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# **Characteristics of Outdoor Recreationists**

# USE AND USERS OF THE APPALACHIAN TRAIL: A GEOGRAPHIC STUDY

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**Abstract:** The Appalachian National Scenic Trail (AT) is a public footpath that spans 2,160 miles of Appalachian Mountain ridgelines from Maine to Georgia. This paper describes the first comprehensive study of recreational use and users of the AT. The primary study method was a survey of visitors to the AT. The Trail was divided into 22 relatively homogeneous sections within four major geographic regions. Sampling was conducted in each of these regions during the summer and fall of 1999. This consisted of contacting randomly selected visitors and asking them to complete a mail-back questionnaire. Nearly 2000 questionnaires were completed and returned. The questionnaire addressed user characteristics, user preparedness, the quality of the visitor experience, attitudes toward alternative management practices and economic impact. This paper presents an initial analysis of the data, including visitor characteristics and perceived problems along the trail. These variables are compared across the four major geographic regions.

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## Introduction

The Appalachian National Scenic Trail (AT) is a public footpath that spans 2,160 miles of Appalachian Mountain ridgelines from Maine to Georgia. The AT is noted for its length and diverse character. It was designed, constructed, and marked in the 1920's and 1930's by volunteer hiking clubs joined together by the Appalachian Trail Conference. The 1968 National Trails System Act designated the AT as a linear national park. The goal of this designation is to

maintain the Trail environment as a place for people to enjoy the Appalachian Mountains and wildlands, while at the same time conserving the natural, scenic, historical, and cultural resources of this one-of-a-kind park. It is estimated that two-thirds of the Nation's population lives within a days drive of the AT.

This study represents the first comprehensive analysis of the use and users of the AT. The research involved querying respondents about a number of variables and issues. Some of these variables and issues included demographic information, satisfaction, perceived problems, motivations, and trip characteristics. This paper includes a preliminary analysis of selected data. It focuses on visitor characteristics and perceived problems along the AT. The data from the entire sample of respondents are presented followed by a geographic analysis by region.

## Methods

The primary study method consisted of a survey of randomly selected users along the Appalachian Trail. Sampling took place in the summer and fall of 1999 (84% of the sample was obtained in summer and the remaining 14% in the fall). Subjects were approached and asked if they would be willing to complete a mail-back questionnaire. A total of 2,847 AT users agreed to participate in the survey and were mailed a questionnaire. Four mailings were sent out; an initial mailing (a questionnaire, a cover letter, and a postage-paid, pre-addressed return envelope), a postcard reminder, a follow-up questionnaire and a final mailing to non-respondents. Nearly 2,000 questionnaires were completed and returned, yielding a response rate of 66 percent. The sample was designed to be as representative as possible of all users of the AT over 18 years of age and consists of hikers/walkers, campers, picnickers, anglers, etc.

## Geographic Division

In order to conduct a geographic study of the AT, the trail was divided into 22 relatively homogeneous sections within four major regions. This division was based on Appalachian Trail Conference jurisdictions as well as physical boundaries. The geographic division is as follows:

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### NEW ENGLAND

1. Baxter St. Park
2. 100 Mile Wilderness
3. Western Maine
4. NH-Mahoosics
5. NH-White Mtns.
6. NH-South
7. Vermont
8. Massachusetts
9. Connecticut

### MID-ATLANTIC

10. New York
11. New Jersey
12. Pennsylvania
13. Maryland
14. Shenandoah

### SOUTHWEST VA

15. Blue Ridge Parkway
16. Outing Club of VA Tech
17. Catawba
18. Mount Rogers

### DEEP SOUTH

19. North of Smokies-Pisgah/  
Cherokee NF
  20. Smoky Mtns.
  21. NC-Nantahala NF
  22. Georgia
-

**Preliminary Findings**

**User Characteristics**

The objective of this study is to help the Appalachian Trail's managing agencies (ATC, NPS, USFS, and trail maintaining clubs) to better understand the quality of visitors' experience and develop future management plans and education initiatives. Data on visitor characteristics plays a key role in this objective because it enables planners and managers to better understand the background of trail users.

**Type of Visitor**

AT users were divided into four basic types: day users (36.7%), overnight users (32.4%), section hikers (users hiking a substantial portion of the trail) (15.2%), and through hikers (users hiking the entire trail) (15.7%) (Table

1a). However, it should be noted that through hikers were intentionally oversampled in order to obtain a large enough sample for statistical purposes. The Southwest Virginia region reported predominantly day users at 77.6% (Table 1b); this is substantially higher than the other three regions.

**Table 1a. Type of hiker**

Type of Hiker	Number	Percent
Day user	640	36.7
Overnight	566	32.4
Through hiker	274	15.7
Section hiker	266	15.2

N=1879

**Table 1b. Type of hiker by region**

Type of Hiker	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Day user	30.1	35.8	77.6	42.3		36.7
Overnight	48.4	36.6	17.8	41.4		32.4
Through hiker					100	15.7
Section hiker	21.4	27.6	4.7	16.3		15.2

**Number of Days and Miles on Trail**

The mean number of days on trail reported by users other than thru hikers was 7.2 (Table 2a). The mean number of miles hiked was 71. By definition, the thru hiker

population reported higher means for both days on trail (148.4) and miles hiked (1862.6). Overall the sample exhibited more days and miles hiked on the trail in the northern regions than in the southern regions (Table 2b).

**Table 2a. Number of days on trail and miles hiked**

	Users (Non-Thru Hiker)		Thru Hikers	
	Days on Trail	Miles Hiked	Days on Trail	Miles Hiked
Mean	7.2	71.0	148.4	1862.6
Median	2	13	167	2160

N=1339, 1356; 305,297

**Table 2b. Number of days on trail and miles hiked by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Days on Trail	8.6 (3)	11.4 (2)	2.1 (1)	4.6 (2)	148.4 (167)	33.4 (3)
Miles Hiked	88.1 (17)	122.6 (16)	16.9 (7)	38.9 (15)	1862.6 (2160)	392.9 (18)

expressed in means (median)

**Group Size**

Overall users tended to hike either alone or in small groups of two and three (Table 3a). However, the regional

analysis exhibits a stronger tendency among users in the Southwest Virginia and Deep South regions to hike in groups of two or more rather than alone (Table 3b).

**Table 3a. Group size**

Size of Group	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
1	309	21.1	185	62.7
2	595	40.6	79	26.8
3	195	13.3	17	5.8
4	123	8.4	8	2.7
5	49	3.3	2	0.7
6	61	4.2	1	0.3
7	15	1.0	2	0.7
8	28	1.9	0	0.0
9	13	0.9	0	0.0
10	24	1.6	0	0.0
More than 10	55	3.7	1	0.3

N=1467;295

**Table 3b. Group size by region**

Size of Group	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
1	20.8	34.5	12.5	18.4	62.7	28.0
2	43.3	39.7	38.0	37.7	26.8	38.3
3	10.3	13.9	17.8	14.6	5.8	12.0
4	7.7	3.0	11.2	12.6	2.7	7.4
5	2.0	3.0	5.0	5.0	0.7	2.9
More than 5	15.9	6.0	15.6	11.7	1.4	11.4

**Gender**

The majority of users were male (69%) versus female (31%) (Table 4a). Males constituted a majority in all four geographic regions (Table 4b). The thru hiker population

displayed a larger difference in gender at 82.4% male and 17.6% female.

**Table 4a. Gender**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
Female	452	31.0	51	17.6
Male	1005	69.0	239	82.4

N= 1457; 290

**Table 4b. Gender by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Female	30.0	25.3	40.1	28.3	17.6	28.8
Male	70.0	74.7	59.9	71.7	82.4	71.2

**Age**

The average age of users was in the mid-to-upper thirties (mean = 37.9 years of age) (Table 5a). The majority of thru hikers (67%) were between 20 and 39 years-of-age.

Average age is relatively consistent across the regions and the thru hiker population (Table 5b).

**Table 5a. Age**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
Under 20	94	6.4	9	3.1
20 to 39	658	45.1	195	67.0
40 to 59	584	40.0	77	26.5
60 and over	124	8.5	10	3.4

N= 1460; 291

**Table 5b. Age by region**

Region					
New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
39.8	40.3	35.3	39.6	33.5	38.0

**Education**

The level of education reported by respondents ranged widely, but was concentrated in the higher educational

levels (Table 6a). This pattern was relatively consistent across geographic regions (Table 6b).

**Table 6a. Level of education completed**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
8th grade or less	1	0.1	0	0.0
Some high school	29	2.0	2	0.7
High school graduate or GED	111	7.6	27	9.3
Business school, trade school, some college	280	19.2	61	21.0
College graduate	448	30.7	135	46.4
Some graduate school	160	11.0	28	9.6
Masters, doctoral, or professional degree	429	29.4	38	13.1

N= 1458; 291

**Table 6b. Level of education by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
8th grade or less	0.2	0.0	0.0	0.0	0.0	0.1
Some high school	2.8	1.9	1.0	1.3	0.7	1.8
High school graduate or GED	8.1	6.7	6.1	9.4	9.3	7.9
Business school, trade school, some College	17.4	19.1	24.0	17.9	21.0	19.5
College graduate	29.4	32.2	31.9	31.1	46.4	33.3
Come graduate school	9.6	10.5	15.3	9.4	9.6	10.7
Masters, doctoral, or professional degree	32.5	29.6	21.7	31.1	13.1	26.7

**Income**

Income levels ranged from less than \$20,000/year to more than \$100,000/year (Table 7a). Income levels appear to be

slightly lower in the southern regions of the trail and substantially lower for thru hikers (Table 7b).

**Table 7a. Household income (before taxes)**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
less than \$20,000	240	17.8	97	36.1
\$20,000 to \$39,999	245	18.2	66	24.5
\$40,000 to \$59,999	272	20.2	36	13.4
\$60,000 to \$79,000	202	15.0	30	11.2
\$80,000 to \$99,000	156	11.6	10	3.7
\$100,000 or more	234	17.3	30	11.2

N= 1349; 269

**Table 7b. Household income by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Less than \$20,000	15.3	14.4	27.0	16.2	36.1	20.8
\$20,000 to \$39,999	17.5	20.4	18.0	17.6	24.5	19.2
\$40,000 to \$59,999	20.7	18.8	19.0	21.8	13.4	19.0
\$60,000 to \$79,000	15.3	14.4	14.2	15.7	11.2	14.3
\$80,000 to \$99,000	11.3	14.0	9.7	12.0	3.7	10.3
\$100,000 or more	19.9	18.0	12.1	16.7	11.2	16.3

**Ethnicity and Race**

The vast majority of AT users were white (96.5%) and not Hispanic or Latino (98%) (Tables 8a & 8b). This is

generally consistent across the regions and the thru-hiker populations (Tables 8a-2 & 8b-2).

