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# Perceived environmental quality and place attachment in North American and European temperate lake districts\*

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## Abstract

Stedman, R.C., R.C. Lathrop, B. Clark, J. Ejsmont-Karabin, P. Kasprzak, K. Nielsen, D. Osgood, M. Powell, A.-M. Ventelä, K.E. Webster and A. Zhukova. 2007. Perceived environmental quality and place attachment in North American and European temperate lake districts. *Lake and Reserv. Manage.* 23:330-344.

Sense of place, or the meanings and attachments held for settings, continues to emerge as an important factor in environmental management. Previous research in a lake-rich setting in northern Wisconsin, USA, demonstrated that attachment to lakes is based in part on the perceived water quality and perceptions of social conflict. This research explores how these findings are similar or different across sites with very different ecological and social characteristics. To explore these cross-site similarities and differences, a social science survey was implemented in 10 lake districts (total n = 2,278 respondents), including 5 sites in North America and 5 in Europe. These sites share several commonalities: they all lie at fairly similar latitudes in the Northern Hemisphere, and they are all regions relatively rich in lake resources. The results demonstrate the myriad commonalities and contrasts in behaviors, environmental perceptions, and place attachment across sites.

Key words: comparative research, environmental perception, environmental quality, lakes, place attachment, sense of place

Recently, resource managers have begun to address the relationship between ecological quality of settings and human attachment to them (Williams and Stewart 1998). Crucial to most treatments of place is the recognition that linkages exist between environmental and social systems (Relph 1976, Brandenburg and Carroll 1995, Sack 1997). “Place attachment” is a positive emotional bond that develops between people and their environment (Low and Altman 1992) based on symbolic meanings attributed to the setting (Greider and

Garkovich 1994). Previous studies have emphasized the “socially constructed” essence of these meanings while placing less emphasis on the biophysical qualities of the setting (Tuan 1977, Eisenhauer *et al.* 2000). However, Stedman (2003) found that a setting’s environmental quality was a crucial predictor of attachment. Further, Stedman and Hammer (2006) examined the relationship between biogeochemical water quality and perceived water quality, and the mediation of this relationship by the level of shoreline development. The authors found that densely settled lakes were perceived as having worse water quality, independent of measurable water quality indicators.

The conclusion that environmental conditions affect beliefs about environmental quality and shape place attachment was derived from research in one particular setting with particu-

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**Figure 1.**-Participants at the 'Sense of Place in North Temperate Lakes' workshop held October 16-19, 2002 at the University of Wisconsin Trout Lake Station in northern Wisconsin. (Front row, kneeling from left: Dick Osgood, John Magnuson, Becky Hollander, Anne-Mari Ventelä; Back row from left: Kathy Webster, Dick Lathrop, Rich Stedman, Bev Clark, Maria Powell, Tim Kratz, Anna Zhukova, Kurt Nielsen, Jolanta Ejsmont-Karabin, Jim Rusak, Peter Kasprzak).

lar behaviors, land ownership patterns, cultural norms, and institutions. We know little about how these findings differ across settings with very different ecological, social, and economic attributes. To test these relationships in a broader context, our project examined environmental perception and place attachment across 10 lake district sites in Europe and North America. This exploratory study describes the unique and common elements found in multiple temperate-latitude lake districts. The physical ecologies of settings probably vary less than their patterns of meaning and use, which are shaped by culture and institutions (both formal and informal). This project compared these elements, focusing on perceptions of lake problems and attachment.

## Methods

Our multi-site research implemented a condensed version of a survey instrument implemented by Stedman (2003). Five temperate-latitude study sites in Europe and 5 in North America were selected to represent a broad diversity of physiographic, institutional, and cultural characteristics. Actual biogeochemical lake data were not included in this phase of the project due to limited availability of the data for some locations and because some study sites simply included too many lakes with wide ranging characteristics to make this feasible. We therefore focused on the relationship between perceived lake quality problems and attachment, although the relationship between lake biogeochemistry and attachment is crucial and deserves further study. Within each region, we asked a similar set of questions from the survey data: (1)

how are the lakes used, (2) how is their well-being perceived, and (3) how attached are people to the lakes? The results are presented as narratives about each lake district. Following the specific treatments of each lake district, we compare the districts in their relationship between perceived problems and attachment.

Researchers from each of the study sites (Fig. 1) coordinated their own data collection. They translated the survey instrument to the local language, added items to reflect local concerns, (while retaining a core set of survey questions that allowed cross-site comparisons), developed their implementation plan, and assembled their field research teams. Research teams were given latitude in several areas. First, they could target special populations of interest (*i.e.*, the sampling frame was not identical across study sites). Second, the contact methods differed between study sites, ranging from mailed surveys of property owners to face-to-face interviews with day users (although most sites made use of face-to-face interviews). This range of methods was necessary, given the diversity of research settings. Giving local teams some methodological latitude resulted in more variation than is ideal, and more than would have been obtained by a single-researcher effort, but this approach was necessary for several reasons. Practically, given budget constraints, we had to use local on-site researchers. This approach led to more local participation than if a researcher from outside the area were to lead the research. A follow-up debriefing at a group workshop suggested that very few people declined to answer questions, and in some locations, there was strong enthusiasm for the project (*e.g.*, the project made the national news in Finland). Finally, we were cautious of "one size fits all" approaches. For example, some of the regions have high rates of seasonal home ownership, others are only sites to visit for the day, while still others consist of permanent, year-round settlements. That said, most researchers attempted to broadly capture the entire range of people using the district, rather than targeting one particular group. Following data collection, research team members gathered for a 3-day workshop to discuss methods, present results, and concatenate the results from each site into a single working database. Across the 10 sites, a total of 2,278 people responded to the survey.

Several summed scales were created for environmental perceptions and for place attachment. We used a principal components factor analysis (PCA) with varimax rotation to examine relationships, or larger domains of meaning, among the items. For the *environmental perception* items, the PCA revealed a factor structure that explained 60.1% of the variation among the threat items. Factor 1 (Chronbach's alpha reliability of 0.737), termed "environmental damage," addresses impacts of use on the lake ecosystem: "my lake has been damaged"; "my lake has suffered from overuse"; "my lake is polluted"; and "my lake has changed a lot over

the years.” PCA Factor 2 (Chronbach’s alpha reliability of 0.697), termed “social conflict,” reflected concerns with human overuse and conflict, indicated by high scores for: “my lake has many people using it”; “my lake is crowded”; and “there is a lot of conflict between user groups” (Table 1). Attachment was measured using 8 items used by Stedman (2003), including “[my lake] is: an important part of who I am”; my favorite place to be”; is the best place to do the things I enjoy most” and others (Jorgensen and Stedman 2001 for a full description of these items). The PCA of these items revealed a single domain, with a very strong standardized 8 item alpha of 0.905. Given the potential for cross-cultural variation in these concepts, we were pleasantly surprised at commonality reflected in the factor results.

**Table 1.-Factor loadings for lake problems.**

Variable	Environmental Damage	Human Conflict
Damage to its environment	.744	
Is being harmed by overuse	.715	
Is polluted	.768	
Has changed over the years	.629	
Has many people using it		.750
Has conflict between users		.754
Is crowded		.748
<b>Cronbach's Alpha</b>	<b>0.737</b>	<b>0.697</b>

## Study site descriptions and survey results

### *Poland: The Great Masurian Lakes*

The Great Masurian Lakes system is the largest freshwater body in Poland, and includes 30 lakes with a combined area of 310 km<sup>2</sup> and a wide range of trophic conditions. The central and northern parts of the system drainage basin are dominated by agriculture; the southern part is forested. The area includes former Soviet-era State-owned farms, cities, and villages. The region is one of the most important recreational sites in Poland. Small communities (<5000 permanent residents) provide tourist services; hotels and smaller rentals serve about 80,000 visitors per year (Fig. 2). At peak times, visitors exceed permanent resident numbers. Much of the visitation focuses on water-based recreation; the lakes are heavily used for recreational fishing. Most shoreline is in public ownership, and areas in private ownership are accessible because Polish law stipulates that even private shoreline areas are open to all. There is no heavy industry in the region, so the main threat to lake water quality is nutrient runoff from sewage and agriculture. About 3% of the catchment basin is covered by the Masurian Landscape Protected Area.

