PLACE ATTACHMENT AS AN INTERGRATING CONCEPT: SOCIAL SCIENCE CONSIDERATIONS IN WATERSHED MANAGEMENT

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
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To my loving parents.

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There are many different ways to know, value, and perceive the natural world. A better understanding of these factors within specific contexts has the ability to inform natural resource education and management decisions. It can also shine a light onto some of the key factors that motivate people to engage in conservation behaviors. Studies have shown that educational campaigns alone are not wholly effective in fostering conservation behaviors. But for the sake of the human race and global ecological health, we must actively seek to realign our individual behaviors in a way that brings added harmony to the human-environment relationship. Thus, there is a direct need to better understand how to foster within people a desire or willingness to actively engage in protecting the Earth and conserving its natural resources.

Our study explores human-place relationships, a concept within the social sciences that attempts to define and measure emotional attachments to physical places, within a specific geographic context – the Lake Alice watershed at the University of Florida. A survey of 376 university students, faculty, and staff was conducted and showed a moderate, positive relationship between place attachment to Lake Alice and willingness to engage in "place-protective behaviors" (Pearson's correlation = .458). Place attachment was measured using a scale that conceptualizes place attachment into two dimensions – place identity and place

dependence. Place identity was found to be more strongly correlated than place dependence with place-protective behaviors. The frequency of visits to Lake Alice was moderately correlated with place attachment (Gamma = .421).

It was also found that respondents exhibited a poor knowledge of surface waters on campus, but a relatively high knowledge of general water issues, such as sources of pollution and wetland benefits. Knowledge of general water issues was positively, but weakly correlated with place-protective behaviors (Pearson's correlation = .121), while the relationship between knowledge of UF campus waters and place-protective behaviors was not significant. The survey also revealed that a majority of survey respondents think that the water on campus is polluted, and that not enough had been done on the part of UF to prevent pollution or to educate the community about water quality issues. Faculty members were found to be the least attached to Lake Alice and were also the least likely to report engaging in place-protective behaviors. Two-thirds of respondents did not know behaviors that can prevent or reduce pollution to watersheds.

The value of research into place attachment lies in its ability to provide insight into the different meanings that stakeholders ascribe to natural environments. Understanding resident's attachment and preferences to elements of their respective watershed can help managers determine priorities for conservation plans and education efforts, as well as, provide insight into behavior change strategies.

CHAPTER 1
INTRODUCTION

Relationships that people form with the natural world can be complex and difficult to characterize. In the last few decades, there has been increased efforts among social scientists, environmental educators, and natural resource managers to understand how these relationships form, how they influence personal values and attitudes, and what behavioral implications they many have. This research is especially relevant in a world where the day to day actions of humans are having ever increasing deleterious effects on small and large scale ecological processes. There is a pressing need to reverse this trend through sound scientific investigation, effective nature programs that reintroduce people to the natural world, and education about living a sustainable life. Better insight into people-place relationships has the potential to enhance our ability to effectively meet these goals.

Along with an increasing loss of natural areas and personal comforts that keep people indoors, there seem to be fewer opportunities for people to have meaningful experiences within natural settings. This unfortunate phenomenon begs the question of how to get someone to value the natural world and act to protect it when the opportunities to experience it are becoming fewer and fewer. Research has shown that information campaigns alone are not enough to foster conservation behaviors, so new avenues must be explored (Hines et al., 1987).

One way to get people to engage in conservation behaviors is through regulations that force people to engage in them at the risk of some punishment, i.e. monetary fine. Another method that has spread to environmental issues from the human health field is community-based social marketing, which, in short, attempts to remove barriers that people may have to engaging in conservation behaviors through various “tools”, such as incentivizing the behavior, making it a social norm, and providing the infrastructure needed to engage in the behavior. Neither of

these methods directly seeks to motivate behavior change through an heightened awareness of or attachment to the natural world itself, which is why there is a need to further explore how people form bonds with the natural world, what can be done to foster these bonds, and what types of bonds instill in people a desire to engage in conservation behaviors.

To characterize people-place relationships within a watershed context, a survey was administered to students, faculty, and staff at the University of Florida to assess their knowledge, attitudes, conservation behaviors, attachment to, and recreational use of surface waters on campus. There are three watersheds on the 1,827 acre University of Florida main campus – the largest being the Lake Alice watershed which covers 60% of the campus land area. The Lake Alice conservation area is also habitat for alligators, wading birds, invertebrates, fish, and aquatic and terrestrial vegetation.

This thesis is divided into two major sections. The first section is a correlational study between attachment to a place and the influence that it has on a person's likelihood to engage in behaviors to protect that place from harm. Place attachment, a theory that has gained in popularity over the last few decades, refers to the meaning and importance of a setting held by an individual or group, based on experiences with that setting. Research has shown that the formation of place attachment can be influenced by sociodemographics (Johnson, 1998), frequency of visitation or recreational involvement (Kyle et, al., 2003; Moore & Graefe, 1994), and landscape type (Kaltenborn & Bjerke, 2002). Place attachment to Lake Alice on the University of Florida campus was measured using eight items from a scale developed by Williams and Roggenbuck (1989) and correlated with five items designed to measure a respondent's likelihood to engage in behaviors to protect Lake Alice from pollution.

The second section of this thesis looks at trends in the survey results to make campus surface water education and management recommendations. Some of the questions were designed to measure respondents' knowledge of surface waters and, in particular, Lake Alice. Knowledge of UF water issues and general water issues were individually correlated with place-protective behaviors. Other questions were designed to measure attitudes toward surface water quality on campus and the frequency of water conservation behaviors. This section of thesis serves as a general introduction into some of the social considerations that can be used to inform future campus watershed management decisions and educational programs.

The overarching goal of this thesis is to further explore human-place relationships within a specific geographic context – the Lake Alice watershed at the University of Florida. The data obtained from the survey are multifaceted. They are general enough to make assumptions about the complex nature of human behavior, but specific enough to provide a foundation from which to make suggestions for the Lake Alice watershed.

CHAPTER 2
ANALYSIS OF PLACE ATTACHMENT AND PLACE-PROTECTIVE BEHAVIORS

Introduction

In the United States, the number of people living on farms has dropped precipitously over the last century. In 1900, 40% of all households were located on a farm, but as of 1990 the number had declined to a mere 1.9 percent (Louv, 2005). According to conservationist and writer Aldo Leopold, in his classic 1949 novel A Sand County Almanac, this decline in farm-owning Americans implies that an ever-increasing percentage of the current population might be in "spiritual danger." Leopold warns:

> There are two spiritual dangers in not owning a farm. One is the danger of supposing that breakfast comes from the grocer, and the other that heat comes from the furnace. To avoid the first danger, one should plant a garden, preferably where there is no grocer to confuse the issue. To avoid the second, he should lay a split of good oak on the andirons, preferably where there is no furnace, and let it warm his shins while a February blizzard tosses the trees outside.

Leopold's astute observation over half a century ago seemed to foreshadow a current societal phenomenon that is growing each year – the disconnect between humans and the natural world. Increasing development, growing population densities in urban areas, the integration of small, family owned farms into large corporations, the insecurity of farming, the expense of owning land, and numerous other factors have served to distance recent generations from the natural world and a working understanding of the land. Fewer Americans seem to understand or value the role that the natural environment plays in providing educational, spiritual, emotional, health, and psychological benefits. Richard Louv, in his book Last Child in the Woods: Saving Our Children from Nature Deficit Disorder, posits that some of the problems that children face today, such as obesity, ADHD, and a general lack of curiosity, stem from a lack of exposure to the natural world. To combat "nature-deficit disorder," humans must be "reconnected" with the

natural world through effective and engaging educational campaigns and increased experiences in natural settings.

Researchers within the social sciences, geography, urban and regional planning, environmental psychology, and anthropology characterize the interactions and connections between people and their environment. The use of place theory concepts to examine these interactions is growing in importance. Researchers in different academic disciplines use different phrases, such as "place attachment," "sense of place" (Brandenburg and Carroll, 1995), "rootedness" (Tuan, 1980), or "insideness" (Relph, 1976) to describe aspects of place theory, but all of the phrases imply an interest in characterizing how people perceive, experience, and value the environment.

The term "place attachment" describes people-place relationships. Place attachment arises when settings (e.g., local parks and natural areas) are instilled with personal meanings and importance, based on an individual's or group's experience with the place (Stedman, 2003). According to Tuan (1977), space becomes place when it is experienced: space is nebulous and abstract, then place is defined and imbued with meaning by virtue of experience. Place theory emphasizes that places are more than geographic locations; they are dynamic contexts of human experience, social relationships, emotions, and thoughts (Brandenburg & Carroll, 1995).

Positivistic and phenomenological approaches to place theory have left its research agenda divided (Stedman, 2002). Some influential place theorists, including Relph and Tuan, align themselves with a phenomenological approach, which emphasizes holistic place concepts and avoids hypothesis testing. According to this approach, the attempt to determine cause and affect relationships between place concepts has the potential to destroy the essence of the overall concept. In contrast, positivistic place theory research focuses on quantitative methods and

traditional hypothesis testing. Although studies with a positivistic lean have proliferated over the last decade, they have often neglected important theoretical tenets, such as the effect of place attachment variables on behavior and the importance of physical characteristics in developing place attachment (Stedman, 2002).

In the past, place attachment was seen as an end in itself, and little attention was paid to its possible applications to natural resource management. Recently, several authors have noted a shift away from traditional resource management policies that value natural resources in terms of the commodities offered by them, such as timber or recreational activities, and toward a more comprehensive perspective that includes a greater emphasis on determining the ways in which humans relate and connect to specific places or landscapes (Williams & Stewart, 1998; Williams & Vaske, 2003; Kyle et. al. 2004). By assuming a place-based perspective in managing natural resources, one recognizes that human connections with natural resources and the landscapes in which they occur are complex and rife with personal and collective meanings (Cheng et al., 2003). A better understanding of these complex interactions may help place natural resource management decisions and education efforts into a more appropriate social and biophysical context.

Theoretical Background

"Sense of place" and "place attachment" are the common phrases used to characterize the connections that people have with the environments they encounter. Both of them refer to the meaning and importance of a setting held by an individual or group, based on experiences within that setting. According to Relph (1976), places are:

> fusions of human and natural order…significant center of experience…the focusing of experiences and intentions onto particular settings. They are based on directly experienced phenomena of the lived world, full of meanings, with real objects, ongoing activities…and become important sources of individual and communal identity, often profound centers of human existence with deep emotional and psychological ties.

The study of sense of place and place attachment is an evolving field of research, and like any initial phase in theoretical development there seem to be more questions than answers. For example, the major factors that lead to strong place attachments are contested among researchers and there is no general consensus on how it should be theorized or measured (Davenport, 2005).

To help characterize place theory, Stedman (2003) culled six important themes from the somewhat muddy and diverse literature. The first theme describes place in opposition to space. Space is not usually culturally defined and is described using distances and directions such that anyone could recognize it. On the other hand, place is the intersection of humans and space, where meaning and values are attributed to physical places (Tuan, 1977). The second major theme is that personal experiences shape place out of space. Research has shown that the formation of place attachment is influenced by not only the types of experiences that people have at a place, but also by the frequency with which a person visits a place (Kyle et, al., 2003; Moore & Graefe, 1994). According to Stedman (2003), "Sooner or later, we pull our eyes away from the horizon and turn them to the dirt under our feet…we look at the dot on the map and find ourselves wondering what the place looks like and what kind of people live there". The transition from space to place involves the foreign becoming the familiar.

The third common theme in the literature is the importance of meanings, or the interplay between emotions and cognition. The literature suggests that humans attribute meanings to landscapes and places and then become attached to these meanings. Some suggest that for a given setting there will be as many different meanings attributed to it as people that use the setting (Relph, 1976, Stedman, 2003). For example, to five different people a river can take on multiple meanings: it may represent an area to canoe or kayak, a place to fish, a place where important ecological processes take place, a place to dump some type of effluent, or a drinking or

agricultural water source. The myriad of different meanings and values that are attributed to natural areas are one of the sources of conflicts in resource management.

The fourth theme is that attachment may be formed through an accumulation of experiences, but the nature of the experiences or how one interacts with the landscape are also important in shaping the meaning ascribed to a given setting. How a person experiences a landscape will determine the type of attachment they ascribe to it. For example, a hunter may become attached to a particular piece of land because of hunting successes in the past, while a bird watcher may become attached to the land because of past birding experiences.

