Watershed Stewardship Program

Summary of Programs and Research 2009

Adirondack Watershed Institute

Adirondack Watershed Institute Report # AWI 2010-02

Paul Smith's College
THE COLLEGE OF THE ADIRONDACKS

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Introduction and Key Findings – 2009

By Eric Holmlund, Director, Watershed Stewardship Program and Associate Professor, Paul Smith's College

Introduction

The Watershed Stewardship Program has served the northern Adirondack area for ten consecutive summers in an effort to raise public awareness about the threat of invasive species with regard to the quality and ecological integrity of Adirondack waterways. The Watershed Stewardship Program (WSP) is administratively and programmatically housed within Paul Smith's College's Adirondack Watershed Institute, which offers a host of research, invasive species mitigation and water quality monitoring services which complement the WSP's aquatic invasive species (AIS) public education and boat inspection program.

The Watershed Stewardship Program is a cooperative, community-based effort to conserve natural resources, including water quality, wildlife and soil, through targeted educational efforts at specific locations near Paul Smith's College in New York State's Adirondack Park. The program entails collaboration by members of the Paul Smith's College faculty, New York State land management agencies, including the Department of Environmental Conservation and Adirondack Park Agency, non-governmental environmental organizations including the Nature Conservancy, the Adirondack Park Invasive Plant Program, the Lake Champlain Basin Program, the Adirondack Cooperative Loon Program, the Great Sacandaga Lake Advisory Council and shore owner organizations from the St. Regis Lakes, Rainbow Lake, Lake Placid, Osgood Pond and Great Sacandaga Lake.

The WSP's wide ranging programs include point-specific environmental interpretation, watercraft inspection, educational outreach, field-based invasive species monitoring and various data-collecting projects aimed at better understanding human pressures on waterways and the mitigation of associated environmental impacts. The program hires college students with expertise in the natural resources to act as educators, researchers and field technicians. This report is an annual effort to consolidate and report on all aspects of program activities for the summer field season.

Summer 2009 Highlights

In 2009, the WSP offered boat launch steward programs at Blue Mountain Lake, Great Sacandaga Lake, Lake Placid, Osgood Pond, Rainbow Lake, Second Pond, Tupper Lake and Upper St. Regis Lake. Along with returning stewardship at Upper St. Regis Lake, Lake Placid, Osgood Pond, Second Pond and Rainbow Lake boat launches, this year saw expansion of boat launch inspection/education to Blue Mountain Lake and Great Sacandaga Lake. This year featured the continuation of efforts to monitor and control the exotic invasive plant purple loosestrife, monitor nesting loon pairs on the St. Regis Lakes, assess invasive plant presence on Lake Placid, publicize WSP program efforts with two summer newsletters and to provide public outreach programming around the St. Regis Lakes. Stewards also conducted a milfoil desiccation pilot study, a study of snowshoe hare summer ranges and monitored water quality on the St. Regis Lakes. The WSP's Volunteer Lake Steward Program was at work on Rainbow Lake and Osgood Pond, with volunteers inspecting boats and educating the public.

The primary thrust of this year's program was once again to educate people launching watercraft about the threat of introduced invasive species, primarily Eurasian watermilfoil (*Myriophyllum spicatum*), and how to minimize exposure of lakes to the threat of aquatic invasive species of all sorts. Stewards also gathered detailed information about the character of boat launch use, including such information as total boats launched, type of watercraft, and demographic information. Watershed Stewards also asked boaters if they routinely take preventative measures, such as removing vegetation, washing boat and trailer, immediately emptying bilges, etc., to avoid the risk of spreading invasive species. Stewards were ordinarily stationed at the boat launches, but had other duties, such as paddling kayaks to observe loons,

monitoring and controlling purple loosestrife on waterways, and conducting public outreach in addition to maintaining databases and meeting weekly to share information.

Steward Evan Rea operating boat wash at St. Regis Lake during staff training

Perhaps the most disturbing and influential "highlight" of the 2009 program season was the discovery on June 25 of an extensive bed of variable leaf milfoil in Paradox Bay on Lake Placid. This discovery rocked the community and forever dispelled any notion of Lake Placid's supposed invulnerability to invasion. The discovery galvanized an already active Lake Placid Shore Owners' Association (LPSOA); the association immediately hired an invasive species management team to harvest the milfoil beds and to conduct subsurface inspections. The WSP has been working closely with the LPSOA and the Lake Placid Village Board to implement appropriate responses to the situation, which could include a partial closure and/or monitoring of the previously uncontrolled and unmonitored village boat launch and an expansion of the LPSOA's volunteer steward program. This situation continues to stretch the capacity of the LPSOA to provide both boat launch stewardship and costly aquatic invasive remediation efforts, and is evolving over the winter. Many other communities are watching the situation carefully.

A related issue is the continual presence and spread of spiny waterflea (*Bythotrephes cederstroemi)* in the southern Adirondacks. WSP stewards stationed on the Great Sacandaga Lake, where spiny waterflea was identified in 2008, made user education about this invasive species the top priority, while finding the organism only three times over the course of the summer. Spiny waterflea has been identified on another lake in the area, Peck's Lake, which as of this writing is planning a steward program for 2010.

The final development over the course of 2009 is the continued evolution of the Adirondack Watershed Stewardship Program, a concept for a park-wide (and beyond) coordinated boat launch steward program, as more and more community groups become aware of the hazards of aquatic invasive species and ask our program for support. This new program is possible through collaboration between the WSP and the Lake Champlain Basin Program, the Lake George Association and the Adirondack Park Invasive Plant Program. Representatives from each of these programs have met regularly over the past

two years to coordinate messages, share best practices and work together with an eye on providing effective, affordable boat launch stewardship to all vulnerable waterways in the northern New York region. A single, jointly designed invasive species flyer is under development for release in the 2010 season. Further, joint staff trainings will continue after two years of effective staff training collaboration at Paul Smith's College.

Staff

The program was funded to employ twelve employees for the summer of 2009 in a variety of full and part-time positions. Six of the Watershed Stewards were Paul Smith's College students or recent graduates. Positions included a Director, a Science Director, an Assistant Director, 5 full-time stewards and four part time stewards.

Joint Lake Steward training at Paul Smith's College, May, 2009

A week of staff training sessions began on May 18, 2009. Stewards began boat launch duties on May 23, in time for Memorial Day. Staff training included program orientation, safety and risk management, interpretation principles, interpretive message development, role-playing public contact, and introduction to WSP research program data collection and entry, all by the program director. Paul Smith's College's Recreation and Intramurals Director Jim Tucker provided First Aid and CPR instruction, Marge and Ted Glowa of the Rainbow Lake Association provided Boater Safety certification, Forest Ranger Keith Bassage and NY State Forester Steve Guglielmi provided an orientation to the DEC, PSC Professor Mike DeAngelo addressed principles of limnology, Dr. Celia Evans taught wetland ecology and Hilary Smith of the Adirondack Park Invasive Plant Program addressed invasive plants. Meg Modley presented the invasive species concerns of Lake Champlain while Lake George Association's Emily DeBolt did the same for Lake George. Dr. Nina Schoch trained our loon monitor. Anne Weld provided an orientation to the St. Regis Lakes, Nicole Broderick and Mark Wilson oriented employees to Lake Placid and Josh Wilson from the Association for the Protection of the Adirondacks presented information on the forest preserve. For the second year, WSP stewards were joined for part of staff training by boat launch stewards employed by

the Lake Champlain Basin Program and Lake George Association. Approximately 22 people attended our staff training.

Key Findings and Program Activities

Overall, Watershed Stewards tallied 13,881 members of the public launching 6,861 watercraft at the Blue Mountain Lake, Great Sacandaga Lake, Lake Placid, Upper St. Regis, Second Pond, Osgood Pond, Tupper Lake and Buck Pond (Rainbow Lake Waterway) boat launches for the summer of 2009.

Table 1: Recreation Use Data from WSP launches.

Overall summary for 2009- Watershed Stewardship Program, Paul Smith's College

	Boat Type							total #	Summer Avg	Four	Group
Site	M	PWC	S	C	K	B	R	boats	HP Outboard	stroke	Size
Blue Mt Lake	27	0	0	18	16	0	0	61	n/a	23	209
Great Sacandaga Lake	1462	168	32	8	28	0	2	1698	n/a	801	4086
Lake Placid	976	0	15	155	386	41	14	1587	75	195	3205
Osgood Pond	20	0	0	41	17	0	0	78	n/a	n/a	126
Rainbow Lake	127	1	0	39	75	0	6	248	48	22	483
Second Pond	590	25	1	561	593	0	6	1771	55	206	3405
Tupper Lake	306	20	1	43	43	0	0	413	75	38	870
Upper St. Regis Lake	342	1	10	326	252	64	10	1005	53	64	1497
totals	**3850**	**215**	**59**	**1191**	**1410**	**105**	**38**	**6861**		**1349**	**13881**

	organisms found		organism type										Used
Site	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	SN	SWF	other	Boat Wash
Blue Mt Lake	1	2	0	0	0	0	0	0	0	0	0	3	n/a
Great Sacandaga Lake	1	4	0	0	1	0	0	0	0	0	3	1	n/a
Lake Placid	74	20	9	1	2	27	0	1	4	0	0	55	n/a
Osgood Pond	1	4	0	0	0	2	0	0	0	0	0	2	n/a
Rainbow Lake	9	10	0	1	0	4	0	0	1	8	0	6	47
Second Pond	33	66	34	1	3	23	0	0	0	0	0	39	n/a
Tupper Lake	17	28	1	1	3	41	1	0	0	0	0	6	n/a
Upper St. Regis Lake	25	19	2	2	2	20	0	0	0	0	0	23	372
totals	**161**	**153**	**46**	**6**	**11**	**117**	**1**	**1**	**5**	**8**	**3**	**135**	**419**

Notes: The values are grand totals for the 15 week 2009 season (May 23 to September 6, 2009). Key: (hp) indicates average horsepower of all observed motors. M = motorboat, PWC= personal watercraft, S = sailboat, C = canoe, K = kayak, B = *barge, R = rowboat,. *Barges were recorded each time they utilized the launch area in an attempt to assess commercial/ construction use of the launch. EWM= Eurasian watermilfoil, BW = native bladderwort, NM = native milfoil, ZM = zebra mussel, VLM = variable leaf milfoil, SN = southern naiad, SWF = spiny waterflea. Osgood Pond numbers include observations from volunteer stewards.

Use trends over the years indicate some variability, with generally increasing numbers of watercraft launched over the last four years. Watershed Stewards compiled data on the recent use history of boats putting into program waterways. This information yielded a detailed picture of the web of interconnections between our lakes and those both within and without the Adirondack Park. Specific information from each lake may be found within this report. All of the WSP lakes were demonstrated to be connected in terms of potential invasive species exposure with hundreds of lakes and rivers from New York State and beyond.

In total, almost 14,000 people were directly given an interpretive message centering on conservation and natural resource health in the summer of 2009 while untold numbers received the message indirectly through their peers or WSP publications.

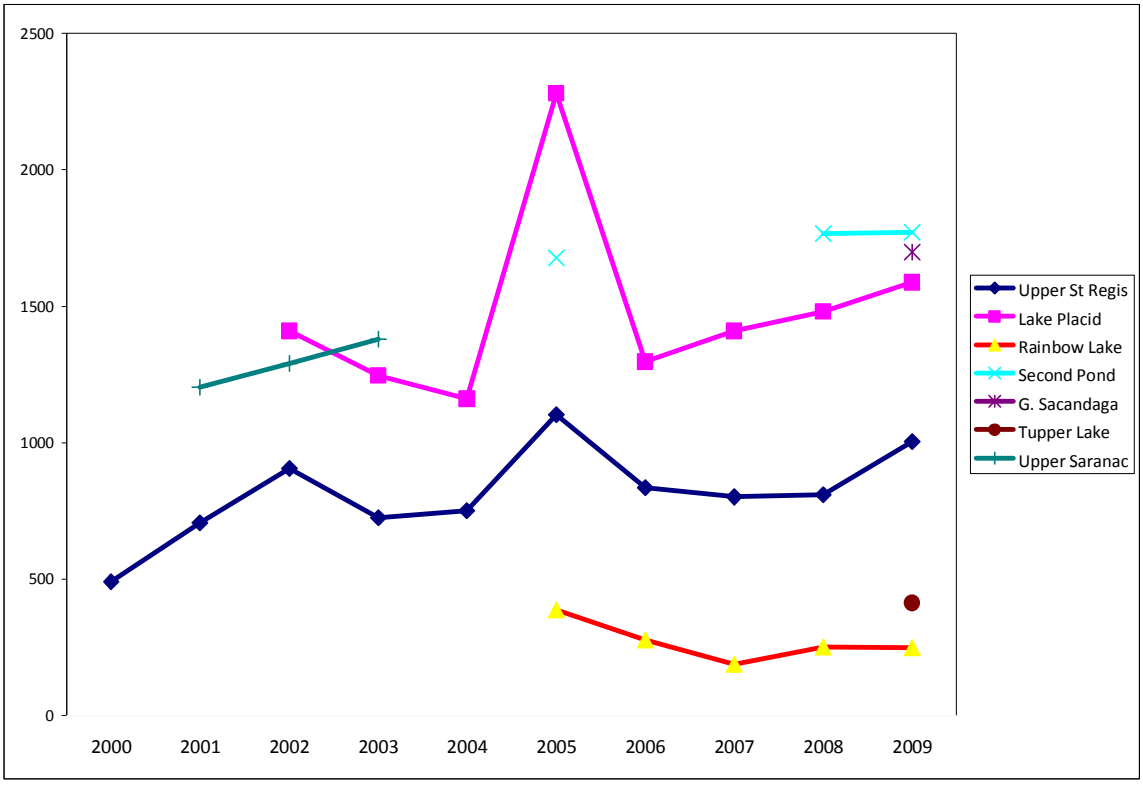


Figure 1: Multi-year trends in boat launch usage

Other Programs

Our Stewards are given the opportunity to pursue their interests beyond public education in the Watershed Stewardship Program. This is what sets this program apart from similar efforts across the country. Our Stewards engage in public contact with experts from area natural resource management and advocacy agencies to solve conservation and research problems. Watershed Stewards once again teamed up with the Adirondack Nature Conservancy to track down, map, count and remove as many purple loosestrife plants as possible on the St. Regis Lakes Chain and on Lake Placid. Our program has been instrumental in this struggle against the exotic invasive plant for eight years. This year's efforts removed 307 of the purple loosestrife plants from sensitive areas on the St. Regis Lakes chain and approximately 25 plants from the single patch on Lake Placid's Buck Island.

Once again, a steward spent one day per week monitoring the pairs of banded loons that are residents of the St. Regis Lakes chain under the aegis of the Adirondack Cooperative Loon Program. The loons had moderate success in hatching and rearing chicks on the St. Regis Lakes.

In a collaborative effort with the Adirondack Park Invasive Plant Program (APIPP), funded by the United States Fish and Wildlife Service, the WSP Science Director Celia Evans served as the Volunteer Lake Steward (VLS) Program Coordinator, sharing the responsibility with Eric Holmlund. The VLS program focused on bringing boat inspection instruction and support to interested lake associations in the area. This year's VLS program included the participation of volunteer groups from Canada Lake, Rainbow Lake, Osgood Pond, Tupper Lake and Horseshoe Pond. Celia Evans offered a VLS training session covering invasive species identification, public education, boat inspection and data management at Paul Smith's College on June 26. A total of 20 volunteers from the various lake associations attended. At the training sessions participants received VLS handbooks, informative brochures, stickers, data sheets and t-shirts to aid them in their volunteer efforts. Celia Evans was the primary contact person for the balance of the summer for the various volunteer steward programs.

This summer saw the initiation of paid steward programs at Blue Mountain Lake and Great Sacandaga Lake. These four new full and part-time summer steward positions offered steady and consistent public service, boat inspection and special project support for invasive species containment and public education in two new program areas. The WSP initiated a new program model for the administration of both of these initiatives. Two on-site, volunteer liaisons, one at each location, served as regular contacts and supports for the stewards, while the WSP Director made inspection and support visits roughly once per month. This new model worked quite well. While being located many miles from Paul Smith's College, the steward programs at these new sites received excellent support and supervision for a reduced cost to the local sponsors. It is likely that this model will be the primary means of WSP expansion into the next decade.

In 2009, the WSP was fortunate to again have partial funding support from a grant for invasive species management by the United States Fish and Wildlife Service (USFWS). This support allowed us to fund the Rainbow Lake Waterway and the Second Pond program and underwrote a significant portion of the rest of the program, principally the Science Director/Volunteer Lake Steward coordinator position.

Each of the special projects described above allows the WSP to respond to current needs, both of the community around us and of the students themselves. In this way, the program becomes a vital bridging experience between academic study and the world of productive conservation work.

Program recommendations

For the 2010 season, we look forward to:

- Continuing to offer the Science Director position
- Expanding the Volunteer Lake Steward program and working to develop hybrid programs at Lake Placid and other locations
- Increasing collaboration with the Lake Steward programs at Lake George, Blue Mountain Lake and Lake Champlain
- Greater collaboration with the NYS DEC.

