Watershed Stewardship Program
Summary of Programs and Research 2010

Paul Smith's College
THE COLLEGE OF THE ADIRONDACKS

Adirondack Watershed Institute

Watershed Stewardship Program

Report # AWI 2011-02

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Cover: Steward and visitor at Saratoga Lake State Boat Launch.
This page: Steward and visitor at Tupper Lake State Boat Launch.

Executive Summary and Introduction

By Eric Holmlund, Director

The Watershed Stewardship Program (WSP), the outreach and education element of Paul Smith's College's Adirondack Watershed Institute (AWI), was initiated in 2000 in an effort to maintain the integrity of the St. Regis Lakes ecosystem in southern Franklin County. The WSP was initially a local stewardship partnership between the St. Regis Foundation on behalf of property owners on the three St. Regis Lakes and Paul Smith's College, the largest property owner on Lower St. Regis Lake. The program has greatly expanded over the last eleven summers in response to the ongoing and emergent progress that aquatic invasive species (AIS) have made from the margins of the Adirondack Park to its center. Communities all over the country and within the Adirondack Park have become painfully aware of AIS over the past decade, resulting in ever-increasing resolve, vigilance and activism in increasingly articulated efforts to prevent or delay the spread of a growing number of invasive species. Over the past decade, the WSP has expanded its scope through the support and partnership of local property owner groups, such as the Lake Placid Shore Owners' Association and the Rainbow Lake Association, among others, and the collaboration and financial support of the Lake Champlain Basin Program, private foundation support and funds directed to Paul Smith's College by the New York Department of Environmental Conservation in recognition of the good work represented by the Adirondack Park Aquatic Nuisance Species Management Plan. The Adirondack partnership for regional invasive species management (Adirondack PRISM), spearheaded by the Adirondack Park Invasive Plant Program (APIPP) has worked tirelessly to help articulate a regional, coordinated approach to AIS management by participating in the drafting and implementation of the ANS Management Plan and by collaborating over the years with the WSP and the AWI, among other regional AIS response partners. Thus the WSP is truly a cooperating partner in a wider regional strategy to combat the negative impacts of AIS.

For the third year, the WSP hosted a regional training for boat ramp stewards from the Lake Champlain Basin Program, the Lake George Association, our own WSP stewards, and stewards sponsored by individual lake associations across the Adirondack Park. In all, approximately 40 stewards from across the Adirondacks came to the Joan Weill Adirondack Library on the Paul Smith's College campus in May, 2010, for a multi-day training

Figure 1- Regional training for Adirondack and Champlain Stewards, 2010

which addressed AIS identification and ecology, public interaction and education skills, and data collection procedures. The training featured presentations by representatives of the Adirondack Park Invasive Plant Program, the Department of Environmental Conservation, the Lake George Association, the Lake Champlain Basin Program and the WSP.

The summer of 2010 brought changes to the lakes served by WSP stewards. Stewards were stationed at Upper St. Regis Lake, Lake Placid, Second Pond, Rainbow Lake, Tupper Lake, Osgood Pond and Saratoga Lake, for spans of duty ranging from one afternoon weekly to seven days per week (Table 1). Variations in coverage depended on funding resources allocated by lake associations and grant sources. In some instances, coverage was bolstered by volunteer steward coverage, as was the case with Rainbow Lake and Osgood Pond. Volunteers from all over the Adirondack Park were trained by WSP staff at two separate trainings in Blue Mountain Lake and Paul Smith's College in June and July. The WSP initiated a new program for 2010 in Saratoga Lake, which represented the first time that Paul Smith's College stewards were posted outside the Adirondack Park.

Duty Post	Coverage
Lake Placid	7 days per week
Osgood Pond	Friday afternoons
Rainbow Lake	Weekends
Saratoga Lake	5 days weekly- Thurs- Mon
Second Pond	3 days weekly- Fri-Sun
Tupper Lake	Weekends
Upper St. Regis Lake	7 days per week

Table 1- Scope of boat ramp coverage, WSP 2010

The WSP's Watershed Stewards had a busy summer in 2010, inspecting almost 9,000 boats and imparting an invasive species awareness message to almost 19,000 people across seven sites (Figure 2). The new site, Saratoga Lake, was by far the busiest, representing over 3,000 boat inspections and over 7,600 members of the public contacted. Saratoga Lake presented unique challenges and opportunities for the steward, as the clientele of the boat ramp was less accustomed to a uniformed presence at the boat ramp and as such had more overall resistance to the program's objectives. Despite this response, the good work of the steward engendered strong support from the long time angler community, which appreciated the presence of an environmental advocate. Use at Lake Placid and Second Pond remained robust, as fair weather and the continued appeal of outdoor recreation on these water bodies drew many visitors.

WSP Data Summary, 2010	Boat Type							total #	total #	organisms found	
Waterbody	M	PWC	S	C	K	B	R	boats	people	entering	leaving
Lake Placid	1159	1	16	176	605	79	17	2036	4501	73	42
Osgood Pond	7	0	0	25	24	0	5	61	107	0	3
Rainbow Lake	117	2	0	77	101	0	15	300	650	25	35
Saratoga Lake	2882	192	30	23	46	1	16	3190	7615	126	56
Second Pond	456	48	0	534	621	2	42	1703	3253	79	66
St Regis	303	1	6	390	239	8	5	956	1586	28	27
Tupper Lake	397	17	25	27	37	1	3	504	1224	17	21
totals	**5321**	**261**	**77**	**1252**	**1673**	**91**	**103**	**8750**	**18936**	**348**	**250**

Table 2- Comprehensive data summary, 2010; M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

Stewards removed 598 organisms from boats entering or leaving boat ramps, for a 6.8% infestation rate over all seven sites, and all watercraft types (Table 2). Infestation rates by water body are as follows: Lake Placid – 5.6%, Osgood Pond – 4.9%, Rainbow Lake – 20%, Saratoga Lake – 5.7%, Second Pond – 8.5%, Upper St. Regis Lake – 5.7%, and Tupper Lake – 7.5%. Thus, approximately 93% of boats visiting the waterways covered by the WSP can be expected to be "clean" or weed-free. However, the 7% of boats that are transporting materials presents a critical, cumulative threat to the integrity of Adirondack waterways. Rainbow Lake has a significantly higher infestation rate, which merits close scrutiny over time. Boats exiting the ramp at Rainbow Lake were infested at a higher rate than those launching, which is likely due to the ramp's proximity to an annual bed of densely growing southern naiad.

WSP Data Summary 2010	organism type								# groups taking AIS spread prevention measures								
Waterbody	EWM	BW	NM	GRS	WC	ZM	VLM	other	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
Lake Placid	2	1	2	60	0	2	1	47	1303	1087	515	564	6	9	3	533	14
Osgood Pond	1	1	0	1	0	0	0	0	21	10	15	5	1	0	0	10	0
Rainbow Lake	2	11	0	15	0	0	1	31	187	101	90	57	2	2	3	63	3
Saratoga Lake	58	0	1	76	2	7	7	30	2608	2548	973	113	1	5	0	13	19
Second Pond	27	2	7	72	0	0	2	24	739	338	523	214	0	11	6	375	6
St Regis	1	2	2	29	0	0	0	26	543	287	418	124	39	37	2	194	12
Tupper Lake	1	2	1	31	0	0	0	3	305	177	226	162	2	13	3	90	2
Totals	**92**	**19**	**13**	**284**	**2**	**9**	**11**	**161**	**5706**	**4548**	**2760**	**1239**	**51**	**77**	**17**	**1278**	**56**

Table 3- Summary of organisms removed and spread prevention measures taken by visitors, 2010; EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil; I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Of the 598 organisms removed over the summer, 114 are considered aquatic invasive species by the Adirondack Park Invasive Plant Program (APIPP), constituting 19% of organisms removed from watercraft. Stewards positively identified Eurasian watermilfoil from among organisms removed from watercraft 92 times over the summer, with the highest incidence of this invasive species at Saratoga

Lake (58 samples), followed by Second Pond (27 times) (Table 3). Eurasian watermilfoil was found very infrequently at the other sites. Zebra mussels were discovered 9 times, again in greatest numbers at Saratoga Lake. Various grasses were most commonly found and removed, along with "other," a category reserved for miscellaneous and unknown organisms such as pine needles, spider webs, mud and badly degraded organics that hopefully pose little risk of introducing new AIS.

Stewards at all seven sites encountered a total of 7,308 groups of visitors, each of whom was asked about the AIS spread prevention measures they took prior to arriving at the boat ramp. 78% of all visitors reported taking some spread prevention measure; some of these visitors took more than one measure, so the total adds up to greater than 100%. 62% inspected their boats prior to launching, 38% washed them, and 17% drained the bilge and dried their boats. Bait bucket spread prevention measures remain infrequently exercised (Figure 2).

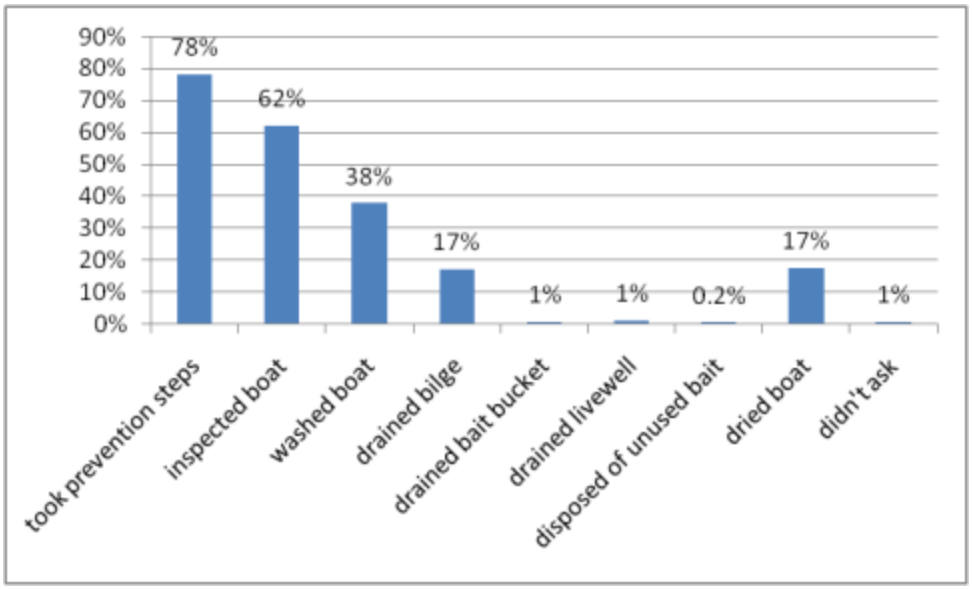

Figure 2- AIS spread prevention measures taken, all WSP sites, 2010

Multiple-Year perspective

Since 2000, the Watershed Stewardship Program has enjoyed steady growth in terms of the number of lakes served and numbers of boats inspected and people educated. This growth has occurred mainly through word of mouth and referrals from lake association groups, and more recently through press coverage and professional networking facilitated in part by the Adirondack Park Invasive Plant Program and the New York State Department of Environmental Conservation. The WSP has benefited from the reputation and good work of both the Adirondack Watershed Institute and Paul Smith's College. As a program of Paul Smith's College, the only baccalaureate college in the Adirondack Park, the WSP has an ideal location and institutional platform for providing expertise, communication and

coordination for the protection and stewardship of natural resources across the Adirondack Park. From its beginning in 2000, when it served only the St. Regis Lakes, the WSP has served 12 different lakes over 11 summers.

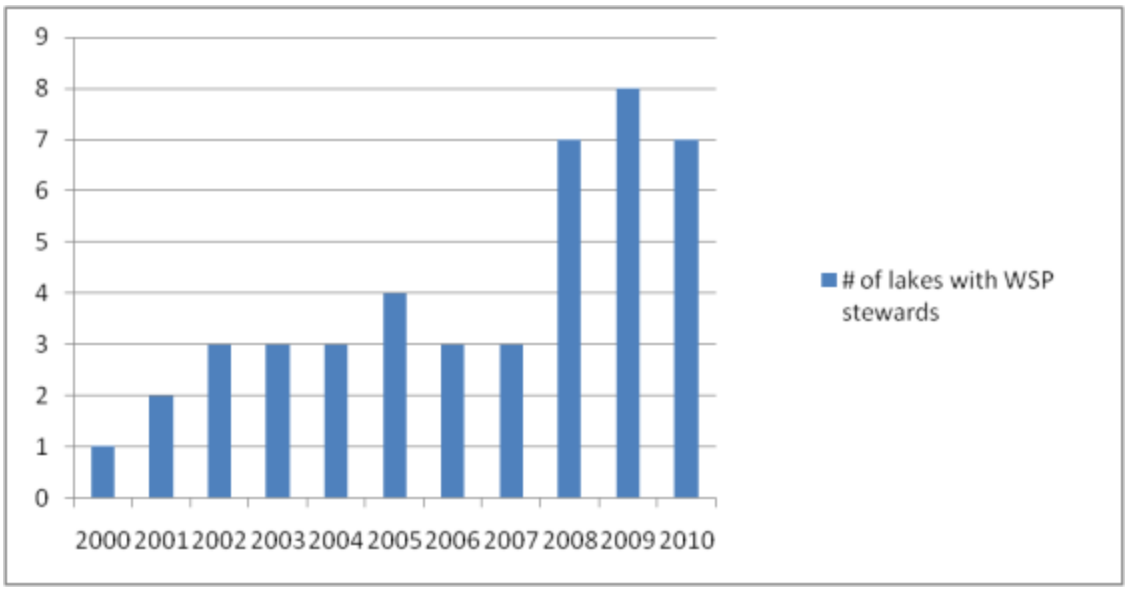

Figure 3- Growth in lakes served by the Watershed Stewardship Program, 2000-2010

With the increasing and changing array of lakes served by Watershed Stewards, the number of visitors educated by the program has increased dramatically as well. From the initial summer, which saw approximately 1,000 visitors contacted at Upper St. Regis Lake, stewards at seven lakes contacted approximately 19,000 visitors in 2010 (Figure 3). A total of 93,369 visitors were contacted over 11 years.

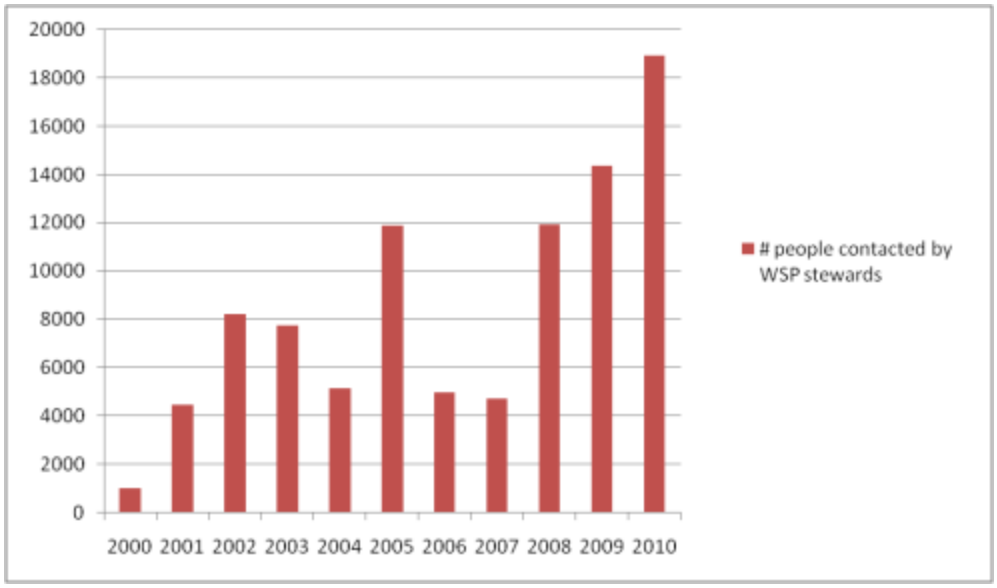

Figure 4- Growth in number of visitors contacted by the Watershed Stewardship Program, 2000-2010

Perhaps the most significant indicator of program growth is the number of boats inspected by stewards at each location over the last eleven years (Figure 5). Stewards inspected 489 boats in 2000, and 8,750 in 2010, an increase of almost 1,800%. A total of 43,789 boats have been inspected over the eleven year history of the Watershed Stewardship Program.

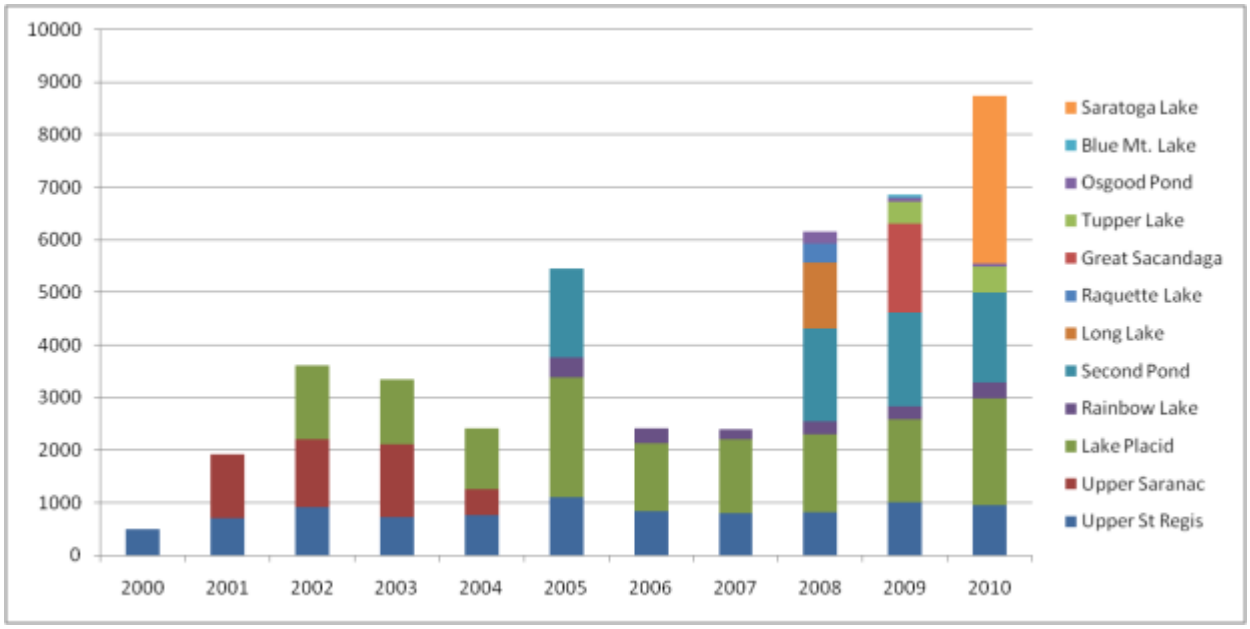

Figure 5- Number of watercraft inspected by Watershed Stewardship Program stewards, 2000-2010

Research and Service Projects

In addition to the core duties of educating the public about AIS and inspecting boats to interdict invasive species, our stewards are involved in a variety of service and research functions designed to support the integrity of local ecosystems and to educate the public at large, away from the boat ramp. Inside this report you will learn about some of these functions and projects, ranging from purple loosestrife montoring and control on the St. Regis Lakes, banded loon monitoring, a study of odonates (dragonfly and damselflys), water quality monitoring and a ground-breaking study of the viability of Eurasian watermilfoil after drying. These projects are under the expert guidance and supervision of Dr. Celia Evans, a plant ecologist and professor at Paul Smith's College, who also functions in the summer as the WSP's Science Director and co-administrator. These projects are essential for extending the scope and range of the program and for offering additional challenges and variety to the stewards, who can become worn down by the rigor and routine of boat ramp duty. The milfoil study also takes advantage of our state of the art lab facilities in the ground floor of the new Paolozzi Environmental Center at Paul Smith's College, which serves as the headquarters of the Adirondack Watershed Institute and the Watershed Stewardship Program.

Conclusion

The WSP has enjoyed an eleventh summer of service to Adirondack waterways. We successfully initiated a new program site at Saratoga Lake, which extended our range and allowed us to experiment with new modes of program deployment and supervision. This new program exemplified the role that our collaborators take in helping to ensure program success and quality. With sites over an hour distant, we must rely on local liaisons to help mentor boat ramp stewards. Alan McCauley of the Saratoga Lake Improvement District served in this behalf as an enthusiastic and involved link to our steward. We have developed similarly productive collaborations with representatives of the Lake Placid, Rainbow Lake, Tupper Lake, Long Lake, Raquette Lake, Blue Mountain Lake and Canada Lake associations. We look forward to offering our services and advice, either through our paid steward program or our support of low or no-cost volunteer steward programs, to other areas of the Adirondack Park and the wider region. Inquiries are welcome. Please contact Dr. Eric Holmlund, Director, Watershed Stewardship Program, Paul Smith's College, Box 265, Paul Smiths, New York, 12970. Telephone: (518) 327-6341. Email: eholmlund@paulsmiths.edu.

We gratefully acknowledge the financial support of the Lake Champlain Basin Program, the St. Regis Foundation, the Lake Placid Shore Owners' Association and the United States Fish and Wildlife Service.

Figure 6- Steward Corrie Mersereau at Saratoga Lake

Watershed Stewardship Program- Staff Profiles

Jeanne Ashworth, Watershed Steward, Milfoil Study
Jeanne Ashworth is a longtime resident of the Town of Wilmington. She has been interested in conservation and protection of the unique character of the Adirondack Park for many years. Jeanne is a graduate of Tufts University with a bachelor's degree in science and is happy to be part of the Watershed Stewardship Program. Jeanne remarks, "It is an education and a pleasure to meet water sports enthusiasts at the boat launch site who are interested in protecting our waterways from the spread of plants and animals that threaten our beautiful lakes."

Kimberly Forrest, Watershed Steward, Odonate and Milfoil Study
Kimberly Forrest is a sophomore at Paul Smiths College where she is majoring in Biology. Upon graduation in 2013 she would like to enter medical school. As a watershed steward Kimberly hopes to broaden her ecological knowledge and gain valuable experience in the field. As a boater herself, Kimberly feels that Watershed program is very important. "I hope that through educating boaters of all types that we can create a preventative AIS net. We all can do our own part in protecting our beloved waterways, and the more people that are active in doing so the stronger our net becomes."

Corrie Mersereau, Watershed Steward, Saratoga Lake
Corrie holds a bachelor's degree in Environmental Studies from St. Lawrence University, where she was active in campus sustainability and was an athlete on the crew team. Corrie grew up in Corinth, New York, near Saratoga Springs, and rowed on Saratoga Lake. Corrie worked with Cornell Cooperative Extension on an old growth maple tree aging study, and helped build a canoe while at St. Lawrence. She also has a minor in Peace Studies and knows basic Spanish and Swahili.

Matthew Rankin, Watershed Steward and Loon Monitor
Matt is a student at SUNY Cortland majoring in Biology, with minors in Environmental Science and Chemistry. After he graduates he plans to continue his education in graduate school pursuing a degree in Energy and Environmental Policy. Born and raised in Rochester, New York, Matt grew up spending time in the Adirondacks camping and hiking, and on the water at his cottage on Lake Ontario, each of which has influenced his study in biology and to spend his summer as a watershed steward.

Jeffrey Sann, Watershed Steward and Purple Loosestrife Monitor
Jeff Sann is entering his senior year at Paul Smith's College where he is studying Natural Resource Management and Policy. Originally from Holland Patent NY, Jeff has been frequenting the park for recreational backpacking, fishing and hunting his entire life. "All it takes to make a difference doing this job is to pull a plant off a trailer and you save the lake's native species and reputation. I feel that the Watershed Stewardship Program plays a crucial role in educating the public on how to conserve their own resources"

Lindsey Steblen, Watershed Steward, Milfoil Study
Lindsey Steblen graduated from The Ohio State University in 2004 with a B.S. in Biology and from the University at Buffalo in 2009 with a M. Ed. in Biology Education. She is from Clayton, NY and enjoys any activity that calls for being outdoors, especially paddling and hiking in the High Peaks with her dog. Lindsey looks forward to working with the public to combat the spread of the invasive species that threaten aquatic systems in order to preserve the natural wonder of the Adirondack Park.

Matthew Stewart, Assistant Director
Matt is entering his fourth year of college—his third at Paul Smith's. He is majoring in fisheries and wildlife management with a concentration in wildlife management and plans to continue his education in graduate school. Matt grew up in New York near the Hudson River and plans on pursuing a career in the wildlife field. He believes that the preservation and overall health of the environment is not only an allegory to, but also a direct means toward the health of humanity as a species.

Celia Evans, Professor and Science Director
Celia has her Ph.D. in Ecology and Evolutionary Biology from Dartmouth College. Celia joined the faculty at Paul Smith's College in 2001 where she is an Associate Professor of Ecology in the Science Liberal Arts and Business Division specializing in biogeochemical cycling and plant / soil / herbivore interactions in forested ecosystems. Celia also conducts research in science education with particular emphasis on student / scientist partnerships and citizen science. Dr. Evans has published in the Canadian Journal of Forest Research (1998), American Biology Teacher (2001), and Plant and Soil (2001).

Eric Holmlund, Director
Eric is a Professor of Environmental Studies at Paul Smith's College as well as the Director of the Stewardship Program and the Director of the PSC Honors Program. He is co-author of a book, *The Camper's Guide to Outdoor Pursuits* and has been a full time faculty member at PSC since 1998. He and his wife Kim have a daughter, Dana, and twin boys, Will and John. He enjoys most outdoor activities, especially lake kayaking and camping. Eric has a Ph.D. in Environmental Studies.

Recreation Use Study: Lake Placid State Boat Launch

By Eric Holmlund, WSP Director

Introduction

Since 2002, the Paul Smith's College Watershed Stewardship Program, a division of the Adirondack Watershed Institute, has posted paid employees to inspect boats and provide environmental education to visitors to Lake Placid as part of a regional effort to prevent the spread of aquatic invasive species (AIS), known to be transported inadvertently by watercraft operators. Non-native plant fragments and animals, such as zebra mussels and waterfleas, have been found on boat hulls and trailers, in bilges, and attached to fishing equipment. Boat launch stewardship programs have become accepted as critical tools to delay or prevent the spread of AIS in the comparatively unimpacted natural waterways of the Adirondack Park. The Watershed Stewardship Program (WSP) has provided trained and professionally administered boat launch stewards to regional lakes and waterways since 2000.

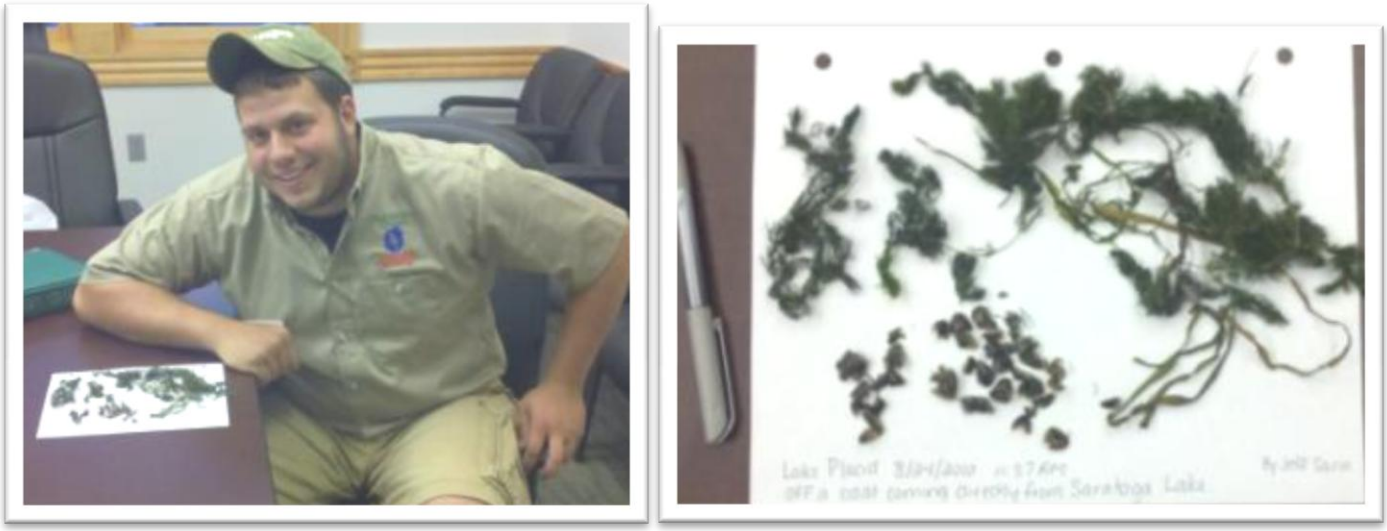

Figure 1- Steward Jeff Sann with Eurasian watermilfoil and zebra mussels removed from boat at Lake Placid launch

Lake Placid has long enjoyed high water quality and the absence of invasive species. In 2009, aquatic plant surveyors discovered a medium-sized patch of variable leaf milfoil (*myriophyllum heterophyllum*) in Lake Placid's Paradox Bay, underscoring the urgency of increased vigilance and the vulnerability of the lake to unwanted invasive species. In response, the Lake Placid Shore Owners' Association (LPSOA) quickly instituted a mapping and harvesting action over the summer of 2009 and increased steward coverage at the New York State Boat Launch from five to seven days per week for the

summer of 2010. Additionally, the LPSOA worked with the Lake Placid Village Board to fund steward coverage on summer holiday weekends at the second public access to Lake Placid, the less well known but still commonly used launch in Paradox Bay, which is maintained by the Village of Lake Placid. Since 2005, stewards have queried visitors about prior waterway use. Consistently, the top reported prior waterway visits, within a two week period, have been to lakes in the Saranac chain, only ten to twenty miles away and known to be infested with Eurasian watermilfoil, variable leaf milfoil, and more recently, curlyleaf pondweed. These ongoing and emergent concerns for the current health and status of Lake Placid form the background for the stewardship effort in the summer of 2010.

Methods

As in past years, stewards were trained in late May and were stationed at the New York State Boat Launch from Memorial Day to Labor Day. The eight-hour shift started at 7 am each day and ran until 4 pm, including an hour of breaks during the day, which were taken during slack visitation periods. Stewards were instructed to approach visitors, greet them, and deliver the interpretive message regarding AIS. In the process of imparting tips regarding responsible practices to prevent AIS transport (inspecting the boat, cleaning the boat, emptying the bilge, draining bait buckets, etc.) the steward and the boat owner would typically conduct a thorough visual inspection of the boat, the trailer, the undercarriage of the trailer, and with the permission of the owner, the interior of the boat, the livewell, anchor line, and other spaces prone to transporting aquatic plant and animal fragments. In the process of the interaction, stewards ask visitors about prior waterway visits and steps the visitor had taken (if any) to prevent AIS transport before arriving at the boat ramp.

Results

Over the course of the fifteen week summer season, from May 29 to September 6, 2010, a team of three different stewards inspected 2,036 watercraft of various types and interacted with 4,501 visitors in 1,654 groups. Use steadily increased over June, spiked to a distinct high around the July 4 weekend, and then steadily rose in August before an end of summer decline. Visitation was directly related to weather conditions: on rainy days, fewer visitors used the boat launch.

Figure 2- A busy day at the Lake Placid State Launch

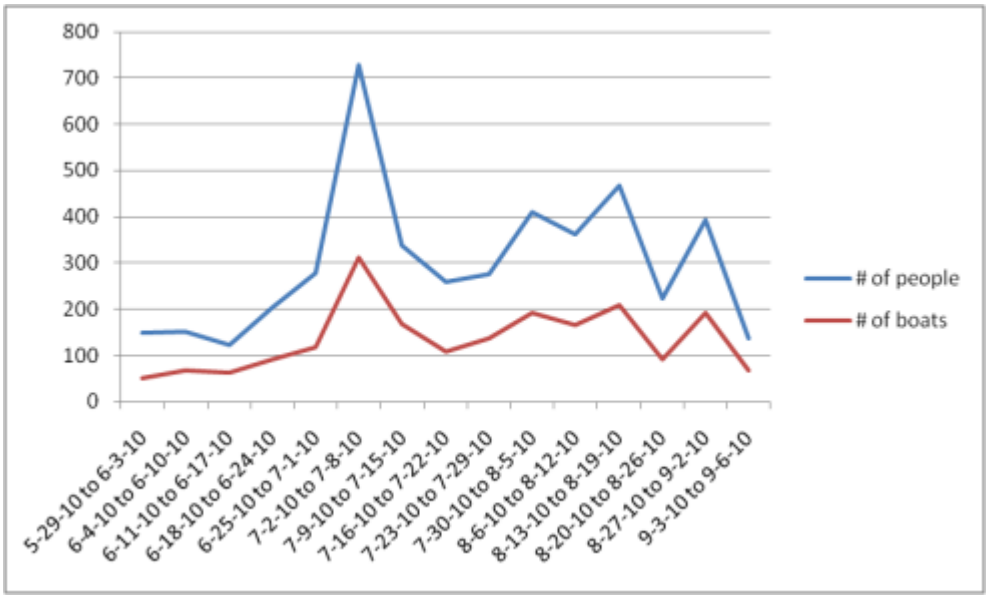

Figure 3- Lake Placid State Boat Launch Use, 2010

For the second year, stewards queried visitors regarding the purpose of their visit, and classified responses into three categories: fishing, recreation and commercial. For the second year, recreation was the most frequent response by far, with fishing and commercial purposes being comparable in frequency.

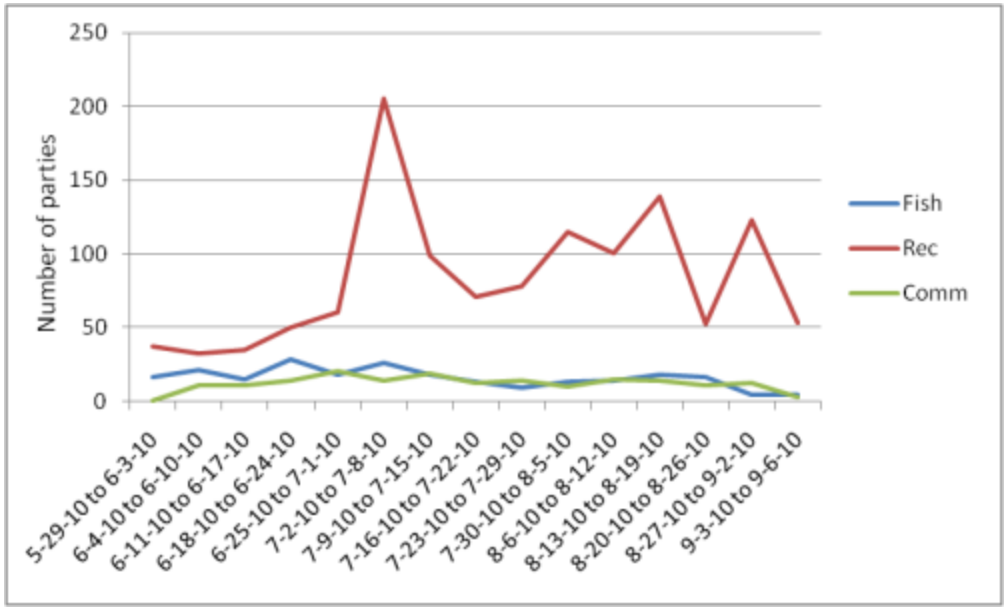

Figure 4- Purpose of visits, Lake Placid 2010. Fish = Fishing; Rec = Recreation (boating, skiing); Comm = Commercial (contractors, deliveries, guides)

Stewards also kept track of the types of watercraft they observed over the summer. In keeping with the multi-year trend, motorboats were the most frequently observed watercraft launched (1,159), representing 56% of the total, followed by kayaks (605, 29%). Canoes were much less frequently launched (176, 9%), followed by construction barges (79, 4%), rowboats (17, 1%), sailboats (16, 1%) and one personal watercraft (Figure 5). Mean summer horsepower on outboard motors was the same as last summer, at 75, while the median figure of 70 hp was also the same as 2009. 334 outboard motors were observed to be the more efficient and clean four-stroke technology, reversing a three year downward trend from the high of 398 observed in 2006 (Figure 6).

