Utah Angler Specialization and Its Relationship to Environmental Attitudes and Angler Motivations

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UTAH ANGLER SPECIALIZATION AND ITS RELATIONSHIP TO ENVIRONMENTAL ATTITUDES AND ANGLER MOTIVATIONS

by

Joseph W. Unger III

A thesis completed in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Recreation Resource Management

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UTAH STATE UNIVERSITY
Logan, Utah

2012
ABSTRACT

Utah Angler Specialization and Its Relationship to Environmental Attitudes and Angler Motivations

by

Joseph W. Unger III, Master of Science
Utah State University, 2012

Major Professor: Dr. Steven W. Burr
Department: Environment and Society

In recent years, fishing has been decreasing in popularity both in Utah and nationwide. Because of this, there has been a reduction in funds and support for fisheries management, causing deterioration of once pristine fisheries. By understanding the motivations and environmental attitudes of the remaining anglers, fisheries managers can better manage areas to retain these anglers and attract new ones. This thesis presents research about the environmental attitudes and motivations of anglers in respect to specialization level. Findings presented in this thesis show anglers in Utah are members of one of three distinct angler specialization groups. The more specialized the anglers, the more aware they were of the environment. Comparison of consumptive and nonconsumptive anglers was also tested, without statistically significant results. Environmental orientations were tested between anglers and the general public as well. Respondents were placed on a continuum ranging from “strong utilitarian” to “strong
preservationist.” Most anglers, like most members of the public, clustered in the center of this continuum. Finally, motivations of anglers were compared across the three specialization groups, but only two of three motivation measures were found to be significantly different across angler specialization levels.

(118 pages)
Utah Angler Specialization and Its Relationship To Environmental Attitudes and Angler Motivations

Joseph W. Unger III

For this research, I sampled 10,000 anglers who purchased a Utah fishing or fishing/hunting combination license from January through November, 2011. An online survey link was provided to the potential participants during November-December, 2011, to determine levels of specialization, motivations for fishing, and environmental awareness/concern. Anglers were also compared to a sample from the general public to compare the two groups’ feelings toward several practices taking place on public lands. Finally, anglers were divided into consumptive and nonconsumptive subgroups to compare the environmental attitudes of these two groups.

Three angler specialization groups were identified from the sample of respondents. Anglers in the higher specialized groups were more aware of environmental conditions and threatened and endangered species. More specialized anglers were more likely to fish for exercise and develop their skills as anglers, while lesser specialized anglers were found to fish for food. Nonconsumptive and consumptive anglers exhibited generally similar environmental orientations, as did the general public compared to anglers.
ACKNOWLEDGMENTS

This thesis would have been impossible to complete without the help of a few individuals. I would first like to thank my committee, Dr. Steven Burr (advisor), Dr. Richard Krannich, and Dr. Christopher Monz, for their help and support not only with this project, but also in class work. They volunteered many hours during busy times of the academic year to ensure this thesis was a success. I would also like to thank the Utah Division of Wildlife Resources who provided the funding and sample for this project, especially Craig Walker, aquatic habitat coordinator, and Kenny Johnson, business analyst, who provided me with the sample for this survey. These are only a few of the people who have helped make this thesis possible, and I would like to extend my sincerest “thank you” to everyone else who has helped me along this long and winding road.

Joseph W. Unger III
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CHAPTER I
INTRODUCTION AND JUSTIFICATION

The United States population has increased dramatically over the past twenty years, rising from just under 249 million in 1990, to over 307 million in 2010 (http://factfinder.census.gov, 2011a, May 10). Cordell, Betz, and Green (2008) stated that outdoor recreation use has steadily been rising since the mid-1990s. Utah has not been an exception to this, with a population rising from approximately 1.7 million in 1990, to over 2.7 million in 2010; the state’s population has grown faster than the national average (http://factfinder.census.gov, 2011b, May 10). As the population rises, so does the demand for outdoor recreation (Dwyer, 1994). Coupled with the diverse recreational opportunities of Utah, the demand for a variety of outdoor recreation has increased throughout the State.

Until recently, recreational fishing, or angling, has not been an exception to the increased demand for outdoor recreation. Between 1955 and 1996, the U.S. population increased by 62%, while the number of anglers over the same period of time increased by 138% (USDI, 1997). This is faster than the rate for hunting, which over the same time, only increased by 44%, and wildlife watching, which, between 1980-1996, decreased by 12% (USDI, 1997). However, the number of anglers began to drop in 2001 nationally, decreasing from 31.6 million anglers in that year to 30.0 million anglers in 2006 (USDI, 2008a). Despite this drop nationally, there is still a significant number of anglers in the U.S. and Cordell et al. (2008) stated one reason for this drop may be because more people are fishing on private waters where they are not required to have a license. By understanding the motivations different people have towards fishing, we can hope to
lessen this decline on public waters by providing opportunities for different anglers’
  wants and needs.

  Utah has not been an exception to this drop in anglers, with the number of anglers
declining from 517,000 in 2001, to 375,000 in 2006, a decrease of 27% (USDI, 2008b). Despite this drop, these anglers still accounted for almost four million days of fishing in Utah’s fisheries and contributed over $371 million to the State’s economy in 2006 (USDI, 2008b). Of the 2006 anglers, 288,000 (3,387,000 days fished) were residents and 87,000 were nonresidents (434,000 days fished) (USDI, 2008b). The number of anglers in Utah is more than double that of hunters, with hunting being the other popular consumptive outdoor recreational activity in the state. Because anglers outnumber hunters, natural areas need to be managed in a way to protect the fisheries from the extra demand.

  **Benefits of Fishing**

  Many out-of state-tourists come to Utah to fish as well. Ditton, Holland, and Anderson (2002) estimated that Utah had a net gain of anglers of 665 angler days. This number was derived from the number of fishing days by nonresidents compared to the number of days Utah anglers spent fishing in other states. This means that more anglers come to Utah to fish than Utah residents leaving the state to fish. Nonresidents tend to spend more money per day fishing compared to their resident counterparts, thus stimulating local economies and generating a greater amount of tax revenue for local, state, and federal governments (Ditton et al., 2002). The USDI Fish and Wildlife Service survey (2008b) reported this net gain in angler days has continued in recent years.
Utah’s Responsibilities for Fisheries Management

As in all U.S. States, the responsibility to manage fish and wildlife is that of the State. In Utah, the Division of Wildlife Resources (UDWR) under the Department of Natural Resources is charged with managing the fish and game in the State. Not only must UDWR manage the biological aspects of these fish and animals, but must also manage the social aspects associated with the wildlife, such as fishing and hunting.

In order to assist with the management of fish, UDWR conducts a state-wide survey of anglers every four to five years (Lilieholm, Krannich, & Tessema, 2006). The original survey in this series focused only on fishing pressure and success rates; however there has been a shift in recent surveys to focus on points of access, angler attitudes, and possible changes in fishery management. In 2011, UDWR commissioned Utah State University to develop and implement the next angler survey. In addition to the angler activity and catch rate survey, a second survey was developed to measure angler specialization levels, motivations, and environmental attitudes of anglers. This research draws on data from the second survey only.

Social Research on Fishing

The publics’ thoughts about and attitudes toward wildlife and fisheries management is one of the most important issues in human dimensions research (Pierce, Manfredo, & Vaske, 2001). License sales are a large part of UDWR’s budget, with hunting and fishing licenses sales accounting for over 46% of the Divisions budget (Braithwaite, 2011). Understanding what the public’s thoughts are, the agency can improve license sales, and thereby have more money to improve fishery habitat.
However, the field of human dimensions in wildlife management has only been an organized field of study since the 1970s compared to the biological aspects of management, which have been studied since the beginning of wildlife/fisheries management (Decker, Brown, & Siemer, 2001). Because of this, many research methods in the field are new and still being tested or developed, leaving researchers with questions on how to proceed with their research. However, there have been some proven methods, which will be used in this thesis.

Aspects of This Thesis

Angler Specialization

The term “angler specialization” (or “recreation specialization” as used in more general research) was first coined by Hobson Bryan (1977) in his paper titled Leisure value systems and recreational specialization: The case of trout fishermen. Bryan was investigating the different social groups of fly fishermen in Montana in order to classify anglers into different specialization groups. Since then, his research has been used numerous times to create specialization groups involving everything from bridge card players (e.g., Godbey & Scott, 1994) to high adventure/technical forms of recreation such as rock climbing (e.g., Schuster, Thompson, & Hammitt, 2001).

Environmental Concerns/Attitudes of Anglers

For many Americans, environmental issues have become less important than other issues in recent years, as voters ranked environmental issues among the lowest in a 2004 survey of voter priorities (Zaradic, Pergams, & Kareiva, 2009). However, past
research has shown a strong link between outdoor recreation and pro-environment behaviors (Larson, Whiting, & Green, 2011). This thesis examines two areas of angler environmental concern and attitudes. The first task will be to determine angler attitudes toward riparian corridors, threatened and endangered fish species, and native fish species. These attitudes will be compared with the angler specialization groups to determine if there is any difference between the groups, as well as consumption levels. The second task will be to compare results from a 2008 public lands attitudes survey of overall land use views of Utahns to those same views specific to anglers (Krannich, 2008). This will be based on the hypotheses presented by Dunlap and Heffernan (1975) regarding outdoor recreationists and their concern for the environment.

**Motivations of Anglers**

As with many forms of recreation, the reasons why people go fishing are vast. Some go fishing to enjoy nature, while others go to catch fish for food. Previous research has found that as specialization levels increase, motivations for enjoying an activity will change (Ewert, 1994; Kuentzel & McDonald, 1992; Lee, Graefe, & Li, 2007). UDWR must understand anglers’ motivations so they can provide fishing opportunities for a variety of motivational factors.

**Research Goals and Objectives**

The overarching goal of this study is to determine and better understand the motivations and environmental attitudes of Utah anglers. In order to accomplish this goal, four research objectives have been identified:

1. Determine the specialization levels of Utah anglers;
a) This objective will group anglers with like anglers to create a variable for use in comparing motivations levels and environmental attitudes.

2. Determine environmental attitudes and knowledge levels for each angler specialization group;
   a) Environmental attitudes and knowledge may change with respect to specialization group. Understanding what groups have differing environmental attitudes and knowledge will allow DWR to focus attention on the groups with limited knowledge.

3. Compare the environmental orientation of anglers with environmental orientation of the general public.
   a) Understanding the environmental orientation of anglers compared to the general public will allow the researcher to determine if anglers are more utilitarian or preservationist oriented than the general public.

4. Determine the motivational levels of Utah anglers with respect to why they go fishing;
   a) Understanding the motivational levels of each of the specialization groups will allow for better understanding as to why people go fishing in Utah, and make it more clear how managers might provide those opportunities for anglers.
Hypotheses

Four hypotheses were developed for this thesis based upon the literature review that follows in Chapter II. They are listed here and will be further discussed at the end of Chapter II.

Environmental attitudes/awareness among angler specialization groups.

1. \( H_{0a} \): There is no relationship between angler specialization and environmental attitudes/awareness.
2. \( H_{1a} \): As level of specialization increases, environmental attitudes/awareness will increase as well.

Environmental attitudes/awareness among consumptive and nonconsumptive anglers.

1. \( H_{0b} \): There is no relationship between consumption levels and environmental attitudes/awareness.
2. \( H_{1b} \): As consumption levels decrease, environmental awareness of anglers will increase.

Environmental attitudes between anglers and the general public

1. \( H_{0c} \): There is no difference between anglers and the general public with respect to environmental attitudes.
2. \( H_{1c} \): Anglers will exhibit preservationist orientation compared to the general public.

Angler specialization and motivations.

1. \( H_{0d} \): There is no relationship between angler specialization and the motivations of anglers..
2. H₁₀: As level of specialization increases, anglers will display different motivations.
CHAPTER II
LITERATURE REVIEW

Recreation Specialization

Ever since there has been a recreating public, natural resource managers have been attempting to manage wildland areas to conserve the biophysical aspects of such areas while also accommodating the needs and wants of human recreationists. Their attempts have been met with some difficulties and resistance while trying to manage for the “average” recreationist, who, as later discovered by Shafer (1969) and by Bryan (1977), really does not exist. Bryan realized that outdoor recreationists are not a homogeneous group, with participants of the same activity exhibiting a wide range of motivations, skills, attitudes, and behaviors (Needham, Sprouse, & Grimm, 2009). Because of this diversity, it is important for researchers to subdivide recreation users into different subgroups of like participants. If managers and researchers fail to recognize and address these differences, outdoor recreation participation will likely decrease, thus reducing the amount of funding and support for the activity (Finn & Loomis, 2000).

The Origins of Recreation Specialization

Recreation specialization can trace its roots to studies conducted before Bryan’s (1977) seminal research. In 1969, Elwood Shafer published a US Forest Service Technical Report titled “The Average Camper Who Does Not Exist.” Shafer obtained 1,140 surveys from five different US Forest Service campsites in northeastern New York to measure why people go to those campgrounds. He found that different reasons to go
camping are associated with different people. Shafer concluded that managers cannot make an overall assumption about campers because each camper is different.

Although Shafer’s (1969) work found that not all outdoor recreationists (particularly campers) have the same wants, needs, and motivations, he did not dive further into the issue or develop an overall thesis related to it. To better understand and develop the preferences of anglers and outdoor recreationists in general, Bryan (1977) published *Leisure Value Systems and Recreational Specialization: The Case of Trout Fishermen*. Through his study, Bryan developed a framework for recreation specialization by observing and studying trout anglers in the Intermountain West (particularly Montana). The study was developed to better understand recreation user groups, and to reduce conflict between different groups and between groups and management. Bryan (1977) has suggested people approach their leisure activities in different ways based on the level of specialization one has in the activity. For example, someone with a lot of experience in the activity will have higher values with respect to their surroundings, settings, and techniques used compared to someone who has less experience in the activity. Bryan (1979) stated as anglers progress through the levels of specialization “the fish are not so much the object as the experience of fishing is an end in itself” (p. 38).

To understand these differences in anglers, Bryan (1977) conducted 263 on-site interviews with anglers and also made numerous observations of angler techniques. The interviews were informal, but he asked participants about their beliefs, attitudes, values, and ideologies connected with fishing. Based upon the findings of these interviews and observations, Bryan was able to develop four user groups for anglers (Table 1): (1)
Occasional Fishermen: those who do not fish frequently and have not established the sport as part of their regular leisure activities; (2) Generalists: those who fish regularly, but not for a particular species or use a particular technique; (3) Technique Specialist: an angler who specializes in a certain fishing technique; and (4) Technique-Setting Specialist: an angler who specializes in a certain fishing technique under certain conditions and settings.
Bryan then developed a continuum with the occasional angler on the lower end and the technique-setting specialist on the higher end, and suggested that each angler has a unique position along the continuum and will move along the continuum as their fishing technique improves (Ditton, Loomis, & Choi, 1992).