Watershed Stewardship Program Funding

The Watershed Stewardship Program was funded for the 2009 season by the United States Fish and Wildlife Service, the St. Regis Foundation, the Lake Placid Shore Owners' Association, the Lake Champlain Basin Program, the Blue Mountain Lake Water Watch and the Great Sacandaga Lake Advisory Council. We are profoundly grateful for their support and contributions to our program vision. We invite current funders to continue their support of this multifaceted and proven program and welcome new supporters to join this effort to serve Adirondack watersheds through education, research and service. The program director is eager to meet with interested parties to discuss future plans and opportunities for the Watershed Stewardship Program. We also would like to appreciate the readers of this document and the many members of the public with whom we have interacted over the past ten years in the course of our efforts raise general awareness of critical watershed issues.

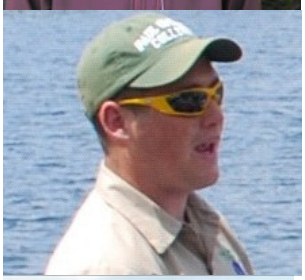
Steward James Parmeter inspecting parade float for invasive species

Watershed Stewardship Program- Staff Biographies, Summer, 2009

Ryan Dockstader, Watershed Steward
Ryan is a geology student from SUNY Potsdam and served as the Blue Mountain Lake Steward in 2009.

Jessica Fitts, Watershed Steward
Jessica is going into her senior year at Plattsburgh State University, majoring in Environmental Science. After she graduates she plans to pursue a career in the environmental and wildlife field. As a native of Lake Placid the Adirondacks are a special place to Jessica which is why she feels this program is so important.

Jessie Gardner, Watershed Steward
Jessie is currently a senior at Paul Smith's College majoring in Fish and Wildlife Science. She is from Hudson, NY. In addition to boat launch stewardship, Jessie spent part of her time monitoring snowshoe hare behavior. Jessie's hobbies are running, horseback riding, needlework, and paddling. Jessie's ideal job would be to study wild mustang herding behaviors.

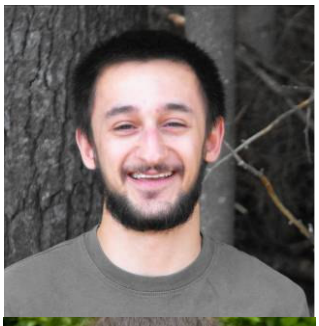


Eric Holt, Watershed Steward
Eric is a 2008 graduate from the Fish and Wildlife Sciences Program at Paul Smith's, currently living in Amsterdam, New York. He has spent most of his summers recreating with his family on Great Sacandaga Lake, and enjoys boating, fishing and Ford Mustangs. He served as a steward on Great Sacandaga Lake.

Althea Marks, Watershed Steward
Althea is a student at the University of New Hampshire, majoring in Environmental Science. After she graduates she plans to continue her education in graduate school. Originally from Rochester, Althea grew up camping, hiking and paddling in the Adirondacks, which is what influenced her to study environmental sciences and to spend her summer being a watershed steward.

Kleigh Orzolek, Watershed Steward
Kleigh is a Recreation, Adventure Travel and Ecotourism student at Paul Smith's College and lives in Broadalbin, New York, where she spent many years recreating on the Great Sacandaga Lake. She has advanced skills in wilderness recreation, paddling and ropes course facilitation. She spent part of her summer as steward on Great Sacandaga Lake.

James Parmeter, Assistant Director, WSP
James graduated from Paul Smith's College in 2009 with a B.S. in Environmental Science and a B.S. in Fisheries and Wildlife Science. After this summer James will be continuing his education by attending grad school. He is from Lisbon, NY and he enjoys fly-fishing, kayaking, hiking and rock climbing. James is a returning steward from the 2008 season and is working to develop his public relations skills, to spend another summer outdoors, and to continue educating the public about invasive species that threaten aquatic systems.



Evan Rea, Watershed Steward
Evan is going into his senior year at Paul Smith's College, graduating in December with a B.S. in Environmental science and a GIS Certificate. When he graduates he plans on continuing his education at graduate school or pursuing a job in his field dealing closely with the public.

Sarah Ryan, Watershed Steward.
Sarah graduated from the University of Massachusetts, Amherst with a B.S. in Natural Resource studies, and minors in Environmental science, Political science, and Fish and Wildlife Conservation. Sarah plans to work in natural resource conversation policy, enforcement and education.

Alex Smith, *Watershed Steward.*
Alex is currently a Forest Recreation and Resource Management student at Paul Smith's College. Originally from Hankins, New York, Alex has spent many years working as a foreman in his family's construction business. Alex served as a steward on Great Sacandaga Lake.

Celia Evans, *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, *WSP Director*
Eric is an Associate Professor and Coordinator of Environmental Studies at Paul Smith's College with graduate degrees in Outdoor Recreation and English education. In addition to his work as Director of the Watershed Stewardship Program, Eric is the Director of the Paul Smith's College Honors Program. Eric is co-author of a book, *The Camper's Guide to Outdoor Pursuits*. Eric and his wife Kim have an eleven-year-old daughter, Dana, and twin ten-year-old boys, Will and John. He enjoys most outdoor activities, especially canoeing and camping. Eric is pursuing a Ph.D. in Environmental Studies from Antioch University New England.

Blue Mountain Lake Steward Report

By Ryan T. Dockstader, Watershed Steward

Introduction

Blue Mountain Lake (BML) has hosted a Steward for several years, formerly under the supervision and aegis of the Residents' Committee to Protect the Adirondacks (RCPA). When the RCPA merged with the Association for the Protection of the Adirondacks in 2009, the members of the community looked for another collaborator to host the program. 2009 represents the initial year of a new partnership with Paul Smith's College's Watershed Stewardship Program (WSP), which has a long history of running boat launch steward programs in the Tri-Lakes as well as one year in Long Lake and Raquette Lake. Traditionally, the Blue Mountain Lake Steward has held a different role than the other stewards in the WSP program. The BML steward fulfills two roles: roving steward of the island campsites and invasive species educator/boat inspector at the various boat launches in the Blue Mountain Lake village.

The duties of the Watershed Steward include protecting the ecology of the watershed by preventing the infestation of aquatic and terrestrial invasive species, and keeping the water cleaner by keeping trash and other human waste out of the lake and off the islands. The watershed of Blue Mountain Lake consists of Blue Mountain and surrounding hills, the Eckford chain (Blue Mountain Lake (BML), Eagle Lake, and Utowana Lake), and Lake Durant. The purpose of this position is to prevent an infestation of invasive species, there by saving the community and state a great deal of money, and maintaining the economic and ecological integrity of the watershed. The steward used several precautions to deal with these issues, including checking boats, trailers, and canoes/kayaks for any invasives or plant matter in general. The steward also performed daily checks of the lake's campsites and picnic areas. A survey of the lake was performed throughout the summer to identify any possible invasive threat, and public education of invasives and campsite "etiquette" was an ongoing idea that was spread to hundreds of people.

Invasive Species Steward Duties

The Invasive Species Steward's main duty is to check boats, trailers, canoes and kayaks that are launching on the lake. The steward also performed a survey of the lake and different parts of the Eckford Chain to monitor an invasive threat. The steward checked the necessary places on the watercraft or trailers to ensure no foreign plant material enters the lake. The steward educated boaters on invasives and their threat, and also did a survey of the lake. Over the summer, the steward checked 61 watercraft, mostly canoes and kayaks. Most people came from New York, with representatives from Florida, Massachusetts, Minnesota and Vermont.

State	# Visitors
FL	1
MA	2
MN	1
NY	39
VT	2

Table 1: State of origin, BML visitors, 2009 .

When asked whether they had taken measures to prevent the transport of invasive species, such as inspecting their boats, washing their boats, draining bilges, etc., 66% percent of groups answered affirmatively. 39% inspected their boats, 23% drained their bilges, and 34% disposed of unused bait properly. None reported washing their boats prior to launching.

Visitors were asked whether they had used their boat in the preceding two week period. It is understood by invasive species managers that recreational and commercial boating is an active vector or route for transporting invasive species from lake to lake. Many of the lakes in and around the Adirondacks currently harbor populations of invasive species. Most responded in the affirmative. Many, however, were launching their boat for the first time of the season, and so presented little if any risk of invasive species transport. The most mentioned lake was Indian Lake, currently without invasive species, and Raquette Lake, with variable leaf milfoil, and the Saranac Lakes, which host Eurasian watermilfoil, variable leaf milfoil, and curly leaf pondweed.

Education and prevention is cheaper and easier to deal with than cleaning up an infestation if one were to occur. The steward asked people where their boats have been within the last month or so, as

that can tell him if there boat or trailer will have a greater chance of carrying aquatic hitchhikers because some lakes have known invasive infestations. The steward checked boats at the public canoe launch and Curry's Boat Launch. The invasives that are most worrisome because the have been found in the Adirondacks are Eurasian Water Milfoil, Zebra Mussels, and Water Chestnut, none of which were found while inspecting boats.

During the steward's aquatic invasive survey of the lake, he closely inspected the areas of the lake that were most used (Town Bay) and the areas of the lake that are topographically ideal for the growth of invasives (0 – 15 feet deep). These are the places where the sunlight in perfect for growth, along with water temperature. Some species of plants found are: common pond weeds, cow lily, common bur-reed, and bladderwort. There are only common weeds in BML, but a few other plants in the channels and other lakes down the chain. There was concern of variable leaf milfoil in the Marion River and near its portage, but none was found anywhere in my inspection.

Water body	# Visits
Abenakee	1
Adirondack	1
Atlantic	1
Blue Mt. Lake	7
Canandagua Lake	1
First Time Out	8
Flower Lake	1
Forked Lake	1
Indian Lake	5
Lake Ontario	1
Long Lake	1
Rainbow Lake	1
Raquette Lake	5
Saranac Lake	2
Second Pond	2
Tupper Lake	1
Upper Saranac	1
Vermont Lakes	1

Table 2: Prior waterway visits reported by BML recreators, 2009.

Since the main concern is preventing an infestation of invasives, public education is the prime objective. If the steward makes the users of the lake more aware of the invasive threat, they will check their boats without being told to do so, spread the word of the threat, and be more aware of the fragility of the ecosystem. The steward received training on invasives and checking boats from Paul Smith's College, with the Adirondack Park Invasive Plant Program (APIPP). The steward attended five days of training including getting his boater safety certification. The training prepared raise awareness about what we are preventing, how to prevent, and the importance of understanding the threat of invasive species.

The steward used a four horsepower electric boat that goes incredibly slowly. Just the batteries weigh over 300 lbs., making it very difficult to be at the boat launch in a timely fashion. This may be a bad thing because the steward could be missing many boats that are launching, or if there is an emergency on the islands he can't respond very quickly. It might be a good idea to have a more agile boat to make sure boats don't enter the water unchecked.

Testimony about the previous years at BML indicates that the summers in the past were not as cold and rainy; 2009 was the wettest summer in recent memory. The weather played a significant role in the poor attendance on the lake, by not just boaters, but campers as well. Also, there was major road construction going on in the village of BML. This created noise, bad traffic, and a dearth of parking spaces, which presumably had a great effect on the lack of visitors and tourists.

Blue Mountain Lake is relatively "young" (oligotrophic) and doesn't have the nutrient supply to support abundant life, though plants and animals are apparent. It doesn't have the silty, nutrient rich load that would be needed for many organisms, which makes for a blue, beautiful lake. The rocks on the shores are mostly large, and relatively well sorted, but again, not the ideal conditions for many organisms. The relatively cold water also may have an effect on the diversity of life.

Island Steward Duties

The Blue Mountain Lake Steward worked with the local Department of Environmental Conservation Ranger, Greg George, to help maintain the campsite areas and the trails around the lake. He instructed the steward on the areas patrolled by the Watershed Steward, including: the campsites on the islands, the lean-to on Utowana, the canoe portage of Utowana, the campsite on private land on Eagle Lake, Rock Island, the Castle Rock Trail, and the Blue Mountain trail. There are certain things at campsites that need to be checked regularly: the fire ring, the outhouse, and the trails leading to and from areas on the islands or campsites. Issues that the steward dealt with were mostly ones of people being

disrespectful of the land, in particular, littering and not using the outhouses. Cleaning up cigarette butts, bottle tops, plastic bottles, assortment of wrappers, and other personal belongings was constant, also there have been many incidences of campers doing their business around the campsite and not digging a hole. The steward requested that visitors take out their trash, confine their fires to fire rings, refrain from cutting standing trees, use outhouses or cat holes 150 feet away from water or trail, and other leave no trace camping principles.

The steward also inquired where people bought their firewood. New York State regulations require that firewood should not be moved more that 50 miles from where it was purchased. This is a good regulation because it can spread unwanted insects to the islands, and the area in general.

Campsite 1:

This site is located at the western most edge of Long Island. The steward dubbed this part "Manhattan" as it's the most popular site used on the lake with an estimated 90-100 campers staying there for a period of time on average two nights. This campsite is open to the west end of the lake with a gorgeous sunset on a clear day. It is easily accessible from many points around it, including the rocky shore close to Campsite 2. There have been many fires in the fire pit, and therefore the ashes need to be spread throughout the campsite regularly. People come throughout the day to use the site as a picnic area, or to camp. It is getting harder and harder to find proper fire wood or kindling as the users of the area have taken most of it. This is a problem for them because they have to leave their camp to find firewood, thereby harming other parts of the island. The campsite soil is becoming compacted. When this happens it becomes more difficult for new plant life to flourish. Due to the open location on the island, the wind is strongest at this location, making it hard for campers and their tents. The wind knocks down many large branches, but keeps the bugs at bay. There was only one problem the steward encountered on this campsite: a family put up a zip-line connecting two trees. It was built well and it wasn't tremendously high and the men setting it up were very careful with its operation so he didn't tell them to take it down as long as they were careful. People have left either live embers or flames when they left their campfires. The steward put all of the fires out quickly, and informed everyone to put them out if no one was at the camp.

Campsite 2

This site is located in the middle of Long Island between Campsite 1 and 3 and can be accessed through the west end of the site, and different points around the campsite by water, including the "Rocky Shore". This site was not used nearly as much as Campsite 1, with approximate attendance of 25 people, possibly because of the poor view, which is in the middle of woods, not too close to the lake. People staying here were coming for the seclusion, and usually they were very respectful of the land. The only problem was one of an unsafe rig meant for keeping bears out of their food. When this was discussed with the campers upon their return, we found a better place for it. Some one tore down the "NO CAMPING" sign upon entrance of the site, but the steward promptly put it back up.

Campsite 3

Out of all of the campsites on the lake, this is the only one that competes with Campsite 1 in terms of attendance. It is located near a little cove in the middle of Long Island. Close to the lake, it has a great view of the mountain, the islands on the lake, the lake itself, and sunrise is particularly nice here. This would explain the almost 80 – 90 campers staying as many as three nights. This site is the only one the steward has ever seen a motor boat docked at; the rest have all been by canoe or kayak. Since it is nestled in a little bay on the island, it is perfect to dock a boat given so much clearance and protection from waves and wind. This is the largest campsite with many flat places to place a tent, lots of tinder for a fire; however, the toilet is very far away. Despite obvious signs (the steward put another sign up), the outhouse is rarely used and there is usually a problem with human waste and toilet paper out in the open. The steward covers the material up as best as possible, but the message of "digging a hole" is always paramount when he is speaking with the campers on this site. There are a few groups of people that the steward has run into on the site that say it's the only site that they stay at when they come for a visit in the summer, because they love it so much. Also, this is the most popular site for large groups.

Campsite 4

This site is very rarely used, given its seclusion in the woods at the very southeast end of Long Island. The site has been used by individual campers, married couples, girl scout troops, and small groups. Overall, since there have only been about 25 people staying for up to 2 nights, it's one of the cleanest campsites.

Campsite 5

The entrance of this site is located at the very east end of Osprey Island and is my favorite campsite for many reasons. It is the least used campsite; the attendance was 12 accounted campers, this is probably because the sign is not easily visible and confusing to find. Even if kayaks and canoes are navigated close to the island it is hard to identify the potential for a campsite, especially if the campers are trying to just hit land and set up camp. There is an ample amount of firewood and kindling and plenty of space for tents and hiking. Watercraft is hard to get up onto the dry part of shore, and the terrain is sort of rough until the fire ring is reached, then there are open woods. There has been one reported incident in which a lone camper made a fire way too large. First he made the fire ring double its original size, which is dangerous in the first place, and then proceeded to burn very large pieces of birch. The smoke billowing from the fire could be seen clearly in town and residents were concerned that the fire could go out of control. Assuming the fire did get out of control, there was a final large cloud of smoke that rose from the fire, probably from water being dumped on it. The steward did not witness the fire or the smoke, but residents informed me about the incident on the days following the event. The steward had spoken to the camper when he first arrived, and explained to him what he told everyone else, but it obviously went in one ear and out the other.

Campsite 6

This site is the most secluded of all of the campsites on BML. It is located on the north shore of the lake, close to the Castle Rock trail and farthest away from town and lots of houses. The view of the lake at spots on the campsite is breathtaking, and there is old infrastructure from a camp, which is interesting to investigate. People usually just come for the day and make a fire at the ring, there have been about 15 visitors to the campsite and they leave it very clean. The concern about the site is that not very many people know it's there, and the lake entrance is terrible. These may be reasons why it's not used often.

Other Sites

Along with the Islands, the steward checked the smaller islands on the lakes and the camp/picnic areas. Rock Island is known by just about everyone and so is one of the dirtiest places on the lake in terms of litter on land. The steward has taken about half of a garbage bag full of junk from Rock Island, and tidy it regularly. It is accessible on many parts of the island, and is visited by more than 50 people on some days, sometimes more. There are a few small islands west of Courtney Island that I've had to go and remind people that are off limits to camping. They all left without complaint to a designated campsite. The picnic area on the southwest end of Osprey Island is one of the most visited places on the lake next to Rock Island, with attendance on some days of over 70 people. It is easily accessible by motorboat and un-motorized craft. Again, due to its overuse the fire pit must be emptied regularly.