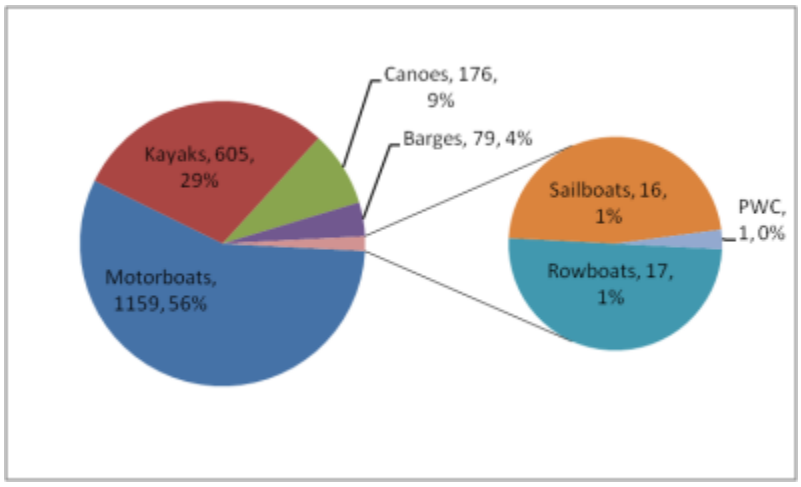

Figure 5- Types of watercraft launched, Lake Placid 2010

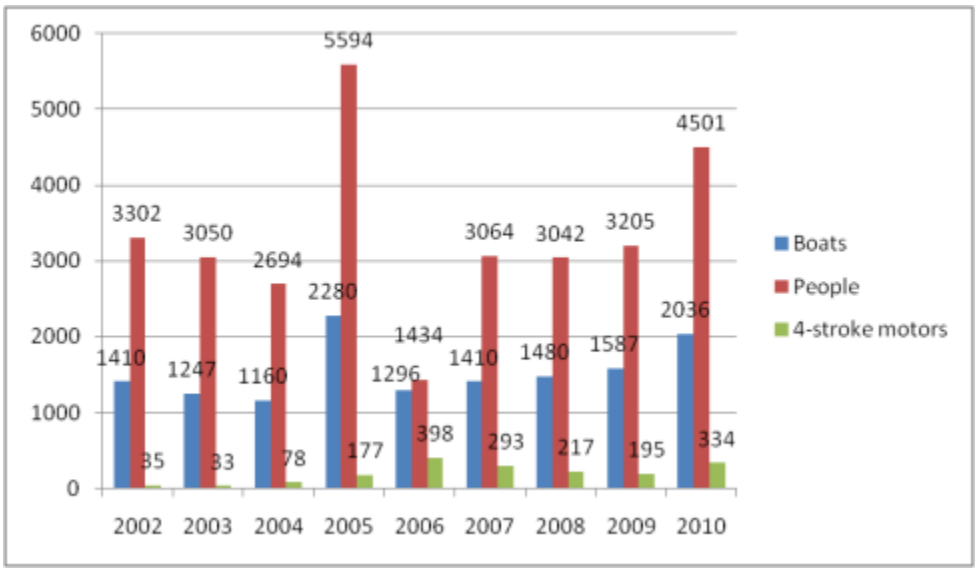

Figure 6- People, total boats and four-stroke outboard motors observed at Lake Placid State Launch, multi-year perspective

Once again, stewards welcomed visitors from all over the country, along with some Canadian provinces. Stewards gathered this information from observations of boat registration tags. Non-motorized craft were excluded from this data set, as the stewards had enough data to gather verbally. We are sensitive to not over taxing our visitors with a battery of questions. Observable data, such as that derived from visible boat registrations, is easy to collect. New York, predictably, was the most frequently observed boat registration (1,071 visits), followed by New Jersey (54), Connecticut (22) and Pennsylvania (17 visits). Lake Placid received visitors from a total of 23 states and provinces, representing both opportunities for the tourism industry and for the transport of AIS.

State/Province	# boats
Connecticut	22
Florida	2
Indiana	2
Massachusetts	3
Maryland	9
Maine	3
Minnesota	1
Michigan	1
Mississippi	8
New Brunswick	1
New Hampshire	6
New Jersey	54
New York	1071
Ohio	3
Ontario	8
Pennsylvania	17
Prince Edward Island	2
Quebec	8
Rhode Island	1
South Carolina	1
Texas	1
Virginia	3
Vermont	10

Table 1- State/Province of origin, motorboats, Lake Placid, 2010

Stewards were stationed at the New York State boat launch seven days per week, and thus were able to gather data for a comparatively complete picture of use at the boat launch. It should be noted that Thursday mornings from 7-8:30 am were staff meetings at Paul Smith's College, which delayed the steward that day until approximately 9:00 am. This undoubtedly resulted in somewhat fewer boats counted and inspected on Thursdays. As always, stewards do not inspect boats before 7 am and after 4 pm, and during their lunch breaks. Thus, we cannot say that we inspected each boat that used the launch. We are confident that we did, however, inspect the vast majority of boats using the launch. As would be expected, Saturdays and Sundays were the busiest days at the launch, followed by Mondays

and Fridays. The least-visited day was Thursday, but considering that the steward arrived on Thursdays at 9, the use levels can be estimated to be comparable to the other middle weekdays (Figure 7).

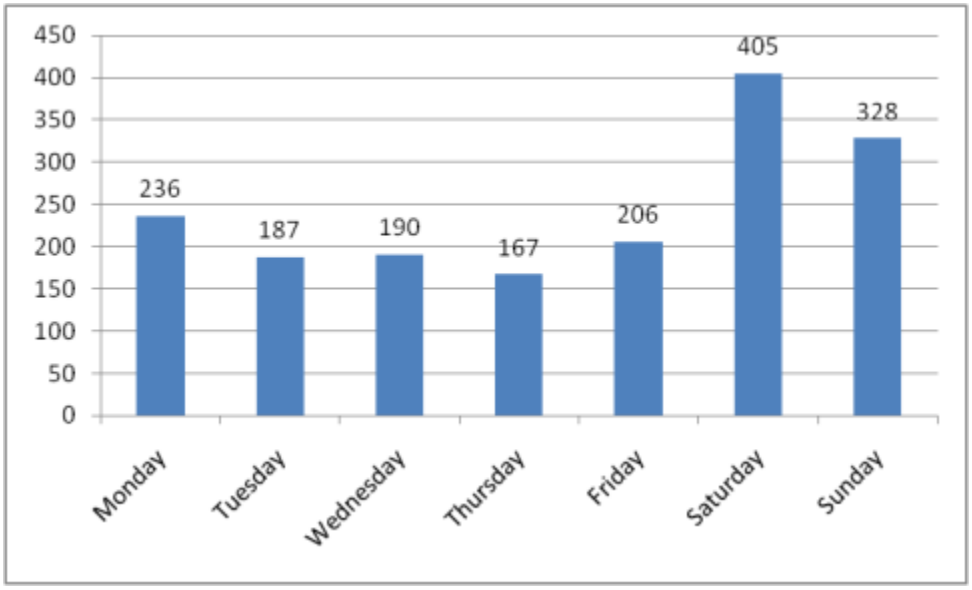

Figure 7- Number of groups visiting boat launch by day of week, Lake Placid 2010

Prior waterway visitation

Stewards also asked each boating party where they had used their boat in the two week period prior to visiting Lake Placid (Table 2). It is clear that boaters came from all over eastern North America, from a variety of fresh and salt-water systems that commonly host populations of aquatic invasive species. A total of 1,147 prior visits were reported, out of 1,654 groups encountered; 69% of groups using Lake Placid reported using another waterway in the preceding two week period. 707 groups (43%) reported using Lake Placid itself, which likely poses little risk of introducing new invasive species. The next most frequently reported water body was Mirror Lake, with 85 prior visits, followed by Lake Champlain (35), Saranac Lake (29), Lake Flower (21), Lower Saranac (14) and Upper Saranac (12). If all the Saranac Lakes are combined, the sum of total visits reported comes to 76, just short of the total for Mirror Lake. The Saranac Lakes are close to Lake Placid and host several AIS species, such as Eurasian watermilfoil, variable leaf milfoil and curly leaf pondweed. Excluding visits from Lake Placid, there were 258 reported visits in 2010 from water bodies known to host AIS; thus, 16% of boats launching into Lake Placid had visited a water body known to host AIS in the preceding two week period, and so presented some level of risk for transporting AIS into Lake Placid. It should be noted that this is a conservative estimate, because many of the lakes reported are distant and/or unfamiliar to our program, and might host AIS. We conducted an internet search of all unfamiliar water bodies to determine AIS presence, but failed to find information on all lakes mentioned by visitors.

water body	Total Visits	Known to be Infected	water body	Total Visits	Known to be Infected	water body	Total Visits	Known to be Infected
Lake Placid	707	yes	Lake Ontario	2	yes	Lake Gibbson, ont	1	
Mirror Lake	85		Long Pond (Essex)	2	yes	Lake Harris	1	
Lake Champlain	35	yes	Mohawk River	2	yes	Lake Luzerne	1	yes
Saranac Lake	29	yes	Niagara River	2	yes	Lake Murray	1	yes
Lake Flower	21	yes	Otsego Lake	2	yes	Lake Pleasant	1	
Lower Saranac	14	yes	Raquette River	2	yes	Lake Wallenpaupack,Pa	1	yes
Upper Saranac	12	yes	Sacandaga Lake	2	yes	Lake Whitehall,Ma	1	
St. Regis	11		Split Rock Falls Res,Nj	2		Lakeville Lake	1	yes
Lake George	9	yes	Thames River, Ct	2		Lime Lake	1	yes
Saratoga Lake	7	yes	Thompsons Lake	2		Lincoln Pond	1	yes
Schroon Lake	7	yes	Upper St. Regis	2		Little Green	1	
St. Lawrence	7	yes	Allegheny River	1	yes	Long Island Sound	1	yes
Ausable River	6		Bass Lake,Ont.	1		Mashpee Lake	1	yes
Chateaugay Lake	6	yes	Black Lake	1		Matecook Lake	1	
Long Lake	6		Booth Bay	1		Mississippi River, Canada	1	
Hudson River	5	yes	Bradley Beach NJ	1		Moose Pond	1	
Lake Erie	5	yes	Brant Lake	1	yes	Mountain Pond	1	
Middle Saranac	5	yes	Bras D'or Lake (NS)	1	yes	Norfolk, L.I.	1	
Tupper Lake	5	yes	Butsville Dam, Pa	1		Oneida Lake	1	yes
Atlantic Ocean	4	yes	Canada Lake	1		Osgood Pond	1	
Blue Mount. Lake	4		Canadaigua	1	yes	Pangaua Puddle	1	
Cascade lakes	4		Carnigie Lake	1		Paradox Lake	1	yes
Cranberry Lake	4	yes	Cayuga Lake	1	yes	Patomac River	1	yes
Fulton Chian 1st - 4th	4	yes	Chapel Pond	1		Piseco Lake	1	
Raquette Lake	4	yes	Chazy Lake	1	yes	Pope Bay	1	
Skaneateles Lake	4	yes	Chubb River	1		Rainbow Res., CT	1	
Buck Pond	3		Copake Lake	1	yes	Rancocas , NJ	1	
Connecticut River	3	yes	Delta Lake	1		Rangley Lake	1	
Delaware River	3	yes	Echo Lake, N.H.	1		Remington Pond	1	
Hoel Pond	3		Eighth Lake	1		Rideau Canal	1	yes
Lake Colby	3	yes	Finger Lakes	1	yes	River Noire	1	
Mill Pond	3		Fish Creek	1	yes	Rollins Pond	1	
Oseetah Lake	3	yes	Forked Lake	1		Santa Clara Flow	1	
Rainbow Lake	3		Fort Lee River	1		Schuylkill River	1	
Second Pond	3	yes	Franklin Falls	1	yes	Seneca River	1	yes
Stoney Creek Pond	3		Garanoyre Lake Ont.	1		South Pond	1	
Taylor Pond	3	yes	Georgian Bay	1	yes	Stillwater Reservoir	1	
Ballston Lake	2	yes	Glen Lake	1	yes	Stockbridge Bowl	1	
Cazenovia Lake	2	yes	Harrison State Park	1		Susquhanna River	1	yes
Follensbeak Clear	2	yes	Hinkley Lake	1		Umbagog, NH	1	
Fourth Lake	2	yes	Hopatcong	1	yes	Union Falls	1	yes
Henderson Lake	2		Indian Lake	1	yes	Union Lake, NJ	1	
Kayaderosseras Creek	2	yes	Lac Monroe	1		Wallburn Res, OH	1	
Kunjamuk River	2		Lac St Joseph	1		Waterbury Res	1	
Lake Clear	2		Lake Everest	1		White Lake	1	
Lake Kushaqua	2						1147	

Table 2-Waterways visited two weeks prior to visiting Lake Placid, 2010

Prior waterway visitation data from 2009 is represented in the invasive potential transport map in Figure 8. Red pathways are of greatest concern, as well as the geographic scope of the lakes previously visited. Lake Placid is a significantly attractive destination for visitors trailering boats from all across the United States and Canada.

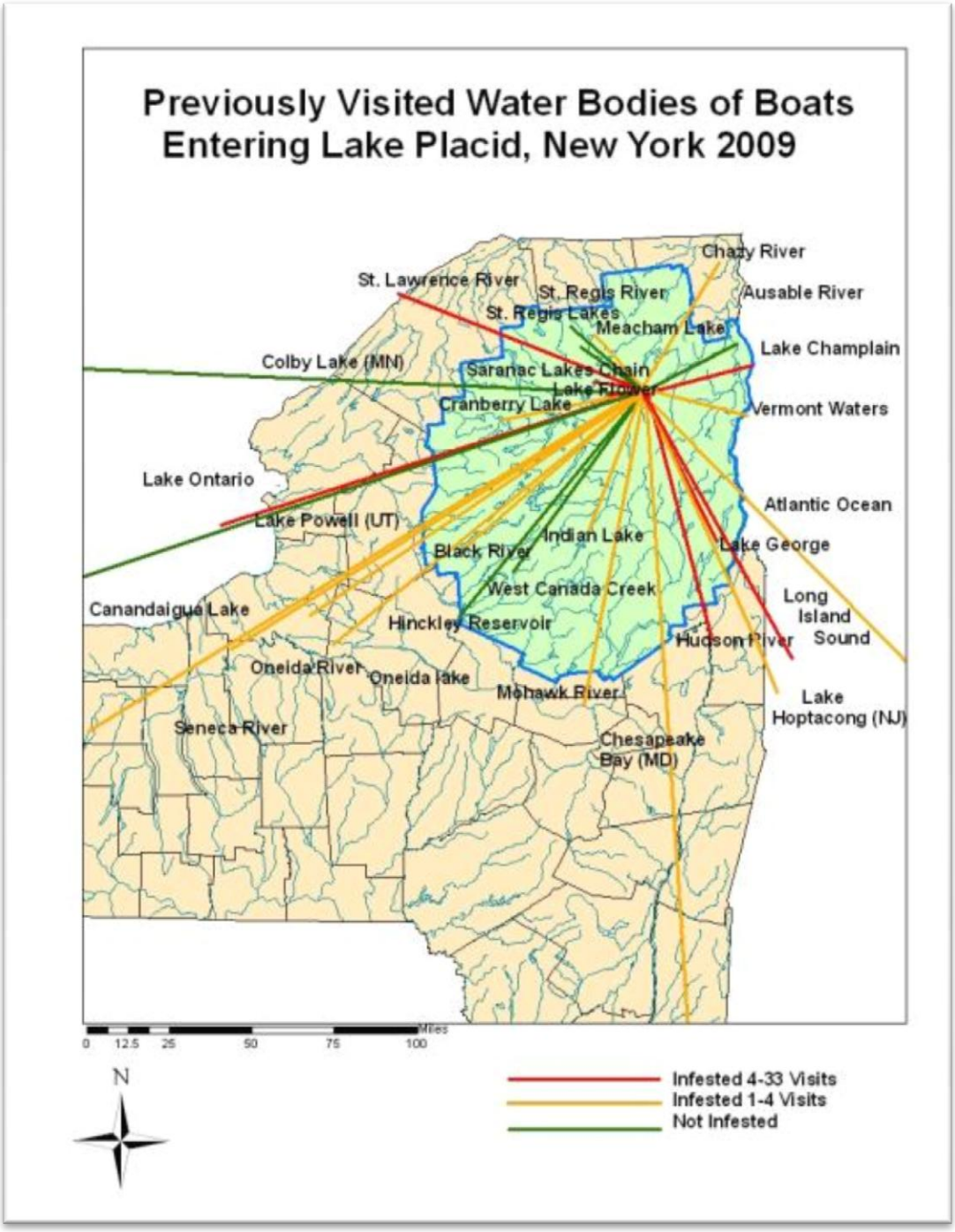

Figure 8- Two week prior visitation history, Lake Placid, 2009

Aquatic Invasive Species (AIS) prevention measures taken by visitors

As part of their interpretive message and boat inspection protocol, stewards asked visitors whether they had taken any measures before arrival to prevent the transport of AIS to Lake Placid. Such

measures could include inspecting their watercraft, washing it, letting the boat dry, draining the bilge, emptying bait buckets, or disposing of unused bait from previous fishing trips. A total of 1,604 groups reported that they had taken some measure to prevent transport of AIS prior to visiting Lake Placid. This represents 79% of visitors, up from 74% in 2009 (Figure 9). The most reported measure of AIS spread prevention reported by visitors was to inspect their boat (66%) followed by draining the bilge (34%), drying the boat (32%) and washing it (31%). These figures differ from the findings in 2009, when washing the boat was the most reported spread prevention measure (50%) followed by inspecting the boat (33%). All of the other measures were reported in the single digits in 2009. Overall, it is clear that visitors are taking spread prevention seriously, and that washing and inspecting their watercraft emerge as the primary means of intervention. Stewards should be ready to assist in bilge draining, if in fact most of the bilges have not been drained. Our intent is that this query aids in the visitor education process, insofar as asking the spread prevention question and outlining the techniques and options sends a message that the question is worth asking, and plants the seed of future visitor action prior to visiting any boat launch.

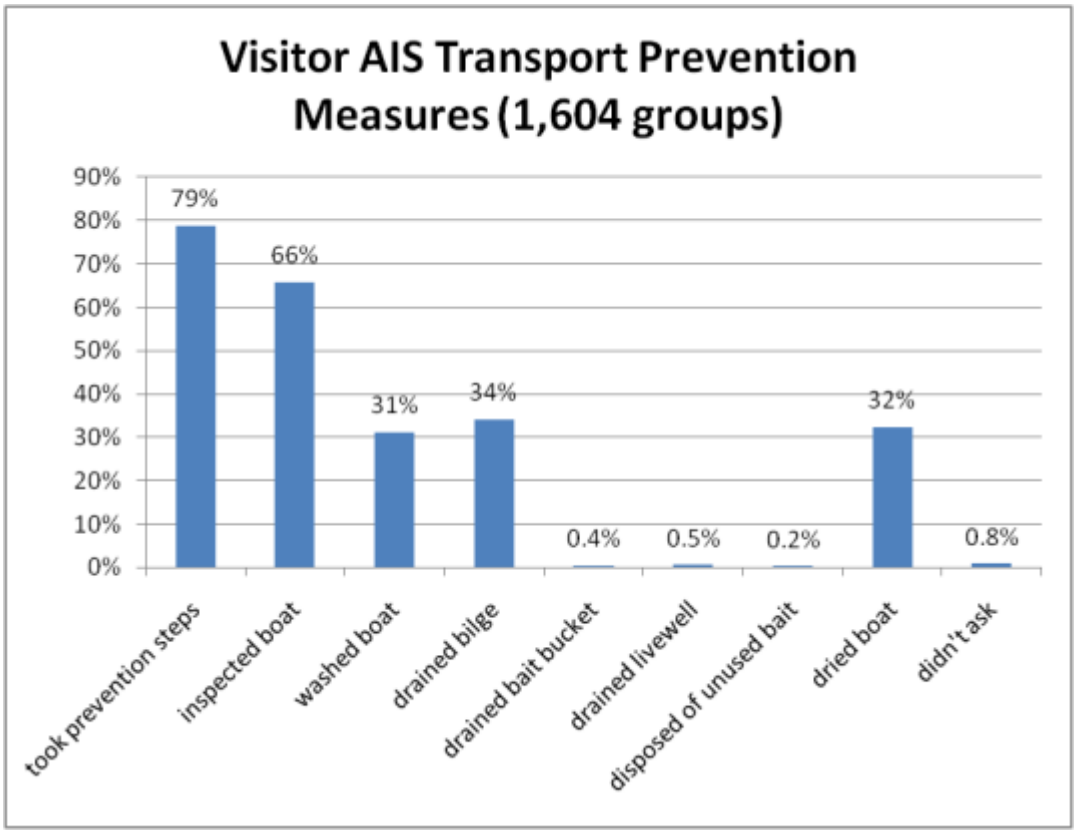

Figure 9- Aquatic Invasive Species spread prevention measures, NYSDEC boat launch at Lake Placid, summer 2010

Organisms found and removed from watercraft

Stewards also examined and tallied what they found when they conducted their boat inspections. 115 organisms were removed from boats over the course of the summer; 73 were found on boats entering Lake Placid and 42 were found on boats being retrieved from the boat launch. Grass was the most commonly found organism (60 instances, or 53% of the samples retained; see Figure 10), followed by other (47, 41%), native milfoil (2, 2%), zebra mussels (2, 2%), Eurasian watermilfoil (2, 2%), bladderwort, and variable leaf milfoil (both 1, 1%). 4.3% of removed organisms were aquatic invasives. The "other" category consisted of unidentifiable or miscellaneous non-invasive detritus, such as pine and spruce needles, spider webs, deciduous leaves, twigs, mud or insect bodies (Table 1). Of course it is possible that single cell propagules (algae, zebra mussel veligers, etc.) could be incorporated in these materials. Stewards discovered zebra mussels on two instances (8/3/10 from St. Lawrence River and 8/24/10 from Saratoga Lake) and Eurasian watermilfoil on two instances (7/11/10 from Lower Saranac Lake and 8/24/10 from Saratoga Lake, with the zebra mussels). On both occasions, stewards removed as much of the material as they could before the boats were launched into Lake Placid. The 8/24/10 find was given excellent media coverage by the Adirondack Daily Enterprise, with a front page, above-the-fold headline article, "SHELL-SHOCKED: Zebra Mussels get into Lake Placid" published on September 4, 2010. By way of comparison, in 2009, 100 organisms were removed from boats, including 8 Eurasian watermilfoil fragments and 1 instance of zebra mussels.

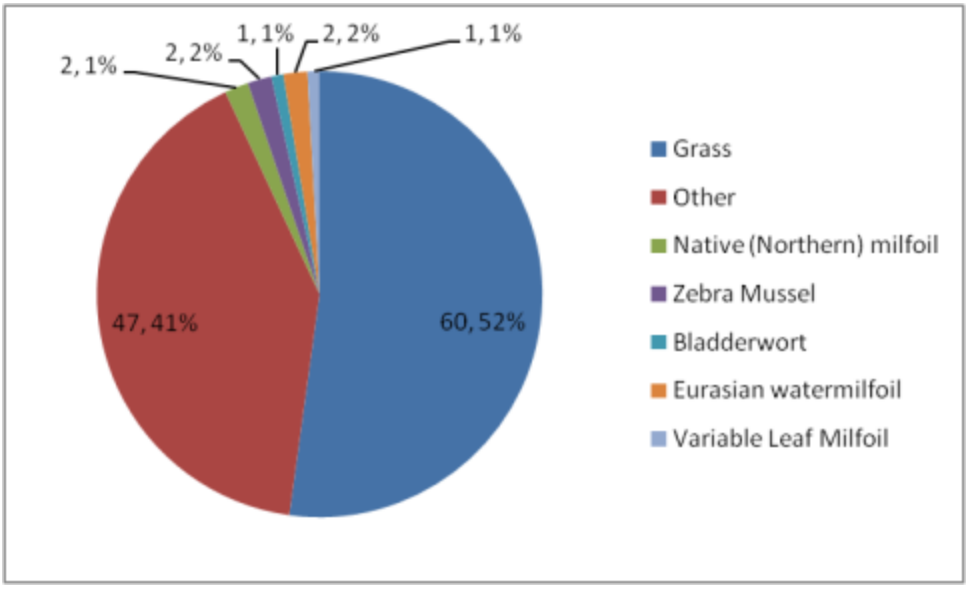

Figure 10- Organisms and fragments found on boats using the NYSDEC boat launch at Lake Placid, 2010. (# of organisms found, % of total)

Organism	Entering	Leaving	Prior waterway
Eurasian watermilfoil	2	0	Saratoga Lake, Lower Saranac Lake
Native milfoil	2	0	
Variable leaf milfoil	1	0	Saranac Lake
Bladderwort	1	0	
Grass	34	26	
Zebra mussels	2	0	Saratoga Lake, St. Lawrence River
Pine needles	7	4	
Other (unidentified)	20	12	
Spider web	1	0	
Barnacles, bivalve	0	1	Long Island Sound
Coontail	0	1	Saratoga Lake
Muck	0	1	Lake Placid
totals	**70**	**45**	

Table 3- Organisms found on boats entering and leaving the NYSDEC boat launch at Lake Placid, summer 2010. Prior waterway listed for invasive species or species of interest.

Reflections from the principle Watershed Steward

In 2010, the WSP stationed one steward at Lake Placid for three days per week: Saturdays, Sundays and Mondays. We did this to experiment with greater consistency on high-traffic times at the boat launch, and because it was convenient for the employee, who lived in Wilmington. The steward, Jeanne Ashworth, brought an unprecedented background as a professional and local elected official. She shares the following reflections on her experience over the summer.

"I saw that the Watershed Stewardship Program had been very successful in education in several ways. Most people indicated a concern about the increasing threat of invasive species to Adirondack lakes, especially Lake Placid. I was very impressed with the number of people who use their boats only in Lake Placid as a matter of concern that they would inadvertently transport an invasive from an infected lake to Lake Placid. Most people were very supportive of the program and the message.

Figure 11- Watershed Steward Jeanne Ashworth

"In performing my duties as a watershed steward, however, I found that different categories of users required different approaches. Commercial users could be divided between commercial companies that clean, repair, service and store boats and the contractors who use boats to take material and workers out to various camps on the lake. For the most part, it seemed to me that the commercial boat storage companies were careful about the introduction of invasives and felt as if they didn't need to be inspected

or listen to the steward's talk every single time. For the most part commercial users were also well aware of the invasives problem and did take precautions. Contractors, however, can also be divided into separate categories: those who go from one lake to another and those who limit their work to Lake Placid. Within this group there are a small number of users who needed monitoring. Contractors who use large machines to load and unload barges presented a whole different dynamic at the launch, and I think the wear and tear on the launch is a concern. Cleaning up, especially after demolition where nails, screws, debris of all kinds had been unloaded, could be improved. I didn't find that the commercial use of the launch really interrupted recreational use of the launch. Commercial users did not work weekends. The contractor would, for the most part, move out of the way if a recreational boater came and wanted to launch a boat while they were working.

"Boaters who contribute most seriously to the problem of invasive species also fall into different categories. Some of them want to pass quickly, are sure they haven't been in an infected lake and try to avoid questions about whether or not they've taken any measures to clean their boats and trailers; others are receptive to the message and want to know what their responsibility is. An example of a resistant user was the boater transporting zebra mussels on a boat coming from Saratoga Lake up to Lake Placid who was not receptive to the steward message or the measures they should have taken. From this I have learned it only takes one to cause an invasion. Compliance about boat washing rules also often proved problematic because there is no boat washing facility at the site. I strongly suggest, to prevent the spread of invasives, the provision of a wash station at launches, especially at infected lakes. Some people use car washes for their boats and trailers. Maybe there could be some sort of cooperative agreement with the car washes for a reduced price and some advertisement for their business.

"My take away from this work has been that I was surprised to learn how many people were very conscientious and concerned about invasive infection. I was also surprised that I did not run into many people who were not supportive of the watershed steward program. Still I did have some people who felt it a waste of time and that it was useless to try to stop invasive' spread. Most people tried to do what was right and they knew that if they came to the Lake Placid state launch there was going to be steward and that their boat was going to be inspected and that they were expected to clean their boat and take care not to transport invasives. It is an important initiative that the village of LP and the town of Harrietstown have passed local laws prohibiting the transportation of invasive species. It will make people more aware that the local municipalities are serious about protecting the lakes from invasives. It is also important the LPSOA instruct their members about summer rentals who will be transporting a boat from another lake."

WEEKEND
SATURDAY-SUNDAY
September 4-5, 2010

The most
- Savings
- News Stories
- Audience
of any media in the Adirondack Part

Since 1894
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Adirondack scientist's new book says warming would deeply change Park; he also offers possible solutions
North Country Living B1

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$1

Zebra mussels get into Lake Placid

SHELL-SHOCKED

Asian clams invade Lake George

Steward catches invader at launch, but boater doesn't fully oblige

By JESSICA COLLIER
Enterprise Staff Writer

A lake steward found a large colony of zebra mussels attached to a boat last week and managed to clean off most of the mussels before it launched into Lake Placid.

Zebra mussels, native to the Black and Caspian seas in Eurasia, are considered an invasive species in North America and other parts of the world.

According to a narrative written up by steward Jeff Sann, boaters from the Albany area had been in Saratoga Lake prior to coming to Lake Placid. Sann said he knew that lake has many invasive species, so he inspected the boat thoroughly.

A large amount of zebra mussels were attached to various parts of the boat, including colonies developed on the depth finder and speedometer units as well as two round holes. Sann wrote. There were also three aquatic plants on the trailer.

(Continued on Page A7)

These zebra mussels, found on a boat about to go into Lake George in late August, came from Saratoga Lake, as did ones found the same week at Lake Placid. (Photo provided)

Mollusks that befouled Tahoe are in iconic Adirondack lake

By MARY ESCH
Associated Press Writer

BOLTON LANDING — A thumbnail-sized clam blamed for clouding the azure bays of Lake Tahoe high in the Sierra Nevada has now turned up in a mountain-ringed Adirondack lake renowned for its limpid, spring-fed waters.

The invasive Asian clam, Corbicula fluminea, is known as the "golden clam" in the aquarium trade and the "good luck clam" in its

(Continued on Page A7)

Asian clams
(Photo — Emily DeBolt, Lake George Association)

Figure 12- September 4, 2010 front page article covering Zebra mussel find at Lake Placid boat launch

Discussion

Use at the New York State boat launch at Lake Placid was up in 2010 compared with 2009, reflecting good weather and the continuing appeal of aquatic recreation and Lake Placid's particular appeal as an Adirondack destination resort and sport fishing attraction. The stewards were dedicated and mature this summer and worked diligently and professionally to conduct their duties as ambassadors and protectors of Lake Placid's ecosystem. Use levels peaked this summer around the July 4 weekend, and did not climb to a season high in August, as has been the typical pattern over the summer. Visitors were generally receptive to the steward message and reported ever higher levels of AIS spread prevention measures taken before arriving at the boat launch, which is a strong sign that the invasive species message and issue is penetrating the consciousness of the boating public. There is little evidence of user conflicts at the Lake Placid boat launch, as the stewards report respectful interactions between commercial users and the general public. One issue of concern, however, is maintaining optimal boat launch hygiene in terms of commercial wastes, rubble, trash and effluents that might be dropped by contractors as they transport materials and wastes from construction jobs back and forth at the launch site. In general, the condition of the launch, parking lot and rest room deteriorated in 2010, perhaps owing to cutbacks in state maintenance capacity under the ongoing budget crisis.

Despite an increase of 28% in terms of boats inspected at the boat launch from 2009 (corresponding to an increase in coverage from 5 days per week to 7 days per week in 2010), stewards found and removed only 15% more organisms/fragments from boats using the launch compared with

2009. We can hope that this year-to-year decrease in contamination rate is due to increased vigilance on the part of boat owners in terms of washing and inspecting their equipment prior to use. Boats continue to leave Lake Placid with significant presence of plant materials on board (46 instances in 2010), which is cause for some concern. This might indicate that they are slipping by steward inspection on the way in, have launched their craft when stewards were not on duty, or that they are engaging in boating practices (piloting watercraft through aquatic vegetation) that cause plant fragments to adhere to their boats while on Lake Placid itself.

For the summer of 2011, the Watershed Stewardship Program would like to make the following recommendations:

- Keep boat launch coverage at the NYS launch at 7 days per week, if at all possible
- Find a way to provide steward coverage (volunteer, village employee or WSP employee) at the Lake Placid Village launch on weekends)
- Provide visitors with a map to nearby boat washes/car washes so that stewards can direct dirty or high risk boats there for more thorough cleaning
- Develop a protocol for the stewards for enforcing the Lake Placid Village invasive species transport law
- Investigate the feasibility of erecting a seasonal shelter for the stewards at the boat launch site (sun and rain protection for personnel, and provision of educational materials)
- Build functional connections with the Lake Placid School District, Northwood School and National Sports Academy in terms of educational opportunities for local environmental students and potential opportunities for service learning/employment as paid stewards and/or volunteer stewards
- Bring stewards and/or administrators to Village Board meetings in early and mid summer for dialog/reporting

Conclusion

The summer of 2010 saw an increased effort on the part of the Lake Placid Shore Owners' Association, the Watershed Stewardship Program and the Lake Placid Village administration to respond to the increased awareness of the threat to Lake Placid's water quality posed by aquatic invasive species. 2009 provided an all-too-tangible demonstration of the vulnerability of Lake Placid to invasive colonization through the discovery of the large variable leaf milfoil bed in Paradox Bay. There is general consensus that the threat is now a real one. Once again, watershed stewards have worked diligently to educate thousands of visitors and to inspect thousands of boats, removing over 100 organism fragments over the course of the summer. Fortunately, it appears that the public is largely aware of the AIS issue, and knows many of the steps in responsible boat and equipment ownership necessary to reduce the spread of AIS, such as washing and inspecting boats, draining bilges, etc. Unfortunately, stewards still experience resistance to their message, as indicated by the highly publicized incident in late August, in which the steward removed a significant sample of milfoil and zebra mussels, engaged the boat owner about the issue, and was unable to convince the owner to take the boat home or to a wash location to more thoroughly clean it.

Once again, the Watershed Stewardship Program has enjoyed a supportive and mutually beneficial relationship with the Lake Placid Shore Owners' Association and support from the Lake Champlain Basin Program's Local Implementation Grants program. Together with Adirondack Park Invasive Plant Program, the three groups form a professional network of expertise and resources that have made the Watershed Stewardship Program a state-wide model for aquatic invasive species spread prevention. The WSP greatly appreciates the expertise and involvement of the leadership of the LPSOA in shaping each year's strategy and looks forward to another summer of service in 2011.