The social science survey data collection focused on Mikolajskie Lake rather than the entire lake region. Of the land use in the catchment area, 28% is in agriculture, 45% is forested, and 21% is in urban uses. Mikolajskie Lake has a total area of 498 ha, a mean depth of 11 m (maximum of 26 m), a 2 m mean summertime Secchi disk reading, and has summer blue-green algal blooms. Data were collected using face-to-face interviews with a random sample ( $n = 111$ ) in the small lake-side community of Mikolajki. The sampling was intended to broadly represent a snapshot of people in the lake region during the peak summer period. Reflecting the diversity of use described above, about 40% of respondents owned property in the local area around the lake (Table 2). Of these, 27% owned recreational property with their permanent



**Figure 2.-Waterfront recreation in the Masurian Lake District near Mikolajki, Poland. (Photo: J. Ejsmont-Karabin)**

residence located elsewhere. Among nonpermanent residents, the lake region was, on average, about 250 km from their permanent residence, yet a majority (63%) had visited the area 10 or more times in the past year, confirming the importance of the Masurian region as a recreational destination. Probably reflecting the post-Soviet era, this is a relatively new place to visit or own property. The average year of first visit was 1990, and only 20% had ever visited the area prior to 1985. The most common recreational activities included swimming (86% of respondents) and boating (80%). About half (52%) used motorized boats, the highest percentage of any of the European sites. Observing wildlife/nature study was also relatively common (72%), as was fishing (57%) and camping (50%). The area receives less winter use, with only 31% engaging in winter activities. Few respondents (16%) reported hunting in the region (Table 3).

Respondents had fairly negative perceptions of the lake region (Table 4). Compared to other study sites, respon-

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**Table 2.**-Selected respondent property characteristics, by study site.

Site	N	Percent Owning Property	Percent Property Recreational Home	Mean Years Owned Property
NHLD (US)	788	100%	67.2%	20.7
Maine (US)	335	80%	61.9%	23.9
Finland	249	78%	75.1%	28.9
Belarus	212	32%	19.4%	23.4
Denmark	180	50%	0.0%	31.5
Madison (US)	177	81%	0.0%	14.8
Poland	111	40%	27.3%	22.2
Canada	109	92%	75.0%	25.3
Germany	79	38%	15.2%	29.7
Minneapolis (US)	38	100%	5.9%	20.8

**Table 3.**-Cross site comparisons: Activity participation.

	Fishing	Non-Motor Boating	Motor Boating	Swim	Camp	Obs. Wildlife	Winter	Hike	Hunt	Average
Poland N=111	57% <sup>6</sup>	80% <sup>3</sup>	52% <sup>6</sup>	86% <sup>5</sup>	50% <sup>3</sup>	72% <sup>6</sup>	31% <sup>8</sup>	80% <sup>3</sup>	16% <sup>1</sup>	<b>58%<sup>4</sup></b>
Germany N= 79	28% <sup>10</sup>	89% <sup>1</sup>	8% <sup>10</sup>	98% <sup>1</sup>	25% <sup>5</sup>	88% <sup>3</sup>	17% <sup>9</sup>	75% <sup>5</sup>	3% <sup>6</sup>	<b>48%<sup>9</sup></b>
Denmark N=180	28% <sup>9</sup>	43% <sup>9</sup>	37% <sup>8</sup>	60% <sup>9</sup>	25% <sup>6</sup>	58% <sup>10</sup>	14% <sup>10</sup>	83% <sup>2</sup>	11% <sup>2</sup>	<b>40%<sup>10</sup></b>
Finland N=249	57% <sup>5</sup>	75% <sup>4</sup>	38% <sup>7</sup>	89% <sup>4</sup>	57% <sup>2</sup>	75% <sup>5</sup>	58% <sup>3</sup>	65% <sup>7</sup>	5% <sup>5</sup>	<b>58%<sup>3</sup></b>
Belarus N=212	42% <sup>8</sup>	75% <sup>5</sup>	33% <sup>9</sup>	95% <sup>3</sup>	60% <sup>1</sup>	62% <sup>9</sup>	41% <sup>5</sup>	77% <sup>4</sup>	0% <sup>8</sup>	<b>54%<sup>6</sup></b>
Maine N=335	49% <sup>7</sup>	65% <sup>6</sup>	61% <sup>3</sup>	85% <sup>6</sup>	9% <sup>8</sup>	72% <sup>7</sup>	33% <sup>7</sup>	n/a	n/a	<b>53%<sup>7</sup></b>
Wisconsin (NHLD) N= 788	82% <sup>1</sup>	42% <sup>10</sup>	60% <sup>4</sup>	68% <sup>8</sup>	8% <sup>9</sup>	79% <sup>4</sup>	37% <sup>6</sup>	n/a	n/a	<b>54%<sup>5</sup></b>
Ontario, Canada N=109	79% <sup>2</sup>	89% <sup>2</sup>	78% <sup>2</sup>	95% <sup>2</sup>	29% <sup>4</sup>	96% <sup>1</sup>	56% <sup>4</sup>	84% <sup>1</sup>	10% <sup>4</sup>	<b>68%<sup>1</sup></b>
Minneapolis N=38	63% <sup>4</sup>	60% <sup>7</sup>	84% <sup>1</sup>	82% <sup>7</sup>	0% <sup>10</sup>	94% <sup>2</sup>	82% <sup>1</sup>	63% <sup>8</sup>	0% <sup>7</sup>	<b>59%<sup>2</sup></b>
Madison N=177	70% <sup>3</sup>	53% <sup>8</sup>	59% <sup>5</sup>	48% <sup>10</sup>	22% <sup>7</sup>	71% <sup>8</sup>	59% <sup>2</sup>	69% <sup>6</sup>	10% <sup>3</sup>	<b>51%<sup>8</sup></b>
<b>Weighted Average N= 2278</b>	<b>62%</b>	<b>59%</b>	<b>52%</b>	<b>77%</b>	<b>24%</b>	<b>72%</b>	<b>40%</b>	<b>74%</b>	<b>7%</b>	<b>54%</b>

Numbers in superscripts reflect the rank ordering of each site for the particular activity.