The lean-to at the northwest end of Utowana Lake is used very often by either scout troops, or people passing through the Eckford chain onto Raquette or Long Lakes. The steward did not make it down to the lean-to very often due to my electric boat, which is not trustworthy on the long trip. The campsite on Eagle Lake, which is not marked, is located about halfway through the lake on the south edge, on private property. The steward saw one group there, and told them to make sure they don't have too large of a fire, as the fire pit might not be constructed properly. They stayed for one night and were careful to have no accidents. The steward walked up Castle Rock most days that it was nice and talked to lots of people (all together over 100) on the trail and summit. He put a sign up at a confusing part of the trail, pointing out the direction of the summit, which hikers have appreciated. He picked up some trash on the trail, but he talked to people about what else they can do for recreation in the area. The steward

let visitors know how to get to the Adirondack Museum, boat rides and rentals at the Boat Livery, other trails close to town, Blue Mountain Trailhead, and the roads leading to other towns/lakes.

The Community

Blue Mountain Lake is located in the center of the Adirondacks, surrounded by Indian Lake, Long Lake, Lake Durant, and Raquette Lake. Many folks live here year 'round, and some come only for the summer. The steward has spoken to many people in the community and has gotten to know many people. They are very concerned with keeping the lake clean, and will do what it takes to maintain the ecological and economic viability of the lake for many reasons. A few reasons would be that they want to see and have a clean, healthy lake; know that they can fish in the lake with no worries; maintain the status of one of the cleanest lakes in the country; prevent a very costly infestation; and keep land values high. They want to make sure future generations can enjoy the natural beauty as we do. Local businesses check boats at their boat launches, helping prevent an invasive species outbreak, and also help educate the public about keeping the lake clean and invasive free.

For the most part, the steward felt supported by most people in the community, and held a healthy relationship with many, and tried to uphold a good name for people trying to conserve nature. There are those however who do not like the idea of authority on a lake that they've lived on their whole life, and others who believe the lake won't ever have milfoil because of the conditions of the lake. They also believe that if invasives haven't made it here yet, they won't. Either way, the Steward position is great for monitoring the ecology of the lake, and educating the public on how to conserve what we have here. The concern that the community has shown in maintaining the lake is great support for the effort being made to protect the watershed and prevent the spread of invasive species.

Recommendations

The chief benefit of the current configuration of duties for the Blue Mountain Lake Steward is public outreach, education and safety. The steward was effective at interacting with campers on the islands, encouraging use of outhouses, policing trash and monitoring potentially dangerous campfires. The other element of the position, inspecting boats and providing education to those at the boat launch, was more difficult to conduct effectively and regularly. The WSP Director advises that more time be designated for boat launch duty on Fridays, Saturdays and Sundays, with defined shifts and duty posts. This would increase the number of interactions and boat inspections performed by the steward and would boost the likelihood of intercepting invasive plant or animal elements on boats launching into the lake. The steward documented 61 boats over the ten-week season. It is unclear whether this is an accurate approximation of actual traffic on Blue Mountain Lake. Overall, the position is unique in its mix of duties, and offers a variety of roles for the employee, along with excellent contact with both campers and the lake itself. The steward was able to develop an intimate knowledge of the lake, the campsites and its seasonal and residential communities. This knowledge translated into advocacy and ability to articulate lake concerns to a wide range of constituents.

Blue Mountain Lake Recreation Study 2009

	Boat Type							total #	Four	Group	number	number
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	launching	retrieving
6-18-09 to 6-24-09	2	0	0	0	0	0	0	2	2	5	2	1
6-25-09 to 7-1-09	2	0	0	0	0	0	0	2	2	6	2	1
7-2-09 to 7-8-09	4	0	0	3	2	0	0	9	4	37	7	2
7-9-09 to 7-15-09	4	0	0	2	2	0	0	8	4	31	6	4
7-16-09 to 7-22-09	3	0	0	2	2	0	0	7	0	20	5	0
7-23-09 to 7-29-09	3	0	0	1	1	0	0	5	2	14	2	2
7-30-09 to 8-5-09	2	0	0	3	3	0	0	8	2	33	5	1
8-6-09 to 8-12-09	2	0	0	2	1	0	0	5	2	20	2	2
8-13-09 to 8-19-09	4	0	0	3	3	0	0	10	4	21	5	2
8-20-09 to 8-26-09	1	0	0	2	2	0	0	5	1	22	3	0
totals	27	0	0	18	16	0	0	61	23	209	39	15

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat.

	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
6-18-09 to 6-24-09	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	1
6-25-09 to 7-1-09	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	2
7-2-09 to 7-8-09	0	0	0	0	0	0	0	0	0	0	5	5	0	1	0	0	4
7-9-09 to 7-15-09	0	0	0	0	0	0	0	0	0	0	6	2	0	2	0	0	4
7-16-09 to 7-22-09	0	0	0	0	0	0	0	0	0	0	5	2	0	2	0	0	3
7-23-09 to 7-29-09	1	0	0	0	0	0	0	0	0	1	4	2	0	1	0	0	2
7-30-09 to 8-5-09	0	0	0	0	0	0	0	0	0	0	4	3	0	2	0	0	1
8-6-09 to 8-12-09	0	0	0	0	0	0	0	0	0	0	4	3	0	1	0	0	2
8-13-09 to 8-19-09	0	2	0	0	0	0	0	0	0	2	5	2	0	2	0	0	2
8-20-09 to 8-26-09	0	0	0	0	0	0	0	0	0	0	3	2	0	1	0	0	0
totals	1	2	0	0	0	0	0	0	0	3	40	24	0	14	0	0	21

Key: EWM = Eurasian Watermilfoil; BW = native 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 = emptied livewell; Dis = disposed of bait.

Recreation Use Study: Great Sacandaga Lake

By Alexander Smith, Watershed Steward

Introduction:

The Watershed Stewardship Program (WSP) represents a major element of the work of the Adirondack Watershed Institute, which is run by Paul Smith's College. The program has operated successfully for years on numerous lakes in the northern Adirondacks, and in the summer of 2009 it was extended to the Great Sacandaga Reservoir at the request of the Great Sacandaga Lake Advisory Council (GSLAC). The primary purpose of the program is to inform the boat-using public about the dangers of invasive species and to show them how to prevent the spread of these species. At the same time, various relevant data on the boat traffic on the lake was collected that will be useful in the effort to curb the spread of non-native and invasive species of plants and animals.

This summer's effort on Great Sacandaga Lake initiated a new model for program delivery by the Watershed Stewardship Program. A local collaborator, Robert Monacchio, worked closely with WSP Director Eric Holmlund to provide day to day monitoring of program delivery and to hold weekly administrative planning meetings with the stewards. Since the program site is about 2.5 hours by car from WSP headquarters in Paul Smiths, it was essential that such an arrangement be put in place. Eric Holmlund provided email support and monthly visits to ensure consistency with the other WSP sites. Three Paul Smith's College stewards were hired to serve as aquatic invasive species educators and boat inspectors at four state boat launches around the lake.

Figure 1: WSP Director Eric Holmlund (R) and watershed steward Alexander Smith at the Northville Boat Launch

Methods:

There are four public boat launches on the Sacandaga reservoir, located in the Town of Broadalbin, the Village of Northville, the Town of Northampton, and the Town of Day (Edinburgh). At the beginning of the program there were three stewards on duty from 7am to 4pm, starting on June 12th, and working on Friday, Saturday, and Sunday. After a steward resigned for personal reasons, the schedule was revised so that two stewards worked five or more days a week, including weekends. Each of the four launches was covered by one steward on a rotating basis, so that an accurate representation of each launch's activity could be formed.

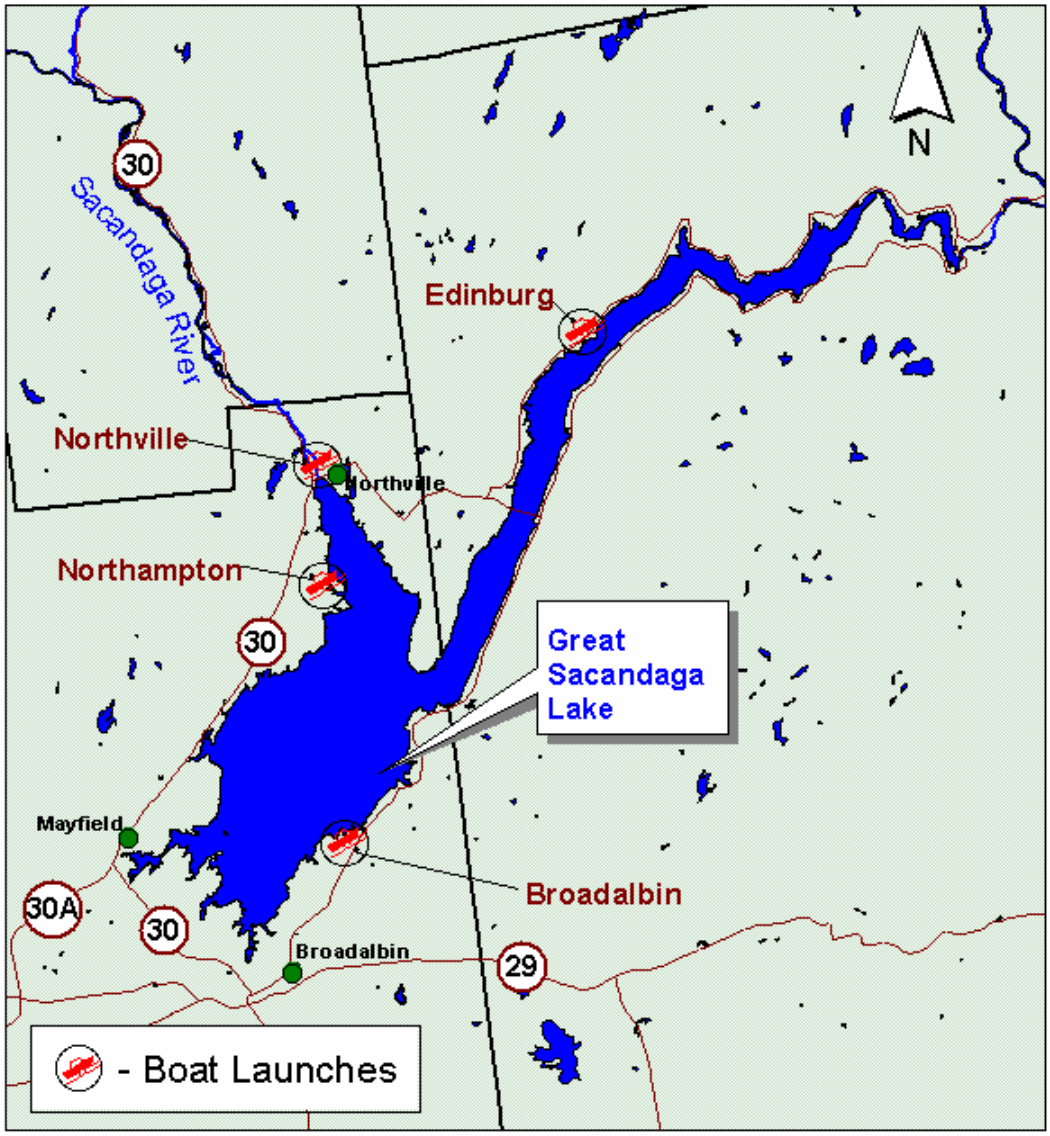


Figure 2: Great Sacandaga Lake State Boat Launches. Stewards were stationed at these four sites: Broadalbin, Northhampton, Northville, Edinburg (Day). Source: NYS Dept. of Environmental Conservation (http://www.dec.ny.gov/outdoor/32533.html)

As boats entered and were retrieved from the launch, a steward would approach the owner and give a brief introduction and explanation of the invasive species of concern. He would then give the boat a visual inspection for invasive species, and inform the owner of the steps he could take to prevent their spread. The steps recommended were washing the boat, allowing it to dry, inspecting boat and trailer, and draining bilge, bait buckets, and live wells before transporting to another water body. If the owner was receptive, a more in-depth description of the problem was sometimes appropriate and relevant literature and stickers for the boat trailer were given to every user who would accept them. The stickers also served the purpose of identifying those to whom invasive species information had already been given, thus expediting the process during periods when the launch traffic was heavy. Data was collected on each boat, including number in user group, state and county of registration, motor type (2 or 4 stroke), boat type (motorboat, sailboat, PWC, etc.), and time of launch/retrieval. All this information was then entered into a database for analysis. The program ran until August 17th for a total of ten weekends.

Figure 3: Watershed Steward Eric Holt (L) explains the preventative steps to a group of boat users at the Broadalbin launch.

Results:

Between June 12th and August 17th, 4,086 boaters received information about invasive species from stewards at the various launches. A total of 1,698 watercraft were launched, including 1,462 motorboats, 168 personal watercraft, 32 sailboats, 8 canoes, 28 kayaks, and 2 rowboats. Boaters came from all over the East Coast, although the overwhelming majority was from New York State, particularly the two counties surrounding the lake. Traffic varied somewhat between launches with Broadalbin usually the busiest and Day generally the quietest. Since we did not have enough stewards to cover all four launches simultaneously, the data here presented is a fair representation of the traffic patterns at each launch rather than complete inventory of that launch's use throughout the summer. Since Broadalbin is the most heavily used launch, it received more coverage overall than the other three.

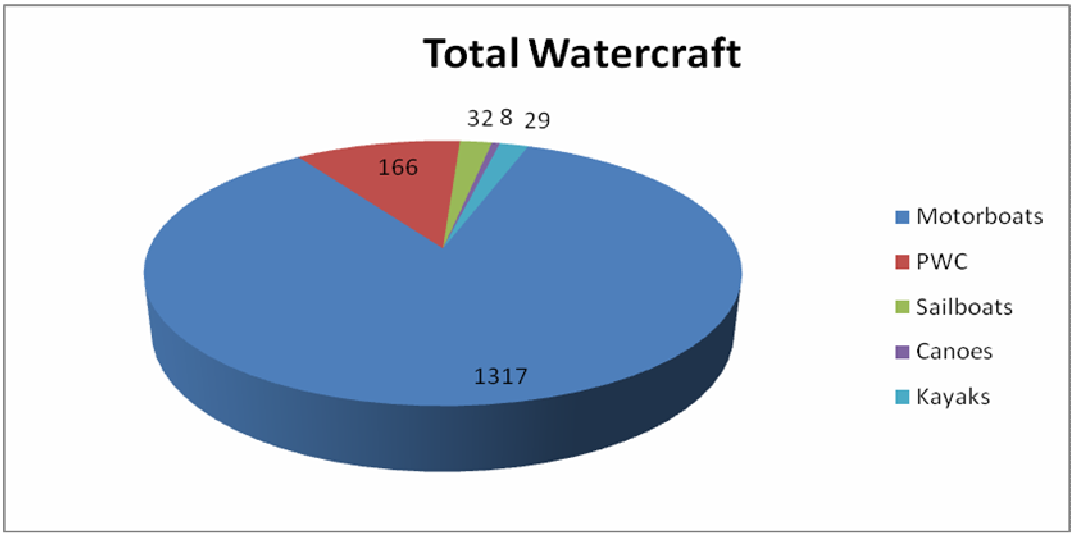


Figure 4: Great Sacandaga Lake, summer, 2009. Watercraft by type recorded at Broadalbin, Day, Northhampton and Northville boat launches during summer session.

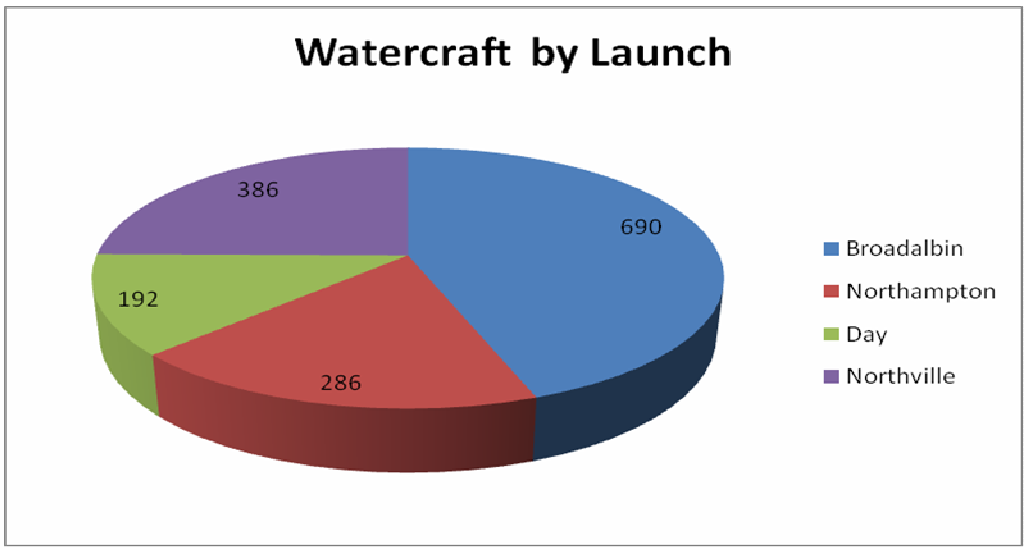
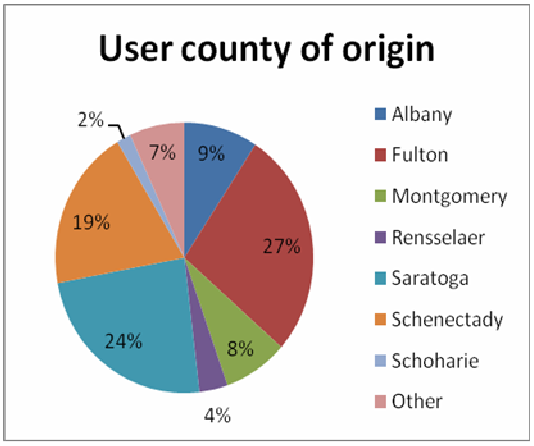


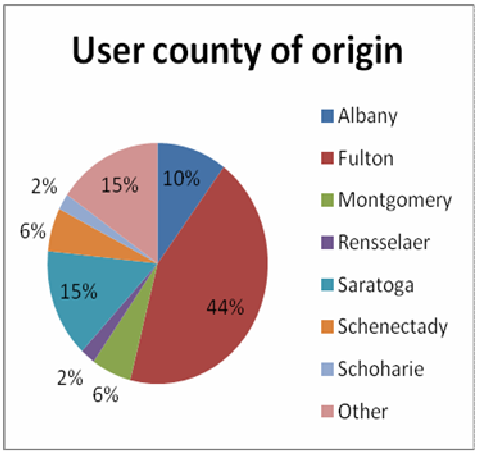
Figure 5: Great Sacandaga Lake, summer, 2009. Watercraft by boat launch recorded at Broadalbin, Day, Northhampton and Northville boat launches during summer session.