**Table 8a. Ethnicity**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
Hispanic or Latino	17	2.0	6	3.9
Not Hispanic or Latino	816	98.0	146	96.1

N= 833; 152

**Table 8a-2. Ethnicity by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Hispanic or Latino	1.3	5.3	0.6	2.3	3.9	2.3
Not Hispanic or Latino	98.7	94.7	99.4	97.7	96.1	97.7

**Table 8b. Race**

	Users (Non-Thru Hiker)		Thru Hikers	
	Number	Percent	Number	Percent
Black or African American	23	1.6	2	0.7
Asian American	17	1.2	4	1.4
White	1365	96.5	269	96.8
American Indian or Alaskan Native	7	0.5	2	0.7
Native Hawaiian or other Pacific Islander	3	0.2	1	0.4

N= 1415; 278

**Table 8b-2. Race by region**

	New England	Mid-Atlantic	Southwest Virginia	Deep South	Thru Hikers	Total
Black or African American	1.8	2.4	1.0	1.3	0.7	1.5
Asian American	1.4	1.2	0.7	1.3	1.4	1.2
White	96.3	95.7	97.4	96.4	96.8	96.5
American Indian or Alaskan Native	0.3	0.4	0.7	0.9	0.7	0.5
Native Hawaiian or other Pacific Islander	0.2	0.4	0.3	0.0	0.4	0.2

**Perceived Problems along the AT**

Respondents were queried concerning the extent to which they perceived issues as problems along the AT (Figure 1). Several issues were addressed in the questionnaire, including use impacts, trail maintenance, safety, and crowding. In all, respondents were asked about 44 conditions or issues that may exist along the AT. Respondents were asked to indicate whether each of these 44 issues was “not a problem” (0), a “small problem” (1), a “big problem” (2), or “don’t know” (3).

To analyze these data a factor analysis was conducted. This is a data reduction technique that identifies relationships among multiple variables. Using this technique, we were able to identify six problem categories. They are identified below followed by a description of results:

- **Crowding:** This factor consisted of issues concerning groups being too large, congestion, groups encountered, and inconsiderate hikers. Overall, respondents rated crowding as a moderate problem. Crowding was perceived as more of a problem in the northern than the southern regions.
- **Not enough facilities:** This factor consisted of issues regarding not enough water or restrooms, too few shelters, and lack of public participation. Not enough facilities received a moderate rating from respondents. Across the regions, this issue was relatively consistent but reported slightly higher in the Mid-Atlantic and Deep South regions.
- **Lack of information:** This factor consisted of not enough information available to hikers, not enough information on how to prepare for a safe hike, and regulations not being publicized. Lack of information received a low rating overall. In the regional analysis this issue was more of a problem in the south than the north.
- **External development:** This factor consisted of questions concerning development that could be seen and traffic noise that could be heard from the trail. External development was rated as a moderate

problem overall. This issue was perceived as more of a problem by respondents in the Mid-Atlantic region than the others.

- **Ecological impacts:** This factor was comprised of issues concerning damage to soil and vegetation as well as trail erosion. Ecological impacts rated highest overall indicating it was a relatively big problem to respondents. Respondents in the northern regions perceived this as more of a problem than in the southern regions.
- **Too much management:** This factor consisted of too many rules and regulations and too many rangers/management on the trail. Too much management rated lowest overall. Respondents in the northern regions and the thru hiker population perceived this issue to be much more of a problem than those in the southern regions.

Overall, the extent to which each of these factors was perceived as a problem was relatively low. Among the factors, ecological impacts were rated as the biggest problem, whereas too much management was rated as the smallest problem.

**Conclusion**

This study represents the first reasonably comprehensive study of use and users of the entire AT. Study data begin to provide potentially important insights into the characteristics of the trail users, perceived trail management issues, and a variety of other variables and issues. Preliminary findings suggest that use and user characteristics may vary by geographic region of the trail. Further analysis will be conducted and may illuminate additional differences in other study variables. This information will be provided to trail managers in order to help them make more informed management decisions concerning the AT and its users.

# A COMPARISON OF RECREATION CONFLICT FACTORS FOR DIFFERENT WATER-BASED RECREATION ACTIVITIES

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**Abstract:** Previous studies point out recreation conflict may be affected by recreation goals, resource specificity, activity style, mode of experience, lifestyle tolerance, norms, problems perceived, visitor values and conflict sensitivity. However, people engaging in single or multiple activities may have different patterns when considering recreation conflict. A study of personal watercraft users, motorboat users and landowners in the New York State's Great Lake area was conducted to compare the recreation conflict factors. Three different types of questionnaires with a total of 4634 surveys were sent out and received an overall response rate of 42%. Eight subgroups were deduced based on their recreation activities and questionnaires answered. The results revealed the eight groups are common in the structure but not in the value of the conflict factors. Study results also showed a series of asymmetrical conflicts in which landowners were interfered with by both personal watercraft users and motorboaters, motorboaters were affected by personal watercraft users but not landowners, and personal watercraft users were not affected by either one.

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## Introduction

The popularity of personal watercraft has stirred controversy both for and against their use in state and National Parks, as well as across many waterways and lakes of the United States. How you view personal watercraft use and operator behavior depends, in part, on whether you own and operate a personal watercraft or not. Both recreation conflict and compatibility have been reported between personal watercraft users, motorboaters, and landowners in a variety of circumstances. Some of the recreation conflicts arise from personal watercraft users interfering with the experience of motorboaters by speeding, jumping their boat wakes, or crossing their boating path. Reportedly personal watercraft users interfere with coastal landowners because of the noise of the personal watercraft, potential safety problems near other recreational users, and some privacy issues of landowners.

Jacob and Schreyer (1980) defined recreation conflict as "goal interference attributed to another's behavior" and proposed four major dimensions of recreation conflict factors, including activity style, resource specification,

mode of experience, and lifestyle tolerance. These dimensions of conflict factors were verified by several studies (Adelman et al., 1982; Watson et al., 1991; Ivy et al., 1992; Kajala, 1994; Watson et al., 1994; Gibbons et al., 1995; Ramthun, 1995; Vaske et al., 1995; Schuster, 1996). For example, Watson et al. (1994) used factor analysis to categorize recreation conflict factors and found that goal interference was affected by activity style, resource specificity, and mode of experience. In addition, Ivy et al. (1992) pointed out that individuals with lower tolerances will feel more conflict, and at the same tolerance level, canoeists will feel more conflict than motorboaters.

In addition to the four dimensions of conflict factors proposed by Jacob and Schreyer (1980), empirical studies found visitors norms (Ruddell and Gramann 1994), goal or motivations (Jackson 1982; Noe et al. 1981; Gibbons and Ruddell 1995), and conflict sensitivity (Ramthun 1995) also affect recreation conflict. Ruddell and Gramann (1994) suggested that the less tolerant a person's individual norm for noise levels, the more likely that violations of the social norm for radio volumes will be perceived as a source of interference. Jackson (1982) studied the conflict between skiers and snowmobilers and concluded that skiers were more natural environment oriented and snowmobilers were more escapism and socialization oriented. In addition, Ramthun (1995) proposed a model in which conflict factors contributed to an intermediate factor, sensitivity, and in turn caused the perceived interference.

Previous studies identified the potential conflict groups as specific activity participants, and did not mention that people engaging in single or multiple activities may have different patterns or different values for the factors when considering recreation conflict. For example, researchers pointed out interference between motorboating and nonmotorboating, but users with both experiences may have different interference levels from those with only one experience. Furthermore, users with both motorboating and nonmotorboating experiences may react differently when participating in motorboating and nonmotorboating activities. The purpose of this paper is a comparison of conflict factors across groups with different activity combinations.

## Methods

New York's Great Lakes (NYGL) in this study included the U.S. side of St. Lawrence River, Lake Ontario, Niagara River, and Lake Erie. Compared to many inland bodies of water in New York State, NYGL has a larger water surface area and less public access overall. However, the potential recreation conflict problems usually do not happen in the middle of a lake, but in the coastal areas with public access, such as in bays, harbors, or near public beaches.

In order to get a sufficient sample size for each user and combination of users (e.g., landowners who own a motorboat), PWC users (n=1000) and motorboat users (n=3000) were selected systematically from the New York State watercraft registrations in the 10 coastal counties along the NYGL including: Jefferson, St. Lawrence,

Oswego, Wayne, Monroe, Niagara, Orleans, Erie, Chautauqua, and Cayuga counties. Landowners with coastal lands adjacent to NYGL were selected (n=634 and about 100 for each site) from the tax maps of six study sites including: Alexandria Bay, Sandy Pond, Sodus Bay, Olcott, Niagara River, and Hanford Bay. These six sites were selected because of their access to the Great Lakes and the significant use for boating, personal watercraft use, other water-based recreation activities, and proximity to private coastal property. By searching the tax maps, this study selected only those owners with residences (primary and secondary) adjacent to the NYGL but omitted those with vacant lands or only docks.

Three mail surveys with parallel questions were designed for personal watercraft owners (PWC), motorboat owners, and coastal landowners to measure the recreation conflict components and compatibility among users with various activity combinations. The term "jet ski" was used in all surveys instead of PWC because it was more commonly understood by the public. Each of the three mail surveys was designed from the research literature around nine reported dimensions of recreation conflict and were each measured by multiple questions. The surveys to users asked about their: recreation motives (19 questions), recreation activity style (11 questions), resource specificity for their recreation activity (10 questions), lifestyle tolerance (30 questions), mode of recreation experience (8 questions), norms for distance from recreational others (8 questions), problems from personal watercraft users and motorboaters (20 questions), sensitivity to recreation conflict (13 questions), and visitor values for recreation activities (13 questions). In addition, any actual recreation conflict perceived by the survey respondents was measured by an open-end question in which respondents were asked to describe the interference they had experienced while recreating in the NYGL during the past year.

An exploratory factor analysis was conducted on data using orthogonal varimax rotation to reduce the 132 items down to meaningful factors to describe the data set. The procedure to establish the factors were: (1) an eigenvalue of 1.0 was retained in factor analysis for each dimension, (2) the numbers of factors within each dimension across the 8 groups were checked to see the most common number of the factors, (3) factor numbers were set at the common number from the previous step and factor analysis run again, (4) factors within each dimension were interpreted based on loading and meaningful item combinations, and

(5) Cronbach's alpha of greater than 0.50 was required for it to be retained because as a "rule of thumb" any solution should account for at least 50 percent of the total variance. The statistical package for the social sciences (SPSS version 10.0 for windows) was used to conduct this analysis.

### Study Results

A total of 4,641 surveys were sent out. After two follow up reminder mailings, an overall adjusted response rate of 42% was achieved (personal watercraft owners = 33%, motorboat owners = 41% and landowners = 63%). Respondents were asked to report their ownership of motorboats, PWC, and coastal lands adjacent to the NYGL. Because each type of survey has four possible ownership combinations, the three surveys produced a total 12 types of owner group combinations (Table 1). To reduce the number of groups, ANOVA with Least Significant Distance was conducted within each type of survey to combine the similar groups together based on the 132 questions in the survey. Motorboat owners with a PWC and land (M-pwc-l) and motorboat owners with a PWC (M-pwc) were grouped together because they only differed in 9 of the 132 items. In addition, PWC owners with a motorboat and land (PWC-m-l), PWC owners with a motorboat (PWC-m) and PWC owners with land (PWC-l) were combined into the same group because they had less than 15 items different of the 132 questions. Landowners with a motorboat and a PWC (L-m-pwc) were similar to landowners with PWC (L-pwc) because only 4 of the 132 items differed. Therefore, the 12 ownership groups were reduced to 8 ownership groups with similar responses (see Table 1).

Please note that the results from similar ownership groups in the three different surveys can not be added together since each survey was designed from the perspective of owning either a motorboat, PWC, or coastal land. Thus, the PWC-m-l group is different from the L-m-pwc group because the first group answered the PWC survey and the second group answered the Landowner survey. In an effort to make it clear which survey a ownership group completed, capital letters on the group abbreviation will denote the type of mail survey for those respondents. For example, PWC-m-l denotes a Personal WaterCraft survey respondent who also owns a motorboat and/or coastal land along NYGLs.