The fifth theme is that social interactions in a setting influence attachment to the setting. According to Relph (1976), "…a place is essentially its people, and appearance or landscape are little more than a backdrop of relatively trivial importance." Stedman acknowledges that social interaction aids in turning space into place, but suggests that physical features alone can play a crucial role in producing attachment. For example, a person can become attached to a place because of the smell, the feel of the wind, or the visual aesthetic – all which depend on the physical environment. The sixth and final theme is that the study of human-place relationships is both multidimensional and multidisciplinary. It involves an understanding of the biophysical landscape, as well as, the people that interact with it. The challenge for ecosystem management is balancing ecosystem function with the wide variety of human benefits.

There is a general consensus among place attachment theorists that it can be defined loosely as an emotional bond between humans and places, but researchers diverge on how the concept is framed and studied. A popular framework has been to divide place attachment into two dimensions – place dependence and place identity (Stokols and Shumaker, 1981; Williams and Roggenbuck, 1989). Place dependence reflects the importance of a resource in providing the

means necessary to perform some task or activity. It is a functional attachment that is influenced by the physical characteristics of the place (Vaske and Kobrinn, 2001). For example, a rock climber who frequents the local bouldering spot needs rocks to be there so he/she can practice. The climber "depends" on the place with the rocks, so that he/she can engage in the desired activity – climbing. Place identity is an emotional attachment to a place that arises over time and repeat visitations. This emotional attachment can lead to a sense of belonging or purpose that gives meaning to life and, therefore, place attachment has been described as a component of self-identity (Relph, 1976, Proshansky et al., 1983). Williams and Vaske (2003) confirmed the reliability and generalizability of the two-dimensional conceptualization (place identity and place dependence) for place attachment across several settings.

To humans, places represent more than just their physical components because we attach emotional, spiritual, and psychological meanings to them. Someone that has conferred significant meanings to a place is likely to be attached to it, and thus it is not unreasonable to assume that they might take actions to protect that place from harm. According to Stedman (2003), there is a latent and poorly tested assumption that people with a high place attachment are more likely to engage in place-protective behaviors, or to resist any proposed environmental damage to that place. Stedman (2002) found that willingness to engage in place-protective behaviors is greatest when place attachment is high, but satisfaction with the place is low. Place attachment has also been shown to increase general (e.g., talking to others about environmental issues) and specific (e.g., sorting recyclable trash) environmentally responsible behaviors (Vaske & Kobrin, 2001). Vorkinn and Riese (2001) found that attachment to specific geographic areas and attachment to a larger municipality both influence environmental attitudes, although a stronger correlation between attachment to a specific geographic area and environmental

attitudes was found. In the same study, it was found that place attachment is a good predictor of the attitudes toward specific proposed environmental changes.

Hypotheses

In this chapter, I examine the concept of place attachment as it relates to Stedman's (2002) "place-protective behaviors." Following previous research (Vaske & Kobrin, 2001; Stedman, 2002; Vorkinn and Riese, 2000; Moore and Graefe, 1994) place attachment is predicted to directly affect willingness to engage in place-protective behaviors. Stedman's (2002) "place-protective behaviors" were measured as a willingness to protect a lake from hypothetical changes to the lake and its surroundings. This study focuses on everyday conservation behaviors that can be engaged in to protect a specific lake from pollution, but they can be generalized to almost any water body. There is also expected to be a difference in the ability of place identity and place dependence to explain place-protective behaviors. Frequency of visitation to Lake Alice is also expected to be a good predictor of place attachment (Kyle et, al., 2003; Moore & Graefe, 1994). The hypotheses are stated more formally below:

H1: Place attachment will be positively correlated with the likelihood to engage in place-protective behaviors.

H2: There will be a stronger correlation between place identity and place protective behaviors than place dependence and place protective behaviors.

H3: Those that have visited Lake Alice most often in the last year will have a higher place attachment to the lake than those that visit it infrequently.

Research Setting and Methods

The University of Florida is a land-grant institution with a total combined enrollment of over 50,000 undergraduate and graduate students, making it one of the top 5 largest public universities in the nation. Of the 1,827 acre main campus, 447 are designated conservation

areas. The largest and most well-known conservation area on campus is the Lake Alice Conservation Area. The Lake Alice watershed is also the largest, encompassing 60% of the main campus land area.

In 2003, UF acquired a NPDES Phase II permit for stormwater discharge, which requires the University to manage stormwater by reducing pollutant discharge, adhering to water quality standards, implementing best management practices (BMPs), and protecting water quality. The goal of a NPDES Phase II permit is to ensure that requirements of the Clean Water Act are met and to reduce pollutant discharges to the "maximum extent possible" (MEP). To achieve MEP, best management practices must be implemented, but water quality monitoring is not required because the MEP does not have concrete numeric effluent limitations. Also, a requirement under the permit is that efforts must be taken to educate the public, increase participation and involvement by the public, detect and eliminate illicit discharges, control construction site runoff and post-construction site runoff, and pollution prevention. Although there has been interest in campus water quality for quite a while, the NPDES Phase II permit provided a catalyst for more active stormwater management. In 2003, UF launched the Clean Water Campaign, which educates the campus community about water quality issues. This campaign also monitors 15 sites around campus to assess water quality and determine any long term trends.

Although there have been multiple outreach efforts implemented as part of the Clean Water Campaign, they have not been evaluated. This question is also more pervasive beyond the campus community as numerous efforts are underway to improve water quality throughout the state of Florida by effecting behavior practices that minimize water quality impacts. A survey of campus students and faculty was conducted to test the hypotheses posed earlier with regard to place based motivation for protective behavior.

The target population consisted of all undergraduate and graduate students, faculty, and staff at the University of Florida. The sample population was chosen nonrandomly from various academic departments and colleges, in the attempt to represent the diverse study population. The survey was sent to the secretary of a department and then forwarded to students, faculty, and/or staff. Although it was confirmed that all of the secretaries forwarded the emails, it is difficult to determine the exact size of the sample population because some of the people in the sample population may not have received the email containing the survey.

Undergraduate students in the Colleges of Education and Business, the School of Forest Resources and Conservation, and the Departments of Art and Art History and Wildlife Ecology and Conservation were surveyed. Graduate students surveyed were in the College of Engineering, the College of Education and the Departments of Sociology and Religion. Faculty surveyed were in the Colleges of Engineering and Education, the Institute of Food and Agricultural Sciences, and the Departments of Religion, Art and Art History, and Sociology. Staff in the Institute of Food and Agricultural Sciences were also surveyed. Some of the staff and faculty respondents were located off campus because the Institute of Food and Agricultural Sciences emailing list includes staff and faculty that are located in satellite campuses throughout Florida. No compensation or incentives were provided.

The survey was pilot tested on a group of 40 undergraduate UF students. Based on written feedback from the students, two questions were removed from the original survey and several others were modified. To obtain more detailed and personal feedback, a focus group was held with four of the students that participated in the pilot test. The students provided valuable insight into improving the clarity of questions and the discussion resulted in the creation of two new questions.

Measures

Place attachment

The survey consisted of 100 items, but the results of only thirteen will be presented in this chapter. Place attachment was measured using eight items developed by Williams and Roggenbuck (1989). Previous research has shown the items to be a reliable predictor of place attachment through place identity and place dependence dimensions (Williams and Vaske, 2003; Kyle et. al., 2004). To measure place identity, respondents indicated their level of agreement with the following four statements: (1) Lake Alice means a lot to me, (2) I am very attached to Lake Alice, (3) I identify strongly with Lake Alice, and (4) I have a special connection to Lake Alice and those that visit it. All four variables were coded on a five point Likert-type scale ranging from strongly disagree (1) to strongly agree (5). To measure place dependence, respondents indicated their level of agreement with the following four statements: (1) I enjoy recreating at Lake Alice more than any other lake, (2) I get more satisfaction out of recreating at Lake Alice than any other lakes, (3) I would not substitute any other lake for the types of recreation I do at Lake Alice, and (4) Recreating at Lake Alice is more important than recreating at any other place. These variables were also coded on a five point Likert-type scale ranging from strongly disagree (1) to strongly agree (5).

Place-protective behaviors

Place-protective behaviors were measured using 5 questions that asked respondents how likely they would be to engage in behaviors to protect Lake Alice from pollution. Respondents could choose from a five point scale that ranged from extremely unlikely (1) to extremely likely (5). The behaviors included reporting activities that may be harmful to Lake Alice, picking up trash while walking around campus, attending a cleanup at Lake Alice, checking personal vehicles for leaks, and attending a cleanup or special event that addresses water quality concerns

on campus. Since this was the first time that these questions were presented in a survey, their validity could not be determined. A place-protective scale was developed using the five items.

Data Collection

The online survey provider Survey Monkey was used to develop and disseminate the survey. After building the online survey, an internet link was provided by Survey Monkey that redirected potential respondents to the survey. The link, along with an informed consent document, was forwarded to departmental and college secretaries and disseminated by UF listserves. The entire study population was contacted by email, except for the undergraduate students in the College of Business, who were made aware of the survey through a weekly e-newsletter for business students. The survey took approximately 15 – 20 minutes to complete. After completing the survey, respondents were automatically redirected the UF Clean Water Campaign website (http://campuswaterquality.ifas.ufl.edu/).

Data Analysis

Data from the survey were downloaded directly from the Survey Monkey website and into a Microsoft Excel spreadsheet. Responses were downloaded as numerical values that corresponded with actual answer choices in the online survey. The data were then imported into SPSS v 15.0 for Windows and, if required, a variable was recoded. Pearson's correlation was used to measure the relationship between place attachment and place-protective behaviors. Based on the observed correlation, principle component analysis was performed to determine if any specific factors or components were causing variance in the place attachment and place-protective behavior scales. For some of the analyses, the sample population was divided into subpopulations. The subpopulations were undergraduate students, graduate students, faculty, and staff.

Results

Survey Respondents Summary

The survey was completed by 376 people, of which 32.9% were faculty members, 25.9% were staff members, 22.6% were graduate students, and 19.1% were undergraduate students. Of the respondents, 2.5% were less than 20 years of age, 55.4% were between 20 and 40 years of age, while 38.5% were over 40 years of age. Females represented 63.5% of respondents. Approximately 8% of the total sample population completed the survey. The approximate response rates for each subgroup are as follows: 5.0% undergraduate students, 2.3% graduate students, 6.9% faculty, and 7.6% staff. The response rates were calculated assuming that every subject in the sample population received the survey email. The sample population represents about 15% of the entire University of Florida population.

Scale Construction and Descriptive Results

Place attachment

The overall Cronbach's alpha for the place attachment scale was .895. Principle component analysis clearly revealed two factors explaining 73.3% of the scale variation: place identity (alpha = .86) and place dependence (alpha = .872) (Table 2-1). The correlation between the two scales is moderately strong and positive. Overall, respondents indicated varied levels of attachment to Lake Alice. More than 70.0% agreed with the place identity item "Lake Alice means a lot to me," while less than 34.0% agreed with the items "I am very attached to Lake Alice," "I identify strongly with Lake Alice," and "I have a special connection to Lake Alice and the people that visit it." Respondents also indicated low place dependence for Lake Alice, with the highest percentage (12.7%) agreeing with the item "I enjoy recreating at Lake Alice more than any other lake." There was no significant difference between the subpopulations in their levels of attachment to Lake Alice ($p > .05$) (Table 2-2).

Table 2-1: Place attachment (scale alpha = .895)

	Mean	Agree and Strongly Agree (%)	Factor 1 Place Dependence	Factor 2 Place Identity
Lake Alice means a lot to me.	3.84	70.6		.84
I enjoy recreating at Lake Alice more than any other lake.	2.68	12.7	.81	
I am very attached to Lake Alice.	3.12	34.0		.84
I get more satisfaction out of recreating at Lake Alice than from visiting any other lake.	2.53	7.5	.86	
I identify strongly with Lake Alice.	2.94	27.3		.79
I would not substitute any other lake for the types of recreation I do at Lake Alice.	2.45	8.1	.75	
I have a special connection to Lake Alice and the people who visit it.	2.71	16.1		.67
Recreating at Lake Alice is more important than recreating at any other place.	2.20	2.2	.82	

Factor	Eigenvalue	Percentage of Variance	Alpha	Correlation
Place Identity	4.64	58.01	.863	.61
Place Dependence	1.23	15.31	.872	

Table 2-2. Difference in place attachment among subpopulations

	Mean	Standard Deviation
Undergraduates	2.87	0.56
Graduates	2.82	0.71
Faculty	2.69	0.68
Staff	2.92	0.68

	ANOVA				
	SS	df	MS	F	Sig.
Place Attachment					
Regression	2.98	3	.99	2.24	.08
Residual	157.83	356	.44		
Total	160.80	359			

Behavioral intentions

Overall, respondents indicated a strong likelihood to engage in three of the place-protective behaviors, with over 70% agreeing with items such as “I will regularly check my car for leaks to prevent oil and other contaminants from washing into Lake Alice,” “I will report any activity that may be harmful to Lake Alice to a person of authority,” and “I will pick up trash that I see while

walking around campus (Table 2-3)." Respondents seem less willing to attend a cleanup at Lake Alice or an event that addresses water quality on campus. Principle component analysis revealed a single, reliable dimension underlying the scale (alpha = .71). There was a significant difference between the subpopulations and their willingness to engage in place-protective behaviors (Table 2-4).

