5-2016

Interaction with Water: Water-Based Outdoor Recreation and Water Quality Perception and Concern Among Residents of Utah

Matthew J. Barnett
Utah State University

INTERACTION WITH WATER: WATER-BASED OUTDOOR RECREATION AND WATER QUALITY PERCEPTION AND CONCERN AMONG RESIDENTS OF UTAH

by

Matthew J. Barnett

**Thesis submitted in partial fulfillment
of the requirements for the degree**

of

**HONORS IN UNIVERSITY STUDIES
WITH DEPARTMENTAL HONORS**

in

**Sociology
in the Department of Sociology, Social Work & Anthropology**

Approved:

Thesis/Project Advisor Dr. Douglas Jackson-Smith	**Committee Member/Advisor** Dr. Melissa Haeffner
Departmental Honors Advisor Dr. Christy Glass	**Director of Honors Program** Dr. Kristine Miller

**UTAH STATE UNIVERSITY
Logan, UT**

Spring 2016

TABLE OF CONTENTS

ABSTRACT

There are a large number of impaired water bodies in Utah, and population trends indicate that water quality impairment will become an increasingly important issue in the future. Because of education and management implications, an understanding of the social processes that drive water quality perception and concern is a matter of interest and importance. Sociodemographic characteristics and outdoor recreational activity have both been associated with environmental concern in the past. Using a Generalized Linear Modeling approach, this study explores the relationship between water-based outdoor recreation and water quality perception and concern. It is found that participation in water-based outdoor recreation increases the odds that a person will perceive the water around them positively, but also makes it more likely they will be concerned about poor water quality. Disaggregation of the recreation categories (boating, fishing, snowsports, and walking or hiking near water) reveals that different recreational specializations are associated with concern of different strengths and directionalities. Those most engaged in boating have lower levels of concern about water quality, while those who often go hiking or fishing are more concerned.

Keywords: *outdoor recreation, water quality concern, generalized linear model*

For Jim and Lillian

INTRODUCTION

Water quality impairment is a wide-ranging national concern, particularly impairment that is caused by non-point source pollution, which is widespread yet difficult to diagnose and mitigate (Brown and Froemke 2012). In Utah, like most other western states, the worst impairment tends to take place around areas of combined urban and agricultural land use (Brown and Froemke 2012)—the primary example of this type of water impairment in Utah is within the Wasatch Front region, which is where the majority of Utah's population lives (EPA 2014). Presently, Utah's waters present a moderate degree of overall impairment. Of the water bodies in Utah that had been assessed as of 2014, there were 7,007 miles of rivers and streams and 152,691 acres of lakes, rivers, and ponds that were classified as impaired by the Environmental Protection Agency (EPA 2014). Utah's population is expected to double by 2050, and this growth is expected to take place in the state's most populous counties (OLRGC 2015). This growth projection for the Wasatch Front indicates that water impairment in Utah may become a more significant problem in the future.

Several studies have noted that outdoor recreational participation is associated with preferences toward natural resource management strategies (McFarlane and Boxall 1990; Oh and Ditton 2006), and educational programs are often initiated to manage water impairment. Additionally, visual experience with water has been demonstrated to have an impact on people's perceptions concerning water quality, as well as potential management alternatives (Larson and Edsall 2010). Based on these previous findings, an understanding the social processes which drive people's water quality perception and concern is needed for the development of effective educational initiatives and water management strategies.

Water-based interactions range from practical (e.g., drinking, cleaning, and watering crops and livestock) to recreational (e.g., boating, fishing, and walking or hiking near water). This paper focuses on the latter and explores the possibility that water-based outdoor recreation may have some predictive validity regarding water quality perception and concern. I begin by exploring prior research regarding the links between outdoor recreation and environmental concern, and studies of the sociodemographic correlates of both recreation specialization and environmental concern.

STRUCTURAL DRIVERS AND CONSTRAINTS

Sociodemographic Dynamics

Several studies have found significant differences between females and males regarding participation in outdoor recreation (Humberstone 2000; Espiner, Gidlow, and Cushman 2011). Boating is a particularly gendered activity: In the 2001 Utah State Park Boater Intercept Survey, the vast majority (77%) of respondents were males (Reiter, Blahna, and Redmond 2002). Fishing has also been found to be highly gendered—a 2002 Texas study found that only 20% of licensed anglers among respondents were female (Hunt and Ditton 2002). The most prevalent snowsports activities, skiing and snowboarding, appear to be less gendered. The 2012–2013 SIA Snowsports Study found that 40% of alpine ski participants were female, and that 33% of snowboard participants were female. Previous research indicates that hiking is the least gendered of all of the outdoor recreational activities explored in this study. A Pennsylvania study found that of those respondents who reported engaging in hiking activity, 43% were female (Xie, Costa, and Morais 2008).

Age and education have also been linked to patterns of participation in outdoor recreation. Increasing age has been associated with reduced participation in outdoor recreation

across the board, but this drop in activity is less pronounced for walking and hiking (Cordell, Lewis, and McDonald 1995). In general, higher levels of educational attainment have been associated with a greater degree of participation in outdoor recreation, although these associations can vary by type of recreation (Reeder and Brown 2005).

People who recreate less frequently, such as women, minorities and low-income households, may be impeded by structural factors. Johnson et al. (2001) found that of three marginalized groups in America—African-Americans, women, and rural residents—women were the most likely to feel constrained by things such as personal safety concerns, inadequate information and facilities, and insufficient funds. They also found that while African-Americans felt that personal safety concerns inhibited their ability to participate in outdoor recreational activities, rural residence was not an important factor in predicting the likelihood of individuals perceiving constraints to participation in outdoor recreation.

Given the links between sociodemographic characteristics and participation in recreation, any associations between recreational activity and environmental attitudes may simply reflect the different characteristics of the participants. Fortunately, there have been many studies linking sociodemographic characteristics and levels of environmental concern, though results have been somewhat inconsistent. Van Liere and Dunlap (1980) found that sociodemographic variables (gender, age, and educational attainment) were limited in their power to predict variation in levels of environmental concern. Samdahl and Robertson (1989) came to a similar conclusion, although they found that political orientation (specifically pro-regulatory liberalism) was a significant predictor of support for environmental regulations. Regarding gender, Xiao and McCright (2007) found that females tend to report higher levels of environmental concern, which they attribute to gender differences in risk perception.