**Table 1. Group ownership<sup>a</sup> combinations based on results from NYGL mail survey respondents<sup>b</sup>.**

Original Ownership Group	Group Symbol	Group Combination	Group Symbol	Sample Size (n)
<b>Motorboat Owner Survey</b>				
Motorboater with pwc and land	M-pwc-l	Motorboater with pwc and/or land	M-pwc-l	49
Motorboater with pwc	M-pwc		M-pwc	
Motorboater with land	M-l		M-l	
Motorboater only	M	Motorboater only	M	694
<b>PWC Owner Survey</b>				
PWC with motorboat and land	PWC-m-l	PWC with motorboater and/or land	PWC-m-l	204
PWC with motorboat	PWC-m		PWC-m	
PWC with land	PWC-l		PWC-l	
PWC only	PWC	PWC only	PWC	82
<b>Landowner Survey</b>				
Landowner with motorboat and pwc	L-m-pwc	Landowner with pwc and/or motorboat	L-m-pwc	49
Landowner with pwc	L-pwc		L-pwc	
Landowner with motorboat	L-m	Landowner with motorboat only	L-m	189
Landowner only	L	Landowner only	L	76

<sup>a</sup> Ownership groups include: Landowners = L; Personal Water Craft owners = PWC; Motorboat owners = M.

<sup>b</sup> Capital letters denote the type of mail survey for those respondents.

**Table 2. Recreation motives and average importance<sup>a</sup> by responding ownership groups in the NYGL surveys.**

Motives	Group								
	PWC Owner		Motorboat Owner			Landowner			
	PWC-l-m	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L	
<b>Nature Enjoyment</b>									
To see the scenic beauty; To be outdoors; To be in natural surroundings	3.6	3.5	3.8	3.7	3.6	4.3	4.3	4.2	
<b>Relax, Rest &amp; Get Away</b>									
For relaxation and rest; To experience peace and quiet; To get away from job stress; To get away from daily routines; To get away from others	3.0	3.0	3.4	3.2	3.2	3.7	3.6	3.3	
<b>Social Interaction</b>									
To be with my family; To meet new people like myself; To be with people who have similar values; To be with friends	2.7	2.8	3.0	2.9	2.8	3.6	3.0	2.8	
<b>Excitement &amp; Exercise</b>									
For excitement; For exercise	2.6	3.0	1.6	1.6	1.6	2.8	2.1	2.1	
<b>Skill &amp; Equipment</b>									
To improve my boating skills; To teach my skills to others; To test my equipment	2.2	2.3	1.9	2.1	2.2	1.9	1.7	0.2	

<sup>a</sup>The number shown in the table is the mean value of importance for the motives from 0 = not important to 5 = very important.

**Recreation Motivations of Users**

In the factor analysis, two of the 19 motive questions were eliminated because of their low statistical reliability, and the remaining 17 questions were grouped into five factors including: Nature Enjoyment, Relax, Rest & Get Away, Social Interaction, Excitement & Exercise, and Skill & Equipment (Table 2). All ownership groups, especially landowners, reported that they enjoyed the NYGL's natural setting (3.5-4.3) and the chance to relax, rest & get away (3.0-3.7). Social Interaction was moderately important for all groups (2.7-3.6). Landowners liked to get their family together or make friends with their neighbors or visitors; PWC owners and motorboat owners liked to see others and be seen during their boating. Although Excitement & Exercise and Skill & Equipment were not important for all groups, PWC owners enjoyed the excitement more (3.0) and focused on their skill more (2.3) than the other groups. Landowners had low interest in Skill & Equipment (0.2), probably because they did not report owning a motorboat or PWC.

**Activity Style**

Activity style was measured by respondent reactions to 11 statements based on a scale from strongly disagree (-2) to neutral point (0) to strongly agree (2). Two of the 11 statements were dropped because of their low statistical reliability and the remaining 9 statements produced two factors, Self-identity and Value Sharing (Table 3). Landowners (0.6-1.0) somewhat identified themselves in Group Identity with other landowners. PWC owners without other ownerships (0.9) more identified themselves as PWC owners than those PWC owners with a motorboat or land (0.4). However, landowners without boats or PWC's (0.6) identified themselves as landowners less than those with a motorboat or a PWC (0.8-1.0). PWC owners disagree with Value Sharing (-0.3 ~ -0.2) with other PWC users; however, motorboat owners (0.3-0.4) and landowners (0.5-0.7) somewhat share their values with other motorboat owners and landowners respectively.

Comparing the two activity style factors within ownership groups, it was found that PWC owners identified well with

other PWC owners but reportedly didn't strongly share values with other PWC owners. On the other hand, landowners strongly identified with other landowners and they also reported that they shared common values with

other landowners. Motorboat owners identified with other motorboat owners and they also reported that they shared common values with other motorboat owners.

**Table 3. Activity style dimension and average response<sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Activity Style	Group								
	PWC Owner		Motorboat Owner			Landowner			
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L	
<b>Self-identity</b>									
I am proud to be a xxx <sup>b</sup> .									
I often describe my self to others by saying, "I am a xxx."									
I am glad I chose to participate in xxx rather than another activity.	0.4	0.9	0.5	0.5	0.5	1.0	0.8	0.6	
I become irritated when I hear others criticize xxx.									
I talk up xxx to my friends as a great activity.									
<b>Value sharing</b>									
The xxx image in the community represents me well.									
I find that my values and the values of other xxx are very similar.	-0.3	-0.2	0.4	0.3	0.3	0.7	0.5	0.5	
I find it is easy to identify my self with other xxx.									
I have a lot in common with other xxx on the coastal of NYGLs.									

<sup>a</sup> The number shown in the table is the mean value of agreement with the statement, from -2=strongly disagree to 2=strongly agree.

<sup>b</sup> For the three different surveys, xxx means jet skiers, motorboaters, and riparian landowners to the related respondents.

**Table 4. Resource specification and average response<sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Factor	Group								
	PWC Owner		Motorboat Owner			Landowner			
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L	
<b>Best Place</b>									
No other places can be compared with that area.									
Being there makes me more satisfied than visiting any other places.									
I would not substitute this place with any other place to go jet skiing.									
<b>Place Dependence</b>									
The area means a lot to me.									
I identify strongly with the area.									
I feel attached to the area.									
Much of my life centers on this area.	1.0	0.7	0.9	1.1	0.7	1.3	1.3	1.1	
New York's Great Lakes is my favorite place in my time off.									
Being on New York's Great Lakes is very important to me.									
When I jet ski there I can really be myself.									
Being there is one of the most pleasant things I can think of.									

<sup>a</sup> The number shown in the table is the mean value of agreement with the statement, from -2=strongly disagree to 2=strongly agree.

**Resource Specificity**

Respondents were asked to evaluate how strongly they agreed or disagreed with 11 questions to measure their resource specificity. Analysis of the 11 resource specificity questions produced two factors, Best Place and Place Dependence (Table 4). Although most respondents did not strongly agree (0.0-0.8) that the NYGL was the best place for water-based recreation, landowners (0.5-0.8) more often agreed it was the best place compared to motorboat and PWC owners (0.0-0.5). PWC owners (0.0) and motorboat owners (0.1) probably realized that, due to their mobility, they had the option to use other areas to enjoy their recreational activities. The factor Place Dependence

indicated all owners were somewhat dependent on the NYGL area for their experiences (0.7-1.3), especially landowners (1.1-1.3). Generally, landowners depended more on the NYGL area because of their properties, whereas motorboat and PWC owners could more easily alternate their activities to other bodies of water.

**Lifestyle Tolerance**

Respondents were asked to evaluate their own group and the other two ownership groups to measure their lifestyle tolerance. One of the 10 questions was eliminated because of its low statistical reliability. The remaining 9 questions were grouped into one factor for each group evaluation

(Table 5). In the evaluation for PWC, all owners with PWC's evaluated PWC owners as somewhat good (0.2-0.4), but other landowners or motorboat owners without a PWC had negative evaluations for PWC owners (-0.5 ~ -0.2). This response pattern did not reoccur in the evaluations for motorboat owners and landowners, all users have relatively positive images for those two ownership groups. Comparing the values within each survey group, PWC owners thought they were similar to motorboat owners (0.3 vs. 0.3) but not too similar to landowners (0.3 vs. 0.5). All motorboat owners thought they were similar to landowners but not to PWC owners; however, landowners did not agree they were similar to the other two groups. Interestingly, PWC owners with land or a motorboat were

similar to both PWC owners and motorboat owners. For example, their evaluation for PWC owners was the same as PWC owners (0.3), but like motorboat owners they thought motorboaters were similar to landowners. The possible reason is many respondents in this PWC group had motorboats. Also landowners had the highest self-evaluation (1.0-1.2), while PWC owners were not so confident in their self-evaluation (0.3). These results suggest a series of asymmetric interferences among those three groups—both PWC owners and motorboat owners affected landowners, motorboat owners were affected by PWC owners but not much by landowners, and PWC owners were not affected by the other two groups.

**Table 5. Lifestyle tolerance and average response <sup>a</sup> to paired word comparisons by responding ownership groups in the NYGL surveys.**

Lifestyle Tolerance	Group							
	PWC Owner		Motorboat Owner			Landowner		
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L
<b>Evaluation of jet skiers</b> Respectful-Risky; Quiet-Noisy; Similar to me-Different from me; Polite-Impolite; Courteous-Discourteous; Friendly-Unfriendly; Responsible-Irresponsible; Good-Bad; Unthreatening-Threatening.	0.3	0.3	0.2	-0.3	-0.2	0.4	-0.5	-0.2
<b>Evaluation of motorboaters</b> Respectful-Risky; Quiet-Noisy; Similar to me-Different from me; Polite-Impolite; Courteous-Discourteous; Friendly-Unfriendly; Responsible-Irresponsible; Good-Bad; Unthreatening-Threatening.	0.7	0.3	0.9	0.8	0.8	0.6	0.6	0.3
<b>Evaluation of landowners</b> Respectful-Risky; Quiet-Noisy; Similar to me-Different from me; Polite-Impolite; Courteous-Discourteous; Friendly-Unfriendly; Responsible-Irresponsible; Good-Bad; Unthreatening-Threatening.	0.7	0.5	0.9	1.0	0.8	1.1	1.0	1.2

<sup>a</sup> The number shown in the table is the mean value of agreement with the paired words, from -2=negative to 2=positive.

**Table 6. Focus of experience and average response <sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Focus of Experience	Group							
	PWC Owner		Motorboat Owner			Landowner		
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L
<b>Focus on safety</b> I operate the jet ski (or motorboat) safely and comfortably I pay attention to the distances from other boats, jet skis, docks, etc.	4.6	4.5	4.4	4.5	4.4	—	—	—
<b>Focus on speed and skill</b> I pursue high speed and fun on jet skiing or motorboating I practice my jet skiing or motorboating skill	3.4	3.6	2.7	2.9	2.8	—	—	—
<b>Focus on social and the nature</b> I enjoy talking to or making friends; I enjoy xxx <sup>b</sup> with my family I enjoy the scenery during xxx; I look for fish, plants or wildlife	3.4	3.3	3.6	3.7	3.7	3.7	3.7	3.4

<sup>a</sup> The number shown in the table is the mean value of agreement with the statement, from -2=strongly disagree to 2=strongly agree.