Based on his findings, Bryan (1977) developed four conclusions with respect to angler specialization. First, anglers go through each stage of angler specialization at a particular rate. They will stay in one stage until ready to move on to the next, however some may feel “pushed” into the next stage by individuals promoting the activity (i.e., fly fishing schools). Second, the most specialized anglers have created their own leisure world. They will only interact with fellow anglers who have the same beliefs and techniques they have while fishing. Third, as specialization level increases, the attitudes and values of anglers shift. The focus of angling shifts from a consumptive activity to one that preserves the fishing environment. Finally, Bryan concludes the level of specialization is linked to environmental conditions. Anglers who are more specialized will have specialized environmental conditions to fish in and therefore are more environmentally aware of their surroundings.

**Theoretical Motivational Models**

The theory of recreation specialization is related to other theories of human needs such as Maslow’s (1954) Hierarchy of Needs (Bryan, 1979; Dawson, Buerger, & Gratzer, 1992). Maslow’s Hierarchy of Needs developed seven levels of human satisfaction, where the first level (physiological) must be met before proceeding to the second level (safety), before going through upper levels, ending at self-actualization (Huitt, 2004). Similar to Maslow’s Hierarchy of Needs, Bryan (1979) recognized his theory of angler
specialization is a process where other tasks must be completed before one can be completely satisfied with the recreation experience. This states that the angler will have motivations/needs, which must be met before proceeding to the action, followed by reward (Figure 1) (Dawson et al., 1992). The reward is both intrinsic (reward provided by the angler such as the satisfaction of catching a fish) and extrinsic (rewards provided by the group such as winning a trophy at a fishing tournament). Once through the process, the angler will begin the process over again with the motivation for the next fishing trip.

Other theories have emerged that relate specialization to motivational factors. For example, Absher and Collins (1987) used the personal investment theory developed by Maehr and Braskamp (1986). This theory contained five domains: behavior, investment, meaning, assessing and predicting meaning, and process. They found that different specialization groups will have separate motivations for fishing and that people are more motivated to fish with those who are members of their own specialization group due to the similar motives.

Since Bryan’s (1977) original work, the concept of recreation specialization has played an important role in grouping recreationists in many activities. Specialization groups have been found in bridge (Godbey & Scott, 1994), SCUBA diving (Anderson & Loomis, 2011), hikers (MacLennan & Moore, 2011), and many other types of recreation. The concept is generally used to compare recreationists in terms of within-group conflicts, environmental knowledge, motivations, and social norms within the activity(ies)
Figure 1. Reinforcement theory model of angler behavior and specialization. Adapted from Bryan (1979).
Measurement of Recreation Specialization

Unlike other widely used and validated methods used to measure attitudes (such as the New Environmental Paradigm (Dunlap & Van Liere, 1978)), research has yet to yield a definitive scale measuring the level of specialization a particular recreationist exhibits (Lee & Scott, 2006). Bryan (1977) used a multiple dimension scale, which measured specialization by observing both the attitudes (preference or setting) and behavior (length and level of involvement) of anglers. Since that time, some scholars have followed Bryan’s (1977) original measurement scale, measuring either behavior or attitudes alone, or a combination of the two as Bryan did (Tsaur & Liang, 2008), but many have also deviated from this technique.

Today’s measurements of the concept vary greatly from Bryan’s original definition (Galloway, 2010). In the early years, two methods of measuring recreation specialization dominated: the single dimension approach and the multiple dimension approach. More recently, another approach, the self-classification approach, has also been studied. Each one of these measurement methods has its own advantages and disadvantages, and the researcher must weigh these when deciding what method to use.

The single dimension approach. The single dimension approach typically uses frequency of activity to measure the level of recreation specialization (e.g., Ditton et al., 1992; Graefe, 1980; Schreyer, 1982). Graefe (1980) used the amount of experience anglers had as the single measurement of angler specialization. Graefe, who was one of the pioneers in this approach, theorized that more time an angler spends fishing, the more specialized he or she may be. He found that anglers who fished more often and (therefore were more specialized) had reported higher skill levels, participated in more diverse
fishing settings, and depended greatly upon the resource, supporting his hypothesis. By comparing the single dimension results with items typically found in multiple dimension measurement instruments, Graefe discovered that a single dimension measurement device can be effectively used.

Ditton et al. (1992) also measured the amount of time spent fishing and divided anglers into four groups, or “social worlds,” each with 25% of the sample. This method is unlike Bryan’s (1977) original method because it does not provide a relationship to equipment. This was done so that the research would avoid tautology to allow the researchers to investigate the social worlds perspective, developed by Unruh (1979), a concept similar to recreation specialization. Unruh described social worlds as “an internally recognizable constellation of actors, organizations, events and practices which have coalesced into a perceived sphere of interest and involvement for participants.” Members of the same social worlds hold similar beliefs, motivations, and attitudes based on four dimensions: orientation, experiences, relationships, and commitment.

Finn and Loomis (2000) retested the single-dimension approached used by Ditton et al. (1992). This was done by testing four hypotheses that showed more specialized anglers would place greater importance on fishing, fish at greater frequencies, have more positive opinions of management, and place more side bets than less specialized anglers. Finn and Loomis found the use of four dimensions, each with multiple variables, to be more robust than the single dimension approach.

**The multiple dimension approach.** Because of concerns that the single dimensional framework is too simplified, others have utilized multidimensional frameworks (Hutt & Bettoli, 2007), as Bryan’s original research used. After Bryan’s
work, Chipman and Helfrich (1988) were among the first to divide recreation specialization into more than two dimensions. Their research used four dimensions: the angler’s use of the resource, angling experience, financial investment in fishing equipment, and centrality of angling to the angler’s lifestyle.

The most common dimensions used to measure specialization include experience, investment, skill, centrality to lifestyle, and commitment (Manning, 2011). Other dimensions have been used in previous research; however, the five listed above have been found to be the most reliable. Researchers have combined, overlapped, and reworked different dimensions of specialization to meet the needs of their individual research (Manning, 2011).

Despite arguably being the most widely used method to measure recreation specialization, issues have been raised on the multiple-dimension method in the past. Kuentzel and McDonald (1992) highlighted three issues pertaining to the multiple-dimensional method. First, Kuentzel and McDonald stated that researchers do not agree on what measures define what dimensions (p. 271). For example, Bloch, Black, and Lichtenstein (1989) placed number of magazines ordered in the “behavioral commitment” dimension, whereas Chipman and Helfrich (1988) placed magazines in the “centrality to lifestyle” dimension. Second, Kuentzel and McDonald (1992) discussed that “results from studies that use additive indexes of multiple dimensions are mixed” (p. 272). Wellman, Roggenbuck, and Smith (1982) found little evidence relating recreation specialization and motivations of canoers; however, Kauffman and Graefe (1984) did find a strong relationship between recreation specialization and the motivations of river runners. Finally, Kuentzel and McDonald (1992) have argued that user attitudes are
influenced more by some attitudes than others. For example, Schreyer and Beaulieu (1986) found that experience in wilderness settings was a better predictor of resource preferences than that of commitment. Despite these early problems with the multiple dimensional approach, Kuentzel and McDonald (1992) felt that recreation specialization is a multiple dimensional construct and more recent research supports this (e.g., Galloway, 2010; Jett, Thapa, & Yong, 2009).

Because of the overlapping and other issues pertaining to the multiple dimensions method, Scott and Shafer (2001) conducted a meta-analysis of recent multiple-dimension research and found behavior, skill, and commitment to be the most used and most understood measurements of recreation specialization. Their scale has since been used and validated by other researchers (e.g., Nelb, 2007; Scott, Ditton, Stoll, & Eunanks, 2005). Despite earlier objections, the multiple dimension approach has been used successfully numerous times and therefore will be the measurement technique used in this thesis.

**Self-classification approach.** Because the multiple dimension approach often involves a long survey, it is not appropriate for all survey methods (i.e., onsite or over the telephone) (Vaske, 2008). Recent research in fields other than fishing has shown the self-classification method to be effective (e.g., Kerins, Scott, & Schafer, 2007; Scott et al. 2005; Sorice, Oh, & Ditton, 2009). Needham, Sprouse, and Grimm (2009) tested a single-item self-classification method to measure angler specialization. They asked anglers at Lost Lake in Oregon to rate themselves as Type I (generalist), Type II (intermediate), or Type III (specialist, veteran) anglers. They then administered a “traditional” multiple-dimension scale and discovered the results from the self-
classification approach to be similar to the results from the multiple-dimension method. Despite the results being similar, Needham et al. (2009) acknowledged that the self-classification approach is not always appropriate, and it should only be used when length constraints limit the size of a survey.

**Measurements Used in this Thesis**

Most modern researchers tend to agree that recreation specialization is a multiple variable construct and should be measured with at least behavior and attitudinal indicators (Scott et al., 2005). This research will utilize the multiple variable method using two of the three dimensions developed by Scott and Shafer (2001) (level of experience and commitment) as well as an “experiential preference” dimension. The experiential preference dimension include aspects of Scott and others’ (2005) behavior and attitudinal dimensions. Variables for each dimension are further discussed in Chapter III, “Methods and Procedures.”

**Environmental Attitudes and Awareness**

As the United States continues to grow, Americans’ use of natural resources is growing as well. This increased dependence creates concern that Americans are depleting the natural resources, and creating environmental conditions that are not able to sustain wildlife that once resided in resource development areas, or humans, who now depend on these areas. It has been widely assumed participation in outdoor recreation generally increases environmental awareness and pro-environmental behavior by exposing people to the out-of-doors, with many studies reporting a relationship between outdoor
recreation and positive environmental attitudes/behaviors (Larson et al., 2011; Zaradic et al., 2009).

The Origins of the Relationship between Anglers and Environmental Concern

The beginning of anglers’ interest in the environment can be traced back to the late 1860s (Pisani, 1984). Salmon, shad, striped bass, and halibut had all but disappeared from waters where they once flourished along the east coast. Both sport anglers and commercial fisherman reacted and started repopulating and maintaining water bodies with fish. Most of these early attempts would be considered unsuccessful today due to large numbers of fish that died during transportation, but at the time most were considered successes (Pisani, 1984).

The Dunlap-Heffernan Hypothesis and Comparing Anglers to the Population as a Whole

It would be over 100 years after these first environmental concerns were raised before researchers tested the assumption that outdoor recreation is related to environmental concern. In 1975, Dunlap and Heffernan devised three hypotheses regarding the relationship between outdoor recreation and environmental concern. These were: (1) There is a positive association between involvement in outdoor recreation and environmental concern; (2) The association is stronger between appreciative activities and environmental concern than between consumptive activities and environmental concern; and (3) There is a stronger association between outdoor recreation and concern with protecting aspects of the environment necessary for pursuing such activities than between outdoor recreation and other environmental issues such as air and water
pollution (p. 20). For the second hypothesis, Dunlap and Heffernan used Hendee’s (1969a) definitions of appreciative and consumptive. Hendee defined appreciative outdoor recreation as an activity that does not “take” from the environment (e.g., hiking, backpacking, etc.) and a consumptive activity as one that does “take” from the environment (e.g., hunting, fishing). However, as explained in Chapter I and the recreation specialization section of this thesis, not all anglers are fishing with the sole purpose to catch fish to keep. Because of this, not all anglers would be considered consumptive recreationists.

Despite the implication that the relationship between outdoor recreation and environmental concern was strongly positive, Dunlap and Heffernan (1975) did not find this to be true. Their results found weak support for the first hypothesis, that there is a relationship between outdoor recreation and environmentalism, with 60% of the results in the positive direction. Their second hypothesis, that consumptive users would have lower concerns for the environment than appreciative users, showed slightly better support. With the exception of protection for endangered wildlife, appreciative users generally showed higher support for the environment than their consumptive user counterparts (Dunlap & Heffernan, 1975). Fourteen out of 24 associations between appreciative activities and environmental concerns reached non-negligible levels while only 2 out 16 did so for consumptive activities, providing support for their second hypothesis (Dunlap & Heffernan, 1975). Their third hypothesis, that there is a stronger relationship between activities and associated concerns that are in relationship to those activities, had the strongest support. For example, anglers exhibited a strong relationship with concern for areas where they fished.
Retesting Dunlap and Heffernan’s (1975) Hypotheses

Since the time of Dunlap and Heffernan’s (1975) research, there has been much more modern research concerning the relationship between outdoor recreation and environmental concern (Bright & Porter, 2001; Thapa, 2010; Thapa & Graefe, 2003; Wolf-Watz, Sandell, & Fredman, 2011). Much of this research tests Dunlap and Heffernan’s hypotheses, but with mixed results (e.g., Geisler, Martinson, & Wilkening, 1977; Jackson, 1986; Teisl & O’Brien, 2003; Theodori, Luloff, & Willits, 1998; Van Liere & Noe, 1981). Table 2 highlights key findings from various tests of Dunlap and Heffernan’s hypotheses.

Geisler et al. (1977) were the first to retest Dunlap and Heffernan’s hypotheses, by reexamining the first and second hypotheses using zero-order correlations. Their results found considerable support for the first hypothesis and mixed results for the second hypothesis, contradicting Dunlap and Heffernan’s (1975) findings.

Van Liere and Noe (1981) tested Dunlap and Heffernan’s (1975) work as well; using the “New Environmental Paradigm” developed by Dunlap and Van Liere (1978) to test the relationship between environmental concern and outdoor recreation. Their results found most appreciative recreation endeavors to have positive relationships with environmental concern. However, despite being statistically significant, support for the Dunlap and Heffernan’s (1975) first hypothesis was weak and Van Liere and Noe (1981) failed to confirm the second hypothesis.
Table 2

*Research That Retested Dunlap and Heffernan’s (1975) Hypotheses*

<table>
<thead>
<tr>
<th>Research</th>
<th>Hypothesis(es) tested</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geisler, Martinson, &amp; Wilkening (1977)</td>
<td>1, 2</td>
<td>Support for Hypothesis 1; those who participate in more outdoor recreation have greater awareness of the environment. Mixed support for Hypothesis 2; hunters and anglers are aware of environmental issues and want to do something about them, while snowmobilers are aware of, but do not care about, the issues, questions whether consumptive activities are really consumptive.</td>
</tr>
<tr>
<td>Van Liere and Noe (1981)</td>
<td>1, 2</td>
<td>Very weak support for Hypothesis 1; No support for Hypothesis 2.</td>
</tr>
<tr>
<td>Jackson (1986)</td>
<td>1, 2</td>
<td>Support for both hypotheses, but strong support for hypothesis 1.</td>
</tr>
<tr>
<td>Theodori, Luloff, and Willits (1998)</td>
<td>2</td>
<td>All items had significant support for environmental behaviors, but found stronger support from anglers (consumptive) than picnickers (appreciative). Argued that not all “consumptive” recreationists are “consumptive.”</td>
</tr>
<tr>
<td>Teisl and O’Brien (2003)</td>
<td>1, 2</td>
<td>Strong support for Hypothesis 1; Weak support for Hypothesis 2 with hunters being involved in environmental activities.</td>
</tr>
<tr>
<td>Bright and Porter (2001)</td>
<td>2</td>
<td>Different methods of consumptive activities have different environmental attitudes.</td>
</tr>
<tr>
<td>Thapa and Graefe (2003)</td>
<td>1, 2</td>
<td>Support for first hypothesis, weak support for second hypothesis</td>
</tr>
</tbody>
</table>

Jackson (1986) studied Dunlap and Heffernan’s (1975) first two hypotheses.