Table 2-3. Behavioral intentions (scale alpha = .714)

	Mean	Likely (%)
I will regularly check my car for leaks to prevent oil and other contaminants from washing into Lake Alice.	3.97	62.6
I will report any activity that may be harmful to Lake Alice to a person of authority.	3.53	81.2
I will pick up trash that I see while walking around campus.	3.74	71.1
I will attend a cleanup at Lake Alice.	2.82	29.0
I will attend a presentation or special event that addresses water quality concerns on campus.	2.93	35.5

Table 2-4. Differences among subpopulations willingness to engage in place-protective behaviors.

	Mean	Standard Deviation
Undergraduate	3.49	0.68
Graduate	3.45	0.63
Faculty	3.29	0.66
Staff	3.50	0.66

	ANOVA				
	SS	df	MS	F	Sig.
Protective Behaviors					
Regression	5.01	3	1.67	3.96	.01
Residual	150.63	357	.42		
Total	155.64	360			

Behavioral Implications of Place Attachment.

The primary hypothesis tested in this paper is that respondents with a higher place attachment to Lake Alice will be more likely to report a willingness to engage in a variety of behaviors to protect the lake from pollution. As predicted, place attachment is correlated with the likelihood that respondents will engage in place-protective behaviors: there is a moderate,

positive correlation between place attachment to Lake Alice and place-protective behaviors (R = .458, p < .000, R^2 = .210). Regression analysis shows that there is very little difference in the correlation between subpopulations and their willingness to engage in place-protective behaviors (Figure 2-1).

Also, as predicted in the second hypothesis, respondents with high place identity are more likely to report a willingness to engage in place protective behaviors than those with high place dependence. There is a moderate, positive correlation between place identity and willingness to engage in place-protective behaviors (R = .508, p < .000, R^2 = .258). The correlation between place dependence and place-protective behaviors is positive, but weak (β = .310, p < .000, R^2 = .096). Crosstabs analysis indicated a significant and moderately positive relationship between frequency of visits to Lake Alice and place attachment (Gamma = .421, p < .05).

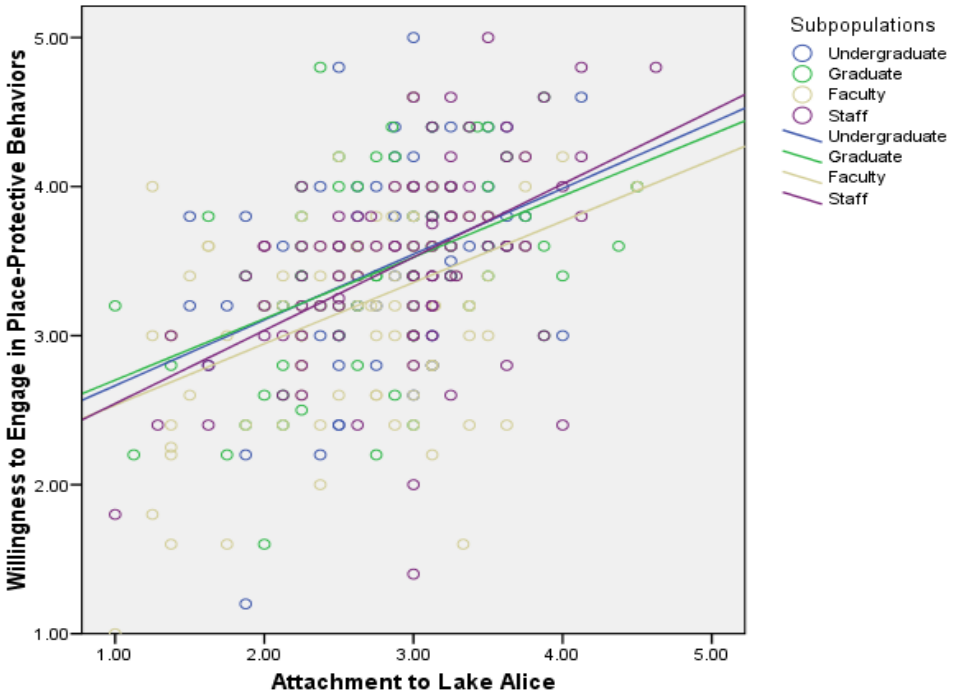

Figure 2-1. Scatterplot of relationship between attachment to Lake Alice and willingness to engage in place-protective behaviors.

Discussion

Previous research concerning linkages between people and the environment has tended to focus on place attachment as an end in itself and not as a likely predictor of human behaviors. Several place theory researchers have called for a research agenda focusing on the relationship between place attachment constructs and environmentally responsible behaviors, but relatively few studies since then have addressed this challenge (Vaske and Kobrin, 2001; Stedman, 2003). Until this study, none have done so in a university setting. Universities have great potential for advancing place attachment research because they provide access to a large and diverse population that has regular contact with the same geographic setting i.e., the campus. Understanding the types or groups of people that form attachments to varying locations on campuses may help researchers better determine how and why place attachment arises.

Although numerous studies have focused on identifying the factors that determine place attachment, the purpose of this study was to simply determine if there is a definitive relationship between place attachment and willingness to engage in place-protective behaviors. Place attachment was found to be a good predictor of a respondent's willingness to engage in place-protective behaviors. Previous studies have also shown that place attachment can influence environmental behaviors (Vaske and Kobrin, 2001; Stedman, 2002), but due to the somewhat nebulous nature of place attachment concepts, there is a need for it to be studied in a variety of contexts.

In this study, place attachment was represented by two conceptual dimensions – place identity and place dependence – which is consistent with previous literature (Williams & Roggenbuck, 1989; Moore & Graefe, 1994). People with high place identity toward a given setting view it as an expression or extension of their own personal identity, so any perceived harm to the setting may serve as a catalyst for action. Place dependence, on the other hand

concerns how well a setting fits the needs of a user and is, therefore, a utilitarian, less emotional view of a place. Previous research suggests that the more frequently a place is visited, the more a person becomes dependent on it, and as dependency increases so too will overall place attachment (Moore and Graefe, 1994). This logic is supported by the moderate and positive correlation between frequency of visits to Lake Alice and place attachment. The results of this study also indicate that place attachment is moderately correlated with place-protective behaviors, so getting people to visit Lake Alice more often may increase place attachment and, thus, willingness to engage in place-protective behaviors.

Though place attachment as a direct management concept may be limited, it does have management implications. For example, it has been noted by several authors that there is a current shift away from traditional resource management policy that emphasizes natural resources with regard to the commodities they offer, and toward a new paradigm that place resource management into a social, as well as, biophysical context. Studying place attachment through both quantitative and qualitative means has the ability to provide insight into the divergent meanings that stakeholders attribute to natural environments and, thus, can help managers make better decisions through the integration of social and biophysical concerns.

The findings in this study suggest several avenues for possible research. First, this study asks respondents to report their willingness to engage in five behaviors to protect Lake Alice from pollution. Other behaviors could be included in future studies (e.g., engage in a protest or join an organization) to help determine the types of behaviors that place attachment might best predict. Secondly, in-depth interviews of those who use Lake Alice as a recreational setting would help better characterize some of the factors that lead people to develop higher place attachments. Finally, empirical data has repeatedly shown that increasing awareness of

environmental issues does not necessarily mean that people will engage in more environmentally responsible behaviors (Hines et al., 1987). Thus, researchers have encouraged educators to explore new paths to promote environmentally responsible place-protective behaviors. Since place attachment has been shown to be a relatively good predictor of place-protective behaviors, attempting to develop place attachment through directed campaigns may be a reasonable alternative to promoting these behaviors. Vaske and Kobrin (2001) found that as place identity increases toward a specific geographic location, so too does the likelihood of engaging in more general environmentally responsible behaviors (e.g., water conservation, talking with friends about environmental issues).

Place attachment is a relatively recent concept that is evolving as its intellectual core is becoming better defined. It may serve as an important tool to encourage the general public to participate in the management process. For example, using place attachment theory as a foundation for environmental education campaigns may provide new ways to help the public understand environmental issues in a local context and, as a result, act responsibly. Also, showing a clear relationship between levels of place attachment and place-protective behaviors provides mangers with the possibility of measuring place attachment to identify people most willing to participate in the management process.

CHAPTER 3
USING SOCIAL SCIENCE DATA TO INFORM EDUCATION AND WATER MANAGEMENT DECISIONS AT THE UNIVERSITY OF FLORIDA

Introduction

In a biophysical context, watersheds are land areas enclosed within specific topographic boundaries, but it is society that defines watersheds as entities and humans that perceive value, alter, pollute, or protect them. Humans are an integral part of the landscape and, therefore, it is impossible for watershed management decisions to take place using only biophysical considerations. To fully understand watersheds it is essential to understand the values, perceptions, attitudes, and behaviors of the people associated with them.

An integrated approach to natural resource management that focuses not only on an integration of landscape features such as surface and groundwater or soil and vegetation type, but also the integration of the efforts and resources of governments, individuals, private corporations, managers/planners, landholders and researchers is gaining support among social scientists and natural scientists alike (Allan et al. 2008). When a collaborative management effort at the watershed scale can be implemented, multiple benefits and opportunities can be realized. For example, there is greater opportunity for managers to understand the needs of diverse groups of stakeholders, to instill within stakeholders a sense that they do have a role in managing their waters, and to create an interdisciplinary atmosphere where innovative solutions can flourish. However, the motivation to collaborate between often disparate entities must come from either a regulatory requirement or some sort of collective “attachment” to the watershed (Allan et al. 2008). The most feasible way that this collective attachment can occur is through informed watershed education programs that actively engage and encourage public participation and interagency collaboration.

There is no consensus among natural resource managers as to how big of a role the public should have in ecosystem management. Some authors believe that the primary goal of ecosystem management is to understand and sustain ecological integrity (Grumbine, 1994, Christensen et. al. 1996). This type of management posits humans as the antithesis to "nature" and focuses research on determining how human activities affect the ecology of different systems. A second approach is the recognition that humans are an integral part of the natural world and should be incorporated into the decision making process. This approach emphasizes increasing public involvement in the development of management policies and strategies, but only after the biophysical or "scientific" data are collected (Grumbine, 1994). A third management philosophy involves moving social considerations beyond increased public participation to an integration of social science data into the study of ecosystems and their management (Endter-Wada et. al., 1998). While the most holistic and possibly the most rewarding, transitioning this management philosophy into action has several obstacles. For example, the foundation of current scientific research is steeped in the religious and intellectual traditions of the Enlightenment era, which viewed humans as separate from nature. Social scientists and natural scientists also tend to work within different research paradigms. Natural scientists tend to focus on traditions that view humans as intruders in ecosystems. Their research agendas generally focus on the need to preserve or lessen the impacts of humans on the natural world, while social scientists generally focus on how humans use and value natural settings and resources. In addition to differing perspectives, there are communication barriers, infrequent professional interactions, and incentive structures that reward narrow scientific inquiry within disciplines (Endter-Wada et al., 1998).

Social science contributions to ecosystem management can range from small scale analyses of individual and group values, attitudes, and behaviors to large scale analyses of social, economic, cultural, and political trends. For example, examining the relationships between resource conditions and trends, population dynamics, economic activity, social well-being, and community stability may help managers to anticipate future conditions with regard to resource use and demand. Social scientists can help put management decisions into a social context by characterizing human beliefs and values towards resource conditions and management options. Also, research into how people and communities form attachments to places and natural features can provide insight into why certain resource uses persist, as well as how people may react and adapt to shifting resource conditions (Endter-Wada et. al., 1998).

This thesis gathers social data from a targeted population within a specific watershed and provides education and management decisions. The targeted population is undergraduate and graduate students, faculty, and staff at the University of Florida. The watershed of interest is the Lake Alice watershed, which is the largest watershed within campus boundaries.