It is also interesting to observe where the boat traffic on the lake comes from. As the following graphs show, the vast majority of users are from the local surrounding counties of the Adirondacks and capital district. The category "Other" includes users from other counties in New York State as well as those from other states, including Massachusetts, Connecticut, Vermont, New Hampshire, New Jersey, Pennsylvania, Ohio, Maryland, Virginia, North Carolina, and Florida. There was also a group hailing from the British Isles. Since all these together make up such a small percentage of the traffic on the Lake, they have been lumped into one group. However, they do represent a wide diversity of origins.

Broadalbin Launch



Northville Launch



Northampton Launch **Day Launch**

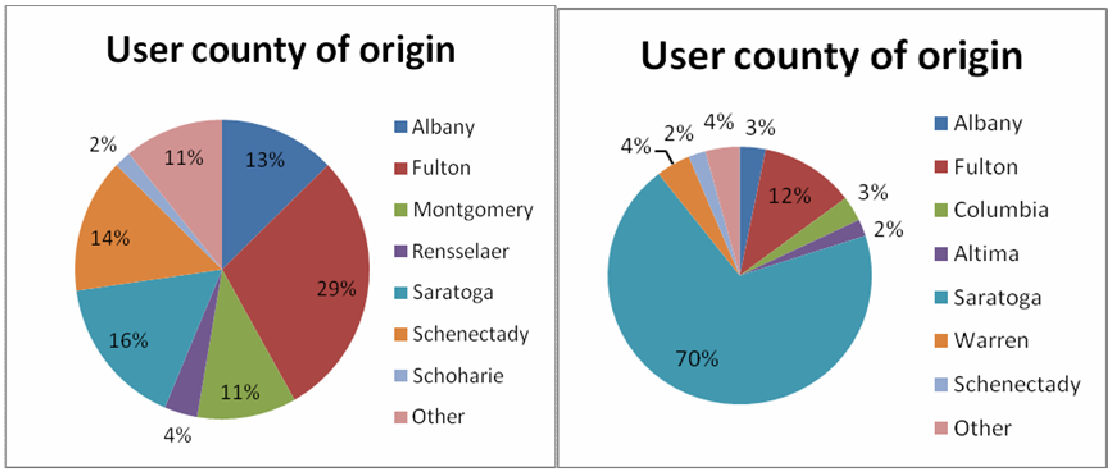
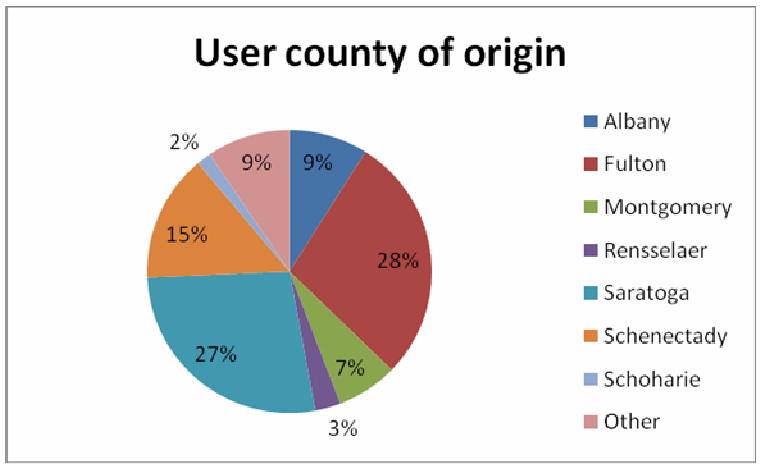


Figure 6: Great Sacandaga Lake launch user county of origin. These graphs show the principal counties of origin for the boats using the respective launches.

There are considerable differences in primary counties of origin between launches, but Albany, Fulton, Schenectady, Montgomery, and Saratoga stand out as the counties providing the heaviest traffic. Other counties represented included Broome, Buffalo, Dutchess, Erie, Franklin, Greene, Herkimer, Nassau, Orange, Queens, Suffolk, Sullivan, Ulster, and Washington.



State	Number of Users
New York	1151
New Jersey	23
Connecticut	15
Massachusetts	12
Pennsylvania	4
Rhode Island	3
Maryland	3
Florida	2
Ohio	1
Vermont	1
New Hampshire	1
North Carolina	1

Figure 7: County and State of origin, all launches combined. This graph and table show the areas of origin for users of all public launches on Sacandaga Lake.

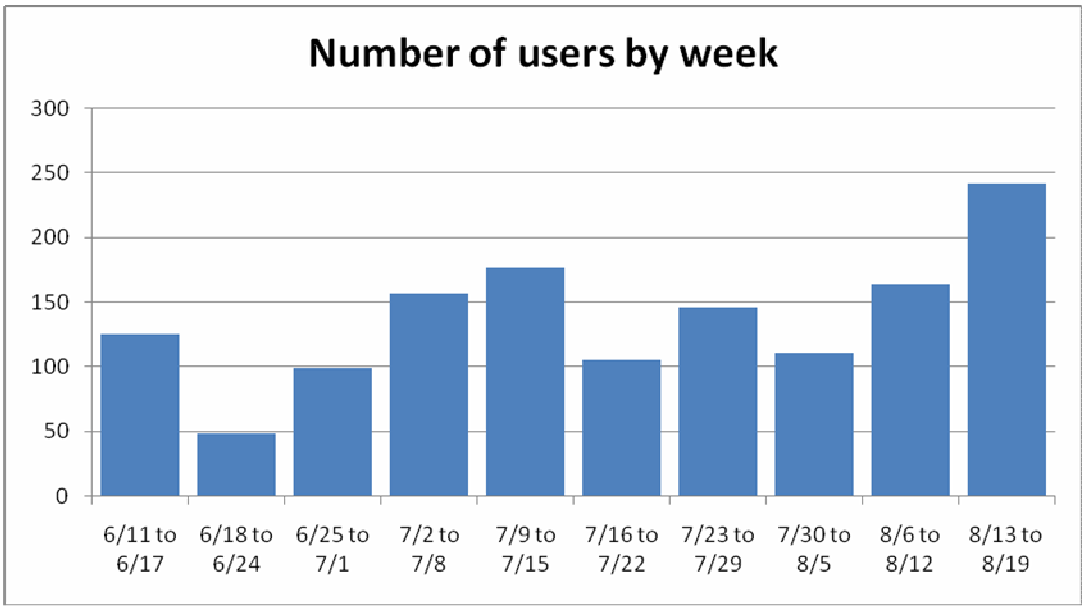


Figure 8: Number of users by week, Great Sacandaga Lake. This graph shows the traffic throughout the summer by week.

Stewards were instructed to ask where visitors had last launched their watercraft in the prior two week period. 885 usable responses were obtained to this question. Unsurprisingly, the vast majority of the responses indicated that the Great Sacandaga Lake itself was the prior waterbody visited in the preceding two weeks (73%). The next most frequently mentioned water bodies were "first launch of the season" or in essence no prior waterbody visits (7.5%), Saratoga Lake (4.4%), Lake George (3.5%), and the Hudson River (2.3%). There was a total of 39 other water bodies mentioned, indicating a diverse list of prior visitations. This question indicates the potential for a great many instances of aquatic invasive species transport both from other lakes into Great Sacandaga Lake, and from various locations on the lake itself.

Stewards conducted careful visual inspections on the vast majority of the 1,698 boats encountered over the summer. Each and every boat got at least a quick check. Most boats got a careful inspection of the propeller, trailer, axles, fenders, wheel wells, boat bunks, license plate, hitch and the interior of the boat. Stewards found very few organisms over the summer, with no findings of invasive milfoil. Stewards documented finding spiny waterflea (*Bythotrephes cederstroemi*) on three occasions.

Discussion

It is clear that the Great Sacandaga Lake is a popular and heavily used recreation resource. It is used for fishing tournaments, sailboat regattas, poker races, personal watercraft rallies, informal speedboat races, and by thousands of local families. It attracts visitors from as far away as the Chesapeake Bay and Florida. The Great Sacandaga Lake is also becoming popular with boaters who previously used Lake George but now come to the Great Sacandaga Lake to take advantage of the free launching and lack of a speed limit or permit system. Since the lake is actually a reservoir, it has some advantages over natural lakes that help to make it less susceptible to takeover by invasive species. The fact that the water level rises and falls considerably over the course of the year doubtless does a great deal to prevent a severe infestation of milfoil by exposing it and leaving it high and dry every winter. Of course, there is some water flow through the dam as well which helps to continually flush the lake. Also, tests have shown that calcium levels in the lake are not high enough to support a large population of zebra mussels, which need the calcium to build their shells. However, the spiny water

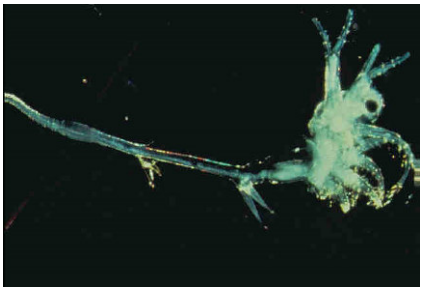


Figure 9: Spiny Waterflea, NYS DEC

flea infestation is still in its early stages, and it remains to be seen how much of an impact this new invader will have.

Water body	Total prior visits	%
Algonquin	1	0.1%
Atlantic Ocean	2	0.2%
Ballston Lake	5	0.6%
Benton Lake	1	0.1%
Canada Lake	4	0.5%
Caroga Lake	4	0.5%
Cayuga Lake	1	0.1%
Chesapeake Bay	2	0.2%
Connecticut River	3	0.3%
Delaware River	1	0.1%
Delta Lake	1	0.1%
First launch of season	66	7.5%
Fish Creek	1	0.1%
Florida	1	0.1%
Galway Lake	1	0.1%
Great Sacandaga Lake	647	73.1%
Greenwood Lake	3	0.3%
Hudson River	20	2.3%
Indian Lake	5	0.6%
Lake Champlain	4	0.5%
Lake Erie	1	0.1%
Lake George	31	3.5%
Lake Lonely	1	0.1%
Lake Nancy	1	0.1%
Lake Placid	1	0.1%
Lake Pleasant	1	0.1%
Lake Winnipesaukee	1	0.1%
Long Island Sound	3	0.3%
Long Lake	1	0.1%
Massachusetts Lakes	2	0.2%
Mohawk River	10	1.1%
Niagara River	2	0.2%
Oneida Lake	5	0.6%
Otsego Lake	2	0.2%
Paradox Lake	1	0.1%
Peck's Lake	1	0.1%
Putnam Pond	1	0.1%
Quebec	1	0.1%
Raquette Lake	2	0.2%
Saratoga Lake	39	4.4%
Schroon Lake	2	0.2%
Skaneateles Lake	1	0.1%
St. Lawrence River	1	0.1%
Stewart's Pond	1	0.1%
total	885	100.0%

Table 1: Waterway visits in preceding two weeks, Great Sacandaga Lake, 2009

Conclusion

This was the first year a program of this kind has ever been tried on Sacandaga. Awareness of the invasive species issue seemed quite high among boat users, and many praised the program and expressed appreciation that efforts were being made to address the problem. Locals and those who live on the lake were especially glad to see the program in action and many expressed their support heartily. A large percentage of users claim to use no lake other than Sacandaga, and these users present no risk of spreading invasives from other lakes, but could be instrumental in spreading invasive populations to otherwise distant regions of the lake itself. The vast majority of users was extremely receptive and agreeable, and pleased to learn what the dangers were and how to avoid them. The sheer numbers of users we educated over the course of the summer ensures at least some measure of success in containing the spread of invasives, and the data collected by the stewards will be useful when considering ideas for the lake in the future.

Figure 10: Great Sacandaga Lake Advisory Council members Bill Christman, Bob Monacchio and Jack Vaillancourt

In this project the AWI worked closely with the GSLAC and several local figures to coordinate the new program. Robert Monacchio, William Christman, and Jack Vaillancourt helped to oversee the operation as representatives of the Great Sacandaga Lake Advisory Council. Robert Monacchio assumed the role of volunteer liaison and was instrumental in troubleshooting, coordinating the stewards, and providing continual encouragement and support. We thank you all for your help and advice. All three GSLAC representatives were very pleased with the results, and hope to continue and expand the program in 2010. The Watershed Stewards are eager to return and improve on a strong first summer.

Figure 11: Watershed Steward Eric Holt at work at the Broadalbin Boat Launch

Summary Data Tables

Table 2: Great Sacandaga Lake Recreation Study Results, 2009

Great Sacandaga Lake Recreation Study 2009- Overall

	Boat Type							total #	Four	Group	prv LS	Number	Number	Number of	organisms found		organism type								Card	Sticker
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	Contact	launching	retrieving	Inspections	entering	leaving	EWM	BW	NM	GRS	WC	ZM	SWF	other	given	given
Broadalbin	622	44	14	5	16	0	0	701	370	1917	246	651	74	674	0	1	0	0	0	0	0	0	0	1	155	448
Day	219	30	5	0	1	0	1	255	103	549	9	190	19	157	1	0	0	0	1	0	0	0	0	0	52	217
Northhampton	223	48	12	1	4	0	0	288	148	744	44	229	42	260	0	1	0	0	0	0	0	0	1	0	22	216
Northville	398	46	1	2	7	0	1	454	180	876	21	254	23	292	0	2	0	0	0	0	0	0	2	0	73	360
totals	1462	168	32	8	28	0	2	1698	801	4086	320	1324	158	1383	1	4	0	0	1	0	0	0	3	1	302	1241

Great Sacandaga Lake Recreation Study 2009- Broadalbin

	Boat Type							total #	Four	Group	prv LS	Number	Number	Number of	organisms found		organism type								Card	Sticker
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	Contact	launching	retrieving	Inspections	entering	leaving	EWM	BW	NM	GRS	WC	ZM	SWF	other	given	given
6-11-09 to 6-17-09	63	4	0	0	5	0	0	72	33	162	24	65	4	71	0	0	0	0	0	0	0	0	0	0	66	57
6-18-09 to 6-24-09	42	0	1	1	0	0	0	44	7	84	20	35	9	44	0	0	0	0	0	0	0	0	0	0	36	32
6-25-09 to 7-1-09	35	2	2	0	6	0	0	45	9	103	26	39	4	41	0	0	0	0	0	0	0	0	0	0	20	7
7-2-09 to 7-8-09	46	5	1	0	1	0	0	53	13	139	25	44	6	40	0	0	0	0	0	0	0	0	0	0	29	12
7-9-09 to 7-15-09	87	10	3	0	1	0	0	101	67	294	25	93	12	97	0	0	0	0	0	0	0	0	0	0	0	71
7-16-09 to 7-22-09	27	3	1	0	0	0	0	31	19	94	18	37	9	37	0	0	0	0	0	0	0	0	0	0	0	24
7-23-09 to 7-29-09	80	9	2	1	0	0	0	92	49	251	8	84	9	87	0	1	0	0	0	0	0	0	0	1	4	86
7-30-09 to 8-5-09	50	5	2	3	2	0	0	62	34	174	5	60	5	59	0	0	0	0	0	0	0	0	0	0	0	54
8-6-09 to 8-12-09	65	0	1	0	1	0	0	67	43	183	37	63	11	67	0	0	0	0	0	0	0	0	0	0	0	27
8-13-09 to 8-19-09	127	6	1	0	0	0	0	134	96	433	58	131	5	131	0	0	0	0	0	0	0	0	0	0	0	78
totals	622	44	14	5	16	0	0	701	370	1917	246	651	74	674	0	1	0	0	0	0	0	0	0	1	155	448

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat; EWM = Eurasian Watermilfoil; BW = native bladderwort; NM = native milfoil; GRS = grass; WC = Water chestnut; ZM = zebra mussel; SWF = spiny waterflea; card = education materials given; sticker = GSLA numbered sticker.