Unlike Dunlap and Heffernan, however, Jackson found considerable support for the first hypothesis and weaker, but still significant, support for the second hypothesis. Jackson
(1986) concluded that research on the subject needs to be more closely examined in the future.

Theodori et al. (1998) once again tested Dunlap and Heffernan’s (1975) second hypothesis. Theodori et al. disagreed with Dunlap and Heffernan in that not all recreation Dunlap and Heffernan considered consumptive was. They argued that some anglers are in fact consumptive, while others are more appreciative, depending on their level of specialization as characterized by Bryan’s (1977) continuum. In their study of Pennsylvania outdoor recreationists, Theodori et al. found that the association between anglers and pro-environmental behaviors was stronger than the association between some appreciative behaviors (i.e., picnicking, mountain biking, and skiing). Therefore, they suggested more research should be conducted studying the different levels of recreation specialization in comparison to environmental concerns.

Teisl and O’Brien (2003) also tested Dunlap and Heffernan’s (1975) work. In their research, Teisl and O’Brien developed four equations to test the first and second of Dunlap and Heffernan’s hypotheses. They discovered that participation in outdoor recreation had a significant positive relationship with both the level of environmental concern and the level of environmental behavior, providing support for Dunlap and Heffernan’s (1975) first hypothesis. However, Teisl and O’Brien (2003) did find some activities had higher association with levels of environmental concern than did others. For example, there was a significant difference in relationships involving wildlife watching and fishing. This would support Dunlap and Heffernan’s second hypothesis. However other results in Teisl and O’Brien’s work indicated that consumption recreationists participate in environmentalism, but in different ways. They found that
hunters are more likely to donate money or belong to environmental groups than anglers, but anglers are more likely than hunters to purchase “environmentally labeled wood products” (p. 520). Therefore, these results only partially support Dunlap and Heffernan’s second hypothesis. Because of these results, Teisl and O’Brien recommend that hunting and fishing not be combined as both being consumptive activities, as these activities are significantly different.

In their study, Bright and Porter (2001) hypothesized “the direct relationship between wildlife-related recreation participation and environmental concern will be completely mediated by the meaning of the recreation to an individual” (p. 261). To do this, they sent a survey to firearm hunters, bow hunters, fly-fishing anglers, artificial lure and bait anglers, and wildlife viewers and asked for their ratings of environmental concern issues and rated their motivations for their particular activity. For fly-fishing the results supported their hypothesis, showing a relationship between commitment to fly-fishing and environmental concern. Bait fishermen’s views supported traditional research, however, that the relationship is between activities rather than within activities.

Bright and Porter (2001) identified two problems that have plagued previous research involving wildlife recreation (i.e., hunting and fishing) and environmental concern. First, they reiterate Geisler and others’ (1977) point that the distinction between appreciative and consumptive behaviors is often inappropriate. As Theodori et al. (1998) stated, this may be because certain anglers are consumptive while other, most often more specialized, anglers are more appreciative. In the survey instrument that accompanies this thesis, the participants are asked if they keep the fish they catch or are happy even if they do not catch any fish, thereby separating appreciative and consumptive anglers.
Second, Bright and Porter (2001) discovered that previous research developed a relationship between outdoor recreation and environmental concerns without considering what the activity means to the individual. Because an activity can mean something entirely different to two different people, it is impossible to categorize those two people in the same group when studying environmental concerns.

Overall, prior research has supported Dunlap and Heffernan’s first hypothesis, that there is a relationship between outdoor recreation and environmental concern/awareness. However, there has been little support for the second hypothesis, that nonconsumptive anglers have more environmental awareness/concern than consumptive anglers. Reasons for this include that not all “consumptive” users are “consumptive” (Geisler et al., 1977; Theodori et al., 1998), or consumptive anglers support the environment in other ways such a donating money (Teisl & O’Brien, 2003).

Other Research Comparing Outdoor Recreation and the General Public’s Views of the Environment

Thapa and Graefe (2003) researched the relationship between forest recreationists and environmentalism. They tested three hypotheses and separated recreationists into three categories (appreciative, consumptive, and motorized). Their first hypothesis stated that appreciative participants would have stronger pro-environmental attitudes than consumptive users. Overall, their results supported this hypothesis. The second hypothesis Thapa and Graefe (2003) investigated was identical to the second hypothesis of Dunlap and Heffernan (1975); however it grouped consumptive and motorized users separately. This hypothesis was only partially supported because, although appreciative users tend to purchase environmentally friendly products, consumptive users are more
likely to be politically active in areas that concern the environment. Thapa and Graefe’s (2003) third hypothesis stated that those who engaged in appreciative activities would “exhibit more support for local forest management emphasizing habitat preservation than participants in consumptive or motorized activities” (p. 92). They found little to no support for this hypothesis, as relationships involving each forest-specific issued varied. However this hypothesis cannot be rejected because appreciative users still tended to have the greatest amount of overall support for the environment and motorized users exhibited the least overall support.

Other Issues Affecting Anglers

Besides the public land use questions, that are used to measure anglers’ environmental views compared to the general public’s, this research also addresses three environmental issues that directly affect anglers: riparian corridors, threatened and endangered species (T & E species), and native fish species.

Riparian corridors. Riparian corridors play a crucial role in managing aquatic habitat. These areas of lush vegetation near water bodies, sometimes in otherwise desolate areas, provide water absorption, nutrients, improved water quality, shade/habitat, and food for fish (Lobb & Femmer, n.d.), all qualities that improve fish habitat. In the past, many of these crucial areas were used for their timber resources, used as routes for cattle access to water, and divert water for farming and residential use, destroying the native vegetation and threatening the fish in the waters.

Fortunately, much of this land is now being renaturalized, as land owners are now seeing benefits from riparian habitat, and homeowners are willing to pay significantly more money for areas with restored riparian corridors (Armstrong & Stedman, 2012).
Once restored, maintenance of these areas is relatively inexpensive because the new vegetation is usually native to the area (Duffy, 2010).

**Threatened, endangered, and native species.** Good water quality is dependent on the biodiversity of organisms that live in that environment. In turn, strong biodiversity can create better fishing for anglers, and benefits both humans and other animals, including fish populations. If one trophic level is disrupted, other species will then become overabundant because of lack of predators, or threatened because of lack of food (Helfman, Collette, Facey, & Bowen, 2009). This imbalance can be detrimental to both water quality and fishing success. When fish become threatened (when becoming endangered is imminent) or endangered (when becoming extinct is imminent), large amounts of time and resources are used to protect these species. However, these efforts may occasionally be met with resistance because they could involve restriction on the use of popular fishing waters. Understanding anglers’ attitudes toward the management of threatened, endangered, and native species will assist managers in better managing such species, which may create better fisheries for less money.

Ditton and Hunt (1996) conducted a survey of 4,888 Texas anglers to measure, among other things, the opinions of anglers about the management techniques used in the state, including those for T&E and native fish species. Their study found that a majority of anglers supported stocking fish that are only native to Texas, and to not be allowed to fish in areas managed to benefit the native fish populations (Ditton & Hunt, 1996).

Despite the management of threatened and endangered species to be expensive, most people tend to support conservation efforts for T&E species (Ekstrand & Loomis, 1998). In their study, Ekstrand and Loomis (1998) wanted to discover if there was a
relationship between willingness-to-pay and conservation for T&E fish species. They found that people are willing to pay $268 for protection of nine T&E species in the Four Corners Region of the American southwest, including Southeastern Utah. Although their study did not differentiate between anglers and non-anglers, it did conclude that most people support the idea of conserving T&E fish species.

**The Relationship Between Environmental Concern and Specialization**

It is widely assumed that there is a positive relationship between angler specialization level and environmental concern. This is because more specialized anglers are assumed to be more aware of the environment around them and want it to stay as natural as possible so they can enjoy their activity. Previous studies have found that more specialized anglers are more aware of negative impacts associated with fishing and fish harvesting (Salz & Loomis, 2005). Salz and Loomis (2005) found that the most specialized anglers are most likely to agree that recreational fishing can have just as much, if not more, of an impact on fisheries than commercial fishing, showing these anglers have greater concern for the environment they use. Research in other aquatic activities have found similar results. For example, SCUBA divers become more knowledgeable of the environment as their specialization level increases (Thapa, Graefe, & Meyer, 2005).

Fisher (1997) also found differences between angler specialization groups when asked a series of environment related questions. For five restrictions that would benefit the fishery (i.e., increase slot limits, decrease creel limits, etc.), Fisher found the highest
specialized group was most likely to support the management action. However, the other six groups were mixed, not supporting this hypothesis.

As suggested earlier in this section, Dunlap and Heffernan’s (1975) work carried one major flaw in that it considered all fishing to be a consumptive activity. However, as described in the “Angler Specialization” section of this thesis, not all anglers are fishing to only catch fish and therefore, not all anglers are consumptive users. Thapa and Graefe (2003) suggest that future research use specialization when measuring any aspect of outdoor recreation because each member of a user group has different specialization levels and therefore different environmental attitudes/concerns.

**Angler Motivations**

Motivation is the underlying factor for all recreation. Humans only have limited time and resources and must choose wisely what to do in their free time. In the past, it was widely thought anglers usually fished to obtain food for the family. When rural living and subsistence farming were important ways of life for many people, this thought may have been true. However, today population centers and lifestyles have shifted, and so have motivations for fishing. Although fishing for food is still one important motivator for many anglers, today it is recognized there are many other reasons why people fish. For example, Bryan (1977) found that 88% of anglers in his study fished for reasons other than catching fish for food.

**Time Constraints**

Humans only have limited amounts of leisure time and what we do with it is important to us. Because fishing is an activity which usually requires significant amounts
of free time (several hours to days), motivation becomes a more important factor, as lack of time has been cited as one major reason former anglers no longer fish (Hutt & Neal, 2010). Managers need to understand the time constraints of anglers to better manage areas that are more accessible to fishing.

**Recreation Experience Preference Scale**

In the past, natural resource managers sought to increase the motivation for fishing by stocking fisheries with desirable fish to catch, believing the stocked fish would have greater impacts on motivations than native fish (O’Neill, 2001). Although fish stocking is still a valuable method to encourage people to go fishing, today resource managers must understand and utilize other methods to increase motivation to go fishing. These other motivations for fishing are similar to many other forms of outdoor recreation because outdoor recreation enthusiasts usually have similar motivations to participate in their respective activities. Driver (1983) compiled a revised list of 234 motivators organized in 21 different dimensions, and named it the Recreation Experience Preference (REP) Scale. Due to the extensive size of this list, it is impractical to use all 234 motivators and all are seldom used. Instead, researchers typically develop a core of items that are germane to their study. For angling studies, many similar attributes are used throughout many studies (Ditton & Sutton, 2004; Hutt & Neal, 2010; Moore, 2005). This research used attributes found in angling-related research so that validity could be increased, but the length of the survey decreased.
Angling Motivations

Since the time when fishing was seen as an important source of food, the way of life for many people has shifted from rural, subsistence farming communities to urban cities where goods are imported from farmlands and then sold in massive markets. Because of this shift, values associated fishing have also changed. In the past, anglers living in urban areas would also fish in those areas because of an increased reliance on fish for food and lack of transportation to more rural areas, where fishing was in a more pristine environment. Today, urban anglers tend to go to more rural areas for fishing because those areas are more pleasant. Arlinghaus, Bork, and Fladung (2008) found that fisheries in urban areas attract only a small number of anglers, whereas the majority of people living in urban centers prefer to go outside of the city to fish. Reasons for this travel may include decreased social conflicts with others, escape from the pressures of modern living, and to simply “get away from it all” (Hendee, 1969b). Due to the wide range of reasons why people recreate, studying the motivations of all recreationists is now an important part of scientific and professional literature (Manning, 2011).

There have now been many studies to determine the motivators behind why people go fishing (e.g., Fedler & Ditton, 1994; Hutt & Neal, 2010; Moeller & Engelken, 1972). Moeller and Engelken (1972) interviewed anglers who fished at the Heiberg Memorial Forest Fishing Ponds in New York and asked them to rank what constituted a good day of fishing out of eight possible reasons. Their results showed size of fish and number of fished caught ranked fourth and sixth, respectively. The top three reasons people felt their day of fishing was a success were water quality, natural beauty, and privacy (Moeller & Engelken, 1972). The anglers wanted to leave the city to spend a day
where traffic and other noises could not be heard, showing there are many reasons to fish rather than catching fish.

Fedler and Ditton (1994) reviewed 17 angler motivation studies. They discovered there were five groups of angler motivations: (1) psychological-physiological, (2) natural environment, (3) social, (4) fisheries resource, and (5) skills and equipment. The psychological-physiological motivations, which are motivations of relaxing and getting away from daily routines, were ranked as “very important” in all 17 studies. The natural environment also ranked high in most studies as anglers felt it was important to spend time outside. Anglers also felt the need to get away from other people, but felt fishing was a good way to spend time with friends and family. The fisheries resource ranked high among salt water anglers, as these anglers enjoyed the challenge of catching “big game” fish (i.e., sharks, etc.), but was less important to smaller fisheries. Finally, developing skills and equipment was important for specialized groups such as salt water anglers and trout anglers, but ranked low for other anglers (Fedler & Ditton, 1994). This study showed the majority of anglers (those who may not be highly specialized) listed reasons other than catching fish as why they go fishing, including getting away from other people.

Even more recent research has shown similar results. Hutt and Neal (2010) discovered that a majority of participants in urban (82.9%), intermediate (suburban) (84.3%), and rural (83.9%) communities agreed at the four or five level on a five-point Likert Scale that a fishing trip could be successful even if no fish are caught. In another study conducted by Schroeder, Fulton, Nemeth, Sigurdson, and Walsh (2008),
participants identified health and appreciation as the highest rated factors as to why they go fishing.

The Relationship between Motivation and Specialization

Considerable research has been conducted to examine the relationship between recreation specialization and motivations to participate in recreational activities, making specialization a potentially useful tool in the measurement of motivation (Lee et al., 2007). Ewert (1994) discovered that motivations are dependent on the level of specialization a mountaineer has. Kuentzel and McDonald (1992) also discovered a relationship between the specialization level and motivations of whitewater boaters on the Ocoee River in Tennessee.

Despite the evidence of a relationship between specialization and motivation, it must be noted that other researchers have not found a relationship between the two. For example, Hvenegaard (2002) conducted a study of birders in a National Park in Thailand. Instead of finding a relationship between the two measurements, Hvenegaard found that approximately half of the motivation measurements were not significantly different across specialization levels.

Hypotheses

In order to address the research objectives outlined in Chapter I, the following hypotheses were tested in relationship to environmental attitudes/awareness and motivations, based on the preceding literature review.

*Environmental attitudes/awareness among angler specialization groups.*
1. \( H_{0a} \): There is no relationship between angler specialization and environmental attitudes/awareness. This null hypothesis states that as level of specialization increases, environmental attitudes/awareness will not change.

2. \( H_{1a} \): As level of specialization increases, environmental attitudes/awareness will increase as well. This hypothesis is in response to literature cited above where environmental attitudes/awareness increase as anglers become more specialized.

*Environmental attitudes/awareness among consumptive and nonconsumptive anglers.*

1. \( H_{0b} \): There is no relationship between consumption levels and environmental attitudes/awareness.