**Table 4.**-Perceptions of lake-related problems (% agree).

	Env damage	Harmed by overuse	Polluted	Change	Many people using	User Conflict	Crowded	High Env Quality	Excellent or perfect
Poland N=111	28.4 <sup>6</sup>	43.3 <sup>3</sup>	28.5 <sup>5</sup>	47.5 <sup>6</sup>	38.5 <sup>3</sup>	11.0 <sup>6</sup>	31.1 <sup>4</sup>	23.9 <sup>9</sup>	4.6 <sup>8</sup>
Germany N= 79	21.9 <sup>7</sup>	20.8 <sup>7</sup>	7.6 <sup>9</sup>	12.7 <sup>9</sup>	20.0 <sup>6</sup>	33.8 <sup>2</sup>	10.3 <sup>8</sup>	96.0 <sup>1</sup>	46.9 <sup>2</sup>
Denmark N=180	9.5 <sup>8</sup>	12.8 <sup>8</sup>	29.5 <sup>4</sup>	21.7 <sup>8</sup>	18.9 <sup>7</sup>	7.8 <sup>8</sup>	14.4 <sup>7</sup>	84.4 <sup>2</sup>	55.7 <sup>1</sup>
Finland N=249	43.4 <sup>3</sup>	28.8 <sup>6</sup>	30.0 <sup>3</sup>	53.4 <sup>3</sup>	18.7 <sup>8</sup>	9.7 <sup>7</sup>	5.3 <sup>9</sup>	63.0 <sup>4</sup>	7.3 <sup>7</sup>
Belarus N=212	47.7 <sup>2</sup>	59.3 <sup>1</sup>	56.8 <sup>1</sup>	47.6 <sup>5</sup>	77.3 <sup>1</sup>	11.9 <sup>5</sup>	49.0 <sup>1</sup>	29.5 <sup>7</sup>	3.3 <sup>9</sup>
Wisconsin (NHLD) N= 788	n/a	n/a	16.9 <sup>7</sup>	42.5 <sup>7</sup>	n/a	n/a	22.8 <sup>5</sup>	64.3 <sup>3</sup>	34.3 <sup>3</sup>
Ontario, Canada N=109	32.1 <sup>5</sup>	36.7 <sup>4</sup>	10.5 <sup>8</sup>	49.5 <sup>4</sup>	32.2 <sup>5</sup>	21.1 <sup>4</sup>	18.5 <sup>6</sup>	59.2 <sup>5</sup>	31.5 <sup>5</sup>
Minneapolis N=38	41.7 <sup>4</sup>	36.1 <sup>5</sup>	22.2 <sup>6</sup>	77.8 <sup>1</sup>	36.1 <sup>4</sup>	28.6 <sup>3</sup>	40.0 <sup>3</sup>	37.8 <sup>6</sup>	31.6 <sup>4</sup>
Madison N=177	68.4 <sup>1</sup>	57.9 <sup>2</sup>	40.8 <sup>2</sup>	65.4 <sup>2</sup>	48.3 <sup>2</sup>	63.3 <sup>1</sup>	47.1 <sup>2</sup>	24.6 <sup>8</sup>	7.4 <sup>6</sup>
Weighted Average N= 2278	38.7%	38.2%	34.3%	58.4%	37.9%	21.5%	32.5%	40.0%	33.4%

Numbers in superscripts reflect the rank ordering of each site for the particular activity.

dents were less likely to perceive the lake as damaged (28% agreed), and a source of conflict (11% agreed). However, they were more likely to perceive it as overused (43%) and crowded (31%). They were unlikely to perceive the lake as “of high environmental quality” (24%, the lowest of any lake region). When asked to give an overall rating of their lake, only 5% rated it as excellent or perfect, far below the 33% for the average of all lake districts. The participants also had relatively low attachment (4.42, the second lowest of the sites). Thus, we have a paradox: the lake region is heavily used and regionally important; yet, lake users perceive problems with the environmental quality and, overall, are not very attached to it. It may simply be the case that people in the region have relatively few substitute areas available.

### **Germany: Lake Stechlin Nature Reserve**

The Lake Stechlin area is located in northeast Germany, roughly 100 km north of Berlin. It is one of Germany’s oldest nature preservation areas (formed in 1938) and protects about 9,000 ha. The catchment area contains glacial deposits of sand and gravel, and most (80%) of the area is covered by forest. Most of the lakes are small (<100 ha), thermally stratifying or polymictic waters. Except for very few lakes,

the spring maximum of total phosphorus is below 70 µg P L<sup>-1</sup>. Lake Stechlin, a large (4.3 km<sup>2</sup>) deep clear water lake (mean annual Secchi readings around 8 m; maximum depth of 68 m), is the signature lake of the region and is inhabited by one of Germany’s few remaining populations of vendace (*Coregonus albula* L.) as well as other rare animals and plants. To the south is fairly flat, sandy and loamy agricultural land, but most of the area is forested with pine and oak. Being part of a preservation area, shoreline development is prohibited, and the vast majority of the lake shores are in public ownership. The Lake Stechlin area is within a 1.5 hour drive for more than 4 million people in the city of Berlin. There are 3 small villages of about 2,500 permanent residents in the area, oriented toward providing visitor services such as restaurants, hotels, and recreational opportunities (Fig. 3). Tourism and recreational use has evolved from luxurious summer retreats of well-off Berliners to mass tourism, with camping and rentals of multiple types. The number of overnight stays in the region has ranged from a low of about 42,000 in 1998 to 62,000 in 2001. A few people own weekend homes, which are confined to the villages rather than being located on the lakeshore areas. Most visitors rent holiday houses or apartments. With few exceptions, the lakes have public access, and land activities such as bicycling and hiking are also popular. Lake concerns include overcrowd-



**Figure 3.-**Waterfront restaurant on Lake Stechlin (Germany) where the owner also catches and serves local fish (vendace). (Photo: P. Kasprzak)

ing, eutrophication, and conflicts between the demands of nature preservation and tourism (these are being addressed by segregation of protected and public areas, and reforestation of former agricultural land). There is no overall strategy to mitigate overcrowding, but motorized boats are prohibited, nonmotorized boats are limited in number, and sensitive areas of the nature preserve prohibit public access. These limitations may sometimes lead to conflicts between visitors and the local nature preservation administration.

The Lake Stechlin Nature Reserve area survey consisted of 79 face-to-face interviews randomly chosen to represent the residents and lake users present in the area. A majority of participants were visitors rather than property owners. Of those owning property, most (85%) were permanent residents rather than vacation home owners. Reflecting the area's proximity to Berlin, visitors only traveled an average of 100 km to reach the area. However, only 31% had made 10 or more visits in the past year, only half the proportion of that seen in the Mansurian lakes region. The most common activities were swimming (98%) boating (89%, although virtually no motor boating occurred), and hiking (75%). Reflecting the restrictive regulations, respondents were unlikely to participate in harvest-oriented activities such as fishing (28%) and hunting (3%); winter activities were not especially popular (17%).

Respondents were very positive about the quality of the Lake Stechlin region. Compared to respondents from all other regions, they were less likely to perceive environmental change (13% agreed); nor did they believe their lake was polluted (8%), damaged (22%), overused (21%), or crowded (10%). However, and again perhaps reflecting potential controversy over restrictions on activity, they were relatively more likely to perceive conflict between user groups (34%). They strongly believe their lake is of high environmental quality

(96% agree) and 47% believe it is in excellent-to-perfect condition. These environmental perceptions did not, however, result in high levels of attachment: the average score (4.59) was below average for all lake districts studied (5.07), and was not significantly different than that in Poland, where lower quality is perceived. In summary, it is clear that Lake Stechlin is enjoyed as a place of high environmental quality, though recreational use is less intense than in some other lake districts, protected by its restrictive regulations. Ecological quality is being maintained, as is quality recreation, even if the restrictions that protect this quality and experience may occasionally create conflict.

### ***Denmark: Danish Lake District***

The 3 lakes investigated for the study (Silkeborg Lakes, Hinge, Slaaen) are located in the central part of the Jutland peninsula. The area contains about 70 larger lakes, ranging to 34 m deep, although shallow lakes with a mean depths of less than 5 m are most common. The trophic state of the lakes varies widely. Many are turbid due to nutrient loading from wastewater treatment plants and agriculture. Others are located in catchments consisting of forest and uncultivated land without point-source discharges of wastewater. About 70% of the total catchment consists of cultivated land. Farming is intensive, and mineral fertilizers and manure are used, which leach nitrate and phosphorus to the aquatic system. High nutrient concentrations are found in lakes in cultivated areas and/or catchments polluted by wastewater discharge. Phosphorus loading has decreased recently due to improved sewage treatment, yet concerns remain about nutrient loads expressed in reduced clarity, decreased macrophytes, increased blue-green algal blooms, decreased piscivorous fish, and poor swimming. Global changes—increasing temperature and precipitation—may increase leaching of nitrogen and phosphorus from farmland.