Great Sacandaga Lake Recreation Study 2009- Day

	Boat Type							total #	Four	Group	prv LS	Number	Number	Number of	organisms found		organism type								Card	Sticker
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	Contact	launching	retrieving	Inspections	entering	leaving	EWM	BW	NM	GRS	WC	ZM	SWF	other	given	given
6-18-09 to 6-24-09	27	2	0	0	0	0	0	29	11	55	1	21	8	14	0	0	0	0	0	0	0	0	0	0	8	29
6-25-09 to 7-1-09	26	4	0	0	0	0	0	30	17	78	0	30	0	18	0	0	0	0	0	0	0	0	0	0	14	29
7-2-09 to 7-8-09	106	6	2	0	0	0	0	114	38	192	5	68	2	46	1	0	0	0	1	0	0	0	0	0	28	70
7-9-09 to 7-15-09	22	8	1	0	1	0	1	32	12	78	2	31	2	29	0	0	0	0	0	0	0	0	0	0	2	33
7-16-09 to 7-22-09	6	4	1	0	0	0	0	11	6	31	1	10	1	10	0	0	0	0	0	0	0	0	0	0	0	11
7-23-09 to 7-29-09	0	0	0	0	0	0	0	0	4	19	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6
7-30-09 to 8-5-09	8	0	0	0	0	0	0	8	4	18	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	8
8-6-09 to 8-12-09	14	4	1	0	0	0	0	19	6	48	0	14	5	18	0	0	0	0	0	0	0	0	0	0	0	19
8-13-09 to 8-19-09	10	2	0	0	0	0	0	12	5	30	0	11	1	11	0	0	0	0	0	0	0	0	0	0	0	12
totals	219	30	5	0	1	0	1	255	103	549	9	190	19	157	1	0	0	0	1	0	0	0	0	0	52	217

Great Sacandaga Lake Recreation Study 2009-Northhampton

	Boat Type							total #	Four	Group	prv LS	Number	Number	Number of	organisms found		organism type								Card	Sticker
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	Contact	launching	retrieving	Inspections	entering	leaving	EWM	BW	NM	GRS	WC	ZM	SWF	other	given	given
6-11-09 to 6-17-09	18	14	1	1	0	0	0	34	7	51	7	10	10	19	0	0	0	0	0	0	0	0	0	0	0	25
6-18-09 to 6-24-09	11	0	0	0	0	0	0	11	6	54	2	11	7	28	0	0	0	0	0	0	0	0	0	0	0	12
6-25-09 to 7-1-09	23	1	1	0	0	0	0	25	17	85	3	24	6	17	0	1	0	0	0	0	0	0	0	0	0	14
7-2-09 to 7-8-09	35	3	1	0	1	0	0	40	28	108	15	37	8	39	0	0	0	0	0	0	0	0	0	0	0	22
7-9-09 to 7-15-09	26	4	2	0	1	0	0	33	19	87	1	31	2	30	0	0	0	0	0	0	0	0	0	0	0	32
7-16-09 to 7-22-09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-23-09 to 7-29-09	27	4	0	0	0	0	0	31	18	68	12	30	1	27	0	0	0	0	0	0	0	0	0	0	22	6
7-30-09 to 8-5-09	11	2	0	0	0	0	0	13	6	46	1	12	0	12	0	0	0	0	0	0	0	0	0	0	0	10
8-6-09 to 8-12-09	25	5	3	0	2	0	0	35	18	92	1	31	0	30	0	0	0	0	0	0	0	0	0	0	0	29
8-13-09 to 8-19-09	47	15	4	0	0	0	0	66	29	153	2	43	8	58	0	0	0	0	0	0	0	0	0	0	0	66
totals	223	48	12	1	4	0	0	288	148	744	44	229	42	260	0	1	0	0	0	0	0	0	0	0	22	216

Great Sacandaga Lake Recreation Study 2009- Northville

	Boat Type							total #	Four	Group	prv LS	Number	Number	Number of	organisms found		organism type								Card	Sticker
Week	M	PWC	S	C	K	B	R	boats	stroke	Size	Contact	launching	retrieving	Inspections	entering	leaving	EWM	BW	NM	GRS	WC	ZM	SWF	other	given	given
6-11-09 to 6-17-09	77	10	0	0	4	0	1	91	27	118	4	0	0	62	0	0	0	0	0	0	0	0	0	0	35	87
6-18-09 to 6-24-09	17	0	0	0	0	0	0	17	6	44	0	14	3	10	0	0	0	0	0	0	0	0	0	0	0	17
6-25-09 to 7-1-09	39	4	0	0	0	0	0	43	23	119	3	38	5	20	0	1	0	0	0	0	0	0	1	0	13	43
7-2-09 to 7-8-09	106	3	0	0	0	0	0	109	25	125	0	46	1	33	0	0	0	0	0	0	0	0	0	0	19	41
7-9-09 to 7-15-09	9	1	1	0	0	0	0	11	3	23	1	10	1	8	0	0	0	0	0	0	0	0	0	0	0	11
7-16-09 to 7-22-09	51	9	0	1	2	0	0	63	29	149	3	61	4	59	0	0	0	0	0	0	0	0	0	0	0	62
7-23-09 to 7-29-09	14	4	0	1	0	0	0	19	8	41	7	0	0	10	0	0	0	0	0	0	0	0	0	0	5	5
7-30-09 to 8-5-09	24	4	0	0	0	0	0	28	19	68	1	21	0	19	0	1	0	0	0	0	0	0	1	0	1	28
8-6-09 to 8-12-09	37	6	0	0	0	0	0	43	26	110	0	42	1	43	0	0	0	0	0	0	0	0	0	0	0	43
8-13-09 to 8-19-09	24	5	0	0	1	0	0	30	14	79	2	22	8	28	0	0	0	0	0	0	0	0	0	0	0	23
totals	398	46	1	2	7	0	1	454	180	876	21	254	23	292	0	2	0	0	0	0	0	0	2	0	73	360

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat; EWM = Eurasian Watermilfoil; BW = native bladderwort; NM = native milfoil; GRS = grass; WC = Water chestnut; ZM = zebra mussel; SWF = spiny waterflea; card = education materials given; sticker = GSLA numbered sticker.

Recreation Use Study: Lake Placid State Boat Launch

By Evan Rea, Watershed Steward

Introduction

Paul Smith's Watershed Stewardship Program is a part of the Adirondack Watershed Institute. The Watershed Stewardship Program employs Watershed Stewards to inspect boats and boat trailers for any clinging plants that might be transported from lake to lake. Stewards have been posted at the Lake Placid state boat launch for the past seven years. Stewards primarily inspected boats and boat trailers for invasive plant fragments, while secondarily educating the public about invasive species. The impact that invasive species can have on recreational boating and property values were some of the negative aspects stressed. Steps to prevent spreading invasive species such as washing boats and looking for plant fragments were conveyed to the public. Lake Placid has, in the past, been free of invasive species, but on June 25 of this year, it was officially announced that a large patch of Variable Leaf Milfoil existed in Paradox Bay. The stewards' message for the rest of the summer integrated this important development and underscored the need for boaters to either avoid Paradox Bay or visit it at slow speeds, avoiding the milfoil beds.

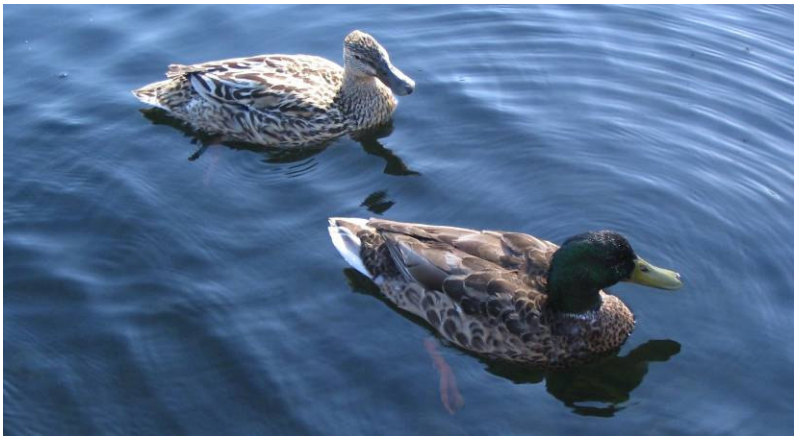


Figure 1: Mallards on Lake Placid

Methods

Stewards were on duty from 7:00am- 4:00pm 5 days a week, Thursday-Monday (5/23/09-9/8/09). Stewards approached boaters, introduced themselves, and asked to inspect the boat for any clinging plants. After the inspection and collection of recreational data (time launching/retrieving, horsepower of boat motor, state of registration, boat type, group number, commercial/recreational/or fishing use, and if the vessel has a four stroke motor), owners were asked if they had been in any other water bodies in the past two weeks, and if they took any precautionary steps to prevent spreading invasive plants (washing boat, inspecting boat, draining bilge, draining livewells, disposing of bait, or drying the boat for at least 5 days).

Results

Beginning on 5/23/09 and ending on 9/8/09, Stewards saw 1,587 boats and 3,205 people at the Lake Placid boat launch (figure 1). Use at the launch rose until 7/9/09-7/15/09, but then dropped for two weeks. A steep increase followed, making one drop before reaching peak usage during the week of 8/13/09-8/19/09, where 415 people launched 201 boats.

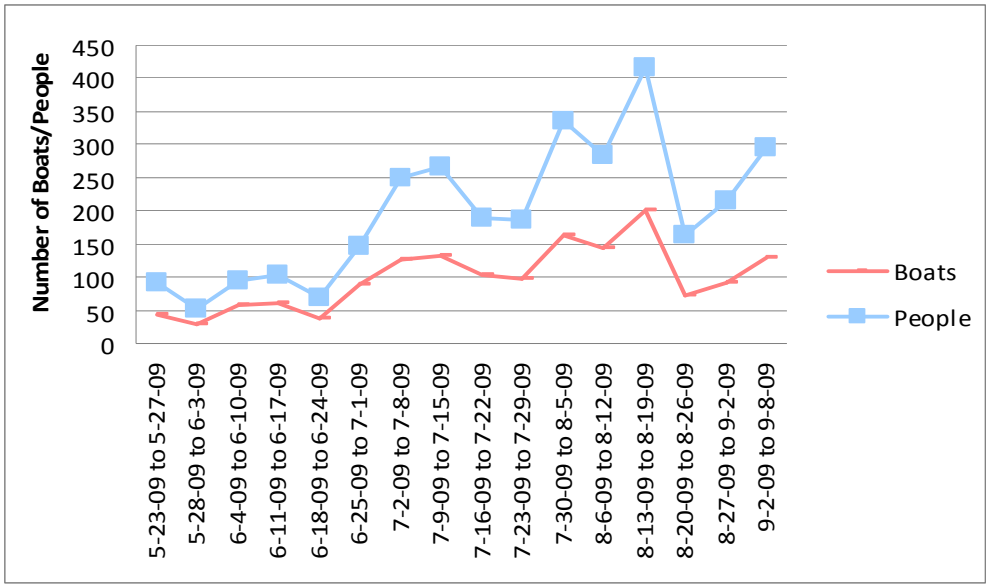


Figure 2. Usage by week of the NYSDEC boat launch at Lake Placid 5/23/09 to 9/8/09, N boats=1572, N people=3156.

This year, Stewards collected data on the type of use boaters were participating in when launching their craft (figure 2). Stewards classified each party into one of three groups: fishing, recreation and commercial. Commercial traffic included all barges and any service providers. The recreation trend closely follows the trends seen in figure 1, with its peak ocurring at the same time (8/13/09-8/19/09). Fishing and commercial usage varies, but stays within a relatively small range, with a slight peak during the week of 8/6/09-8/12/09. According to the data, recreation accounted for the vast majority of use on Lake Placid, accounting for 75% of the total usage types. Fishing and commercial uses evenly comprised the remaining 25% of the usage (13% each).

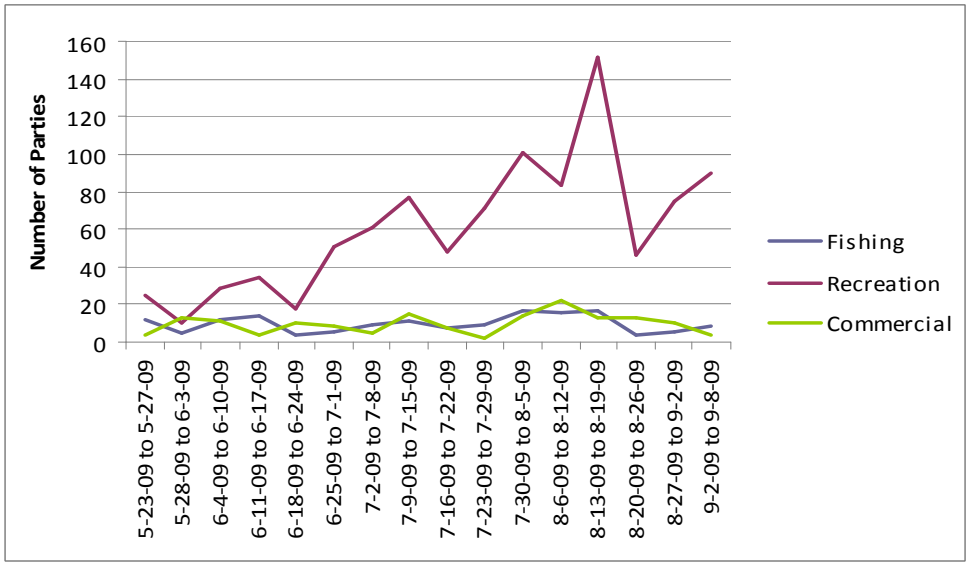


Figure 3. NYSDEC boat launch use types at Lake Placid, 5/23/09-9/8/09. N fishing=157, N recreation= 971, N commercial= 155, total= 1283.

The majority of watercraft seen launching were motorboats, 976 of them accounting for 61% of the total (figure 2). Second came kayaks, with 386 representing 24% of the total. Canoes were third most numerous at the launch, with 155 of them consisting of 10% of the total. Barges (41), sailboats (15) and

rowboats (14) together make up the remaining 5% of the total. No personal watercraft (PWC) were seen at Lake Placid due to an existing ban on specialty prop craft. Horsepower of outboard motors was also collcted (n=481), with the average being 74.9. Median horsepower was 70, while the range of horsepower spanned from the low of 4 to a high of 350. Of the motorboats with outboard motors, there were 195 with four-stroke motors, which is 22 less than the 217 recorded in 2008, and 98 less than the 293 recorded in 2007.

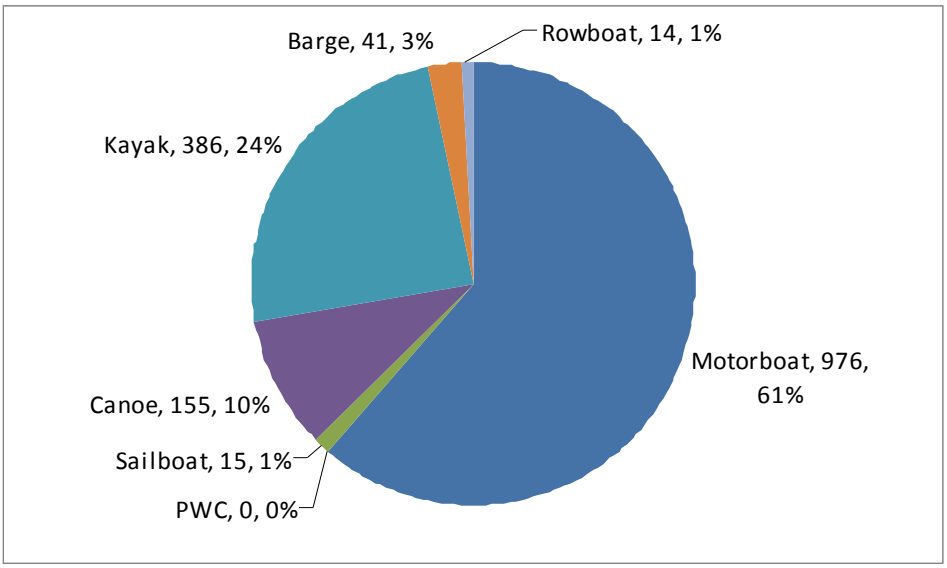


Figure 4. Types of watercraft launched at NYSDEC boat launch at Lake Placid, 5/23/09 to 9/8/09, n=1572.

State or province of origin was determined by the registration on boats or by license plate of vehicles transporting kayaks or canoes. Out of the 1259 states/provinces recorded, the overwhelming majority of boats seen at the launch were from New York (1083, 86%), which is in accordance with the number seen last year. A wide range of states and two provinces were recorded as well, with New Jersey-48, Connecticut-23, and Pennsylvania-17 having, in descending order, the second, third and fourth most boats as their origin.

State	Total	State	Total	State	Total	State	Total
AZ	1	MA	10	NY	1083	VA	3
CA	1	MD	6	OH	9	VT	12
CAN	6	ME	3	ON	2	WA	1
CT	23	MO	1	OR	1	WI	2
DE	1	NC	4	PA	17	**Total**	**1259**
FL	5	NH	10	QC	5		
IL	1	NJ	48	RI	4		

Table 1. States of origin of watercraft seen at the NYSDEC Lake Placid boat launch, 5/23/09-9/8/09, as taken from boat registration or vehicle license plate.

Stewards were posted for five days per week at the Lake Placid public boat launch, the same as in 2008. However, with the discovery of Variable Leaf Milfoil, the Watershed Stewardship Program made an effort to increase coverage, but was only able to cover two consecutive Wednesdays. This data was insufficient to produce a trend in use for that day, so it was excluded in this aspect of the results. Saturdays were the busiest day, with a total of 385 watercraft (figure 4), which is similar to 2008's trend. Sundays saw the next most boats, with just 5 less than Saturday- 380.