2. \( H_{1b} \): As consumption levels decrease, environmental awareness of anglers will increase. This hypothesis is in response to literature cited above, which suggests that non-consumptive anglers display higher levels of environmental concern and awareness than do more consumptive anglers.

*Environmental attitudes between anglers and the general public.*

1. \( H_{0c} \): There is no difference between anglers and the general public with respect to environmental attitudes. This null hypothesis states that whether one fishes or does not fish has no implications with respect to a person’s environmental attitudes.

2. \( H_{1c} \): Anglers will exhibit preservationist orientation compared to the general public. This hypothesis will test Dunlap and Heffernan’s (1975) hypothesis that participants in outdoor recreation will tend to have stronger pro-environment attitudes than is the case among the public at large.

*Angler specialization and motivations.*
1. $H_{0d}$: There is no relationship between angler specialization and the motivations of anglers. This null hypothesis states that as level of specialization increases, motivations to go fishing will not change.

2. $H_{1d}$: As level of specialization increases, anglers will display different motivations. This hypothesis is in response to literature cited above suggesting that motivations for participation in fishing do change as anglers become more specialized.
CHAPTER III

METHODS AND PROCEDURES

The overarching research goal of this thesis was to discover if there is a relationship between types of anglers and their views about the environment and between angler types and angler motivations. The information gleaned from this research may be used in an applied setting by UDWR to assist in managing fisheries and anglers throughout Utah.

Methodology

In order to complete this research, an internet survey was conducted utilizing the web-based survey program, “Survey Monkey.” The survey consisted of both multiple choice questions where the respondent could choose one or more answers depending on the question and a series of question matrices, which utilized a 5-point Likert-type scale (see Appendix C). The survey had four major sections: the specialization section, the motivations section, the environmental attitudes/awareness section, and a demographic section; additional questions were included to address UDWR interests and data needs. The questionnaire was pretested before implementation to test for length and content.

Email addresses were provided by UDWR of all persons who held a fishing or combination fishing/hunting license at some point during 2011, up to October 31, 2011, and for whom the data field corresponding to a provided email address was not empty. Five thousand individuals were omitted from this list of licensed anglers because of a concurrent survey being conducted during the same time period, to avoid having any potential respondents “overloaded” with survey requests. Ten thousand license holders
who provided email addresses were randomly selected to receive the survey. These individuals were sent one pre-survey email notification on November 2, 2011 (Appendix A), informing them they had been selected for the survey and highlighting the importance of the survey. A message requesting participation in the survey (Appendix B), which also included a web link to access the survey, was sent on November 7. Two reminder notifications were sent within two weeks after the initial contact, utilizing a modified Dillman (2007) multiple contact method (Appendix D). Access to the survey was closed on December 12, 2011, allowing respondents five weeks to complete the survey. Once data were collected, responses were analyzed using Statistical Package for Social Statistics (SPSS), Version 20.

**Benefits of Online Surveys**

As in mail surveys, online surveys allow respondents to self-report information pertaining to the survey in an anonymous setting (Neuman, 2011). Internet surveys are also much cheaper than other forms of survey methods. Kaplowitz, Hadlock, and Levine (2004) found that internet surveys cost approximately $1.32 per completed questionnaire compared to mail surveys which cost approximately $10.97 per completed questioner. Internet surveys also essentially allow for instant response time so the researcher can be updated with data as responses accumulate during the survey process. This allows the researcher to immediately identify and address any problems that may arise during the survey period that were not addressed during the pretesting stage. Utilizing the features of Survey Monkey, the survey was designed so that follow-up questions could automatically be skipped by respondents based upon their answers to previous questions, making navigation much easier than other survey methods (Dillman, 2007). Finally, online
surveys allow for automatic data entry, reducing human error and time when entering data for analysis.

**Disadvantages/Sources of Bias Associated with Online Surveys**

One of the major disadvantages associated with online surveys is that the method is plagued with low response rates. This can be because these surveys may be sent to a large group that may or may not be interested in the research topic (Neuman, 2011, p. 340). In this research, this issue was addressed by sending the survey to only persons who held a valid fishing or combination fishing/hunting license during the reporting period. By selecting people who currently had a valid license, the researcher anticipated that they would be more inclined to complete the survey because the issues would likely be of interest or concern to them. The online method also addressed a concern raised by Dillman (2007) that people with multiple email addresses might receive more than one invitation to the survey. The UDWR collects only one email address from license holders, thus all but eliminating this potential source of bias. In the event two people used the same email address, each would need to use a separate computer with a separate IP address so the same person could not complete the survey twice. Third, online surveys are not available to everyone due to the lack of internet access or inexperience in using the internet, especially in rural areas. Neuman (2011) estimates that by 2012, approximately 77% of American households will be connected to the internet. This represents a potential source of bias in that not every person holding a valid fishing license was eligible for the survey because they could not be contacted by email and do not have access to the internet. However, UDWR records indicate that
approximately 45% of license purchasers did provide email addresses. Finally, some may see the email message about the survey as being “junk mail” or “spam” and simply delete the email. This issue was combated by sending all emails from an official Utah State University email account (utahanglersurvey@usu.edu), and all messages were sent using an image that included official Utah State letterhead. Although online surveys contain these disadvantages, other forms of data gathering contain their own disadvantages and, if proper methods are used, the disadvantages can be mitigated.

Measurement Procedures and Statistical Processes

Determining Level of Angler Specialization

Since Bryan’s original work, three methods of determining angler specialization have been established, the single-item approach, which measures frequency of participation (e.g., Ditton et al., 1992), the self-classification approach, which asks participants to self-identify their specialization level, and the multiple dimension approach, which measures specialization across several dimensions (e.g., Needham, Vaske, Donnelly, & Manfredo, 2007). Despite the debate over which approach is better suited at measuring recreation specialization, it has generally been accepted that “specialization is a multidimensional construct consisting of behavioral, cognitive, and affective dimensions” (McFarlane, 2004). McFarlane continues by stating most research has focused on of the behavioral and cognitive dimensions, with little research focusing on the affective dimension, and reports no research found that used all three dimensions.

Questions for determining level of angler specialization were based upon the three dimensions of recreation specialization used previously: skill level, level of commitment,
and experiential preference. The questions consists of both multiple choice and five-point Likert scale questions.

**How cluster analysis was used.** Cluster analysis has been used successfully in past research (e.g., McFarlane, 1994) to develop specialization categories based on Bryan’s (1977) framework. Previous studies that have used this method have modified Bryan’s (1977) work by placing users into three user groups: beginner, intermediate, and advanced (e.g., Dyck, Schneder, Thompson, & Virden, 2003; Kersetter, Confer, & Graefe, 2001) based on the assumption that as someone becomes more advanced in an activity they become more specialized. Although this may be true for most research, some anglers may have intermediate skill levels, but be a technique specialist in that they only use one method of fishing. Therefore cluster analysis has been found to be the more appropriate measure in developing specialization groups.

Besides the continuum option described in Chapter II, cluster analysis has been used successfully in measuring specialization levels among recreationists (i.e., Needham et al., 2007; Oh & Ditton, 2006). Cluster analysis allows the researcher to “empirically segment groups of participants in an activity, introduces less researcher bias, and does not assume that individual dimensions of specialization covary” (Needham et al., 2007).

To develop the specialization groups, K-means cluster analysis was used with three clusters. Previous research has indicated that three or four cluster are appropriate with recreation specialization tests. Two-step cluster analysis was also considered, but due to the skill level variable having most influence when compared to all other variables, it was shown to be ineffective in this analysis. The nine variables used to measure specialization levels are displayed in Table 3. Items in each dimension were
standardized with a mean of 0 and standard deviation of 1 due to different scales being used.

**Measuring Utilitarian-Preservationist Orientations**

To measure the anglers’ environmental attitudes two analytic comparisons were used. The first tested the attitudes of anglers in relationship to a scale based on questions

Table 3

*Dimensions/Variables Used to Measure Level of Angler Specialization*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Level</td>
<td>1. Angler Experience Level&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Level of Commitment</td>
<td>1. Distance willing to travel for a single day of fishing&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>2. Amount of multiple-day fishing trips taken per year&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>3. Total days fished&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>4. Total money spent&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Experiential Preference</td>
<td>1. Would rather catch a few large fish opposed to many fish&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>2. Would rather catch many fish opposed to a few large fish&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>3. Prefer to see no one else fishing while fishing&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>4. Prefer to see no one else at all while fishing&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> 1 = Beginner, 2 = Intermediate, 3 = Advanced;  
<sup>b</sup> 1 = Less than 5 miles, 2 = 5-10 miles, 3 = 11-20 miles, 4 = 21-30 miles, 5 = 31-40 miles, 6 = Over 40 miles;  
<sup>c</sup> 1 = None, 2 = One, 3 = Two, 4 = Three or four, 5 = Five or more;  
<sup>d</sup> 1 = 1-2 days, 2 = 3-5 days, 3 = 6-10 days, 4 = 11-15 days, 5 = 16-20 days, 6 = 21-30 days, 7 = 31-50 days, 8 = More than 50 days;  
<sup>e</sup> 1 = No money spent, 2 = Less than $50, 3 = $50-$99, 4 = $100-$499, 5 = $500-$999, 6 = $1,000 or more;  
<sup>f</sup> 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.
focusing on public lands management priorities developed by Krannich (2008). The themes addressed (1) “mineral exploration and extraction,” (2) “timber harvest,” (3) “designation of wilderness areas,” (4) “protection of important fish or and wildlife habitat,” (5) “developing water storage and delivery systems to meet the needs of area communities,” (6) “protection of endangered species,” (7) “livestock grazing,” and (8) “designation of wild and scenic rivers.” These statements were worded exactly as they appear in Krannich’s (2008) report, with responses on a 5-point Likert scale with values ranging from “major reduction to major increase” as well as a “Don’t Know” category, which was coded as “missing.” Data from the general public statewide survey compared to data from the 2011 angler survey, with the general public data statistically weighted to adjust for disproportionate sampling across Utah’s 29 counties (Krannich, 2008).

An initial exploratory factor analysis revealed two distinct factors, one indicating utilitarian use orientation and another indicating all preservation use orientation (Table 4). However, comparing the two factors between anglers and the general public, produced inconclusive results. Therefore another approach which had been used successfully in the past with the general public data (Styczynski, 2011) was used. Responses to the questions in this serious were used to develop a sizable unidimensional scale that places respondents on a continuum from “strong utilitarian” to “strong preservationist.” This scale was used to address H1c, “Anglers will exhibit preservationist orientation compared to the general public,” with overall attitudes of anglers compared to the general public data gathered by Krannich (2008).
Table 4

*Factor Analysis for Land Use Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor(^a)</th>
<th>Factor 2: Natural Resource Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1: Protection</td>
<td>2: Natural Resource Use</td>
</tr>
<tr>
<td>Mineral extraction</td>
<td>1: Protection</td>
<td>2: Natural Resource Use</td>
</tr>
<tr>
<td>Timber harvest</td>
<td>.853</td>
<td>.841</td>
</tr>
<tr>
<td>Designation of wilderness</td>
<td>.844</td>
<td></td>
</tr>
<tr>
<td>Protection of fish</td>
<td>.840</td>
<td></td>
</tr>
<tr>
<td>Water extraction</td>
<td>.708</td>
<td></td>
</tr>
<tr>
<td>Endangered species protection</td>
<td>.871</td>
<td></td>
</tr>
<tr>
<td>Livestock grazing</td>
<td>.791</td>
<td></td>
</tr>
<tr>
<td>Designation of wild and scenic</td>
<td>.856</td>
<td></td>
</tr>
<tr>
<td>rivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>3.069</td>
<td>2.583</td>
</tr>
<tr>
<td>Percentage of variance</td>
<td>38.357</td>
<td>38.357</td>
</tr>
<tr>
<td>Cumulative percentage</td>
<td>32.292</td>
<td>70.649</td>
</tr>
</tbody>
</table>

\(^a\)Eigenvalues below .4 were suppressed for ease of interpretation; Principal Components Analysis with varimax rotation was used.

Items from this list were summed, producing a scale with variables ranging from 8 (strong utilitarian) to 40 (strong preservationist). Several items were reverse coded (timber harvest, water extraction, livestock grazing and mineral extraction) to maintain consistency in the directionality of responses. This scale exhibited strong reliability (\(\alpha = .819\)), as indicated in Table 5. The scale values were then compared across anglers and the public at large to assess potential differences between the two groups.

**Environmental Awareness Compared Across Specialization Levels**

To test H\(_{1a}\), that “as the level of angler specialization increases, the levels of environmental awareness of anglers will increase,” analysis of the variance (ANOVA) comparing specialization levels with environmental awareness was used. ANOVA is used to test for statistical significance whenever the researcher is comparing means of
Table 5

*Cronbach’s Alpha for Items Used in Utilitarian-Preservationist Scale*

<table>
<thead>
<tr>
<th>Item</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td></td>
<td></td>
<td>.819</td>
</tr>
<tr>
<td>Mineral</td>
<td>.560</td>
<td>.795</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>.593</td>
<td>.790</td>
<td></td>
</tr>
<tr>
<td>Wilderness</td>
<td>.575</td>
<td>.792</td>
<td></td>
</tr>
<tr>
<td>Fish protection</td>
<td>.591</td>
<td>.791</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>.315</td>
<td>.825</td>
<td></td>
</tr>
<tr>
<td>Endangered</td>
<td>.611</td>
<td>.787</td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td>.466</td>
<td>.808</td>
<td></td>
</tr>
<tr>
<td>Wild rivers</td>
<td>.580</td>
<td>.792</td>
<td></td>
</tr>
</tbody>
</table>

different groups (Warner, 2008). For this, the angler groups defined in the cluster analysis are compared with regard to responses from the questions related to native fish, threatened and endangered species, and riparian corridors.

Principal components analysis was used to reduce data and view relationships between the ten variables. Three factors were discovered (“Benefits to Native Fish,” “Riparian Corridors,” and “Importance of Native Fish”) as described in Table 6. These results were adequate (KMO = .840) and significant (Barlett’s Test of Sphericity $p \leq .001$).

Once items were summarized, Oneway ANOVA with Tukey’s Post-Hoc test was used to determine whether differences across the three specialization groups were statistically significant.
### Table 6

**Factor Analysis for Environmental Attitudes Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factora 1: Benefits to native fish</th>
<th>Factora 2: Riparian corridors</th>
<th>Factora 3: Importance of native fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native fish species play an important role in the ecosystem.</td>
<td>.784</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support to altering the management of a fishery to protect a population of sensitive native fish species.</td>
<td>.864</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some native fish species are much more important to protect than others.</td>
<td>.823</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DWR is doing a good job of protecting Utah's native fish species.</td>
<td>.539</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use additional license funds to support native/threaten fish species</td>
<td>.726</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DWR manages some Utah fisheries so that they would contain only native fish species.</td>
<td>.739</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support conservation or recovery of native fish species if those species had potential value as sportfish.</td>
<td>.611</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Continued*
Healthy riparian corridors are crucial to healthy fish populations in Utah.

DWR should increase efforts to restore damaged riparian corridors.