Both age and educational attainment have been associated with environmental concern. In regards to age, this relationship has usually been noted as being negative: common research suggests that as a person gets older, they tend to become less environmentally concerned (Arcury, Thomas A., and Eric H. Christianson 1990; Jones and Dunlap 1992). However, this relationship has appeared to change as the baby boom generation ages, and more recent studies find consistent positive relationships between age and environmental concern (Liu, Vedlitz, and Shi 2014). Although the relationship between educational attainment and environmental concern has typically been described as less significant than the age-concern relationship, more highly-educated people have consistently reported a higher level of concern in most studies (Dietz, Stern, and Guagnano 1998; Liu, Vedlitz, and Shi 2014).

Recreation Specialization

The concept of 'recreation specialization' has been used to describe the way that diverse forms of recreational activity may reflect the values, attitudes, and beliefs of participants. Drawing on previous work by Devall (1973) which explained leisure activity from an interactionist perspective, recreation specialization was initially defined by Bryan (1977:175) as "a continuum of behavior from the general to the particular reflected by the equipment and skills used in the sport and activity setting preferences". This theoretical framework has been applied in numerous research settings, most often exploring differences among participants in diverse outdoor recreational activities such as boating, vehicle-based camping, rock climbing, and fishing (Donnelly, Vaske, and Graefe 1986; McIntyre and Pigram 1992; Merrill and Graefe 1996; Sals and Loomis 2005).

Dunlap and Heffernan (1975) were some of the first to investigate the relationship between different types of outdoor recreation and environmental concern. They did this using

five separate recreational categories—camping, hiking, visiting parks, fishing, and hunting. Based on previous work by Hendee (1969), in which a distinction between 'appreciative', or low-resource utilization activities (camping, hiking, and visiting parks), and 'consumptive', or high-resource utilization activities (fishing and hunting), Dunlap and Heffernan hypothesized that appreciative outdoor recreational activities would be more strongly associated with environmental concern than consumptive activities. This hypothesis was supported by their analysis: they found that the activities that they'd deemed as appreciative were associated with higher levels of environmental concern while the activities deemed as consumptive were associated with lower levels of concern, and in the case of hunting, a negative relationship with certain items such as concern towards air and water pollution.

The Dunlap-Heffernan hypothesis has been frequently revisited by researchers, which have produced mixed support for their distinction between appreciative and consumptive activities. A restudy conducted the following year concluded that age, educational attainment, and place of residence were responsible for most of the observed variation in environmental concern (Geisler 1977). Another restudy used a multivariate model which included age, educational attainment, and residence (and not recreation) found that total explained variances were small and that recreational activity was one of the weakest predictors of environmental concern (Piney and Grimes 1979). Later studies have often shifted the focus from environmental concern to pro-environmental behavior. Tarrant and Green (1999) found that outdoor recreational activities were positively associated with pro-environmental behaviors across the board, with hiking having a slightly stronger correlation with pro-environmental behaviors than fishing.

Moving beyond the spectrum of appreciation/consumption, research has also demonstrated a difference in environmental attitudes between participants in motorized versus non-motorized outdoor recreation. A higher frequency of ATV activity among recreationists in Newfoundland was found to correspond with a lower level of concern about environmental degradation (Waight and Bath 2014). Recreational specializations can also be quite diverse. Boating, as a recreation specialization, consists of both motorized and non-motorized activities, as well as activities that vary from consumptive to appreciative (e.g. fishing from a boat vs. kayaking). Beardmore (2015) found that different types of boating (e.g. sightseeing, fishing, water-skiing, and kayaking) are associated with coherent subgroups that have varying focuses and levels of environmental concern.

DATA AND METHODS

The Utah Water Survey

This study utilizes data from the Utah Water Survey, which was conducted as part of the larger iUTAH (innovative Urban Transitions and Aridregion Hydro-sustainability) initiative. iUTAH is a five-year interdisciplinary research program funded by the National Science Foundation which has brought together researchers, universities, governmental agencies, industry partners, and non-profit organizations in order to develop a base of scientific knowledge geared towards ensuring Utah's water future. The three primary goals of the iUTAH initiative are: to measure the relationships between water and ecosystems; to assess water use behaviors and decisions, and how these influence the urban environment; and to establish uniform data sets to understand the connections between human and environmental water systems.

The Utah Water Survey is a questionnaire administered on iPads at grocery stores in major population centers across the state of Utah from fall 2014 to the present. Teams of students

from universities across the state were recruited and trained to approach adult shoppers as they entered grocery stores and ask them to participate in the brief survey. Grocery stores were selected to represent a range of different store types and community locations within the most urbanized areas in Utah. I actively participated in research teams that collected survey data at a number of stores across the Wasatch Front.

The survey included questions about a respondent's perceptions and concerns about water issues, frequency of water-related behaviors (including lawn-watering behavior and frequency of participation in water-based outdoor recreation), and a set of standard sociodemographic items (including age, gender, educational attainment, and Utah nativity).

To ensure that respondents were representative of the people over the age of 18 who entered each sampled grocery store, team members also tracked the gender composition of each adult entering the store. Results indicate that the proportion of women in the shopping population (53.5%) and respondent pool (52.9%) are very similar, which suggests that sampling and response bias are not serious problems. The field teams also tracked refusals and disqualifications (e.g., people who were approached but who indicated they had already filled out the survey or were not residents of Utah). Based on these data, we estimated that the Utah Water Survey had 6,891 usable cases with an overall response rate of 40.6%. As noted below, the respondents to the Utah Water Survey largely reflect demographic characteristics of Utah's adult population.

Dependent Variables

In the present analyses, two blocks of questions were used to measure the water quality perceptions and concerns of respondents. Perceptions of water quality were measured using items asking survey participants to rate the quality of four types of water in their community:

groundwater, drinking water, water in nearby mountain rivers and lakes (upstream), and water in streams and rivers located downstream of the respondent's community. Responses were measured using five-point Likert-type scales where answers ranged from 'very bad' to 'very good' ('not sure' was also included as a response option). Respondents were most likely to say they were 'not sure' with respect to drinking water quality (where 28% chose this option, compared to 2-16% for the other items). In the analyses below, 'not sure' responses were recoded to the neutral scale midpoint of 'neither good nor bad.' Since answers on these items were highly correlated, the four water quality perception items were then combined into a single additive index (with a Cronbach's alpha of 0.732, indicating strong reliability and internal consistency). This index variable for water quality perception is used in the analyses reported below.

To measure concern about poor water quality, I used a question that asked respondents how concerned they were about impaired water quality in their community over the next ten years. This item was included in a block of ten related questions that captured levels of concern about different issues using a similar five-point Likert-type set of answer options ranging from 'not at all concerned' to 'very concerned'.