The catchment area of the Danish Lake District has a population of approximately 350,000 inhabitants. A few major towns are found, but most people live in small towns with <5,000 inhabitants. Conservation legislation prohibits constructing houses within 150 m of the shoreline of lakes >3 ha. Thus, few houses are located on the lakeshore except in older settlements of permanent residents. These houses are attractive and expensive. Few summer houses are found in the area compared to coastal areas. In summer the lakes are used by visitors, but seasonal housing is scarce: visitors live at campsites, in small hotels and rented apartments in the villages. Due to the short distance from the coast to the central part of Denmark (1–2 hr by car), visitors can easily reach the area for a one-day trip. The population increases by 100–200% during summer. According to the Danish Nature Protection Act, the public is allowed access to all major lakes. Residents and visitors use the lakes for a variety of activities such as swimming, canoeing, sport fishing, boat-

ing, and walking along the shore. Motor boating is generally prohibited, and speed restrictions are found in the few lakes where it is allowed.

For this study, 3 lakes were selected to reflect the diversity of water quality and use within the Danish Lake District: (1) The Silkeborg Lakes are 4 large lakes centrally located in the 964 km<sup>2</sup> catchment area, with a total lake area of 9.4 km<sup>2</sup>, and mean depths 1.8–7.8 m. The lakes are turbid (Secchi depths 1.2–1.5 m) and phosphorus rich (140–180 µg P l<sup>-1</sup>). Waste-water treatment plant improvements have resulted in decreased phosphorus concentrations, but toxic cyanobacteria occur during summer due to high phosphorus concentrations; (2) Lake Slaaen is a small (0.20 km<sup>2</sup>) clearwater lake. The small catchment area (<10 km<sup>2</sup>) is dominated by forests and is devoid of farmland and towns, and groundwater is the main water inlet to the lake. The phosphorus concentration, 10–15 µg P l<sup>-1</sup>, is among the lowest in Denmark, and no changes in environmental state have been observed during the last 30 years. The summer chlorophyll concentrations were about 2 µg Chl l<sup>-1</sup>. The vertical distribution of submerged vegetation reflects the clearwater state of the lake: macrophytes appear at 7.4 m depth, exceptional compared to other Danish lakes; (3) Lake Hinge is a turbid lake with an area of 0.9 km<sup>2</sup>, and maximum depth of 2.6 m. Farmland constitutes 93% of the 54 km<sup>2</sup> catchment area and is the dominant source of nitrogen and phosphorus (Fig. 4). During 1989–2000, the summer Secchi depth ranged from 0.4 to 0.6 m and phosphorus concentrations from 150 to 220 µg P l<sup>-1</sup>. Submerged vegetation was scarce, and the maximum vertical distribution was about 1 m.

For each study lake, at least 30 persons were interviewed face to face (total n = 180) on randomly chosen dates in July 2001. The users were comprised of 4 groups: (1) residents of the town of Silkeborg; (2) rural agricultural interests (persons who grew vegetables or forests within the catchment or within 3 km of the lake), interviewed by visiting farms at random; (3) overnight visitors, interviewed by visiting campsites or via encounters in Silkeborg or on the lakeshore; and (4) day users, sampled on the lakeshore. Because these groups represent the interests of the region in reasonable proportion, their responses are aggregated to form overall responses. Reflecting the sampling strategy, 50% of respondents were local residents, all of whom were permanent residents of the area. Residence was relatively long term (they had owned their property for an average of 32 years). Visitors were relative newcomers: the average year of first visit was 1988. There appear to be 2 distinct groups: recent visitors and long term residents. Visitors travelled an average of roughly 140 km from their residence to the area and made relatively few visits to the area (about 90% had visited the area 4 times or fewer in the previous year). Lake recreation participation was relatively lower than in the other sites. Although they were more likely than respondents overall to hike (83%), they were



**Figure 4.-Agriculture in the Lake Hinge catchment, Denmark.**  
(Photo K. Nielsen)

less likely to swim (60%), boat (43%), and fish (28%). Winter activities (14%) and hunting (11%) were uncommon.

Danish respondents were quite favorable (about equal to German respondents) about the status of their lakes. They were unlikely to consider their lakes damaged (10%), over-used (13%), crowded (14%), and the site of conflict between user groups (8%). Despite expert concerns about water quality, 85% agreed that their lake had high environmental quality, and 56% (the highest for any site) rated their lake as excellent or perfect. They were attached to their lakes (mean for the summed scale = 5.03, higher than most European sites). Although responses are aggregated across multiple types of lakes in the district, these results are interesting: the lakes face a host of nutrient-related threats, yet are perceived very positively. The lakes appear to be less a destination recreation site than those found in Poland and Germany: even though they are relatively close to Denmark's population centers, they are not visited as often, they are not sites for permanent recreational home development, and recreation participation is less intense than in the other sites. The close proximity of the Danish coastline, where the majority of summer homes are located, probably overshadows the lake district somewhat. This district appears to represent a rural "working landscape," where agriculture and rural habitation maintain a relatively strong presence.

### ***Belarus: Naroch Lakes***

The Naroch Lakes consist of 3 interconnected lakes (Batorino, Miastro, Naroch) in northwest Belarus, near the Latvian border. Lake Batorino is 6.3 km<sup>2</sup>, with a mean depth of 3.0 m; Miastro is 13.1 km<sup>2</sup> with a mean depth of 5.4 m. Naroch is the largest lake of the system, 79.6 km<sup>2</sup>, with a mean depth of 8.9 m. The total catchment area is 279 km<sup>2</sup> and consists of forests (40%), agriculture (30%), and grasslands. The area suffered anthropogenic eutrophication until the mid-1980s.



**Figure 5.-**National Health Centre “Naroch” on Lake Naroch, Belarus. (Photo: A. Zhukova)

Recent protection, including limiting fertilizer application and removing or updating cattle farms, have resulted in a reduction in improved water clarity. Secchi disk readings taken in the late 1970s averaged 5.1 m in Naroch and 1.7 m in Myastro; by the late 1990s, these readings had improved to 6.1 m for Naroch and 3.8 m in Myastro. There are 2 towns and 37 villages in the area, with about 15,000 permanent residents. The area has been a National Health Resort since the 1960s, and Narochansky National Park was established in 1999 (Fig. 5). The district is 160 km from the capital of Belarus (Minsk, population approximately 2 million). The entire shoreline zone is communal; private land only exists in the settlements. Numerous hotels, restaurants, and stores serve the needs of visitors who participate in water activities such as sport fishing, boating, and waterskiing. Despite improvements to water quality, concerns remain about excess nutrient loading, including plant growth, blue-green blooms, and oxygen depletion. Concerns exist about the recreational and development capacity of the lakes. Management efforts include the provision of protected areas in the shoreline zone (including forest planting, prohibition of building, and prohibition of car entry).

The social science survey methodologies varied to reflect the unique concerns associated with each lake. All surveys were conducted as face-to-face interviews. In Lake Naroch, 3 groups were sampled: (1) property owners, (2) overnight visitors; and (3) day users. In Lake Miastro, property owners and visitors were sampled in the lakeshore community of Myadel. Finally, in Lake Batorino, the study primarily addressed lake visitors. These methods resulted in 212 interviews overall and well represent the local resident and visitor population. About one-third (31%) of those interviewed were local residents. Among visitors, the mean distance of the

lake region from their residence was 112 km, although the area is used by local people (33% reported that they lived <10 km from the area). Perhaps reflecting this proximity, the lake region receives relatively heavy use from those sampled: 28% reported that they had visited the lake 10 or more times in the previous year. Recreation patterns were average for the European sites: most (95%) swam; hiking (77%) and nonmotorized boating (75%) were also popular. Fishing (42%) was less common than Poland and Finland, but more common than in Germany or Denmark. Probably reflecting restrictive regulations, motorized boating (33%) was uncommon.