Lake Placid Recreation Study 2010

	Boat Type							total #	Weekly Avg	Four	Group	# groups	# groups
Week	M	K	C	B	R	S	PWC	boats	HP Outboard	stroke	Size	launching	retrieving
5-29-10 to 6-3-10	36	6	10	0	2	0	0	52	77	13	150	44	28
6-4-10 to 6-10-10	57	5	2	3	0	0	0	67	96	17	151	46	36
6-11-10 to 6-17-10	42	11	6	5	1	0	0	64	56	14	122	55	29
6-18-10 to 6-24-10	77	6	4	3	1	1	1	92	79	21	203	74	51
6-25-10 to 7-1-10	71	29	14	5	1	0	0	119	66	22	279	83	56
7-2-10 to 7-8-10	182	100	21	7	1	1	0	311	78	38	728	217	121
7-9-10 to 7-15-10	84	71	8	4	2	1	0	168	74	19	339	104	74
7-16-10 to 7-22-10	70	25	6	6	0	1	0	108	70	14	260	80	56
7-23-10 to 7-29-10	62	58	16	2	2	0	0	138	74	13	275	49	26
7-30-10 to 8-5-10	91	69	28	3	1	0	0	191	67	21	411	114	80
8-6-10 to 8-12-10	86	53	21	4	1	1	0	165	68	20	362	92	75
8-13-10 to 8-19-10	113	68	18	7	1	4	0	210	64	19	467	147	98
8-20-10 to 8-26-10	58	22	6	5	2	0	0	91	83	12	223	59	36
8-27-10 to 9-2-10	89	62	12	25	1	4	0	192	96	75	394	128	78
9-3-10 to 9-6-10	41	20	4	0	1	3	0	68	92	16	137	54	34
totals	1159	605	176	79	17	16	1	2036	Summer Avg 75	334	4501	1346	878
									Median HP 70				

Table 4- Summary, 2010. M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

Lake Placid Recreation Study 2010

	organisms found		organism type								Use		
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	Fish	Rec	Comm
5-29-10 to 6-3-10	0	1	0	0	0	0	0	0	0	1	16	37	0
6-4-10 to 6-10-10	1	1	0	0	0	1	0	0	0	1	21	32	11
6-11-10 to 6-17-10	3	0	0	0	1	1	0	0	0	1	15	35	11
6-18-10 to 6-24-10	0	1	0	0	0	0	0	0	0	1	28	50	14
6-25-10 to 7-1-10	0	0	0	0	0	0	0	0	0	0	18	60	20
7-2-10 to 7-8-10	3	1	0	0	0	3	0	0	0	1	26	205	14
7-9-10 to 7-15-10	7	6	1	1	0	6	0	0	0	5	18	99	19
7-16-10 to 7-22-10	4	1	0	0	0	1	0	0	0	4	13	71	12
7-23-10 to 7-29-10	9	7	0	0	0	9	0	0	0	7	9	78	14
7-30-10 to 8-5-10	12	7	0	0	0	10	0	1	0	8	13	115	10
8-6-10 to 8-12-10	10	6	0	0	1	11	0	0	0	4	14	100	15
8-13-10 to 8-19-10	13	3	0	0	0	9	0	0	0	7	18	139	14
8-20-10 to 8-26-10	5	4	1	0	0	4	0	1	0	3	16	52	11
8-27-10 to 9-2-10	6	3	0	0	0	5	0	0	1	3	4	123	12
9-3-10 to 9-6-10	0	1	0	0	0	0	0	0	0	1	4	53	3
totals	73	42	2	1	2	60	0	2	1	47	233	1249	180

Table 5- EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil; Fish = fishing; Rec = recreational; Comm = commercial

Lake Placid Recreation Study 2010

	visitor prevention steps									
Week	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask	# groups
5-29-10 to 6-3-10	47	44	17	14	2	1	1	30	1	50
6-4-10 to 6-10-10	42	36	17	12	0	1	0	13	0	65
6-11-10 to 6-17-10	37	38	18	13	0	2	0	29	0	56
6-18-10 to 6-24-10	73	54	33	30	3	1	1	39	0	91
6-25-10 to 7-1-10	78	73	41	36	1	0	0	14	4	98
7-2-10 to 7-8-10	209	191	64	49	0	0	0	112	1	248
7-9-10 to 7-15-10	112	76	42	37	0	0	1	62	2	131
7-16-10 to 7-22-10	82	69	42	31	0	0	0	22	0	96
7-23-10 to 7-29-10	54	45	26	22	0	0	0	29	0	102
7-30-10 to 8-5-10	117	90	50	50	0	0	0	54	1	139
8-6-10 to 8-12-10	88	72	38	56	0	2	0	31	1	129
8-13-10 to 8-19-10	136	99	46	75	0	1	0	30	1	170
8-20-10 to 8-26-10	51	39	20	30	0	1	0	14	3	78
8-27-10 to 9-2-10	120	113	44	75	0	0	0	37	0	141
9-3-10 to 9-6-10	57	48	17	34	0	0	0	17	0	60
totals	1303	1087	515	564	6	9	3	533	14	1654

Table 6- I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: Osgood Pond

By: Matthew Rankin, Watershed Steward

Figure 1- View from Osgood Pond Waterway Access

Introduction

The Watershed Stewardship Program (WSP) of Paul Smith's College's Adirondack Watershed Institute educates the public about aquatic invasive species (AIS) as well as other conservation and preservation issues that pertain to the Adirondack Park. Watershed Stewards employed by the WSP were stationed at the Osgood Pond public boat launch in 2008, 2009 and again in 2010. Stewards were responsible for inspecting watercraft, providing boaters with an interpretive message tailored specifically to Osgood Pond, and collecting recreation data to track the usage patterns of the launch over time. This data aids AIS managers in understanding the spread of invasive species across the Adirondack Park while utilizing the appropriate preventative measures and management policies. As in past years, the Osgood Pond Association has volunteer stewards that are stationed at the boat launch on days that the WSP stewards are not on duty. Both paid and volunteer stewards attended the annual volunteer training session offered by the WSP. Here, they were provided with the skills and knowledge necessary to educate the public about AIS and effectively perform boat checks as they were launched and retrieved. They were also provided with information regarding the most effective preventative measures to be taken to prevent the spread of AIS.

Methods

The WSP provided a paid steward each Friday afternoon between June 4th and August 27th. Stewards were responsible for collecting data on groups utilizing the launch such as, boat type, engine type and horsepower of the engine, group size, the state of registration, time of launch/retrieval and species of any organism found on the boat or trailer. As the operator of the watercraft began preparing to launch the craft, stewards would approach the boater and introduce themselves and describe their purpose for being there. The steward would collect the data stated above by asking a brief series of questions to the boat operator. A visual inspection of the watercraft and trailer for AIS was completed in order to demonstrate an effective visual inspection technique to the boater. If any native and invasive plant material were found on the watercraft, it was identified and noted on the data sheet, and properly disposed of on dry land far enough away from the water body so that it could not be transported in. The stewards would provide the boater with a verbal message along with an information card highlighting their general message along with pictures of AIS and diagrams of common places where AIS can accumulate on the boat and trailer. Prevention steps against the spread of AIS are also highlighted on the card with hopes that the boater would take preventative measures against the spread of AIS from one body of water to another.

Results

Non-motorized boats made up the vast majority of watercraft observed by stewards at the Osgood Pond boat launch. Canoes and kayaks collectively constituted 80% of all boats using the boat launch, with motorboats constituting only 12%, as shown in Figure 1. These percentages are very similar to the prior two years of data collected at this site. The peak day of use in terms of visitors and watercraft reported by the steward on duty was on 8/20/2010 (Figure 2). Use was strongly influenced by weather conditions.

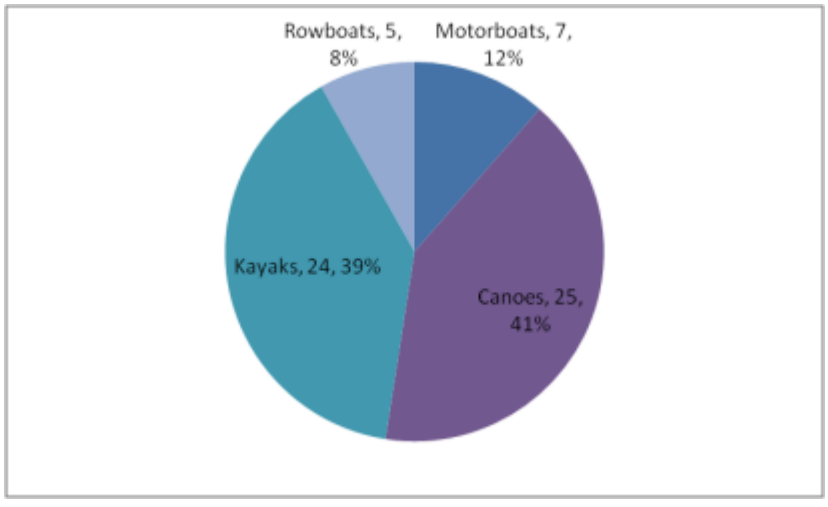

Figure 2-Types of watercraft launched on Friday afternoons, Osgood Pond 2010

Over the course of thirteen Friday afternoons between June 4 and August 27, watershed stewards inspected 61 boats and educated 107 people. Use was weather dependent and was highest in the latter part of August (Figure 3). Volunteer steward data was not available for this report.

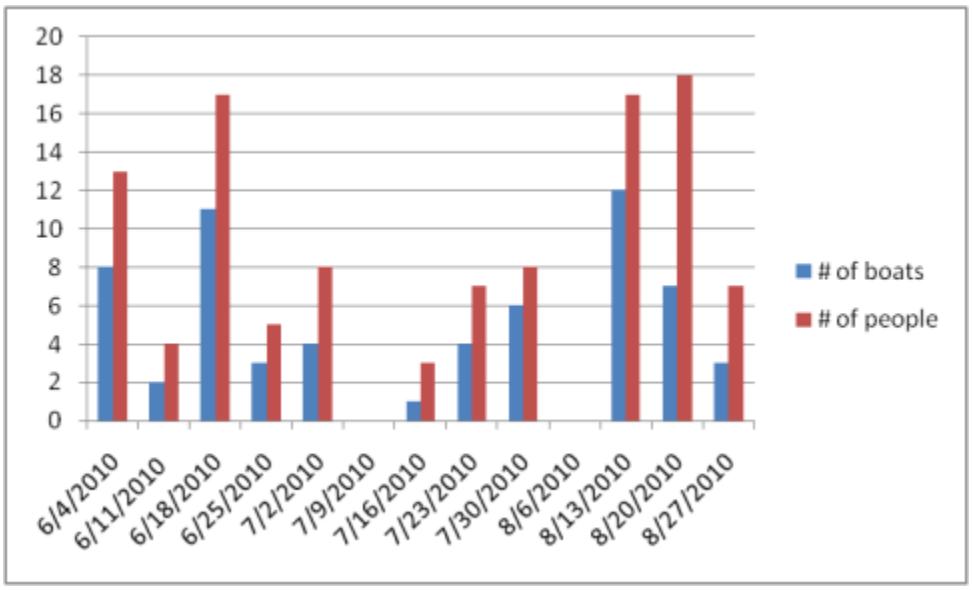

Figure 3- Osgood Pond Waterway Access Use, Fridays, 2010

State/Province of Origin:

Osgood Pond is a small lake located in Paul Smith's New York. Due to its central location in the Adirondack Park, it was expected that most of its visitors have watercraft registered in New York State (11 of the 15 registered watercraft). Origin information was gathered from either observing the motorboats registration sticker, asking the boater, or observing the license plate of the vehicle the boat came off. Four states were represented in the final tally (Table 1).

State	# boats
NY	11
VT	2
DL	1
OH	1
Total	**15**

Table 1- State of origin of motorboats, Osgood Pond 2010

Previously Visited Water Bodies:

Of the 61 boats encountered by the steward at the Osgood Pond boat launch, 41% of them reported being on a body of water in the previous two weeks. Of those boats, 31% (19 of 61 boats) of them reported being on a body of water other than Osgood Pond, and five of those water bodies were confirmed infested with an invasive species. This indicated that at least 6 of those prior visits were to lakes known to be infected with AIS. This indicates the significance of asking the question "Which bodies of water has your boat been on in the past two weeks?" The response to this question assisted the steward in determining the likelihood that their particular boat is transporting an invasive species.

Water body	Infected	total visits
Black Pond	Unknown	1
Chateaugay Lake	Yes (EWM)	1
Fish Creek Ponds	Yes (EWM)	2
Jones Pond	Unknown	1
Lake Colby	Yes (EWM)	1
Lake Placid	Yes (VLM)	1
Little Clear Pond	Not Observed	1
Little Osgood Pond	Not Observed	1
Long Lake (Franklin County)	Not Observed	1
Lower St. Regis Lake	Not Observed	2
McCauley Pond	Unknown	2
Mohawk River	Yes	1
Moose Pond	Not Observed	2
Osgood Pond	Not Observed	6
Raquette River	Yes (VLM)	1
Upper St. Regis Lake	Not Observed	1
Total		**25**

Table 2-Waterways visited two weeks prior to visiting Osgood Pond, 2010

Measures Taken to Prevent Invasive Species Introduction:

Asking boaters if they took in any preventative measures to stop the spread of AIS also aids the steward in determining the likelihood of a particular boat transporting an invasive species. This question also allows the steward to explain each of the recommended preventative measures and their role in preventing the spread of AIS. Stewards recorded prevention steps such as, visually inspecting the boat, washing the boat, drying the boat, draining the bilge, draining the live well, draining their bait bucket and disposing of live bait in the trash. Of the 39 groups encountered, 54% of reported actively taking at least one of these steps, with washing the boat being the most popular preventative measure (38%), followed by a visual inspection and drying the boat, which accounted for 26% each, as shown in Figure 4.

Stewards removed organic plant material from 3 boats (5%). Of these, Eurasian Watermilfoil and bladderwort were removed from two boats on two different dates. They were both found on the boat as they were exiting Osgood Pond. The other boat was transporting a native terrestrial grass species.

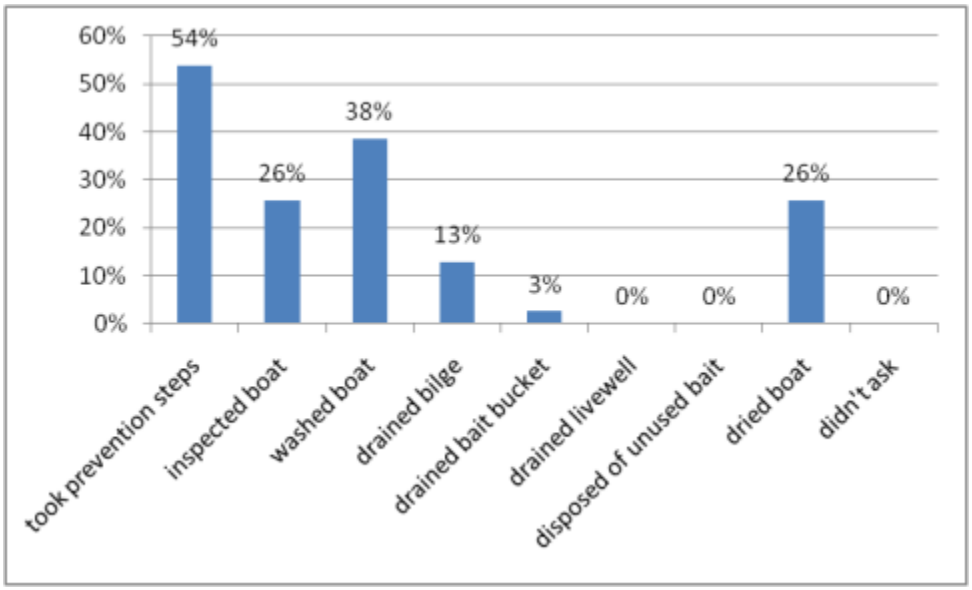

Figure 4-Aquatic Invasive Species spread prevention measures, Osgood Pond waterway access site, summer 2010

Volunteer Steward Program:

The Osgood Pond Association staffed the boat ramp on weekends on a limited basis. Volunteers were able to inspect boats on 6 days over the course of the summer, inspecting a total of 28 boats and educating 62 people about AIS (Tables 3 and 4). This volunteer effort is greatly appreciated and will be encouraged in 2011.

Discussion and Conclusion

It is evident that the Osgood Pond boat launch is used by a small number of visitors each year. This year's totals are comparable to those found in 2009, when the combined WSP and volunteer stewards encountered 78 boats and 126 people. The percentage of boaters that took preventative measures in 2010 was 54%; a lower figure than expected but comparable to the 55% of visitors taking AIS spread prevention measures in 2009. The WSP hopes that another year of educating boaters will increase that figure in the future years. A majority of the launching vessels were registered in NY, although this figure only takes into account the motorboats, and does not include the non-motorized vessels launching, which made up 80% of the total vessels launching. With the threat of importing and exporting AIS from one body of water to another, it is crucial that the preventative measure compliance rate increase to ensure the ecological integrity of Osgood Pond. The best preventative measure is knowledge, and with this knowledge, visitors to the Adirondack Park can aid in curbing the spread of AIS from one body of water to another.

Osgood Pond Recreation Study 2010													
	Boat Type							total #	Weekly Avg	Four	Group	# groups	# groups
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size	launching	retrieving
6/4/2010	0	0	0	7	0	0	1	8	0	0	13	2	1
6/11/2010	2	0	0	0	0	0	0	2	7	0	4	1	1
6/18/2010	1	0	0	5	5	0	0	11	2	0	17	4	3
6/25/2010	0	0	0	1	2	0	0	3	0	0	5	1	1
7/2/2010	1	0	0	2	0	0	1	4	15	1	8	0	4
7/9/2010	0	0	0	0	0	0	0	0	0	0	0	0	0
7/16/2010	0	0	0	0	0	0	1	1	0	0	3	1	0
7/23/2010	0	0	0	1	3	0	0	4	0	0	7	1	0
7/30/2010	0	0	0	2	4	0	0	6	0	0	8	3	0
8/6/2010	0	0	0	0	0	0	0	0	0	0	0	0	0
8/13/2010	1	0	0	3	8	0	0	12	8	0	17	5	2
8/20/2010	2	0	0	3	2	0	0	7	83	1	18	3	4
8/27/2010	0	0	0	1	0	0	2	3	7	0	7	2	2
subtotals	7	0	0	25	24	0	5	61	Summer Avg 24	2	107	23	18
Volunteer Steward inspections	11			17				28			62	22	9
Grand Total	18	0	0	42	24	0	5	89			169	45	27

Table 3- Summary, 2010. M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

Osgood Pond Recreation Study 2010																				
	organisms found		organism type								AIS spread prevention steps taken by visitors									
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask	
6/4/2010	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0	0	3	0	
6/11/2010	0	0	0	0	0	0	0	0	0	0	2	0	2	2	1	0	0	2	0	
6/18/2010	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0	0	0	2	0	
6/25/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/2/2010	0	2	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	
7/9/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/16/2010	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	
7/23/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/30/2010	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	
8/6/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/13/2010	0	0	0	0	0	0	0	0	0	0	4	1	3	1	0	0	0	2	0	
8/20/2010	0	1	0	0	0	1	0	0	0	0	3	3	3	1	0	0	0	0	0	
8/27/2010	0	0	0	0	0	0	0	0	0	0	3	3	1	0	0	0	0	0	0	
subtotals	0	3	1	1	0	1	0	0	0	0	21	10	15	5	1	0	0	10	0	
Volunteer Stewards	1	0	0	0	1	0	0	0	0	0	0	6	10	1	0	0	0	0	0	
Grand Total	1	3	1	1	1	1	0	0	0	0	21	16	25	6	1	0	0	10	0	

Table 4- EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil; I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: Rainbow Lake

By: Kimberly M. Forrest

Introduction

Through continuing education, the Paul Smith's College Watershed Stewardship Program has worked to prevent the spread of invasive species for its sixth season at Rainbow Lake. Rainbow Lake is not just one lake, but in fact a series of waterways that are all connected. The waterways include Rainbow Lake, Lake Kushaqua, Kushaqua Narrows, Rainbow Narrows, and Clear Pond.

The Rainbow Lake Waterway, as the linked lakes have been come to be known, hosts no invasive species but does host a nuisance species, southern naiad (*Najas guadalupensis*). This species grows in thick mats under the surface of the water, which in result makes it hard for people to fish, swim, and boat. Stewards checked boats coming into the waterway for invasive species, and checked boats exiting the waterway for southern naiad. As the season progressed and the weeds grew, stewards found increasing amounts of southern naiad clinging to boats and their trailers.

Figure 1- Southern naiad clinging to boat trailer

Methods

From May 29th through September 7th a Watershed Steward was stationed on Saturdays and Sundays at the Buck Pond State boat launch in Onchiota, NY. From 7:00 am to 4:00 pm, stewards welcomed boaters to the launch and gave them a brief interview. Boaters were asked where they had boated in the two weeks prior to the date of the interview, about what the boater had done to prevent spreading invasive species, and if they knew about the threat of southern naiad. The boaters were also asked the number of people in their group and if they had visited the Buck Pond state boat launch before. In addition the stewards recorded the type of boat, the horsepower of the engine, the strokes of the engine, and the boat registration.

After conducting the interview stewards then proceeded to visually inspect the boat for any hitchhikers. Stewards scrutinized the lower unit of the engine and any protruding edges on boats, trailers, and equipment that could catch a plant. The boaters were given informational cards and stickers as reminders of how important it is to keep our waters clean. Regardless of the condition of the boat, stewards strongly encouraged boaters to use the boat wash before and after using the waterway. All of the boaters' responses were recorded on an Excel database for future analysis to determine recreational use and risks.

Results

During the 2010 season, Watershed Stewards observed 300 boats recreating at the NYS DEC boat launch at Buck Pond State Campground. Stewards interacted with 650 people at the boat launch that recreated, and 125 (42%) of the 300 boats had recreated on the Rainbow Lake waterway in the past. The highest use of the boat launch occurred on the weekend of July 23, 2010 to July 24, 2010 with a total of 51 boats and 107 people.

Figure 2- Family time at Rainbow Lake Waterway boat launch

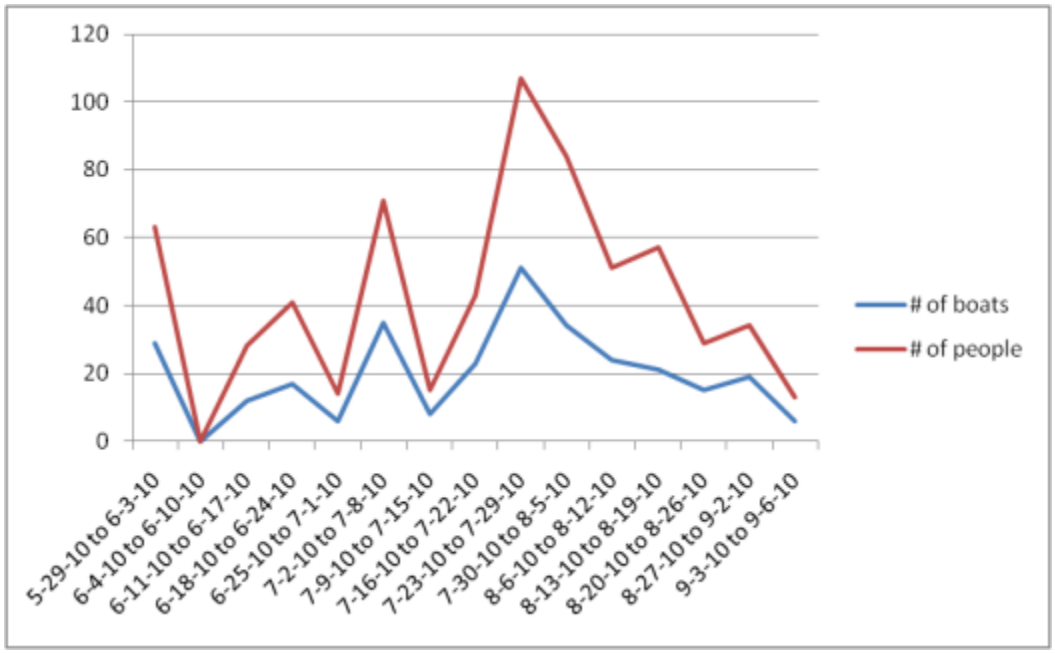

Figure 3- Usage at boat launch at Buck Pond State Campground accessing Rainbow Lake Waterway, 2010

The most common watercraft observed in 2010 was the motorboat at 37% of the total boats encountered. Kayaks were the second most encountered boat with 32% of the total number of boats throughout the 2010 season. The strokes of each motorboat were recorded also, and out of 104 outboard motors, 27 were four stroke engines (26%).

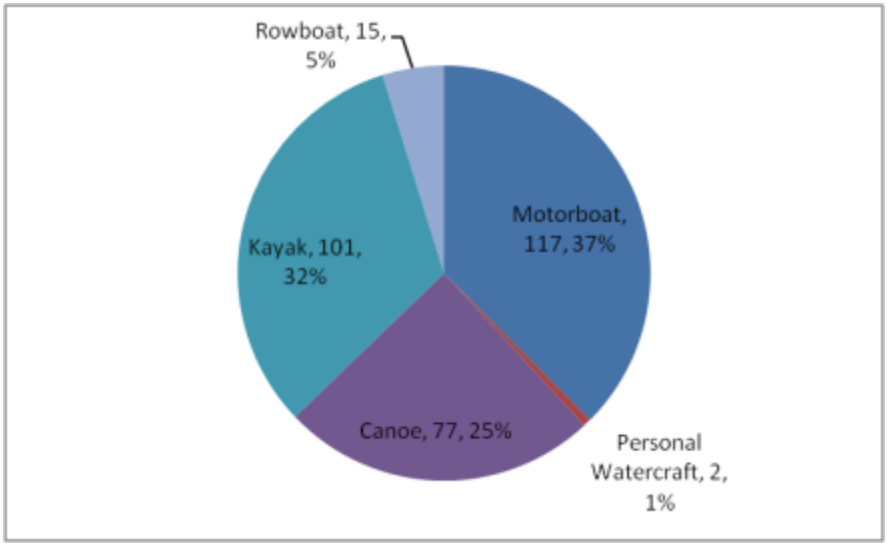

Figure 4- Types of watercraft launched, Buck Pond Campground/Rainbow Lake Waterway 2010

Origin	Total
NY	120
NJ	2
PA	1
VA	1
OH	1
MS	1
CA	1

Table 1- State of origin of users of Buck Pond Campground/Rainbow Lake Waterway boat launch, 2010

Stewards asked the boat owners at the Rainbow Lake Boat Launch which aquatic invasive species (AIS) spread prevention measures they had taken since the last use of the boat in question. 90 (38%) boat owners washed their boats before they launched, and 63 (27%) of boat owners had dried their boats for two weeks or greater. The number of boat owners that had inspected their boat and boating equipment for any organic matter was 101(43%). 57 (24%) boaters had drained their bilge after their last use, and 2 (0.8%) of the boaters had drained their live wells. 2 (0.8%) boaters had drained their bait buckets, and 3 (1.3%) boaters disposed of their live bait properly. Of the total 236 groups 187 (79%) of them had taken some preventative measures before launching their boats. 65 boats of the total 297 (22%) had been washed using the boat wash at the boat launch either before or after use in the Rainbow Lake waterway, which is up from 19% in 2009.

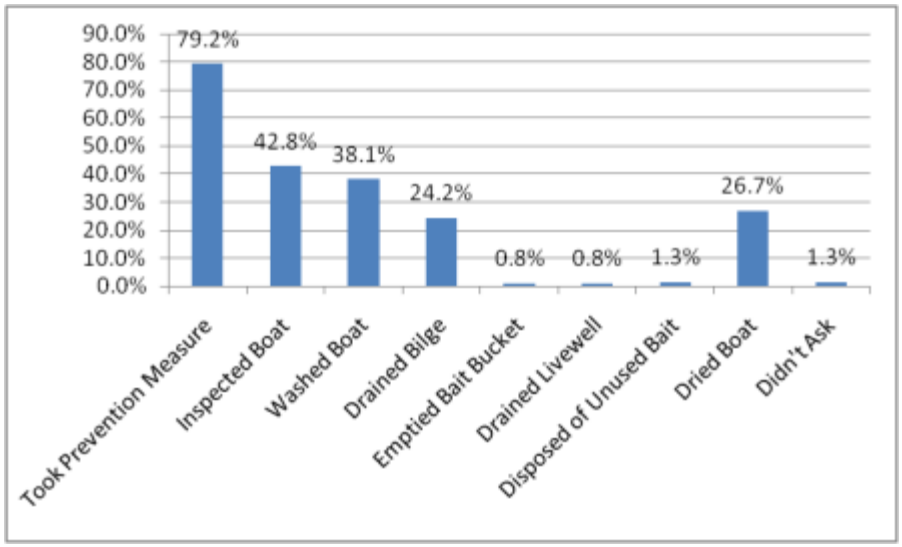

Figure 5- Aquatic invasive spread prevention measures taken by visitors to Buck Pond Campground boat launch, 2010

Watershed Stewards visually inspected each boat that visited the launch during the study time. Any hitchhiking material found on the boat, trailer, or equipment was removed and if possible identified. After identification the material was placed in a desiccation box at the boat launch. During the 2010 season Stewards removed material 60 times. There were five total instances of potentially invasive organisms intercepted and removed by stewards: 2 Eurasian watermilfoil, 1 zebra mussel, 1 variable leaf milfoil and 1 curly leaf pondweed (8.3% of total organisms removed). The most notable instance of an infested boat came on August 28 when a boat with a New York registration sticker and a 20 hp motor arrived and was found to be carrying Eurasian watermilfoil, variable leaf milfoil and curly leaf pondweed. The operator claimed to have inspected his boat before launching it and reported having been in Lake Erie in the prior two week period. This interaction represents an unfortunately distinct example of the need for boat ramp educators and boat inspectors.

Species	# Found
Eurasian watermilfoil	2
Bladderwort	12
Grass	14
Zebra Mussels	1
Variable leaf milfoil	1
Lily pad	2
Southern naiad	14
Curly leaf pondweed	1
Pine needles	1
Other	12

Table 2- Organisms removed from boats, Buck Pond Campground boat launch, 2010

For each boat encountered the waterways that were used in the prior two weeks were also recorded. The range of waterways that were used is considerable, and represents many potential pathways for invasive species transport.

Figure 6- Kushaqua narrows near boat ramp

Water body	Infested?	Number of Boats	Water body	Infested?	Number of Boats
None		76	Long Lake		1
Ausable Point		2	Lower Saranac Lake	yes	
Black Lake		1	Lower St. Regis Lake		3
Buck Pond		21	Middle Saranac Lake	yes	1
Chazy Lake	yes	1	Mirror Lake		2
Chesapeake Bay	yes	1	Mississippi River	yes	1
Deer River Flow	yes	1	Moose Pond		2
Fern Lake		1	Niagara River	yes	1
Fish Creek Pond	yes	2	Osgood Pond		3
Fish Kill Stream		1	Piercefield Flow	yes	1
Fockhead Lake		1	Putnam Pond	yes	2
Follensby Clear Loo	yes	1	Rainbow Lake	yes	45
Franklin Falls	yes	1	Raquette River		1
Hoel Pond		1	Rollins Pond		2
Higley Flow		1	Saranac River	yes	4
Jaques Cartier		1	Second Pond	yes	1
Jones Pond		1	Seneca River		1
Keuka Lake	yes	1	Spitfire Lake		2
Lake Champlain	yes		St. Lawrence River	yes	3
Lake Erie	yes	2	St. Regis River	yes	1
Lake Kushaqua	yes	21	Taylor Pond	yes	1
Lake Ontario	yes	1	Upper Saranac Lake	yes	1
Lake Placid	yes	5	Upper St. Regis Lake		4

Table 3- Prior waterway visits, two weeks prior to visiting Rainbow Lake Waterway, 2010

Discussion

The Watershed Stewardship Program has operated for its sixth season at the Buck Pond Campground/Rainbow Lake boat launch. Stewards have successfully prevented invasive Eurasian watermilfoil, zebra mussels, and variable leaf milfoil from entering the Rainbow Lake waterway. The multi-year trend is for use to rise, approaching the historic high of 2005. Fair weather and the positive experience visitors have at the Buck Pond Campground, along with the continued appeal of the recreational experience on the Rainbow Lake Waterway, continue to draw visitors in moderate numbers.

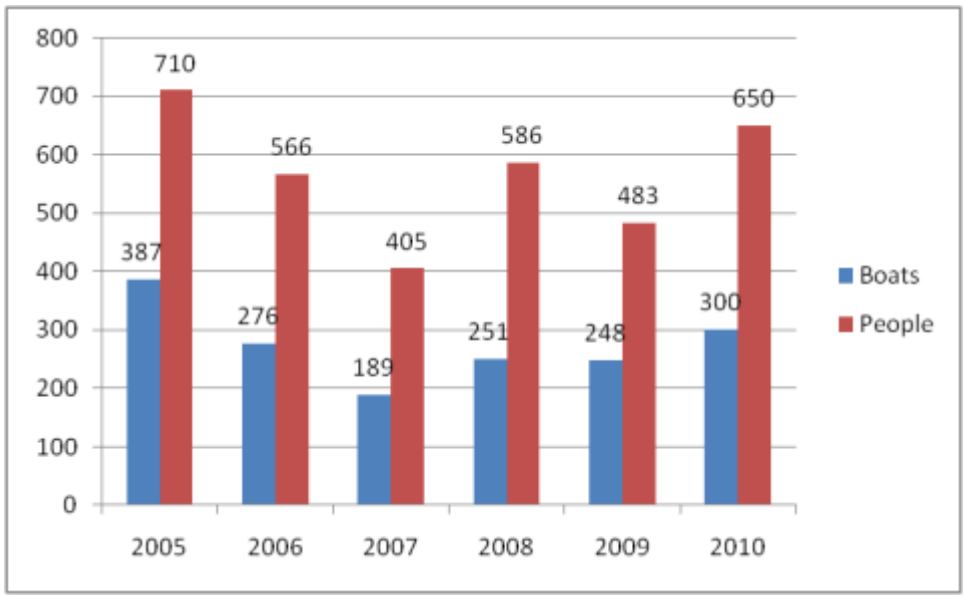

Figure 7- Six-year use perspective, Rainbow Lake Waterway boat launch

Spread prevention behavior, as reported by visitors, continues to be strong, with 79% of visitors reporting taking some measure. This compares with 63% in 2008 and 81% in 2009. Boat inspections by users is up from 2009 (43% in 2010; 35% in 2009), washing boats is down (38%; 56%) and draining bilges is way up (24%; 5%). While 65 boaters used the boat wash facility at the ramp, more work can be done to increase compliance. Stewards note that the layout and condition of the boat ramp and boat wash station are poor, undoubtedly resulting in lower use of the facility. It is questionable whether the pressure and reach of the boat wash is sufficient to adequately remove invasive species in any case.

Conclusion

It is vital to the health of our environment to keep aquatic invasive species out of our waterways, for everything is interconnected. Now and into the future we will continue to educate

boaters on the threats of aquatic invasive species and the threats that they bear. As a part of a local and global community we share the burdens that non-native and invasive species pose. By taking a minute to prevent the spread of such species, together we can keep the environment in our and others backyard clean. The WSP would like to recognize and appreciate the support of the volunteer stewards from the Rainbow Lake Association who monitor the boat ramp on Friday afternoons.