Independent Variables

The independent variables used in the present analyses include measures of several sociodemographic characteristics and frequency of participation in water-based outdoor recreation. The respondent characteristics used in this analyses include: gender and being originally from Utah (both measured dichotomously); age, measured categorically in ten-year increments ('18–29', '30–39', '40–49', '50–59', and '60 and over'); and educational attainment,

also measured with five answer categories ('some high school or HS diploma/GED', 'some college and/or vocational/tech degree', '4-year college degree' and 'graduate degree').

Participation in water-based outdoor recreational activities was measured using four questions that asked how frequently the respondent participated in four types of water-based outdoor recreation: boating, fishing, snowsports, and walking or hiking near water. Answers were captured using a four-point scale (ranging from 'never', 'rarely', 'sometimes' and 'often'). I also constructed an aggregate index of water-based outdoor recreation which consists of the sum of each of the individual recreation items (Cronbach's alpha = 0.706). In the analyses presented below, I explore whether a single omnibus measure of water-based outdoor recreational activity (per se) produces different results than using four separate indicators of participation in each different type of activity.

Analytical Strategy

Version 23 of IBM's Statistical Package for the Social Sciences (SPSS) was used to facilitate the present analyses. First, descriptive statistics and bivariate correlations were used to gain a better understanding of the characteristics of Utah's adults (Table 1) and the strength and direction of bivariate relationships between the variables (Table 2). Because the relevant variables are a combination of dichotomous nominal variables and nonparametric ranked variables, Spearman's rank correlation coefficients were used for the correlation matrix.

In order to assess the odds that participation in water-based outdoor recreation is associated with perceptions of water quality and levels of concern about impaired water quality, in conjunction with in which sociodemographic characteristics are associated with these attitudes, a Generalized Linear Modeling (GLM) approach was used. Because my dependent variables consisted of ordinal scales with categorical values, I elected to use ordered logistic

regression (OLR) techniques. Three OLR models were created for each of the two dependent variables. In both cases, the first model represented a control model to illustrate the degree to which variation in the dependent variables could be explained by respondent sociodemographic characteristics. The second and third models tested whether adding indicators for participation in water-based outdoor recreation were related and significantly improved the ability to explain variation in water quality perceptions and concerns. Model 2 uses the aggregated recreation index, while model 3 drops the recreation index and incorporates the four measures of participation in separate types of water-based outdoor recreation.

RESULTS

Descriptive statistics for the independent variables used in the present analyses are shown in Table 1, as is a comparison with U.S. Census data for Utah (for those variables in which a commensurate U.S. Census measure exists). Of the shoppers surveyed, 47.7% of

Of the shoppers surveyed, 47.7% of respondents indicated that they were female while 58.3% indicated that they were originally from Utah. Those who responded tended to indicate a higher level of educational attainment than the overall Utah population, as indicated by U.S. Census data. While 18.1% of respondents reported having obtained a graduate degree, and over 85% reported that they have attended at least some college, 14.7% of the respondents reported having attended some high school or obtaining a high school diploma. The reported age distribution of survey respondents is largely proportionate with the U.S. Census data.

In aggregate (as measured by the recreation index), a moderate level of recreational frequency was reported by survey respondents. The mean score of water-based outdoor recreational participation as measured by the recreation index (on a 16-point scale) was 9.26. With a mean score of 3.1 (on a four-point scale), walking or hiking near water was reported as the most commonly engaged-in of all of the recreational specializations included in this study—

Table 1. Descriptive Statistics and Census Data Comparison for Independent Variables

VARIABLE	CODING/DESCRIPTION	SURVEY PERCENTAGE	CENSUS PERCENTAGE[2]	MEAN	SD
Female	0 = No	47.1%	50.2%		
	1 = Yes	52.9%	49.8%		
Utah nativity	0 = No	41.7%			
	1 = Yes	58.3%			
Age	1 = 18-29	25.4%	28.9%		
	2 = 30-39	22.3%	20.8%		
	3 = 40-49	17.6%	16.3%		
	4 = 50-59	15.8%	15.1%		
	5 = 60 and over	18.9%	18.8%		
Educational attainment	1 = Some high school or HS diploma/GED	14.7%	33.9%		
	2 = Some college and/or vocational/tech degree	38.8%	36.8%		
	3 = 4 year college degree	28.4%	19.9%		
	4 = Graduate degree	18.1%	9.4%		
Boating	1 = Never	41.3%		1.96	0.98
	2 = Rarely	30.3%			
	3 = Sometimes	19.8%			
	4 = Often	8.6%			
Fishing	1 = Never	36.7%		2.15	1.07
	2 = Rarely	25.5%			
	3 = Sometimes	24.3%			
	4 = Often	13.5%			
Snowsports	1 = Never	40.3%		2.08	1.08
	2 = Rarely	25.1%			
	3 = Sometimes	20.7%			
	4 = Often	13.9%			
Hiking	1 = Never	9.1%		3.10	0.94
	2 = Rarely	11.7%			
	3 = Sometimes	39.1%			
	4 = Often	40.1%			
Combined recreation index[1]	0-16 = Composite variable for all water-based outdoor recreation categories			9.26	2.97

Notes:

[1] The measure of internal consistency for items in the combined recreation index is (α = .706).

[2] Census percentages were taken from 2010 U.S. Census data estimates for Utah.

over 40% of respondents indicated that they walk or hike near water often. Conversely, boating was the least frequently engaged in activity as reported by respondents, with a mean score of 1.96 and only 8.6% of respondents indicating that they participate in boating activity 'often'. Fishing and boating had similar distributions of frequency, with mean scores of 2.15 and 2.08, respectively, and 13.5% and 13.9% of respondents reporting engaging in the activities 'often', respectively.

In comparison with other environmental concern items included on the Utah Water Survey, respondents reported a moderately high level of concern about poor water quality (see Figure 1), with 55.8% of respondents indicating a score of four or above on the five-point scale. While respondents were much more concerned about poor water quality than flooding, they were less concerned about water quality as compared to climate change (with 56.6% of respondents indicating a score of four or above for the climate change item), although they were more likely to report that they were 'not at all concerned' about climate change (13.1% as compared to 6.4% for poor water quality). Of the four environmental concern items featured in Figure 1, respondents were most galvanized toward concern about air pollution, with 77.4% indicating a score of four or above.