Riparian areas should be protected from uses that damage habitat and water quality.

| Eigenvalue | 4.268 | 1.461 | 1.089 |
| Percentage of variance | 42.682 | 14.608 | 10.891 |
| Cumulative percentage | 42.682 | 57.290 | 68.182 |

Although three factors were originally discovered, the scale created using the three items that loaded on the “Importance of Native Fish” dimension had a low Cronbach’s Alpha level ($\alpha = .484$), and was dropped from further analysis (Table 7).

**Environmental Awareness Compared Across Consumptive Vs. Nonconsumptive Anglers**

This research will also compare consumptive vs. non-consumptive anglers by asking if anglers generally take fish home to eat to test $H_{1b}$, that environmental concern will differ between consumptive and nonconsumptive anglers. $H_{1b}$ utilized the same factors and statistical techniques as $H_{1a}$, but compared consumption levels. This was done to address concerns raised in previous research about Dunlap and Heffernan’s (1975) Second Hypothesis.
Table 7

**Alpha Levels for Environmental Attitude Summarized Items**

<table>
<thead>
<tr>
<th>Benefits to Native Fish</th>
<th>Item total correlation</th>
<th>Alpha if item deleted</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native fish species play an important role in the ecosystem.</td>
<td>.667</td>
<td>.787</td>
<td>.831</td>
</tr>
<tr>
<td>Support to altering the management of a fishery to protect a population of sensitive native fish.</td>
<td>.738</td>
<td>.752</td>
<td></td>
</tr>
<tr>
<td>Use additional license funds to support native/threaten fish species</td>
<td>.617</td>
<td>.809</td>
<td></td>
</tr>
<tr>
<td>DWR manages some Utah fisheries so that they would contain only native fish species.</td>
<td>.632</td>
<td>.800</td>
<td></td>
</tr>
<tr>
<td>Riparian Corridors</td>
<td>.913</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy riparian corridors are crucial to the health of fish populations in Utah.</td>
<td>.817</td>
<td>.882</td>
<td></td>
</tr>
<tr>
<td>DWR should increase efforts to restore damaged riparian corridors.</td>
<td>.859</td>
<td>.845</td>
<td></td>
</tr>
<tr>
<td>Riparian areas should be protected from uses that damage habitat and water quality</td>
<td>.801</td>
<td>.896</td>
<td></td>
</tr>
<tr>
<td>Importance of Native Fish</td>
<td>.484</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Continued*
Some native fish species are much more important to protect than others.  

DWR is doing a good job of protecting Utah’s native fish species.  

Support for the conservation or recovery of a native fish species if that species had potential value as a sportfish.

| Specialization Level Compared to Motivations |

To measure the motivations of anglers and address $H_{1d}$, a set of 15 questions were developed from Driver’s (1983) Master List. Items were chosen based on how they would be related to anglers and from previous angler research, and all variables were measured on a one to five Likert Scale, where 1 = strongly disagree and 5 = strongly agree. Principal components analysis (PCA) was used to reduce the variables into factors easier to understand. The sample was adequate for principal components analysis, with a Kaiser-Meyer-Olkin score of .845 and Bartlett’s Test of Sphericity significant at $p \leq .001$. Four factors were found to have eigenvalues above one, accounting for 62.420% of the variance; results of the factor analysis are summarized in Table 8.

For each of the four factors determined by PCA, reliability was tested using Cronbach’s alpha. Scales corresponded if items that loading most reliably on two of the factors, “Self-Development” and “Fishing” produced alphas below the traditional .7
Table 8

*Factor Analysis for Motivational Dimensions*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relaxation</th>
<th>Self-Development</th>
<th>Future Benefits</th>
<th>Fishing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spend time outdoors</td>
<td>.832</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spend time with friends</td>
<td>.560</td>
<td>.490</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To relax</td>
<td>.824</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spend time in nature</td>
<td>.850</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To get away from the demands of life</td>
<td>.776</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For exercise</td>
<td></td>
<td>.623</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To develop skills</td>
<td></td>
<td>.705</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To catch any fish</td>
<td>.771</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To catch fish to eat</td>
<td></td>
<td>.627</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To catch trophy fish</td>
<td>.535</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the challenge</td>
<td>.404</td>
<td>.466</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To meet new people</td>
<td>.694</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For solitude</td>
<td>.503</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To pass on skills to future generations</td>
<td></td>
<td></td>
<td>.872</td>
<td></td>
</tr>
<tr>
<td>To teach younger generations about the environment</td>
<td></td>
<td></td>
<td>.876</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Eigenvalue</th>
<th>% of Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.975</td>
<td>24.970</td>
<td>24.970</td>
</tr>
<tr>
<td></td>
<td>1.782</td>
<td>13.456</td>
<td>38.427</td>
</tr>
<tr>
<td></td>
<td>1.437</td>
<td>13.254</td>
<td>51.680</td>
</tr>
<tr>
<td></td>
<td>1.168</td>
<td>10.739</td>
<td>62.420</td>
</tr>
</tbody>
</table>

a Principal Components Analysis with Varimax Rotation; Items that loaded below .4 were omitted for ease of understanding.
The cutoff (α = .634 and .520, respectively). Results are displayed in Table 9.

Because the fishing alpha was very low, that factor was dropped from further analysis. However, recent research has shown that alphas above .6 may be acceptable (George & Mallery, 2005), so the scale dimension from items imbedded in the “self-development” category was retained in the analysis.

Table 9

Reliability for Motivational Factors

<table>
<thead>
<tr>
<th>Item total correlation</th>
<th>Alpha if item deleted</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relaxation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To spend time outdoors</td>
<td>.737</td>
<td>.801</td>
</tr>
<tr>
<td>To spend time with friends</td>
<td>.474</td>
<td>.847</td>
</tr>
<tr>
<td>To relax</td>
<td>.750</td>
<td>.798</td>
</tr>
<tr>
<td>To enjoy nature</td>
<td>.773</td>
<td>.790</td>
</tr>
<tr>
<td>To get away from the demands of life</td>
<td>.708</td>
<td>.803</td>
</tr>
<tr>
<td>For solitude</td>
<td>.409</td>
<td>.872</td>
</tr>
<tr>
<td><strong>Self-Development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For exercise</td>
<td>.455</td>
<td>.519</td>
</tr>
<tr>
<td>To develop new skills</td>
<td>.512</td>
<td>.438</td>
</tr>
<tr>
<td>To meet new people</td>
<td>.367</td>
<td>.638</td>
</tr>
<tr>
<td><strong>Future Benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To pass on skills to future generations</td>
<td>.842</td>
<td>.</td>
</tr>
<tr>
<td>To teach younger generations about the environment</td>
<td>.842</td>
<td>.</td>
</tr>
<tr>
<td><strong>Fishing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To catch any fish</td>
<td>.445</td>
<td>.349</td>
</tr>
<tr>
<td>To catch fish to eat</td>
<td>.195</td>
<td>.583</td>
</tr>
<tr>
<td>To catch trophy fish</td>
<td>.338</td>
<td>.421</td>
</tr>
<tr>
<td>For the challenge</td>
<td>.322</td>
<td>.444</td>
</tr>
</tbody>
</table>
CHAPTER IV
RESULTS

Descriptive Results

The database contained approximately 145,000 people who purchased a Utah fishing license or Utah fishing/hunting combination license from January 1 through October 31, 2011, and provided an email address. After the removal of duplicates, persons who did not leave a valid email address, and emails from those who previously informed the researcher they were unwilling to participate, 10,000 email addresses were randomly selected from a field of approximately 140,000.

The survey was available for participants from November 7, 2011, through December 12, 2011. Each participant was sent a prenotification message on November 4, a message containing the survey link on November 7, and two reminder notices, each containing the survey link. Final response rates included 2,165 respondents and 563 undeliverable email addresses or refusals. This yielded an adjusted response rate of 22.94%. Among the 2,165 respondents, 559 (25.8%) either indicated they had not taken any fishing trips over the past two years, and skipped to the demographic questions or refused to answer enough questions to provide useable results. Compared to results from a 2005 mail back survey of Utah anglers (Lilieholm et al., 2006), this response rate is higher than its 20% response. Also, due to the ease and decreased costs of internet surveys, more participants were solicited than had been possible with the mail-back surveys used in past angler surveys conducted for UDWR, thereby increasing the overall response numbers.
Addressing the Low Response Rate

A response rate of almost 23% may seem low, and for traditional research, it is. However, when compared to other internet surveys, this response rate is typical. Schonlau, Fricker, and Elliott (2002) found that response rates for internet surveys range between 7 to 44 percent. Response rates for surveys in natural resource-based research have been decreasing since 1970 (Connelly, Brown, & Decker, 2003) and even lower response rates associated with online surveys continue to plague researchers (Couper & Miller, 2008). There are several unique reasons for low response rates with online surveys (Dillman & Bowker, 2002). First, people may not understand how to use a computer or may not have one. Second, screens have different sizes, which may result in a participant not seeing the entire survey page and may cause confusion. Finally, a link may not work for an individual. Because of these issues, a 20% response rate for an online survey is reasonable, and with the decreased cost of sending emails/internet surveys compared to traditional mail-back surveys, a higher number of potential respondents can be contacted. This allows for a greater number of cases, thus improving the validity of the survey.

Questions may also arise over the additional bias associated with internet surveys, as not everyone has access to the internet. According to the US Census Bureau (2011c), only 73.5% of Americans has access to the internet in October 2009 (the most recent year for data). However, with the increasing popularity of the internet and the decreasing cost of ownership of computers and internet access, one could expect that this number would be higher in 2011. In the data obtained from UDWR, approximately 45% of license
purchasers included an email address when purchasing a fishing license or combination license in 2011, allowing for a reasonably representative sample across all anglers.

**Respondent Demographics**

When compared to Utah anglers in general, survey respondents differed in several ways. Considerably more survey respondents (91.7%) were male than was the case among all license purchasers (77.4%). Survey respondents were also older on average (mean age 47.81 years old) compared to all license holders (39.85 years old). At the same time, the percentage of Utah residents responding to the survey (79.1% of survey respondents) were very similar to the percentage among all license purchasers. Because UDWR does not collect ethnicity or race data, that demographic could not be used when comparing results to Utah anglers. However, given there are substantial sex and age differences between survey participants and the overall population of license purchasers, there is reason for caution when generalizing the results from this survey to all Utah fishing license holders. Table 10 presents data pertaining to the demographics characteristics of survey participants, and provides a comparison with the characteristics of all licensed anglers in Utah.

**Cluster Analysis for Angler Specialization**

**Reliability**

Reliability of the scale items was used to measure angler specialization associations using Cronbach’s alpha. Because only the commitment and experiential preference dimensions contained more than one variable, reliability was only measured
Table 10

Demographic Results of Survey

<table>
<thead>
<tr>
<th>Gender</th>
<th>Race/Ethnicity</th>
<th>Residency</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>White/Anglo</td>
</tr>
<tr>
<td>Survey Respondents</td>
<td>1,620</td>
<td>146</td>
<td>1,696</td>
</tr>
<tr>
<td></td>
<td>91.70%</td>
<td>8.30%</td>
<td>96.10%</td>
</tr>
<tr>
<td>All License Purchasers</td>
<td>327,930</td>
<td>96,022</td>
<td>N/A b</td>
</tr>
<tr>
<td></td>
<td>77.40%</td>
<td>22.60%</td>
<td>N/A b</td>
</tr>
</tbody>
</table>

a Other race/ethnicity includes African American, Hispanic, Asian, Native American, Pacific Islander, and others
b UDWR does not collect ethnicity data.

...for those two dimensions. The results for the reliability Cronbach’s Alpha test are displayed below, in Table 11.

Cluster Analysis

For ease of interpretation, cluster center relationships from the three factors above were used to understand angler specialization group membership. K-means cluster analysis was used and three specialization groups were identified. The cluster centers that resulted from the cluster analysis were compared and the group with the highest overall mean score across the dimensions was considered the most specialized. The scores were then added to determine specialization level. Specialization groups included anglers who were most specialized \((n = 572)\), moderately specialized \((n = 533)\), and least specialized \((n = 501)\). The highest specialization group had the highest cluster center for two of the three dimensions (experience and commitment), while the moderately specialized group had the highest cluster center for experiential preference. Experience and commitment...
Table 11

*Reliability of Cluster Analysis Items*

<table>
<thead>
<tr>
<th></th>
<th>Item total correlation</th>
<th>Alpha if item deleted</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commitment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total days fished</td>
<td>.581</td>
<td>.767</td>
<td>.786</td>
</tr>
<tr>
<td>Total money spent</td>
<td>.339</td>
<td>.783</td>
<td></td>
</tr>
<tr>
<td>Number of multiple day trips</td>
<td>.664</td>
<td>.730</td>
<td></td>
</tr>
<tr>
<td>Distance willing to drive for single day of fishing</td>
<td>.406</td>
<td>.776</td>
<td></td>
</tr>
<tr>
<td><strong>Experiential Preference</strong></td>
<td></td>
<td></td>
<td>.764</td>
</tr>
<tr>
<td>Prefer to fish where no others are</td>
<td>.484</td>
<td>.735</td>
<td></td>
</tr>
<tr>
<td>Prefer to fish where no others are fishing</td>
<td>.488</td>
<td>.735</td>
<td></td>
</tr>
<tr>
<td>Prefer to catch many smaller fish</td>
<td>.406</td>
<td>.748</td>
<td></td>
</tr>
<tr>
<td>Prefer to catch few large fish</td>
<td>.488</td>
<td>.734</td>
<td></td>
</tr>
</tbody>
</table>

have been tested more often in prior research than experiential preference and therefore the mismatch of specialization categories with the experiential preference dimension still allowed for interpretable results. Cluster centers for each group can be found in Table 12.

**Comparison of Anglers Specialization Groups across Specialization Dimensions**

To compare differences among the three specialization levels with respect to the three dimensions of experience, commitment, and experiential preference, a one-way analysis of variance (ANOVA) was used. In addition, Tukey’s Post Hoc test was used to compare differences between each of the specialization levels within each dimension.
Table 13 describes the between group differences. Differences between the specialization level categories were found to be statistically significant for all three dimensions at the $p \leq .001$ level, as presented in Table 13.

**Experience.** The highest specialized group was also the most experienced (with a mean score of 2.67 out of 3), followed by the moderately specialized group (with a mean score of 2.35), and lastly the lowest specialized group (with a mean score of 1.86). ANOVA revealed statistical significance ($p \leq .001$) when comparing the three specialization groups with the experience dimension. Tukey’s HSD test revealed differences between all paired comparisons of the specialization groups were statistically significance when compared to the experience dimension.

**Commitment.** The comparison of the commitment dimension with the specialization groups revealed there were statistically significant ($p \leq .001$) differences across the specialization categories. The highest specialized group was the most skilled with a mean score of 4.61, followed by the moderately specialized group with a mean score of 3.60, and lastly the lowest specialized group with a mean score of 2.84. Tukey’s
Table 13

Statistical Significance Levels for Differences Across Angler Specialization Categories on the Three Dimensions Used to Measure Angler Specialization.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Mean Square</th>
<th>Df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>104.982</td>
<td>2</td>
<td>352.922</td>
<td>.001*</td>
</tr>
<tr>
<td>Commitment</td>
<td>464.125</td>
<td>2</td>
<td>1993.685</td>
<td>.001*</td>
</tr>
<tr>
<td>Experiential Preference</td>
<td>2.977</td>
<td>2</td>
<td>202.478</td>
<td>.001*</td>
</tr>
</tbody>
</table>

* Significant at the $p \leq .001$ level.