Rainbow Lake Waterway Recreation Study 2010

	Boat Type							total #	Weekly avg	Four	Group
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size
5-29-10 to 6-3-10	14	1	0	4	8	0	2	29	46	3	63
6-4-10 to 6-10-10	0	0	0	0	0	0	0	0	0	0	0
6-11-10 to 6-17-10	6	0	0	2	4	0	0	12	25	1	28
6-18-10 to 6-24-10	10	1	0	2	3	0	1	17	43	4	41
6-25-10 to 7-1-10	4	0	0	2	0	0	1	6	36	2	14
7-2-10 to 7-8-10	10	0	0	6	19	0	1	35	52	5	71
7-9-10 to 7-15-10	4	0	0	2	2	0	0	8	52	0	15
7-16-10 to 7-22-10	8	0	0	2	13	0	3	23	41	2	43
7-23-10 to 7-29-10	12	0	0	23	16	0	1	51	58	3	107
7-30-10 to 8-5-10	12	0	0	8	14	0	4	34	31	1	84
8-6-10 to 8-12-10	13	0	0	8	3	0	0	24	25	2	51
8-13-10 to 8-19-10	12	0	0	3	6	0	1	21	78	1	57
8-20-10 to 8-26-10	4	0	0	8	3	0	0	15	54	1	29
8-27-10 to 9-2-10	5	0	0	4	10	0	1	19	53	1	34
9-3-10 to 9-6-10	3	0	0	3	0	0	0	6	62	1	13
totals	117	2	0	77	101	0	15	300	Summer Avg 47	27	650
									Median 35		

Table 4- Summary, 2010. M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

	# groups	# groups	organisms found		organism type							
Week	launching	retrieving	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other
5-29-10 to 6-3-10	23	10	3	2	0	0	0	4	0	0	0	1
6-4-10 to 6-10-10	0	0	0	0	0	0	0	0	0	0	0	0
6-11-10 to 6-17-10	5	8	0	1	0	0	0	1	0	0	0	0
6-18-10 to 6-24-10	11	12	1	4	0	0	0	0	0	0	0	5
6-25-10 to 7-1-10	4	3	3	0	0	0	0	2	0	0	0	1
7-2-10 to 7-8-10	23	10	3	1	0	0	0	2	0	0	0	2
7-9-10 to 7-15-10	6	4	1	1	0	1	0	0	0	0	0	1
7-16-10 to 7-22-10	15	13	0	6	0	4	0	0	0	0	0	2
7-23-10 to 7-29-10	0	0	6	7	1	1	0	4	0	0	0	7
7-30-10 to 8-5-10	21	11	3	2	0	1	0	0	0	0	0	4
8-6-10 to 8-12-10	16	11	0	2	0	0	0	0	0	0	0	2
8-13-10 to 8-19-10	16	9	1	4	0	2	0	0	0	0	0	3
8-20-10 to 8-26-10	10	7	1	2	0	2	0	0	0	0	0	1
8-27-10 to 9-2-10	12	4	3	3	1	0	0	2	0	0	1	2
9-3-10 to 9-6-10	2	1	0	0	0	0	0	0	0	0	0	0
totals	164	103	25	35	2	11	0	15	0	0	1	31

Table 5-EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil

	boat	visitor prevention steps								
Week	wash	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-29-10 to 6-3-10	10	19	6	13	5	0	0	0	5	2
6-4-10 to 6-10-10	0	0	0	0	0	0	0	0	0	0
6-11-10 to 6-17-10	4	6	1	2	2	0	0	0	5	0
6-18-10 to 6-24-10	6	15	9	8	5	0	0	0	2	0
6-25-10 to 7-1-10	0	5	3	2	2	0	0	0	2	0
7-2-10 to 7-8-10	6	24	12	16	2	0	1	1	12	0
7-9-10 to 7-15-10	3	5	4	1	2	0	0	0	0	0
7-16-10 to 7-22-10	9	16	9	8	3	0	0	0	6	0
7-23-10 to 7-29-10	5	23	12	7	7	0	0	0	10	0
7-30-10 to 8-5-10	7	23	11	13	5	1	1	1	8	0
8-6-10 to 8-12-10	2	17	12	8	5	0	0	0	3	1
8-13-10 to 8-19-10	7	13	8	6	10	1	0	1	3	0
8-20-10 to 8-26-10	3	8	5	0	3	0	0	0	1	0
8-27-10 to 9-2-10	3	10	6	5	4	0	0	0	6	0
9-3-10 to 9-6-10	0	3	3	1	2	0	0	0	0	0
totals	65	187	101	90	57	2	2	3	63	3

Table 6-I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: Saratoga Lake State Boat Launch

By: Corrie Mersereau, Watershed Steward

Introduction

Paul Smith's Watershed Stewardship Program (WSP) and the Saratoga Lake Protection and Improvement District (SLPID) worked together in the summer of 2010 to provide visitor education and boat inspection at the State Boat Launch site on Saratoga Lake. This new initiative expanded the WSP outside the Adirondack Park to a very busy boat launch. Aided by a small group of volunteers, the lake steward inspected boats and educated launch users about the dangers of invasive species. Saratoga Lake is known by anglers as "the fish factory" and hosts many fishing tournaments throughout the summer. Sport fishermen came from as far away as Florida, Texas, and Arizona while local fisherman came every day. This lake is also highly used by recreational boaters, sail boats, and crew boats as well. Saratoga Lake is known to have Eurasian watermilfoil, curly-leaf pondweed, zebra mussels, and water chestnut. The Saratoga Lake community is actively engaged in a multi-element lake management initiative intended to control existing invasive species infestations and to prevent new ones. In addition to their support of the Saratoga Lake steward, SLPID administered a chemical spot treatment to reduce Eurasian watermilfoil and two harvesters to cut the milfoil down. SLPID is also concerned with limiting the possibility that Saratoga Lake becomes a source for invasive species for uninfected lakes near and far, and so instructs its steward to inspect boats leaving the lake as well.

Figure 1- Saratoga Lake Steward engaging a visitor. Credit: John Carl D'Annibale, Times Union

Methods

The Saratoga Lake steward was on duty from 7:00 AM – 4:00 PM Thursday – Sunday and 7:00AM – 11:00 AM Mondays. The Cornell Cooperative Extension provided their intern to assist the Lake Steward

on Fridays and Mondays in July. Stewardship was part of his internship as well. Stewards approached boaters with a smile and asked them where if their boat had been in any body of water in the past two weeks, if they had washed it, drained bilge, inspected it, drained bait buckets and live wells, disposed of bait properly, and dried the boat. The stewards also noted the time, type of boat, horsepower of the motor (if outboard), if it was a four stroke or not, and the state of origin. If the stewards found any debris on the boat they recorded what type of invasive it was and removed it. On the way out they removed plants that came off the boats and recorded findings.

Results

At the Saratoga Lake State Boat Launch stewards collected data from 3,190 boats and 7,615 people between May 29th and September 6th. The peak week for boats launching was June 25th through July 1st with 329 boats and 583 people. July 2nd to July 8th was the peak week for people with 745 people and 295 boats (Figure 2). After July 8th attendance was up and down depending on the weather.

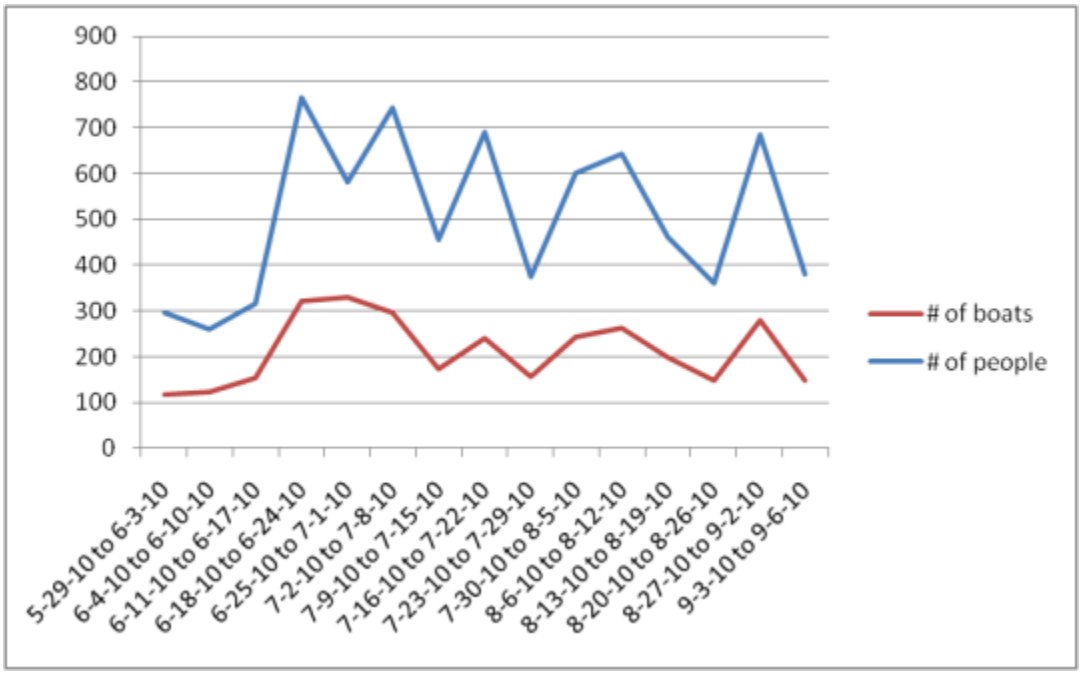

Figure 2- Saratoga State Boat Launch use, 2010

Sunday was the busiest day of the week with 1,085 boats, Saturday was second with 964 boats, and Friday was third with 604 boats. Monday was the slowest day of the week with 245 boats, but this was expected because the steward was only on duty from 7 AM to 11 AM. Thursday was the slowest full eight hour day with 289 boats. The busiest day of the summer was Sunday August 29th (the day after Travers Day) with 123 boats. The slowest day of the summer was Monday August 18th with 3 boats due to heavy rain.

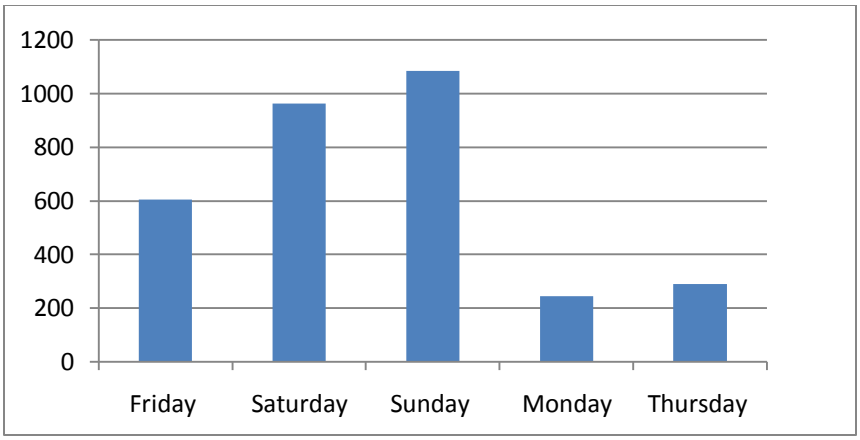

Figure 3- Saratoga State Boat Launch use by day of week, 2010

Out of the 3,187 boats that came to the boat launch this summer 2,882 were motorboats, 192 were personal watercrafts, 46 were kayaks, 30 were sailboats, 23 canoes, 16 rowboats and 1 barge. Barges were on the water, but were taken out on motorboats in pieces and assembled on the water. Many Canoes and Kayaks launched from a different site on Saratoga Lake. With this amount of motorboats the ramp was often crowded and boaters would have to wait for access.

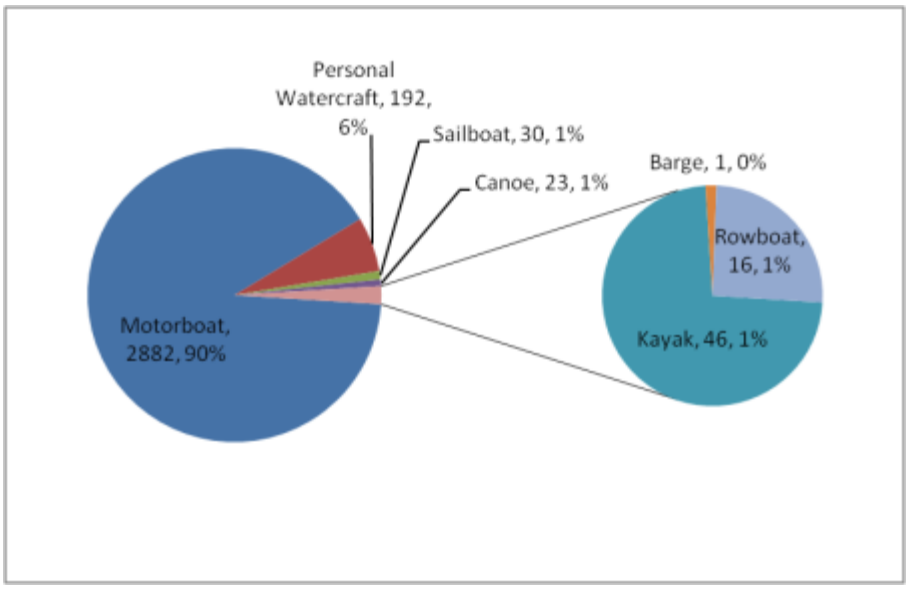

Figure 4- Watercraft launched by type, Saratoga State Boat Launch, 2010

Stewards recorded the horsepower of outboard motors and whether the outboard motor had a four stroke engine. Outboard horsepower ratings ranged from 2 to 300. Of 1,549 total outboard motors, 54% or 839 outboard motor boats were four stroke low emission engines.

The most important question the stewards asked boaters this summer was where their boats had been in the last two weeks. 1,061 boats had not been in the water in the past two weeks. Out of the remaining 2,126 boats 90% or 1,709 were returning to Saratoga Lake. 82 boats came out of the Hudson River and 80 boats out of Great Sacandaga Lake. 3 boats had traveled to Saratoga Lake after being in the Atlantic Ocean in the past two weeks; these boats were examined very thoroughly.

Water body	# visits	Water body	# of visits
Atlantic Ocean	3	Lake Mahopac	1
Baboosic Lake	1	Lake Onderdonk	1
Ballston Lake	4	Lake Ontario	2
Black Lake	1	Lake Placid	1
Blue Mountain Lake	1	Lincoln Pond	1
Brant Lake	2	Long Lake	4
Butterfield Lake	1	Loon Lake	1
Canada Lake	1	Lower Saranac	1
Cossayuna Lake	8	Mohawk River	68
Chatauqua Lake	1	Moreau Lake	3
Copake Lake	2	Niagara Falls	1
Caroga Lake	1	Oneida Lake	2
Crooked Lake	1	Paradox Lake	3
Delta Lake	1	Pleasant Lake	1
Fourth Lake	1	Raquette Lake	3
Fish Creek	1	Saratoga Lake	1701
Great Sacandaga	80	Schroon Lake	13
Hampson Lake	1	Seneca Lake	1
Hudson River	82	Stewarts Pond	1
Hutchens Lake	1	St. Lawrence River	2
Indian Lake	4	Swinging Bridge Lake	1
Kinderhook Lake	4	Thompson's Lake	3
Lake Champlain	32	Tupper Lake	1
Lake George	66	Upper Saranac Lake	2
Lake Lewisville	1	Warner's Lake	1
Lake Lonely	3	Wasco Lake	1
Lake Luzerne	2	**Total**	**2126**

Table 1- Lakes visited in previous two weeks prior to launching at Saratoga Lake State Boat Launch, 2010

Because of the high number of boats visiting from Saratoga Lake, the Hudson River, The Great Sacandaga, The Mohawk River and Lake George, it became evident that most boaters lived in the area. Out of 3,187 boats 3,120 were registered in the state of New York. Boats did come as far away as

Arizona, Texas, and Florida. The steward also noticed that at times boaters had different plates on their car than on their boat.

State	Total	State	Total	State	Total	State	Total
AZ	1	ME	1	NY	3120	VT	16
CT	4	MT	1	OH	2	WS	1
DL	1	NC	2	PA	4		
FL	5	NH	4	TX	2		
MC	3	NJ	18	VA	2		

Table 2- State of origin, visitors to Saratoga Lake State Boat Launch, 2010

Every boater was asked if they took prevention steps to stop the spread of invasive species. 2,608 groups said that they did take prevention steps, 2,548 said that they inspect their boat after use, 973 said that they washed their boat after use, 113 said that they drained their bilge water. 19 people did not respond to the question (Figure 5).

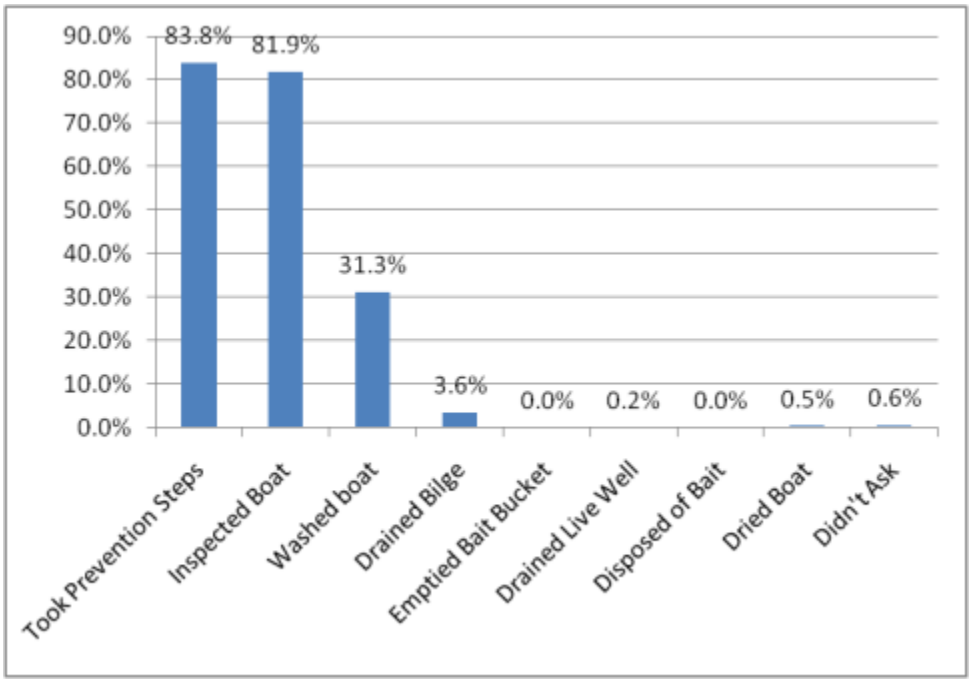

Figure 5- AIS Spread Prevention Steps taken by boaters at Saratoga Lake State Boat Launch, 2010. % of 2,608 groups

Saratoga Lake is known to have invasive species. The most common is Eurasian Water Milfoil: 58 pieces of EWM were found on boats. 127 organisms were found on incoming boats while 55 organisms

were found on boats leaving the boat launch. The steward successfully stopped 183 potentially invasive organisms from entering or leaving Saratoga Lake. 6% of boaters had one of these organisms on their boat.

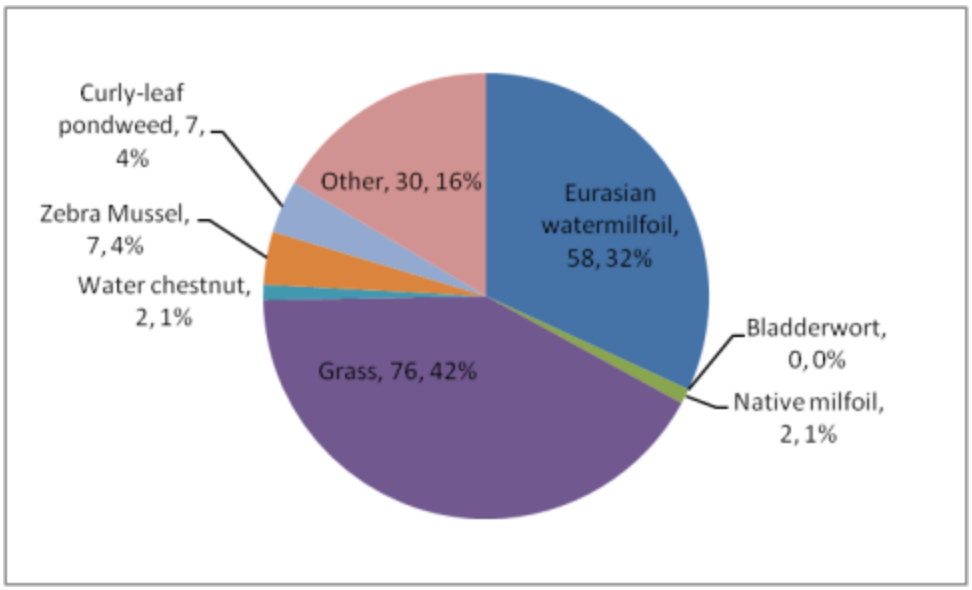

Figure 6- Organisms removed from boats using Saratoga Lake State Boat Launch, 2010. N = 183 samples removed from boats.

Invasive Species Awareness

The goal of our first summer at Saratoga Lake was to spread awareness of invasive species to boaters. On the first day the steward found two signs about invasive species that were both in hard to see places. In May many boaters were not aware that Saratoga Lake and neighboring lakes have invasive species. Through stewardship boaters learned about local invasive species threats.

In early spring *Didymosphenia geminata*, also known as didymo or "rock snot" was found in Kayaderosseras Creek which flows into Saratoga Lake. Fishermen claimed to have noticed it, but had not known what it was. The steward educated fishermen about steps to prevent the transport of didymo, including washing their boots, tackle, and fishing poles before entering another waterway. Although Didymo is not a threat to the lake because it lives in flowing water, it is a threat to fish that travel to and from Kayaderosseras Creek and Saratoga Lake.

Two other new invasive species were found on nearby lakes this summer. Spiny waterflea (*Bythotrephes longimanus*) was found in the Great Sacandaga and Peck's Lake in 2008 and 2009, respectively. The Department of Environmental Conservation confirmed that spiny waterflea is present in Sacandaga Lake, in Speculator, this summer, confirmed in a DEC press release on September 17, 2010. Every boater that had been in these lakes in the past two weeks received more detailed information about prevention specifically for the spiny water flea. It is important that down riggers and live wells are

washed as well as boating equipment. Some boaters had noticed the goo-like substance on the ends of their fishing line before though none was found by the steward. The Adirondack Watershed Stewardship Program rack card was helpful because it has a picture of the spiny water flea on it along with pictures of other invasive species to distribute to boaters.

In August , the Asian clam (*Corbicula fluminea*) was found on Lake George. All boaters were educated on the importance of prevention methods emphasizing inspection and washing. The Asian clam is an organism that is a direct threat to Saratoga Lake and only 20 miles away. The discovery of the Asian clam was on the front page of local newspapers and sparked a lot of concern from Saratoga Lake boaters.

Invasive species awareness grew this summer and will continue to grow with the program. The rack cards, maps, stickers, and fishing guides the steward gave out this summer all include prevention information that boaters can refer back to all year long.

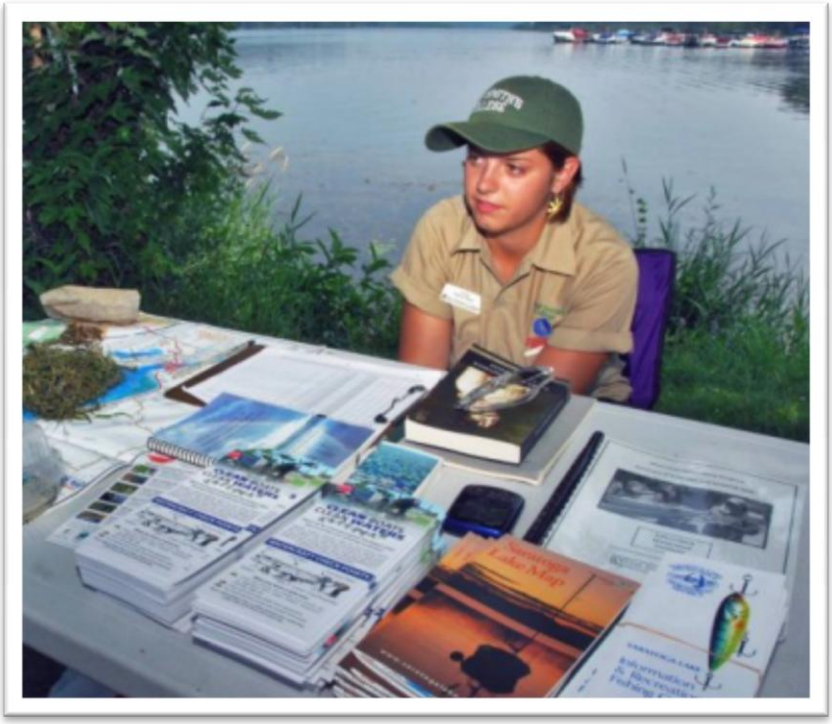

Figure 7- Steward Corrie Mersereau at her post at the Saratoga State Boat Launch. Credit: John Carl D'Annibale / Times Union

Discussion

Because this was the first year a steward was placed on Saratoga Lake we do not have any previous data to compare with this summer. Many boaters were very receptive to the invasive species message, but the steward and volunteers also felt some resistance. There are two types of boaters on Saratoga Lake, pleasure boaters and fishermen. The steward learned throughout the summer that they need to be approached differently. When approaching fishermen the steward needed to be quick and to the point, with no introduction or speech, but simply questions. With pleasure boaters it is important that the steward explains exactly what they are doing and gives a speech about invasive species. Once the steward learned the best ways to approach Saratoga Lake boaters they were more willing to share information and have discussions. The Albany Times-Union published a high profile story on the program on July 14 (http://www.timesunion.com/news/article/When-our-home-isn-t-their-home-575959.php) which resulted in excellent publicity and increased receptivity from the general public. Such media exposure is critical in building general public awareness and support for conservation initiatives such as the Saratoga Lake Steward program. SLPID and the WSP should make every effort to publicize the program in the future.

While 54% of boaters were returning to Saratoga Lake the other 46% may not have been expecting to pay a launch fee. The Saratoga Lake State Boat Launch is part of Parks and Recreation which charges an $8 fee for admission. Some boaters assumed that $8 fee was to pay the steward's salary because the steward looked like a park ranger. Once boaters realized the steward had nothing to do with the $8 dollars they were more responsive, but still hesitant to answer survey questions.

As the stewardship program on Saratoga Lake continues it will become easier to approach boaters. By the end of the summer boaters expected to see the steward and were ready to answer questions. Next year the new steward can build upon summer 2010.

Recommendations

This was a very demanding job for one steward. It was helpful when the intern from Cornell Cooperative Extension had extra time to help the steward, but his hours were dependent on the workload he had at Cornell. If the reconstructed boat launch is to feature two ramps in 2011, one for incoming traffic and one for outgoing traffic, then two stewards could be easily used, one at each ramp. The steward found it difficult to inspect boats leaving the ramp because of the size of the parking lot and the priority on incoming traffic. Having two stewards on at least Saturdays and Sundays would result in more accurate data.

On the data sheet it would be interesting to differentiate if the boater is pleasure boating or fishing. This would give some hard data about why people are coming to Saratoga Lake. The steward also noticed that many people brought their dogs. It would be helpful to know the number of dog visitors so the park could provide boaters with enough "doggy bags" to keep the launch clean.

The uniform, though very official looking, may have deterred some boaters from giving information because the steward was mistaken for a park ranger. SLPID and the WSP could consider a

Figure 8- WSP Director Eric Holmlund displaying water chestnut growth at Saratoga State Boat Launch for Times Union Reporter. Credit: John Carl D'Annibale / Times Union

less formal uniform to improve visitor receptivity to the message. The next steward should work with SLPID to create more signs to put around the boat launch. Having the sandwich board dry erase sign made a huge difference. It would be great to have another sign at the kiosk when boaters first come in.

The Lake Steward spoke at the Saratoga Lake Association annual meeting. It would great if in the future the steward could do more speaking engagements and projects. As a suggestion, the steward could write a weekly column for the Saratoga Lake website, local newspapers, or do a research project. It is very hard to work at the launch five days a week at the same spot. With two stewards they can each take some time to work on other projects while still collecting data at the boat launch.

Conclusion

Paul Smith's College Watershed Stewardship Program expanded outside of Adirondack Park to a very busy lake with great success. Awareness of invasive species has risen in the area. Many boaters were very concerned when they heard about the Asian clam outbreak in Lake George and the spiny water flea in Great Sacandaga Lake. Boaters began to appreciate that Saratoga Lake was actively doing something to keep these aquatic hitchhikers out. With stewardship SLPID continued the chemical treatments and harvesting Eurasian Water Milfoil to create a trifecta of invasive species control.

The new awareness of invasive species on Saratoga Lake will help keep aquatic hitchhikers from making their way into the Adirondack Park Watershed and other watersheds. We thank the Saratoga Lake Protection and Improvement District, especially Alan McCauley, for both their support and their vision in creating a stewardship program on Saratoga Lake.

Saratoga Lake Recreation Study 2010													
	Boat Type							total #	Weekly Avg	Four	Group	# groups	# groups
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size	launching	retrieving
5-29-10 to 6-3-10	108	7	0	0	2	0	0	117	101.0	34	296	104	0
6-4-10 to 6-10-10	114	7	2	0	1	0	0	124	95.1	50	259	124	109
6-11-10 to 6-17-10	136	3	4	1	6	0	3	153	80.6	73	315	153	25
6-18-10 to 6-24-10	290	12	2	9	6	0	3	322	94.5	107	766	322	11
6-25-10 to 7-1-10	316	10	1	0	1	0	1	329	81.7	80	583	263	15
7-2-10 to 7-8-10	255	31	4	0	2	0	3	295	95.0	70	745	295	5
7-9-10 to 7-15-10	161	11	0	0	0	0	0	172	85.4	48	457	172	4
7-16-10 to 7-22-10	210	22	3	2	4	0	0	241	89.6	61	690	241	10
7-23-10 to 7-29-10	139	11	2	2	1	0	2	157	81.0	34	374	157	10
7-30-10 to 8-5-10	222	15	0	3	2	0	1	243	80.4	49	601	243	2
8-6-10 to 8-12-10	240	17	2	0	2	0	3	264	98.4	51	642	264	2
8-13-10 to 8-19-10	172	13	4	0	9	0	0	198	95.3	42	460	198	3
8-20-10 to 8-26-10	138	7	3	0	0	0	0	148	98.3	34	361	148	4
8-27-10 to 9-2-10	253	16	1	1	8	1	0	280	98.4	66	685	280	1
9-3-10 to 9-6-10	128	10	2	5	2	0	0	147	83.3	40	381	147	10
totals	2882	192	30	23	46	1	16	3190	Summer Avg = 91	839	7615	3111	211
									Median HP = 75				

Table 3- Summary, 2010. M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

Saratoga Lake Recreation Study 2010										
	organisms found		organism type							
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	CLP	other
5-29-10 to 6-3-10	6	3	3	0	0	0	0	0	0	5
6-4-10 to 6-10-10	12	6	5	0	0	2	0	1	0	8
6-11-10 to 6-17-10	9	25	12	0	1	6	0	3	2	9
6-18-10 to 6-24-10	12	10	4	0	0	15	1	0	2	0
6-25-10 to 7-1-10	10	1	5	0	0	4	0	0	3	1
7-2-10 to 7-8-10	5	2	2	0	0	5	0	0	0	0
7-9-10 to 7-15-10	8	2	2	0	1	6	0	1	0	0
7-16-10 to 7-22-10	13	1	4	0	0	10	0	0	0	0
7-23-10 to 7-29-10	6	0	2	0	0	3	0	0	0	1
7-30-10 to 8-5-10	6	0	4	0	0	1	1	0	0	0
8-6-10 to 8-12-10	7	0	3	0	0	4	0	0	0	1
8-13-10 to 8-19-10	10	0	3	0	0	5	0	0	0	2
8-20-10 to 8-26-10	7	2	2	0	0	7	0	0	0	0
8-27-10 to 9-2-10	10	0	3	0	0	5	0	1	0	1
9-3-10 to 9-6-10	6	4	4	0	0	3	0	1	0	2
totals	127	56	58	0	2	76	2	7	7	30

Table 4-EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil; Fish = fishing; Rec = recreational; Comm = commercial

Saratoga Lake Recreation Study 2010									
	Measures Taken to Prevent Transport of Invasive Species								
Week	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-29-10 to 6-3-10	115	115	15	6	0	0	0	0	2
6-4-10 to 6-10-10	124	124	2	0	0	0	0	0	0
6-11-10 to 6-17-10	144	144	59	7	0	0	0	1	6
6-18-10 to 6-24-10	320	320	99	17	0	0	0	7	1
6-25-10 to 7-1-10	257	257	67	51	0	0	0	1	3
7-2-10 to 7-8-10	291	262	57	8	0	2	0	0	2
7-9-10 to 7-15-10	152	152	52	10	0	0	0	1	0
7-16-10 to 7-22-10	168	167	105	7	0	0	0	2	3
7-23-10 to 7-29-10	95	91	59	2	0	0	0	0	1
7-30-10 to 8-5-10	161	140	59	0	0	1	0	0	0
8-6-10 to 8-12-10	172	171	59	3	1	1	0	0	0
8-13-10 to 8-19-10	149	149	68	2	0	1	0	1	0
8-20-10 to 8-26-10	127	127	81	0	0	0	0	0	0
8-27-10 to 9-2-10	218	215	125	0	0	0	0	0	0
9-3-10 to 9-6-10	115	114	66	0	0	0	0	1	1
totals	2608	2548	973	113	1	5	0	14	19

Table 5- I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: Second Pond/Lower Saranac Lake

By: Matthew Rankin, Watershed Steward

Figure 1- Entrance to Second Pond boat launch

Introduction

The Watershed Stewardship Program (WSP) educates the public about aquatic invasive species (AIS) and other conservation and preservation issues that pertain to the Adirondack Parks waterways. The WSP stationed Watershed Stewards at the Second Pond public boat launch in 2005, 2008, 2009 and again in 2010. First and Second Pond are both critical sources of Eurasian watermilfoil (*Myriophyllum spicatum)* in this region. It serves as the main entrance to Lower and Middle Lake, as well as the popular Saranac Lake Islands public campground. The Second Pond boat launch is a high traffic boat launch due to the public campground and the vast waterway access it gives boaters access to. Visitors travel from all across the United States and Canada. As a result, it is a critical point used by watershed stewards for public outreach, education and boat inspections in the Adirondack region.

Saranac Lake Islands Campground

The Saranac Lake Islands public campground is formed by two adjacent lakes, Middle and Lower Saranac Lake, which are connected by a shallow river and the upper locks. The campground was established in 1934, with only one cabin located in Crescent Bay. With recreation use becoming increasingly popular on Lower Saranac Lake, and the quality of the forests for camping areas, the campground was expanded and 62 campsites designed for overnight camping were built on the lake. In 1992, another significant expansion occurred when 25 additional sites were built on Middle Saranac Lake, making a total of 87 campsites between the two lakes. Increasing popularity of the Saranac Lake Islands campground has labeled it as one of the premier public campgrounds for boating recreation and camping in the Adirondack Park.

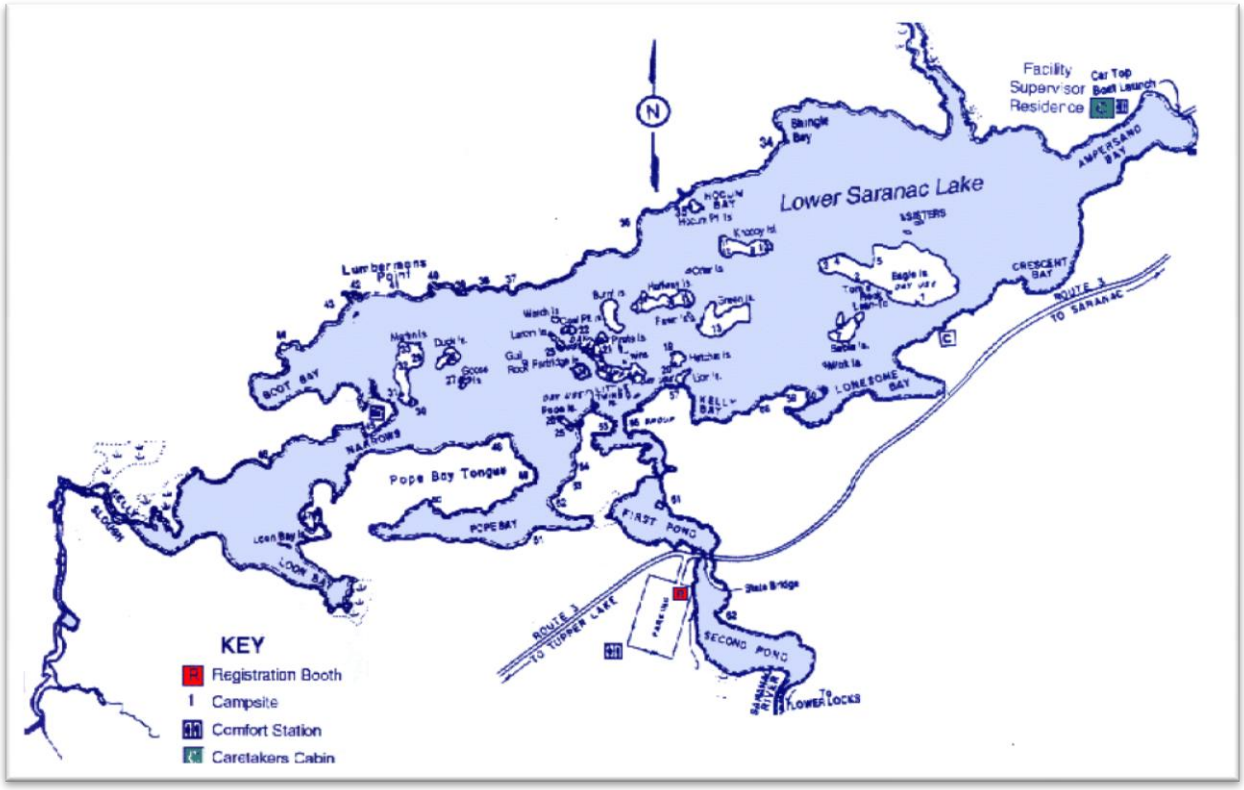

Figure 2- Saranac Lake Islands Campground map. Second Pond at bottom center.