Belarus respondents perceived many problems with their lakes: they were most likely to consider their lake over used (59%), and crowded (49%). Interestingly, they reported relatively low conflict (12%), suggesting that this heavy use does not necessarily result in disagreements. However, they were most likely to consider their lake polluted (57%) and damaged (48%). Only 30% agreed that the lake was of high environmental quality, and only 3% rated the overall quality of their lake as excellent or perfect, the lowest level reported for any of the sites. Belarus respondents were moderately attached to their lake (4.75 on a 7 point scale, or 6th among the 9 sites with these data). In many ways, the Belarus and Poland systems are similar: lake systems that are heavily used recreation areas, with some lingering attributes from Soviet-era development, located in mixed landuse areas close to many people with few substitute recreation sites. The lakes’ ecological quality is stressed by these pressures. They are perceived as relatively low quality, but this does not dissuade heavy use.

### ***Finland lakes***

Inland waters are a basic element of tourism in Finland. There are 187,888 lakes in Finland, and most tourist services are located at lakes or rivers. Lakes are most dense in the north (Lapland), with 1000 lakes >100 km<sup>2</sup>. Because lakes are so omnipresent, identifying discrete lake districts was challenging. The study lakes range from oligotrophic to hypertrophic status, and sizes range from small (0.42 km<sup>2</sup>) to large (154 km<sup>2</sup>). Three lakes were selected for study from each of 2 contrasting areas: a coastal area in SW Finland, and an inland area in the province of Häme in southeast Finland. The inland area has many lakes, and the land base is primarily forested, with good water quality. In contrast, the southwest coastal area has few lakes, and their catchments contain intensive agricultural use, contributing to eutrophication problems.

Finland has many lake-based recreational homes (Fig. 6): shorelines are privately owned with no right of public access, and the density of cottages is high. People spend weekends and vacations in their cottages, increasingly using them at any time of year. There are increasing concerns about the



**Figure 6.**-A typical Finnish lake cabin. (Photo: A.-M. Ventelä)



**Figure 7.**-Rental cabins along a Maine lake. (Photo: L. Bacon)

influences of cottages not connected to municipal sewage systems on nutrient loadings, as well as over-fishing and general overuse. Because the lakes are widely distributed, it is generally felt that Finns have many choices about where to engage in lake-based recreation, rather than being tied to a discrete region (as in, for example, Belarus and Poland). In each region, one large ( $>30 \text{ km}^2$ ), one medium, and one small lake ( $<1 \text{ km}^2$ ) were selected for the social science survey, consisting of random samples of face-to-face personal interviews of lake users ( $n = 249$ ). Most participants (78%) were property owners, and 75% of properties were for recreational use. Finns use the lake extensively (74% had visited  $>10$  times in the past year). Reflecting the wide distribution of lakes, people lived only 42 km on average from their lake region. Finland respondents are active recreationists, more than in any other European site: they were most likely to swim (89%), and use nonmotorized boats (75%). Consistent with other findings in Europe, their use of motorized boats was relatively low (38%). Finnish respondents were also more likely than other European respondents to fish (57%), and much more likely to engage in winter recreation.

Reflecting the cultural importance of lakes to the region, Finnish respondents are very attached to their lakes (mean = 5.08, the highest among the European sites). Probably reflecting the strong cultural traditions about proper uses of lakes, they were unlikely to perceive human conflict (only 5% felt their lakes were crowded, and only 10% perceived conflict between user groups). These figures were among the lowest reported for any site. They were concerned, however, about the ecology of their lakes: although 63% agreed that their lake had high environmental quality, 30% felt it was polluted (the third highest of any site), 43% agreed that their lake had been damaged, 53% agreed that it had changed a lot, while only 7% rated their lake as being in excellent or perfect condition (compared to about 50% for German and Danish respondents). Thus, Finland's lakes are heavily used and culturally crucial. Respondents are not bothered by the

activities of others, but are concerned about the ability of the environment to continue to absorb current levels of use.

### **Maine lakes, USA**

Lake resources are widely distributed in Maine (5,785 lakes overall). Over 75% of the land base in Maine is covered with forest, 15% is in surface water or wetlands, 7% is in agriculture, and <2% is developed in urban areas. Half the land base is owned by commercial forest operations, 38% is in other private ownership, and about 5% is owned by federal or state government. Maine is lightly populated overall, but some areas of the state are experiencing rapid population growth, particularly areas around highway or river corridors, or relatively close to the Boston (Mass.) metropolitan area. Second homes, locally referred to as "camps," (Fig. 7) are very popular in Maine's lake regions. Although Maine lakes vary in their limnology, they tend toward the oligotrophic end of the trophic spectrum.

In contrast to other research sites that focused on discrete regions, the social science survey was implemented widely throughout the state of Maine on 33 dispersed lakes and focused on a wide range of lake users (total  $n = 335$ ). Lakeshore property owners were approached in several different venues, including attendees of state level lake association meetings ( $n = 51$ ) and attendees of 15 lake-specific association meetings ( $n = 196$ ). In each instance, the respondent filled out the questionnaire, although a representative from the research team was present to answer questions. Day users were contacted using random intercept sampling at area boat landings, resulting in an additional 88 responses. Similar to other second-home intensive areas (Wisconsin, Ontario, and Finland), seasonal property owners dominate the landscape: 80% owned property in the area, and a majority (62%) owned recreational property. As in the other recreational home sites, property use is heavy: 76% made 10 or more visits to the lake



**Figure 8.-**The wilderness of Lake of the Woods, Ontario. (Photo: B. Clark)

in the previous year. There are strong differences in recreation behaviors between the European and North American sites in boating: European respondents were far more likely to report nonmotorized than motorized boating, but Maine respondents were equally likely to do each, 65% and 61%, respectively. Unfortunately, an incomplete version of the survey instrument was implemented in Maine; therefore, we have data on behaviors, but not lake perceptions or attachment.

### ***Canadian lakes, Ontario***

Three lake districts were examined in Ontario: (1) Canadian Shield lakes, (northern Ontario); (2) off-shield lakes (southern Ontario), and (3) Lake of the Woods (western Ontario). Each is characterized by very different lake types and issues. There are over 250,000 lakes in Ontario, most of which are on the shield. The highest concentration of cottages ("cottage country") is around those lakes that lie within a 2.5–4.5 hour drive from Ontario's densely populated urban areas to the south. Shield lakes are relatively oligotrophic, with granite bedrock shorelines. The area contains dilute, clear, soft-water lakes and "tea-stained" dystrophic (humic) lakes. The main use of the lakes in this area is recreational property and to a lesser extent fishing and other day use activities. The southern area of Ontario's lake region is not on the shield. This area lies just to the north of Lake Ontario and is less than a 2 hour drive from Toronto. Off-shield lakes have a more ion-rich chemistry and are mesotrophic to eutrophic. The watersheds lakes have deeper soil and are primarily in low density urban or agricultural use. Property values are high despite occasional severe blue-green algal blooms. Use has intensified as better transportation has connected both regions to Canada's larger urban centers. Finally, Lake of the Woods is a large (385 km<sup>2</sup>) lake in the northwest part of Ontario.

The lake is an interconnected maze of islands and channels (Fig. 8). It is remote from large urban areas, but has been a destination for visitors and recreational home owners despite significant algal blooms.