<sup>b</sup> For the three different surveys, xxx means jet skiers, motorboaters, and riparian landowners to the related respondents.

**Focus on Experience**

PWC owners and motorboat owners were asked to evaluate how they focused on the 8 questions about their recreation experience. Only four of the 8 questions were used in the landowners' survey because they answered questions based on their enjoyment of their properties (Table 6). Both PWC owners and motorboat owners responded that they focused on safety seriously (4.4-4.6). PWC owners seemed more

focused on speed and skill (3.4-3.6) than motorboat owners (2.7-2.9). Although PWC owners reported they moderately focused on social and nature settings (3.3-3.4), motorboat owners and landowners (3.4-3.7) had a slightly higher response than PWC owners. These results indicate that PWC owners are strongly speed and skill oriented and both PWC owners and motorboat owners care about safety issues and enjoy nature and social settings. Compared to

PWC owners, motorboat owners reported that they were seeking social and nature enjoyment but are not as focused on high speed and fun.

*Perceived problems from PWC use and motorboat use*

Respondents were asked to evaluate 10 statements about potential problems caused by PWC use and motorboat use (Table 7). The 10 potential problem statements related to PWC use were statistically grouped into two factors: Operator Behavior & Machine Impact Related Problems and Environmental Related Problems. Potential problem statements related to motorboat use were statistically grouped into three factors: Operator Behavior Related Problems, Machine Impact Related Problems, and Environmental Related Problems. Operator Behavior & Machine Impact Related Problems were grouped into the same factor for PWC use but separated for motorboating and that may indicate that when considering problems, respondents consider PWC's and PWC use together but consider motorboats and motorboat use separately. Generally, the perceived problems from both PWC use and

motorboating were reported as low to moderate in the NYGL area (0.9~3.1). Respondents perceived PWC users as having higher levels of Operator Behavior & Machine Impact Related Problems (1.0~3.1) than Environmental Related Problems (0.7~2.2). In addition, motorboaters perceived Operator Behavior & Machine Impact Related Problems from PWC use as higher than landowners did. All groups perceived Machine Impact Related Problems from motorboating more significant than Environmental Related Problems and Operator Behavior Related Problems from motorboating. Landowners seemed to perceive more trouble from motorboating than the other groups and they considered Machine Impact Related Problems from motorboats as serious as those from PWC's. Again, these results suggest a series of asymmetric interferences among the three groups—both PWC owners and motorboat owners affected landowners, motorboat owners were affected by PWC owners but not by landowners, and PWC owners were not generally affected by the other two groups

**Table 7. Perceived problems from PWC use and motorboat use and average response<sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Perceived Problems From PWC Use And Motorboating	Group								
	PWC Owner		Motorboat Owner			Landowner			
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L	
<b>Operator behavior &amp; machine impact related problems from PWC use</b> Speeding; Noising; Waking; Distance Problems; Crowding; Meeting a PWC.	1.4	1.0	2.0	2.8	2.9	1.4	3.1	2.4	
<b>Environment related problems from PWC use</b> Coast erosion; Impacts on wildlife; Impacts on fish; Water pollution	0.9	0.7	1.5	1.9	2.0	0.9	2.1	2.2	
<b>Machine impact related problems from motorboating</b> Speeding; Noising; Waking	1.9	1.9	1.9	2.5	2.6	2.0	2.7	2.5	
<b>Environment related problems from motorboating</b> Coast erosion; Impacts on wildlife; Impacts on fish; Water pollution	1.3	1.5	1.5	1.7	1.8	1.1	2.1	2.2	
<b>Operator behavior related problems from motorboating</b> Distance Problems; crowding; Meeting a PWC.	1.1	1.1	1.2	1.6	1.5	2.0	1.9	1.7	

<sup>a</sup>The number shown in the table is the mean problem level from 0 = not problem to 5 = serious problem.

**Table 8. Visitor values and average response<sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Visitor values	Group								
	PWC Owner		Motorboat Owner			Landowner			
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L	
<b>Positive Statements</b> PWC users are experienced. Motorboaters do not mind boating in sites used by PWC's. Meeting a PWC makes a boat trip more interesting.	-0.2	-0.1	-0.3	-0.8	-0.8	0.0	-0.8	-0.3	
<b>Negative Statements</b> PWC users do not pay attention to their impacts on other users. When motorboats meet a PWC, boating safety problems become significant. PWC use causes more environmental impact than motorboat use. PWC causes more impacts on other visitors than motorboat use. Seeing a PWC seems out-of-place. Motorboats are more appropriate than a PWC in the coastal area of NYGL's.	-0.5	-0.7	-0.1	0.6	0.5	-0.4	0.6	0.4	
<b>Regulations</b> Boating regulations are the same for motorboats and PWC's. Speed limits for motorboats are the same as for PWC's.	0.8	0.7	0.8	0.4	0.5	0.7	0.4	0.1	

<sup>a</sup> The number shown in the table is the mean value of agreement with the statement, from -2=strongly disagree to 2=strongly agree.

#### Visitor Values

Thirteen statements were used to evaluate the compatibility between motorboating and PWC use. Two statements were eliminated because of their low statistical reliability. The remaining 11 statements were grouped into three factors: Positive Statements, Negative Statements, and Regulations (Table 8). All ownership groups, even PWC owners, disagree with the positive statements for PWC use, especially motorboat owners (-0.8) and motorboat owners with land (-0.8). However, PWC owners disagree (-0.1--0.7) with the negative statements about PWC use, whereas people without PWCs agree with the negative statements about PWC use (0.4-0.6). Interestingly, evaluations from people without PWCs were negative towards PWC use and people with PWCs perceived they were not compatible with other users, but not as serious as other ownership groups thought. Although NYC speed and distance from fixed object regulations are the same for motorboat use and PWC use, all groups did not strongly agree with these true statements (0.1-0.8). This suggests that respondents were not completely familiar with boating regulations.

#### Recreation Conflict Sensitivity

Respondents were asked to evaluate their sensitivity to interference when they encountered 11 recreation activities. Factor analysis produced three factors: High Sensitivity, Medium Sensitivity and Low Sensitivity (Table 9). All groups were highly sensitive to PWC use, motorboating

and water skiing. Water skiing was considered similar to PWC use and motorboating because of its high speed and large space requirements. Although all the 8 groups had a lower sensitivity to scuba diving, snorkeling, swimming and windsurfing, it is expected that users of those activities would be sensitivity to conflicts from motorboating and PWC use. Generally, all values in the table were less than 2.0, indicating recreation conflict existed but was not high in NYGL. However, all motorboaters and those landowners without PWCs had a higher sensitivity for conflict from PWC use, motorboating and water skiing than PWC users.

#### Distance Norms

Respondents were asked to report their preferred distance from their own activities to personal watercraft use. The 5 categories for preferred operating distance ranged from 100' to 1000' or above (Figure 1). The current NYS regulation is that personal watercraft and boats must operate at 5 m.p.h or less when within a 100 foot from shore or any other fixed object. Although many users with PWC reported the current NYS regulation was acceptable to them most motorboaters and landowners without PWCs preferred more distance from operating PWC. About 45% of PWC users preferred longer distances from other PWC users. In addition, a noticeable proportion of non-PWC users reported 1000 feet or more was needed from PWC users and this might indicate their negative experiences from PWC use.

**Table 9. Recreation conflict sensitivity and average response<sup>a</sup> to statements by responding ownership groups in the NYGL surveys.**

Recreation Conflict Sensitivity	Group							
	PWC Owner		Motorboat Owner			Landowner		
	PWC-m-l	PWC	M-pwc-l	M-l	M	L-m-pwc	L-m	L
<b>High sensitivity</b> PWC use; Motorboating; Water skiing	0.9	0.9	1.5	1.9	1.9	0.9	1.9	1.7
<b>Medium sensitivity</b> Boat fishing; Bank or shore fishing; Canoeing & kayaking; Sail boating	0.5	0.6	0.5	0.5	0.5	0.3	0.4	0.3
<b>Low sensitivity</b> Scuba diving; Snorkeling; Swimming; Windsurfing	0.4	0.6	0.4	0.4	0.4	0.2	0.3	0.2

<sup>a</sup> The number shown in the table is the mean value of sensitivity level, from 0=never interferes to 5=extremely interferes.

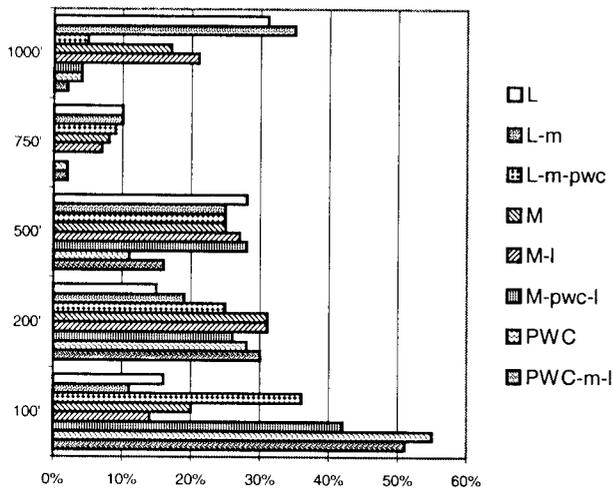


Figure 1. Preferred operating distances from PWC users.

Respondents were asked to report their preferred distance from their own activities to motorboating and their responses seemed more constant than for PWC use. For all groups, more than 60% reported a preferred distance of more than 100 feet from operating motorboats (Figure 2). Even 65% of motorboaters (M) preferred longer distances from other motorboats. And 24% of landowners (L) preferred 1000 feet or more from motorboating activities. These results indicate that landowners were affected by motorboating activities and the current NYS regulation for motorboats to allow a 100 foot zone of 5 m.p.h. from the shore and other fixed objects may not be sufficient from their perspective as coastal users.

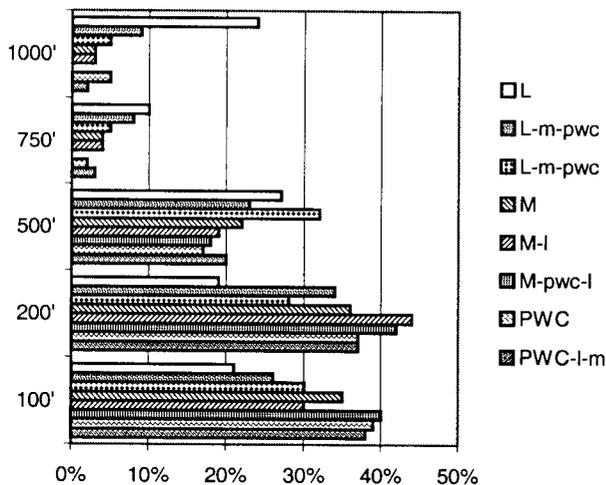


Figure 2. Preferred operating distances from motorboats.

Motorboat and PWC operators were asked to report their preferred distance from their own activities to shore line (Figure 3). The results were constant among most groups and about 70% of PWC users and motorboaters cumulatively reported preferred distances of more than 100

feet. These results indicate that the current NYS regulation for motorboaters and PWC operators to allow a 100 foot zone of 5 m.p.h. from the shore and other fixed objects may not be sufficient from the motorboaters and PWC operators perspectives as coastal users.