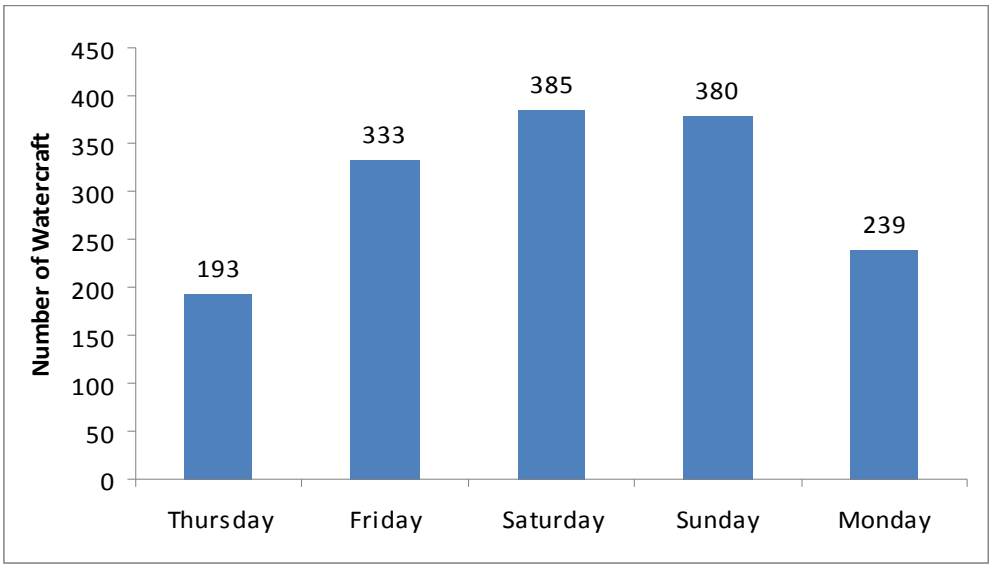


Figure 5. Use by day of the NYSDEC boat launch at Lake Placid, by number of boats per day, 5/23/09-9/8/09.

Stewards asked each boater if they had been in any water bodies in the previous two weeks. This enables the Watershed Stewardship Program to determine where any possible threats are coming from, and with what frequency. A total of 119 different lakes were recorded to have been visited prior to Lake Placid, constituting 910 boats which had been in water previously, and therefore could potentially spread invasive aquatic plants (table 2). This number represents 58% of the 1572 boats launched, which is higher than last year's 24%. The fact that many boats have not been in water prior to launching at Lake Placid could indicate that boats stay in storage and only come to Lake Placid for the boating season. Or, this means that Stewards were unable to ask the question due to a rush of traffic. The higher percentage of boats having been in the water in the last two weeks could mean that boaters are moving around more, which will increase the likelihood of spreading invasive species.

The lake that was visited the most frequently before launching at Lake Placid was, in fact, Lake Placid. Over half (543, 60%) of the responses to the prior water body question indicated Lake Placid. The next most numerous lake was the Saranac Lakes Chain, totaling 72, which consist of Saranac Lakes (33), Upper Saranac Lake (15), Middle Saranac Lake (4) and Lower Saranac Lake (20). Following the Saranac Lakes in frequency was Mirror Lake with 45 visits, and Lake Flower with 24. There were also 22 visits from boats coming out of Lake Champlain. While the numbers of boats coming from these lakes may not be as numerous as boats from Lake Placid, it is important to note that the Saranac Lakes, Lake Flower, and Lake Champlain all have Eurasian Watermilfoil in them. Furthermore, Lake Champlain is a notorious hotspot of invasive species, and contains Water Chestnut, Hydrilla and Zebra Mussels.

Water Body	Visits	Water Body	Visits	Water Body	Visits
Anota Lake (MA)	1	Hudson River	5	Ocean	1
Atlantic Ocean	1	Indian Lake	1	Oneida Lake	2
Auger Lake	1	Jordan Pond (ME)	1	Oneida River	1
Ausable River	3	Kiwassa Lake	2	Osgood Pond	2
Black River	2	Lake Bonaparte (Harrisville, NY)	1	Oswego Lake	2
Brant Lake	2	Lake Champlain	22	Otsego Lake	2
Buck Pond	1	Lake Clear	1	Owasco Lake	1
Canada Lake	2	Lake Colby	3	Pine Creek (PA)	2
Canandaigua Lake	1	Lake Corey	1	Potomac River	1
Cape Cod	1	Lake Erie	2	Raquette Lake	1
Carry Falls Reservoir	1	Lake Eaton	2	Raquette River	5
Cascade Lakes	4	Lake Everest	1	Rollins Pond	1
Cayuga Lake	1	Lake Flower	24	Round Lake	1
Chapel Pond	1	Lake George	7	Round Valley Reservoir (VT	1
Chautauqua Lake	1	Lake Hopatcong (NJ)	3	Rude Pond	1
Chateaugay Lake	1	Lake Kushaqua	2	Sacandaga Lake	1
Chazy Lake	4	Lake Nockamixon (PA)	1	Sacandaga Reservoir	1
Chazy River	1	Lake Onondaga (NH)	1	Sadagan Lake (VT)	1
Chesapeake Bay	1	Lake Ontario	5	Saranac Lakes	33
Chester River (MD)	1	Lake Placid	543	Saratoga Lake	2
Chubb River	1	Lake Powell (UT)	1	Schroon Lake	4
Cranberry Lake	1	Lake Rescue (VT)	1	Second Pond	1
Colby Lake (MN)	1	Lincoln Pond	1	Seneca Lake	1
Conesus Lake	3	Little Clear	1	Seneca River	1
Connecticut River	5	Little Tupper Lake	2	Silver Lake	1
Connery Pond	1	Long Island Sound	7	Spear Falls	1
Connetquot River	1	Long Lake	6	St. Lawrence	8
Cosuno Lake	1	Loon Lake	1	St. Regis Lakes	4
Eagle Pond	1	Lower Follonsby Clear Pond	1	St. Regis River	2
Eighth Lake	2	Lower Saranac Lake	20	Taylor Pond	6
First Lake	1	Lows Lake	2	Thirteenth Lake	1
Follonsby Clear Pond	2	Maryland	1	Tridelphia Reservoir (MD)	1
Franklin Falls	1	Meacham Lake	2	Tupper Lake	6
Fulton Chain 1st - 4th	1	Middle Saranac Lake	4	Union Falls	3
Glenville Lake	1	Mirror Lake	45	Upper Chateaugay	1
Hatch Lake	1	Mohawk River	2	Upper Saranac Lake	15
Heart Lake	1	Moody Pond	1	Upper St. Regis	1
Hemlock Lake	1	Muskellunge Bay	1	West Canada Creek	1
Higley Flow	2	Niagara River	1	White Water Lake (WI)	1
Hinckley Reservoir	1	North Lake	1		

Table 2. Water bodies, if any, visited in the two weeks prior to launching at the NYSDEC Lake Placid Boat launch, N lakes=119, responses=910.

Stewards asked boaters if they had taken any form of prevention steps to stop the spread of invasive species. Responses were grouped into the following categories: inspect boat, wash boat, dry boat for at least 5 days, dispose of bait, drain live wells, empty bait buckets, and/or drain bilge.

A total of 1,004 'yes' responses and 1,278 prevention steps were recorded (figure 3). This means that some people were doing more than just one thing to help stop the spread of invasive species. The most popular response was boat washing, to which 685 (50% of total groups) groups admitted to doing. The other main prevention step taken was boat inspecting, with 450 groups (30% of total). Other prevention steps were much less frequently noted as follows: draining bilges- 6% of groups, drying boat- 4%.

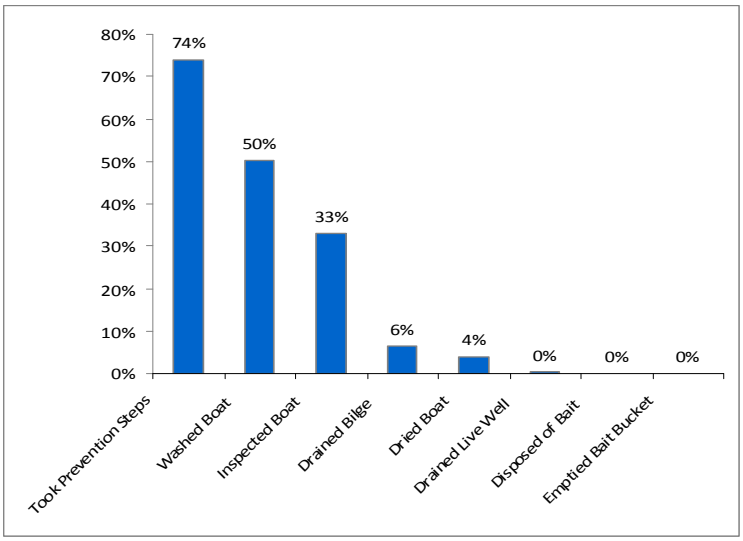


Figure 6. Prevention steps taken by boaters at NYSDEC boat launch at Lake Placid, 5/23/09 to 9/8/09. N=1278.

Stewards examined and recorded what they found upon inspecting boats. This year, Stewards found 79 organisms, whether identifiable or not, entering the lake and 21 leaving (table 3). Of those found entering the lake, 14 were identified as invasive or of concern (9 Eurasian watermilfoil, 4 variable leaf milfoil, 1 zebra mussel). As for organisms found leaving the lake, the only thing of concern was one piece of Eurasian Water Milfoil, but was reported to have been stuck onto the boats' trailer before launching. The 'Other' category encompasses anything the Stewards were unable to identify, due to the sample being too decomposed or destroyed. It also includes things such as grass, twigs, mud, and terrestrial leaves and weeds.

Organism	**Entering**	**Leaving**
Eurasian watermilfoil	8	1
Bladderwort	1	0
Native milfoil	2	0
Grass	24	6
Variable leaf milfoil	4	0
Zebra mussels	1	0
Pine needles	8	2
Other	31	12
Total	**79**	**21**

Table 3. Organisms found on boats entering and leaving the NYSDEC boat launch at Lake placid, 5/23/09-9/8/09. N=100.

Purple Loosetrife Monitoring and Control

This year, Stewards found and removed 25 invasive purple loosetrife (*Lythrum salicaria*) plants from Camp Sunrise on August 21st. No plants were found at the Paradox Bay site discovered last year. A

complete shoreline survey, including the islands, was also carried out, in which no other purple loosestrife plants were found.

Discussion

The summer of 2009 brought a small increase from last year in number of boats and people using the Lake Placid launch (figure 5). The 3,205 people using the launch was 163 (+ 5.3%) more than last year's 3,042. As for boats, there were 107 more this year (1,587) than last year (1,480; + 7.2%). These small fluctuations in usage, as compared to previous years, suggests a three-year plateau for usage at the launch. It should be noted, however, that these numbers are affected by the number of days of service per week Stewards are posted at the launch. In 2007, stewards were there every day of the week, whereas in 2008 and 2009, they were there only 5 days per week.

Motorboats consisted of 61% of the launch usage, and the next most numerous was kayaks with 24%. This is almost identical to last year's 61% and 27% respectively. There were fewer four-stroke motors in use at the launch this year, totaling 195, which is less than both last year's 217 and 2007's 293. A total of 79 organisms were found entering Lake Placid, while 21 were found leaving. The fact that Variable Leaf Milfoil was seen entering the lake is disturbing, especially because of the patch found in Paradox Bay in June. However, there is a positive trend in people taking steps to prevent spreading invasive species. Last year, there were 604 affirmative responses to the question "What, if any, kind of steps do you take to prevent spreading invasive species?" This year, there were more positive responses, totaling 1,004, which is 400 more people (an increase of 66%) taking steps to prevent spreading invasive species. This dramatic uptick in public consciousness and behavior suggests the positive impact of programs like the Watershed Stewardship Program in educating the public about the threat of invasive species, the damage they can cause, and how to prevent them from infecting new lakes.

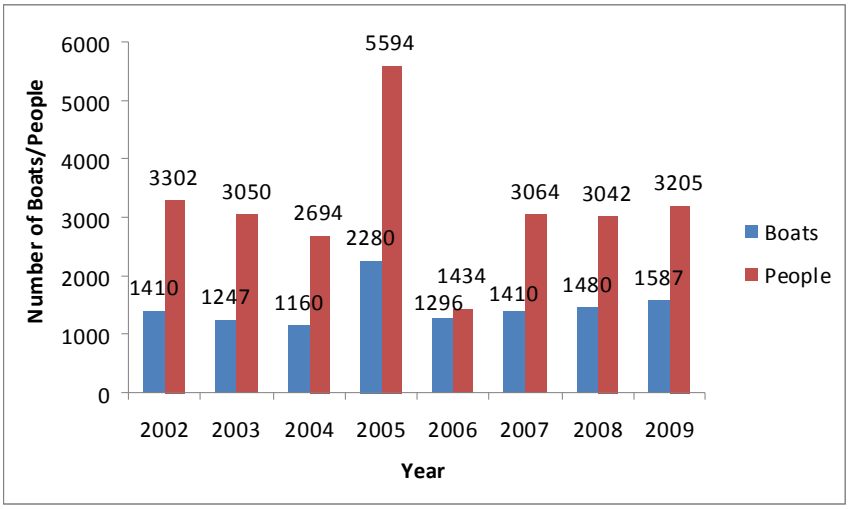


Figure 7. Historical usage of NYSDEC boat launch at Lake Placid, 2002-2009.

Conclusion

This summer was a success for the Watershed Stewardship Program because it appears that more and more people are learning about invasive species and are actively doing something to stop them from spreading to new lakes. However, it is disheartening to note that a well-established colony of Variable Leaf Milfoil was found in Paradox Bay. In the previously percieved to be uninfected Lake Placid, this discovery was a wake up call to community members that there is an urgent need to prevent invasive organisms from spreading before they can become a problem. Lake Placid acted quickly and managed to control the plants in short order, but now we recognize definitively that invasive species can and have infected the Lake Placid, that is no longer and never was "immune" to invasives, and that constant monitoring will now be needed to ensure that it or other types of invasives do not again take root.

Since 2002, the Watershed Stewardship Program has benefitted from help and guidance from the Lake Placid Shore Owner's Association. It is them we thank for not only helping us to protect their lake, but for the strong sense of stewardship they feel for the lake. It is indeed with the help of people like the shore owners that public awareness is rising, and on which the struggle to keep waterways free of harmful invasive organisms depends.

Figure 8: Temporary closure sign, Lake Placid Village Boat Launch, during VLM removal

Lake Placid Recreation Study 2009

	Boat Type							total #	Weekly Avg	Four	Group	number	number
Week	M	PWC	S	C	K	B	R	boats	HP Outboard	stroke	Size	launching	retrieving
5-23-09 to 5-27-09	33	0	0	1	9	0	0	43	68	14	95	32	9
5-28-09 to 6-3-09	24	0	0	1	0	3	0	28	63	10	53	23	12
6-4-09 to 6-10-09	42	0	0	3	7	5	3	60	64	10	95	36	39
6-11-09 to 6-17-09	45	0	0	4	11	1	0	61	61	10	103	46	25
6-18-09 to 6-24-09	21	0	0	0	11	5	1	38	96	6	70	24	12
6-25-09 to 7-1-09	50	0	0	5	29	4	0	88	76	8	151	54	37
7-2-09 to 7-8-09	66	0	8	12	36	4	0	126	72	7	250	59	48
7-9-09 to 7-15-09	83	0	0	12	33	5	2	135	77	13	275	80	70
7-16-09 to 7-22-09	65	0	0	12	23	2	1	103	81	17	194	59	38
7-23-09 to 7-29-09	50	0	0	10	37	1	0	98	65	5	189	71	40
7-30-09 to 8-5-09	104	0	1	23	31	3	1	163	81	20	344	119	57
8-6-09 to 8-12-09	92	0	0	12	36	4	2	146	73	15	285	83	75
8-13-09 to 8-19-09	118	0	0	33	48	2	2	203	74	24	428	137	80
8-20-09 to 8-26-09	44	0	1	4	21	2	0	72	88	12	162	54	36
8-27-09 to 9-2-09	65	0	2	10	16	0	1	94	72	12	216	64	48
9-2-09 to 9-8-09	74	0	3	13	38	0	1	129	75	12	295	86	55
totals	976	0	15	155	386	41	14	1587	Summer Avg 75	195	3205	1027	681
									Median HP 70				

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat;