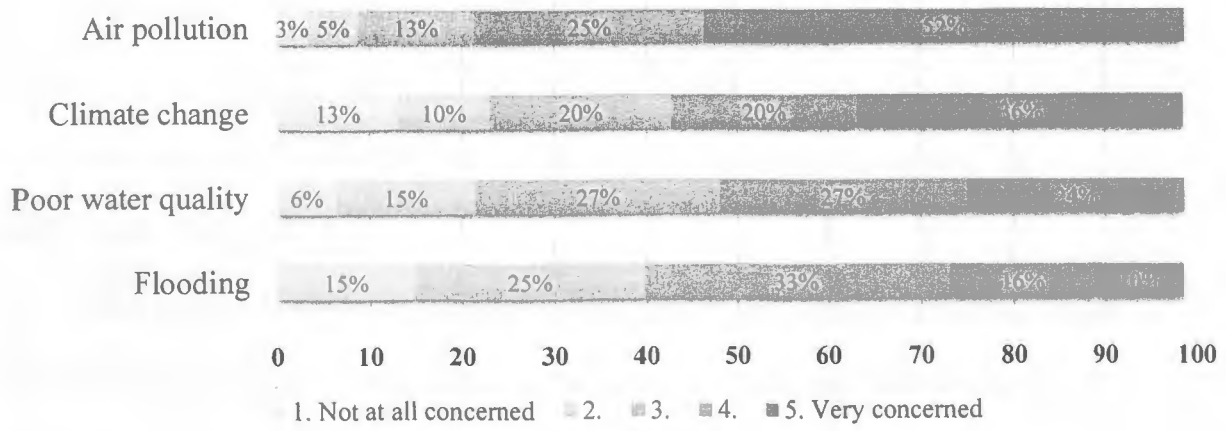

Figure 1. Comparison of Selected Environmental Concern Items

Respondents tended to report a positive perception of drinking water quality—nearly 70% of respondents indicated a rating of four or higher for drinking water (see Figure 2). As to groundwater ratings, a score of three ('neither good nor bad') was the most common response (51.9%). Comparing upstream ratings to downstream ratings, the former tended to be more positive, with 59.6% of respondents indicating a rating of four or above, as compared to 39.9% for downstream water.

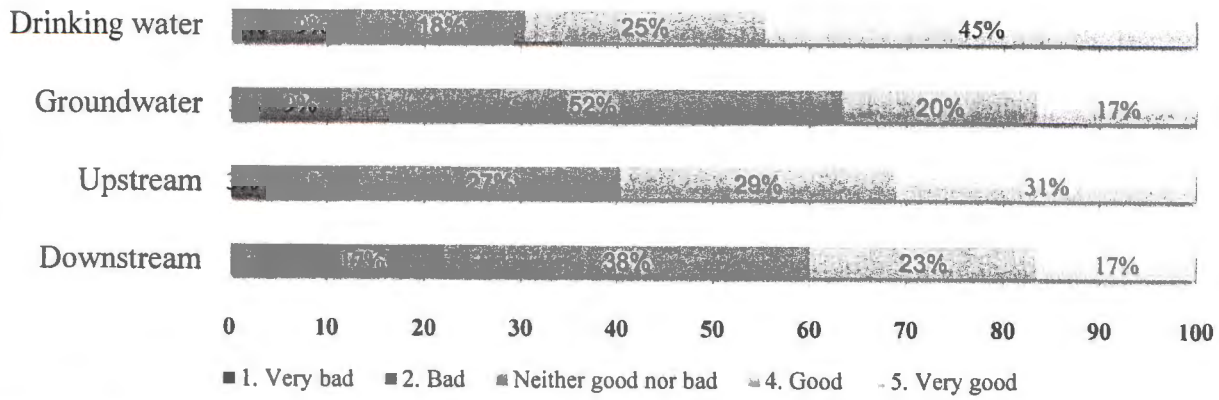

Figure 2. Water Quality Perception Ratings

Bivariate Findings

A correlation matrix for all study variables is presented in Table 2. Females participate in water-based outdoor recreation less frequently than do males—this association is strongest for boating and weakest for walking or hiking near water. Females are less likely to rate water quality positively than males—this association holds true for all water quality rating categories. Females are also more likely than males to report a higher level of concern about poor water quality in the future.

Utah nativity is positively correlated with water-based outdoor recreation overall, as indicated by the Spearman rank coefficient for the recreation index, and with each of the individual specializations included in the present study (with the exception of snowsports). Utah

nativity is positively associated with all water quality perception items, but is negatively associated with concern about poor water quality. Age is negatively correlated with participation in water-based outdoor recreation across the board, but is positively associated with drinking water, groundwater, upstream, and downstream perception. Educational attainment is not significantly correlated with boating, but presents a negative association with fishing and positive associations with both snowsports and walking or hiking near water

Generalized Linear Models

Table 3 presents the GLM regression models for both the water quality perception index and water quality concern, as well as the measures of fit for each of these models. For model 1, all of the sociodemographic factors (female, Utah nativity, age, and educational attainment) act as the predictors and the water quality perception index and water quality concern act as the outcome variables. The odds ratios presented in the table indicate that females are much less likely than males to perceive water quality positively. Utah natives, meanwhile, have higher odds of reporting a positive perception of the water in their communities. An increase in age is associated with positive perception, although this effect drops slightly at the '60 and over' level. Similarly, an increase in educational attainment increases the odds of a positive perception rating, but this drops slightly between the 'four-year degree' and 'graduate degree' levels.

Model 1 for water quality concern presents, in many ways, a mirrored story to that of water quality perception. Females show greater odds of being concerned than males, and Utah nativity is associated with a lower odds ratio for water quality concern. The only significant odds ratio for age lies within the '40-49' category, which shows moderately higher odds for concern about poor water quality. A higher level of educational attainment is associated increased higher

Table 2. Spearman Correlation Matrix for all Variables

	F	UN	A	E	B	FI	S	H	RI	DW	G	U	D	WQPI	WC
Female	–														
Utah nativity	.020	–													
Age	.023	-.083**	–												
Educational attainment	-.075**	-.136**	.180**	–											
Boating	-.091**	.126**	-.195**	-.019	–										
Fishing	-.132**	.134**	-.146**	-.091**	**.474****	–									
Snowsports	-.116**	.000	-.194**	.125**	**.471****	**.325****	–								
Hiking	-.031**	.030*	-.178**	.117**	.283**	.290**	**.414****	–							
Combined recreation index	-.128**	.100**	-.242**	.047**	**.759****	**.721****	**.766****	**.643****	–						
WQ perception: drinking water	-.078**	.050**	.135**	.143**	.041**	-.009	.040**	.046**	.040**	–					
WQ perception: Groundwater	-.106**	.058**	.059**	.079**	.076**	.038**	.049**	.011	.058**	**.454****	–				
WQ perception: Upstream	-.112**	.031*	.057**	.093**	.071**	.037**	.072**	.067**	.085**	**.302****	**.389****	–			
WQ perception: Downstream	-.121**	.052**	.082**	.109**	.089**	.037**	.065**	.038**	.078**	**.685****	**.719****	**.765****	–		
WQ perception: combined index[1]	-.050**	.025*	-.006	.008	.069**	.028*	.023	-.017	.035**	.282**	**.411****	**.582****	**.763****	–	
WQ Concern	.092**	-.070**	.006	-.053**	-.029*	.023	.008	.064**	.019	**-.327****	-.255**	-.198**	**-.343****	-.229**	–

* = $p < 0.05$; ** = $p < 0.01$

Notes:

Coefficients larger than 0.3 are shown in bold.