In 2006, campus scientists, planners, and land managers put together a report outlining a general framework for achieving sustainable water management in the Lake Alice watershed. The report suggests implementing appropriate best management practices, supporting continued stormwater research, extending the campus water quality monitoring program, adopting an internal Total Maximum Daily Load (TMDL), public education, and the development of a Water Task Force. Presently, few of these objectives have been fully achieved.

Although the specific goals of the sustainable water management report have not all been met, this does not mean that the University has been idle in its efforts to protect and improve campus waters. Interest was kindled in campus water quality and stormwater management when

UF obtained a NPDES Phase II permit in 2003. The same year a campus water quality monitoring program was started by members of the UF Wetlands Club under the auspices of the UF Clean Water Campaign. Fifteen sites on the UF main campus are monitored monthly for the following 12 parameters: temperature, dissolved oxygen, pH, conductivity, total dissolved solids, redox potential, total suspended solids, total nitrogen, total Kjeldahl nitrogen, ammonium, total phosphorus, and soluble reactive phosphorus.

For this thesis, a survey was administered to University of Florida undergraduate and graduate students, faculty, and staff. Items in the survey attempt to characterize respondent's knowledge, attitudes, perceptions, attachment, and behaviors with regard to the surface waters on campus and, specifically, the Lake Alice watershed. Specifically, knowledge of UF campus waters issues and general water issues was correlated with willingness to engage in conservation behaviors. Knowledge of environmental issues alone has not been proven to be a good predictor of environmental behaviors (McKenzie-Mohr and Smith, 1999), but this thesis attempts to determine if knowledge of watershed-specific issues may be a better predictor of conservation behaviors than general water knowledge.

The Lake Alice watershed is the largest on campus and is almost completely contained within campus boundaries, making UF solely responsible for maintaining the integrity of its waters. The Lake Alice conservation area is also the largest and most well-known conservation area on campus. Data from this survey will provide the insights to the social context that will help UF educate its community and make wise decisions concerning the future management of campus waters.

Characterization of the Lake Alice Watershed at the University of Florida

Land use

The Lake Alice watershed (1,140 acres) covers more than 60% of the 1,827 acre UF main campus, while an additional 381 acres contribute from off campus (Figures 3-1 & 3-2). Portions of campus drain to other watersheds – Hogtown Creek and Bivens Arm. There are several depressional basins that have no surface water outlet and drain directly to the aquifer. The Lake Alice watershed is a closed basin, which means that water that enters the lake can only leave the basin through evapotranspiration or infiltration to groundwater.

In the late 1800s, the majority of the land within the Lake Alice watershed was agricultural. By 1971, only about 27% was cropland, with the remaining land being urban (60%) and forested (12%). Presently, about 40% of the watershed is covered by impervious surfaces, i.e. roads, buildings, parking spaces, and other hard surfaces. Runoff from these impervious surfaces is conveyed through a series of culverts, stormdrains, creeks, and ponds directly into Lake Alice. Because of the increased volume of water that drains into Lake Alice from impervious surfaces during periods of high rainfall, two drainage wells were installed in Lake Alice to control flooding and stabilize lake levels. Water entering these wells flows directly into the surficial Floridan aquifer (Wells et al., 2006).

Hydrology and Water Quality

The current hydrology of Lake Alice has been largely shaped by human activity. In the early 1900s, it was a 1 ha sinkhole owned by a local farmer. The lake got its name from the farmer's daughter, Alice. Today, it is a 33 ha open water/marsh system that receives inputs from stormwater runoff, inter-storm discharges, irrigation water, and direct rainfall. Lake Alice increased in size to 22 hectares in 1948 due to the construction of a small earthen dam on the

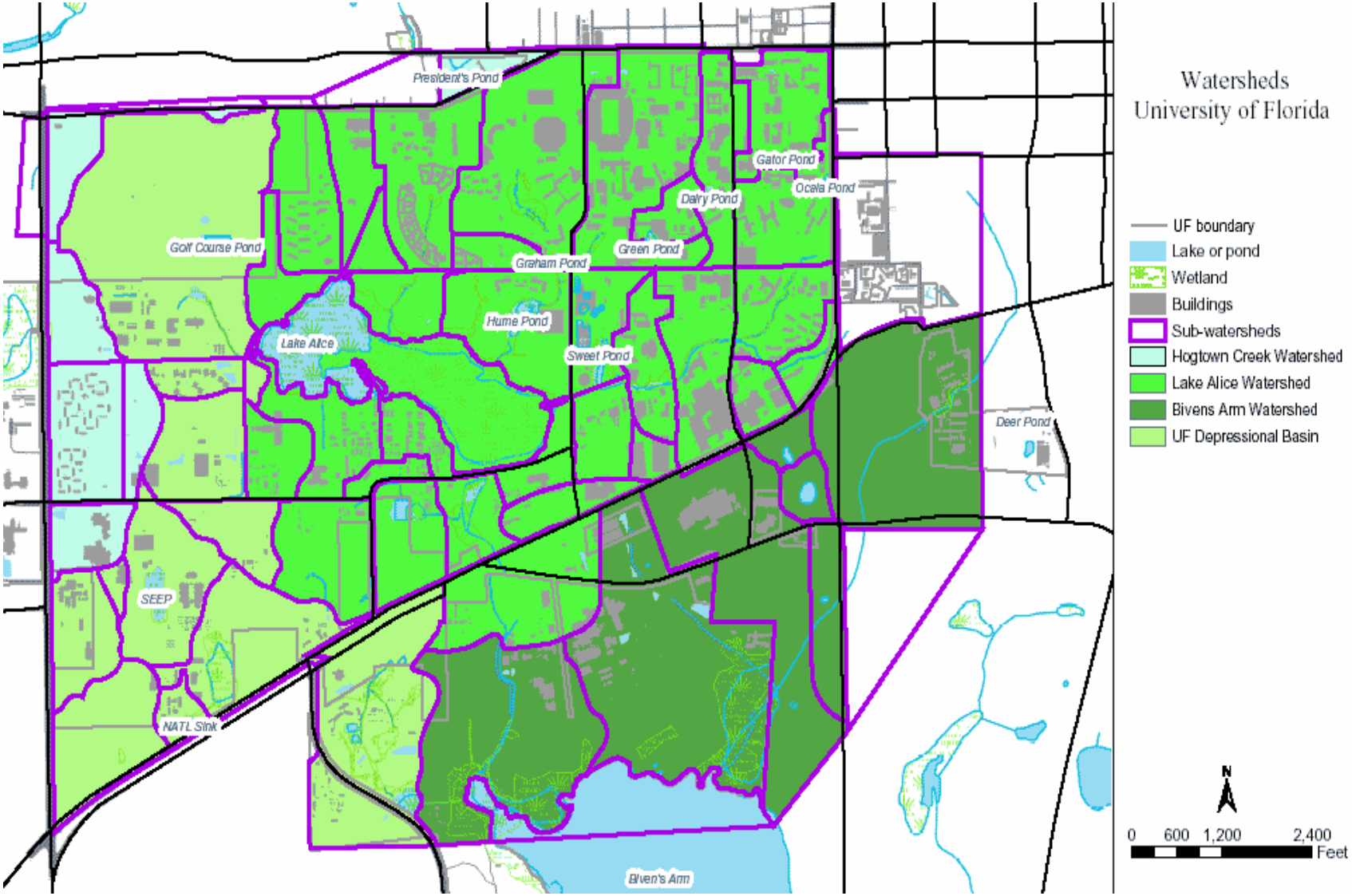

Figure 3-1 Watersheds on the University of Florida main campus.

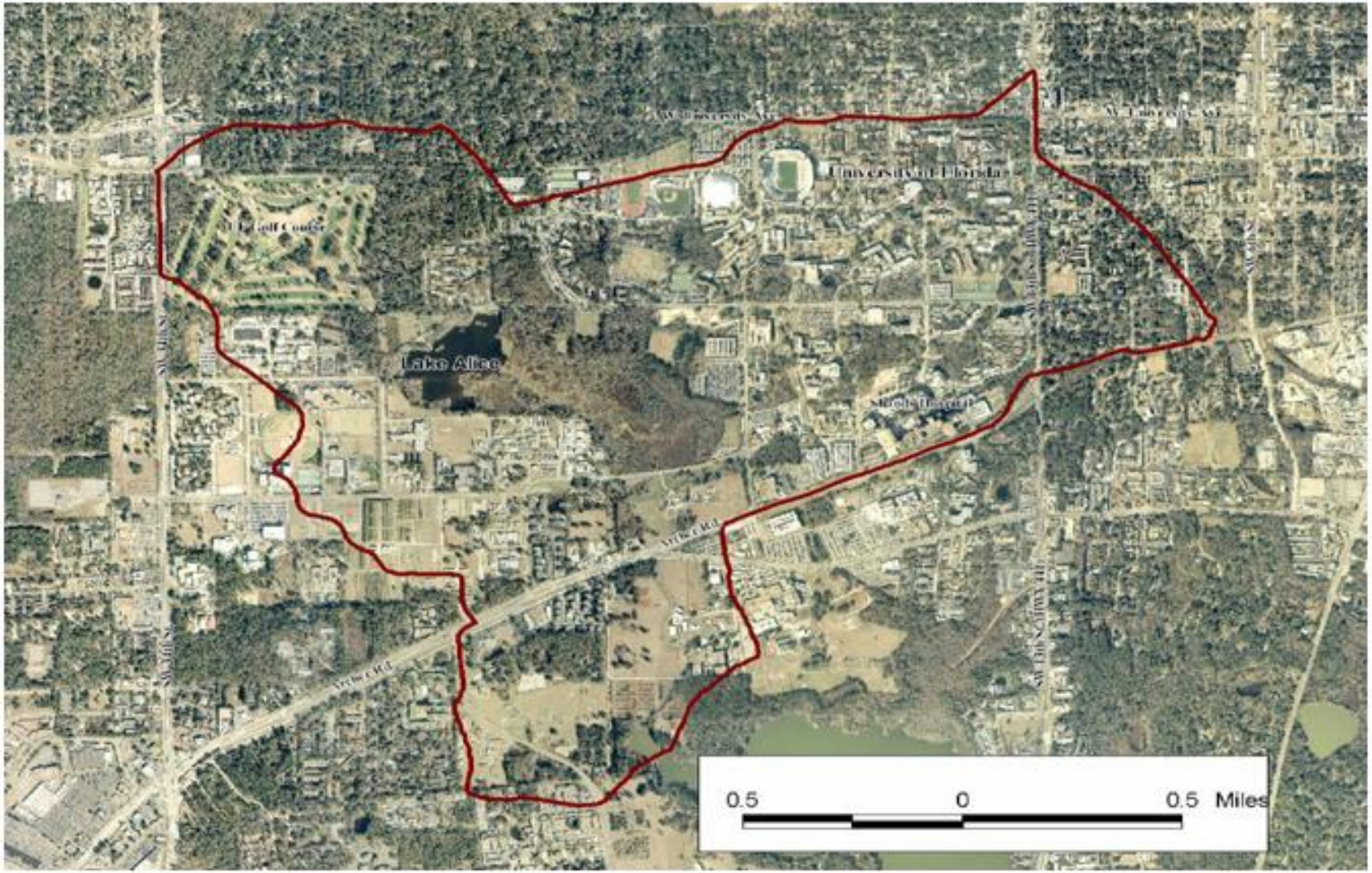

Figure 3-2. Lake Alice watershed using aerial imagery

western end of the lake. Canals built during the 1960s conveyed secondary treated wastewater and effluent from a heating plant into the lake, increasing the open water part of the lake to its present size of 33 ha.

Two tributaries on campus have nitrate concentrations as high as 11.5 mg/L. Concentrations above 10.0 mg/L in drinking water are considered harmful to humans (EPA, 1994). Levels greater than 5mg/L for amphibians, 1.1 mg/l for some fishes and 0.23 mg/l for some invertebrates have been shown to be toxic (Mattson et. al., 2007). Increases in nitrogen can also result in excess plant growth, eutrophication and depressed oxygen concentrations. It is presumed that these nitrate loads are from high fertilizer application to the UF baseball field and practice football fields.

Several sites on campus have dissolved oxygen levels below the Florida Class III designated use standard of 5.0 mg/L. These low levels may have been anthropogenic in nature or may natural due to the type of ecosystem that the water flows through. For example, one monitoring site is downstream from a horse pasture and, therefore, the low levels may be a result of manure in the runoff. Another monitoring site is in a wetland system, which would be expected to exhibit lower dissolved oxygen content in the water.