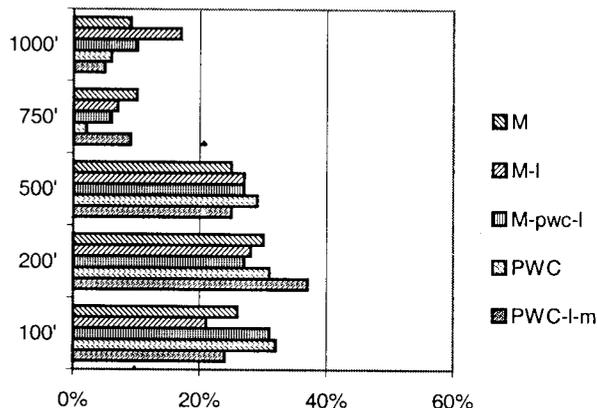


Figure 3. Preferred operating distances from shoreline.

#### Activity Interference

Recreation conflict was measured by asking respondents if they had any perceived activity interference during their recreational use of NYGLs. If respondents answered “yes”, they were asked to describe their experiences. The experiences described were organized into four categories: physical problems and situations, interference from motorboaters, interference from PWC users, and interference from both motorboaters and PWC users. Physical problems and situations referred to such as low water levels in the lake, limited boating access, enforcement issues, water pollution, and other problems. PWC users were somewhat bothered by physical problems and motorboaters were bothered by PWC use and physical problems. Landowners were affect by both motorboating and PWC use (Table 10).

Table 10. Percent of respondents with perceived interference with water-based recreation activities in NYGL.

	No Problems	Physical Problems	Motorboat Use	PWC Use	PWC and Motorboat Use
PWC-m-I	85	7	3	5	0
PWC	74	14	5	4	3
M-pwc-I	78	8	2	8	4
M-I	60	11	4	16	9
M	80	9	2	1	8
L-m-pwc	69	0	12	5	14
L-m	40	1	6	25	28
L	61	1	4	11	23

#### Observations and Implications

The study results suggest several important implications and issues. First, a series of “asymmetric conflicts” were evident between landowners who were bothered by both PWC users and motorboaters, motorboaters who were bothered by PWC users but not much by landowners, and

PWC users who did not seem to be affected by either motorboaters or landowners. Resource dependence as is one possible reason to explain this situation. Landowners are more dependent on the NYGL because of their property ownership and this area is more meaningful for them and hard to substitute with other resources. However, PWC users and motorboaters are more flexible when using this area because alternative areas are available in NYGL or inland in NYS for their activities. PWC use usually interfere with motorboaters by speeding, jumping their wakes to close to the boat, or causing motorboaters to have to alter their boat direction to avoid PWC. However, both PWC use and motorboating interfered with landowners because of motor noise, concerns for safe watercraft and boat operating, and privacy issues when using coastal property at the waterfront.

Asymmetrical recreation conflicts are a common conclusion in many published studies (Adelman et al. 1982; Ruddell and Gramann 1994; Ramthun, 1995) and that concept is also supported by this study. The series of asymmetrical conflicts points out a potential problem in multiple use areas in which several activities could be available at the same time. Some users reported spatial or site-to-site displacement when experiencing recreation conflicts. Based on the concept of a series of asymmetrical conflicts, recreation planners and managers may have to identify the groups experiencing more interference and minimize potential conflict for the affected groups in multiple use zones. Place dependence and sensitivity to conflict could be possible indicators to identify potential conflict in a recreation area. Failing to maintain the recreation quality for visitors who are sensitive to conflict may cause the affected groups to be dissatisfied and could displace their activities.

The study suggests that education programs may help to reduce the conflict. In this study, PWC users perceived they were not appreciated by other users; however, they thought safety issues and their behaviors were not as bad as other groups thought. Motorboaters perceived interference from PWC use, but did not perceive that they also caused problems to landowners. Interestingly, both motorboaters and landowners with PWC had more sympathy for PWC use and users, possibly because these people had similar recreational motivations as PWC users and perceived what PWC users were feeling during their activities. A similar situation happened between motorboaters and landowners. Landowners with motorboats were not against motorboating as much as landowners without watercraft. This indicates that people participating in multiple activities, with the potential conflicts, may have more empathy and tolerance for other types of visitors. Therefore, recreation managers may reduce some perceived recreation conflict by increasing users' tolerance through "experience sharing" among different user groups.

PWC users are highly motivated on social interaction and nature enjoyment although less than motorboaters and landowners. PWC users focused on social interactions and nature as much as the other groups for their experiences. It is reasonable to educate PWC users what other groups

concerns are about their machine disturbing the nature environment and their behavior can potentially interfere with other user groups experiences. Education programs could enhance users' perceptions about activity impacts on the social and natural environments and provide appropriate compensatory strategies to avoid conflict such as selecting a quieter 4-cycle PWC motor, participating in suitable and appropriate areas for PWC that minimize impacts, and acting courteously to other users to reduce conflict (e.g., understanding other user's motivations, the difficulties of operating larger boats, the rules of navigation for all types of boats).

User's perceptions of boating regulations (Table 8) suggest that many users do not understand the current NYS regulations for motorboating and PWC use. In addition, the landowner's responses indicate not only their unfamiliarity with NYS boating regulations but also their strong feelings against PWC use. Education strategies can offer opportunities to enhance user's knowledge of boating regulation and increase tolerance among different user groups.

Study results indicate that although the preferred operating distances between PWC, motorboats and riparian properties were different, the majority of users preferred more than 100 feet between these activities. Users preferring more distance between users may feel this way because of motor noise, concern for safety, perceptions of crowding, disruptive or unsafe behaviors, and privacy issues. Riparian landowners, for instance, felt noise and speeding from PWC use and motorboating disturbed their daily life and this type of use close to their properties caused privacy problems and may pose a safety concern for their family when wading, swimming, or fishing. PWC users reportedly bothered motorboaters by following them too close, jumping the boat wakes, or interrupting their boating course. Overall, most respondents in this study preferred longer distances between recreational activities which might be due to the fact that NYGL has a large water surface area for users to participate in various activities.

Although some changes are suggested by this study based on the distances preferred, other alternatives need more consideration, such as noise reduction through mechanical technology and changes in boat and PWC operator behavior. For example, studies about the impacts of motors on the nature environment or wildlife could help users to understand how these issues are directly related to distance from shore and other users activities (e.g., observing wildlife or fishing). New boat and PWC motor technology also helps to reduce noise levels and minimize the impacts to the natural environment. The types of water bodies and various bank or shoreline situations, are important considerations in distance regulations because large limits distance may be appropriate for open water areas like NYGL, but not in narrow rivers or bays because such distance restrictions may limit the use of PWC and motorboats in some areas altogether.

In summary, recreation conflicts among PWC use, motorboating and landowners are not serious in most NYGL areas probably because of its large water surface

area. However, problems emerged near coastal areas because of more interaction among those different users. Users with single and multiple recreation activity experiences are similar in the pattern of responses when considering recreation conflicts, but different in the value of each factor response. Study results reveal a series of asymmetrical conflicts that may imply current multiple use recreation may not be a good strategy in terms of reducing recreation conflict. The study also suggests education programs were needed to reduce conflict and increase compatibility between different user groups. However, preferences for large distances between users during their activities, and the implication that users may accept increases in the 100 foot limit in which boats must operate at 5 m.p.h or less from shore, should not be generalized to inland lakes or river systems because the physical environment (e.g. area, waves, wind, shoreline and adjacent lands) of the NYGL is different from those other inland NYS water areas.

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**SCUBA DIVING & UNDERWATER CULTURAL RESOURCES: DIFFERENCES IN ENVIRONMENTAL BELIEFS, ASCRIPTIONS OF RESPONSIBILITY, AND MANAGEMENT PREFERENCES BASED ON LEVEL OF DEVELOPMENT<sup>1</sup>**

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**Abstract:** This study examined SCUBA divers' level of development in relationship to environmental beliefs, ascriptions of responsibility, and management preferences concerning the use and management of New York's Great Lakes' underwater cultural resources. More than 850 New York State divers were surveyed during the fall of 1999, ranging from novices to experts and post-experts. Particular emphasis was placed on measuring extent of agreement with statements that focused on the use and preservation of underwater artifacts, which implicitly involved issues related to accessibility of abandoned shipwrecks. Although divers of all levels of development did tend to share certain beliefs, ascriptions of responsibility, and management preferences, the strength of agreement with half of the statements did differ by level of development. The predicted pattern of increasing in strength from beginner to expert and declining again for post-expert stages was supported in nine cases, while post-experts continued a more direct linear relationship with three items. In these particular cases, a "history effect" may have had an influence on post-expert divers. The results of this study documented the need for continuing support to educate divers on safe and responsible use of underwater resources.

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**Introduction**

Tourism professionals, community developers, and SCUBA divers are concerned with the protection and use of underwater cultural resources in New York's Great Lakes, an area encompassing the two lakes bordering the state (Ontario and Erie) as well as the two rivers that feed into them (the Niagara and St. Lawrence). Increased interest in SCUBA diving in this area has been attributed to two recent factors.

First, water clarity has significantly increased within the last ten years, due not only to pollution control programs, but also to zebra mussel infestations. This overpopulated exotic species is predominantly known for its negative environmental impacts: disturbing the natural balance of the Great Lakes' ecosystem as well as clogging drainage pipes to and from water, electrical, and industrial plants (Hogan, 1996). However, by filter feeding on phytoplankton and zooplankton, this dominating pest has dramatically increased the water clarity of murky waters, a positive effect appreciated by SCUBA divers (Hogan, 1996). Instead of seeing only a few feet under the water's surface (as was the case prior to 1988, the year the first zebra mussel appeared in the Great Lakes), divers can now see 20 to 60 feet (Zeidner, 1996).

Second, the passage of the 1987 Abandoned Shipwreck Act (ASA) has led to greater interest in shipwreck diving and artifact finding. Due to its vast cultural resources, the Great Lakes region is considered by many to be the best cold water diving location in the United States; in fact, the region has a reputation of offering the best shipwreck diving in the world, with vessels dating back to the Revolutionary War (brochure, no author).

Importantly, the ASA shifted ownership of underwater shipwrecks from the federal government to each individual state in which they are found. New York allows and even encourages exploration, but divers are prohibited from taking and even touching artifacts that are found under the surface. When a diver removes an item from its original setting the value, integrity, and significance are lost because the whole picture and its surroundings are missing. According to researchers, historians, and state agencies, however, removal of items from under the surface is a noticeable problem because the act is so hard to enforce (Zeidner, 1996).

Because SCUBA diving is gaining in popularity, the potential to affect not only underwater cultural resources, but also marine resources and fragile ecosystems, is high (Davis & Tisdell, 1996; Fabbri, 1990). The underwater environment is delicate and can become unbalanced and threatened more easily than realized. However, as most studies incorporating Dunlap & Van Liere's (1978) "New Environmental Paradigm" scale have shown, those who participate in outdoor recreation and are members of environmental organizations tend to have positive attitudes toward the environment. Possessing pro-environmental attitudes, however, has not been shown to automatically lead to environmentally responsible behaviors. Only

recently have several studies demonstrated fairly strong support for the relationship between outdoor recreation participation and pro-environmental behaviors (Nord, Luloff, & Bridger, 1998; Theodori, Luloff, & Willits, 1998; Tarrant & Green, 1999; Theodori & Luloff, 1999).