[1] The WQ perception index contains the sum of upstream, downstream, groundwater, and drinking water ratings (0-16; $\alpha = .732$). Individual items are ordinal rankings of water quality, ranging from 'very bad' (1) to 'very good' (5). 'Not sure' (0) was also included as an option. 'Not sure' responses were recoded as 'neither good nor bad' (3) to correct for missing data.

odds of being concerned about water quality, especially for respondents in the 'four-year degree' level.

As the recreation index is added in model 2 for both water quality perception and water quality concern, it becomes clear that the effects of water-based outdoor recreation and sociodemographic characteristics act largely independent of each other. Regarding water quality perception, the effect of belonging to the '60 and over' age category become more pronounced, but the majority of the odds ratios for the sociodemographic factors remain largely unchanged. The story is similar for concern about poor water quality, as the addition of the recreation index to the model leaves the sociodemographic effects largely unchanged. The addition of the recreation index improves the measures of fit and shows an increase in the odds for both positive water quality perception (1.044, $p < 0.01$) and concern about poor water quality (1.030, $p < 0.01$). This indicates that for every increase of one point on the 16-point recreation index scale, the odds ratios for water quality perception and concern about poor water quality increase by roughly 4.4% and 3%, respectively.

In model 3 for both the water quality perception index and concern about poor water quality, each of the recreation specializations was added to the model individually. Once again, no major changes in the odds ratios of the sociodemographic factors can be seen. An increase of frequency in boating activity is associated with a higher odds ratio for positive water quality perception. Walking or hiking near water is also associated with increased odds for positive water quality perception, but the effect is less pronounced than that of boating and drops off slightly between the 'sometimes' and 'often' levels.

In regards to concern about poor water quality, more frequent participation in boating activity is associated with lower odds of being concerned, while an increase in the frequency of

Table 3. Generalized Linear Models: Water Quality Perception and Concern

	WQ PERCEPION INDEX[1]			WQ CONCERN[2]		
FACTOR	MODEL 1	MODEL 2	MODEL 3	MODEL 1	MODEL 2	MODEL 3
Female	.658**	.680**	.676**	1.387**	1.418**	1.407**
Utah nativity	1.308**	1.275**	1.263**	.751**	.740**	.748**
Age[3]						
30-39	1.054	1.071	1.072	1.029	1.039	1.040†
40-49	1.200**	1.217**	1.212**	1.178*	1.190*	1.208**
50-59	1.406**	1.461**	1.466**	1.066	1.093	1.060
60 and over	1.374**	1.513**	1.535**	.992	1.059	1.053
Education[4]						
Some college	1.302**	1.284**	1.269**	.801**	.794**	0.793**
4-year degree	1.760**	1.705**	1.687**	.666**	.653**	0.645**
Graduate degree	1.632**	1.587**	1.579**	.707**	.695**	0.675**
Recreation Index		1.044**			1.030**	
Boating[5]						
Rarely			1.188**			.916
Sometimes			1.417**			.794**
Often			1.502**			.796*
Fishing[5]						
Rarely			.971			1.065
Sometimes			.946			1.125†
Often			.894			1.288**
Snowsports[5]						
Rarely			1.037			.989
Sometimes			1.083			1.061
Often			.979			1.073
Hiking[5]						
Rarely			1.069			.995
Sometimes			1.278*			.992
Often			1.191†			1.334**
MEASURES OF FIT:						
LR CHI-SQUARE	241.2	270.9	306.4	128.1	141.4	193.0
LOG LIKELIHOOD	-13,295.1	-13,280.2	-13,262.5	-7,636.5	-7,629.8	-7,604.0
AIC	26,640.2	26,612.5	26,599.1	15,298.9	15,287.7	15,258.1
BIC	26,809.5	26,788.5	26,849.5	15,387.0	15,382.5	15,427.5

† = $p < 0.1$; * = $p < 0.05$; ** = $p < 0.01$

Notes:

[1] The WQ Perception index contains the sum of upstream, downstream, groundwater, and drinking water ratings (0-16; α = .732). Individual items are ordinal rankings of water quality, ranging from 'very bad' (1) to 'very good' (5). 'Not sure' (0) was also included as an option. 'Not sure' responses were recoded as 'neither good nor bad' (3) to correct for missing data.

[2] 'WQ concern' is an ordinal variable coded from '0 = 'not at all concerned' to '5 = 'very concerned'.

[3] Reference category for age: '18-29'.

[4] Reference category for education: 'some high school/high school graduate'.

[5] Reference category for recreation items: 'never'.

participation in fishing is associated an increase in odds of being concerned. The effect for walking or hiking near water in this model remains insignificant up to the 'often' level, at which point the odds ratio for concern about poor water quality becomes significantly higher (1.334, $p < 0.01$). Snowsports are not shown to significantly impact the odds ratios of either of the outcome variables.

Each of the recreation specializations were added individually in lieu of the recreation index in model 3. Once again, no major changes in the odds ratios of the sociodemographic factors can be seen. Meanwhile, each of the activities presents different odds ratios for both water quality perception and concern about poor water quality. An increase of frequency in boating activity is associated with a higher odds ratio for positive water quality perception. Walking or hiking near water is also associated with increased odds for positive water quality perception, but the effect is less pronounced than that of boating and drops off slightly between the 'sometimes' and 'often' levels.

Increasing participation in boating activity is associated with lower odds of being concerned about poor water quality, while an increase in the frequency of participation in fishing is associated an increase in the odds of being concerned. The effect for walking or hiking near water in this model remains insignificant up to the 'often' level, at which point the odds ratio for concern about poor water quality becomes significantly higher (1.334, $p < 0.01$). Snowsports are not shown to significantly impact the odds ratio for either of the outcome variables.