Many of the sites on campus have exhibited high levels of phosphorus. At one site, levels have been as high as 5.7 mg/L. Although phosphorus levels are not considered toxic to aquatic organisms, phosphorous is often considered the limiting nutrient in freshwater systems and when added can increase plant growth. However the increased levels of phosphorus are a bit more difficult to ascertain than that of nitrogen. The Lake Alice watershed lies at a point where the geological Hawthorne Formation is often exposed by creek incising and clays in the formation that are naturally high in phosphorus erode or leach phosphorus into the water column.

Due to increased flow volumes and velocities in the creeks due to watershed development, increased erosion and leaching of this phosphorus rich soil is occurring. In addition, the highest phosphorus levels are occurring in those same tributaries with elevated nitrogen levels suggesting that fertilizers may be a contributing factor. (Wells et. al., 2006).

Regulatory Status of Lake Alice

Lake Alice is currently a water of the United States that is regulated by the Clean Water Act and National Pollutant Discharge Elimination System (NPDES) permits, a water of the State of Florida, a UF conservation area, and a permitted stormwater system.

In 2003, UF acquired a NPDES Phase II permit for stormwater discharge, which requires the University to manage stormwater by reducing pollutant discharge, adhering to water quality standards, implementing best management practices (BMPs), and protecting water quality. Also, a requirement under the permit is that efforts must be taken to educate the public, increase participation and involvement, detect and eliminate illicit discharges, control construction site runoff and post-construction site runoff, and prevent pollution.

Lake Alice has also been classified as a Class III water of the state by the State of Florida. Designated as such, water quality in Lake Alice is required to meet a number of standards. But in 1987, while state jurisdiction of Lake Alice was still uncertain, UF obtained a permit from the St. Johns River Water Management District (SJRWMD) that designated Lake Alice as a wet retention system for stormwater management. According to Florida Statute 4, any stormwater system that is designated and maintained for stormwater treatment is not subject to state water quality standards applicable to waters of the State of Florida. Lake Alice is such a prominent feature on campus and because it has potentially conflicting management objectives, the UF Conservation Area Study Committee during the Campus Master Planning 2005 – 2015 process, adopted the following policy:

Although there are obvious management conflicts in the legal status of Lake Alice, the UF Conservation Area Study Committee of the Campus Master Planning 2005 – 2015 process, adopted the following policy:

> Policy 3.7: The University shall continue to monitor Lake Alice and other surface water bodies for compliance with existing standards for water quality in order to meet Class III water quality standards and report findings to the Lakes, Vegetation, and Land Use Committee annually (UF Conservation 2005b).

UF is not required to meet state Class III water quality standards, but agreed to monitor and adhere to the standards.

Research Objectives

The objectives of this chapter are:

1) To use the survey data to develop a more targeted watershed education and management plans on the University of Florida campus.
2) To determine if knowledge of water issues specific to the University of Florida and general water knowledge are predictors of place-protective behaviors
3) To advance the study of watershed protection through the integration of social science and biophysical data.

Methods

Development of the Survey Instrument

The survey consisted of 100 items. Forty-one of the survey questions designed to assess knowledge, attitudes, and behaviors were adapted from a survey designed by the Mississippi Watershed Management Organization (MWMO, 2005). Eight items designed by Williams and Roggenbuck (1989) were adapted to measure place attachment. The remaining questions were designed by the researcher and addressed issues specific to surface waters on the University of

Florida campus, such as perceptions of water quality on campus, behaviors to protect campus surface waters, and the types of recreation engaged in at Lake Alice.

Measures

Knowledge

Water knowledge was measured using eight multiple choice items. Five of the questions were designed to measure a respondent's knowledge of UF campus waters. Some example questions are "A watershed is an area of land that drains into a particular body of water, such as a river, lake, or wetland. Which do you think is the largest watershed on campus" and "Where do you think the majority of water used for irrigation at UF comes from." Three of the questions were designed to measure respondent's knowledge of general water issues, such as the main sources of pollution of surface waters and the benefits of wetlands. The questions were combined to measure overall water knowledge. Respondents were also asked where they learned about efforts to improve water quality on the UF campus.

Perceptions and Attitudes

To determine perceptions of water quality on campus, respondents were asked whether campus waters are polluted or clean and getting worse, staying about the same, or getting better. This item was followed by an open ended question that asked respondents to provide evidence to support their answer. To examine the types of sensory cue that might influence perceptions toward surface water quality, respondents were asked which of six possible answers best indicates poor surface water quality. A few of the possible answer choices were "the water is colored and difficult to see through," "there are few aquatic organisms and little aquatic vegetation present," and "the water is foul-smelling."

Attitudes toward water and general conservation on campus were measured using two items. First, respondents were asked whether they were concerned about surface water on the

UF campus. Second, respondents were asked to identify to what extent they agreed or disagreed with statements such as "Maintaining water quality standards on the UF campus is important," "Conserving UF natural areas is important," and "Installing signs to identify creeks and water bodies on campus is a good idea." The items were measured on a 5 – point Likert scale that ranged from strongly disagree (1) to strongly agree (5). Another item determined some of the possible reasons that respondents' may value Lake Alice. Seven choices covered a range of possibilities, including Lake Alice as a place to exercise, as habitat for native plants and animals, as a place to relax, and as having general aesthetic beauty.

Place attachment

Place attachment was measured using eight items developed by Williams and Roggenbuck (1989). Previous research using Williams and Roggenbuck's items have shown them to be a reliable predictor of place attachment through the place identity and place dependence dimensions (Kyle et al., 2004). To measure place identity, respondents indicated their level of agreement with the following 4 statements: (1) Lake Alice means a lot to me, (2) I am very attached to Lake Alice, (3) I identify strongly with Lake Alice, and (4) I have a special connection to Lake Alice and those that visit it. All four variables were coded on 5 – point Likert-type scales ranging from strongly disagree (1) to strongly agree (5). To measure place dependence, respondents indicated their level of agreement with the following 4 statements: (1) I enjoy recreating at Lake Alice more than any other lake, (2) I get more satisfaction out of recreating at Lake Alice than any other lakes, (3) I would not substitute any other lake for the types of recreation I do at Lake Alice, and (4) Recreating at Lake Alice is more important than recreating at any other place.

Behaviors

Respondents were asked how often they engage in a list of thirteen behaviors. Some of the behaviors were positive or responsible environmental behaviors, such as picking up pet waste and leaving grass clippings on the lawn, while others were negative or irresponsible behaviors, such as taking showers more than five minutes long and using chemicals on the yard or garden. The possible answer choices were "I never do this," "I rarely do this," I sometimes do this," "I often do this," and "Not relevant to me."

Place-protective behaviors were measured using 5 items that asked respondents how likely they would be in the future to engage in behaviors to protect Lake Alice from pollution. Respondents could choose from a 5 – point scale that ranged from extremely unlikely (1) to extremely likely (5). The behaviors included reporting witnessed activities that may be harmful to Lake Alice, picking up trash while walking around campus, attending a cleanup at Lake Alice, checking personal vehicles for leaks, and attending a cleanup or special event that addresses water quality concerns on campus.

Two items characterized respondents' usage of Lake Alice. The first asked respondents to estimate how many times a year they visit Lake Alice. The second item asked about the types of activities participated in at Lake Alice and included options related to exercise, leisure activities, wildlife viewing, pets. Another item determined the possible barriers or factors that may inhibit respondents from engaging in behaviors to help improve campus water quality.

Survey Audience and Data Collection

The target population consisted of all undergraduate and graduate students, faculty, and staff at the University of Florida. The sample population was chosen nonrandomly from various academic departments and colleges, in the attempt to represent the diverse study population. The survey was sent to the secretary of a department and then forwarded to students, faculty, and/or

staff. Although it was confirmed that all of the secretaries forwarded the emails, it is difficult to determine the exact size of the sample population because some of the people in the sample population may not have received the email containing the survey.

Undergraduate students in the Colleges of Education and Business, the School of Forest Resources and Conservation, and the Departments of Art and Art History and Wildlife Ecology and Conservation were surveyed. Graduate students surveyed were in the College of Engineering, the College of Education and the Departments of Sociology and Religion. Faculty surveyed were in the Colleges of Engineering and Education, the Institute of Food and Agricultural Sciences, and the Departments of Religion, Art and Art History, and Sociology. Staff in the Institute of Food and Agricultural Sciences were also surveyed. Some of the staff and faculty respondents were located off campus because the Institute of Food and Agricultural Sciences emailing list includes staff and faculty that are located in satellite campuses throughout Florida. No compensation or incentives were provided.

The survey was pilot tested on a group of forty undergraduate UF students. Based on written feedback from the students, two questions were removed from the survey and several others were modified. To obtain more detailed and personal feedback, a focus group was held with four of the students that participated in the pilot test. The students provided valuable insight into improving the clarity of questions and the discussion spurred the creation of two new questions.

The online survey provider Survey Monkey was used to develop and disseminate the survey. After building the online survey, an internet link was provided by Survey Monkey that redirected potential respondents to the survey. The entire sample population was contacted by email, except for the undergraduate students in the College of Business, who were made aware

of the survey through a weekly e-newsletter for business students. The survey took approximately 15 – 20 minutes to complete. After completing the survey, respondents were automatically redirected the UF Clean Water Campaign website (http://campuswaterquality.ifas.ufl.edu/)

Data Analysis

Data from the survey were downloaded directly from the Survey Monkey website and into a Microsoft Excel spreadsheet. Responses were downloaded as numerical values that corresponded with actual answer choices in the online survey. The data were then imported into SPSS v 15.0 for Windows and, if required, a variable was recoded. General descriptive statistics were used to characterize the data.

Results

Summary

The survey was completed by 376 people, of which 32.9% were faculty members, 25.9% were staff members, 22.6% were graduate students, and 19.1% were undergraduate students. Of the respondents, 2.5% were less than 20 years of age, 55.4% were between 20 and 40 years of age, while 38.5% were over 40 years of age. Females represented 63.5% of respondents. Approximately 8% of the total sample population completed the survey. The approximate response rates for each subgroup are as follows: undergraduate students – 5%, graduate students – 2.3%, faculty – 6.9%, and staff – 7.6%. The response rates were calculated assuming that every subject in the sample population received the survey email. The sample population represents about 15% of the entire University of Florida population.

Knowledge

The overall mean scores of the responses to the three categories of knowledge questions – UF campus water knowledge, knowledge of general water issues, and a combination of general

and campus water knowledge – will be given a letter value based on the University grading system. A common University grading system is as follows: A (90% – 100%), B (80% - 89%), C (70% -79%), D (60% - 69%), F (50% - 59%).

The overall mean score for the eight water knowledge questions was 54.4 out of a possible 80 points (68.0%, D). For the three general water knowledge questions, the overall mean score was 24.1 out of a possible 30 points (80.3%). Respondents theoretically passed the general knowledge section, but failed the UF campus water knowledge section with an F (58.0%). Knowledge of general water issues was weakly correlated with place-protective behaviors ($R = .121$, $p < .05$, $R^2 = .015$), while the relationship between knowledge of UF campus waters and place-protective behaviors was not significant.

Undergraduate respondents scored the highest on questions regarding campus waters, but scored significantly lower than the rest on general surface water knowledge questions (Figure 3-3). Faculty respondents knew the most about general water quality issues, but scored lower than undergraduate and graduate students in their knowledge of campus surface waters. Overall, respondents' knowledge of UF campus surface water is substantially lower than their knowledge of general water issues.