HSD test revealed there were statistically significant differences in commitment for each pairwise comparison across these groups.

**Experiential preference.** The comparison between the experiential preference dimension and the three-group specialization measure was statistically significant ($p \leq .001$). Interestingly, the moderate group had the highest mean score on this dimension (3.70). The highly specialized group was in the middle with a mean score of 3.30, followed by the lowest specialized group, with a mean score of 3.05. Tukey’s HSD test revealed no statistically significant differences for any of the pairwise comparisons of specialization groups with respect to the experiential preference dimension.

Table 14 displays the means and standard deviations of the three factors compared to specialization level across the experience, commitment, and experiential preference factors.

**Demographic data by angler specialization level.** Anglers in each of the three specialization categories were compared with respect to age, gender, ethnicity, income, and education level. Statistically significant relationships were observed between specialization level and three of the five demographic variables (age, ethnicity, income).
Table 14

Means and Standard Deviation of Dimensions Used to Measure Angler Specialization Across Specialization Groups

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Mean (SD) Mean (SD)</th>
<th>Mean (SD) Mean (SD)</th>
<th>Mean (SD) Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highly Specialized</td>
<td>Moderately Specialized</td>
<td>Least Specialized</td>
</tr>
<tr>
<td>Experience</td>
<td>2.67 (.483)</td>
<td>2.35 (.515)</td>
<td>1.86 (.510)</td>
</tr>
<tr>
<td>Commitment</td>
<td>4.61 (.457)</td>
<td>3.60 (.412)</td>
<td>2.84 (.513)</td>
</tr>
<tr>
<td>Experiential</td>
<td>3.30 (.570)</td>
<td>3.70 (.464)</td>
<td>3.05 (.532)</td>
</tr>
<tr>
<td>Preference</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Higher mean scores indicate higher level of specialization

Statistical significance was measured at the $p \leq .05$ level. Overall, highly specialized anglers tend to be older and white/Anglo, and represent the highest income levels.

Tukey’s HSD test revealed no statistical significance for income and race compared to the paired moderate and high specialization groups. Table 15 presents means, standard deviation, and statistical significance for the comparisons involving each of the demographic items.

Environmental Awareness and Attitudes of Anglers

Environmental items were used to test several hypotheses, including hypothesis $H_{1a}$, comparing specialization levels with environmental attitudes, $H_{1b}$, comparing consumption level with environmental attitudes, and $H_{1c}$, comparing environmental orientation between anglers and the general public.

Comparison of Angler Specialization Groups with Native Fish and Riparian Corridor Statements

The “Benefits to Native Fish” and “Riparian Corridors” factors were compared
Table 15

*Means, Standard Deviations, and Statistical Significance Levels for Comparisons of Angler Demographic Characteristics Across Specialization Levels*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Most Specialized</th>
<th>Moderately Specialized</th>
<th>Least Specialized</th>
<th>Mean Square</th>
<th>Df</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.03 (.883)</td>
<td>2.37 (.839)</td>
<td>2.58 (.782)</td>
<td>38.643</td>
<td>2</td>
<td>55.284</td>
<td>.000*</td>
</tr>
<tr>
<td>Gender&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.10 (.296)</td>
<td>1.08 (.276)</td>
<td>1.06 (.241)</td>
<td>.160</td>
<td>2</td>
<td>2.147</td>
<td>.117</td>
</tr>
<tr>
<td>Race/Ethnicity&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.29 (1.045)</td>
<td>1.11 (.563)</td>
<td>1.12 (.740)</td>
<td>5.455</td>
<td>2</td>
<td>8.976</td>
<td>.000*</td>
</tr>
<tr>
<td>Education&lt;sup&gt;d&lt;/sup&gt;</td>
<td>3.48 (1.016)</td>
<td>3.50 (.563)</td>
<td>3.52 (.948)</td>
<td>.286</td>
<td>2</td>
<td>.295</td>
<td>.745</td>
</tr>
<tr>
<td>Income&lt;sup&gt;e&lt;/sup&gt;</td>
<td>4.60 (1.690)</td>
<td>4.53 (1.585)</td>
<td>4.03 (1.662)</td>
<td>9.960</td>
<td>2</td>
<td>3.710</td>
<td>.025*</td>
</tr>
</tbody>
</table>

<sup>a</sup> 1 = 62 or older, 2 = 45-61, 3 = 30-44, 4 = Under 30;  
<sup>b</sup> 1 = Male, 2 = Female;  
<sup>c</sup> 1 = White, 2 = African American, 3 = Hispanic, 4 = Pacific Islander, 5 = Native American, 6 = Other;  
<sup>d</sup> 1 = Some high school, 2 = high school graduate, 3 = some college/Associates degree, 4 = college graduate, 5 = college post graduate; and  
<sup>e</sup> 1 = Under $25,000, 2 = $25,000-$39,999, 3 = $40,000-$59,999, 4 = $60,000-$74,999, 5 = $75,000-$99,999, 6 = $100,000-149,999, 7 = $150,000 or more.  

* *<sup>p</sup> < .05.

 across angler specialization groups to provide a test of Hypothesis H<sub>1a</sub>. ANOVA as well as Tukey’s Post Hoc test were used to compare the factor scores against specialization levels. Table 16 displays means, standard deviations, and statistical significance levels for these comparisons.

**Benefits to native fish.** The “benefits to native fish” factor compared to the angler specialization groups revealed that there was not statistical significant results (<sup>p</sup> = .549). Despite not being significant, the lowest specialization group had the lowest mean score, while the highest specialization group had the highest mean score. Tukey’s HSD
Table 16

Means, Standard Deviations, and Significance Levels for Two Environmental Factors vs. Specialization Group

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean a (SD)</th>
<th>Mean Square</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits to native fish</td>
<td>Low: 3.57 (.740)</td>
<td>6.534</td>
<td>2</td>
<td>.601</td>
<td>.549</td>
</tr>
<tr>
<td></td>
<td>Moderate: 3.58 ( .792)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: 3.62 ( .786)</td>
<td>8.056</td>
<td>2</td>
<td>8.056</td>
<td>.001*</td>
</tr>
<tr>
<td>Riparian Corridors</td>
<td>Low: 3.77 (.694)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate: 3.84 (.790)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: 3.96 (.792)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Measured on a 5-point Likert Scale, where 1 = Strongly Disagree, 3 = Neutral, and 5 = Strongly Agree
*p < .001

A test revealed there were no statistically significant differences in the “benefits to native fish factor” for each paired comparison across the angler specialization groups.

Riparian corridors. The “riparian corridor” factor compared to the angler specialization groups reveal there was statistical significance overall, (p ≤ .001). The low specialization group had the lowest mean score (3.77), followed by the moderately specialized group (mean = 3.84), and the highest specialized group had the highest mean score (3.96). Tukey’s Post Hoc Test revealed there was no statistical significant differences in the riparian corridors factor and the pairwise comparison between moderate and low specialization groups (p = .300).

Support for Hypothesis H_{1a}. Hypothesis H_{1a} stated that as specialization level increases, support for the environment will also increase. Since only one of the two factors used to measure this support differed in a statistically significant way across the angler specialization categories, the null hypothesis cannot be fully rejected. Two interesting findings did emerge from this comparison. First, although not statistically significant, there was a positive relationship between specialization level and the
“Benefits to Native Fish” factor. Second, all mean scores among all three specialization groups were on the positive side of the Likert Scale, suggesting that overall Utah anglers do express support for the environmental factors that were measured in this research.

Native Fish and Riparian Corridors Compared to Consumptive and Nonconsumptive Anglers

To test $H_{1b}$ (environmental awareness will differ between consumptive and nonconsumptive anglers), the native fish and riparian corridor statements were compared to the anglers’ consumptive level. Results from the two factors used above in comparing environmental attitudes with specialization levels were used to measure environmental support. Table 17 displays means, standard deviations, and significance levels for consumptive verse nonconsumptive anglers.

Comparison of consumptive and nonconsumptive anglers. Although consumptive anglers had lower mean scores on both of the environmental factors compared to their nonconsumptive counterparts, these comparison between both environmental factors and the anglers’ consumption level were not statistically significant. Because only two groups were measured, it was impossible to conduct a post hoc test.

Support for Hypothesis $H_{1b}$. Because the comparisons of the environmental factors and consumption level were not statistically significant at the $p \leq .05$ level when comparing consumptive and nonconsumptive anglers, the null hypotheses cannot be rejected. Appropriately, there is not a relationship between anglers’ level of consumption and their environmental awareness.
Table 17

Means, Standard Deviations, and Significance Levels for Environmental Factors Compared to Consumption Level

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean (SD)</th>
<th>Mean square</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits to native fish</td>
<td>Consumptive 3.56 (.801)</td>
<td>5.682</td>
<td>1</td>
<td>2.459</td>
<td>.117</td>
</tr>
<tr>
<td>Benefits to native fish</td>
<td>Nonconsumptive 3.62 (.590)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparian Corridors</td>
<td>Consumptive 3.82 (.750)</td>
<td>28.925</td>
<td>1</td>
<td>3.524</td>
<td>.061</td>
</tr>
<tr>
<td>Riparian Corridors</td>
<td>Nonconsumptive 3.90 (.766)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Anglers Compared to the Public

Anglers were compared to the public using the “utilitarian-preservationist” scale from several survey questions that were also asked in a statewide survey in 2008 (see Chapter III). Scale scores grouped into four ordinal categories, where 8-16 = “strong utilitarian,” 17-24 = “utilitarian,” 25-32 = “preservationist,” and 33-40 = “strong preservationist. Figures 2 and 3 illustrate the distributions of anglers and the general public along this continuum.

Overall, anglers and the public exhibited similar orientation, with the largest number of respondents falling into the “utilitarian” group, followed by the “preservationist” group. Not surprisingly, the two smallest groups among both anglers and the public were the two extremes, strong preservationists and strong utilitarian. The comparison of the anglers and general public in the utilitarian-preservationist orientation was not statistically significant ($p = .114$). However, it is interesting to note, that more members of the general public fell into the two extreme categories (22%), while more
Anglers

Strong Preservationist 1%
Preservationist 33%
Utilitarian 58%

Public

Strong Preservationist 6%
Preservationist 30%
Utilitarian 48%

Figure 2. Utilitarian-preservationist orientation among Utah anglers.

Figure 3. Utilitarian-preservationist orientation among the general public in Utah.

anglers had more moderate views (91%). Table 18 describes the statistical significance for comparison of anglers and the general public in this measure.

**Support for Hypothesis H₁c.** Because differences between anglers and the general public were not statistically significant, Hypothesis H₁c was not supported. Both
Table 18

*Means, Standard Deviation, and Statistical Significance Comparing Anglers and the Public on Utilitarian-Preservationist Orientation*

<table>
<thead>
<tr>
<th></th>
<th>Mean (S.D.)</th>
<th>Mean Square</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglers</td>
<td>21.98 (4.62)</td>
<td>129.811</td>
<td>1</td>
<td>2.504</td>
<td>.114</td>
</tr>
<tr>
<td>Public</td>
<td>21.64 (7.51)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Anglers and the public at large within Utah have similar views concerning natural resource use/preservation.

**Angler Motivations**

Angler motivations of the different angler specialization groups were used to test Hypothesis H1d, that motivations for fishing will differ between anglers of different specialization groups.

**Summarization and Comparison of the Motivation Factors**

The variables in each factor were summarized based on mean score. These numbers were then used to compare specialization levels to motivations. Table 19 displays descriptive information pertaining to motivation levels.

**Comparisons amongst the Factors**

**Relax.** Overall, the comparison of the relax factor and three specialization groups revealed statistical significance ($p \leq .001$). This factor also had the highest mean scores of any of the three factors, with all three specialization groups averaging above four out of five. The moderate group had the highest mean score at 4.27, followed by the high specialization group, at 4.25, and finally the low specialization group, at 4.14.
Tukey’s post hoc test revealed the relationship between the relax factor and the pairwise comparison between the high and moderate specialization groups was not statistically significant when compared to the relax factor \((p < .961)\). All other comparisons were statistically significant.

**Self-development.** When compared to the three angler specialization groups, the self-development factor was statistically significant \((p < .001)\). The highly specialized group had the highest mean score, at 3.25, followed by the moderately specialized group at 3.07, and finally the lowest specialized group, at 2.89. Tukey’s post hoc test revealed statistically significant differences at the \(p < .001\) level in the self-development factor for each pairwise comparison across the specialization groups.

**Future benefits.** When compared to the three angler specialization groups, the future benefits factor was statistically significant \((p < .001)\). The highest specialization group had the highest mean score at 3.89, followed by the moderate group at 3.80, and finally the least specialized group, with a mean score of 3.76. Tukey’s Post Hoc test revealed the relationship between future benefits faction and the pairwise comparison
between the highly specialized group and moderately specialized group was not statistically significant ($p = .253$). All other comparisons were statistically significant.

Testing of hypothesis. This section analyzes the hypothesis that as angler specialization level increased, anglers will have different motivations for fishing ($H_{1d}$). Although the comparisons between all three factors and the three specialization groups demonstrated overall statistical significance, differences between the moderate and highly specialized groups were not statistically significant for two of the three factors. Because of this, there is an increased risk of Type I error and the null hypothesis cannot be fully rejected.
CHAPTER V
DISCUSSION

The purpose of this thesis was to evaluate levels of environmental awareness, attitudes toward the uses of natural resources, and motivations of anglers in Utah across levels of specialization among those anglers and their consumption orientations. Anglers were also compared to the general public with regard to their attitudes toward the uses of natural resources. An online survey was utilized to gather data from a probability sample of resident and nonresident fishing and combination fishing/hunting license purchasers. Three distinct angler specialization groups were discovered, using K-means cluster analysis. These three groups differed significantly in three dimensions -- skill level, commitment level, and experiential preference -- used to determine group placement.

Hypothesis $H_{1a}$, that as the level of specialization increases environmental attitudes/awareness will increase as well, was not fully supported because only one comparison between the two environmental attitude factors and the angler specialization groups was statistically significant. Despite this, anglers in the highly specialized group did exhibit the highest levels of awareness and concern about the environmental issues measured by these factors.

Hypothesis $H_{1b}$, that as consumption levels decrease, environmental awareness of anglers will increase, was not supported. Neither of the two comparisons of environmental awareness levels across consumptive and nonconsumptive anglers was statistically significant. Consequently, the evidence produced by this analysis revealed there is no relationship between the measures of environmental attitudes used here and consumption levels of anglers, contrary to Dunlap and Heffernan’s (1975) second
hypothesis. Hypothesis H₁c, that anglers will exhibit a stronger preservationist orientation compared to the orientations of the general public, also was not supported, again contradicting the expectations associated with Dunlap and Heffernan’s (1975) hypothesis.

Hypothesis H₁d, that as level of specialization increases anglers will display different motivations, was neither fully rejected nor fully supported. Although differences between the three specialization groups and the three motivational factors were statistically significant overall, Tukey’s Post-Hoc test revealed there was not a significant difference between the high and moderate specialization groups when comparing the motivational factors.