Methods

Watershed Stewards were stationed at the NYSDEC Second Pond boat launch from May 29th through September 4th, Fridays through Sunday, from 7am-4pm. Stewards were responsible for collecting data such as, boat type, horsepower of the outboard engine, group size, state of registration, time of launch/retrieval and species of any organism found on the boat or trailer. In addition to this,

boaters were asked to specify the last body of water the boat visited in the past two weeks and if they had taken any steps to prevent the potential spread of invasive species. The steward then proceeded to show the boater where AIS become entangled on the boat and trailer; discarding of any species found whether native or invasive. The primary AIS of concern at this launch was Eurasian Watermilfoil, which has the potential to spread quickly throughout the Adirondack Park, as is already evident in many other lakes. Stewards provided the boater with an information card provided by the WSP and a verbal message, along with pictures of AIS and diagrams of common places where AIS can become entangled on the boat and trailer. Prevention steps against the spread of AIS are also highlighted on the card, with hopes that the boater would take preventative measures in the future.

Results

Watershed stewards encountered 1,703 boats and 3,253 visitors at the NYSDEC Second Pond Waterway Access Site working Friday through Saturday, between May 29th and September 4th, 2010. There were a total of 456 motorboats (27% of total boats launched), 621 kayaks (36%), 534 canoes (31%), 48 personal watercraft (3%), 42 rowboats (3%) and 2 barges.

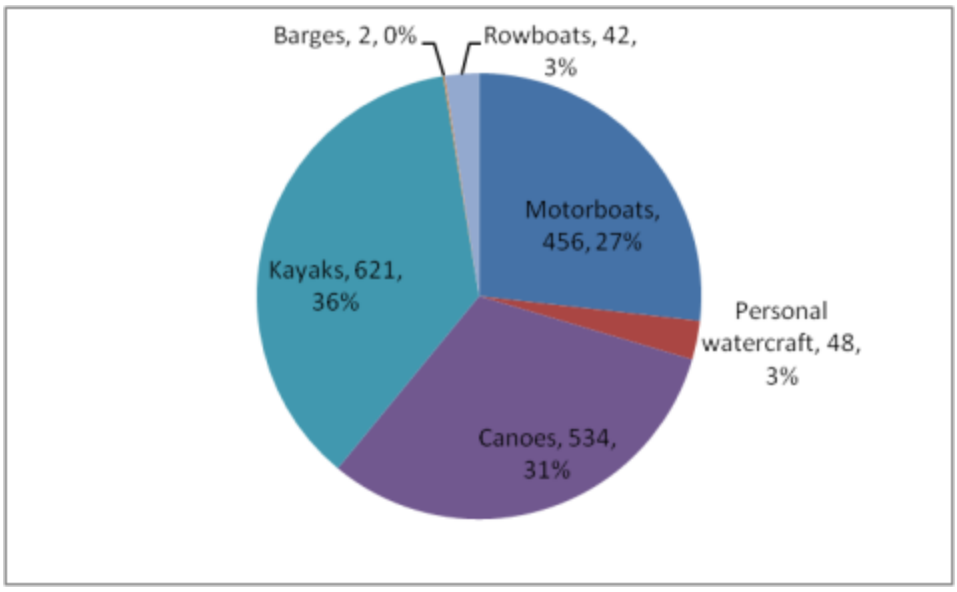

Figure 3- Types of watercraft launched, Second Pond 2010

Within the dates and hours covered by a steward, three peak weeks of usage at the Second Pond boat launch occurred during the weeks of 7/30/2010, 8/13/2010 and 8/27/2010 as shown in Figure 4. It is clear that levels of use fluctuated throughout the summer due to factors such as weather and time of year, with use increasing in general as the summer wore on.

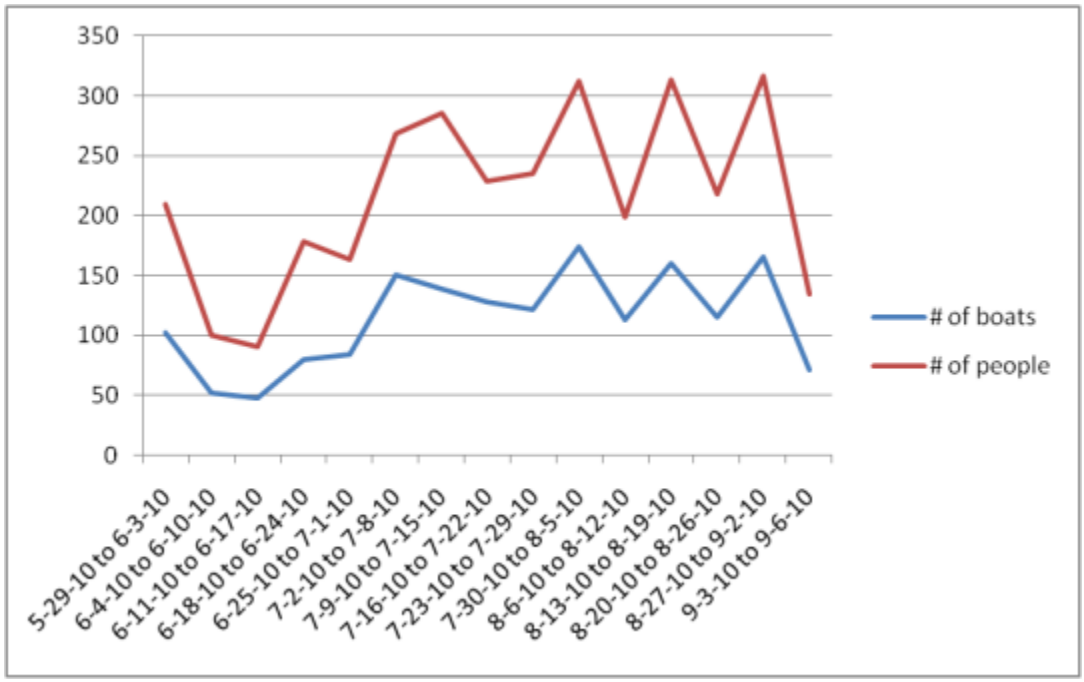

Figure 4- Boat launch use, Second Pond, 2010

State/Province of Origin:

The Second Pond boat launch is located in the center of the Adirondack Mountains of New York state, therefore, it was expected that a majority of the watercraft using the launch were registered in New York State (411 boats, 79%). Since it serves as the primary entry site for the NYSDEC Saranac Islands public campground, it attracts visitors and campers from all over the country. As shown in Table 1, a large majority of the visitors were from either New York State or other states located in the Northeastern U.S, with one visitor as far away as Arizona.

State	# boats	State	# boats
NY	411	IN	4
NJ	42	MD	1
MS	15	GA	1
PA	6	NC	1
FL	1	DL	2
CT	21	OH	1
VT	8	AZ	1
QC	1	**Total**	**519**
RI	2		

Table 1- State or province of origin, Second Pond visitors, 2010 (indicated by boat sticker)

Previously Visited Bodies of Water

Numerous AIS can survive outside of their water submersed habitat for an extensive period of time. By asking boaters the last body of water their boat was in during the past 2 weeks, if any, the steward could more accurately assess the likelihood that a particular boat is transporting any viable aquatic species, native or invasive. This information was crucial to the steward. Previously visited waterbodies for 2009 are represented in Figure 5. Red lines indicate pathways of greatest concern.

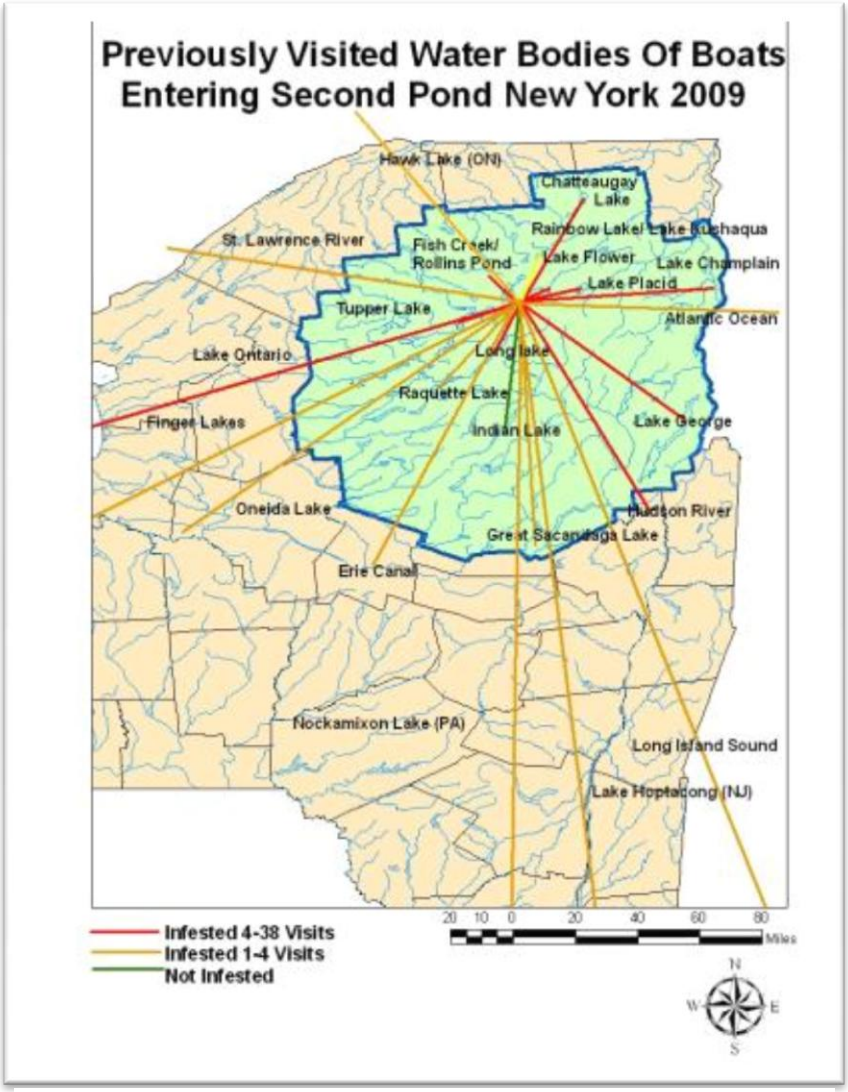

Figure 5- Two week prior visitation map, Second Pond, 2009

In 2010, of the 1,667 boats inspected, 531 (32%) reported being on another body of water in the past two weeks. Of those boats, 433 (82%) reported being on a body of water other than Middle or Lower Saranac Lake. A total of 371 of these previous visits came from lakes that are currently infested with an invasive species, as shown in Table 2. This indicates that at least 370 (70% of the total) of these prior visits were previously at a body of water with a known invasive species. These findings only represent the figures that could be recorded the three days per week when a steward was on duty.

Body of Water	Infected	#	Body of Water	Infected	#
16 Islands Lake (QC)	Unknown	1	Lincoln Pond	Yes (EWM)	2
Atlantic Ocean	Yes	12	Little Tupper Lake	Not Observed	1
Ausable River	Unknown	5	Long Pond (CT)	Unknown	1
Ballston Lake	Yes	1	Long Pond (Franklin County)	Not Observed	5
Bartlett Pond	Yes (EWM)	1	Loon Lake (Warren County)	Yes (EWM)	3
Big Bass Lake (PA)	Unknown	1	Low's Lake	Unknown	1
Black River	Unknown	3	Lower St. Regis Lake	Not Observed	1
Blue Mtn. Lake	Unknown	1	Martins Lake	Unknown	1
Bolton Landing	Unknown	1	Mirror Lake	Not Observed	12
Bow Lake	Unknown	1	Mohawk River	Yes	6
Buck Pond	Not Observed	1	Moose Pond	Not observed	6
Burr Pond (CT)	Unknown	1	Niagara River	Yes	2
Canada Lake	Unknown	3	Nigel Lake	Unknown	1
Cascade Lake	Not Observed	1	Normanskill Creek	Unknown	2
Cayuga Lake	Yes (EWM, ZM)	5	Northwood Lake	Unknown	2
Chateaugay Lake	Yes (EWM)	7	Oneida Lake	Yes (ZM)	2
Chatauqua Lake	Yes	2	Osgood Pond	Not observed	4
Chazy Lake	Yes (EWM)	2	Oswegatchie River	Yes (VLM)	1
Chenango River	Unknown	1	Ottawa River	Unknown	2
Chubb River	Unknown	1	Owasco Lake	Unknown	2
Conesus Lake	Yes (ZM)	1	Panther Lake	Unknown	1
Connecticut River (CT)	Yes	2	Patrick Lake (QC)	Unknown	1
Dunham Reservoir	Unknown	1	Petty Lake (NJ)	Unknown	1
Durant Lake	Unknown	2	Piercefield Flow	Unknown	1
Eagle Lake	Yes (EWM)	3	Pleasant Lake	Unknown	1
Eastonbrooke Reservo	Unknown	1	Putnam Pond	Yes (EWM)	1
Echo Lake	Yes (EWM)	1	Queechy Lake	Unknown	1
Farmington River	Unknown	1	Rainbow Lake	Yes (SN)	5
Fern Lake	Unknown	1	Raquette Lake	Yes (SN)	1
Fish Creek Pond	Yes (EWM)	11	Raquette River	Yes (VLM)	13
Floodwood Pond	Unknown	2	Rollins Pond	Unknown	3
Follensby Clear Pond	Yes (EWM)	5	Round Pond	Unknown	3
Franklin Falls Pond	Yes (EWM, CLP	2	Sandyhook Bay	Unknown	1
Fulton Chain	Yes (VLM)	2	Saranac Chain	Yes (EWM)	98
Georgiaville Pond (RI)	Unknown	1	Saranac River	Unknown	6
Great Sacandaga Lake	Yes (EWM, SWI	14	Saratoga Lake	Yes (EWM)	2
Greenwood Lake	Unknown	1	Scroon Lake	Yes (EWM)	1
Heart Lake	Unknown	2	Shuesberry River (NJ	Unknown	1
Hog's Back Res. (CT)	Unknown	1	Sodus Bay	Unknown	1
Horseshoe Pond	Unknown	2	Sommerset Reservoir	Unknown	1
Hudson River	Yes (WC, ZM)	11	St. Heuberts Lake	Unknown	1
Indian Lake (Franklin C	Yes (EWM)	7	St. Lawrence River	Yes	4
Kayderosseras Creek	Yes (DG)	1	Stillwater Reservoir	Unknown	1
Lake Champlain	Yes (EWM, VLM	26	Stockbridge Bowl (MA)	Unknown	1
Lake Clear	Not Observed	2	Stoney Creek	Unknown	1
Lake Colby	Yes (EWM)	4	Susquehanna River	Unknown	3
Lake Eaton	Unknown	1	Swinging Bridge (QC)	Unknown	1
Lake Everest	Unknown	3	Taylor Pond	Yes (EWM)	2
Lake Flower	Yes (EWM, VLM	31	Tenth Pond	Unknown	1
Lake George	Yes (EWM, CLP	5	Tiorati River	Unknown	1
Lake Harris	Unknown	1	Titus Lake	Unknown	1
Lake Kushaqua	Yes (SN)	1	Tromblant National Park	Unknown	1
Lake Lila	Not Observed	2	Tupper Lake	Yes (VLM)	17
Lake Marine	Unknown	1	Upper Saranac Lake	Yes (EWM)	48
Lake Ontario	Yes (ZM)	10	Upper St. Regis Lake	Not Observed	11
Lake Placid	Yes (VLM)	20	Wappingers Falls	Unknown	1
Lake St. Louis	Unknown	2	Waterbury Reservoir (VT)	Unknown	1
			Total		531

Table 2- Waterways visited in prior two week period, Second Pond State boat launch, 2010. EWM = Eurasian watermilfoil, CLP = curly leaf pondweed, VLM = variable leaf milfoil, DG = didymosphenia geminate, SN = southern naiad, ZM = zebra mussels

Measures Taken to Prevent Invasive Species Introduction

Watershed stewards asked visitors if any preventative measures were taken to prevent transporting aquatic species, native or invasive, from one lake to another. If so, they were asked what steps had been taken. Stewards recorded prevention steps such as, visually inspecting the boat, washing the boat, drying the boat, draining the bilge, draining the live well, draining their bait bucket and disposing of live bait in the trash. A total of 1,467 preventative measures were taken by 1,204 total groups. 65% of visitors took some prevention measure. 46% of groups washed their boats, 33% made sure their boat had dried prior to launching, and 30% conducted their own boat inspection. 19% drained their bilges while a negligible number of groups drained livewells or disposed of bait properly (Figure 6).

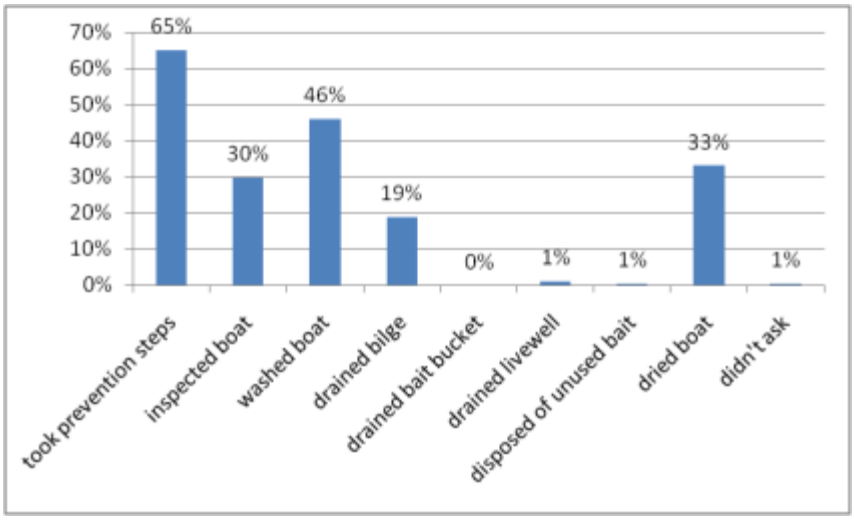

Figure 6-Aquatic Invasive Species spread prevention measures, NYSDEC boat launch at Second Pond, summer 2010

Conclusion

This was the fourth summer the watershed steward program has posted a steward at the Second Pond public boat launch. Use over the four seasons of coverage has been very consistent at approximately 1,700 watercraft inspected and approximately 3,200 visitors encountered. Use in 2005 was considerably higher than that in subsequent years when the decreased ramp coverage (2 days compared to 3 days in the latter years) is considered (Figure 7). It was evident that the Second Pond boat launch was used by a large number of visitors, primarily canoe and kayaks which consisted of 69% of the total boats. Surprisingly, only 1.7% (29 of 1,667) of the total boats that were launching or retrieving were carrying an invasive plant. This is slightly lower than 2009's percentage of 1.9%. This difference is insignificant, and cannot be concluded as an improvement from last year. There was also a

wide variety of states of origin, indicating that visitors travel from all over the country to visit the Saranac Lakes area. This indicates the importance of our role as a watershed steward at this boat launch. The 2010 season featured steward coverage Friday-Sunday, which included one of the busiest summer holidays, July 4th.

Taking into account that not every group of visitors actively takes preventative measures, the ratio of preventative measures taken to total groups was still greater than one. This indicates that many of those who do take preventative measures perform more than one. This is indicative that our education program is working in a positive manner. The WSP hopes to see this same incremental growth each year. The threat of importing and exporting the high stocks of Eurasian Watermilfoil from the Second Pond boat launch is just as urgent of a concern as it ever has been. The best preventative measure is knowledge, and with this knowledge, visitors to the Adirondack Park can aid in curbing the spread of AIS from one body of water to another. The WSP would like to recognize and appreciate the cooperation and partnership of NYSDEC campground operations staff, fish and wildlife staff and Environmental Conservation Officers, all of whom offered support and encouragement.

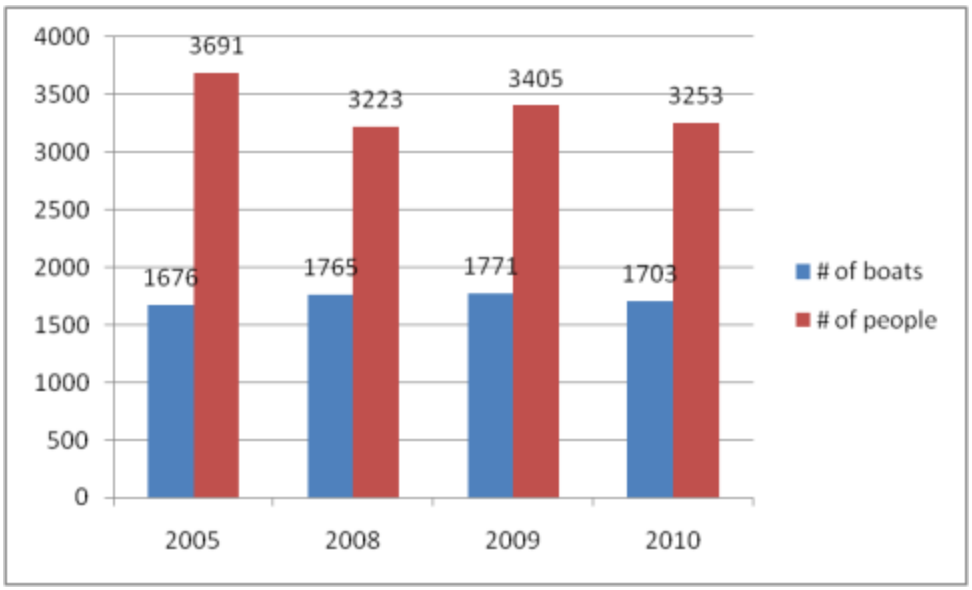

Figure 7- 4 year use history, Second Pond boat launch. # of days of weekly coverage: 2005 - 2 (Sat-Sun); 2008-2010 - 3 (Fri, Sat, Sun)

Figure 8- View of the Second Pond boat launch from State Route 3

Second Pond Recreation Study 2010

	Boat Type							total #	Weekly Avg	Four	Group
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size
5-29-10 to 6-3-10	26	2	0	30	44	0	0	102	91	15	210
6-4-10 to 6-10-10	15	0	0	29	8	0	0	52	84	5	100
6-11-10 to 6-17-10	13	2	0	21	12	0	0	48	44	9	91
6-18-10 to 6-24-10	36	2	0	16	22	1	3	80	55	11	178
6-25-10 to 7-1-10	23	2	0	23	33	0	3	84	37	3	163
7-2-10 to 7-8-10	32	15	0	41	55	0	7	150	42	13	268
7-9-10 to 7-15-10	43	0	0	45	48	1	2	139	48	11	286
7-16-10 to 7-22-10	37	6	0	31	48	0	6	128	57	6	229
7-23-10 to 7-29-10	30	1	0	49	39	0	3	122	62	11	235
7-30-10 to 8-5-10	53	2	0	38	76	0	5	174	48	8	312
8-6-10 to 8-12-10	30	0	0	36	41	0	6	113	56	6	199
8-13-10 to 8-19-10	35	2	0	54	64	0	5	160	63	24	313
8-20-10 to 8-26-10	31	4	0	35	44	0	1	115	66	0	218
8-27-10 to 9-2-10	37	10	0	57	60	0	1	165	61	11	317
9-3-10 to 9-6-10	15	0	0	29	27	0	0	71	38	3	134
totals	456	48	0	534	621	2	42	1703	Summer Avg = 57	136	3253
									Median HP = 40		

Table 3-Summary, 2010. Key: M = Motorboat; PWC = Personal Watercraft; S = Sailboat; C = Canoe; K = Kayak; B = Barge (construction); R = Rowboat

Second Pond Recreation Study 2010												
	# groups	# groups	organisms found		organism type							
Week	launching	retrieving	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other
5-29-10 to 6-3-10	60	27	7	1	1	0	1	5	0	0	0	1
6-4-10 to 6-10-10	21	15	3	1	1	0	0	1	0	0	0	2
6-11-10 to 6-17-10	17	20	2	5	3	0	0	3	0	0	0	1
6-18-10 to 6-24-10	39	34	3	5	3	0	1	2	0	0	0	2
6-25-10 to 7-1-10	42	23	3	1	1	0	1	2	0	0	0	0
7-2-10 to 7-8-10	76	38	12	4	2	0	0	13	0	0	0	3
7-9-10 to 7-15-10	56	35	3	4	2	0	1	3	0	0	0	2
7-16-10 to 7-22-10	60	30	6	6	0	0	0	10	0	0	0	2
7-23-10 to 7-29-10	45	34	13	15	0	0	0	6	0	0	0	5
7-30-10 to 8-5-10	85	43	6	4	2	1	1	6	0	0	0	0
8-6-10 to 8-12-10	44	24	3	6	0	0	2	4	0	0	0	2
8-13-10 to 8-19-10	69	41	7	4	3	0	0	6	0	0	0	2
8-20-10 to 8-26-10	46	32	3	5	6	0	0	3	0	0	0	1
8-27-10 to 9-2-10	79	41	7	2	2	1	0	6	0	0	1	0
9-3-10 to 9-6-10	22	6	1	3	1	0	0	2	0	0	1	1
totals	761	443	79	66	27	2	7	72	0	0	2	24

Table 4- EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil

Second Pond Recreation Study 2010									
	visitor prevention steps								
Week	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-29-10 to 6-3-10	40	1	29	8	0	0	0	2	0
6-4-10 to 6-10-10	21	9	15	4	0	0	0	12	0
6-11-10 to 6-17-10	17	11	12	5	0	0	0	8	0
6-18-10 to 6-24-10	41	23	29	20	0	0	1	16	0
6-25-10 to 7-1-10	28	12	23	10	0	0	1	13	0
7-2-10 to 7-8-10	70	42	51	21	0	0	1	32	2
7-9-10 to 7-15-10	53	22	32	18	0	0	0	36	3
7-16-10 to 7-22-10	62	20	52	22	0	2	1	39	1
7-23-10 to 7-29-10	46	25	40	19	0	1	1	30	0
7-30-10 to 8-5-10	86	46	61	28	0	1	0	39	0
8-6-10 to 8-12-10	58	24	43	16	0	2	0	45	0
8-13-10 to 8-19-10	70	20	32	20	0	4	0	44	0
8-20-10 to 8-26-10	53	36	38	9	0	0	0	21	0
8-27-10 to 9-2-10	83	45	58	13	0	1	1	31	0
9-3-10 to 9-6-10	11	2	8	1	0	0	0	7	0
totals	739	338	523	214	0	11	6	375	6

Table 5- I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: St. Regis Lakes

By: Matthew Rankin, Watershed Steward

Introduction

The Watershed Stewardship Program (WSP), under the Paul Smith's College Adirondack Watershed Institute, seeks to prevent the spread of aquatic invasive species (AIS) by educating the public about AIS and other conservation issues that pertain to the Adirondack Park's watersheds. Invasive species are non-indigenous species that adversely affect the habitats they enter by growing at very rapid rates and out-competing indigenous species. Watershed stewards are trained in depth about proper identification techniques for each of the invasive species, along with appropriate preventative measures to reduce the spread via watercraft/trailer, and how to properly inspect watercraft for AIS. The WSP has stationed watershed stewards at the Upper St. Regis Lake boat launch for the past 11 consecutive years. As of 2010, the St. Regis Lakes are free of any AIS. The Upper St. Regis Lake boat launch is one of the major access points to the St. Regis Wilderness Canoe Area, ergo, it is largely used to launch canoes and kayaks. These lakes also provide anglers with great fishing, making it a popular access site to fisherman. As a result, it is a critical point for public outreach, education and watercraft inspections in the Adirondack region.

Figure 1- Sunset on Upper St. Regis Lake

Methods

One Watershed Steward was stationed at the Upper St. Regis boat launch from May 29th through September 5th, seven days per week, from 7am-4pm. Stewards were responsible for collecting data such as boat type, horsepower of the outboard engine, group size, state of registration, time of launch/retrieval and species of any organism found on the watercraft or trailer. In addition to this data, as visitors entered the boat launch, the steward would ask them the last body of water the watercraft visited in the past two weeks and if they had taken any steps to prevent the spread of invasive species. The steward would then proceed to show the boater where AIS can become entangled on the watercraft and trailer, discarding of any species found, indigenous or invasive. The primary AIS of concern at this launch is Eurasian watermilfoil, which has the potential to spread quickly throughout the Adirondack Park, as is already evident in many other lakes. The steward provided the boater with a verbal message as well as an information card highlighting the general message, along with pictures of AIS and diagrams of common places where AIS can accumulate on the watercraft and trailer. Prevention steps against the spread of AIS are also highlighted on the card with hopes that the boater would take preventative measures against the spread of AIS from one lake to another in their future travels.

Results

Within the hours covered by a steward for the 2010 season, the stewards posted at the Upper St. Regis boat launch encountered a total of 956 boats, and 1,586 total people, as seen in Figure 2. Among the seven types of boat types recorded in the data, canoes were the most abundant type of boat launched, accounting for 41%, as seen in Figure 1. Motorboats and kayaks closely followed with 32% and 25%, respectively.

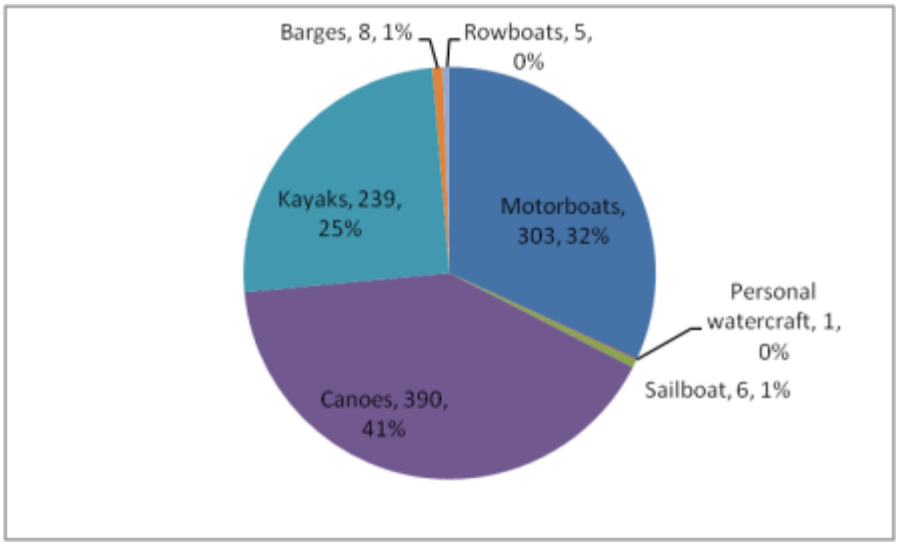

Figure 2- Types of watercraft launched, St. Regis Lake 2010

As shown in Figure 3, the peak week of usage was during the week of 7/2/2010 – 7/8/2010 and the peak day was 7/17/2010. Sundays were reported to be the busiest day of the week at the boat launch, with 20% of the total visitors launching and/or retrieving vessels on Sundays.

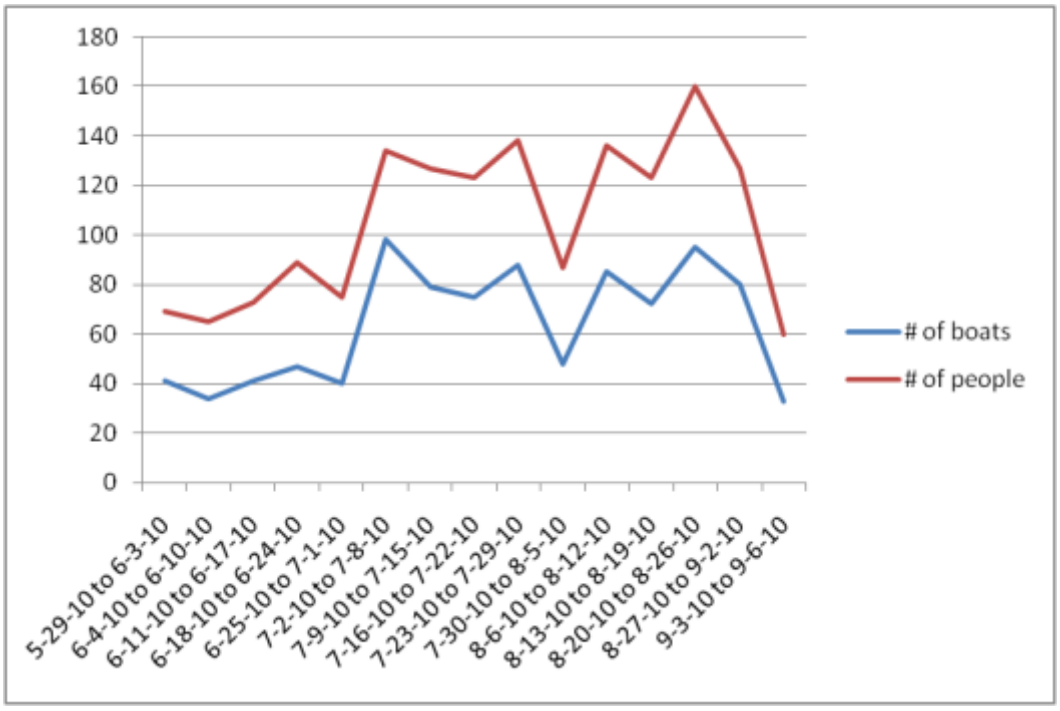

Figure 3-Upper St. Regis Boat Launch Use, 2010

State/Province of Origin

The St. Regis Lakes are located in the heart of the Adirondack Mountains of New York state, so it was expected that a majority of the watercraft using the launch were registered in New York State (293 boats). It can be noted that there is an inverse correlation between state of registration and distance from the boat launch on Upper St. Regis, as shown in Table 1. One group travelled from as far as Arizona to recreate on Upper St. Regis Lake.

State	#	State	#
NY	293	SC	1
VT	4	AZ	1
CT	5	OH	1
FL	3	NJ	3
MS	1	DL	2
PA	3	MN	1
VA	2	**Total**	**320**

Table 1- State of Origin: Upper St. Regis Lake Boat Launch, 2010

Previously Visited Water Bodies

Many AIS can survive outside of the water for an extensive period of time. By asking boaters the last body of water their boat was in, if any, the steward could more accurately assess the likelihood that

a particular boat was transporting any viable aquatic species, native or invasive. It was crucial that the steward ask for this information. Of the 956 boats inspected during the 2010 season, 374 (39%) reported being on another body of water in the past two weeks, as shown in Table 2. Of those boats, 240(64%) of them reported on being on a body of water other than Upper St. Regis Lake, 28 of which have been confirmed to have an invasive species by the Adirondack Park Invasive Plant Program. This indicates that at least 141(or 15 %) of the boats entering Upper St. Regis Lake were previously at a body of water with a known invasive species. These findings only represent the figures that could be recorded when a steward was on duty.

Body of Water	Infected	Total Visits	Body of Water	Infected	Total Visits
Allens Falls	Unknown	1	Lake Lila	Unknown	1
Atlantic Ocean	Yes	1	Lake Placid	Yes (VLM)	13
Ausable River	Unknown	2	Little Clear Pond	None Observed	9
Brant Lake	Yes (EWM, CLP)	1	Little Green Pond	None Observed	2
Buck Pond	Unknown	1	Little Wolf Lake	Unknown	1
Burr Pond	Unknown	1	Long Lake	Yes (VLM)	3
Candlewood Lake	Unknown	1	Long Pond (Franklin County)	None Observed	4
Cayuga Lake	Yes (ZM)	3	Loon Lake (Warren County)	Yes (EWM)	1
Chateaugay Lake	Yes (EWM)	3	Lower Saranac Lake	Yes (EWM)	11
Chazy Lake	Yes (EWM)	2	Lower St. Regis Lake	None Observed	7
Church Pond	None Observed	2	Meecham Lake	Unknown	1
Connecticut River	Yes (DG)	1	Middle Saranac Lake	Yes (EWM)	1
Cranberry Lake	Yes (VLM)	3	Mohawk River	Unknown	1
Croton River	Unknown	1	Moose Pond	None Observed	5
Deer River Flow	Yes (EWM)	2	Oneida Lake	Unknown	1
Fish Creek Ponds	Yes (EWM)	10	Osgood Pond	None Observed	14
Floodwood Pond	Yes (EWM)	2	Polliwog Pond	None Observed	1
Follensby Clear Pond	Yes (EWM)	10	Rainbow Lake	Yes (SN)	4
Grass River Flow	Unknown	1	Raquette Lake	Yes (VLM)	3
Great Sacandaga Lake	Yes (EWM, SWF)	1	Raquette River	Yes (EWM)	3
Higley Flow	Unknown	1	Rollins Ponds	Unknown	8
Hoel Pond	Unknown	6	Saratoga Lake	Yes (EWM, WC)	1
Hudson River	Unknown	3	Second Pond	Yes (EWM)	1
Jones Pond	Unknown	3	Seneca Lake	Yes (ZM)	1
Lake Champlain	Yes (EWM, CLP, VLM, WC, ZM)	6	Shelborn Pond	Unknown	2
Lake Clear	None Observed	9	Silver Lake	Unknown	2
Lake Colby	Yes (EWM)	4	St. Lawrence River	Unknown	4
Lake Eaton	Unknown	1	Titus Lake	Unknown	1
Lake Flower	Yes (EWM, VLM, CLP)	15	Tupper Lake	Yes (VLM)	8
Lake George	Yes (EWM, CLP, ZM)	1	Upper Saranac Lake	Yes (EWM)	24
Lake Harmony	Unknown	1	Upper St. Regis Lake	None Observed	134
Lake Kushaqua	Yes (SN)	3	**Total Visits**		**374**

Table 2- Waterways visited two weeks prior to visiting Upper St. Regis Lake, 2010. EWM = Eurasian Watermilfoil; BW = native bladderwort; NM = native milfoil; GRS = grass; SN= southern naiad; WC = water chestnut; ZM = zebra mussel; VLM = variable leaf milfoil

Measures Taken to Prevent Invasive Species Introduction:

Boaters were asked if they had taken any measures to prevent the spread of invasive species from one body of water to another. 82% of the groups reported taking some AIS spred prevention measure, such as visually inspecting their boat, washing/drying their boat, draining the bilge, emptying live wells, disposing of like bait and emptying their bait bucket. Of the 665 groups of boaters the

steward encountered, the most popular preventative measure was washing the boat, reported by 63% of groups, followed by a visual inspection by 43% of groups, according to Figure 4.