Water recreationists are generally less aware than land-based outdoor recreation participants of the negative effects they may cause the marine environment, because a change in water quality may happen over a period of time with less indication of the direct cause (Wall & Wright, 1977). Of particular note, inexperienced divers tend to contribute more to environmental damage than skilled divers because of their inability to control buoyancy under the surface. A direct result of this lack of control is stirring up silt clouds that suffocate and kill organisms, as well as touching, bumping, and crashing into shipwrecks, reefs, and other ecologically and culturally significant resources (Davis & Tisdell, 1995). In order to minimize effects on the environment, Graver (1999) suggests diving should be a "no contact" activity. Although SCUBA diving is a self-regulated industry, participation does require certification. Many certification agencies include environmental awareness in their courses, but because certification does not expire, being kept informed of how not to negatively affect the environment may not occur (Davis & Tisdell, 1995).

As the above discussion demonstrates, factors such as skill level, experience, and knowledge seem to be directly related to divers' level of development. In the literature two prominent leisure theories, amateur/professionalism and specialization, form the basis for studying the growth, progress, and development of participants in leisure activities.

Perhaps best known for proposing a progression of commitment, Stebbins (1979, 1992) studied "serious leisure" and amateurism in art, entertainment, science, and sport. According to his theory, as an activity becomes more important to participants, they progress from dabblers to novices, amateur participants, or amateur devotees, or may even become paid professionals. In describing participants' career histories, however, Stebbins also described a stage of decline or post-professionalism. Scanlan, Ravizza & Stein (1989) demonstrated many of Stebbins' concepts in their study of elite figure skaters by documenting five phases of development (with the final two characterized as retirement from competitive skating, and staying involved past retirement through coaching or show performing), based on skaters' evolving commitment, achievement, and involvement. In her study of quiltmakers, Todd (1998) also documented a progression and retrogression of development. Data from 459 quiltmakers (including 24 inactive quiltmakers) showed that level of quilting development was related to measures of equipment, knowledge, experience level, perceived skill, participation, and commitment; mean scores for each of these factors increased from beginners through experts and then declined for post-experts.

On the other hand, Bryan (1977) defined specialization as "a continuum of behavior from the general to the particular, reflected by equipment and skills ... and activity preferences" (p. 175). Degree of specialization was defined as a function of one's time, money, equipment, skill, and psychic commitment to an activity. In his study of fly fishermen, as specialization increased, Bryan found that attitudes and values about the activity changed, affected in part by the prominence of a leisure social world. Bryan suggested that the activity was linked to the properties of the resource in which the sport was practiced, with the specialist wanting to be able to control and manipulate the resource setting in such a way that skill and luck could be differentiated.

In addition, Bryan (1977, 1979) found that more experienced anglers developed a preservationist focus where nature and the setting were more important than actually catching fish, versus the consumptive point of view found in less developed anglers. Similarly, when Katz (1981) evaluated the relationship between environmental attitudes and specialization of fly fishermen, he found that concern for the environment increased as specialization increased. Kauffman (1984) reinforced this notion in his study of canoeists; environmental attitudes toward the resource base increased as level of specialization increased, and were strongest for highly specialized canoeists. However, it is important to note that none of these studies accounted for what eventually happens to specialists once their levels of development begin to decline, i.e., the existence of a post-professional or post-expert phase.

### Purpose of the Study

This study therefore examined SCUBA divers' level of development in relationship to their environmental beliefs, ascriptions of responsibility, and management preferences concerning the use and management of New York's Great Lakes underwater environment. It was hypothesized that divers with higher levels of development (i.e., beginners through experts) would have stronger beliefs about the use of underwater cultural resources. It was also expected that divers with higher levels of development would tend to take more responsibility for their actions and prefer management actions that place more responsibility on divers to police themselves rather than encourage the use of invasive, controlling management actions. In each case, it was further hypothesized that post-expert divers would decrease in the strength of their responses when compared to experts.

This study could establish the extent to which theories of specialization and amateur/professionalism may be applied to SCUBA divers. By documenting a progression of novice through post-expert divers, the applicability and generalizability of the models could be significantly expanded. As Somers (1988) writes,

SCUBA diving is often referred to as a "recreational sport." However, the term "sport" sometimes implies erroneous connotations and

limits understanding. SCUBA diving can be an avocation or a vocation. It is a pastime, a pursuit, or even a lifestyle, that can be as limited or extensive as one makes it. A person's level of commitment, degree of skill, and types of equipment all depend on what he/she wants out of SCUBA diving. (On-line abstract)

This study could also document the need for continuing support to educate divers on safe and responsible use of underwater resources so that they learn to preserve as well as appreciate them. Without users' environmental awareness and the implementation of environmentally responsible management practices to help sustain the underwater environment, the very resource that SCUBA diving depends on may disappear and become unavailable for future use.

## Methods

Two methods of data collection were used: focus group interviews and a mail survey. First, during the month of June 1999, six focus group interviews were conducted in five key locations across the New York Great Lakes Region: Buffalo/Niagara Falls, Rochester, Syracuse, Oswego, and Clayton (2 groups). For each meeting, a key informant helped organize 4 to 12 divers representing a wide range of diving levels. Using an established protocol, the primary investigator asked a series of 6 questions; each tape-recorded meeting lasted approximately 90 minutes. Major themes of discussion were then gleaned from the focus group data to aid in the development of a 16-page written questionnaire.

The second method of data collection involved mailing 2850 surveys to a sample of active and inactive New York State divers. A database of approximately 6700 individuals was compiled from various resources, including a national certifying agency, a statewide organization, a dive symposium, a dive shop, a non-profit organization, and several dive clubs.<sup>2</sup> In order to select a sample of 2850 divers, addresses were stratified by major regions across the state. Primary emphasis was placed on contacting divers in the regions closest to the Great Lakes, with subsequently less emphasis placed the farther away one resided. Consequently, those selected to receive the survey included all available names from some regions and a random selection from other regions. A total of 2850 surveys was then mailed during October 1999, followed by reminder postcards and a second mailing of the survey to non-respondents.

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<sup>2</sup> Cooperation was received from the following organizations: Professional Association of Diving Instructors (PADI); New York State Divers Association (NYSDA); Great Lakes Underwater III Symposium; Syracuse's National Aquatic Service, Inc.; Bateaux Below, Inc.; Rochester's Rec Divers club; Buffalo Aqua Club; Syracuse University's dive club; and Central New York Dive Club.

For purposes of this study, respondents were asked to rate a total of 18 statements concerning the use and management of the underwater environment on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Statements were worded to reflect beliefs (9 statements), ascriptions of responsibility (3), and management preferences (6). Particular emphasis was placed on measuring extent of agreement with statements that focused on the use and preservation of underwater artifacts, as well as issues of accessibility to abandoned shipwrecks. Respondents were also asked to rate the extent to which 6 specific management actions would affect their diving experiences if they were to encounter them while diving in New York's Great Lakes region. Choices on a 7-point scale ranged from -3 (negatively) to +3 (positively) with 0 representing no effect.

Level of development was operationalized by a self-selected single measure, where respondents were asked to characterize their current stage of development as a diver by choosing one of the following five categories: beginner, intermediate, advanced, expert, or "post-expert - not the expert I once was."

One-way analysis of variance was used to determine if a difference existed among mean scores for each statement (worded as a belief, ascription of responsibility, management preference, or effect of management action) by level of development. To compare the differences between mean scores for each pair of developmental levels, Scheffé's was used as a post hoc test if the F-value was significant ( $p < .05$ ).

**Table 1. Environmental Statements with a Majority of Respondents Agreeing**

Item	Mean	% who disagreed	% who were neutral	% who agreed	n
If I take an artifact and so does every one else, nothing will be left for anyone to see.	4.2	8.1	9.1	82.8	804
Compared to 10 years ago, the underwater visibility in NY's Great Lakes is better.	4.1	2.9	32.0	65.1	771
There should be stiff fines for divers who take valuable historical artifacts.	4.0	11.3	14.1	74.6	799
Compared to 10 years ago, I am more environmentally conscious and sensitive to environmental issues than I used to be.	3.9	10.2	20.7	69.1	797
Information about shipwreck locations should be made easily accessible to the public.	3.8	7.7	22.7	69.5	801
Directly contacting objects on abandoned shipwrecks causes them to deteriorate.	3.7	10.1	28.0	61.9	801

**Table 2. Environmental Statements with a Majority of Respondents Disagreeing**

Item	Mean	% who disagreed	% who were neutral	% who agreed	n
Zebra mussels should be removed from the surfaces of shipwrecks so I can see them better.	2.4	55.0	34.1	11.0	797
If I don't take an artifact as a souvenir, someone else will.	2.3	61.9	21.8	16.2	801

**Table 3. Environmental Statements with a Majority of Respondents Remaining Neutral**

Item	Mean	% who disagreed	% who were neutral	% who agreed	n
Canada does a better job of protecting and regulating shipwreck diving than the U.S.	3.5	3.3	59.6	37.1	767
There is government support of the diving industry in Canada.	3.4	2.4	65.8	31.8	757
There is government support of the diving industry in NY's Great Lakes.	2.6	31.7	61.6	6.7	757

**Table 4. Environmental Statements with No Majority Captured by Any Response Category**

Item	Mean	% who disagreed	% who were neutral	% who agreed	n
Access to abandoned shipwrecks should be unrestricted.	3.3	30.6	22.7	46.7	801
Artifacts should be collected and displayed in museums for the general public to view.	3.2	24.7	32.8	42.6	799
Fifty years is a reasonable time period to use when dating whether objects are of significant archaeological interest.	3.1	22.2	47.4	30.3	784
Diving on shipwrecks should be monitored by authorized diving guides.	3.0	35.1	27.6	37.2	803
Touching objects is okay unless they are historically significant or fragile.	2.8	41.9	23.2	34.9	794
The bubbles I blow while diving can have an impact on the underwater environment.	2.6	46.4	28.6	15.0	796
It is okay to recover objects that have sunk to the bottom and will disappear anyway.	2.6	46.0	29.1	24.9	800

## Results

Although 2850 surveys were originally mailed, 490 (17 percent) were returned either as undeliverable or noted as having been sent to non-divers. (While an unusable rate of 10 percent is common for studies of this nature, the higher undeliverable rate for the current study was not unexpected. One focus of the overall project was to uncover why divers cease participating; thus, some of the addresses used were up to 10 years old, increasing the chance of incorrect addresses.) Of the remaining 2360 potential respondents, 869 usable questionnaires were returned, yielding a 37 percent response rate.

Four out of five respondents were male. While ages ranged from 12 to 80, the average age reported was 43. Half of the respondents had earned 2- or 4-year college degrees, while another quarter had received advanced degrees. Half reported earning more than \$60,000 in household income per year.

Due to the relatively low response rate, a non-respondent bias check was conducted by phone. Non-respondents did not differ significantly from respondents when age, gender, education level, number of years spent diving, or stage of development were compared. However, significantly lower percentages of non-respondents were certified or active divers. Thus, when interpreting results, it is important to remember that diving was likely to have been more salient for respondents than non-respondents.