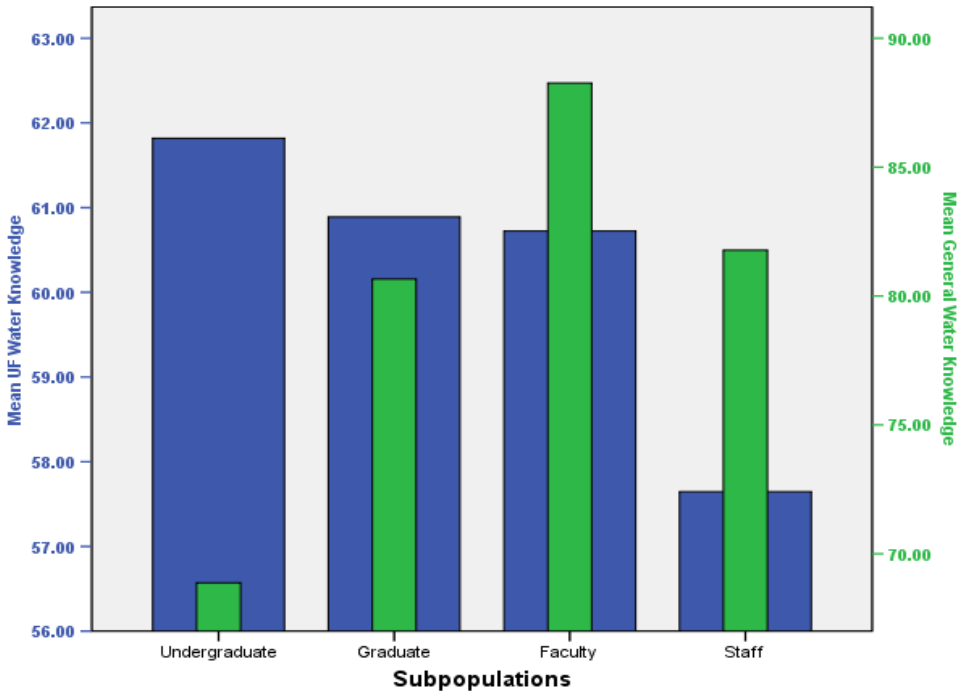

Figure 3-3. Mean UF water knowledge (wide bar) and general water knowledge (narrow bar) scores for each subpopulation.

63.9% of the survey respondents indicated that they did not know that any efforts had been made to protect and improve water quality on campus. 23.5% said that they had learned about these efforts through friends and contacts, 13.0% through a class, 11.1% by a website, and 3.9% through a campus cleanup.

Perceptions and Attitudes

Over two-thirds of the survey respondents think that surface waters on campus are polluted. 29.9% of the respondents think that the water quality on campus is getting worse, 54.5% think that it is staying about the same, and 15.6% think it is getting better.

Answers to the open-ended question that asked respondents to provide evidence for their perceptions of water quality showed that many feel the water on campus is polluted because 1) there has not been enough done by UF to prevent pollution, 2) trash is visible in the water, 3) algal blooms are common, 4) there has been an increase in impervious surfaces, 5) there has been

a decline in wildlife over the years, and 6) water pollution is a problem across the United States and, therefore, must be a problem on campus. A few of the responses were

> Due to the large amount of disturbed surfaces on the UF campus, I would assume that there is a lot of runoff into surface water on campus, creating pollution. I also assume that the level of pollution is staying the same, due to the absence of any campus-wide initiatives. Of course, neither of these are evidence; they are both assumptions.

> Trash floating in water. Drainage from roads and other impervious surfaces channels to Lake Alice etc, water lettuce problem, more construction on campus = more impervious surfaces and run-off.

> Surface water on campus is often highly enriched with nutrients and the algal blooms on the ponds can frequently completely cover the ponds. People also throw garbage in them.

> Several years ago, there was plenty of evidence of animal life in the water around campus, e.g., alligators, turtles, etc. Lately, animal life is not so evident, especially near water that has been affected by construction sites.

> You hear about pollution and water quality being a concern, so I assume that there is an issue.

Respondents that think the surface water on campus is clean tend to provide the sustainability movement on campus, initiatives to restore smaller creeks on campus, and general awareness of surface water issues as evidence. Below are some of the responses:

> "The sustainability movement around campus is helping us ensure that we are limiting our environmental footprint in this area. I assume this might be having a positive impact on surface water quality around UF."

> "I believe wiser management of run-off from parking lots and careful use of pesticides and fertilizers has improved the quality of surface water on campus."

> "UF is doing a great job of keeping people aware of water quality with specific programs, but it's a difficult thing to improve."

> "I have read/attended presentations about small research projects documenting water quality on campus. In addition I am also aware of initiatives to improve at least one stream on campus."

> "I am equating awareness of the issue with surface water quality. More people are becoming aware of water issues so I am assuming that at least in small ways, water quality is improving."

The majority of respondents value Lake Alice because of its aesthetics, and because it provides breeding habitat for plants and animals, including migratory birds (Table 3-1). People also value it because it is a place to relax and a prominent place to take visiting friends and family. Few respondents seem to value it for its more utilitarian services, such as a place to exercise or take pets.

Table 3-1. Respondent's valuation of Lake Alice.

Lake Alice…	Total Response Percent
has aesthetic value and general beauty.	89.4
provides a habitat for plants, animals, and migratory birds.	76.7
is a place to take visiting friends and family.	62.9
is a place to relax.	61.0
provides a natural area for me to explore.	52.8
is a place to exercise.	29.3
is a good place to walk my dog.	5.7

Most respondents think that poor surface water quality is indicated by visible trash (68.4%). Of the respondents, 60% chose foul smelling water a sign of poor water quality, 58.8% chose a lack of aquatic vegetation and organisms is a good indicator, 41.9 % chose green algae on the water's surface, and 29.7% identified decreased water clarity. Respondents strongly agreed that conserving natural areas, maintaining water quality, and planting and maintaining trees on campus are important (Table 3-2). They disagreed most strongly with statements concerning UF's efforts to raise awareness about water quality issues on campus.

Table 3-2. Attitudes towards conservation on campus.

	Mean	Std. Deviation	% Strongly Agree/Agree
Conserving UF campus natural areas is important.	4.62	0.57	97.7
Maintaining water quality on campus is important.	4.58	0.52	98.7
Sufficient efforts have been made to educate the UF community about water quality issues.	2.29	0.78	5.2
Fertilizers should not be used for campus landscaping purposes.	3.02	1.08	32.8

Table 3-2 Continued.

Reducing the number of parking lots will help improve campus water quality.	3.09	1.08	37.5
Planting and maintaining trees on campus is important.	4.52	0.58	96.8
Signs around campus make surface water easy to identify.	2.93	0.97	29.6
It is not important how green the grass is on Florida Field in football stadium.	3.27	1.20	45.0

Place Attachment

Overall, respondents indicated a moderate place attachment to Lake Alice (μ = 2.82). They tended to agree more with items designed to measure the place identity dimension (μ = 3.16) than those that measured place dependence (μ = 2.47). Staff indicated the greatest place attachment (Figure 3-4). Undergraduates and graduate students had a higher place dependence than identity, while faculty and staff had a higher place identity than dependence (Figure 3-5). Faculty respondents had the lowest overall place identity and place dependence. Staff had the highest place identity and undergraduates had the highest place dependence.

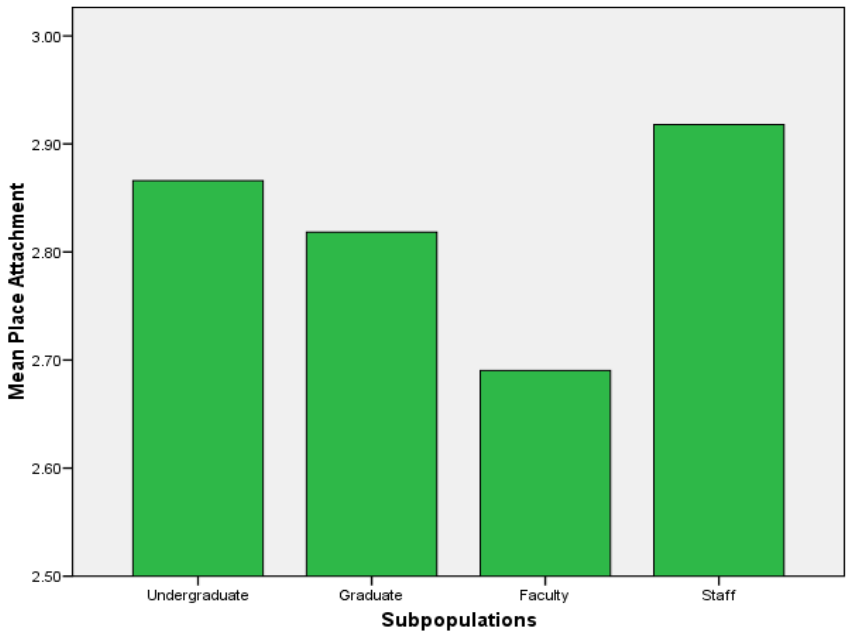

Figure 3-4. Overall place attachment means for each subpopulation.

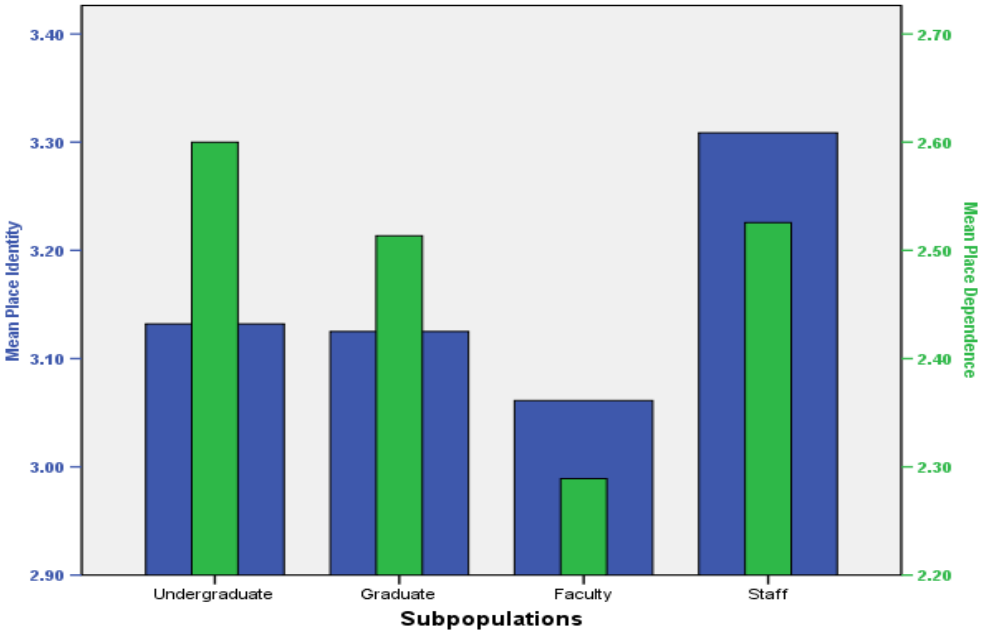

Figure 3-5. Place identity (wide bar) and place dependence (narrow bar) means for each subpopulation.

Behaviors

Respondents reported a high rate of engagement in the positive environmental behaviors of leaving grass clippings on the lawn, picking up litter, and checking cars for leaks (Table 4-3). Moderate engagement was reported for the following behaviors: picking up pet waste, using a hazardous waste facility to dispose of household waste, talking to neighbors about lawn care/landscaping, and donating to environmental groups. The lowest engagement was reported for attending public events about environmental issues in the neighborhood or on the UF campus.

Of the five "negative" environmental behaviors, respondents were most likely to report taking showers longer than five minutes (Table 3-3). Moderate engagement in washing cars in the street, letting water run from property into street, and using chemicals on the lawn or garden was reported. Respondents reported almost never sweeping or blowing grass into the street. Of

the subpopulations, faculty members reported being the least willing to engage in place-protective behaviors (Figure 3-6).

Table 3-3. Descriptive statistics for "positive" and "negative" environmental behaviors. Means closer to 1 represent a low rate of engagement in the behavior; those closer to 4 represent a high rate of engagement in the behavior.

	Mean	Standard Deviation
Positive Environmental Behaviors		
pick up pet waste	2.76	1.25
leave grass clippings on lawn	3.69	0.78
use hazardous waste facility	2.92	1.19
talk about lawn care with others	2.30	1.09
pick up litter	3.34	0.74
donate to environmental groups	2.30	1.07
attend public events	1.71	0.86
check car for leaks	3.13	0.93
Negative Environmental Behaviors		
take showers longer than 5 minutes	3.18	0.91
sweep grass into street	1.39	0.72
wash car in street	2.02	0.97
let water on property run to street	1.89	1.01
use chemical on lawn or garden	2.20	1.03

Almost 70% of respondents reported using Lake Alice for wildlife viewing, while 57.4% reported using it for some form of exercise – hiking, running, biking, or walking. Less than 25% of the respondents use Lake Alice as a place to hang out with friends or a place to exercise pets. 60.0% of respondents said that they had not taken any measures to improve campus water quality because they did not know what actions could be taken. 23.8% reported that improving water quality on campus was not a priority, and 22.7% reported not having enough time. The largest percentage of respondents for all subpopulations reported visiting Lake Alice 1-5 times last year (Figure 3-7).

