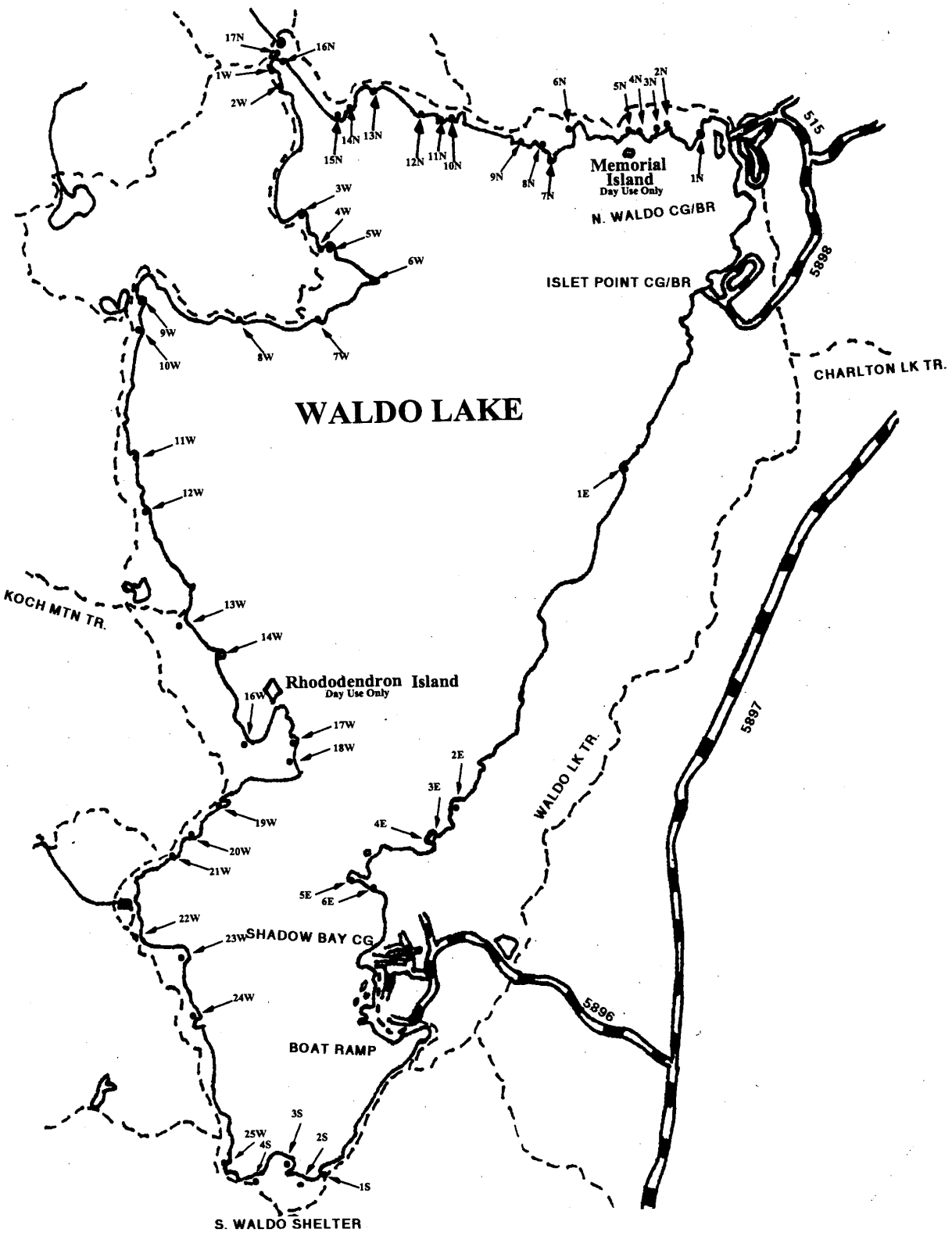
+4	+3	+2	+1	0	-1	-2	-3	-4
Far more people at the lake				The same number of people as you saw			Far less people at the lake	

31. Was Waldo Lake your primary destination for this trip? _____ Yes _____ No

32. Finally, on this trip did you recreate just at Waldo Lake or did you go to other National Forests, parks, or recreation areas? ____ Just Waldo Lake ____ Other places (please list)

_____

Thank You


WALDO LAKE
Memorial Island
Day Use Only
N. WALDO CG/BR
ISLET POINT CG/BR
CHARLTON LK TR.
KOCH MTN TR.
Rhododendron Island
Day Use Only
WALDO LK TR.
SHADOW BAY CG
BOAT RAMP
S. WALDO SHELTER
515
5898
5897
5896
1W
2W
3W
4W
5W
6W
7W
8W
9W
10W
11W
12W
13W
14W
15W
16W
17W
18W
19W
20W
21W
22W
23W
24W
25W
1S
2S
3S
4S
1E
2E
3E
4E
5E
6E
1N
2N
3N
4N
5N
6N
7N
8N
9N
10N
11N
12N
13N
14N
15N
16N
17N

APPENDIX B
SURVEY REFUSAL FORM

2003 Waldo Lake Noise Impact Study

Refusal Sheet

Date _____ Location _____

Interviewer _____ Time _____

Boat Length (approximate)_____ft.

Boat type:

___ Cabin Cruiser
___ Runabout
___ House Boat
___ Sailboat
___ Bass Boat
___ Other Describe _____
___ Row Boat
___ Canoe or Kayak
___ Pontoon Boat
___ Waverunner/jetski
___ Sailboard

Power:
___ Outboard
___ Inboard
___ Inboard/Outboard
___ Sail Only
___ Paddle/oar only
___ Other_____

Number in Party: _____total

Gender: _____male _____female

Apparent Race: _____

Reason:_____

_____

APPENDIX C
ADDITIONAL TABLE

Table 46: "Other" Noise Category Response List.

"Other" Noise Category Open-Ended Responses	n	%
Loud Noisy People		
Loud people	16	34.8
People	6	13
Loud people late night	3	6.5
Motorcycles	3	6.5
Boats early am	1	2.2
Crying children	1	2.2
Fireworks, loud drunk people late night	1	2.2
Loud engines	1	2.2
Loud late night campers	1	2.2
Loud late night people	1	2.2
Loud partying	1	2.2
Loud people at night	1	2.2
Loud/rowdy people all noises too early in the am	1	2.2
Noisy campers	1	2.2
People yelling	1	2.2
People whooping	1	2.2
People yelling late at night	1	2.2
Rowdiness	1	2.2
Rowdy people	1	2.2
Shouting people	1	2.2
Shouting people on mountain bikes	1	2.2
Yelling late night	1	2.2

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BIOGRAPHICAL SKETCH

The author of this thesis was born in Paterson, NJ; raised in southern NJ; completed high school in Marlton, NJ; and attended college in Pomona, NJ. He received a Bachelor of Science in environmental studies from the Richard Stockton College of New Jersey and moved to Florida and began a career as an environmental scientist and later as an environmental analyst. He later returned to the University of Florida to pursue a graduate degree in the Department of Recreation, Parks, and Tourism. His coursework focused on outdoor recreation and natural resource management. Upon graduation, Joseph hopes to pursue a career in park planning and management with one of the federal land agencies utilizing his knowledge and experience in both the environmental science and outdoor recreation fields.