Lake Placid Recreation Study 2009

	organisms found		organism type								Use Type		
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	Fish	Rec	Comm
5-23-09 to 5-27-09	2	0	0	0	0	0	0	0	0	2	12	25	4
5-28-09 to 6-3-09	1	0	0	0	0	0	0	0	0	1	5	10	13
6-4-09 to 6-10-09	3	2	0	0	0	0	0	0	0	5	12	29	11
6-11-09 to 6-17-09	4	0	0	0	0	1	0	0	0	3	14	34	4
6-18-09 to 6-24-09	1	1	0	0	0	1	0	0	0	1	4	18	10
6-25-09 to 7-1-09	6	2	2	0	1	2	0	0	1	4	6	51	8
7-2-09 to 7-8-09	4	2	0	0	0	1	0	0	1	4	9	61	5
7-9-09 to 7-15-09	4	1	0	0	0	2	0	0	1	2	11	77	15
7-16-09 to 7-22-09	7	0	1	0	0	2	0	0	0	4	7	48	7
7-23-09 to 7-29-09	5	2	0	0	0	2	0	0	0	4	9	71	2
7-30-09 to 8-5-09	10	1	1	1	1	4	0	0	0	4	17	101	14
8-6-09 to 8-12-09	8	1	0	0	0	3	0	0	0	8	16	83	22
8-13-09 to 8-19-09	3	0	0	0	0	0	0	0	0	3	17	152	13
8-20-09 to 8-26-09	6	3	2	0	0	3	0	1	1	3	4	46	13
8-27-09 to 9-2-09	4	2	2	0	0	2	0	0	0	2	6	75	10
9-2-09 to 9-8-09	6	3	1	0	0	4	0	0	0	5	8	90	4
totals	**74**	**20**	**9**	**1**	**2**	**27**	**0**	**1**	**4**	**55**	**157**	**971**	**155**

Key: EWM = Eurasian Watermilfoil; BW = native bladderwort; NM = native milfoil; GRS = grass; WC = water chestnut; ZM = zebra mussel; VLM = variable leaf milfoil

	Measures taken to Prevent Inv. Species								No. of
Week	took steps	I	WB	DB	BB	LW	Dis	Dry	Groups
5-23-09 to 5-27-09	29	14	15	7	0	0	0	3	41
5-28-09 to 6-3-09	24	17	11	2	0	0	0	0	26
6-4-09 to 6-10-09	36	17	24	1	0	0	1	0	52
6-11-09 to 6-17-09	36	15	27	5	0	0	0	0	53
6-18-09 to 6-24-09	23	8	19	0	0	0	0	0	30
6-25-09 to 7-1-09	47	18	32	5	0	0	0	0	70
7-2-09 to 7-8-09	68	36	39	8	0	1	0	3	101
7-9-09 to 7-15-09	82	29	54	11	0	1	0	4	114
7-16-09 to 7-22-09	63	22	47	7	0	0	0	4	86
7-23-09 to 7-29-09	60	29	39	4	0	2	0	2	82
7-30-09 to 8-5-09	95	32	70	8	0	1	0	9	142
8-6-09 to 8-12-09	97	43	66	9	0	0	0	6	120
8-13-09 to 8-19-09	132	57	89	8	0	0	0	13	181
8-20-09 to 8-26-09	50	16	39	8	0	0	0	2	64
8-27-09 to 9-2-09	84	49	58	1	0	0	0	3	90
9-2-09 to 9-8-09	78	48	56	1	0	1	0	2	109
totals	**1004**	**450**	**685**	**85**	**0**	**6**	**1**	**51**	**1361**

Key: I = Inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Recreation Use Study: Osgood Pond

By Sarah Ryan, Watershed Steward

Introduction:

The Watershed Stewardship Program (WSP) of Paul Smith's College's Adirondack Watershed Institute has worked to protect Adirondack lakes from the threat of invasive species since 2000. In this, the second year of operation at Osgood Pond, the WSP employed stewards to inspect boats and trailers, provide an interpretive message tailored to the lake in question, and collect data to track the recreational usage of the launch over time. The stewards provided by the WSP were supplemented by Volunteer Stewards from the Osgood Pond Association who attended a volunteer training offered by the WSP. The Volunteer Stewards performed a similar function by inspecting in and outgoing vessels for plant material, collecting recreational use data, and providing information on best practices to avoid the spread of unwanted organisms.

Methods:

A watershed steward was stationed at the Osgood Pond Waterway Access Site (WAS) beginning May 29th through August 14th on Friday afternoons. Volunteer stewards from the Osgood Pond Association covered shifts on many Saturdays and Sundays. Stewards watched for boats preparing to put in to, or take off of the water. Approaching vessels were assessed for relevant information including: type of craft, number of people, horsepower and type of engine when applicable, the state of registration (gleaned from car plates for non-motorized craft), and the time of day.

Once the operator of the craft began preparations to launch or debark, the steward would approach and introduce him or herself and their purpose. From the operator, the steward would determine and note the most recent water body that the vessel had been used on, and what, if any, measures the operator takes to prevent transporting potentially invasive organisms from one place to another. The steward would then inspect (and demonstrate the inspection process to the operator) all boats and trailers for any visible plant or other organic material.

Upon discovery of organic material, it was physically removed and identified to species when possible. The discovery was noted on the data sheet. The material was disposed of on dry land far away enough away to ensure that it could not find its way in to a water body.

Before, after or during the inspection process, the steward provided a lake-specific interpretive message focusing on native and non-native ecology. The steward also answered questions, provided publications with further information, and suggested simple and effective measures that the boater could employ to protect the waters on which they recreate. These methods include washing the boat and trailer with a garden hose, at a boat wash station, or at a car wash. Also important and effective are a thorough visual inspection including the removal of anything found, draining and cleaning live wells and bilge, allowing trailer and boat to dry (two weeks is recommended). Stewards suggest prevention measures only after determining what measures the boat owner already employs, to avoid unnecessarily biased results in that category.

Each watershed steward was responsible for the database of at least one lake at which there was a WSP presence. All data collected at that launch was entered and analyzed for trends over the course of that season, and over the entire length of time the WSP has tracked that lake. In the case of Osgood Pond, the 2009 data represents the second year, and begins to allow year to year comparisons.

Results:

The following results reflect the paid WSP stewards' results only. Volunteer Stewards results are discussed below. Friday afternoons between May 29th and August 14th, stewards recorded 38 boats entering or leaving the NY State WAS, and interacted with 55 people. The peak usage was Friday, July 24th with 20 people and 7 boats. July 10th and August 14th also showed elevated usage with 7 boats 8 people,

and 6 boats 9 people respectively. Use trends showed an inconsistent increase until July 24th, followed by a sharp drop for two weeks and a slight elevation in the last week of monitoring, August 14th.

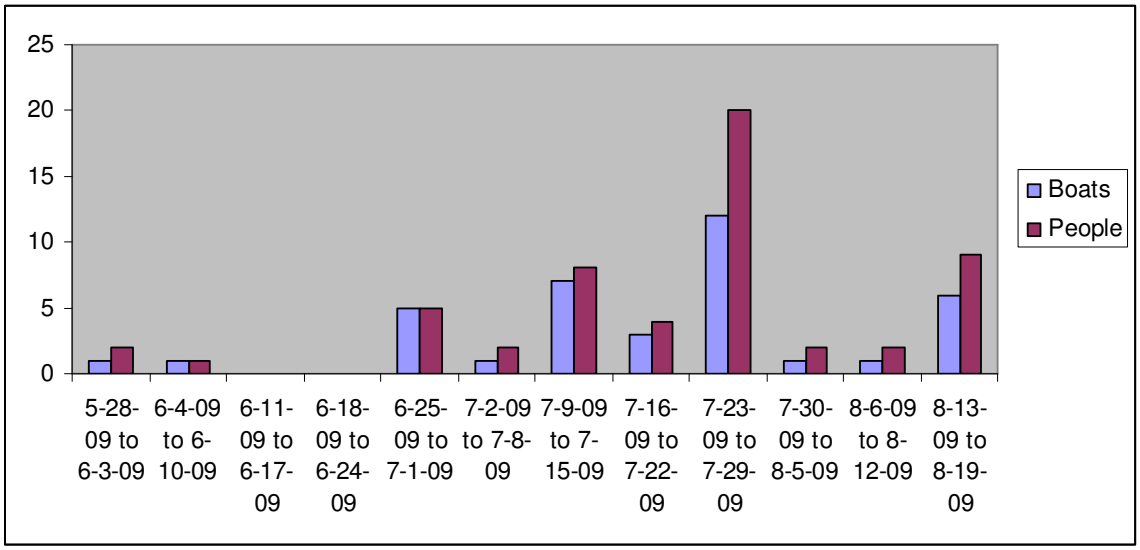


Figure 1: Summer 2009 usage by people and boats of NY State WAS at Osgood Pond on Fridays.

Kayaks were the most numerous crafts observed totaling 17, or 45% of all boats. Canoes were also common totaling 11 for the season, or 29%. Motorboats consisted of 26% of all boat traffic, with 10 in all. Motorboats were the third and last watercraft type observed by stewards in 2009. Personal watercraft, sailboats, barges and rowboats were not observed at all in 2009.

When asked if they regularly employed any measures to prevent the spread of invasive species, 21 boat operators indicated that they did. This indicates that 55% of boats observed at Osgood Pond in 2009 had taken some form of invasive spread prevention prior to their visit. Two measures were cited by boaters: visual inspections and washing of boat (and trailer when applicable). Some boat operators indicated that they employed both inspections and boat washing, the numbers and figure include these multiples. 11 operators regularly wash their boat between uses or 29% of observed boats at Osgood Pond.

Slightly fewer (10) operators indicated regular visual inspections when exiting or entering a body of water, which is approximately 26% of observed boats. None of the boat operators spoken to by a steward at Osgood Pond in 2009 indicated that they drained their bilges, cleaned bait buckets, cleaned their live wells or disposed of unused bait on dry land.

Origin	Total
NY	16
MI	1
CT	1
PA	1

Figure 2: Origin by state or province of boats using NY State WAS at Osgood Pond in summer 2009

While watershed stewards made an effort to record the state that every boat came from, or was registered in, it was not always possible due largely to the unique challenges of the NY State WAS at Osgood Pond. Many non-motorized boats are carried not driven to the water at this launch restricting the stewards' ability to record the state of the driver's license plate. There had also been a question early in the season, of whether stewards would record the state of origin at all for non-motorized watercraft. Of the 38 boats observed in 2009, 19 had a state of origin recorded. The majority of boats were from New York State, with one boat each from Michigan, Connecticut and Pennsylvania.

In response to stewards' question, "has your boat been in the water anywhere in the last two weeks? If so, which one?" boaters responses included 8 separate bodies of water. 9 boats had not been in the water at all in the prior two weeks. Osgood Pond was most frequently cited as the prior water

body. Of the 8 bodies of water cited, 3 of them are known to be infested with one or more invasive species: Upper Saranac Lake (Eurasian watermilfoil), Lake Champlain (Curlyleaf Pondweed, Eurasian watermilfoil, Water Chestnut, Zebra mussels) and Lake Colby (Eurasian watermilfoil). Additionally Long Lake has Variable-leaf milfoil, which is a species of concern.

Water body	Known to be Infested?	Total boats	Water body	Known to be Infested?	Total boats
Osgood Pond		20	Mountain View Lake		1
None		9	Lake Champlain	Yes	1
Chubb River		1	Lake Colby	Yes	1
Upper Saranac	Yes	2	Long Lake	Yes- VLM	1
Lake Tiorati	Likely	2			

Figure 3: Bodies of water visited in the last two weeks by boats using NY State Boat Launch at Osgood Pond

Volunteer Steward Results

Volunteer Stewards from the Osgood Pond Association monitored the WAS on many Saturdays and Sundays. Every weekend but one (6/27 and 6/28) featured at least one shift of volunteer coverage on a Saturday or Sunday, or both days. Volunteers inspected a total of 66 boats, of which 11 were motorized and 55 were non-motorized. Volunteers interacted with a total of 102 visitors. 26 of 41 groups (63%) reported being aware that Eurasian watermilfoil was a threat to waterway health. 25 of 41 groups (61%) reported taking some measure to prevent invasives from hitchhiking on their boats or gear. Previously visited waterbodies included Osgood Pond, Follonsby Clear Pond, Little Tupper Lake, Bog River, Long Lake, Albany area, Upper St. Regis Lake, Raquette River, Piercefield Flow, Lake Flower, Round Lake, Rainbow Lake, St. Regis River, Lower St. Regis Lake, Upper Saranac Lake, and Lower Saranac Lake.

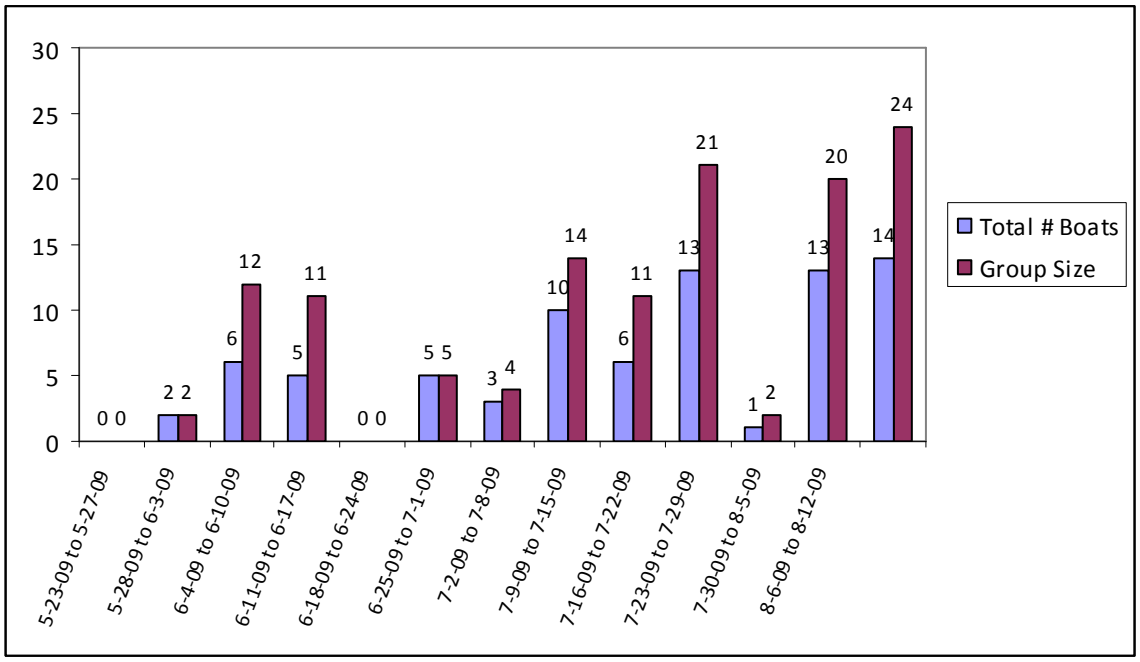


Figure 4: Overall Osgood Pond Waterway Access use: All steward data combined, Summer 2009, Fridays-Sundays (irregular coverage).

Discussion:

Overall use was down in 2009 when compared with 2008. However, this comparison is misleading given that stewards were present at Osgood Pond Boat Launch for Fridays, Saturdays and Sundays for the latter half of 2008, and Fridays only for the entirety of the 2009 season, and not at all for the last three weeks of the summer prior to Labor Day, due to staff shortages. While summer 2008 use showed a trend upward over the course of the season, 2009 was less consistent, with a usage peak in mid July. Several factors may have contributed to the discrepancy included reduced monitoring in 2009 during which data was collected for Fridays only. Weather and the economic recession may have also contributed.

One or more preventative measures to avoid transporting invasive species were reportedly performed by 55% of boaters spoken to by a steward. The measures they used were washing boat and visual inspections. None of the boat operators at Osgood Pond in 2009 indicated that they drained their bilges, cleaned bait buckets, cleaned their live wells, or disposed of unused bait on dry land. This contrasts with 2008 when 24% of boaters reported that they drained their bilge, 3% cleaned bait buckets. While no boater stated that they intentionally let their boat and trailer dry thoroughly to prevent spreading organisms from one place to another, the act of preventative drying is implied by the users who stated that their boat had not been in the water at all in the last two weeks (9, 24%).

Of the 8 bodies of water visited in the two weeks prior to launching at Osgood Pond, 3 of them are known to be infested with one or more invasive species, and a 4th has a potentially invasive watch species. These 4 bodies of water together were 18% of the waterways last visited prior to use in Osgood Pond. This number is significantly higher than the same figure from 2008, for which 13% of boats had been in infested waters in the prior two weeks. This represents a significant threat to the goal of keeping Osgood Pond free of invasive species.

Non-motorized boats made up the vast majority crafts observed by stewards at Osgood Pond's public boat launch. Kayaks and canoes together constituted 74% of all boats, while motor boats constituted the remaining 26%, which is a similar result compared with 2008 data. The average horsepower observed was 14.99, down from an average of 23 in 2008. No four stroke engines were observed in 2009. While 3 four stroke engines were observed in 2008, a comparison in this category would be misleading due to the fact that there were more days covered by stewards, and more boats total observed in 2008. 2009 stewards were present at Osgood Pond's public launch for a total of 12 half-days, all of them Fridays.

Of the 38 boats inspected, stewards removed organic material from 4 of them (11%). In 2 cases, the material removed was grass (the database does not differentiate between aquatic and terrestrial grasses). The other 2 boats were transporting various native Potamogeton species.

Conclusion:

The 2009 Watershed Stewardship Program at Osgood Pond represented a positive continuation of boater education, invasive spread prevention, and data collection. This second year of coverage enabled personal engagement with 55 people and inspection of 38 boats. This second year of data provides helpful year to year comparisons enabling the establishment of use trends that will guide efforts in the future. 55% of boaters reported using one or more preventative measures to avoid transporting invasive species. An additional 24% had not had their boats in any water in the prior two weeks, which theoretically reduces the likelihood that they could be a vector for viable invasive introduction. Watershed stewards removed organic matter from 11% of boats that they encountered.

The data presented here has been that of the Watershed Stewardship Program's paid stewards. The results from the Osgood Pond Volunteer Steward Program have not yet been received or analyzed. Volunteer data will be made available through the WSP Director's office.