DISCUSSION AND CONCLUSIONS

The results from the regression analyses discussed above clearly indicate that there is an association between water-based outdoor recreation activity and increased odds of a more positive water quality perception. Additionally, these analyses also suggest that, based on the

category, water-based outdoor recreational activity is associated with both increased and decreased odds relating to concern about poor water quality, although the net effects as measured by the recreation index is positive. These findings are both empirical and practical in nature.

Studies investigating outdoor recreation and environmental concern have tended to focus on how activities are associated with environmental concern as a broad, canopy concept, and have paid little attention to the way that interaction with the natural resource associated with the individual aspects of concern; in this case, water, is associated with the odds of perception and concern, both in terms of strength and direction. The findings presented in this study highlight the highly nuanced nature of social science research which focuses on outdoor recreation and environmental concern. This research also contributes to a body of literature that is highly explored, but still ultimately incomplete. Because of the relationship between water quality perception and preferences toward management strategies, more research on the social drivers of water quality perception and concern is not only needed to fill the gaps extant in the literature on the subject, but will be useful in assisting the development of socially and environmentally sustainable education and management practices (McFarlane and Boxall 1990; Oh and Ditton 2006).

Because the measures of fit improve between the control models and the recreational models—the log likelihood chi-square increases and the log likelihood, Akaike information criterion (AIC), and Bayesian information criterion (BIC) all decrease between model 1 and model 2 for both dependent variables—it can be carefully assumed that water-based outdoor recreation has some predictive validity in regards to the odds to which participants are likely to perceive water quality positively or negatively or be concerned about poor water quality.

The results described above indicate that not only does recreational specialization acts as a significant predictor of water quality perception and concern, but also (as noted by Dunlap and Heffernan in 1975) that the specific type of recreational participation matters, as the various individual recreation specializations explored in this study present differing significance, strength, and directional relationships with water quality perception and concern. For example, while boating activity is associated with higher odds for more positive perception and a lower level of concern, fishing is associated with higher odds for positive perception and a higher level of concern about poor water quality.

Contrary to previous studies which have investigated the drivers of environmental concern, results from these analyses suggest that education is actually negatively associated with concern about poor water quality among residents of Utah. Barring this difference, the rest of the sociodemographic items investigated during these analyses follow the trends that one would expect based on previous research. Consistent with the findings from Xiao and McCright (2007), females were found to be significantly more concerned about poor water quality. The positive effect noted between increasing age and environmental concern (in this case, concern about poor water quality) in recent studies is also supported by the data, as the odds ratios for concern in all of the GLM models increase significantly as respondent age increases (Liu, Vedlitz, and Shi 2014).

These findings, in conjunction with the inherent limitations of survey-based research, raise two important questions: To what degree is the association between water-based outdoor recreation and water quality perception and concern driven by the interaction with water that recreation provides? Moreover, to what degree does recreational specialization create a distinct subcultural space in which perception and concern are influenced? These questions are

unanswerable with the macro-level methodology utilized in this study, and should be addressed in the future using qualitative and mixed-method approaches.

Further disaggregation of the recreational categories discussed in this paper may be useful in future studies. Each of the recreational categories in the Utah Water Survey can be broken down into distinct subcategories (e.g., powerboating and kayaking for boating; snowmobiling vs. skiing for snowsports). Although snowsports did not act significantly in the regression analyses, there are a large number of highly idiosyncratic activities included under the umbrella of snowsports which could, potentially, present very different odds ratios when measured individually.

Although boating is comprised of a number of diverse activities, and it may be useful to explore these distinctions in future research, a survey of registered boater owners in Utah conducted found that 84.2% of registered boats were classified as open motorboats, personal watercraft, or cabin motorboats (Spain, Reiter, Blahn, and Burr 2007). Boating, an activity which is largely motorized in Utah, is associated with a lower level of concern about poor water quality (.796, $p < 0.05$), while each of the other activities (excluding snowsports, which is not significant within the GLM models) are largely non-motorized in nature and are associated with higher odds for concern about poor water quality. The results presented in this paper indicate that the distinction between motorized and non-motorized water-based activity may be worth noting when the associations discussed in this paper are explored in future research.

REFERENCES

Arcury, Thomas A., and Eric H. Christianson. 1990. "Environmental Worldview in Response to Environmental Problems: Kentucky 1984 and 1988 Compared." *Environment and Behavior* 22(3): 387-407.

Beardmore, Ben. 2015. "Boater Perceptions of Environmental Issues Affecting Lakes in Northern Wisconsin." *Journal of the American Water Resources Association* 51(2): 537-549.

Brown, Thomas C., and Pamela Froemke. 2012. "Nationwide Assessment of Nonpoint Source Threats to Water Quality." *BioScience* 62(2): 136-146.

Bryan, Hobson. 1977. "Leisure Value Systems and Recreational Specialization: The Case of Trout Fishermen." *Journal of Leisure Research* 9(3): 174-187.

Cordell, H. Ken, Burt Lewis, and Barbara L. McDonald. 1995. "Long-term Outdoor Recreation Participation Trends." Proceedings of the Fourth International Outdoor Recreation Tourism Trends Symposium.

Devall, Bill. "The Development of Leisure Social Worlds." *Humboldt Journal of Social Relations* (1973): 53-59.

Dietz, Thomas, Paul C. Stern, and Gregory A. Guagnano. 1998. "Social Structural and Social Psychological Bases of Environmental Concern." *Environment and Behavior* 30(4): 450-471.

Donnelly, Maureen P., Jerry J. Vaske, and A. R. Graefe. 1986. "Degree and Range of Recreation Specialization: Toward a Typology of Boating Related Activities." *Journal of Leisure Research* 18(2): 81-95.

Dunlap, Riley E. and Robert Bruce Heffernan. 1975. "Outdoor Recreation and Environmental Concern: An Empirical Examination." *Rural Sociology* 40(1): 18-30.

EPA. 2014. "Utah Water Quality Assessment Report". United States Environmental Protection Agency.

Espiner, Stephen, Bob Gidlow, and Grant Cushman. 2011. "Outdoor Recreation and Gendered Space: The Case of Men's Enthusiasms for Hunting, Fly-fishing and Scuba Diving." *Annals of Leisure Research* 14(2-3): 176-193.

Geisler, Charles C. 1977. "Outdoor Recreation and Environmental Concern: A Restudy." *Rural Sociology* 42(2): 241-249.