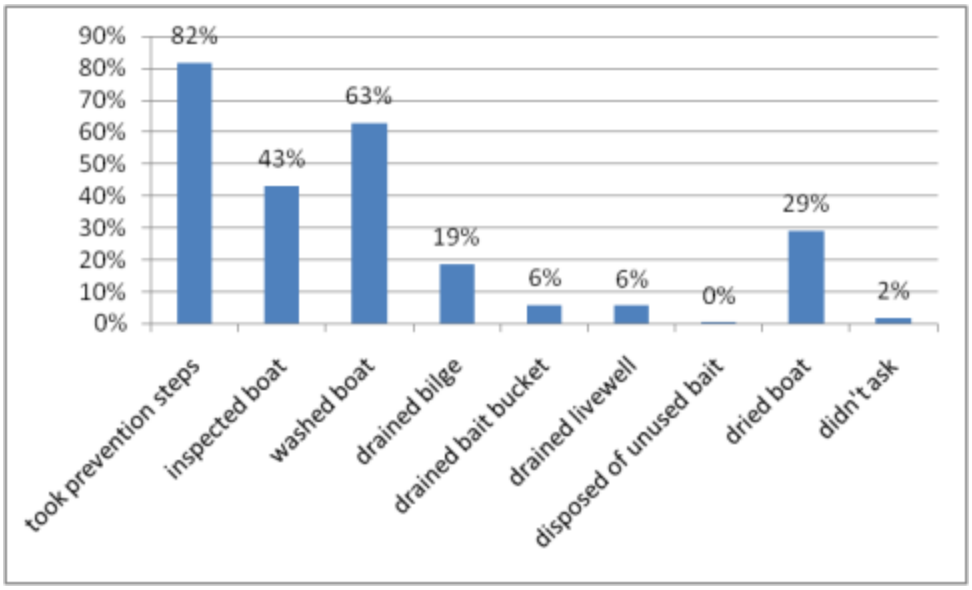

Figure 4- Aquatic Invasive Species spread prevention measures, NYSDEC boat launch at Upper St. Regis Lake, summer 2010

Discussion:

The summer of 2010 at the Upper St. Regis boat launch brought a slight decrease from 2009 in usage in terms of number of vessels being launched. However, the total number of visitors increased when compared to 2009. For the past 11 years that watershed stewards have been present at the boat launch, this ranked to be the 3rd busiest year in terms of total number of boats launching or retrieving (Figure 5). The overall trend for boats and users is a slow rise over the last decade. Non-motorized vessels comprised the majority of use at 66%, which is a 10% increase over 2009's 56% figure. The number of vessels using four stroke engines was similar to the previous year's figures, with 22% of the motorboats using a four stroke engine in 2010. Of the total 665 groups of boaters that stewards encountered, 351 (53%) of them used the boat wash. The 351 (37% of all boats) uses of the boat wash in 2010 compares with 372 uses of the boat wash (also 37% of all boats) in 2009. Stewards found a total of 55 organisms on vessels launching or retrieving. Four of these were AIS; two samples of Eurasian water milfoil and two clumps of zebra mussels. Nearly two-thirds of the boaters using the launch claimed to have either washed their boat or visually inspected it, or both. High boat wash compliance ratios and decreased numbers of aquatic species found on boats both indicate success on behalf of the Watershed Steward Program is educating the public about aquatic invasive species.

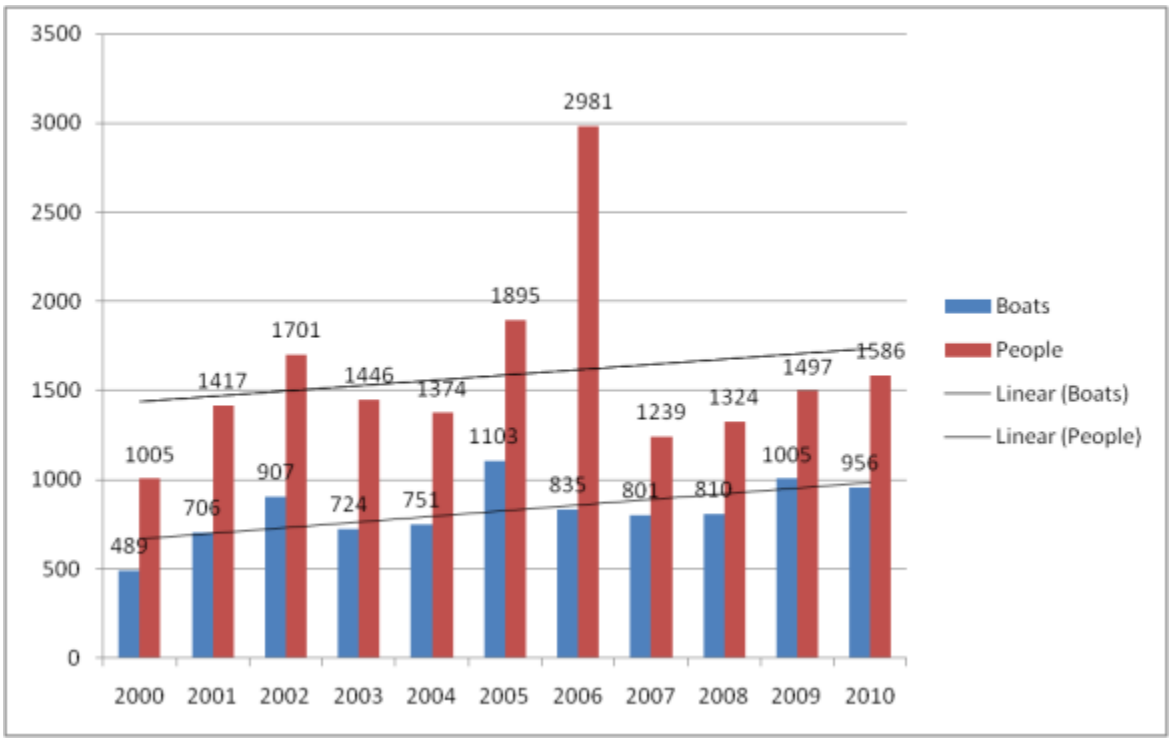

Figure 5- Eleven year use trend, Upper St. Regis Lake, 2000-2010

Figure 6- View from a kayak, St. Regis Lakes

Conclusion

During the summer of 2010, a total of 1,586 people and 956 boats used the Upper St. Regis boat launch to launch/retrieve watercraft. With increased public knowledge and understanding of AIS, the likelihood that boaters will engage in preventative measures is expected to increase. In total, the stewards inspected 956 boats, removing and disposing of organisms 55 times, 4 of which removed an invasive species not currently present in Upper St. Regis, Spitfire or Lower St. Regis Lakes. This marks a success for the watershed steward program, which thereby prevented the transport of a new species into the St. Regis chain of lakes.

For next year, we hope to achieve a greater boat wash compliance rate from both the property owners, as well as non-resident boaters. The watercraft owned by property owners and/or their caretakers are just as much in jeopardy of introducing invasive species to this lake as are non-resident boaters. This is why stewards urge both to use the boat wash for each time a boat enters or exits at the Upper St. Regis boat launch, public or private.

Since 2000, the Watershed Steward Program at Paul Smith's College has been graciously funded and supported by the St. Regis Foundation, as well as the St. Regis Property Owners Association. On behalf of each of the 2010 watershed stewards, we would like to thank both of these groups for their continued support and dedication in helping us achieve our mission to educate the public about the threat of AIS throughout the Adirondack Park, and maintain the ecological integrity of its beautiful waterways.

St Regis Recreation Study 2010

	Boat Type							total #	Weekly Avg	Four	Group
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size
5-29-10 to 6-3-10	13	0	0	15	12	0	1	41	62	7	69
6-4-10 to 6-10-10	18	0	1	8	3	0	0	34	56	9	65
6-11-10 to 6-17-10	24	0	0	17	0	0	0	41	35	5	73
6-18-10 to 6-24-10	25	0	1	13	7	1	0	47	58	5	89
6-25-10 to 7-1-10	13	0	0	21	5	1	0	40	65	3	75
7-2-10 to 7-8-10	22	0	0	48	27	0	1	98	32	3	134
7-9-10 to 7-15-10	17	0	1	36	21	4	0	79	67	5	127
7-16-10 to 7-22-10	30	0	0	25	20	0	0	75	55	4	123
7-23-10 to 7-29-10	25	0	1	37	24	1	0	88	85	3	138
7-30-10 to 8-5-10	26	1	1	16	4	0	0	48	75	7	87
8-6-10 to 8-12-10	22	0	0	34	29	0	0	85	84	2	136
8-13-10 to 8-19-10	15	0	1	32	24	0	0	72	53	5	123
8-20-10 to 8-26-10	17	0	0	40	35	1	2	95	36	2	160
8-27-10 to 9-2-10	20	0	0	33	26	0	1	80	52	5	127
9-3-10 to 9-6-10	16	0	0	15	2	0	0	33	67	2	60
totals	303	1	6	390	239	8	5	956	Summer Avg 58	67	1586
									Median 40		

Table 3- Summary, 2010. M = motorboat; K = kayak; C = canoe; B = construction barge; R = rowboat; S = sailboat; PWC = personal watercraft

St Regis Recreation Study 2010														
	private	# groups	# groups	organisms found		organism type							
Week	side	launching	retrieving	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other
5-29-10 to 6-3-10	4	30	11	0	0	0	0	0	0	0	0	0	0
6-4-10 to 6-10-10	10	26	10	1	5	0	0	0	2	0	0	0	4
6-11-10 to 6-17-10	10	29	16	1	2	0	0	0	2	0	0	0	1
6-18-10 to 6-24-10	8	33	14	3	1	0	0	0	3	0	0	0	2
6-25-10 to 7-1-10	4	25	16	1	1	0	1	0	1	0	0	0	0
7-2-10 to 7-8-10	7	49	18	5	6	0	0	0	8	0	0	0	3
7-9-10 to 7-15-10	7	39	22	0	1	0	1	1	0	0	0	0	1
7-16-10 to 7-22-10	9	54	20	6	2	0	0	0	3	0	0	0	7
7-23-10 to 7-29-10	13	45	21	3	2	0	0	0	3	0	0	0	2
7-30-10 to 8-5-10	7	38	11	4	3	0	0	1	3	0	0	0	3
8-6-10 to 8-12-10	8	45	18	0	1	0	0	0	1	0	0	0	0
8-13-10 to 8-19-10	4	38	17	2	1	0	0	0	1	0	0	0	2
8-20-10 to 8-26-10	5	44	25	2	2	1	0	0	2	0	0	0	1
8-27-10 to 9-2-10	6	51	18	0	0	0	0	0	0	0	0	0	0
9-3-10 to 9-6-10	2	16	19	0	0	0	0	0	0	0	0	0	0
totals	104	562	256	28	27	1	2	2	29	0	0	0	26

Table 4- EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil

St Regis Recreation Study 2010										
	boat	visitor prevention steps								
Week	wash	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-29-10 to 6-3-10	14	31	2	30	2	0	1	0	18	0
6-4-10 to 6-10-10	20	22	12	22	12	18	8	1	1	0
6-11-10 to 6-17-10	17	29	14	29	14	18	14	0	1	1
6-18-10 to 6-24-10	24	33	19	24	12	1	4	0	15	1
6-25-10 to 7-1-10	15	23	14	15	7	1	1	0	9	1
7-2-10 to 7-8-10	40	42	25	31	6	0	0	0	20	3
7-9-10 to 7-15-10	33	42	20	34	9	0	1	0	18	0
7-16-10 to 7-22-10	30	47	24	31	11	0	1	0	19	2
7-23-10 to 7-29-10	31	49	27	40	14	0	2	0	22	1
7-30-10 to 8-5-10	25	39	16	26	15	0	2	0	17	0
8-6-10 to 8-12-10	29	42	15	27	5	0	3	0	16	2
8-13-10 to 8-19-10	21	37	19	24	4	0	0	0	15	0
8-20-10 to 8-26-10	25	42	29	30	8	1	0	1	16	1
8-27-10 to 9-2-10	21	46	35	36	5	0	0	0	6	0
9-3-10 to 9-6-10	6	19	16	19	0	0	0	0	1	0
totals	351	543	287	418	124	39	37	2	194	12

Table 5- boat wash = used onsite boat wash; I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Recreation Use Study: Tupper Lake

By: Kimberly M. Forrest, Watershed Steward

Introduction

Tupper Lake is known to have a population of invasive variable leaf milfoil (*Myriophyllum heterophyllum*) within its waters. For the summers of 2009 and 2010, Paul Smith's College Watershed Stewardship Program placed a weekend-duty steward at Tupper Lake to prevent the spread of variable leaf milfoil (VLM) as well as other aquatic invasive species (AIS) into Tupper Lake. VLM presents a clear threat to neighboring lakes, and locations within Tupper Lake and Simon Pond that do not presently host VLM beds. Because it grows in thick mats, it out-competes native plants for sunlight and reduces recreation quality by becoming tangled in propellers and making it hard for people to swim and fish.

Figure 1- Watershed Steward inspecting boat with visitor to Tupper Lake state boat launch

Methods

Between May 29th and September 7th watershed stewards were placed at the Tupper Lake state boat launch on Saturdays and Sundays. Between the hours of 7:00 am to 4:00 pm, stewards welcomed boaters to the launch and gave them a brief interview. Boaters were asked where they had boated in the two weeks prior to the date of the interview, what the boater had done to prevent spreading

invasive species, and if they knew about the threat of variable leaf milfoil. The boaters were also asked if they had visited the Tupper Lake boat launch before. In addition, the stewards recorded the number of people in each group, the type of boat, the horsepower of the engine, and whether outboard motors were four-stroke.

After the interview, stewards then visually inspected each boat for aquatic hitchhikers. Attention was paid to the lower unit of the motor and any edges on the boat, trailer, or protruding equipment that could catch a plant or animal. Informational stickers and cards were then given to the boaters as reminders to keep our waters clean.

Results

During the 2010 season, Watershed Stewards observed 504 boats recreating at the NYS DEC boat launch at Tupper Lake. Stewards interacted with 1,221 people recreating at the boat launch. The highest use of the boat launch occurred on the weekend of July 3, 2010 to July 4, 2010 with a total of 82 boats and 175 people. Peak use weekends occurred on Memorial Day weekend, June 19 and 20 and on August 28. Stewards were not available to staff the boat launch on 8/8, 8/14, 8/15, 8/29 and 9/5, which affected use tallies on those dates and overall.

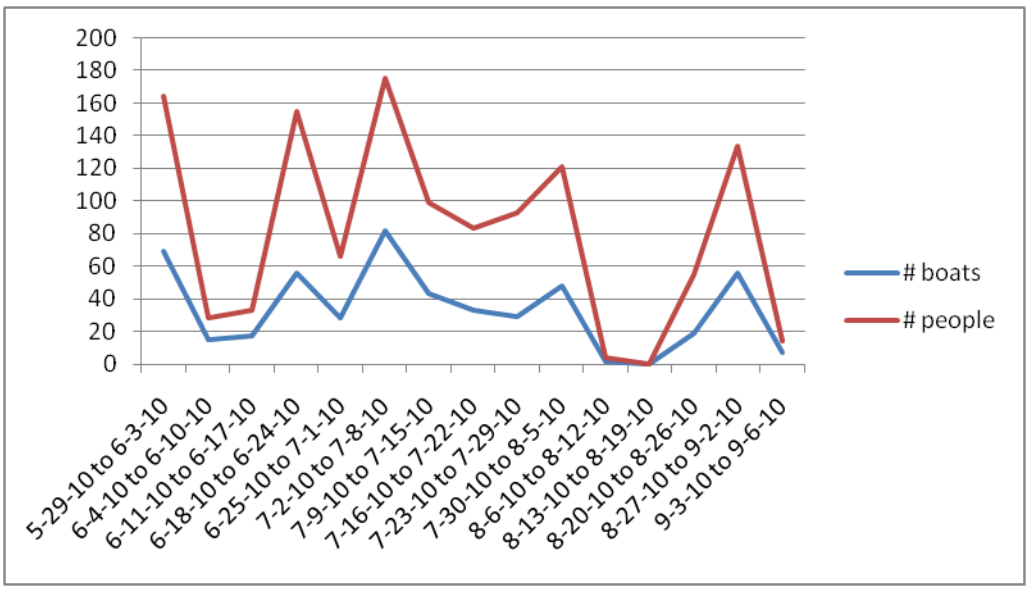

Figure 2- Tupper Lake state boat launch use, summer 2010, weekends.

Motorboats were the most encountered watercraft in the 2010 season at the Tupper Lake state boat launch, representing 78% of the watercraft observed. Out of all the motorboats that were encountered 106 boats had four stroke outboard engines (27% of all observed motorboats, including inboards). Kayaks were the second most encountered boat with 7% of all watercrafts encountered, and

canoes followed at the third most encountered boat at 5% of the total boats. Sailboats also represented 5% of the total. Barges and rowboats represented a negligible portion of watercraft encountered (Figure 3).

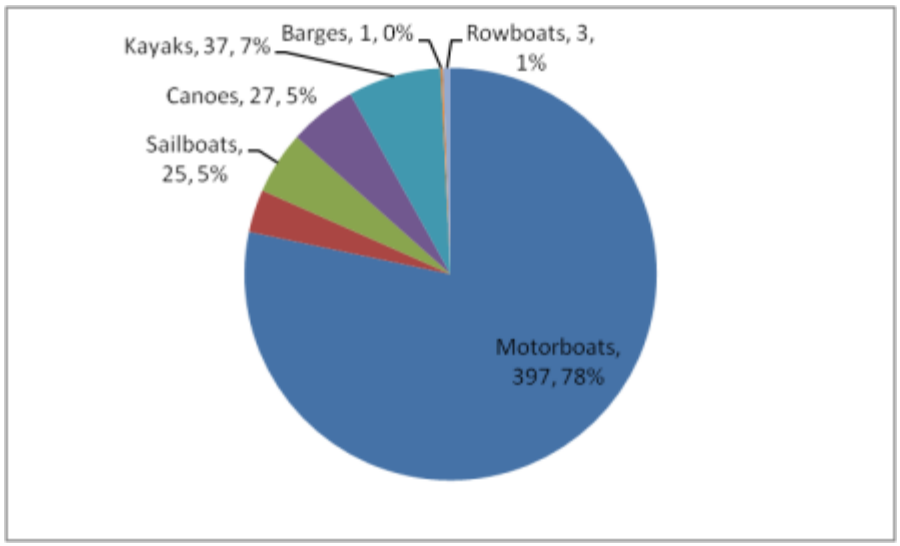

Figure 3- Types of watercraft launched, Tupper Lake, weekends 2010

Stewards kept track of the states represented on boat stickers on the days they were assigned to cover the boat launch. New York State was the most frequently observed motorboat registration sticker, followed by New Jersey and Pennsylvania. In total, 14 different state registration stickers were observed (Table 1).

Origin	Total
CT	2
FL	2
IN	1
LA	1
MA	2
ME	1
MS	1
NC	1
NJ	17
NV	1
NY	372
OH	1
PA	5
VT	2

Table 1- State of origin, Tupper Lake state boat launch visitors, 2010

Stewards asked the boaters at the Tupper Lake Boat Launch which preventative measures they had taken since the last use of their individual boats. Out of 469 total groups encountered, 226 (48%) of boat owners washed their boats before they launched, and 90 (19%) boat owners had dried their boats. 177 (38%) of boaters had inspected their boats and boating equipment for any organic material between launches. 162 (35%) of boat owners had drained their bilge after their last use, and 13 (3%) boat owners had drained their live wells. 2 (0.4%) of boat owners had drained their bait buckets, and 3 (1%) of boat owners disposed of their live bait properly. Out of 491 boat owners, 2 (0.4%) boat owners were not asked if they had taken any preventative measures during the time of the study.

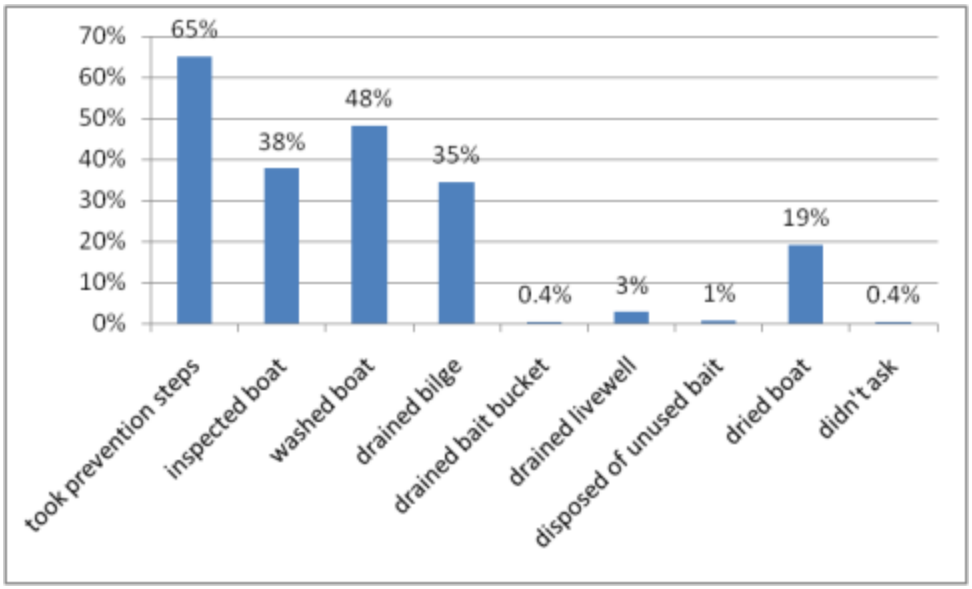

Figure 4- Aquatic Invasive Species spread prevention measures, NYSDEC boat launch at Tupper Lake, summer 2010

Watershed stewards visually inspected each boat that recreated during the study time. Any hitchhiking material found on the boat, trailer, or equipment was removed and if possible identified. After identification the material was placed in a desiccation box at the boat launch. During the 2010 season Stewards removed material 38 times (Table 2).

Figure 5- Boat inspection, Tupper Lake state boat launch

Species	# Found
Eurasian Watermilfoil	1
Bladderwort	2
Native Milfoil	1
Grass	31
Other	3

Table 2- Organisms removed from boats at Tupper Lake state boat launch, 2010

For each boat encountered, the waterways that were used in the prior two weeks were also recorded. 485 visitors reported having used their watercraft in 34 different waterbodies in the preceding two week period. Many of these waterbodies are known to be infested with AIS. The majority of waterbodies reported were located in New York State and the surrounding states, with the most frequently mentioned prior waterways being Tupper Lake itself (223 visits), the Saranac chain (37 visits), the Hudson River (7) and Saratoga Lake (4), all of which host aquatic invasive species (Table 3).

Waterbody	Known to be infected	Total Visits	Waterbody	Known to be infected	Total Visits
Barnegat Bay	yes	1	None		167
Brant Lake	yes	2	Osgood Pond		1
Burden Lake		1	Payne Lake		1
Eagle Lake	yes	2	Piercefield Lake	yes	1
Fish Creek Pond	yes	1	Raquette Lake	yes	2
Forked Lake		2	Raquette Pond		1
Great Sacandaga Lake	yes	1	Raquette River		6
Hudson River	yes	7	Round Lake		1
Lake Champlain	yes	2	Sacandaga Lake	yes	1
Lake Delta		1	Saratoga Lake	yes	4
Lake Flower	yes	1	Schroon Lake	yes	2
Lake Placid	yes	1	Second Pond	yes	1
Long Lake		6	Skaneatalas Lake	yes	1
Lower Saranac	yes	15	St. Lawrence River	yes	3
Middle Saranac	yes	8	Tupper Lake	yes	223
Moose River		1	Upper Saranac Lake	yes	13
Newcomb Lake		1	Upper St. Regis	no	2
Niagara River	yes	2	total		485

Table 3- Waterways visited two weeks prior to visiting Tupper Lake, 2010

Discussion

In 2010, Tupper Lake stewards educated a total of 1,224 boaters in 469 groups and inspected 504 boats. Use was comparable to 2009, when paid stewards along with a substantial volunteer steward effort encountered 1,358 people and 638 boats. Thus, 2010 represents a 9% decrease compared with 2009 in the total number of people contacted and a 21% decrease in boats inspected by both paid and volunteer stewards. Of the 504 boats inspected in 2010 season, 38 had organisms of some type attached, for an infestation rate of 7.5%. The infestation rate for 2009 was 11% (45 out of 413 boats inspected by paid watershed stewards). The volunteer steward program was much less substantial in 2010 compared with 2009, in part because of the effectiveness of the paid stewards. It is clear from the decreased number of contacts and boat inspections that there remains a need for volunteers to augment the efforts of the paid stewards. Boaters continue to be attracted to Tupper Lake from locations across New York State and beyond, demonstrating the need for effective measures to prevent the introduction of new AIS into the relatively uninmpacted waters of Tupper Lake.

Conclusion

Even though Tupper Lake has a known infestation of invasive species, it is our duty as a community to make certain that the infestation does not get worse and that no other body of water becomes infested with any invasive species. As a global community we all share the responsibility to prevent any further infection of our waters and lands with invasive species. By taking a minute out of our day to take preventative measures on boats, boating equipment, and trailers we make a difference in our environment. The Watershed Stewardship Program would like to thank the people of Tupper Lake

for their cooperation and the Tupper Lake Volunteer Steward Program for their time and dedication to protecting Adirondack waterways.

Tupper Lake Recreation Study 2010

	Boat Type							total #	Weekly Avg	Four	Group	# groups	# groups
Week	M	PWC	S	C	K	B	R	boats	HP Outboard	stroke	Size	launching	retrieving
5-29-10 to 6-3-10	60	0	2	6	1	0	1	69	80	35	164	62	20
6-4-10 to 6-10-10	12	0	0	2	0	1	0	15	62	7	28	11	6
6-11-10 to 6-17-10	16	0	0	1	0	0	0	17	68	7	33	12	6
6-18-10 to 6-24-10	47	3	0	6	0	0	0	56	55	14	155	43	26
6-25-10 to 7-1-10	24	0	0	0	4	0	0	28	60	6	66	18	13
7-2-10 to 7-8-10	61	7	1	1	12	0	1	82	63	9	175	65	15
7-9-10 to 7-15-10	33	2	0	0	8	0	0	43	68	5	99	35	8
7-16-10 to 7-22-10	30	2	0	0	1	0	0	33	62	3	83	27	10
7-23-10 to 7-29-10	23	0	0	1	5	0	0	29	62	1	93	19	12
7-30-10 to 8-5-10	38	2	0	8	0	0	0	48	60	10	121	32	14
8-6-10 to 8-12-10	2	0	0	0	0	0	0	2	125	0	4	2	0
8-13-10 to 8-19-10	0	0	0	0	0	0	0	0	0	0	0	0	0
8-20-10 to 8-26-10	18	0	0	1	0	0	0	19	43	3	55	15	14
8-27-10 to 9-2-10	26	1	22	1	6	0	0	56	82	5	134	48	12
9-3-10 to 9-6-10	7	0	0	0	0	0	1	7	73	1	14	4	6
totals	397	17	25	27	37	1	3	504	Summer Avg 66	106	1224	393	162
									Median HP 60				

Table 4- Summary, 2010. M = motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = construction barge; R = rowboat

Tupper Lake Recreation Study 2010

	organisms found		organism type								visitor prevention steps								
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-29-10 to 6-3-10	6	0	0	0	0	5	0	0	0	1	30	12	21	18	0	2	2	16	0
6-4-10 to 6-10-10	0	3	0	1	0	2	0	0	0	0	11	3	5	10	0	0	0	4	0
6-11-10 to 6-17-10	0	2	0	0	0	1	0	0	0	2	14	6	9	8	0	3	0	8	0
6-18-10 to 6-24-10	1	0	0	0	0	1	0	0	0	0	34	21	21	25	0	3	0	0	0
6-25-10 to 7-1-10	1	1	0	0	0	2	0	0	0	0	12	3	10	4	1	0	0	7	0
7-2-10 to 7-8-10	3	0	1	0	0	2	0	0	0	0	39	18	30	27	0	0	0	9	2
7-9-10 to 7-15-10	1	1	0	0	0	1	0	0	0	0	26	9	17	16	0	0	1	17	0
7-16-10 to 7-22-10	0	1	0	0	0	1	0	0	0	0	21	16	16	18	0	2	0	15	0
7-23-10 to 7-29-10	3	4	0	1	1	5	0	0	0	0	16	11	10	9	0	0	0	1	0
7-30-10 to 8-5-10	0	6	0	0	0	6	0	0	0	0	32	13	24	18	1	2	0	11	0
8-6-10 to 8-12-10	0	0	0	0	0	0	0	0	0	0	2	1	1	2	0	0	0	1	0
8-13-10 to 8-19-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-20-10 to 8-26-10	1	3	0	0	0	4	0	0	0	0	13	12	11	4	0	1	0	0	0
8-27-10 to 9-2-10	1	0	0	0	0	1	0	0	0	0	48	45	45	0	0	0	0	0	0
9-3-10 to 9-6-10	0	0	0	0	0	0	0	0	0	0	7	7	6	3	0	0	0	1	0
totals	17	21	1	2	1	31	0	0	0	3	305	177	226	162	2	13	3	90	2

Table 5- EWM = Eurasian watermilfoil; BW = bladderwort; NM = native milfoil; GRS = grass; WC= water chestnut; ZM = Zebra mussel; VLM = variable leaf milfoil; I = inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = drained livewell; Dis = disposed of unused bait; Dry = dried boat

Fragment viability and rootlet formation in Eurasian watermilfoil after desiccation

By Celia Ann Evans[1], K. M. Forrest[2], D. L. Kelting[3], L. E. Steblen[2]

Editor's Note:

This project was conceived in 2009 to address a lack of data surrounding questions regarding how long boats need to be dried or out of water before attached and/or hidden Eurasian watermilfoil (*Myriophyllum spicatum*) fragments can be reasonably considered non-viable. The typical time period cited by boat ramp programs is one to two weeks, but we could find no science to substantiate this figure. We conclude that this is simply an educated guess. To attempt to quantify this estimate, Watershed Stewardship Program (WSP) Science Director Dr. Evans designed a study to dry milfoil under laboratory conditions and then reintroduce it under both laboratory and controlled in situ environments and check for re-growth as evidenced by rootlet production. Several watershed stewards participated in obtaining the samples, processing and flagging them, drying and weighing them in the Adirondack Watershed Institute's laboratory, building the isolation cages for the in-field regrowth element of the study, and analyzing the findings. The study involved a considerable amount of steward field and laboratory time, and depended on the resources of most of the WSP team, including the Adirondack Watershed Institute Director, Dr. Kelting. We could find no other study that attempted to quantify Eurasian watermilfoil viability subsequent to drying and are hopeful that this work contributes significantly to science's understanding of the organism's reproduction and potential for spread via transport on motorboats used by the public.

Abstract

Eurasian watermilfoil often invades aquatic ecosystems in North America via fragment transport from infested lakes to uninfested water bodies by watercraft and boat trailers. While fragments transported on watercraft and trailers are likely introduced to new water bodies in various stages of desiccation, surprisingly little is known about the desiccation tolerance and subsequent viability of Eurasian watermilfoil. We conducted *in-situ* and laboratory experiments, during the growing season in 2010 to examine 1) the rate at which Eurasian watermilfoil desiccates, 2) the likelihood of new growth and rootlet formation in control fragments and fragments that had been desiccated for 3, 6, 18, 24 and 48 hours, and, 3) time until new growth and rootlet formation in the different treatment groups. We found that desiccation over time fit a Michaelis-Menten type function on which 87% and 96% desiccation occurred after just 3 and 6 hours respectively and 100% desiccation of milfoil strands

occurred at approximately 13 hours under laboratory conditions. Based on a logistic regression model, desiccation significantly reduced the likelihood of fragment viability from 98% in control fragments to 2% in fragments that were completely (100%) desiccated in the laboratory experiment. Desiccation also increased the time until new growth and rootlet formation. In control treatments, 20% of Eurasian watermilfoil nodes produced new growth (via lateral bud growth) after 5 weeks and 90% of those produced rootlets. We learned that while desiccation significantly reduced viability, a small proportion of fragments that were 100% dried were still viable and able to form rootlets.

Key Words*: desiccation tolerance, logistic regression, drying, watermilfoil physiology*

Introduction

Eurasian watermilfoil (*Myrophyllum spicatum* L.) is a submersed rooted, aquatic perennial that continues to invade and negatively influence recreational activity and alter the structure of littoral zone ecosystems across a wide geographic distribution outside of its native range. In the Adirondack Park of Northern New York State, the Adirondack Park Invasive Plant Program (APIPP) reported 79 lakes infested with aquatic invasive plants in 2010, 55 of which were reported to contain Eurasian watermilfoil, making it the most common aquatic invasive plant in the Adirondack region (T. Smith, personal communication, November 22, 2010). Working in collaboration with APIPP, the Adirondack Watershed Institute of Paul Smith's College manages a spread prevention initiative called the Watershed Stewardship Program, wherein Stewards work at boat launches in the Adirondack Park to inspect watercraft, collect data on boater demographics, and educate boaters about the ways in which they can reduce the likelihood of transporting invasive species from lake to lake. While doing this work, Stewards regularly pull fragments of aquatic plants off of boats and trailers. Stewards stationed at 7 boat launches in 2008 and 8 boat launches in 2009 (for varying numbers of days per week) identified and removed 21 and 12 Eurasian watermilfoil fragments (in those years, respectively) from boats and trailers preparing to launch into lakes without Eurasian watermilfoil populations (Watershed Stewardship Program 2008 and 2009). These fragments were in various stages of desiccation.

Dispersal of Eurasian watermilfoil within lakes occurs primarily by stolon growth and secondarily by fragmentation; seeds are thought to be a relatively unimportant means of dispersal (Madsen and Smith 1997). Autofragmentation occurs in mid-late summer when biomass is greatest in the top 20 cm of growth. Some nodes develop rootlets and begin to abscise from the plant below and can be carried by currents to surrounding areas to settle and establish. Allofragmentation occurs from disturbance such as boat motors, paddles, wind etc. that breaks fragments free from rooted stems and similarly allows establishment of new colonies. In a Texas study, fragmentation was responsible for 26% of the spread of Eurasian watermilfoil within the study ponds, while in Lake George, NY, 46% of fragments that settled in the sediment established as new plants (Madsen and Smith 1997).