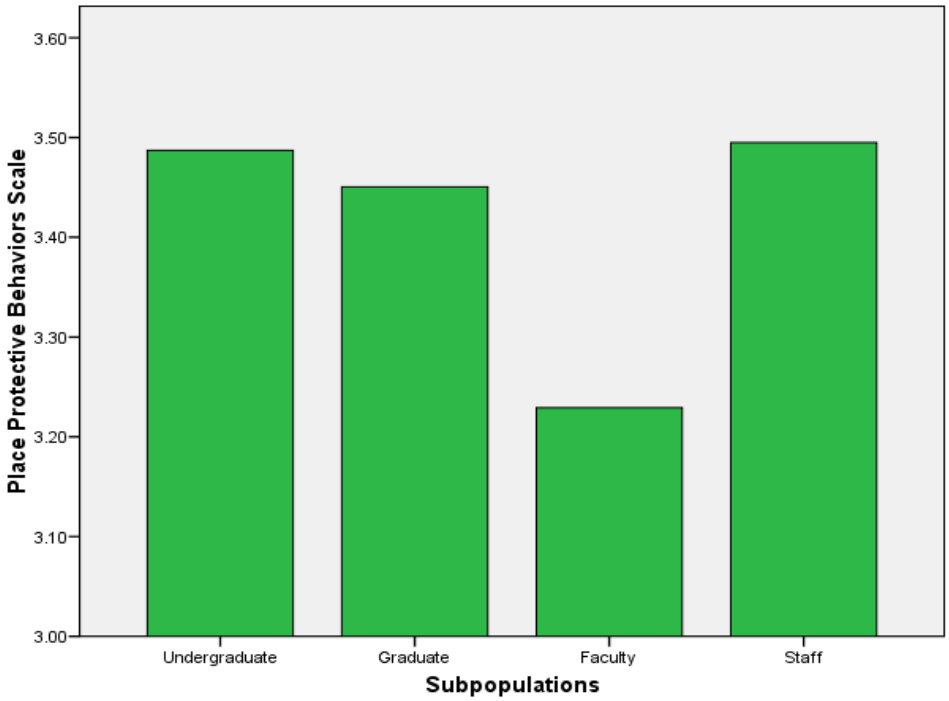

Figure 3-6. Overall means of willingness to engage in place-protective behaviors for each subpopulation.

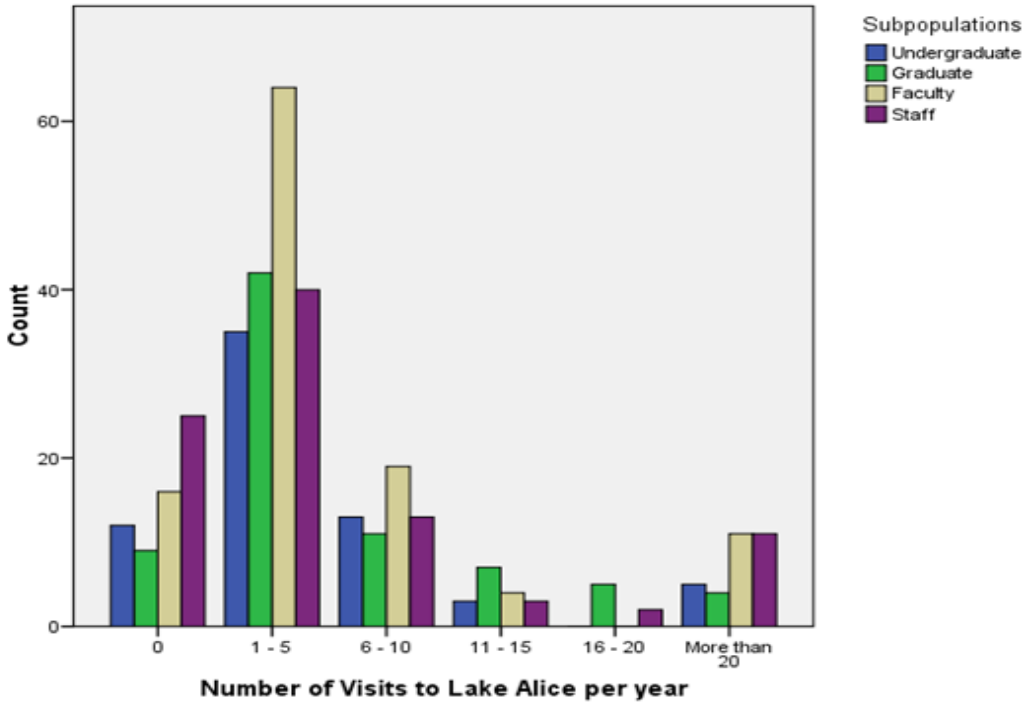

Figure 3-7. Visits to Lake Alice for each subpopulation.

Discussion

Summary of Findings

Survey respondents seem to have a firm grasp on general water issues, such as pollutant loading into receiving water bodies from surface water runoff, the biological effects of elevated nutrient levels, and the ability of wetlands to filter and store water. On the other hand, respondent's knowledge of water issues specific to the UF campus is low. For example, over half of the respondents did not know that UF has been monitoring water quality on a monthly basis for almost five years. Knowledge of general water issues and those specific to the University of Florida were not shown to be good predictors of place-protective behaviors.

Based on discussions with students during the initial focus group, it seems to be a common misconception that stormwater is treated at a wastewater facility before entering a receiving water body. This misunderstanding was reinforced by the fact that 45.0% of respondents either did not know where stormwater on campus flows to or thought that it flows directly to a treatment facility. Respondents also exhibited a lack of knowledge concerning the spatial extent of the watersheds on campus, with only 42.1% correctly choosing Lake Alice as the largest watershed on campus.

Interestingly, most respondents seem to value Lake Alice less for the recreational opportunities that it provides, and more as a general place of natural beauty and wildlife breeding habitat. Although half of the respondents reported visiting Lake Alice only 1-5 times last year, Lake Alice is the largest and most publicized conservation area on campus and, therefore, respondents may be more likely to report valuing it just because it is the most well-known. The results also indicate that Lake Alice serves as a good place to take visiting friends and family. This is probably, again, because of its novelty as a large conservation area and, also, because it is

an easily accessible place to show off charismatic fauna, such as alligators and large, wading birds.

Although the item that asks respondents to choose visual cues that indicate decreased water quality oversimplifies the reality of water processes, it does provide useful information about how respondents perceive good or poor water quality. For example, respondents reported visible trash as the most important determinant of water quality. In fact, visible trash has little to do with water quality, which refers to its chemical constituents. Visible trash is unattractive and may be correlated with poor water quality, but an algal bloom or low clarity is a more conclusive indicator of pollutant loading. A little less than two-thirds of the respondents believe a foul smell and a lack of vegetation indicate poor surface water quality. Generally, a creek flowing through an area like the UF campus should not have a foul smell and should have a relative abundance of aquatic and riparian vegetation. But this is not the case with all surface waters. For example, wetlands that have experienced long periods of inundation can result in the reduction of sulfur and a smell of rotten eggs. Also, some lakes are naturally oligotrophic, or lacking in nutrients, and therefore sustain few aquatic organisms or vegetation.

It is clear that the survey respondent's feel efforts to educate the campus community about campus water quality have been inadequate. Only 5.2% agreed that sufficient educational efforts have been made, and 63.9% did not know that any efforts have been made to improve water quality on campus. Students that take natural resource classes may be familiar with efforts on the part of UF to conserve campus natural resources, but most others probably have very little exposure. The lack of knowledge concerning topics related to campus surface waters implies that there is a need for increased education about the natural areas on campus.

Most of the respondents use Lake Alice as a place to view wildlife, which is supported by the fact that the majority of respondents reported valuing Lake Alice for its aesthetic beauty and as habitat for plants and animals. Although Lake Alice does provide some recreational activities the conservation area is not large enough to provide an extensive network of trails. Most people probably pass through or by the Lake Alice Conservation Area on a longer walk or run. Therefore, the best recreational benefits that Lake Alice offers are picnicking, relaxing, and wildlife viewing, and any attempt to promote the Lake should focus on these opportunities as to what Lake Alice can offer.

Undergraduate and graduate respondents may have the greatest place dependence on Lake Alice because they have generally been in Gainesville for less time than faculty or staff and may not be familiar with other natural areas. They may also have lower place identity with Lake Alice because they have not enough experiences with Lake Alice or the campus to become emotionally attached. Faculty probably have the lowest place identity and place dependence with Lake Alice simply because they are busy maintaining careers and family lives and do not have time to visit Lake Alice. Faculty are also significantly less willing to engage in behaviors to protect Lake Alice than the other subpopulations, which may be due lack of time, lack of exposure to Lake Alice, or lack of knowledge concerning the Lake Alice watershed.

Watershed Education and Management

The common adage "Think Globally, Act Locally," is an adept summation of how to begin to bring about positive social, environmental, and political change, but its meaning is all too often clouded in today's globalized world. For instance, it is sometimes easier to learn about environmental issues taking place clear across the country than it is to find information about a local watershed. The results of this survey indicate that respondents are familiar with general water quality issues (e.g., effects of nutrient loading, benefit of wetlands), but are noticeably

lacking in knowledge of a watershed that is located in their own "backyard." While a sound knowledge of general water issues is obviously a step in the right direction, this knowledge must also include local watersheds.

Several avenues can be taken to encourage people to protect local watersheds. The first is effective watershed education efforts. Although informational campaigns alone have proven ineffective in fostering conservation behaviors, the results of Chapter 2 indicate that people with a higher place attachment are more willing to engage in place-protective behaviors. This means that tailored informational campaigns that target specific populations in specific watersheds may increase attachment and, in turn, willingness to actively protect watersheds through conservation behaviors. Simply relaying to people the name of the watershed they are located in, its geographic extent, and its importance in the region may be the first step in fostering a sense of attachment and belonging to surrounding natural areas that can lead to active engagement in local conservation issues.

Another strategy used to promote place-protective or conservation behaviors is social marketing. Social marketing employs five "tools" to bring about a specific behavior change i.e., reducing fertilizer use, recycling, or composting. The five tools are 1) obtaining written and verbal commitment to behavior change 2) prompting people to act through signs, stickers, or other visual aids, 3) creating an environment where the behavior is seen as a social norm, 4) effectively communicating to the audience through captivating information and credible sources, and 5) incentivizing the behavior change. Before any of these tools are employed, the barriers that people may have to engaging in the behavior are assessed through surveys and personal interviews. The tools are then applied to specifically tackle the barriers that people may have. For example, if the barrier to recycling is that people simply forget, then an appropriate response

would be to place a reminder prompt in visible area of the household. Results from this project indicate that a large majority of the UF respondents simply do not know behaviors that can be engaged in to protect water quality. So, the next step would be to determine what behaviors the UF community would be most likely to engage in and target them with a CBSM campaign.

The goal of environmental education is not only to produce environmentally aware citizens, but also to foster behavior change. Technology has a great potential to help alleviate some of the environmental crises that we face today, but so too does reconnecting people to the environment in such a way that makes them want to protect it. Understanding how people value, perceive, and become attached to natural places has this potential, as well as, the potential to provide a more holistic atmosphere in which management decisions can be made.

CHAPTER 4
EDUCATION AND MANAGEMENT RECOMMEDATIONS CONCERNING THE LAKE ALICE WATERSHED AT THE UNIVERSITY OF FLORIDA

Over the last few years, the University of Florida has dramatically bolstered its commitment to the environment. For example, the Office of Sustainability, officially created in 2006, has done an excellent job at educating the UF population about sustainability initiatives and environmental stewardship. The UF Clean Water Campaign has also sponsored several initiatives to help educate students about water quality on campus. Although efforts have been made to "green" the campus, relatively little has been done to educate the population about its specific natural resources. UF has a large and diverse population of students, faculty, and staff and a land area of over 1,800 acres with thirty-one natural areas. This environment is ripe with opportunities to promote the use of conservation areas and to educate the UF population about ecological sciences, water issues, and the complexities involved in natural resource management.

Based on survey results presented in this thesis, the following are some suggestions to help the University of Florida community become more aware of and attached to Lake Alice.

1) Increase passive and active recreational opportunities at Lake Alice. The results of this study indicate that increasing frequency of visits to Lake Alice can result in a higher place attachment and that a higher place attachment is positively correlated with willingness to engage in place-protective behaviors. Some specific actions that can be taken are as follows:
    a. Sponsor wildlife viewing events at Lake Alice. Almost 70% of respondents reported visiting Lake Alive for wildlife viewing, so organizing different official events would be a good way to get people to the lake.
    b. Allow for more active recreational opportunities, such as canoeing and kayaking. These are relatively unobtrusive recreations and would provide the

UF community with a great "escape," as well as, an opportunity to have a more intimate experience with lake.