The use of an online survey proved to be a valuable tool to obtain the data. Because of the low cost in developing, sending, and receiving online surveys, more potential respondents were solicited than could have been accomplished using more traditional survey administration procedures. Even though the survey response rate was relatively low, the online procedures provided the researcher with a larger number of respondents than would have been possible if other survey methods were used. As more and more people acquire access to the internet and as the cost of postage continues to rise, online surveys will undoubtedly gain in popularity among social researchers.

**Goals and Objectives of this Research**

One goal with five objectives was developed in Chapter I to successfully complete the theoretical component of this thesis. Overall, the goal to determine the motivations and environmental orientation of Utah anglers was successful – both motivations and environmental orientation were measured using survey data, and then
compared across angler specialization levels and consumption levels. A measure of environmental orientation focusing on views about the uses of natural resources was also compared across anglers and the general public.

Objective One, to determine the specialization levels of anglers in Utah was met. K-means cluster analysis provided three distinct groups of anglers; each demonstrated statistical significance when compared to the other groups. The cluster center memberships of each of the three groups were compared and the groups were labeled as low, moderate, and highly specialized. With one exception (experiential preference), the cluster center memberships ranked with the low group having the lowest cluster center and the high group having the highest cluster center. Despite the moderate group having a higher cluster center for the experiential preference dimension, the difference was not statistically significant.

Objectives Two and Three, to determine the environmental attitudes, based on the threatened and endangered species and riparian corridor statements, of anglers at each of the specialization levels and across differing consumption levels were met. Anglers as a group tend to be supportive of the environmental efforts used by DWR, and they become more supportive of these efforts as specialization level increases. However, when comparing consumptive and nonconsumptive anglers there was no statistical significant difference in these measures of environmental attitudes. Overall, anglers in Utah tend to be supportive of protection of native, threatened, and endangered fish as well as riparian corridors, with no specialization group having an average rating of below “neutral” on a 5-point Likert scale.
Objective Four, to compare the environmental attitudes of anglers with those of the general public was successfully addressed, although findings revealed that anglers and the general public have similar views. Anglers’ orientations towards land and resource uses were measured on a utilitarian-preservationist scale. When those orientations were compared to the perspectives of the general public, no statistically significant differences were found. There are several reasons for this research not supporting Dunlap and Heffernan’s (1975) first hypothesis. First, Krannich’s (2008) data, which were used to measure utilitarian-preservationist orientations among the general public, did not factor out that segment of the public that is actively engaged in outdoor recreation uses. Participants in this earlier study undoubtedly included a substantial number of the same types of sportpersons (e.g., those involved in fishing) included in the data for this research, thereby limiting the potential for differences between the respondents to the two surveys. Second, in a state such as Utah that is dependent on natural resource use for a large portion of its economy, more people may be willing to sacrifice some fishing areas to provide income for their families and economic stability for their communities.

Objective Five, to determine the motivational levels for anglers, was successfully addressed. Four dimensions were originally discovered, but after reliability testing, only three dimensions were used to compare motivational levels to specialization levels. Although overall comparisons between the motivational factors and specialization groups were statistically significant, the relationship between the motivational factors and the moderate and high groups was not significant for two of the three factors, leaving
concern for Type I error and suggesting that angler motivations among the moderate and high specialization groups is similar.

Unfortunately, the results of this survey cannot necessarily be used to generalize all Utah anglers. This is because the demographic results of this survey were significantly different than the demographics of all Utah anglers (see Table 10). Future research should use a combination of online surveys and mail back surveys to account for license purchasers who did not provide an email address. Also, a nonresponse bias check would help to generalize results.

**Similarities and Differences to Previous Research**

This research found several similarities and differences compared to previous research. First, the results of this research found no statistically significant differences between the moderate and high specialization levels for several factors. There are several possibilities as to why this occurred. First, because of the potential for bias addressed above, only more highly specialized anglers may have participated in the survey. This would make the differences for the motivations and environmental attitudes insignificant. Second, anglers may be becoming more alike and there could be a finite number of specialization groups they fall into. However, based on the literature review conducted for this thesis, this most likely is not the case nationally, but could be occurring in Utah. Future research could test different numbers of groups of specialized anglers to determine if there is a threshold where different specialization levels become similar. Second, this research found no significant difference when comparing anglers and the general public with environmental use orientation, rejecting Dunlap and Heffernan’s (1975) first
hypothesis. This is similar to some previous research, be contradictory to other research. Dunlap and Heffernan’s second hypothesis was not accepted, which makes the argument that consumptive anglers and nonconsumptive anglers are different invalid.

**Implications for Management**

The popularity of fishing continues to decrease both in Utah and nationwide. With this decrease in demand, there are associated declines in sales of fishing licenses, tackle, and other angling supplies, that generate tax revenue and make up a large portion of budgets for fisheries management agencies such as UDWR. The agencies must understand the motivations and attitudes of anglers in their jurisdictions if they are to provide optimal fishing quality for all types of anglers. In doing this, agencies may be able to enhance the fishing experience and reduce the number of anglers who choose to leave the sport.

However, this process becomes difficult because, as discovered in this research, anglers are not a homogeneous group. Rather, this research identified three different and distinct groups of anglers based on levels of specialization, each exhibiting different values, attitudes, and motivations for fishing. For example, a highly specialized angler may wish to be in a place where they are not bothered by anyone else and can catch a specific type of fish. Management for the specialized angler can become costly and time consuming because of the specific resources this person needs compared to less specialized anglers who have less-specific expectations and needs, and who are therefore easier to satisfy with regard to their angling experience. Yet, while it may be easier to manage for the less specialized angler, as found in this research, that person typically
spends less time fishing and contributes less support for management actions undertaken by UDWR. Thus, a focus on addressing the needs of less specialized anglers could create difficulties when UDWR attempts to make changes to fishery management plans.

Based on the results of this research, there are several generalizations that can potentially help managers in retaining not only anglers, but other types of outdoor recreationists. These are:

1. Anglers are members of different specialization groups and each group needs separate areas to enjoy fishing. For example, members of the least specialized group are less experienced in fishing and care more about catching fish than enjoying the natural surroundings. This group also has the lowest income level of the three specialization groups. Therefore, UDWR should maintain more developed fishing areas, stocked with many fish, in areas close to population centers, so these are accessible to the least specialized anglers. In contrast, UDWR must manage more remote areas where anglers may not see any other people and catch a few large fish to satisfy the higher specialized anglers.

2. In general, Utah anglers support measures used by UDWR to manage native fish and riparian corridors. UDWR should continue funding for research and protection of threatened and endangered fish. UDWR should also work with other agencies to maintain riparian corridors, as anglers recognize these areas are crucial for fishery management.

3. Although UDWR has little authority over land management practices, the agency should understand the utilitarian orientation or preservation
orientation of anglers. This understanding will allow UDWR to make recommendations to land management agencies that may satisfy anglers.

Large portions of the land in Utah are owned and managed by the Federal Government. Whenever changing designation of federal lands or developing management plans for these lands, the managing agency must follow elements of the National Environmental Policy Act of 1969 (NEPA). Under NEPA, the managing agency must provide time for public comment. UDWR should use results of this research to provide comment to these managing agencies so fisheries remain in the condition anglers want.

4. Anglers in the specialization groups have different motivations for fishing. In the areas developed (or left undeveloped) for each specialization group, there should be features that accommodate users’ needs and wants.

UDWR should continue its “Community Waters” program, where fisheries near population centers are managed so they are easily accessible and easy to catch fish, which appeals to the low specialization group. The agency should also continue its “Blue Ribbon Fisheries” program, where fisheries are managed to provide a more pristine fishing experience, which appeals more to the moderate and high specialization groups.

5. UDWR should also consider other management tools such as the Recreation Opportunity Spectrum (ROS) developed by the US Forest Service. The ROS provides management a continuum of settings for outdoor recreation ranging from Modern Urbanized to Primitive
(Manning, 2011). These conditions also coincide with specialization level, as lower specialized anglers would prefer more urbanized settings whereas the higher specialized anglers would prefer more primitive settings.

6. Finally, a majority of anglers fall within the high or moderate specialization groups. Both groups have similar motivations and requirements for fishing. Therefore, UDWR should focus a majority of their resources to satisfy these anglers, particularly with the “Blue Ribbon Fisheries” program.

In conclusion, managers must understand there are three groups of anglers in the state, each with different wants and needs for their specific fishing areas. However, all three groups tend to be in support for management actions involving improving fish diversity, protection of fish habitat, and protection of riparian areas.

**Future Research**

Although recreational fishing has been around since ancient Egypt, the sport has continued to evolve with the introduction of new gear and techniques. UDWR has continued to understand these new trends, and the new wants and needs, by conducting surveys similar to the one conducted for this research, approximately once every five years. By continuing to conduct these surveys in the future, DWR will continue to understand the wants and needs of their anglers, and provide the best opportunities possible to the angling public, as these wants and needs evolve over time. Despite decreasing numbers of anglers, research in the field should continue because anglers still provide large portions of budgets for fishery management agencies. This money not only
supports anglers, but also protects the biodiversity of fisheries, and creates a trickle-effect that benefits all humans with improved water quality.

**Angler Specialization**

Anglers will continue to be members of specialization groups and future research should pursue measurement strategies that will enhance the ability to effectively measure specialization and accurately assign anglers to such groups. Although this concept has continued to generate positive results when applied to a broad range of outdoor recreation research, it has continued to evolve into several different methods and many more dimensions than what was used in this research. Researchers using recreation specialization in future research must understand the different methods and dimensions used to measure specialization levels, and different dimensions may be used to generate a wider range of responses.

With regard to anglers in Utah, UDWR should determine what specific waters each specialization group prefers and then focus on managing that specific water for the respective specialization group. This will assist UDWR to focus on specific areas for each group and will be more efficient than managing fisheries for the wrong type of angler and not managing fisheries where very little fishing occurs.

**Environmental Attitudes**

The results in this thesis show anglers care greatly about the environment. Although not supported in this research, future research should continue to use Dunlap and Heffernan’s (1975) first hypothesis to determine if the public’s opinion of the environment changes over time compared to anglers’ opinions. As stated in Chapter I,
recent years outdoor recreation has been decreasing throughout the United States. If Dunlap and Heffernan’s hypothesis is true, than support for the environment should also be decreasing. This decline in environmental concerns could hinder actions taking in protecting the environment in the future. However, more research is needed to determine the classification of consumptive and nonconsumptive recreationists because of disagreement since the hypothesis was first developed. The data used in this study to assess environmental orientations among the general public may have contained anglers, which may have skewed results. Future research should divide the general public into separate groups and recreationists overall. The environmental orientations scale used in this research is also different from methods used to measure Dunlap and Heffernan’s hypotheses in the past. Past research has tested their hypotheses against environmental attitude scales and not environmental use scales. Therefore more tests should be conducted to determine if there is a difference between peoples’ environmental attitudes and their environmental use attitudes.

**Angler Motivations**

Driver’s (1983) list of motivations has been well validated since its first use. However, with 283 variables, it is impossible to use all of them in a single survey. This gives future researchers the opportunity to use other variables to determine the motivations of anglers. Other variables should be tested in the future due to the low number that achieved statistical significance in this research.
The Use of Online Surveys

The use of online surveys should also continue. By using on-line survey administration methods in this study, the researcher was able to generate more responses than previous surveys. Because a higher number of survey respondents was gathered, results from this survey may be more reliable than previous angler surveys. With the passage of time, the use of the internet and the acceptance of online surveys will continue to increase, possibly generating higher response rates on future surveys. Finally, after several email surveys that were sent in concurrent research, including this one, it was determined that a modified Dillman method with the initial contact containing the survey followed by two follow-up emails produces the best response rates for online surveys.
REFERENCES


APPENDICES
APPENDIX A:

SURVEY PRE-NOTIFICATION
November 4, 2011

Dear Sportsperson,

I am writing to ask for your help a few days from now with a study we are conducting in cooperation with the Utah Division of Wildlife Resources (DWR). Starting next week, we will be contacting you and a limited number of other randomly-selected people who had a fishing license or combination hunting/fishing license in Utah during 2011, asking for input about fishing opportunities and experiences in the state.

On November 7 we will send a second email message that asks you to complete a brief on-line questionnaire. That message will include a web address link that you can click on to easily access and complete the questionnaire. Even if you did not fish in Utah during 2011, we hope you will take a few minutes to answer several questions that apply to everyone included in our sample.

Thank you in advance for your consideration. If you have questions, feel free to contact me by telephone (435-797-1241) or email (richard.krannich@usu.edu).

Sincerely,

Richard S. Krannich, PhD
Professor and Project Director
APPENDIX B:

SURVEY COVER LETTER
Dear Sportsperson,

Utah State University, in cooperation with the Utah Division of Wildlife Resources (DWR), is gathering information that will help DWR continue its work to provide high-quality fishing opportunities and experiences throughout the state. You have been randomly selected from the list of people who have had a valid Utah fishing license or combination hunting/fishing license during 2011. We hope you will help us in this effort by completing a brief on-line questionnaire that asks about your fishing experiences in Utah, your opinions about fishing conditions and opportunities, and your views about selected fisheries management strategies.

Your participation in this survey is completely voluntary. However, your response is very important to the quality of this study. Our findings will accurately represent the experiences and views of Utah’s anglers only if we hear back from nearly everyone included in our sample of license purchasers. All information you provide will remain completely confidential, and survey results will be reported only as combined responses from all participants.

There is no anticipated risk associated with your cooperation, and you will not experience any consequences should you decide not to participate. The Institutional Review Board (IRB) at USU has reviewed and approved of this research. If you have questions related to your rights or about any consequences you might experience as a possible study participant, you may contact the IRB administrator at (435) 797-0567, or email irb@usu.edu. Also, if you have any concern or complaint about the research and you would like to contact someone other than the research team, you may contact the IRB Administrator to obtain information or to offer input.

The questions in this survey apply broadly to anyone who has any interest in Utah fishing issues, so we hope you will take the time to complete the survey even if you have not gone fishing recently. Completion of the questionnaire will normally take only about 15 minutes.
To participate in the survey, please click on the following link, which will take you directly to a dedicated questionnaire web page. Instructions provided on this web page will then guide you through the survey questions: https://www.surveymonkey.com/s/K6ZV3VH

Thank you for your interest, and your assistance in providing this information. If you have questions or comments, feel free to contact me by telephone (435-797-1241) or email (richard.krannich@usu.edu).

Sincerely,

Richard S. Krannich, PhD
Professor and Project Director
APPENDIX C:

SURVEY INSTRUMENT
Dear Sportsperson:

You have been randomly selected from the list of Utah fishing or combination hunting/fishing license-holders to participate in an important survey. Your responses will assist the Utah Division of Wildlife Resources (UDWFR) in better managing the state’s fisheries. The survey will take less than 20 minutes of your time, and all responses will remain strictly confidential.

Thank you in advance for your help!