When rating a total of 18 statements concerning environmental beliefs, ascriptions of responsibility, and management preferences on a 5-point agreement scale, a majority of respondents tended to agree with the six statements shown in Table 1. These statements generally reflected a pro-environmental attitude and awareness of the consequences of disturbing underwater artifacts. A majority of respondents tended to disagree with only two statements: "Zebra mussels should be removed from the surfaces of shipwrecks so I can see them better," and "If I don't take an artifact as a souvenir, someone else will." (See Table 2.) Interestingly, a majority of respondents tended to be neutral towards three items: "Canada does a better job of protecting and regulating shipwreck diving than the U.S.," "There is government support of the diving industry in Canada," and "There is government support of the diving industry in NY's Great Lakes." (See Table 3.) Those who were not neutral, however, were much more likely to feel that Canada does a better job than the U.S. of supporting the dive industry and protecting underwater resources. Responses for the remaining seven statements were more evenly distributed among respondents, with no clear majority agreeing, disagreeing, or being neutral. (See Table 4.)

Respondents were also asked to rate the extent to which six specific management actions would affect their diving experiences if they were to encounter them while diving in New York's Great Lakes region. Choices on a 7-point

scale ranged from -3 (negatively) to +3 (positively) with 0 representing no effect. Approximately 75 percent of all respondents answered that three items would positively affect their experience, with means ranging from +1.4 to +1.5: additional artificial reefs, more intentionally sunk ships, and underwater parks and trails. About half of all respondents felt that two items (interpretive signs [e.g., on shipwrecks, etc.], and collection and display of artifacts in an accessible underwater location for the general public to view) would positively affect their experience, but mean scores were just +0.7. Finally, respondents felt negatively more often than positively (44 vs. 32 percent) about underwater protection of artifacts (e.g., roping them off, chaining them down, putting them under plastic domes). Consequently, the mean score for that item was slightly negative (-.3).

Of the 847 respondents who selected a category to represent level of development, 198 (23 percent) marked "beginner," 267 (32 percent) were "intermediate," and 250 (30 percent) considered themselves to be "advanced." However, less than 10 percent (77 respondents) rated themselves as "expert," and only 6 percent (55

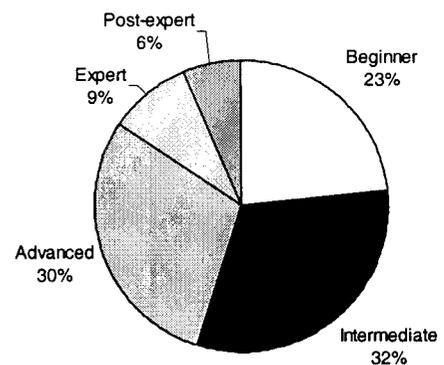


Figure 1. Level of Development

respondents) called themselves "post-expert - not the expert I once was." (See Figure 1.)

As with quiltmakers (Todd, 1998), these categories were found to adequately reflect dive-related factors of equipment owned, knowledge, experience, perceived skill, participation, and commitment, plus an additional scale measuring amateur/professional growth (Todd, 2000). For six of the scales, mean scores increased from beginner to expert and then decreased for post-experts. Experience was the only scale that displayed a different pattern: instead of declining at the post-expert stage, experience level continued to increase, due to its cumulative nature. Figure 2 highlights how post-expert scores tended to return to a level equal to those of advanced divers for six of the seven indices.

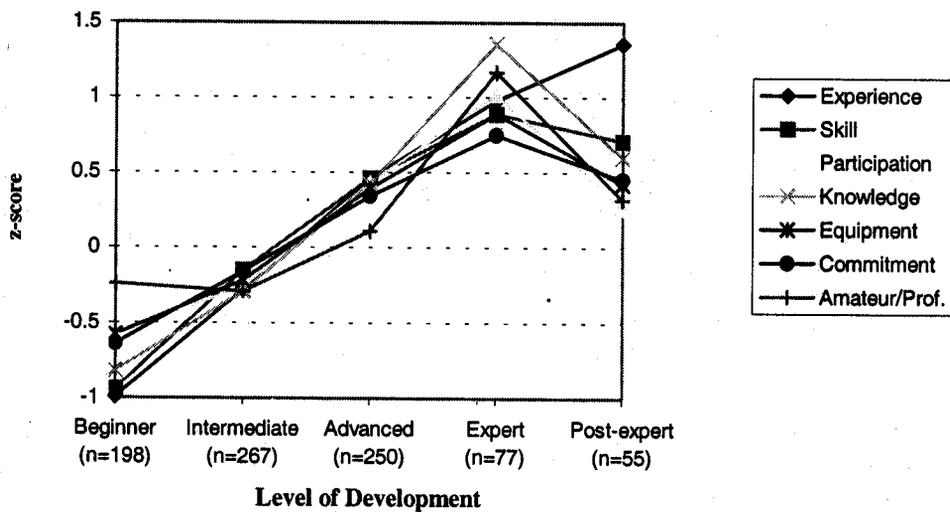


Figure 2. Factors Related to Level of Development

It was hypothesized that divers with higher levels of development (i.e., beginners through experts) would have stronger beliefs toward the use of underwater cultural resources, but the strength of these responses would decrease for post-expert divers. It was also expected that divers with higher levels of development would tend to take more responsibility for their actions and prefer management actions that place more responsibility on divers to police themselves rather than encourage the use of invasive, controlling management actions; a decrease was again expected for post-expert divers. As shown in Table 5, partial support was found for these relationships. One-way analysis of variance yielded significant differences among the mean scores of half of the 24 items based on level of development ( $p < .01$ ): 10 of the 18 environmental statements and 2 of the 6 effects on experience quality statements.

As displayed in Figures 3 and 4, several distinct patterns emerged. First, the predicted pattern of responses increasing in strength from beginner to expert and decreasing again for post-experts was demonstrated in two ways: a progression of *agreeing* more strongly, or a progression of *disagreeing* more strongly. However, although all mean post-expert scores tended to decrease in strength when compared to experts in each of these cases, it is important to note that the decline was statistically significant for only one item: the belief that there is government support of the diving industry in New York's Great Lakes. Interestingly, experts significantly *disagreed* more strongly with this belief when compared with any other level of development. On the other hand, experts tended to *agree* most highly with a total of 8 items: the 4 beliefs that underwater visibility is better than 10 years ago, Canada protects and regulates shipwreck diving better than the U.S., the Canadian government supports the diving industry, and touching objects is okay unless they are significant or fragile; and 4 management-related variables: information on shipwreck locations should be accessible, access to abandoned shipwrecks should be unrestricted, plus additional artificial reefs and more intentionally sunk ships would enhance their diving experiences.

For the second set of patterns, instead of post-experts decreasing in the strength of their responses when compared to experts, they followed a more direct linear relationship with several items: the belief that it is acceptable to recover objects that have sunk to the bottom and will disappear anyway; and the management preference statements that there should be stiff fines for taking artifacts, and that diving on shipwrecks should be monitored by authorized diving guides. As hypothesized, divers in the beginning stages of development responded more heavily, indicating significantly more support for invasive management practices (such as fines for taking artifacts and authorized diving guides for shipwreck diving). Beginner divers were also the least likely to believe that it is acceptable to touch or recover objects.

On the other hand, there were no significant differences between diver development levels for the remaining 12 items, including all 3 ascriptions of responsibility. Specifically, all divers tended to *agree* with 3 statements: the beliefs that they were more environmentally conscious and sensitive than they had been 10 years ago, and that directly contacting objects on abandoned shipwrecks causes them to deteriorate; and the ascription of responsibility that taking artifacts will leave nothing for anyone else to see. Regardless of developmental level, all divers tended to *disagree* with the following 3 statements: the ascriptions of responsibility that their bubbles impact the underwater environment and that if they don't take an artifact someone else will; and the management preference for removing zebra mussels from shipwreck surfaces. Finally, all divers tended to be more *neutral* towards 2 statements: the belief that 50 years is a reasonable time period for dating significant artifacts, and the management preference for collecting and displaying artifacts in museums. When rating effects on experience quality, all divers felt slightly positive about encountering underwater parks and trails, interpretive signs, and displaying collected artifacts in an accessible underwater location, but were slightly negative towards noticeably invasive underwater protection of artifacts.

Table 5. Environmental Statements: One-way Analysis of Variance Using Mean Scores of Divers with Different Levels of Development

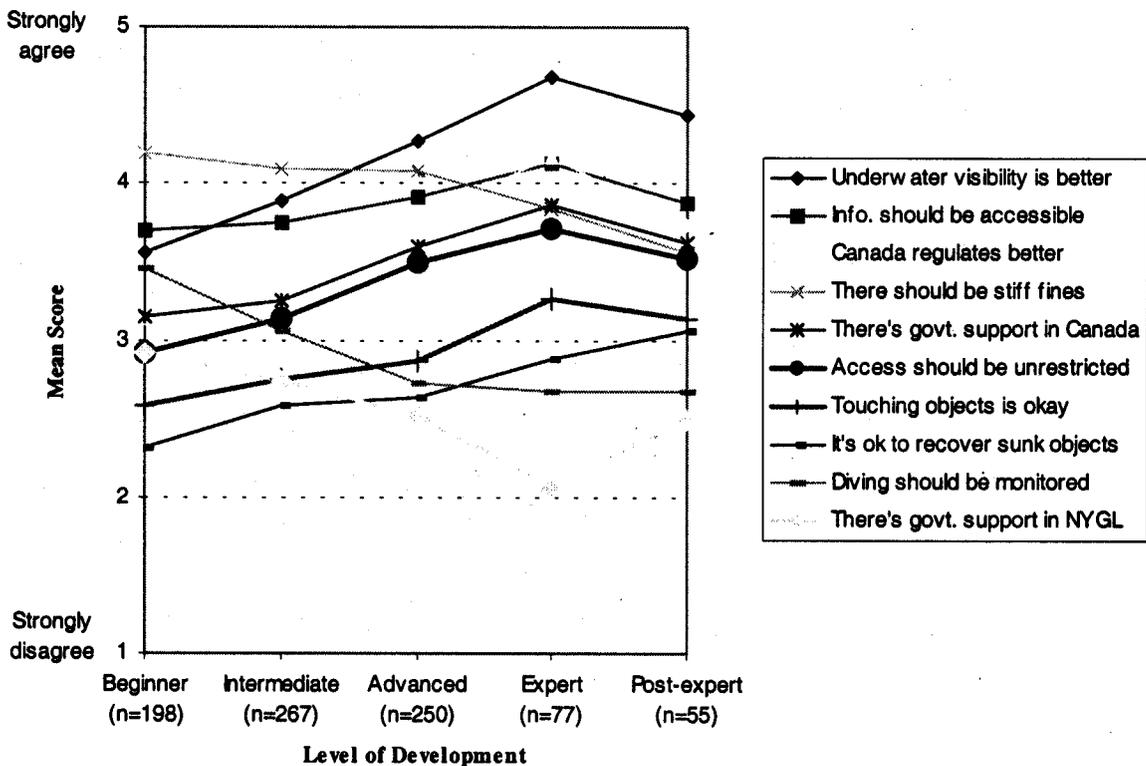
Statement	Total (n=847)	Level of Development					F	p	# of Differences Detected
		Beginner (n=198)	Intermediate (n=267)	Advanced (n=250)	Expert (n=77)	Post-expert (n=55)			
<b>Beliefs:</b>									
Compared to 10 years ago, the underwater visibility in NY's Great Lakes is better.	4.05	3.56 <sup>a</sup>	3.89 <sup>b</sup>	4.27 <sup>c</sup>	4.68 <sup>d</sup>	4.44 <sup>cd</sup>	30.00	.01	8
Compared to 10 years ago, I'm more environmentally conscious and sensitive to environmental issues ....	3.87	3.81	3.77	3.93	4.07	3.93	1.60	.17	n.s.
Directly contacting objects on abandoned shipwrecks causes them to deteriorate.	3.75	3.76	3.79	3.73	3.79	3.56	0.64	.63	n.s.
Canada does a better job of protecting and regulating shipwreck diving than the U.S.	3.55	3.14 <sup>a</sup>	3.36 <sup>ac</sup>	3.78 <sup>b</sup>	4.17 <sup>bd</sup>	3.73 <sup>bc</sup>	28.41	.01	6
There's government support of the diving industry in Canada	3.42	3.15 <sup>a</sup>	3.25 <sup>a</sup>	3.60 <sup>b</sup>	3.86 <sup>b</sup>	3.62 <sup>b</sup>	19.68	.01	6
Fifty years is a reasonable time period to use when dating whether objects are of significant archaeological interest.	3.05	3.09	3.05	3.06	3.12	2.85	0.74	.57	n.s.
Touching objects is okay unless they are historically significant or fragile.	2.83	2.59 <sup>a</sup>	2.75 <sup>a</sup>	2.86 <sup>ab</sup>	3.26 <sup>b</sup>	3.13 <sup>ab</sup>	5.10	.01	2
It is okay to recover objects that have sunk to the bottom and will disappear anyway.	2.60	2.32 <sup>a</sup>	2.58 <sup>ab</sup>	2.64 <sup>ab</sup>	2.88 <sup>b</sup>	3.06 <sup>b</sup>	5.60	.01	2
There is government support of the diving industry in NY's Great Lakes.	2.63	2.92 <sup>a</sup>	2.74 <sup>ac</sup>	2.52 <sup>bc</sup>	2.07 <sup>d</sup>	2.50 <sup>c</sup>	17.79	.01	6
<b>Ascriptions of Responsibility:</b>									
If I take an artifact and so does every one else, nothing will be left for anyone to see.	4.23	4.24	4.22	4.26	4.32	3.96	1.11	.35	n.s.
The bubbles I blow while diving can have an impact on the underwater environment.	2.66	2.84	2.62	2.59	2.54	2.75	1.41	.23	n.s.
If I don't take an artifact as a souvenir, someone else will.	2.25	2.15	2.26	2.20	2.33	2.65	2.15	.07	n.s.
<b>Management Preferences:</b>									
There should be stiff fines for divers who take valuable historical artifacts.	4.05	4.20 <sup>a</sup>	4.09 <sup>a</sup>	4.08 <sup>a</sup>	3.84 <sup>ab</sup>	3.55 <sup>b</sup>	4.19	.01	3
Information about shipwreck locations should be made easily accessible to the public.	3.83	3.70 <sup>a</sup>	3.75 <sup>a</sup>	3.92 <sup>ab</sup>	4.13 <sup>b</sup>	3.87 <sup>ab</sup>	3.96	.01	2
Access to abandoned shipwrecks should be unrestricted.	3.28	2.92 <sup>a</sup>	3.14 <sup>ac</sup>	3.49 <sup>b</sup>	3.71 <sup>b</sup>	3.52 <sup>bc</sup>	9.71	.01	5
Artifacts should be collected and displayed in museums for the general public to view.	3.23	3.22	3.22	3.16	3.31	3.53	1.26	.29	n.s.
Diving on shipwrecks should be monitored by authorized diving guides.	2.98	3.45 <sup>a</sup>	3.06 <sup>b</sup>	2.72 <sup>c</sup>	2.68 <sup>bc</sup>	2.67 <sup>bc</sup>	12.31	.01	5
Zebra mussels should be removed from the surfaces of shipwrecks so I can see them better.	2.35	2.45	2.36	2.32	2.29	2.21	0.79	.53	n.s.