Long distance dispersal of Eurasian watermilfoil from one water body to another appears to be caused mainly by the transfer of fragments on water craft and water craft trailers. In a New Zealand study nearly 20% of the aquatic wetland flora were introduced species, and the inter-lake movement of boats was almost exclusively the cause of the transfer of aquatic weeds. Johnstone et al. (1985) reported that none of the 5 invasive species they were studying were found in lakes with no boating or fishing activity.

Once Eurasian watermilfoil has established in a lake it is rarely possible to eradicate it through management efforts. Among other methods, benthic matting (Mayer 1978) and hand pulling operations (Kelting and Laxson 2010) have been shown to be effective at significantly reducing milfoil density. In Upper Saranac Lake, NY in the Adirondack Park, after 2 years of intensive hand harvesting, Eurasian watermilfoil was reduced to <5% cover for over 90% of the littoral zone. The cost of a program like this is astronomical, however, and not economically feasible in most cases. In the context of the above information, efforts to prevent the initial invasion are likely the best option for uninfected lakes.

Figure 1- Eurasian watermilfoil. Credit: John Carl D'Annibale / Times Union

A study conducted in the Great Lakes Region showed that while high pressure boat washing and visual inspection reduced the amount of macrophytes introduced to water bodies by boats by 88%, only about 1/3 of registered boaters always take these precautions (Rothlisberger et al. 2010), suggesting that there is much work still to be done to educate the boating public with the hope of changing behaviors. Surprisingly little published information exists about how drying or desiccation influences the viability of aquatic invasive plant fragments. A New Zealand study showed that survivorship of fragments decreased greatly with % water loss and that there were differences in desiccation tolerance among the aquatic macrophyte species in that study (Johnstone et al. 1985). In the only information we could find on the effects of desiccation in Eurasian watermilfoil, Barnes et al. (2009) reported that desiccation after 1 hour and 3 hours was 70% and 90% respectively and that fragments that were coiled as they dried were substantially less dry after the same time period. In most plants, particularly the higher plants (i.e. angiosperms) sufficient drying results in death. The term desiccation tolerance is used to describe the condition in which the adults of the species (not just the inactive stages such as seeds or spores) can tolerate drying. Approximately <0.1% of angiosperms have been shown to be desiccation tolerant (Alpert 2000), though it is more common in bryophytes (Proctor 2000).

The level of desiccation tolerance in Eurasian watermilfoil has not been yet established but the rapid spread of this common invasive plant in North America via boats and boat trailers suggests that tolerance of plant tissue or dormant lateral buds to desiccation is a likely characteristic of at least some proportion of individuals in the species. Understanding the levels of tolerance of aquatic plants to desiccation is critical in being able eventually model the probability of new invasions. Indeed, a better understanding of how drying affects growth and development of Eurasian watermilfoil will provide valuable information for managers and educators as well.

In order to understand the viability of Eurasian watermilfoil, after different degrees of drying, we set out to determine, 1) the rate at which desiccation occurs in Eurasian watermilfoil, 2) the proportion of fragments or nodes likely to form rootlets in undesiccated (control) fragments and in fragments that had been desiccated for 3, 6, 18, 24 and 48 hours, and, 3) the length of time it takes for rootlets to form in the different treatment groups.

Methods

During the summer of 2010, we conducted two *in- situ* experiments and one in lab experiment to determine the viability of Eurasian watermilfoil after different drying times resulting in varying levels of desiccation. The two in-situ experiments were conducted in Eurasian watermilfoil infested lakes: Second Pond (44.282755, -74.184237) and Little Lake Colby (44.329988, -74.151621), both located in the Saranac River watershed in the northern Adirondack Park of New York State.

Field Experiments. Fragments of Eurasian watermilfoil were harvested from infected lakes in the northern Adirondack Park in the vicinity of Paul Smiths, NY where beds were easily accessible by canoe, or where hand harvesting operations were being conducted. Sixty strands of Eurasian watermilfoil, each 10 nodes long were selected for each experimental trial. Individual strands were measured, patted dry and weighed. The samples were then laid out to air dry in a low humidity, room temperature laboratory for 3, 6, 18, 24, or 48 hours, with ten replicate strands in each treatment. After the sample groups had dried, and after they were re-weighed, each individual replicate was marked by loosely tying short lengths of embroidery thread between the second and third node on each end, so we could track the progress of individual strands. The control treatments consisted of 10 fragments that were patted dry, weighed, measured and put immediately back into lake water.

Six, 50cm X 40cm X 40cm cages were constructed out of 1 cm hardware cloth zip ties. These cages were placed at Second Pond (6/24/10 to 7/15/10) and in Little Lake Colby (7/23/10 to 8/27/10) in a sandy area of the littoral zone for 4 and 5 weeks respectively. The cages were submerged to just below the surface in about 75 cm of water in the littoral zone attached to narrow wooden stakes with zip ties.

The cages were checked and data collected at weeks 2 through 4 at Second Pond, and weeks 1 through 5 weeks at Little Lake Colby to determine viability of strands using proportion of new growth and rootlet formation as indices. It should be noted that due to desiccation damage to plant tissue, and

various amounts of wave action, fragments from desiccation treatments were lost over time from cages in the field experiments and so qualitative data are presented here, rather than statistical analyses (see *Observation of plant tissue integrity and growth* section).

Laboratory experiment. We conducted a laboratory experiment using the same drying treatments and methods. After weighing, measuring and drying we placed 10 Eurasian watermilfoil fragments (each with 10 nodes) from each treatment into clear plastic basins containing water from Lower St. Regis Lake in a temperature controlled laboratory (around 21^{o}C) under grow lights set at a height of approximately 1.3m above the basins. The lights were set to a cycle of 16 hours on and 8 hours off. Water levels in the basins were marked, and at least 1/5 of the water was changed every 3-5 days with freshly collected lake water to increase aeration and provide new nutrients. Starting at day 7, strands were examined and data collected on new growth and rootlet development for 5 weeks.

Desiccation controls. In 2009 (a preliminary study) and 2010, ten (each) additional 10-node fragments were used as a desiccation control, to determine the total % water by weight in milfoil strands so we could determine the % of total desiccation for each strand in each of the drying treatments. In each year these fragments were weighed and placed in an oven set at 45°C for 48 hours or until no further mass loss. Percent water weight was determined as: ((fresh mass – oven dry mass)/fresh mass) *100. There was no significant difference between % water weight of Eurasian watermilfoil strands between years so 2009 and 2010 data were combined to determine the mean.

Data Analysis. Drying of fragments in 2009 and in 2010 showed that Eurasian watermilfoil is 88.9 ($\pm$ 0.35 SD) and 88.2 ($\pm$ 1.4 SD) and percent water by weight respectively (not significantly different across years). These data were used to determine the percent of total desiccation for each fragment that occurred as a function of the drying time. Because we subtracted the percent mass loss of each fragment from the average percent water weight of the strands in the desiccation control trials, percent total desiccation is presented with 95% confidence intervals that occasionally exceed 100%. We decided that this would be the most honest and appropriate way to display the data on percent desiccation even though plants could not, in reality, be >100% desiccated.

Percent desiccation due to drying time was not different in either of the two field experiments or the laboratory experiment, therefore desiccation data from the three trials were pooled to analyze fragment drying rates. We used logistic regression on laboratory data to determine the probabilities of fragments producing new growth and fragments producing rootlets in the different drying treatment. We developed full and reduced logistic regression models to look at the effect of drying treatment, experimental time and the interaction between drying and time on production of new growth (indicating viability). All statistics were done using Mini-tab (version 15). We present qualitative data for evidence of rootlet production in laboratory and field experiments because sample size was too small for logistic regression and also for growth in *in-situ* pond studies since logistic regression was not valid due to loss over time of fragments from cages in the lakes.

Results and Discussion

Desiccation of Eurasian watermilfoil *due to drying.* We fit a Michaelis-Menten type function to the relationship between percent total desiccation and drying time (Figure 1). The strands were 87% desiccated after just 3 hours of drying under our laboratory conditions of room temperature and low humidity. After 6 hours of drying, the percent desiccation of strands ranged between 93 and 99 percent. After 18 hours of drying and beyond, all measurable water was lost from the strands. Using the equation for the fitted function we estimate that 100% desiccation occurs at approximately 13 hours.

Eurasian watermilfoil dried quickly under the conditions in this study. Rapid drying has been associated with desiccation tolerance, especially with bryophytes, but also in vascular plants (Gaff 1997). It has been proposed that rapid loss of water reduces damage that can occur during rehydration and that the greatest amount of damage to plant tissues may be sustained at intermediate dryness levels (Alpert 2000). Our data for desiccation rates are very close to those reported for Eurasian watermilfoil by Barnes et al. (2009) in which 3 hours of drying resulted in 90% desiccation.

Fragment viability - effect of drying treatment and time on new growth in the laboratory.

Full and reduced logistic regression models showed that drying treatment alone significantly reduced the likelihood of new growth on desiccated milfoil fragments ($z = -7.24$, $p = 0.000$, reduced model, Table 1). Using the reduced model in Table one, we predicted the probability of new growth. Control fragments had a probability of 0.98 of producing new growth while fragments dried for only 3 hours resulting in 87% desiccation had significantly reduced probability of viability of 0.06 and completely desiccated plants had a probability of viability of 0.02 (Table 2). The confidence intervals for desiccation percentages greater than 0 are large, so a larger sample size is needed to narrow the confidence limits around the probability for dry fragments. Regardless, there is a probability greater than zero of highly desiccated fragments producing growth.

No loss of tissue could occur over time in the laboratory experiment, which provided insight to the loss of fragments over time in the field experiments. Control treatment fragments were buoyant for the entire period of the experiment while fragments from the 3 hour drying treatment were initially buoyant and then began to sink in week 3. All other treatments were not buoyant after drying as noted above. The only disturbance in laboratory basins was the changing of water every 3 to 5 days. Even this minimal disturbance began to break apart the most desiccated strands within 2-3 weeks. After 4 weeks of no evidence of new growth in the 18 through 48 hour drying treatments (100% desiccated) we were about to end the experiment, when we observed new growth and rootlet development in both the 18 and 48 hour drying treatments.

Observation of plant tissue integrity and growth after drying in pond experiments. The same disintegration of plant tissue we observed in the laboratory experiment lead to the loss of fragments or partial fragments from cages in the field over time (aided in Second Pond by heavy wave action).

After 2 weeks in Second Pond the cages were checked and partial fragments remained in the control, 3, 6 and 18 hour drying treatments. There was no new growth in any of the treatments, and fragments were longest and most abundant in the control treatment, shorter and fewer in the 3 hour drying treatment, and even smaller and fewer fragments after 6 and 18 hours of drying. There were no fragments remaining in the 24 hour and 48 hour drying treatments. After three weeks, the control treatment contained fewer and shorter fragments; however a proportion of remaining fragments showed new growth, some with rootlets. The three hour treatment also showed new growth, however in a reduced proportion of remaining fragments and with no rootlet production. Only a few partial fragments remained in the 6 hour drying treatment with none showing new growth. After 4 weeks, only several short fragments remained in the control cage.

After just one week in the Little Lake Colby experiment the control treatment showed new growth. The other treatments had no new growth and appeared to be in the process of disintegrating. In the second week the Little Lake Colby control group had new growth on all 10 fragments, some with rootlet growth. The 3 hour drying treatment had one fragment with new growth after two weeks, and all the rest of the samples showed no new development. By the third week rootlets appeared on 8 of 10 control fragments and new growth was found on every fragment. Also a second strand in the 3 hour drying treatment had new growth. By the fourth week the 6, 18, 24, and 48 hour drying treatments no longer contained fragments due to disintegration of tissue and loss from cages.

Effect of desiccation on node viability in the laboratory. Table 3 presents the data for proportion of 100 nodes (10 fragments of 10 nodes each) in each drying treatment in the laboratory in which we observed new growth and the proportion of those which formed rootlets. Because all fragments remained in the basins for the entire experimental time, unlike the *in-situ* experiments, we could calculate the proportion of viability on a per node basis which allows us to think about viability in plant fragments of different lengths (# of nodes). New growth began in the first week in the control and 3 hour (87% desiccation) drying treatments. The proportion of nodes with new growth increased through time in the control treatment. In the 3 hour drying treatment the new growth observed after the first week was not observed again until week 5 (day 33) with a proportion of viable nodes of only 0.01. No growth was observed in the 6 hour (96%) and 18, 24, and 48 hour (100% desiccation) drying treatments until week 5 when the proportion of viable nodes in the 6, 18 and 48 hour drying treatments were each 0.01.

Rootlet production began in the control treatment in the 3rd week of the experiment where the proportion of nodes with new growth forming rootlets was 0.3. By the end of the experiment the proportion of nodes forming new growth in the control was 0.2 and the proportion of those nodes that formed rootlets was 0.9. These data suggest that at least 20% of Eurasian watermilfoil nodes contain viable dormant lateral buds. All fragments we used had the apical tip and between 5 – 10 cm of the upper stem removed because it was difficult to count the crowded nodes of the tips. The removal of the apical tips likely released some dormant lateral buds. However the process of desiccation *per se* may initiate physiological changes leading to growth in some aquatic plant buds (Malek 1981). To be able to move forward and predict the likelihood that desiccated fragments will be viable when introduced to

new lakes we need to learn more about the ratio of lateral buds/node (Johnstone et al. 1985) and mechanisms of lateral bud growth initiation. If release from apical dominance is partially or mostly responsible for initiation of bud growth, then the likelihood of viability will be different for fragments that include the terminal growth and those that have had that terminal growth removed.

Of the other 4 treatments that produced one instance of new growth, two (3 and 18 hour drying treatments) did not produce a rootlet during the experiment but the other two (6 and 48 hour drying treatments) each showed rootlet growth. It should be noted that new growth and rootlet development were delayed until after week 4 in these treatments. If we present these data in desiccation categories, as we did for the regression analysis, the 96% desiccation (6 hour drying) had a 0.01 probability of a node producing new growth and the 100% desiccation (18, 24, and 48 hour) showed new growth and rootlet development, a proportion of 0.007 (2 out of 300 nodes were viable). These data represent a valuable first estimate and could be useful in initial predictions of time until invasion of new lakes where boater traffic and incidents of fragment transport and number of nodes of Eurasian watermilfoil are available.

Both the quantitative and qualitative analyses show a significant reduction in viability as a function of desiccation. However, even after long desiccation time and 100% loss of measurable water some small fraction of fragments (nodes within fragments) were able to produce growth. Our data suggest that once new growth is initiated, rootlets usually follow. The initiation of new growth in Eurasian watermilfoil does not appear to be the rehydration of leaf tissue, but rather the rehydration of dormant lateral buds which produce new stems and rootlets. Eurasian watermilfoil does not appear to have a high tolerance to desiccation; however, some lateral buds can withstand full drying and eventually produce new growth. This is similar to what Johnstone et al. (1985) found for several aquatic invasive species they studied in New Zealand They reported that after 50% mass loss of fragments, all leaves on the fragment died, but fragments still were able to grow from lateral buds.

Mechanisms of tolerance to desiccation probably include both cellular and sub-cellular level responses to oxidative damage and possibly mechanisms that reduce physical damage to cell membranes when desiccated cells begin to lose turgor (Alpert 2000). If there is variability within Eurasian watermilfoil populations for tolerance to desiccation, then fragments that ultimately are successful in colonizing new lakes that are transported via watercraft will be those that can withstand desiccation. It seems that long distance transport of milfoil strands could create a strong selection pressure against fragments of plants that are not tolerant to desiccation, potentially resulting in substantially increased desiccation tolerance in subsequently colonized lakes.

In conclusion, Eurasian watermilfoil fragments dry out quickly, at least under the conditions in our study (room temperature and relatively low humidity). After 3 hours, fragments contained only an average of 13% of the original moisture. Loss of tissue integrity and a significant reduction in viability are associated with desiccation. Decreased viability was a function of percent desiccation and was statistically significant and also shown qualitatively by both the reduction in production of new growth and rootlets and also by the longer time it took for the development of new growth and rootlets in dryer

fragments. While this is good news, and the likelihood of growth and root production of a desiccated or partially desiccated fragment is much reduced, it is not, however, eliminated. Our data suggest that for fragments that are 100% dry there is still a 0.02 probability of new growth and that the new growth will likely form rootlets. Moreover, one of the incidences of rootlet formation in the 100% desiccation group was in the 48 hour drying treatment. Based on our desiccation rate curve full desiccation occurred in 13 hours, so this tissue was viable after having been fully desiccated for 35 hours. This suggests that at least a small amount of Eurasian watermilfoil dormant lateral buds are highly desiccation tolerant.

Our data can not estimate the likelihood of establishment of fragments once introduced to a new lake, since environmental variables such as lake sediment texture, nutrient composition, and light environment (Grace and Wetzel 1978) will also play a role in the establishment of any viable Eurasian watermilfoil fragments. Nor can our data be used to determine a minimum drying time to reduce viability to zero: 1) because our treatments did not result in zero viability, and 2) because drying conditions in the environment where fragments are clinging to watercraft may be very different than in this study. Fragments transported along with watercraft in wells, on bunks of trailers and other locations may be kept moist to a greater or lesser degree. Barnes et al. (2009) found that coiled Eurasian watermilfoil fragments desiccated much more slowly than uncoiled fragments. More work is needed to better understand the relationship between desiccation and viability under different environmental conditions and in different populations of Eurasian watermilfoil. It will be valuable to consider how this information can be applied in modeling the likelihood of new Eurasian watermilfoil colony establishment from lake to lake.

In the meantime, the results of this study can be used to emphasize the need for continued vigilance on the part of educators and boaters, as fragments that look, feel and are dry may indeed still be viable. In order to reduce invasion of Eurasian watermilfoil into new lakes, the inspection and removal of all plant material (regardless of the observed apparent condition) and careful boat washing are critical practices.

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Footnotes

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Tables and Figures

Predictor	Coefficient	S.E. Coefficient	Z Statistic	P value	Odds Ratio	Confidence Intervals for the Odds Ratio	
						Lower 95% CI	Upper 95% CI
Model 1							
Constant	1.696	1.818	0.93	0.351			
Desiccation	-0.085	0.024	-3.5	0	0.92	0.88	0.96
Days	0.139	0.125	1.11	0.268	1.15	0.9	1.47
Desiccation x Days	-0.0004	0.0014	-0.27	0.79	1	1	1
Model 2							
Constant	4.031	0.97	4.15	0			
Desiccation	-0.079	0.011	-7.24	0	0.92	0.91	0.94

Table 1- Results of logistic regression analysis on the probability of fragments producing new growth as a function of percent fragment desiccation and incubation days for a laboratory incubation study.

Desiccation %	Probability	95% Confidence Interval	
		Lower	Upper
0	0.98	0.89	1
87	0.06	0	0.72
96	0.03	0	0.61
100	0.02	0	0.55

Table 2- Probability and 95% confidence intervals for probability of fragments producing new growth as a function of percent fragment desiccation for a laboratory study predicted using the logistic regression model 2 in Table 1.

Experimental day	Drying Treatment (hours)	% Desiccation	Proportion of nodes with new growth	Proportion of new growth with rootlets
	0	0	0.09	0
	3	87	0.01	0
7	6	96	0	NA
	18	100	0	NA
	24	100	0	NA
	48	100	0	NA
	0	0	0.14	0
	3	87	0	NA
14	6	96	0	NA
	18	100	0	NA
	24	100	0	NA
	48	100	0	NA
	0	0	0.17	0.3
	3	87	0	NA
20	6	96	0	NA
	18	100	0	NA
	24	100	0	NA
	48	100	0	NA
	0	0	0.17	0.71
	3	87	0	NA
26	6	96	0	NA
	18	100	0	NA
	24	100	0	NA
	48	100	0	NA
	0	0	0.2	0.9
	3	87	0.01	0
33	6	96	0.01	1
	18	100	0.01	0
	24	100	0	NA
	48	100	0.01	1

Table 3-Data from a laboratory experiment examining the new growth and rootlet development over time after exposure to drying which lead to different degrees of desiccation in European Water Milfoil (Myriophyllum spicatum) Each drying treatment contained 10 replicate strands, each 10 nodes long, resulting in 100 nodes per drying treatment. Qualitative data are presented as proportion of nodes rather than fragments that grew and rooted. NA = not applicable because in those treatments/time there is no new growth that could form rootlets.

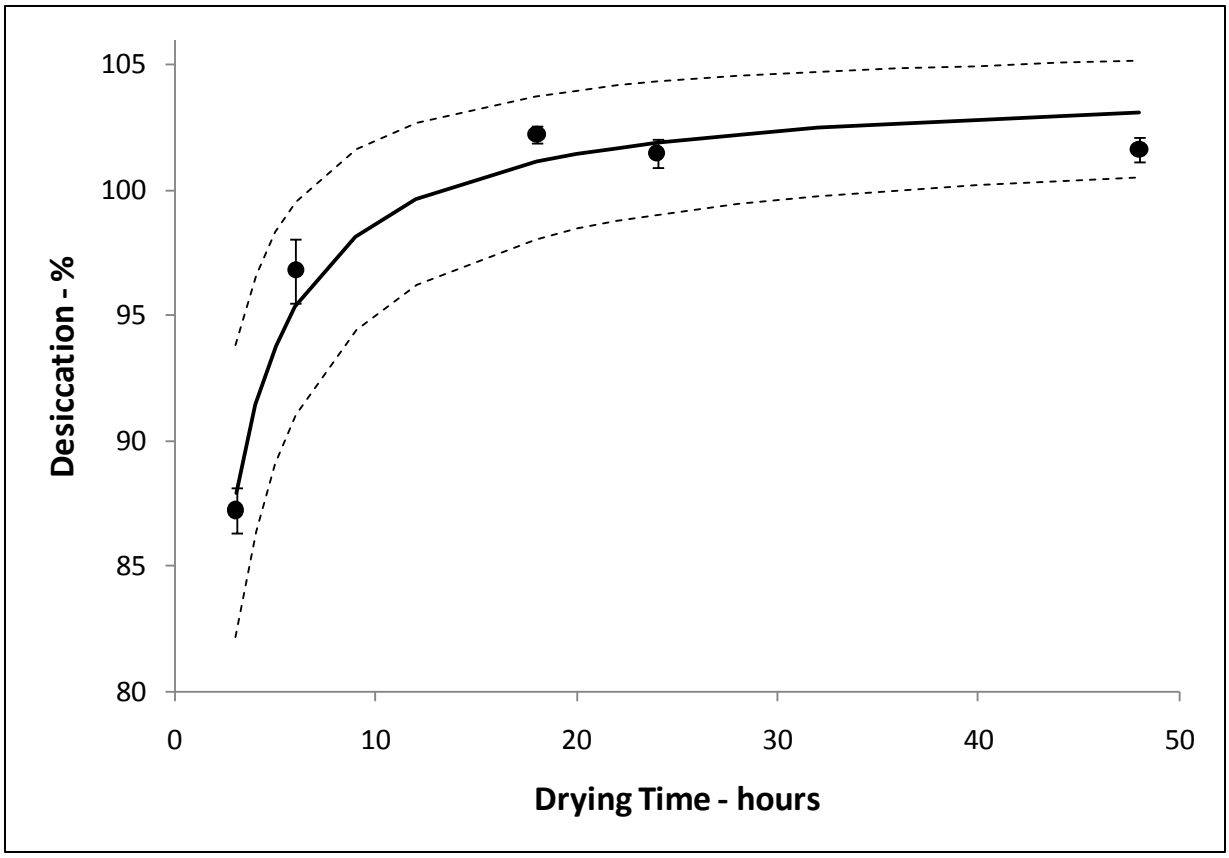

Figure 2- The average percent fragment desiccation versus drying time with bars showint + one standard error of the mean, n=30. A Michaelis-Menten function was fit to the data and the equation shows that drying time explained 95% of the variation in desiccation%, with 100% desiccation occurring in about 13 hours drying time. Dashed lines are upper and lower 95% confidence intervals for the predicted desiccation %.

Loon Monitoring Report: St. Regis Lakes

By: Matthew Rankin, Watershed Steward

Figure 1- Common loons on St. Regis Lake

Introduction

The Common Loon *(Gavia immer)* is a large, long-bodied, heavy-billed, diving bird with a breeding range that stretches across a broad band of boreal and mixed forest in North America. The Common Loon's preferred habitat is fresh, clear, oligotrophic lakes, with rocky shorelines, numerous islands, and surrounded by forest. Loons find prey by peering into the water while floating, and foot-propelled underwater pursuit is initiated upon locating prey (Barr 1973). Their diet consists mainly of fusiform, soft-scaled fish ranging in size from 10-70g (Forbush 1925). Common Loons form monogamous pairs on breeding grounds (McIntyre 1988a). Upon finding a mate, Common Loons are territorial, and will protect their territory if a stray loon poses an imminent threat to either the territorial pairs health or food supply. Pairs often arrive separately on breeding grounds, but typically remain together throughout the summer. Courtship displays are simple, and involve a series of head-turns until one loon solicits copulation, which always occurs on land (McIntyre 1988a). The nesting site is selected by the pair. A floating bog mat is best, but island shoreline, near water deep enough for underwater approach and escape is also preferred as opposed to mainland shorelines which are prone to predation and flooding (McIntyre 1988a). The Common Loon typically has a clutch size of two eggs per breeding season (McIntyre 1997).

The reproductive success of the pair is determined by the number of hatchlings that survive to the fledgling age. Mercury contamination has contributed to elevated mortality rates of adult and juvenile loons. Methylmercury levels in aquatic ecosystems are increased by industrial processes such

as, atmospheric dispersal from coal-fired power plants and point-sources such as pulp mills and watershed disturbances (Brossert 1982). Common Loons are highly susceptible to bioaccumulation of these aquatic toxins because they are secondary consumers and consume mostly fish; organisms that readily absorbs methylmercury through their flesh and accumulates in their body fat. The Biodiversity Research Institutes Adirondack Center for Loon Conservation annually captures Common Loons in the Adirondack Park, banding them and collecting blood samples used to determine blood mercury levels. Behavior and reproductive success of territorial loons is adversely effected by methylmercury levels, which is the primary mission of BRI's field staff in monitoring the progress and reproductive success of banded loons across the Adirondack park.

The goal of this program is monitor Common Loon populations and determine the effect of heavy metal pollution in aquatic ecosystems and how its effects the Common Loons behavior and reproductive success.

Methods

The Watershed Steward working for the Biodiversity Research Institute's Adirondack Center for Loon Conservation was responsible for monitoring Common Loon (*Gavia immer)* populations on Upper St. Regis Lake, Spitfire Lake, and Lower St. Regis Lake for the 2010 summer season. Monitoring began on June 6th, 2010, and ended August 28th, 2010. Loon observation was done 1- 2 days per week, depending on weather conditions, using a canoe to paddle to the four territories; Birch Island, Spring Bay (Upper St. Regis Lake), Rock Island (Spitfire Lake), and River Territory (Lower St. Regis Lake). Observation began at 7:00am in order to take advantage of calm waters, with trip duration approximately 6 hours. Using 10 x 42 binoculars, Common Loon observations and behaviors were recorded in a field notepad so that they could be recalled upon transcribing them on the Loon Lake Survey Table (LLST). Data recorded included Common Loon behavior, weather information, number of Common Loons observed and the presence of territorial pairs and nesting pairs, nest location and type, clutch size, and number of successful hatchlings and fledglings.

Results

<u>Upper St. Regis Lake</u>

In the summer of 2010, Upper St. Regis Lake contained two territories; Birch Island and Averill Spring Bay. The Birch Island territory contained a territorial and nesting pair which was observed from June 9th, to August 28th. The nesting site was located on the lee side of the first island west of Birch Island under dense understory. The earliest date when this pair began nesting was June 9th. The clutch size was not observed due to constant incubation of the eggs by the loon pair. As early as June 17th, a nest failure was observed and no eggshell fragments, or other evidence was left behind, resulting in an unknown cause of failure. However, this pair renested on June 30th in a different (uninhabited) territory

located on the south side of the lake in a small cove. The clutch size was observed on July 28th, with one egg on the nest. However, this was also the first day that neither adult loon had been observed incubating the egg. The nest was deemed abandoned on July 30th, exactly 30 days after they had renested. One whole egg was collected and sent to BRI for further analysis. The female was banded and determined to be loon # 898-091-14. This banded female nested in the Birch Island territory for the past three years. The male was unbanded, however, it can be speculated that he was the same male as in 2009. The loon pair was last seen on August 28th, healthy and foraging in Upper St. Regis Lake.

The Averill Spring Bay territory contained a territorial and nesting pair which was observed from June 9th, through August 28th. The nest site was located atop a small marsh island in the southernmost area of the bay. The earliest date when this pair began nesting was June 10th. The clutch size was not observed due to continuous incubation by the loon pair. One egg successfully hatched on June 14th, and a second on June 15th. However, observations on June 28th determined one chick went missing and has not been seen since; cause of death was most likely avian predation. Leg bands were not observed on either loon this summer, so it can only be speculated that this was the same pair as last year. The loon pair was seemingly healthy along with their chick as of August 28th, 2010.

Spitfire Lake

Spitfire Lake contained one territorial and nesting pair which was observed from June 9th, to August 28th. In the year 2009, this pair hatched one chick that went missing days after it hatched. This year, the pair built a hummock nest on the rocky island in the westernmost side of the bay. The pair produced a clutch of 2 eggs, and had one successfully hatch on June 19th. The other egg was abandoned by the loon pair on June 22nd, leaving an abandoned, intact, whole egg on the nest. The egg was collected and sent to BRI in Maine for further analysis. The loon chick was observed healthy and in the water with the pair beginning on June 19th. The male was unbanded. The female was banded and identified as loon # 649-088-50. The female loon was the same as last year. The male last year was banded, ergo, it was not the same male loon as this year. The loon pair and their chick was last observed on August 28th and appeared thriving and healthy in Spitfire Lake.

Lower St. Regis Lake

Lower St. Regis Lake contained one territorial pair which was observed from June 9th, to August 28th. This territorial pair built a hummock nest on a marsh peninsula in the slough entering Spitfire Lake. The pair nested in the same location in 2009, and produced 2 healthy chicks. For 2010, the pair produced a clutch of 2 eggs, neither of which successfully hatched. The nest was abandoned on August 5th after 57 days of incubation, with the cause of nest failure unknown. The male was banded and identified as loon # 898-090-98 and occupied the same territory during the summer of 2009. The females bands were not clearly seen, however, she was observed to have been banded. This healthy loon pair was last seen foraging and swimming in Lower St. Regis Lake on August 28th, 2010.

Discussion

The Adirondack Center for Loon Conservation focuses much of their research on the impact of environmental pollution to aquatic ecosystems and wildlife. The nights of July 15th-18th, 2010, employees from Biodiversity Research Institute, the New York State Department of Environmental Conservation and the Wildlife Conservation Society teamed up to form banding crews which spent the nighttime hours on the water banding loons and collecting blood samples. BRI analyzed blood samples for toxins such as lead and mercury in order to better understand the effects of heavy metal pollution levels on loon behavior and reproductive success. Low levels of blood mercury results in greater reproductive success and a greater ability for species populations to expand into unpopulated lakes in North America. High mercury contamination levels would disrupt the already fragile nature of Common Loon reproductive levels, which are evident by the ratio between cumulative nest clutch sizes and total fledglings.

Conclusion

Throughout the three lakes, there were four territorial and nesting pairs of Common Loons. Three of the eight Common Loons were banded, assisting in long-term research of the Common Loon species by the Biodiversity Research Institute's Adirondack Center for Loon Conservation and the New York State Department of Conservation's Wildlife Bureau. Two pairs hatched three chicks, with only two chicks surviving as of August 28th, 2010. The other two pairs had unsuccessful nesting in 2010. Poor success rates such as these emphasize how critical it is for humans to understand that physical disturbance of both adult and young loons can be detrimental to their health. It was deemed very likely, from witness accounts, that one egg had been abandoned on the nest due to high pressure disturbance from humans. It is imperative that people enjoy the beauty of the Common Loon from a distance in order not to endanger their health, or disturb the rearing of their young. Informing the public of the loon's needs will decrease anthropogenic impacts on Common Loon populations throughout the Adirondacks.

The mean reproduction rate between 2008 and 2010 remained constant; however, their ability to successfully hatching and fledging of offspring decreased. While it is too early to conclude the exact cause of this, it can be suggested that avian predation and human disturbance are the likely causes of decreased reproductive success this year, not toxicity from mercury contamination.

The goal of BRI's research is to evaluate the long-term reproductive success of the Common Loon. Reduction of blood mercury levels in the Common Loon stimulates reproductive success, allowing them to repopulate habitats across North America. Lead poisoning, acid rain, and other types of pollution also pose significant risks to the loon population across North America. Despite these dangers, Common Loon populations in New York State are stable, and possibly increasing (NYSDEC 2010).

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Odonate Abundance and Habitat Patterns at Three Adirondack Lakes

(Upper St. Regis Lake, Buck Pond, Osgood Pond, and Second Pond)

By Kimberly Forrest, Watershed Steward

Introduction

Odonates are classified into two suborders, Ansioptera and Zygoptera, which are commonly called dragonfly and damselfly respectively. Odonates change their habitat during their lifetime, spending most of their time as aquatic larvae where they hatch and capture prey (Lam, 2004). Typically odonates will spend anywhere from 1 to 4 years in the aquatic larvae stage (Remsburg, 2008). Odonate larvae will eventually emerge from the water and mature into their adult form as either a dragonfly or a damselfly. Changes in either habitat could affect odonate abundances in the other (Knight, 2005). Depending on the ovipositor structure of the individual species, odonates will lay their eggs in running water, stagnant water, mud or rotting wood (Mead, 2003). The differences between species egg-laying patterns could influence the patterns and locations of daily odonate commutes (Conrad, 1999).

Many species of odonates spend much of their adult lives out of and away from the water's edge (Conrad, 1999). Maiden flights and daily commutes of odonates occur between wetland breeding areas and adjacent upland habitat used for foraging, maturation, and nocturnal roosting (Bried, 2006). Most odonates are unlikely to move far from the water (Conrad, 1999), and few are capable of moving up to 200 m away from the water's edge (Bried, 2006). Remsburg and Turner (2008) showed a positive relationship between the abundance of larval odonates and abundance of terrestrial vegetation. As vegetation and wood is removed due to lakeshore development, odonate abundances and diversity could decline (Remsburg, 2008). This decline in odonate abundances could have a negative ecological effect on the environment; such as the loss of odonate predators including bluegills (*Lepomismacrochirus*) and largemouth bass (*Micropterussalmoides*). Also a decline in odonates could result in the increase of odonate prey (i.e. mosquitoes, McPeek, 1990).

In this descriptive study we looked to see which of three Adirondack sites had the greatest abundance of odonates, which genus was the most frequent at each site, and the dominant vegetation that the most frequently identified odonates occupied. Also, through observation over several years, we hope to learn more about the relationships between the odonates and their environment in the Adirondacks.

Figure 4- Odonates visiting the arm of a Watershed Steward

Methods

Study Sites

Sampling Sites included Osgood Pond boat launch, Upper St. Regis Boat launch, and Rainbow Lake boat launch in the northern Adirondack Park. Osgood Pond boat launch is on a pond that is surrounded by a mixed forest. The littoral zone of Osgood Pond is very sandy and mucky. There is also a small field near the boat launch and adjacent to the road. Upper St. Regis boat launch gives motorboat and canoe access to Upper St. Regis Lake. To the right of the launch there is a very large wetland that is surrounded by mixed deciduous woods. The dirt road to the launch is surrounded on both sides from anywhere of 1 to 10 feet of grasses and small shrubs before forest is reached. The Rainbow Lake boat launch site gives access to a mixed waterway between Buck Pond and Lake Kushaqua, the Rainbow Narrows and Rainbow Lake. Coniferous woods with small shrubs and bushes largely surround the lake with a small wetland on one side.

Data Collection Methods

Watershed Stewardship Program stewards cooperatively collected data at each site twice a week with the exception of Osgood Pond. Osgood Pond was surveyed once per week. The observation period for a single site was a minimum of forty minutes. Depending on boater traffic, the observation period could be broken into several smaller periods or extended.