Hendee, John C. 1969. "Appreciative Versus Consumptive Uses of Wildlife Refuges: Studies of Who Gets What and Trends in Use." *Transactions of the North American Wildlife and Natural Resources Conference*. Vol. 34.

Humberstone, Barbara. 2000. "The 'Outdoor Industry' as Social and Educational Phenomena: Gender and Outdoor Adventure/Education." *Journal of Adventure Education & Outdoor Learning* 1(1): 21-35.

Hunt, Kevin M., and Robert B. Ditton. 2002. "Freshwater Fishing Participation Patterns of Racial and Ethnic Groups in Texas." *North American Journal of Fisheries Management* 22(1): 52-65.

Johnson, Cassandra Y., Bowker, J. Michael J. Bowker, and H. Ken Cordell. 2001. "Outdoor Recreation Constraints: An Examination of Race, Gender, and Rural Dwelling." *Southern Rural Sociology* 17(1): 111-133

Knopp, Timothy B., and John D. Tyger. 1973. "A Study of Conflict in Recreational Land Use: Snowmobiling vs. Ski-touring." *Journal of Leisure Research* 5(3): 6.

Larson, Kelli L., and Robert M. Edsall. 2010. "The Impact of Visual Information on Perceptions of Water Resource Problems and Management Alternatives." *Journal of Environmental Planning and Management* 53(3): 335-352.

Liu, Xinsheng, Arnold Vedlitz, and Liu Shi. 2014. "Examining the Determinants of Public Environmental Concern: Evidence from National Public Surveys." *Environmental Science & Policy* 39(1): 77-94.

McFarlane, Bonita L., and Peter C. Boxall. 1990. "Exploring Forest and Recreation Management Preferences of Forest Recreationists in Alberta." *The Forestry Chronicle* 72(6): 623-629.

McIntyre, Norman, and J. J. Pigram. 1992. "Recreation Specialization Reexamined: The Case of Vehicle-based Campers." *Leisure Sciences 14.1* (1992): 3-15.

Merrill, Kurt, and Alan Graefe. 1996. "The Relationship Between Activity Specialization and Preferences for Setting and Route Attributes of Selected Rock Climbers." Ph.D. dissertation, Outdoor Program, Pennsylvania State University.

Mowen, Andrew J., Daniel R. Williams, and Alan R. Graefe. 1997. "Specialized Participants and their Environmental Attitudes: Re-examining the Role of "Traditional" and Psychological Specialization." *General Technical Report-Northeastern Forest Experiment Station, USDA Forest Service* NE-232: 134-138.

Jones, Robert Emmet, and Riley E. Dunlap. "The Social Bases of Environmental Concern: Have They Changed Over Time?" *Rural Sociology* 57(1): 28-47.

Oh, Chi-Ok, and Robert B. Ditton. 2006. "Using Recreation Specialization to Understand Multi-Attribute Management Preferences." *Leisure Sciences* 28(4): 369-384.

OLRGC. 2015. "Population and Demographic Trends in Utah: Growing, Concentrating, Diversifying, Aging." Office of Legislative Research and General Council.

Pendleton, Linwood, Nicole Martin, and D. G. Webster. 2001. "Public Perceptions of Environmental Quality: A Survey Study of Beach Use and Perceptions in Los Angeles County." *Marine Pollution Bulletin* 42(11): 1155-1160.

Pinhey, Thomas K., and Michael D. Grimes. 1979. "Outdoor Recreation and Environmental Concern: A Reexamination of the Dunlap-Heffernan Thesis." *Leisure Sciences* 2(1): 1-11.

Reeder, Richard J., and Dennis M. Brown. 2005. *Recreation, Tourism, and Rural Well-being* (No. 7). Washington, DC: US Department of Agriculture, Economic Research Service.

Reiter, Doug, Dale Blahna, and Mert Redmond. 2002. "A Summary Report: 2001 Utah State Park Boater Intercept Survey". Utah Department of Natural Resources, Division of Parks and Recreation.

Salz, Ronald J., and David K. Loomis. 2005. "Recreation Specialization and Anglers' Attitudes towards Restricted Fishing Areas." *Human Dimensions of Wildlife* 10(3): 187-199.

Samdahl, Diane M., and Robert Robertson. 1989. "Social Determinants of Environmental Concern Specification and Test of the Model." *Environment and Behavior* 21(1): 57-81.

SIA. 2013. "SIA Snowsports Participant Study". Snowsports Industries America/Physical Activity Council.

Spain, William, Doug Reiter, Dale Blahn, and Steve Burr. 2007. "Recreational Water Use Issues and Regional Planning on Utah's Lakes and Reservoirs." Logan, UT: Institute for Outdoor Recreation and Tourism, Utah State University.

Tarrant, Michael A., and Gary T. Green. 1999. "Outdoor Recreation and the Predictive Validity of Environmental Attitudes." *Leisure Sciences* 21(1): 17-30.

Thorpe, Holly. 2005. "Jibbing the Gender Order: Females in the Snowboarding Culture." *Sport in Society* 8(1): 76-100.

Waight, Celina F., and Alistair J. Bath. 2014. "Recreation Specialization among ATV Users and Its Relationship to Environmental Attitudes and Management Preferences on the Island of Newfoundland." *Leisure Sciences* 36(2): 161-182.

Xiao, Chenyang, and Aaron M. McCright. 2007. "Environmental Concern and Sociodemographic Variables: A study of statistical models." *The Journal of Environmental Education* 38(2): 3-14.

Xiao, Chenyang, and Aaron M. McCright. 2012. "Explaining Gender Differences in Concern about Environmental Problems in the United States." *Society & Natural Resources* 25(11): 1067-1084.

Xie, Hui, Carla A. Costa, and Duarte B. Morais. 2008. "Gender Differences in Rural Tourists' Motivation and Activity Participation." *Journal of Hospitality & Leisure Marketing* 16(4): 368-384.

UtahState University

iUTAH EPSCoR

Local Perspectives on Water Issues

You are being asked to complete a brief survey about water. This survey is part of a statewide project to learn more about Utahns' thoughts on water resources. Your responses are completely anonymous. Participation is entirely voluntary. You may refuse to participate at any time without consequence. In addition, you have the right to refuse to answer any specific questions if there is information you are not comfortable sharing with us. There are very minimal risks associated with participation in this survey. None of the topics are sensitive.