The social science surveys were implemented through door-to-door sampling, using face-to-face interview methods with cottage owners (total n = 109). A few day users were contacted as well, but the sample is primarily of cottage owners, reflecting the dominant user group. Thus, nearly all (92%) of those surveyed were property owners, (75% owned a recreational home). The lakes receive heavy use: 77% reported visiting the lake 10 or more times in the past year, despite the greater distance from their permanent residence (270 km on average). This area, like northern Wisconsin, Maine, and Finland, is cottage country. Canadian respondents were more likely than any other site except Northern Wisconsin to report fishing (79%). Nearly all (95%) swam, and they were also more likely than respondents from other lake districts to hike (84%). They were very likely to participate in nonmotorized (89%) and motorized (78%) boating, again reflecting the North American tendency toward motorized recreation. Despite common images of Canadian lakes as uncrowded pristine wilderness, concerns exist about the social and physical well being of the study lakes: 37% thought their lake was being overused, 19% thought it was crowded, 50% thought it had changed a lot, and 21% agreed that there was user group conflict. The physical environs are perceived somewhat more positively: about 60% thought their lake had high environmental quality, only 11% labeled it as polluted, and 32% agreed that their lake was in excellent or perfect condition. Attachment to one's lake was higher (mean = 5.90) than in any other site. In sum, Canadian lakes, like Finland lakes, play a strong role in the cottage country culture. These lake regions are important and heavily used; however, although both sets of respondents express some concern about the sustainability of their lake region, concern in the Canadian region is articulated in terms of social conflict, while Finns are more concerned about the sustainability of their lake's ecology.

### ***Northern Highland Lakes District (NHL), Vilas County, Wisconsin***

This was the original setting for the sense of place framework study (see Stedman 2002, 2003 for additional information). The lakes in this mostly forested lake district are heavily used by recreationists, with dense development of the shoreline areas with seasonal (increasingly year-round) housing. Some shoreline areas are publicly owned where there is no development, but many lakes have shorelines almost entirely under private ownership. Privately owned land is commonly divided into parcels of 1 ha or less, with each parcel commonly having 30–75 m that border the lake. Many lakes, therefore, are completely encircled by lots of



**Figure 9.**-The rush for lakeshore property in northern Wisconsin.  
(Photo: R. Stedman)



**Figure 10.**-Heavy boating use on one of the Twin City Lakes, Minnesota. (Photo: D. Osgood)

this size. Recent new home construction (Fig. 9) has led to concerns that development has been too rapid. Private land is quite 'private,' in that people do not often venture onto each others' properties: there is no communal land except that owned by the government. There are a number of small communities of about 1,500 residents each in the area oriented toward providing visitor services such as restaurants, hotels, and stores selling outdoor equipment. The lake district is within a 7-hour drive for over 20 million people, and summer weekend use is quite popular. Unlike areas such as Scandinavia or Maine, the lakes are concentrated in the northern area of the state. Most visitors and/or seasonal property owners have their permanent residence at least 4 hours away. A variety of water activities occurs on these lakes. Sport fishing is common, as are motorized activities such as waterskiing or riding personal watercraft (jet skis). Conflicts sometimes arise between these recreational activities. Some lakes have regulated motorized activity by declaring times of day (such as early morning and evening) or places (*i.e.*, within 200 m of the shore) where strict speed limits must be observed. The public forest lakes offer a more wilderness experience; some prohibit motorized craft.

The social science survey consisted of a mailed survey to 1150 property owners (788 responses) randomly sampled from local tax records. Because this survey was conducted earlier than in the other sites, some perceived problem questions were not asked in the same manner. The survey revealed strong similarities to the other 'second home' sites of Ontario, Finland, and Maine: 67% of the property owned was for recreational purposes, and recreational use was heavy. NHLD respondents were more likely than any other group to fish (82%), and, in common with the other North American sites, to motor boat (60%). Nonmotor boating was less common (42%). Respondents held generally positive perceptions of their lake: they were unlikely to agree that it was polluted (17% agree), that it had changed a lot (43%),

or that it was crowded (23%). They were relatively likely to agree that it was of high environmental quality (64.3%). As with the other second home areas, attachment was quite high (mean = 5.51). Thus, despite widespread concern about over-development of these lake resources, property owners in the NHLD are quite positive about, and attached to, their lake resources.

### **Twin Cities Metropolitan Area (TCMA), USA**

The research project included 2 heavily urbanized lake districts that are socio-culturally quite different from lake districts that emphasize nature protection and/or recreation. The latter, especially in North America, draw disproportionately from people of high socioeconomic status, but urban lake systems conjoin a broad spectrum of people and interests, many of whom have relatively little contact with the lakes. The Twin Cities Metropolitan Area (TCMA) is heavily urbanized, and includes 190 municipalities and a total population of about 2.6 million residents. It also contains about 700 lakes that range in surface area from 0.25 km<sup>2</sup>, to >10 km<sup>2</sup>, and cover the full limnological continuum from nearly oligotrophic to hyper-eutrophic (secchi disk readings range from >10 m to 0.2 m). Day use of the area is extensive, with up to 5.5 million lake use days per year (Fig. 10). This use is facilitated by an extensive parks system, with 40 regional parks. Lake use includes multiple forms of recreational activities, ranging from power boating to quieter uses, such as sailing, fishing, and wildlife viewing. Lakeshore owners and public users differ in their use and value of TCMA lakes. Lakeshore owners tend to value exclusivity and amenities, whereas public users tend to value widespread rights of use. As a result of these differences, there are often conflicts between the two user groups. There are few restrictions or controls on access or surface use of TCMA lakes.



**Figure 11.**-A gathering place along the shore of the Madison lakes in southern Wisconsin. (Photo: R. Lathrop)

The social science data collection consisted of written surveys distributed by hand or mail to lake associations or individuals with whom the TCMA investigator had previous relationships. The sample was the smallest of the study, with 38 responses. The sampling focused on 2 large recreation intensive lakes (Minnetonka and White Bear) in the region. Lake Minnetonka consists of about 25 interconnected bays and basins, and water quality varies widely throughout the sub-basins of the lake. There is a long history of recreational use, dating back to resorts in the late 1800s. Beginning in the 1950s, seasonal residences began converting to permanent homes. Lake Minnetonka is on the urban fringe in the metro area, and thus has a gradient of land uses ranging from commercial to agricultural (though the latter is being rapidly converted due to the high demand for lakeshore property). Lake Minnetonka is the most heavily-used lake in Minnesota in total numbers and boat densities. It is the wealthiest lake in the area. Property values start at \$1,000,000 and are increasing rapidly. White Bear Lake is the second-most popular lake in the metro area. The water quality is very good, and it is a popular fishing lake. Development consists mainly of low density residential development with some commercial development.

Because the sample is small, not random, and focuses on one particular group (property owners), caution is urged in interpreting the TCMA results. The investigator with extensive experience in the region believes the sample represents lake residents across the region. However, shoreland owners who can afford homes costing millions of dollars hardly represent the range of all lake users. The 'day user' population was not addressed in this location; thus, unlike nearly all of the other regions, the results cannot be generalized across the range of interests, but are limited to property owners. Reflecting this sample, all respondents owned property, and only 5% listed their property as recreational. Despite the very urban nature of the watershed, participation in recreational

activities was very strong. Continuing the North American tendency toward motor recreation, motorized boating was the most common activity (84%), and more common than nonmotorized boating (60%). Most respondents swam (82%) and fished and hiked (63% for each). Thus, even though the area is highly urbanized, recreation patterns are similar to more natural lake systems. This extends to perceptions and attachment as well: property owners in the TCMA reported higher attachment to their lake than any other site save Ontario. Nor were the physical or social environs of this urban lake system perceived as especially problematic: respondents were near the population mean for most items. For example, about 36% agreed that their lakes were over-used, 40% agreed that they were crowded, and 29% perceived conflict between user groups; 38% perceived their lake to be of high environmental quality, and 32% rated their lake as excellent or perfect. Thus, despite the highly urban character of the lake system, respondents' perceptions were no more negative than in more ecologically intact settings. This suggests perhaps that respondents' expectations for the ecological and recreational services provided by this urban lake system have been tempered by the reality that these are heavily used urban lakes (*e.g.*, they do not expect solitude). Similarly, what constitutes high environmental quality may be driven by setting-specific expectations.