Entomologist Janet Mihuc of Paul Smiths College trained the Stewards in the capture and identification of odonates. The 2010 Stewards were all given a combination net and a picture identification key of Franklin County odonates created by Evan Rea (Watershed Steward, 2009) to aid in their data collection. Captured specimens were either held in one's hand or placed in a plastic envelope to determine the species. Common species with distinct markings were not always captured but identified through observation. Specimens that were not identifiable were photographed for expert

examination at a later time. Stewards collected data on the duration of each sapling time, species/taxa name, common name, the method used to identify the odonates, and the established abundance of each species in the area. Also, data were collected on the habitat each odonate was found in which included the vegetation type and height at the time of identification, and the surrounding landscape. The data collected was recorded on a data sheet adapted from the New York State Dragonfly and Damselfly Survey Protocol (NYSDDS). Due to the possibility that specimen could be captured more than once a frequency of odonates was recorded.

Data Analysis

The Upper St. Regis launch had the most search time due to the daily placement of watershed stewards there throughout the 2010 season. Even though Rainbow Lake had the smallest amount of sampling time, approximately 6 times as many odonates were identified there, as were identified at St. Regis boat launch where sampling was the most intense (Table 1).

Site	Total Time Searched (Min)	Total Odonates Caught	Odonata Per Minute
Upper St. Regis Lake	811	36	0.044
Osgood Pond	262	36	0.137
Rainbow Lake	245	66	0.269

Table 1- The total odonates captured for each site for every sampling session for the entire 2010 season.

Dragonfly Genus	Number Identified	Damselfly Genus	Number Identified
Ladona	34	*Enallagma*	42
Epitheca	11	*Agria*	21
Leucorrhinia	6	*Coenagrion*	17
Gomphus	5	*Ischnura*	16
Aeshna	5	*Lestes*	12
Cordula	2	*Nehalennia*	2
Libellula	2		
Sympetrum	2		
Neurocordula	1		

Table 2- The total number of each genus that was identified throughout the 2010 season at all three sampling sites combined.

Some species were spotted and identified more frequently than others. Overall the most common dragonfly genus that was identified was the *Ladona*, which includes Chalk Fronted Corporals, and the least common dragonfly genus identified was *Neurocordula* that includes Stygian Shadowdragons (Mead, 2003). Stygian shadowdragons are primarily active during dusk and on moonlit evenings, but they can also be found flying on overcast days (Mead, 2003). Our study was conducted only during the day and the only Stygian Shadowdragon we found was found on a sunny day, which is unusual. The most damselflies that were identified belong to the genus *Enallagma* that include species such as the Azure Bluet (*Enallagma aspersum*) (Lam, 2004). The damselfly genus that we identified the least was the *Nehalennia*, which includes Sedge Sprites (*Nehalennia Irene*) and Sphagnum Sprites (*Nehalennia gracilis*) (Lam, 2004). Differences in the abundance of odonate groups seen may be due to the temporal maturation of each species, habitat selections of species (Mead, 2003), and/or to the weather (Lam, 2004) during the prime maturation times of each species.

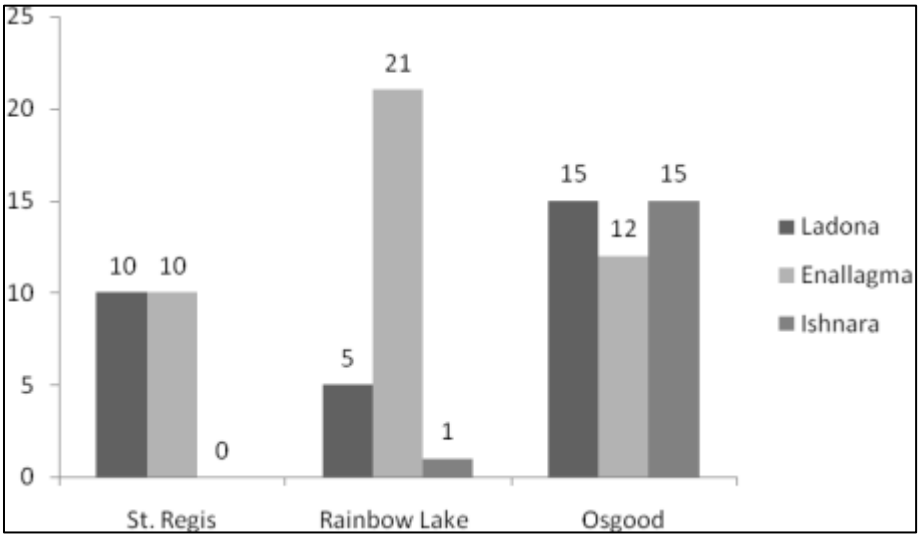

Figure 1- The most common genus of the odonates identified at each of the three sampling sites Upper St. Regis Lake, Rainbow Lake, and Osgood Pond in the Northern Adirondacks. Data was collected from June 2010 through the August 2010.

The most common genera of odonates found at Upper St. Regis Lake were the *Ladona* and the *Enallagma* with 10 identifications each. The most common genus of odonates found at Rainbow Lake was the *Enallagma* with 21 identifications. The genus *Enallagma* consists of various Bluetdamselflies such as the Azure Bluet (*Enallagmaaspersum*), the Skimming Bluet (*Enallagmageminatum*) and the Tule Bluet (*Enallagmacarunculatum*). At Osgood Pond the *Ischnura* was the most common genus that consists of various forktailed damselflies such as the Eastern Forktail (*Ischnuraverticalis*), (Lam, 2004). Damselflies were more abundant overall at Rainbow Lake than at the other two study sites where they were about equal in abundance with dragonflies.

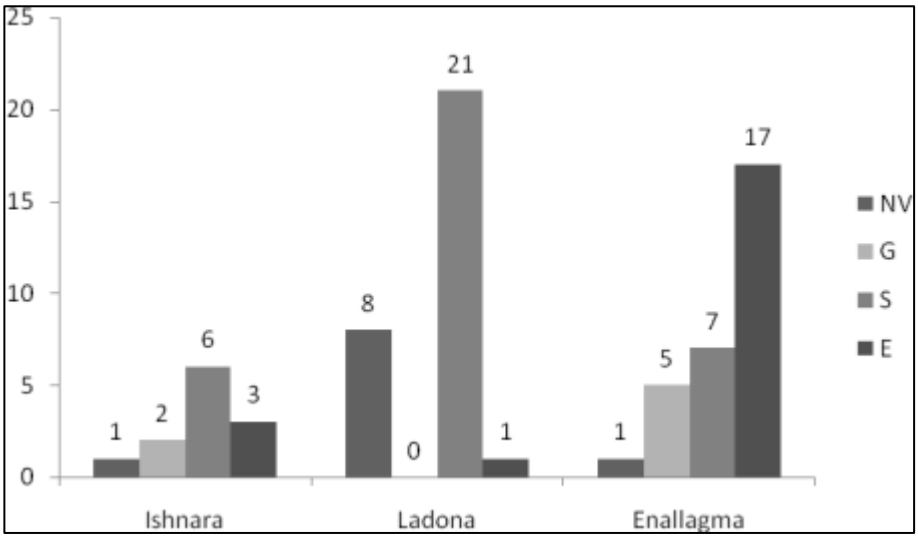

Figure 5-Comparisons of the different types of vegetation on which the three most common genera were identified (NV= Not vegetated, G= Grass/ shrub dominated, S=Sedge dominate, E= Emergent vegetation) at sampling sites from June 2010 through August 2010 in the No

Sedge vegetation was the most common type of vegetation for *Ischnura* and *Ladona* to be identified on in the 2010 season. The genus *Enallagma* was mostly found on Non-vegetated surfaces which consisted of rocks, roads, mud, fences and buildings.

Results and Discussion

Collectively the Watershed Stewards spend 1,424 minutes (23.7 hours) during the 2010 season collecting and observing odonates. Overall they observed 104 specimens and captured an additional 52 specimens. The most common Ansioptera (Dragonflies) were from the genus *Ladona* (i.e. the chalk fronted corporal) and the most common Zygoptera (Damselflies) were from the *Enallagma* genus (Bluets). Between the three sampling sites Rainbow Lake had the most recorded identifications of 66 odonates. Of the most identified genus at each site, sedge vegetation was the most common vegetation with 27 records. Non-Vegetated habitat was the second most common vegetation with 21 records. This could be an artifact of sampling due to natural camouflage of odonates in the forest and the hidden high perches of odonates within the trees.

Human disturbances, such as air, land, and water pollution and the unintentional transfer of invasive species, have a negative effect on the environment around us. According to Frolich Strong (2004) the Adirondack Mountain region contains the second highest proportion of acidic lakes in the United States. Even though some species are tolerant to the acidification of the Adirondack Lakes there will still be a negative impact on the odonate population due to environmental impacts such as the loss of fish (Frolich Strong, 2004). Some species of *Enallagma* damselfly odonates, such as *aeshna*, are limited to fishless lakes due to the predation of fish on such species (McPeek, 1990). We may be able to use odonates as indicators to see changes in populations of predatory fish and birds, as well as invertebrate prey based on species composition and abundance. Also if the shores of the three lakes

(St. Regis, Osgood, and Rainbow Lake) are developed over time we may be able to use data to predict what effect this will have the local ecosystem.

Overall there were more data collected and recorded in the 2010 season than the 2009 season by the Watershed Stewards. With the continuation of the study over the next few years we may learn more about the ecological relationship of odonates with the environment along Rainbow Lake, Osgood Pond, and Upper St. Regis Lake in the Northern Adirondacks.

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Purple Loosestrife Monitoring and Control

By Jeffrey Sann, Watershed Steward

Introduction

Purple loosestrife (*Lythrum salicaria*) is a plant native to Eurasia that possesses many attributes that make it a dominant invader in North America (Malecki et. al. 1993). Like many terrestrial invasive species, the plant was believed to be first introduced in the Americas in the early 1800's as ornamental as a result of its vibrant magenta flowers and stalks growing in excess of 6 feet (USDA, 2009).

The plant prefers frequently wet areas such as wetlands, marshes, shorelines, and even roadside drainage ditches (USFWS, 2004). The plant is well adapted to out-compete native species with its ability to form dense root masses, and produce from 100,000 to 300,000 seeds per year per stalk. Purple loosestrife blooms from July to September and flowers connect to a distinctive square stem covered in long "spearhead" shaped leaves. In order to germinate well, the seeds prefer warm temperature and moist soil (WIDNR 2004).

The rapid reproduction of the loosestrife coupled with the tendency of the plant to grow for years undetected (non flowering) make the plant a highly successful invader of North America's native wetlands which are significant sources of ecological diversity (WIDNR, 2004). The plant has been deemed a nuisance in every state but Florida. The Adirondack Watershed Institute has been monitoring and managing the plant on the St. Regis Lakes chain since 2001. The intentions of these efforts are to combat the spread of the plant and reduce the number of plants that emerge each year.

Methods

The control method used on the St. Regis Lakes chain by Stewards this year was the manual removal of both the flowering and non-flowering purple loosestrife plants. Stewards grasp the plant as close to the soil as possible (often below it) and remove as much of the root as achievable. At times, stewards used a small shovel to better insure the removal of all the parts of the deeply rooted plants. When removal of the entire root mass was not possible, the plant was clipped just above the soil. A third treatment option that was not used in this particular summer is the application of a small amount of herbicide to the root and stalk of the plant. Once removed, the plants were counted, recorded and placed in black garbage bags and placed in the sun where they were left for weeks to liquefy. Upon decomposition, they were disposed of.

On Monday, July 26th, the first day of surveying and removal of the loosestrife was conducted by Adirondack Watershed Institute Steward Jeffrey Sann with the help of The Adirondack Park Invasive Plant Program's Brendan Quirion. The entire shoreline of Spitfire Lake was surveyed as well as the slough between Lower St. Regis Lake and Spitfire Lake. The northeastern shore of Upper St. Regis Lake was also surveyed the same day. Monday August 2nd saw the removal of many juvenile and adult plants at the Camp Regis Applejack summer camp (S3) with the help of Program Director Eric Holmlund. A third survey or "mop up" was conducted on Monday, August 9th in which many plants were again removed mostly from the eastern shore of Spitfire Lake, and the slough.

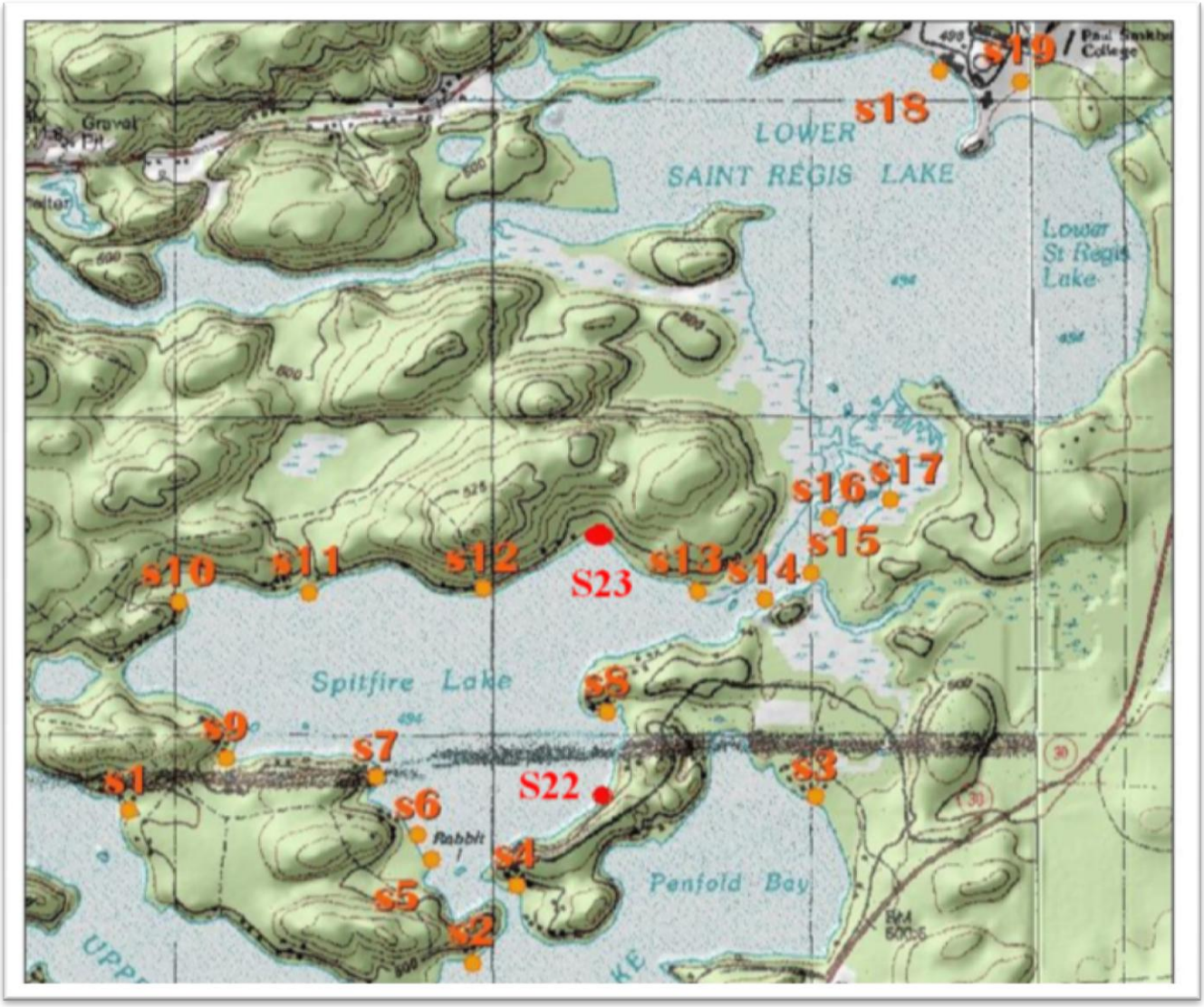

Figure 1- Purple loosestrife sites, St. Regis Lakes

Results

During the first survey, 320 plants were removed. When the plants at Camp Regis Applejack as well as the plants found during the second and third surveys were added, the total number of *Lythrum salicaria* plants remove for 2010 was 773. This year's total more than doubles last year's (307 plants).

Site/ GPS UTM	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
S1 N4917982, E556881	0	14	0	0	0	0	0	0	1	0
S2 N4917503, E557965	0	0	0	0	0	0	1	0	0	0
S3 N4918026, E559045	450	1400	330	742	130	14	380	123	196	222
S4 N4917748, E558103	5	63	5	26	5	0	7	10	0	0
S5 N4917831, E557837	0	74	23	50	15	54	12	3	15	2
S6 N4917905, E557790	0	0	0	0	0	0	7	22	3	0
S7 N4918087, E557660	250	915	117	146	250	200	89	34	8	39
S8 N4918290, E558390	110	49	3	74	150	101	375	132	3	6
S9 N4918149, E557190	0	437	143	116	25	117	107	87	0	72
S10 N4918636, E557038	0	123	5	34	25	11	7	3	1	4
S11 N4918668, E557451	0	0	0	0	10	0	0	3	0	3
S12 N4918680, E5579988	18	11	13	3	10	23	1	0	0	1
S13 N4918673, E558675	25	260	35	111	100	96	8	11	55	89
S14 N4978647, E558887	0	0	0	0	0	15	0	4	0	0
S15 N4918731, E559028	30	8	16	42	40	0	4	9	0	25
S16 N4918901, E559086	0	0	0	0	0	3	0	0	0	3
S17 N4918960, E559279	0	0	0	1	0	0	0	0	0	0
S18 N4920309, E559434	0	0	0	0	4	0	0	0	0	0
S19	0	0	0	0	0	0	6	0	0	0
S20	0	0	0	0	0	0	0	6	0	0
S21	0	0	0	0	0	0	0	3	0	0
S22	0	0	0	0	0	0	0	0	25	305
S23	0	0	0	0	0	0	0	0	0	2
Total	**888**	**3354**	**690**	**1345**	**764**	**634**	**1004**	**450**	**307**	**773**

Table 1- Number of plants found at each location on the St. Regis Lakes, site numbers correspond to points in figure 1, 2001-2010.

Upper St Regis Lake:

Sites 1 and 2 had no plants present when surveyed, however it was reported to a boat launch steward that there was a small cluster of plants to the right of the exit of the canal, which was subsequently removed. Site 3 at Camp Regis Applejack had a large quantity of plants of which most were juvenile or non-flowering. The plants were mostly less than 0.25 meters in height and few were flowering. There were mature plants discovered adjacent to a sleeping quarters.

Spitfire Lake:

Site 22 contained a majority of the plants on Spitfire Lake both during the first and second surveys. The site consists of virtually one third of the lake's eastern shore. Sites 7, 8, 9, 11 and 12 all had some plants with a notable increase at site 9. The discovery of two single plants behind a boathouse at site 23 was the only new site discovered on this lake.

Lower St. Regis Lake and slough:

The slough area contained the only plants in sites from years past; no new sites were discovered along the shoreline of Lower St. Regis Lake and upon visiting former sites, all were clear.

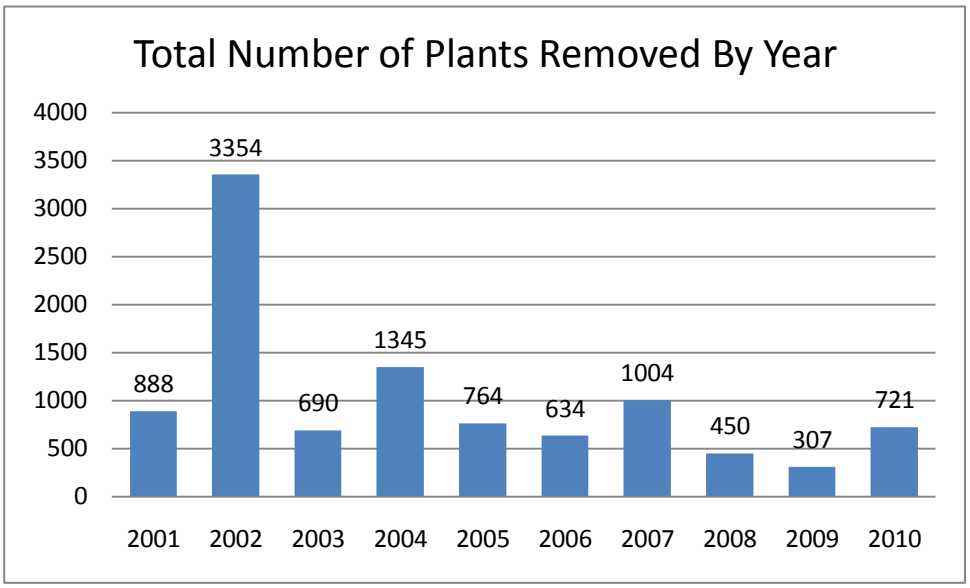

Figure 2- Purple loosestrife plants removed 2001-2010, St. Regis Lakes

Discussion

This year's survey and control program found more than twice last year's plants as well as the discovery of a new site. Thirteen sites were infested which is 4 more than last year's 9. This increase in plants could be the result of a warmer summer than last year's wet and cold summer months. The plant continues to spread, however the harvesting by Watershed Stewards drastically reduces the potential for more spread by eliminating the ability of the plants to disseminate seeds which could germinate. Performing more than one survey per growing season is a crucial step in limiting the plants ability to spread because it only required a few weeks for new flowering plants to be detected. The site discovered on Spitfire Lake's eastern shore in 2009, S22, could have become infested as a result of the

intense winds that were noted each time surveys were conducted that would have deposited seeds along this shore.

One notable observation is that upon the last survey, the leaves of several of the loosestrife plants had the appearance that they had been eaten by some type of organism. This was especially evident in the sites on Spitfire Lake. Leaf feeding beetles have been raised and released in a variety of locations nationwide and deter both reproduction and growth of the plants (Loos et al. 2010). The most effective form of the beetle is the larval stage which, after hatching, eats directly down the stem of the plant until it reaches the soil. It has not been reported that any form of loosestrife beetle has been introduced to the region.

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St. Regis Lakes Water Quality Study

By Jeffrey Sann, Watershed Steward and Dr. Celia Evans, Science Director

Introduction

Lake shore owners have access to the distinctive and fragile ecosystem that exists around and within water bodies. The presence of development around lakes and the recreational use of water bodies, bring with them the possibility of nutrient loading and the introduction of invasive species from human activity. Freshwater water bodies are highly sensitive to any changes in the surrounding environment; such changes ultimately affect the natural biota (Elliot et al. 2006).

Lakeshore development often begins with a few outlying lakeside homes on septic systems, but leads, gradually, to more houses with more septic systems and leach fields. In densely developed lakeshore situations, sanitary sewer systems are installed to contain and address the wastewater of the community (Moore et. al. 2003). However, in the case of the secluded St. Regis Lakes chain, septic systems are still the preferred method and are located at a variety of distances from the shoreline.

The objective of monitoring and comparing the data collected regarding the quality of water in Upper St. Regis Lake, Spitfire Lake, and Lower St. Regis Lake is to notice any change in patterns of nutrient concentrations or other indicators which may suggest eutrophication. Eutrophication refers to the characteristics a lake displays when it is saturated with nutrients, usually phosphorus and nitrogen. Lakes with substantial development are more eutrophic than those that are less developed or not developed (Moore et. al. 2003). The aspects of water quality that are reported on are pH, alkalinity, total

phosphorus, chlorophyll-a concentration and nitrate concentration. Data presented are from 2002 to 2010.

Methods

The Adirondack Watershed Institute (AWI) of Paul Smith's College provides consistent monitoring of the St. Regis Lakes in order to detect any changes in chemistry and quality of the water bodies. Employees of the AWI, employees of the Watershed Stewardship Program, and volunteers take samples from the St. Regis lakes and additional lakes in the Adirondack Park to detect any changes in the water bodies. This report details some aspects of water quality of Upper and Lower St. Regis lakes and Spitfire Lake. We report on pH, alkalinity, total phosphorus, chlorophyll A concentration and nitrate concentrations in the lakes over time using data collected this summer and historical data from the AWI (M. Deangelo, Water Quality Specialist).

In the months of July, August and September of 2010, a Watershed Steward was employed to perform the task of sampling the water from each of the lakes in the St. Regis lakes chain. This task was performed once per month. Using equipment provided by the AWI, samples were collected from the deepest parts of the lake, and on the surface in a manner designed to protect the integrity of the results. Samples were placed in sterilized bottles to be returned for analysis. During this monthly sample, a Secchi disk reading was also performed to determine water clarity.

These samples that were taken were returned to the AWI, where they were analyzed by AWI personnel using standard methods.

Results

Mean pH and alkalinity in 2010 are very similar to the values reported for 2009. In all three lakes there appears to be a trend in the past 3 years of increased pH levels. Because pH is a logarithmic scale, one unit change in pH represents a ten-fold change in acidity, thus a change in 6.8 to 7.0 or 7.1 is a substantial decrease in acidity. Most aquatic organisms require a pH within the range of 6.5 to 8.0, depending on the ecosystem (Addy et al 2004).

Alkalinity is the measurement of the buffering capacity of a water body, thus lakes with high alkalinity are able to buffer the effects of acidification better than those that have low alkalinity. Increases in alkalinity can come from detergents and from runoff from lawns where neutralizing (lime based) chemicals have been used. Alkalinity seems to have been more consistent in the last 5 years of the study period.

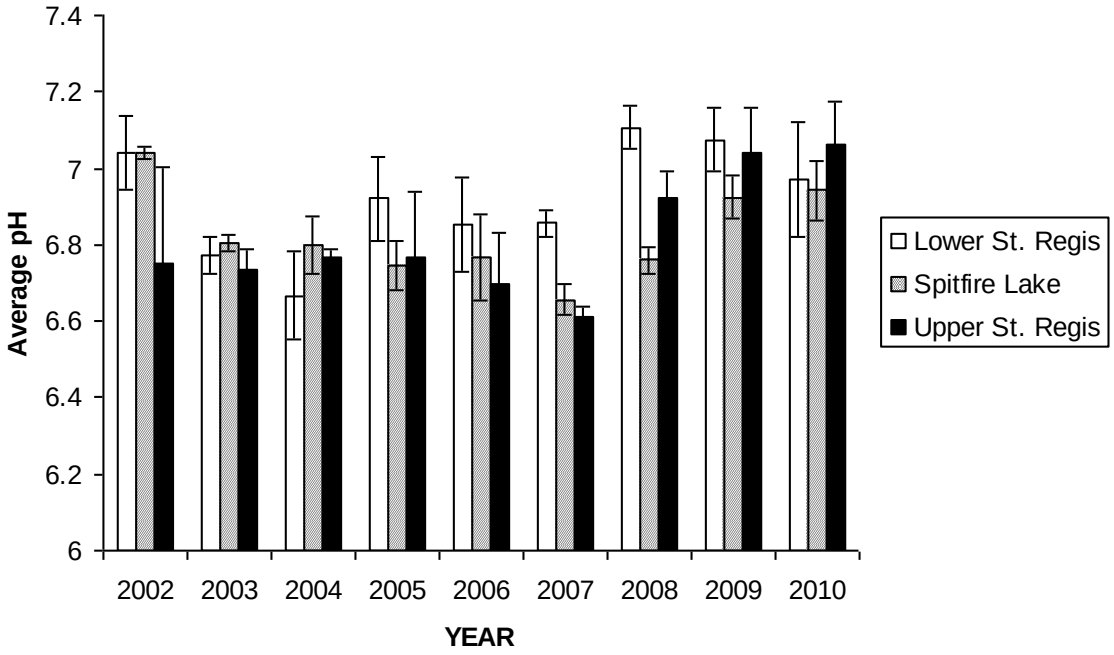

Figure 6. Average pH of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

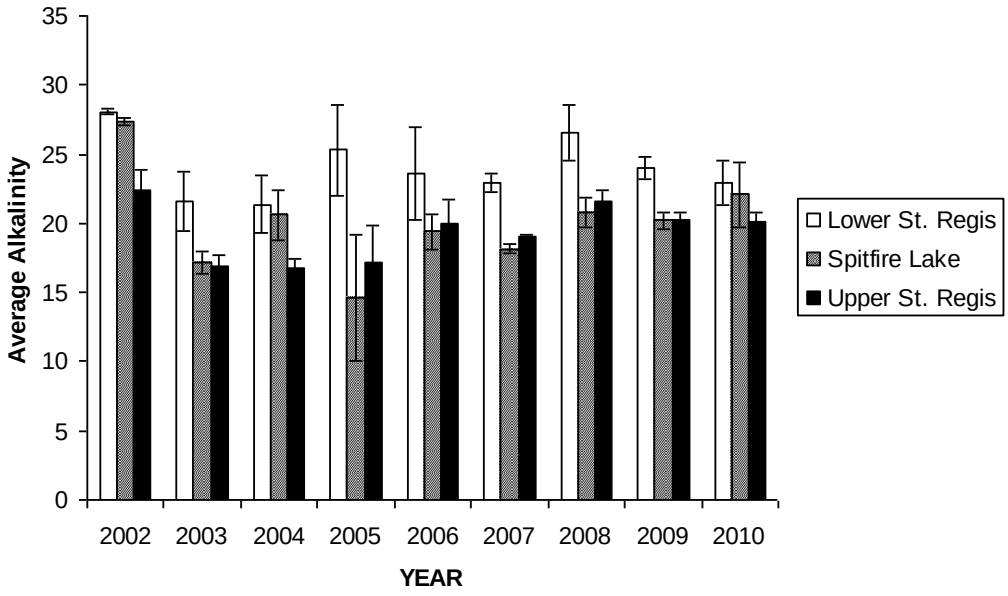

Figure 7. Average alkalinity of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

While concentrations of total P show a trend of decrease in the last 3 years in the Upper Lake and Spitfire, there is an apparent, but not significant, increase in Lower St Regis Lake. Lower St. Regis Lake has total P concentrations approximately twice those of Upper St. Regis Lake and substantially more variable. Chlorophyll A has also been declining over the past 3 years in the Upper Lake and Spitfire and may be lower in Lower St. Regis in 2010 than in 2009. Chlorophyll A and Total P are often tightly correlated. Chlorophyll A is an indication of phytoplankton abundance, and increased phosphorus in lakes can increase phytoplankton biomass. In some cases chlorophyll A levels can be extremely high, which is what is referred to as an algal bloom.

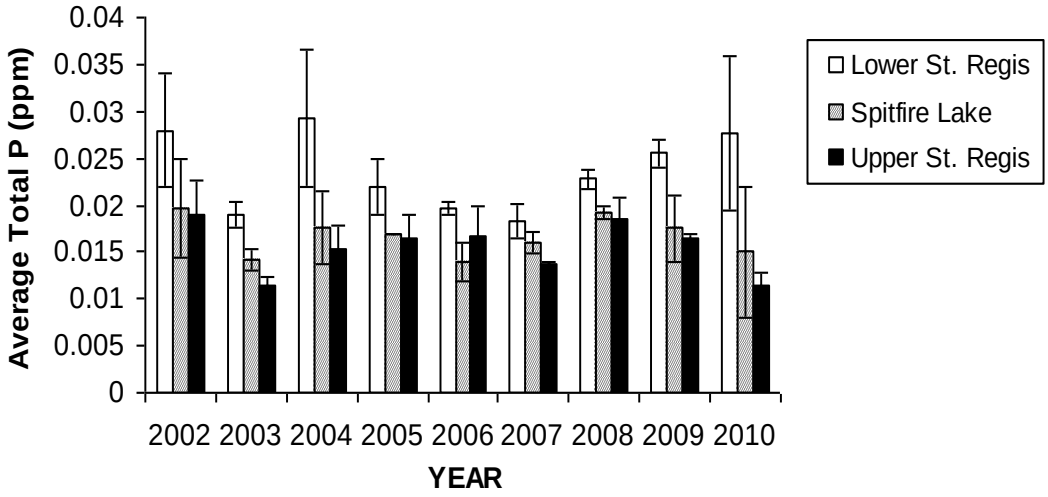

Figure 8. Average total phosphorus of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

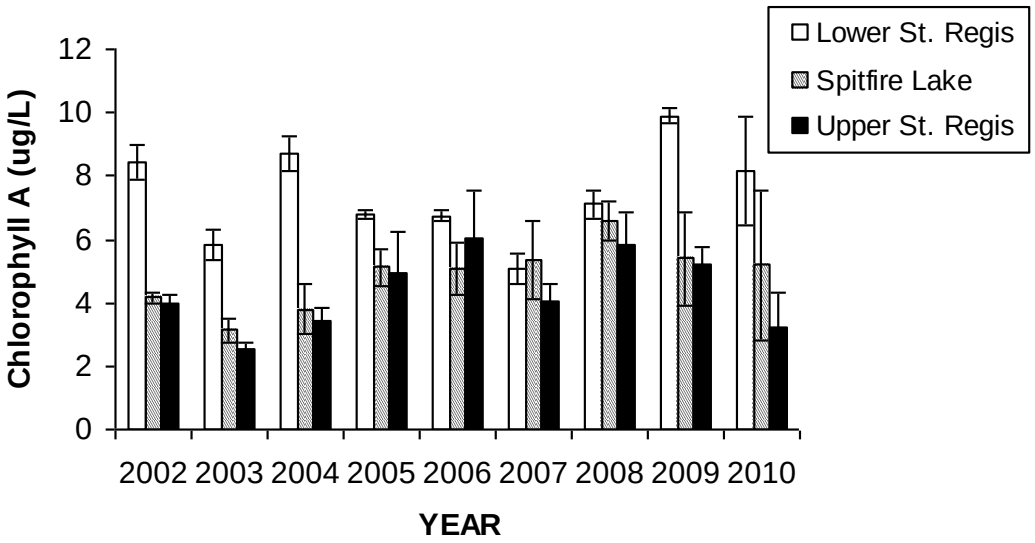

Figure 4. Average Chlorophyll A concentrations in water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

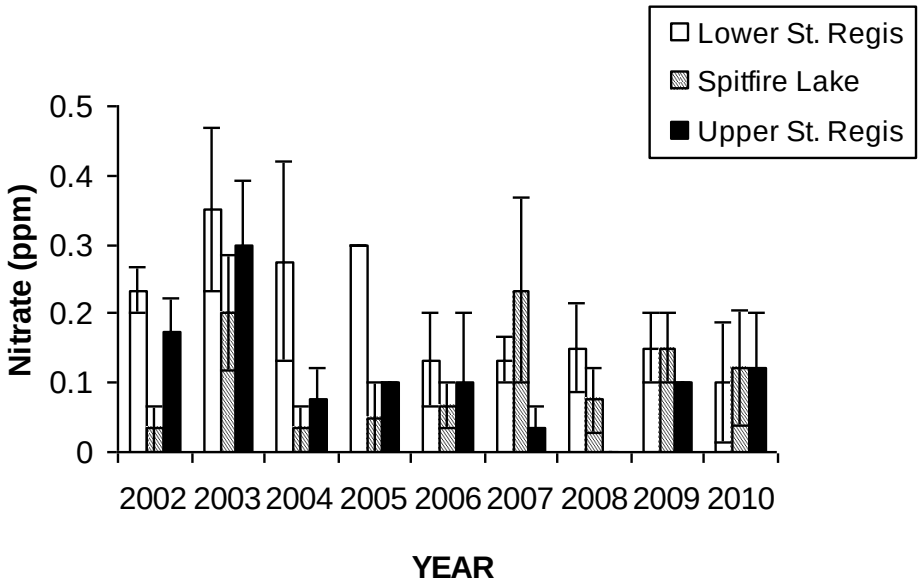

Figure 5. Average nitrate concentrations in water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Nitrate concentrations were quite variable across the years of the study, but are relatively consistent between 2009 and 2010. In Lower St. Regis Lake the levels have been declining fairly consistently since 2002 and in Upper St Regis Lake the Nitrate levels have been consistently low since 2004. Spitfire Lake shows the most variability in nitrate concentration across the study period

Discussion and Conclusion

Lower St. Regis Lake continues to be the lake in the chain with the highest levels of phosphorus; however nitrate concentrations appear to be declining and are the same as the other two lakes. Upper St. Regis tends to have the lowest nutrient levels and Spitfire Lake tends to have pH, alkalinity and P levels in between the Upper and Lower Lakes. It appears that the Average pH has increased in the chain over the past 3 years Phosphorus has stayed fairly constant across the 8 year study period and nitrate has stayed constant or decreased slightly.

Chlorophyll A concentrations are strongly related to total P in water samples and so show similar patterns across the years.

The data used to prepare these results are part of an extensive database. The long term monitoring provides valuable information and context in order to differentiate negative human impacts and natural ecological processes (Nevers, M.B., Whitman, L.R. 2004).

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