1. **Are you 18 or over** ○ YES -- ***Continue*** ○ NO (STOP HERE—you need to be 18)

2. **For each of the following statements, to what extent do you agree or disagree?**

	Strongly disagree		*Neither agree nor disagree*		*Strongly agree*
There is enough water to meet the CURRENT needs of all the people and businesses in my community.	○	○	○	○	○
There is enough water to meet the FUTURE needs of all the people and businesses in my community.	○	○	○	○	○

3. **How would you rate the water quality of the following types of water?**

	Very bad		*Neither good nor bad*		*Very good*	*Not sure*
a. My current drinking water supply	○	○	○	○	○	○
b. Groundwater beneath my community	○	○	○	○	○	○
c. Water in nearby mountain rivers and lakes	○	○	○	○	○	○
d. Water in streams or rivers downstream from my community	○	○	○	○	○	○

4. **Thinking about the next 10 years in your community, how concerned are you about each of the following issues?**

	Not at all concerned				*Very concerned*
a. Water shortages	○	○	○	○	○
b. Flooding	○	○	○	○	○
c. Poor water quality	○	○	○	○	○
d. High cost of water	○	○	○	○	○
e. Deteriorating water infrastructure	○	○	○	○	○
f. Air pollution	○	○	○	○	○
g. Traffic congestion	○	○	○	○	○
h. Loss of open space	○	○	○	○	○
i. Population growth	○	○	○	○	○
j. Climate change	○	○	○	○	○

5. **How familiar are you with how much money your household usually spends on water each month?**

Not at all familiar ○ ○ ○ ○ ○ *Very familiar*

6. **Is there a grass lawn on the property where you live?**

○ YES → ***if yes, CONTINUE*** *to question #6*

○ NO → ***If no, SKIP*** *to question #7 below*

7. **Who is mainly responsible for watering the grass lawn on your property?** *(Check the one that does most of the outdoor watering).*

○ Me or someone else in my household

○ Landlord

○ Our homeowner or condominium association

○ A hired private company (e.g. lawn maintenance service)

○ Other (*explain*): _____

8. **How often do you participate in any of the following water-related activities in Utah?**

	Never	*Rarely*	*Sometimes*	*Often*
a. Boating	○	○	○	○
b. Fishing	○	○	○	○
c. Snow sports (skiing, snowmobiling)	○	○	○	○
d. Walking or hiking near water	○	○	○	○
e. Gardening	○	○	○	○

9. **Are you originally from Utah?** ○ YES ○ NO

10. **How satisfied are you with the overall quality of life in your community?**

Very Dissatisfied ○ ○ ○ ○ ○ *Very Satisfied*

11. **Do you currently own or rent your residence?** ○ OWN ○ RENT

12. **Do you or any of your relatives currently farm?** ○ YES ○ NO

13. **Are you female or male?** ○ FEMALE ○ MALE

14. **How old were you at your last birthday?**

○ 18-29

○ 30-39

○ 40-49

○ 50-59

○ 60 and over

15. **What is the highest level of school you have completed?**

○ Some high school or high school diploma/GED

○ Some college and/or vocational/technical degree

○ 4 year college degree

○ Graduate degree

16. **What is the zipcode where you live?** ___ ___ ___ ___ ___ *(type zipcode)*

REFLECTIVE WRITING

I transferred up to the main USU campus in Logan after having completed the first part of my college journey at the USU satellite campus down in Blanding, on the southsestern end of the state. My experience there was a positive one—I felt integrated into the community and close with the faculty and staff. Originally, my plan was to use a Bachelor's degree in sociology as a springboard to attend law school, aiming to practice environmental law or potentially as a criminal defense attorney. As I learned more about the legal system, though, I became disenchanted with the idea. I couldn't see myself working within the framework of a system that I believed to be completely broken. I had grown passionate about sociology and enthralled with the concept of studying how the structure of society impacts the life chances and progression of individuals. I decided that I wanted to give research a try.

Towards the end of the semester, just before the summer, I began probing the possibility of conducting undergraduate research. After investigating the research work that the various professors in my department are engaged in, I emailed the professors whose research I found to be interesting. One of these professors (my research mentor Professor Jackson-Smith) returned the email and offered to meet up to discuss potential research options. I met with him shortly thereafter, and he told me that he would contact me in a few weeks. Honestly, I was not sure whether or not I'd hear from him again.

It was at this time that I also began the process of joining the Honors program. I was instructed that completing Honors in a year could be done, but it would be tough and time-consuming. I was told that a decision regarding my application to Honors would be reviewed when the Honors staff reconvened at the end of the summer. At this time, I pushed college into the back of my mind and settled into working a summer job at a call center.

After a few weeks of working my summer job, Professor Jackson-Smith contacted me and let me tag along with his team of students involved in the iUTAH iFellows Undergraduate Research Program, which was involved in administering the Utah Water Survey. Slowly, my work on this project evolved into the thesis above. Eventually, Professor Jackson-Smith hired me to work as a research assistant. Being part of his research team has been a wonderful experience that I am truly grateful for. Each member of the team is a talented, hardworking individual who has been a joy to get to know. I am truly looking forward to seeing what each of them is going to accomplish in the future.

I would like to end this reflective writing with some advice to those who are considering joining the Honors program—particularly those who are considering squeezing the program into a truncated timeframe. Personally, due to stress and a lack of free time, my social life has dwindled a bit from the decision. Positive ramifications of the decision, however, have been abundant. Should you decide to join Honors, doors will become open to you that weren't before. You will have an opportunity to work closely with faculty, take interesting courses, and be more fully integrated into the University's academic community. Additionally, the opportunity to construct an Honors thesis is great practice if you are planning on attending graduate school, and it does look good on graduate/professional school applications. I would suggest that you consider all of the potential ramifications of your decision, and what you truly want for your present and your future. If you are willing to invest the proper amount of time, and are able to cope with the consequences that arise from that investment, Honors is truly a great program to be involved with. It's a fantastic networking opportunity, an opportunity to gain practical research experience, and ultimately, it will improve your academic ability and help you to be a more effective and efficient person. All told, I do not regret my decision to join Honors—in fact, I'm

quite happy with it—but I did underestimate the amount of time and work that would be involved in completing the requirements. Luckily, the Honors staff is extremely supportive and have done everything within their power to help me succeed. Thanks for reading.

AUTHOR BIO

Matthew Barnett was born in Salt Lake City, and spent the first 12 years of his life there. Eventually, his family relocated to the southeastern portion of the Utah, where he lived for the next 13 years. He decided to begin attending college after working a string of menial jobs, including as a gas station attendant, a middle school custodian, and a cook. He transferred up to the main Utah State University campus early in 2015 and has since become involved with the University Honors program. He will begin graduate school in the fall of 2016, studying Rural Sociology in the College of Environment and Natural Resources at The Ohio State University.