2) Focus less attention on a large-scale information campaign. This study shows that knowledge alone is not a good predictor of willingness to engage in place-protective behaviors. Although educational efforts should not be completely disregarded, focusing on getting people to recreate at Lake Alice would be a better use of resources to encourage place attachment and place-protective behaviors.
3) Create a UF Water Task Force. The Office of Sustainability has committed to the creation of a Water Task Force that focuses on campus water issues, but has not yet met this goal. One of the charges of the Task Force should be to increase efforts to educate the UF population about campus water issues and to create more recreational opportunities at Lake Alice. Much of the information and resources already created by the UF Clean Water Campaign could be shared with the Task Force and Office of Sustainability.
4) Procure funding for a graduate research position that is focused on developing an education campaign. A requirement under UF's NPDES Phase II permit is that efforts should be made to increase the public's awareness of water quality issues. If an educational campaign is going to be successful, there needs to be at least one person with a vested interest in the program. As a master's project, a student interested in environmental education would gain valuable hands-on experience, as well as, provide a valuable service to the UF community. At the end of the program, its success would need to be evaluated. Based on the evaluation, the direction of the program could be continued, adapted, or radically altered.

There are multiple ways to know and experience the world around us. For example, Lake Alice may be a place to exercise for one person and a place to picnic for another. When the values and meanings that people place on natural resources are put into the political process of planning and management, then there will inevitably be winners and losers. Hopefully, the information gained through this survey provides a social context through which effective and equitable campus water management decisions can be made.

A common identity is fostered among the UF community; we are a part of the "Gator Nation." This common identity transcends academic, social, and athletic pursuits. However, based on the survey respondents knowledge of campus waters it is safe to say that being a part of the Lake Alice watershed does not factor into this common identity. The Lake Alice watershed is the common landscape that ties all of the UF community together and, in a way, its health serves as the litmus test for the University's commitment to protecting natural areas. Unfortunately, too few people know it.

APPENDIX A
SURVEY

Q1. In general, how much do you feel that you know about the following?

nothing	*only a little*	*a fair amount*	*a lot*
1	*2*	*3*	*4*

1) Major sources of pollution to our nation's waters bodies
2) The location of creeks, ponds, wetlands, and lakes on the UF campus
3) The quality of water in lakes, creeks, and wetlands on UF campus
4) Individual behaviors that can reduce water pollution

Q2. Surface water is found above the surface of the land and includes ponds, rivers, streams, lakes, wetlands, etc. Who do you think is ultimately responsible for maintaining the health of campus waters? *(Circle one.)*
1) Individuals (students, faculty, staff)
2) Campus environmental organizations
3) The city of Gainesville
4) The Physical Plant Division at UF
5) Water experts on campus
6) The University of Florida administration
7) I don't know
8) Other:_____

Q3. Are you concerned about surface water quality on campus?
1) Yes
2) No

Q4. Which of the following do you think most accurately describes the quality of surface water on the UF campus?
1) It is polluted and getting worse
2) It is polluted and staying about the same
3) It is polluted and getting better
4) It is clean and getting worse
5) It is clean and staying about the same
6) It is clean and getting better

Q5. Question 4 asks you to pick an answer that you think best describes the quality of surface water on the UF campus. Please provide any evidence of justifications for you answer to # 4.

Q6. I think the best indicator of poor surface water quality is when…(Please choose all answers that you think apply)
1) the water is colored and difficult to see through
2) there are few aquatic organisms and little aquatic vegetation present
3) there is green-colored algae floating on top of the water
4) trash is visible in the water
5) the water is foul-smelling
6) none of the above

7) other_____

Q7. On a scale of 1 to 5, indicate whether you agree or disagree with the following statements. *(Circle one answer for each statement.)*

Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	*2*	*3*	*4*	*5*

a. We are approaching the limit of the number of people the earth can support.
b. The balance of nature is very delicate and easily upset.
c. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
d. I have the power to make changes that will help improve UF campus water quality.
e. While I am concerned about UF campus water quality, I am not in the position to do much about it.
f. While I am concerned about UF campus water quality and know that individuals can make a small difference, I am more concerned about other issues and so don't devote much energy to this.

Q8. Which of the following do you think is the most common cause of pollution of streams, rivers and oceans? *(Circle one.)*
1) Dumping of garbage
2) Surface water running off yards, city streets, paved lots and farm fields
3) Trash washed into the water
4) Waste from factories
5) None of the above
6) I don't know

Q9. Many lawn fertilizers contain phosphorous which can be damaging to the environment. Which of the following do you think is the major environmental impact of phosphorus? *(Circle one.)*
1) It is poisonous to fish
2) It can kill plants
3) It promotes excessive plant and algae growth in lakes and rivers
4) It pollutes ground water
5) None of the above
6) I don't know

Q10. Which of the following do you think is one of the most important benefits of wetlands? Do they… *(Circle one.)*
1) Help to control global climate change
2) Help filter and store water before it enters a water body
3) Prevent the spread of undesirable plants and animals
4) Provide good sources of water for irrigation
5) None of the above
6) I don't know

Q11. Using the scale provided, please indicate to what extend you agree or disagree with the following statements.

Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	*2*	*3*	*4*	*5*

a. People that are important to me think that I should support water conservation efforts on campus.
b. People that are important to me think that I should engage in behaviors to protect Lake Alice from pollution.
c. To me, supporting water conservation efforts on campus is important.
d. To me, adopting personal behaviors that can help protect Lake Alice from pollution is important.

Q12. Does UF have a campus water quality monitoring program? *(Circle One)*
1) YES
2) NO
3) I don't know

Q13. Where do you think the majority of water used for irrigation at UF comes from? (*Circle one)*
1) wells
2) Lake Alice
3) reclaimed water
4) domestic (drinking) water
5) None of the above
6) I don't know

Q14. Please indicate to what extent you agree or disagree with the following statements.

Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	*2*	*3*	*4*	*5*

a. Conserving UF natural areas is important.
b. Maintaining water quality standards on the UF campus is important.
c. Using native plants in campus landscaping is important.
d. Planting and maintain trees on campus is important.
e. Installing signs to identify creeks and water bodies on campus is a good idea.
f. Educating the UF community about campus water quality is a good idea.

Q15. UF campus has storm sewers that limit flooding by draining rainwater from streets and parking lots. Where do you think most of the water entering storm sewers goes? Does it go… *(Circle one.)*
1) To a wastewater treatment plant
2) To Lake Alice
3) Into groundwater
4) None of the above
5) I don't know

Q16. A watershed is an extent of land where water from rain or snow melt drains into a particular body of water, such as a river, lake, wetland, or ocean. Different watersheds are separated by ridges, hills, or mountains. Which of the following do you think is the largest watershed on campus? *(Circle one)*
1) Hogtown Creek
2) Lake Alice
3) Bivens Arm
4) None of the above
5) I don't know

Q17. Where do you think UF's drinking water comes from: *(Circle one.)*
1) Rivers and lakes that surround UF campus
2) Lake Alice
3) Underground/ The Floridan aquifer
4) None of the above
5) I don't know

Q18. Please indicate how often you engage in the following activities

	I never do this	*I rarely do this*	*I sometimes do this*	*I often do this*	*Not Applicable*
	1	*2*	*3*	*4*	*5*
a. Take showers that are more than 5 minutes					
b. Sweep/blow grass or leaves into the street					
c. Pick up pet waste					
d. Mulch or leave grass clippings on my lawn					
e. Wash my car in the street or driveway					
f. Use a hazardous waste facility to dispose of old household waste					
g. Talk about lawn care/or landscaping with other in my neighborhood					
h. Pick up litter					
i. Let water run from my property into the street					
j. Donate to environmental groups					
k. Attend public hearings about environmental issues in the neighborhood/campus					
l. Check my car for leaks					
m. use chemicals (fertilizers, herbicides) in my yard or garden					

Q19. Do you value Lake Alice?
1) YES, automatically sent to Q20
2) NO, automatically sent to Q 22

Q20. About how many times did you visit Lake Alice last year?
1) 0
2) 1-5
3) 6-10
4) 11-15
5) 16-20
6) 20 or more

Q21. In which of the following activities do you generally participate in at Lake Alice?
1) hiking, running, biking, or walking
2) picnicking, hanging out with friends
3) exercise for pets
4) wildlife viewing
5) other_____

Q22. If you value Lake Alice, which of the following choices describes why you value it the most? You may choose more than one answer
1) Provides me with a place to exercise
2) Provides me and my pet a place to walk or run
3) Provides breeding habitat for native plants and animals, including migratory birds
4) Has aesthetic value/general beauty
5) Provides a natural area for me to explore
6) Provides me with a place to relax
7) Provides me a place to take visiting friends and family
8) I don't value Lake Alice for any reason

Q23. What prevents you from taking measures to improve campus water quality? You may choose more than one answer
1) I don't care to take these measures.
2) It's not a priority. Other issues are more important to me.
3) I would make changes, but I don't know what actions to take that will enhance campus water quality.
4) I don't have the time.
5) I have personal or physical limitations.

Q24. Do you know the names of any creeks, ponds, or lakes that are located on the UF campus, excluding Lake Alice? If so, please list all that you know.

_____
_____
_____

Q25. Please circle/click on the number that best indicates the extent to which you agree or disagree with each statement. Use the following key

1	*2*	*3*	*4*	*5*
Strongly disagree	*disagree*	*neutral*	*agree*	*strongly agree*

1) Lake Alice means a lot to me.
2) I enjoy recreating at Lake Alice more than any other lake.
3) I am very attached to Lake Alice.
4) I get more satisfaction out of recreating at Lake Alice than from visiting any other lake.
5) I identify strongly with Lake Alice.
6) I would not substitute any other lake for the types of recreation I do at Lake Alice
7) I have a special connection to Lake Alice and the people who visit it.
8) Recreating at Lake Alice is more important than doing it at any other place.

Q26. In the future, how likely are you to engage in behaviors to protect Lake Alice from pollution

1	*2*	*3*	*4*	*5*
Extremely unlikely	*unlikely*	*neutral*	*likely*	*extremely likely*

1) I will report any activity that may be harmful to Lake Alice to a person of authority
2) I will regularly check my car for leaks to help prevent oil and other contaminants from washing into Lake Alice.
3) I will pick up any trash that I see while walking around campus.
4) I will attend a clean-up at Lake Alice.
5) I will attend a presentation or special event that addresses water issue concerns on campus.

Q27. How do you USUALLY get to campus?
1) I walk
2) I bike
3) I ride a scooter/motorcycle
4) I ride the bus
5) I drive alone
6) I carpool with friend/colleagues

Q28. How have you learned about efforts to protect and improve water quality on the UF campus? Please check all that apply.
1) a class
2) a campus clean up
3) a website
4) personal friends or contacts
5) I didn't know efforts had been made to protect campus waters.

Q29. In what year were you born? _____ (A drop down menu is provided that ranges from 1935-1992.

Q30. How long have you worked/studied at UF? _____ years (A drop down menu is provided that ranges from 1-40 years.

Q31. Are you a/an
1) undergraduate living on campus
2) undergraduate living off campus
3) graduate student
4) faculty member
5) staff member

Q32. What is your gender?
1) Male
2) Female

Q33. What racial or ethnic group best describes you?
1) African American
2) American Indian
3) Asian, Asian American, or Pacific Islander
4) White or Caucasian
5) Hispanic, Latino or Spanish origin
6) Biracial or multiracial
7) Other: _____
Q34. Please indicate in which department you are housed? (A drop down menu of all departments is provided.)

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BIOGRAPHICAL SKETCH

John Linhoss earned his Bachelor of Science from Birmingham-Southern College in Birmingham, Alabama, where he studied biology and psychology. As an undergraduate, he had the opportunity to work with an assistant professor, Dr. Scot Duncan, on several fire ecology projects. During his junior and senior years, he developed a research project on the regeneration of Virginia Pine (*Pinus virginiana*) after a Southern Pine Beetle (*Dendroctonus frontalis*) outbreak in the Sipsey Wilderness Area, Alabama. Working on this project solidified his love of the natural world and his commitment to working to improve it.

After graduating from college in 2004, John spent a year in Szekesfehervar, Hungary, teaching conversational English at a college and English grammar at a high school. He then spent a year teaching high school Environmental Science and Biology at Arlington School in Birmingham, Alabama before enrolling into the School of Natural Resources and Environment at the University of Florida.