### ***Madison, Wisconsin, USA***

The Madison area has a metropolitan area population of approximately 450,000 (220,000 in the city of Madison) and contains 5 interconnected lakes that vary in size, depth, and limnological characteristics. All 5 lakes have problems with eutrophication from residential and agricultural sources, including frequent heavy blue-green algal blooms and excessive growths of aquatic plants, as well as heavy recreational use (Fig. 11) that includes swimming, boating, and fishing. Heavy public use is facilitated by large sections of the lakes' shorelines in parks and institutional ownership as well as many boat launching facilities. For the 4 largest lakes, much of the shoreline is privately owned, including many year-round homes held by people of considerable wealth. There is considerable quasi-subsistence angling among people of lower socio-economic status.

Reflecting this diversity, the methods for the social science survey targeted multiple user groups ( $n = 177$  overall), including local residents ( $n = 49$ ) and multiple types of day users. Shore anglers ( $n = 29$ ) were approached for face-to-face interviews while fishing. This group was primarily minority and of lower socioeconomic status. Boat anglers ( $n = 69$ ) were contacted through boat landing intercepts and meetings of local fishing clubs; sailors ( $n = 30$ ) were members of local sailing clubs and completed the survey over the telephone. Because of the differences in the sampling strategy, the results from the Madison lakes differ strongly from those

**Table 5.-Lake perceptions and attachment: Mean differences across sites.**

	Belarus	Denmark	Finland	Germany	Poland	Minn	Madison	Canada	NHLD	Weighted Mean
Environment Damage <sup>1</sup>	3.60 <sup>e</sup>	2.49 <sup>b</sup>	2.96 <sup>c</sup>	2.16 <sup>a</sup>	3.09 <sup>d</sup>	3.11 <sup>d</sup>	3.60 <sup>e</sup>	2.82 <sup>c</sup>	n/a	2.53
Human Conflict <sup>1</sup>	3.30 <sup>e</sup>	2.46 <sup>b</sup>	2.04 <sup>a</sup>	2.74 <sup>c</sup>	2.97 <sup>d</sup>	3.03 <sup>d</sup>	3.49 <sup>f</sup>	2.74 <sup>c</sup>	n/a	2.32
Attachment <sup>2</sup>	4.75 <sup>c</sup>	5.03 <sup>c</sup>	5.00 <sup>c</sup>	4.59 <sup>b</sup>	4.42 <sup>b</sup>	5.55 <sup>d</sup>	4.29 <sup>a</sup>	5.90 <sup>e</sup>	5.51 <sup>d</sup>	5.07

<sup>a</sup> Groups with different subscripts are significantly different from each other at p<.05.

<sup>1</sup> 5 point scale where 1 = strongly disagree; 5 = strongly agree

<sup>2</sup> 7 point scale where 1 = strongly disagree; 7 = strongly agree

of the TCMA. The Madison lakes are heavily used: 65% using the lake 10 or more times in the past year. Perhaps reflecting concerns about water quality or perhaps based on the different sampling strategy, the proportion who reported swimming (48%) was far lower than for other sites, even the other urban site (82% of TCMA respondents swam). Fishing was relatively more common, at 70% (expected, given that 2 of the groups targeted were anglers). Both forms of boating were less common than in most of the other sites and tended toward motors: 59% participated in motor boating, compared to 53% who participated in nonmotorized boating. Respondents showed low levels of attachment (mean = 4.29), but part of that is due to subsistence anglers being interviewed from other urban areas (*e.g.*, Milwaukee 130 km away) and almost no lakeshore property owners being interviewed. Respondents also agreed that ecological and social environs of the Madison lakes has been damaged: 58% agree the lakes are overused, 47% report that they are crowded, and 63% agree that there is conflict between user groups, nearly 10 times the agreement with this item of Danish respondents. The ecological condition is perceived as damaged: 68% believe their lake to be damaged, 41% agree that it is polluted, and only 7% rate their lake as excellent or perfect. It is clear that those interviewed perceive this system as problematic, yet others clearly believe that what makes Madison a special place to live is that the city is centered around its lakes (Mollenhoff 2005).

### Site comparisons

Although the narratives reveal strong differences between sites, we also directly compared study sites on a few key variables: perceived problems, attachment, and the relationship between perceived problems and attachment. We compared the lake districts on the summed scales for ecological quality, social conflict, and attachment (Table 5). A ONEWAY analysis of variance revealed that the 8<sup>1</sup> sites separated into 5 groups based on perceptions of ecological damage. German respondents were least likely to perceive ecological damage,

followed by Denmark, and Canada/Finland respondents. Respondents from the Madison and Belarus sites were most likely to agree that their lakes were damaged. Responses were more differentiated among sites in perceptions of human conflict, as the 8 sites formed 6 distinct groupings. Respondents from Finland were least likely to perceive human conflict around their lake, followed by Denmark and Germany. Respondents from Madison were most likely to perceive human conflict, followed by Belarus, Minneapolis, and Poland.

Overall levels of place attachment were moderately high (5.07 on a 7.0 scale), and strongly variant across the 9 sites for which we had data. North American respondents had both the highest and lowest attachment levels: attachment was lowest for Madison respondents, followed by many of the European sites (Poland, Germany, Belarus, Finland, and Denmark), representing 2 distinct site clusters based on attachment levels. However, the focus on subsistence anglers and local homeowners not associated with the lake area renders the comparisons between Madison and other sites problematic (see the summary for further elaboration). TCMA and Canadian respondents reported the highest levels of attachment.

We sought to understand how the factors associated with attachment differed by research site. The correlations between perceived threat and attachment revealed interesting patterns when disaggregated by site (Table 6). Across all sites, we found moderately negative relationships between the levels of attachment and the perception of one's lake as ecologically damaged ( $r = -0.161$ ,  $p < 0.001$ ) and characterized by overuse and human conflict ( $r = -0.211$ ,  $p < 0.001$ ). These

<sup>1</sup> Maine is excluded from the environmental perception/attachment analysis, as a number of missing items form the survey implementation in that site make direct comparisons impossible. Similarly, some environmental perception items are missing from the NHLD site.

Perceived environmental quality and place attachment in  
North American and European temperate lake districts

**Table 6.**-Perceived threat and attachment: Bivariate correlations.

	All	Belarus	Denmark	Finland	Germany	Poland	TCMA	Madison	Canada	NHLD
Environment-Damage	<b>.161***</b>	-.046	-.001	-.080	-.066	<b>-.261***</b>	<b>-.348***</b>	<b>-.406***</b>	<b>-.222**</b>	<b>-.263***</b>
Human Conflict	<b>-.211***</b>	-.106	<b>-.260***</b>	<b>-.225**</b>	-.011	<b>-.239**</b>	<b>-.325***</b>	<b>-.472***</b>	-.037	-.062

\* = p<0.05; \*\* = p<.01; \*\*\* = p<.001

relationships varied considerably across sites. The negative effect of perceived ecological damage on attachment was observed for all 4 of the North American sites and was especially strong in the 2 urban lake sites. However, only in one European site, the Polish Masurian lakes that elicited particularly negative responses, was this relationship found. There was no relationship between attachment and perceived ecological quality for the other 4 European sites. In contrast, the presence of social conflict was more strongly tied to decreased attachment in the European sites (significant for 3 of the 5 sites), but the strongest negative effects were still observed at the more urban sites. There was no relationship between social conflict and attachment in the North American “cottage country” sites.