Means with different superscripts are significantly different at the .05 level. Values are mean scores on a 5-point scale ranging from strongly disagree (1) to strongly agree (5).

**Table 6. Effects on Experience Quality: One-way Analysis of Variance Using Mean Scores of Divers with Different Levels of Development**

Statement	Total (n=847)	Level of Development					F	p	# of Differences Detected
		Beginner (n=198)	Inter- mediate (n=267)	Advanced (n=250)	Expert (n=77)	Post- expert (n=55)			
<i>Effects on Experience Quality:</i>									
<b>Additional artificial reefs</b>	<b>+ 0.54</b>	<b>+ 1.17<sup>a</sup></b>	<b>+ 1.42<sup>ac</sup></b>	<b>+ 1.87<sup>b</sup></b>	<b>+ 1.89<sup>bc</sup></b>	<b>+ 1.25<sup>abc</sup></b>	<b>8.35</b>	<b>.01</b>	<b>3</b>
<b>More intentionally sunk ships</b>	<b>+ 0.43</b>	<b>+ 0.85<sup>a</sup></b>	<b>+ 1.18<sup>a</sup></b>	<b>+ 1.88<sup>b</sup></b>	<b>+ 2.08<sup>b</sup></b>	<b>+ 1.52<sup>ab</sup></b>	<b>15.35</b>	<b>.01</b>	<b>4</b>
Underwater parks and trails	+ 0.40	+ 1.31	+ 1.35	+ 1.60	+ 1.41	+ 0.98	2.07	.08	n.s.
Interpretive signs (e.g., on shipwrecks)	+ 0.69	+ 0.66	+ 0.65	+ 0.77	+ 0.91	+ 0.30	1.07	.37	n.s.
Collection and display of artifacts in an accessible underwater location for the general public to view	+ 0.67	+ 0.56	+ 0.58	+ 0.73	+ 0.96	+ 0.80	1.03	.39	n.s.
Underwater protection of artifacts (e.g., roping them off, chaining them down, putting them under plastic domes)	- 0.33	- 0.14	- 0.37	- 0.39	- 0.25	- 0.62	0.84	.50	n.s.

Means with different superscripts are significantly different at the .05 level. Values are mean scores on a 7-point scale ranging from negatively (-3) to positively (+3) with 0 representing no effect.



**Figure 3. Environmental Statements by Level of Development**

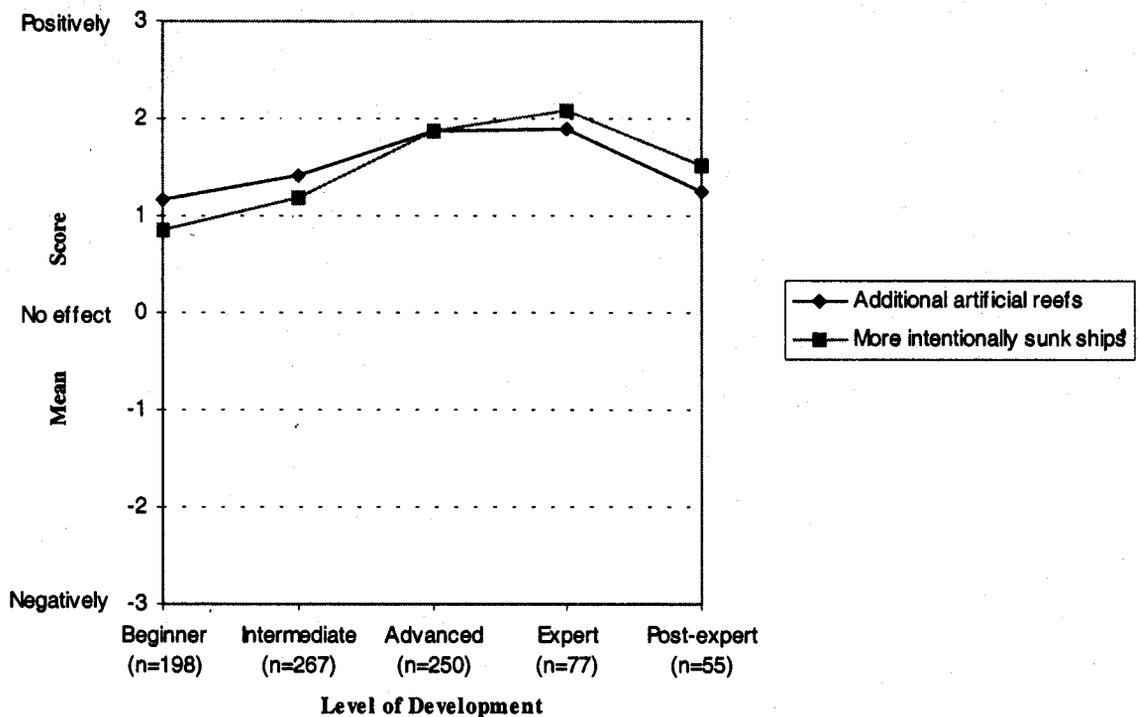


Figure 4. Effects on Experience Quality by Level of Development

### Conclusions and Implications

Based upon the findings, divers of all levels of development do tend to share certain beliefs, ascriptions of responsibility, and management preferences. For instance, all divers tended to agree that they are more environmentally conscious and sensitive than they were 10 years ago, they all tended to disagree that the bubbles they blow have an impact on the underwater environment, and they all tended to be neutral on whether artifacts should be put in museums.

However, some beliefs about the use of underwater cultural resources are related to level of diving development, with a tendency to increase in strength from beginner to expert and decrease again in strength for post-experts. Of particular note, disillusion with and/or distrust of the U.S. government (especially versus the Canadian government) seems to be most evident for divers at the expert level.

In addition, some ascriptions of responsibility and management preferences also appear to be related to level of development. Divers with higher levels of development tend to take progressively more responsibility for their actions and prefer the least invasive management actions. The pattern, however, tends to vary for the post-expert phase.

As previously mentioned, beginners displayed more "purist" attitudes, i.e., were more "heavy-handed" by supporting invasive practices of fines and authorized guides, and disagreeing that it is acceptable to recover or touch objects. Perhaps beginners' lack of experience is causing them to perceive these as hypothetical situations, whereas divers with higher levels of development have actually encountered these circumstances, and, having faced reality, subsequently relaxed their purist perceptions based on true feelings.

Looking at it from a different angle, divers in the later stages of development tended to feel most strongly about being able to collect artifacts unimpaird. This seemingly "anti-environmental" response may be due in part to a history effect. Significantly, 50 percent of all experts and post-experts (specifically, more than one-third of all experts, and exactly two-thirds of all post-experts) had been diving more than 20 years (compared to just 10 percent of all beginner, intermediate and advanced divers combined.) When a large portion of these experts and post-experts started diving, artifact collecting was a major focus that was deemed highly acceptable by the dive community. Thus, their resistance to embracing and adopting the change in diving ethics may be well founded in the length of their diving histories.

Being aware of the environment and abiding by established regulations are important considerations in order for divers

to help preserve the marine environment. Divers should be role models for preservation, and proactively educate others to preserve the marine environment as well.

Not only is it essential for recreational divers to think in this manner, but these attitudes also play a key role for management agencies, instructors, clubs, and retailers. Divers often rely on charter boat operators, SCUBA diving clubs, and gear shops for current information and are influenced by their attitudes and practices when it comes to environmental issues. Divers who are involved in the community and work with organizations that advocate for the preservation of the environment benefit the dive industry the most. Management agencies need to implement management plans like Marine Protected Areas (MPAs), which use interpretive tools to educate divers and prevent the destruction of the underwater resource (Davis & Tisdell, 1995, 1996; Vereka & Ponneleit, 1981). Well designed interpretive programs can benefit the dive community by recommending dive locations, assisting with site selections, and creating an understanding of the marine and cultural environment while helping to preserve the resource (Graver, 1999; Vereka & Ponneleit, 1981).

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