**Have you done any fishing during the past two years?**
- [ ] Yes
- [ ] No

**Looking at the list below, please check the top three fish species that you are most interested in catching when you have a chance to go fishing.**

- [ ] Bluegill
- [ ] Brook trout
- [ ] Brown trout
- [ ] Bullhead
- [ ] Channel catfish
- [ ] Crappie
- [ ] Cutthroat trout
- [ ] Kokanee salmon
- [ ] Lake trout
- [ ] Largemouth bass
- [ ] Rainbow trout
- [ ] Smallmouth bass
- [ ] Spatke
- [ ] Striped bass
- [ ] Tiger muskellunge
- [ ] Walleye
- [ ] White bass
- [ ] Whitefish
- [ ] Wiper
- [ ] Yellow perch

**Are you a member of any of any fishing-related organizations (for example, Trout Unlimited, FLW, BASS, etc.)?**
- [ ] Yes
- [ ] No

**How would you rate your level of fishing experience as an angler?**
- [ ] Beginner
- [ ] Intermediate
- [ ] Advanced
Please indicate how often you typically fish in the following types of water bodies.

<table>
<thead>
<tr>
<th>Water Body Description</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large lakes or reservoirs (for example, Strawberry, Jordanelle, Steinaker, and Flaming Gorge reservoirs)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Smaller lakes or reservoirs (for example, Cedar, Brough, Huntington, and Paragonah reservoirs)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Large rivers (more than 30 feet in width; for example Weber, Green, Lower Provo, Bear, and Colorado rivers)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Moderately-sized streams (15 to 30 feet in width; for example Logan, Middle Provo, and Sevier rivers, Currant Creek, Huntington Creek)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Small streams (less than 15 feet in width; for example Right Fork Huntington, Birch, Big Cottonwood, Corn, and Sheep creeks)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Please indicate the extent to which you agree or disagree with each of the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can consider my trip satisfying even if I do not catch any fish.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I am only willing to fish on certain bodies of water that provide the kinds of fishing experience I prefer.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>When I catch fish, I usually keep them for food.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I would rather catch a few large fish than a lot of fish.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>I would rather catch a lot of fish than a few large fish.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>I prefer to fish where there is no one else fishing.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I prefer to fish where there is no one else at all (regardless of whether or not they are fishing).</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I prefer to fish in places where I have an opportunity to catch a variety of fish species.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

To what extent do you support or oppose more widespread use of special fishing regulations on Utah waters (for example, slot limits, reduced harvests, or bait restrictions)?

- ☐ Strongly support
- ☐ Somewhat support
- ☐ Neutral
- ☐ Somewhat oppose
- ☐ Strongly oppose
Utah’s “Community Waters” are fisheries that are readily accessible to local-area residents by biking, walking, or taking a bus to fish. Examples include Mayor's Pond in Brigham City, Willow Pond in Murray, Gigliotti Pond in Helper, and Leigh Hill Reservoir in Cedar City. Have you fished these or any other locations designated as “Community Waters” in Utah over the past twelve months?

- Yes
- No
- Don't Know

Please list the names of up to TWO Community Waters that you have fished most often over the past twelve months:

Name of first Community Water area:

Name of second Community Water area:

Utah's “Blue Ribbon” fisheries are typically waters that provide high-quality, highly-satisfying fishing and outdoor experiences for diverse groups of anglers. Examples of “Blue Ribbon” fisheries in Utah include Bear Lake, the Middle Provo River, Lake Powell, Panguitch Lake, Scofield Reservoir, and Pelican Lake. Have you fished in any of Utah’s Blue Ribbon waters in the past twelve months?

- Yes
- No
- Don't Know

Please list the names of up to TWO “Blue Ribbon” fisheries that you have fished most often over the past twelve months:

Name of first “Blue Ribbon” fishery:

Name of second “Blue Ribbon” fishery:

In a typical year, about what percentage of your time do you spend fishing with a paid outfitter or guide, while fishing in Utah?

- I do not use an outfitter/guide for any fishing in Utah.
- Less than 10% of the time
- 10-25% of the time
- 26-50% of the time
- 51-75% of the time
- 76-100% of the time
Below is a list of common reasons people to go fishing. For each item in the list, please check the appropriate box that best indicates how important or unimportant each of these specific reasons is in your decision to fish.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Very Unimportant</th>
<th>Unimportant</th>
<th>Neutral</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be outdoors</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>To spend time with family/friends</td>
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<tr>
<td>For relaxation</td>
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<tr>
<td>To be close to nature</td>
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<tr>
<td>To get away from the demands of everyday life</td>
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<tr>
<td>For physical exercise</td>
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</tr>
<tr>
<td>To develop my skills as a fisherman</td>
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<tr>
<td>To catch any fish</td>
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<tr>
<td>To catch fish to eat</td>
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<tr>
<td>To catch large, &quot;trophy&quot; fish</td>
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<tr>
<td>To experience the challenge of catching and landing fish</td>
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<tr>
<td>To meet new people with similar interests</td>
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<tr>
<td>To experience solitude</td>
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<tr>
<td>To pass my angling skills on to younger generations</td>
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</tr>
<tr>
<td>To teach younger generations an appreciation for the outdoor environment</td>
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</tbody>
</table>

To the best of your recollection, about how much money have you spent on each of the following types of fishing-related equipment or activities over the past twelve months?

<table>
<thead>
<tr>
<th>Category</th>
<th>No money spent</th>
<th>Less than $50</th>
<th>$50 to $99</th>
<th>$100 to $499</th>
<th>$500 to $999</th>
<th>$1,000 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing licenses (total for all states)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fishing information (magazines, DVDs, etc.)</td>
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</tr>
<tr>
<td>Fishing gear (rods, reels, tackle, line, etc.)</td>
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<tr>
<td>Other related gear (waders, rain gear, etc.)</td>
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</tr>
<tr>
<td>Purchase of boats or other floating devices for fishing use</td>
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</tr>
<tr>
<td>Boat-related expenses (fuel, maintenance, accessories, registration, insurance, etc.)</td>
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<tr>
<td>Travel expenses for fishing trips (airfare, fuel, lodging, etc.)</td>
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<td></td>
</tr>
<tr>
<td>Outfitter and guide services</td>
<td></td>
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</tbody>
</table>
Since 2008 the Utah Division of Wildlife Resources (DWR) has worked with other state, federal, and local management agencies to implement an aquatic invasive species (AIS) control program. Prior to now, have you heard anything about Utah’s AIS control program?

☐ Yes
☐ No

To the best of your knowledge, which of the following is an approved method for decontaminating your boat after each use to help avoid the possible spread of aquatic invasive species (AIS) from one body of water to others? (Please check ALL that you consider to be an approved method for boat decontamination).

☐ Let your boat dry in the sun for five days after fishing in any AIS contaminated waters, prior to boating in any other area

☐ Have your boat professionally decontaminated with a high-pressure washer that delivers scalding (140 degree F) water immediately following boating in any AIS contaminated waters

☐ Rinse your boat with a high concentration (80 parts per million) salt water solution for at least 12 hours after boating in any AIS contaminated waters

☐ Dry your boat for at least 18 days in the spring or fall, at least 7 days in the summer, and at least 30 days in the winter after boating in any AIS contaminated waters

As Utah’s population has grown, suitable habitat for native species has declined. As a result, many native species are now listed as “state sensitive,” and in danger of becoming listed as threatened or endangered (T & E) under the Federal Endangered Species Act (ESA). The Utah Division of Wildlife Resources is charged with managing all wildlife species in Utah, including sensitive and T & E species. Please indicate your level of agreement or disagreement with each of the following statements regarding sensitive and T & E species and their management.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native fish species play an important role in the ecosystem.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I would support altering the management of a fishery if doing so would</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>help protect a population of sensitive native fish species.</td>
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</tr>
<tr>
<td>Some native fish species are much more important to protect than others.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>DWR is doing a good job of protecting Utah’s native fish species.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I would support increased use of funds from fishing license sales to</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>reduce the possibility of a sensitive fish species becoming listed as</td>
<td></td>
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</tr>
<tr>
<td>threatened or endangered under ESA.</td>
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</tr>
<tr>
<td>I would support efforts by DWR to manage some Utah fisheries so that</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>they would contain only native fish species.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I would support the conservation or recovery of a native fish species if</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>that species had potential value as a sportfish.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To the best of your knowledge, which of the following are native fish species in Utah? (please check each that you believe is a native species)

- Rainbow trout
- Lake trout
- Channel catfish
- Colorado pike
- Walleye
- Mountain whitefish
- Bonneville cutthroat trout

Riparian corridors are areas along rivers, streams, or lakes with unique plant and animal species compared to the species found in surrounding upland areas. Below is a list of statements concerning riparian corridors. Please rate your level of agreement or disagreement with each of these statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy riparian corridors are crucial to the health of fish populations in Utah.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DWR should increase efforts to restore damaged riparian corridors.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparian areas should be protected from uses that damage habitat and water quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the following, please choose the ONE type of location you MOST prefer as a place to fish in Utah.

- Large lakes or reservoirs (for example, Strawberry, Jordanelle, Steinaker, and Flaming Gorge reservoirs)
- Smaller lakes or reservoirs (for example, Cadair, Brough, Huntington, and Paragonah reservoirs)
- Large rivers (more than 30 feet in width); for example Weber, Green, Lower Provo, Bear, and Colorado rivers)
- Moderately-sized streams (15 to 30 feet in width); for example Logan, Middle Provo, and Sevier rivers, Currant Creek, Huntington Creek)
- Small streams (less than 15 feet in width); for example Right Fork Huntington, Birch, Big Cottonwood, Corn, and Sheep creeks)

For your preferred fishing locations in Utah, how would you rate the overall availability of fishing access?

- Availability of accessible fishing is excellent
- Availability of accessible fishing is good
- Availability of accessible fishing is satisfactory
- Availability of accessible fishing is poor
- Availability of accessible fishing is terrible
For your preferred fishing locations in Utah, to what extent is your access limited due to private property restrictions?

- Highly limited
- Moderately limited
- Slightly limited
- Not at all limited

How far are you willing to drive for a single-day fishing trip?

- Less than 5 miles
- 5 to 10 miles
- 11-20 miles
- 21-30 miles
- 31-40 miles
- Over 40 miles

In a typical year, about how many multiple-day fishing trips that involves being away from home for at least one night?

- None
- One
- Two
- Three or four
- Five or more

How far are you willing to drive for a multiple-day fishing trip lasting at least one night?

- Less than 20 miles
- 21-50 miles
- 51-100 miles
- 101-250 miles
- Over 250 miles
To what extent does each of the following represent an obstacle or restriction that makes it difficult for you to travel to your favorite fishing area as often as you wish to go there?

<table>
<thead>
<tr>
<th>Difficulty in scheduling time to be away from work</th>
<th>No effect on my ability to fish</th>
<th>Slight effect on my ability to fish</th>
<th>Moderate effect on my ability to fish</th>
<th>Major effect on my ability to fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distant location of the area, and the amount of time needed to get there</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>The costs of traveling to the area (fuel or other transportation costs)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Other demands on your schedule not involving your employment</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Interest in and time spent pursuing other recreational activities</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

Besides fishing, which of the following outdoor recreational activities have you participated in during the past twelve months? (Please check all that apply)

- 4-wheel driving/jeeping
- ATV riding or offroad motorcycling
- Backpacking (multiple days)
- Big game hunting (elk, bear, mule deer, etc.)
- Camping
- Cross-country skiing or snowshoeing
- Downhill skiing or snowboarding
- Flat water rafting/canoeing
- Hiking (single day)
- Horseback riding
- Motor boating
- Mountain biking
- Rock climbing
- Small game hunting (upland bird, waterfowl, rabbit, etc.)
- Snowmobiling
- Whitewater rafting/canoeing
- Wildlife viewing
About two-thirds of the land area in Utah is “public” land. Most of the state’s public lands are managed by federal agencies such as the U.S. Forest Service, the National Park Service, and the Bureau of Land Management. To what extent do you think those responsible for managing these areas and resources should reduce or increase the extent to which each of the following activities occurs on public lands in Utah?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Major Reduction</th>
<th>Moderate Reduction</th>
<th>Stay About the Same</th>
<th>Moderate Increase</th>
<th>Major Increase</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral exploration and extraction</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Timber harvest</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Designation of wilderness areas</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Protection of important fish and/or wildlife habitat</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Developing water storage and delivery systems to meet the needs of area communities</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Protection of endangered species</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Livestock grazing</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Designation of wild and scenic rivers</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Finally, to enable us to compare the responses of Utah anglers with similar or different characteristics, we need to ask you to provide some information about yourself and your household. Please check the appropriate answer or fill in the requested information. As with all of the questions in this survey, your response is completely voluntary, and any information you provide will remain completely confidential.

**What is the five digit ZIP code where your mail is delivered?**

---

**What year were you born?**

---

**What is you gender? (check one)**

- [ ] Male
- [ ] Female
<table>
<thead>
<tr>
<th>Which of the following best describes your race/ethnicity (please check all that apply)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ White/Caucasian/Anglo</td>
</tr>
<tr>
<td>☐ African American</td>
</tr>
<tr>
<td>☐ Hispanic/Latino/Latina</td>
</tr>
<tr>
<td>☐ Asian</td>
</tr>
<tr>
<td>☐ Pacific Islander</td>
</tr>
<tr>
<td>☐ Native American</td>
</tr>
<tr>
<td>☐ Other racial/ethnic group</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is the highest level of education you have completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Some high school</td>
</tr>
<tr>
<td>☐ High school graduate/GED</td>
</tr>
<tr>
<td>☐ Some college or associate’s degree</td>
</tr>
<tr>
<td>☐ College graduate (Bachelor’s degree)</td>
</tr>
<tr>
<td>☐ Post graduate degree (Master’s/PhD)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Which of the following best represents your annual pre-tax household income for the current year?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Under $25,000</td>
</tr>
<tr>
<td>☐ $25,000-$39,999</td>
</tr>
<tr>
<td>☐ $40,000-$54,999</td>
</tr>
<tr>
<td>☐ $50,000-$64,999</td>
</tr>
<tr>
<td>☐ $75,000-$99,999</td>
</tr>
<tr>
<td>☐ $100,000-$149,999</td>
</tr>
<tr>
<td>☐ $150,000 or more</td>
</tr>
</tbody>
</table>

**YOU HAVE FINISHED THE SURVEY -- THANK YOU FOR YOUR ASSISTANCE!**
APPENDIX D:

SURVEY REMINDER EMAIL
Dear Sportsperson,

Last week we sent you a message requesting your assistance in completing a brief on-line questionnaire focusing on your fishing experiences and preferences. If you have already completed the questionnaire, THANK YOU! If you have not yet found the time to complete the survey, we hope you will do so soon. To access the questionnaire, just click on the following link, or cut and paste it into your web browser: https://www.surveymonkey.com/s/TLFC6RF

Utah State University is conducting this study in cooperation with the Utah Division of Wildlife Resources, with a goal of gathering information that will help DWR continue its work to provide high-quality fishing opportunities and experiences throughout the state. You were randomly selected from the list of people who had a Utah fishing license or combination hunting/fishing license at some point during 2011. Even if you did not fish in Utah over the past year, we hope you will take a few minutes to answer several questions that apply to everyone in our sample, including those who do not regularly fish.

Thank you in advance for your consideration. If you have questions, feel free to contact me by telephone (435-797-1241) or email (richard.krannich@usu.edu).

Sincerely,

Richard S. Krannich, PhD

Professor and Project Director