## Summary

We used a survey research approach to compare 10 temperate-latitude lake district sites (5 in Europe and 5 in North America): how they are used and how their users feel about them. While aquatic resources may be compared on their limnological properties, this research was more concerned with describing and comparing human behaviors, beliefs, and feelings that typify lake areas. It is possible for 2 systems to have similar ecological qualities but differ dramatically due to cultural or institutional differences, in the kinds of places they become: dense urban settlements, second home places, or preserved nature with little human use.

While each site has its own unique story about human interactions, certain factors (even if not universal) vary systematically between sites. First, North Americans were more likely to participate in relatively intensive recreation activities such as motor boating and fishing. In contrast, Europeans were generally more likely to camp, swim, and use nonmotorized boats. As described in the individual sites, many of these differences are based on regulation differences because many of the European lake districts have much more stringent regulations on activities. We also discovered the 3 sites with the highest levels of attachment were all in North America. Perhaps this reflects cultural differences or a certain “lost in translation” of the survey questions from English to other languages, or it may reflect that the North American

sites included more lake property owners (characterizing the system). Property owners have strong attachment to home (Meinig 1979). Other differences between North American and European sites in the relationship between lake problems and attachment were noteworthy. Social conflict was far more tied to decreased attachment in Europe (European respondents were more able to have a positive bond with settings they thought ecologically degraded), while perceived ecological problems were linked to lower attachment in North America. In contrast, North American respondents, except in the heavily urbanized sites, were not particularly troubled (at least as reflected in decreased attachment) by social conflict, while European respondents were.

The lake districts also seemed to group into types based on common cultural traditions and regulations that dictate patterns of use, as well as the kinds of problems that are perceived. First, this research revealed a lake country cultural/institutional type, based on high densities of second homes and abundant lakes (Stedman 2006). This cottage county appears to be a Nordic (as exhibited here by Finland) and rural North America (northern Wisconsin and Maine in the United States, and Ontario in Canada) phenomenon, with strong traditions of recreational home ownership, lake-based recreation, very private shoreline areas, strong attachment, and relatively few concerns about lake-based problems. The ownership of second homes produces stronger connections and attachment than for sites more characterized by visitors (see McIntyre *et al.* 2006). The German and Danish lake districts appear quite similar, characterized mostly by day use (or by overnight visitors that do not own property), and relatively restrictive regulations that limit recreational use more than in other districts. Perhaps as a result, few problems are perceived, especially with ecological quality, but respondents were not particularly attached to these lakes. If experience fosters attachment (Tuan 1977), this finding makes sense given that human encounters with the lakes may be more limited than in other sites. The Poland and Belarus districts also seem to share much in common: each has a similar historical-political legacy and currently operates as a primary recreation destination for large numbers of people with relatively few substitutes. Day and overnight use of these systems is heavy (with little second home ownership) even though a number of social and ecological problems

are perceived. These 2 sites consistently ranked poorly on respondents' perception of lake problems, possibly due to the attitude that "this is the best recreation option we have." Finally, the 2 urban lake systems (Madison, Wisc., and TCMA, Minn.) have strong differences that are almost certainly tied to the markedly different survey approaches. In Madison, subsistence anglers fishing from shoreline and day-user boat anglers were interviewed, whereas in TCMA, only well-off home owners were surveyed. The TCMA survey respondents were much less likely to perceive either ecological harm or social conflict at their lake, and were much more attached than the Madison respondents. Because the target populations were so different, we are very cautious about reading too much into this particular comparison. Given the generally positive relationship between property ownership and attachment, we are not surprised at the higher levels of attachment in the TCMA survey results.

With respect to implications for lake managers, our study demonstrated only modest relationships between perceived lake threats and attachment: people have the capacity to be attached to settings perceived as environmentally degraded (especially true of our European respondents). This confirms previous research by Stedman (2003), where no effect was found on attachment and actual lake quality variables such as chlorophyll, clarity, and shore development. The implications of this lack of connection between attachment and environmental quality may be crucial for lake managers: the idea of managing for a sense of place has increasingly gained currency among many natural resource managers. The data suggest that the link between environmental degradation (or at least perceived environmental degradation) and attachment is not as robust as many might have imagined. By implication, we suggest prudence in the current spate of enthusiasm for attempting to manage the physical environment to promote attachment.

Finally, this research addresses a conundrum raised earlier in the paper: every study of place attachment is a study of a single place, and should remain tied to site specific environment, history, institutional structure and culture. Lakes are created by geology and climate, but lake districts are also created by human interactions. Despite the difficulty in doing so, there is great potential value in attempting to identify general principles about people-place interactions that transcend but take into account these particulars. This paper represents a broad-brush treatment of lake districts; future research should go deeper into the particular histories of each site as well as pairing the social science data with lake-specific (rather than regional) limnological data. We also hope that analyses of this type may serve as initial steps toward identifying the parameters around which overarching multi-site models might be developed.

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## References

- Brandenburg, A.M., M.S. Carroll. 1995. Your place or mine?: The effect of place creation on environmental values and landscape meanings. *Soc. Nat. Resour.* 8:381–398.
- Eisenhauer, B.W., R.S. Krannich and D.J. Blahna. 2000. Attachments to special places on public lands: an analysis of activities, reasons for attachments, and community connections. *Soc. Nat. Resour.* 13:421–441.
- Greider, T. and L. Garkovich. 1994. Landscapes: the social construction of nature and the environment. *Rural Sociology* 59:1–24.
- Jorgensen, B.S. and R.C. Stedman. 2001. Sense of place as an attitude: lakeshore owners attitudes towards their properties. *J. Environ. Psych.* 21:233–248.
- Low, S.M. and I. Altman. 1992. Place attachment: a conceptual inquiry. P. 1–12. *In* I. Altman and S.M. Low [Eds.]. *Place Attachment*. Plenum Press, N.Y.
- McIntyre, N., K. McHugh and D. Williams [Eds.] 2006. *Multiple Dwelling and Tourism: Negotiating Place, Home, and Identity*. Oxford, CABI Press.
- Meinig, D.W. 1979. *The Interpretation of Ordinary Landscapes*. Oxford University Press, New York.
- Mollenhoff, D. 2005. Lakes of silver and green. *LakeLine* 25:21–38.
- Relph, E. 1976. *Place and Placelessness*. Pion Limited, London.
- Sack, R.D. 1997. *Homo Geographicus: A Framework for Action, Awareness, and Moral Concern*. Johns Hopkins University Press, Baltimore, Md.
- Stedman, R.C. 2002. Toward a social psychology of place: predicting behavior from place-based cognitions, attitude, and identity. *Environ. Behav.* 34:405–425.
- Stedman, R.C. 2003. Is it really just a social construction: the contribution of the physical environment to sense of place. *Soc. Nat. Resour.* 16:671–685.
- Stedman, R.C. 2006. Understanding place attachment among second home owners. *Am. Behav. Scientist* 50:1–19.
- Stedman, R.C. and R.B. Hammer. 2006. Environmental perception in a rapidly growing, amenity-rich region: the effects of lakeshore development on perceived water quality in Vilas County, Wisconsin. *Soc. Nat. Resour.* 19:137–151.
- Tuan, Y.F. 1977. *Space and Place: the Perspective of Experience*. University of Minnesota Press, Minneapolis.
- Williams, D.R. and S.I. Stewart. 1998. Sense of place: an elusive concept that is finding a home in ecosystem management. *J. For.* 96:18–25.