We at Paul Smith's College's Watershed Stewardship Program would like to acknowledge the support of the Osgood Pond Association which has made this second successful stewardship season possible. The WSP is grateful also to the Osgood Pond Volunteer Stewards for their good work this season. We look forward to continuing the tradition of stewardship and cooperation for a third year in 2010.

Osgood Pond Recreation Study 2009

Watershed Steward and Volunteer Steward data combined

	Boat Type							total #	Group	organisms found	
Week	M	PWC	S	C	K	B	R	boats	Size	entering	leaving
5-23-09 to 5-27-09	0	0	0	0	0	0	0	0	0	0	0
5-28-09 to 6-3-09	2	0	0	0	0	0	0	2	2	1	0
6-4-09 to 6-10-09	3	0	0	3	0	0	0	6	12	0	0
6-11-09 to 6-17-09	2	0	0	3	0	0	0	5	11	0	0
6-18-09 to 6-24-09	0	0	0	0	0	0	0	0	0	0	0
6-25-09 to 7-1-09	1	0	0	1	3	0	0	5	5	0	0
7-2-09 to 7-8-09	2	0	0	1	0	0	0	3	4	0	1
7-9-09 to 7-15-09	2	0	0	5	3	0	0	10	14	0	0
7-16-09 to 7-22-09	2	0	0	2	2	0	0	6	11	0	0
7-23-09 to 7-29-09	2	0	0	4	7	0	0	13	21	0	2
7-30-09 to 8-5-09	1	0	0	0	0	0	0	1	2	0	0
8-6-09 to 8-12-09	0	0	0	13	0	0	0	13	20	0	0
8-13-09 to 8-19-09	3	0	0	9	2	0	0	14	24	0	1
totals	20	0	0	41	17	0	0	78	126	1	4

Osgood Pond Recreation Study 2009

Watershed Steward and Volunteer Steward data combined

	organism type								visitor prevention steps							
Week	EWM	BW	NM	GRS	WC	ZM	VLM	other	yes	I	WB	DB	BB	LW	Dis	didn't ask
5-23-09 to 5-27-09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-28-09 to 6-3-09	0	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0
6-4-09 to 6-10-09	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	5
6-11-09 to 6-17-09	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
6-18-09 to 6-24-09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-25-09 to 7-1-09	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
7-2-09 to 7-8-09	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0
7-9-09 to 7-15-09	0	0	0	0	0	0	0	0	7	4	1	0	0	0	0	1
7-16-09 to 7-22-09	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
7-23-09 to 7-29-09	0	0	0	1	0	0	0	1	5	1	4	0	0	0	0	1
7-30-09 to 8-5-09	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
8-6-09 to 8-12-09	0	0	0	0	0	0	0	0	10	5	2	0	0	0	0	0
8-13-09 to 8-19-09	0	0	0	1	0	0	0	0	11	9	5	0	0	0	0	0
totals	0	0	0	2	0	0	0	2	46	24	18	0	0	0	0	7

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat EWM = Eurasian Watermilfoil; BW = native 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 = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Recreation Use Study: Rainbow Lake

By Sarah Ryan, Watershed Steward

Introduction:

The Watershed Stewardship Program of Paul Smith's College provided invasive species education and spread prevention at Rainbow Lake for the fifth season in 2009. The Rainbow Lake waterway is a series of connected, navigable lakes and channels including Rainbow Lake, Clear Pond, Rainbow Narrows, Kushaqua Narrows and Lake Kushaqua. Currently the waterway does not host invasive species, but does host well established colonies of Southern Naiad (*Najas guadalupensis*), which grows in some seasons into dense mats which pose navigational hazards. This species is not present in nearby waterways, and as such care should be exercised to prevent its transport from the Rainbow Lake waterway through boats exiting the waterway.

Paid Watershed Stewards were stationed Saturdays and Sundays at the State Boat Launch in the Buck Pond State Campground in Onchiota, NY. This is the main public access into Rainbow Lake via Lake Kushaqua. Volunteer stewards were stationed each Friday afternoon, coordinated by the Rainbow Lake Association. Stewards welcomed boaters and introduced them to the launch as well as the particulars of the Rainbow Lake water way. This was done through use of an interpretive message, informative pamphlets and maps. Boaters were briefly interviewed by the steward to determine where the boat had last been used and what, if any, measures that the boater had taken to prevent carrying potentially invasive organisms into new lakes or rivers. Each boat and trailer that was entering or exiting the waterway was visually inspected for hanging or clinging organic material, which was removed when found. Additional data was collected by the steward through observation for use in monitoring use trends which will guide conservation and educational efforts in future seasons.

Figure 1: Boat Launch users, Buck Pond State Campground

Methods:

Between May 23rd and August 30th, 2009, a watershed steward was stationed at the New York State Boat Launch on Lake Kushaqua from 7:00 am until 4:00 pm. As boats approached, the steward would make note of the type of watercraft, horsepower, type of engine when applicable (two or four stroke), the state in which the boat was registered (alternately the motor vehicle's state of registration for non-registered boats), and the number of people in the group.

While the boat operator prepared to launch their watercraft, or to secure the boat for departure, the steward would approach, and introduce themselves and the Watershed Stewardship Program's mission. This was followed by a brief interpretive message, and three questions: Is this your first visit to Lake Kushaqua and Rainbow Lake? If your boat has been in the water in the last two weeks, where was it used? What, if any measures do you take to prevent the spread of invasive species when you take your

boat from one place, and use it the following time somewhere else? The answers to these questions were recorded by the steward.

Due to the availability of a boat wash station at this launch, stewards asked users to wash their boats before launching, or leaving the launch. Stewards walked around the craft, visually inspecting it and the trailer, for any hanging or clinging organic material. At any point in the interaction, the steward would answer any questions that the boater may have had regarding the lake system, its ecology, invasive species, spread prevention or related issues.

The boater's responses were entered on a data sheet at the launch, and later compiled, along with the observed data into an Excel database and analyzed for recreational use trends and spread risks. The cumulative data collected continuously over these past five seasons provides the opportunity to observe changes in the behavior of boaters over time, identify emerging threats or spread prevention successes.

Results:

During the 2009 Watershed Stewardship Program season at Rainbow Lake, stewards observed 248 boats recreating by way of the public launch at the Buck Pond State Campground. Stewards interacted with 483 people. The highest use occurred during the weekend of August 15th and 16th with 30 boats and 75 people. Use at this launch was relatively steady with a slight and inconsistent rise until leaping to the peak in mid August. After peaking, the levels declined over the final two weekends for which data was collected. 25.5% of the 483 visitors, or 123 people, indicated that they had recreated on Rainbow Lake/Lake Kushaqua previously.

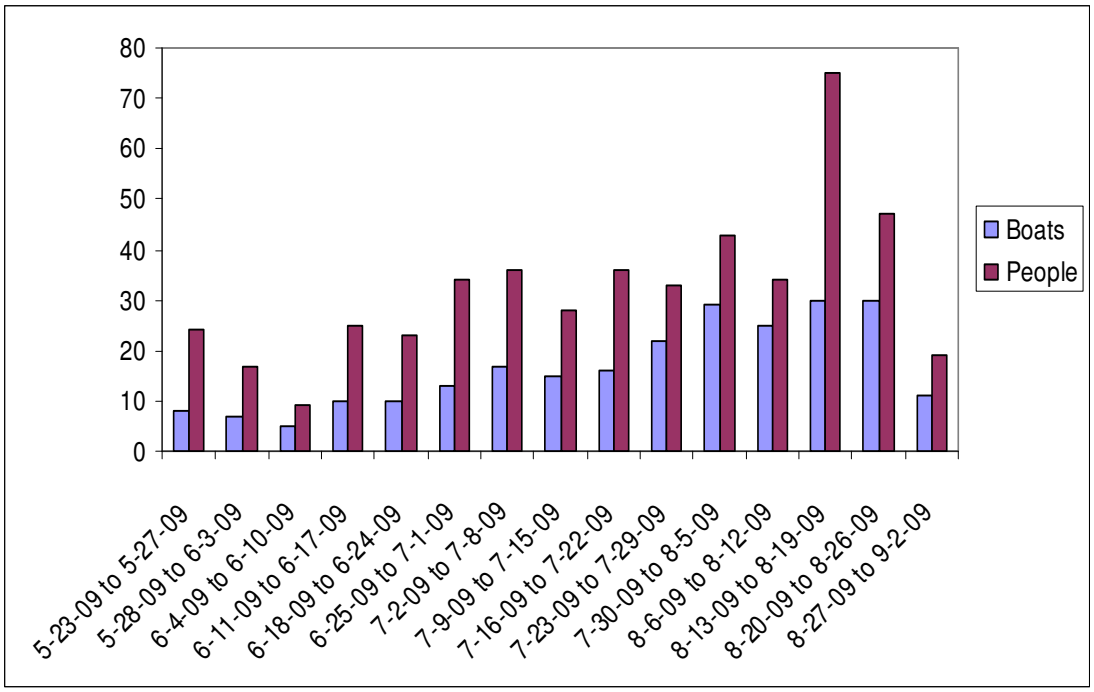


Figure 2: Weekly use of the New York State Boat Launch into Lake Kushaqua and Rainbow Lake during summer 2009

The most common watercraft observed in 2009 were motorboats at 127 boats, this class represented 52% of all boats. Kayaks comprised 30% with 75 boats. Use of canoes comprised 16% of all observed craft, or a total of 39 boats. There were relatively few rowboats (6, 2%) and personal watercraft (1, >1%) tracked by watershed stewards. Non-motorized craft made up approximately 48%, or less than half of all boats. Four-stroke outboard engines were also tracked, 22 such engines were noted by stewards at this launch in 2009.

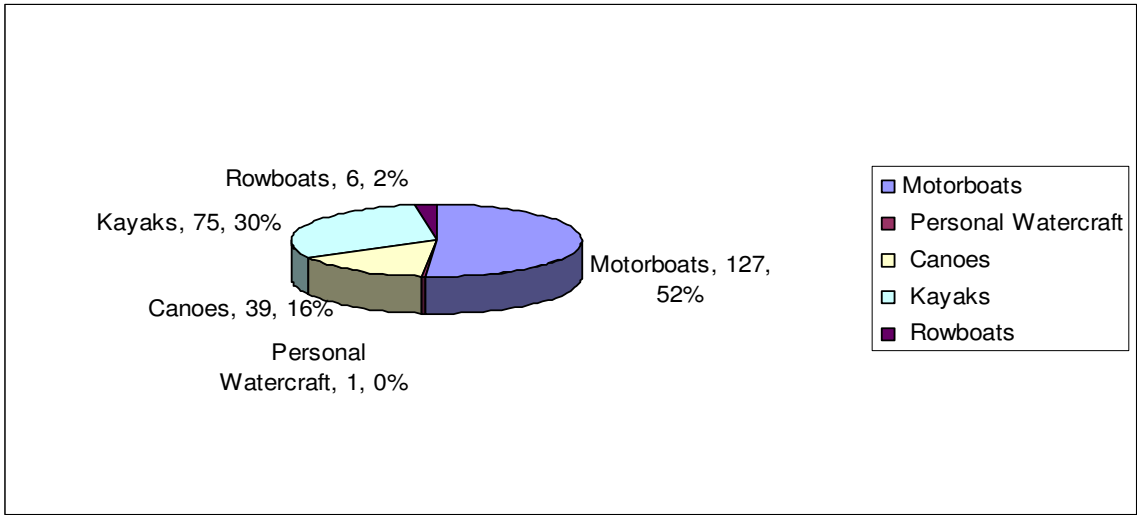


Figure 3: Type of watercraft observed, by number and percent, at Rainbow Lake during summer 2009

The numbers of visitors varied day to day and week to week, however, Saturdays showed a higher total boat usage than Sundays. Over the course of the summer, 143 boats were recorded on Saturdays, and 105 boats on Sundays for an average of 9.5 boats per Saturday, and 7 boats on Sundays.

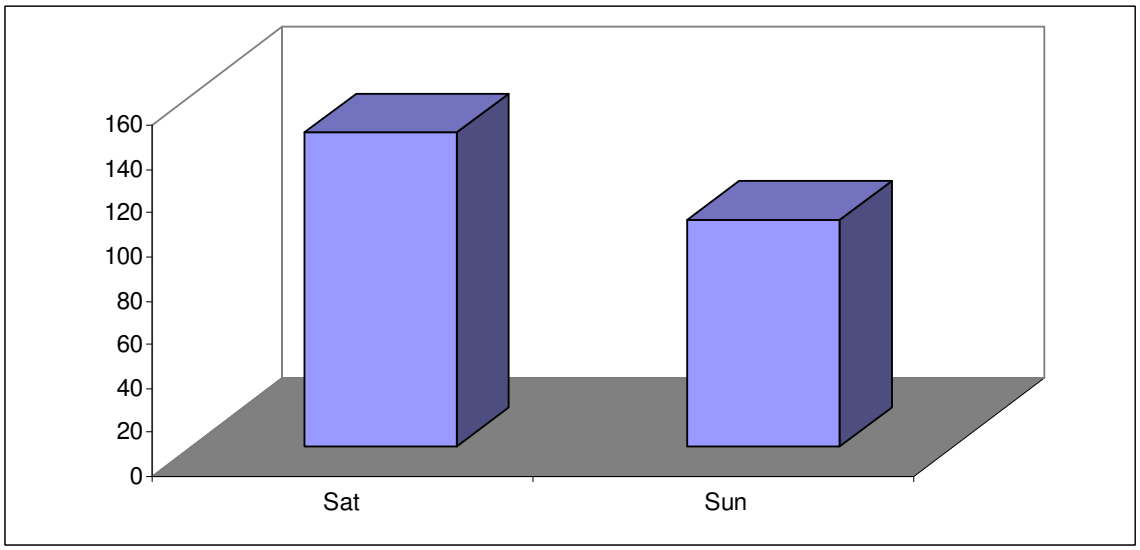


Figure 4: Total number of boats that used the NYS boat launch into Lake Kushaqua and Rainbow Lake by day, as observed by Watershed Stewards in 2009.

The vast majority of boats (191) using the public launch were registered in New York State. The next highest category consisted of those boats for which we have no recorded origin (27 boats). Ten boats were from Quebec, 1 from Ontario and 1 additional which was recorded as being from Canada (without a specified province) were observed. This makes visiting boats from Canada the most common visitors to the Rainbow Lake Waterway after New Yorkers. Six boats arrived here from Vermont, 3 from Massachusetts, 3 from New Jersey and 1 each from California, Michigan, New Hampshire, North Carolina and Pennsylvania.

Origin	Total
NY	191
Unknown	27
CA	1
QC	10
MA	3
Canada (non-specific)	1
VT	6
PA	1
NJ	3
MI	1
ON	1
NC	1
NH	1

Figure 5: Origin of boats using the Rainbow Lake waterway via New York State Boat Launch in Buck Pond Campground, 2009.

Watershed Stewards recorded whether boats visiting the Rainbow Lake waterway had been used within the prior two weeks. When affirmative, the location of the last use was also recorded. In 2009, 90 boats (36%) had not been used in the prior two weeks.

Water Body	Infested?	# of Boats	Water Body	Infested?	# of Boats
None	Unknown	90	Knap Pond (VT)	Unknown	1
Kushaqua/Rainbow	**sp. of concern**	**59**	Rollins Pond	Unknown	3
Didn't Say	Unknown	7	Rented boat	Unknown	1
Sacandaga Lake	**Yes**	**1**	Albemarle Sound (NC)	Unknown	1
Fish Creek	**Yes**	**1**	**Lake Flower**	**Yes**	**4**
Collins B. Pond	Unknown	1	Ross's Point	Unknown	1
Clear Pond	Unknown	2	**Onieda Lake**	**Yes**	**1**
Saranac Lakes	**Yes**	**5**	Moose Pond	Unknown	2
St. Regis Lakes	Unknown	1	Hail Lake	Unknown	1
Jones Pond	Unknown	2	Raquette Lake	Unknown	1
Saranac River	**Yes**	**7**	**Lake Placid**	**sp. of concern**	**1**
Buck Pond	Unknown	6	Long Lake	Unknown	1
McKenzie Pond	Unknown	1	**Hudson River**	**Yes**	**1**
Lake Champlain	**Yes**	**6**	Little Clear Pond	Unknown	1
Chateaugay Lake	**Yes**	**2**			

Figure 6: Waters last visited by boat within prior two weeks, Rainbow Lake waterway, 2009.

An additional 59 boats (24%) had their last use in the Rainbow Lake waterway. 28 boats, or 11%, of all boats observed using the public launch had been used previously in waters known to be infested with one or more invasive species. There were 8 boats (3%) for which stewards were unable to ascertain the last date and location of use, including one rented boat. One boat had last used Lake Placid in which variable-leaf milfoil was identified for the first time in June of 2009. This particular species is being carefully monitored to determine its potential ecological impact and whether or not it should be considered an invasive for Adirondack waters. The remaining boats observed (62, 25%) using the public

launch had been used on a water body that has not been surveyed, or for which the survey did not show the presence of any invasive species.

In response to Stewards' question, "What, if any, steps do you take to prevent the spread of invasive species?" 200 boat operators (81%) indicated that they perform one or more prevention measures between uses. The measures include visual inspection of boats, trailers and equipment with removal of any organic matter identified 86 boats (35%), washing boat and trailer 138 (56%), draining bilge water 12 boats (5%), cleaning of bait bucket (0) or live well (3 boats, 1%), disposing unused bait on dry land (1, >1%) or thoroughly drying boat between uses for which two weeks is recommended (16 boats, 6%).

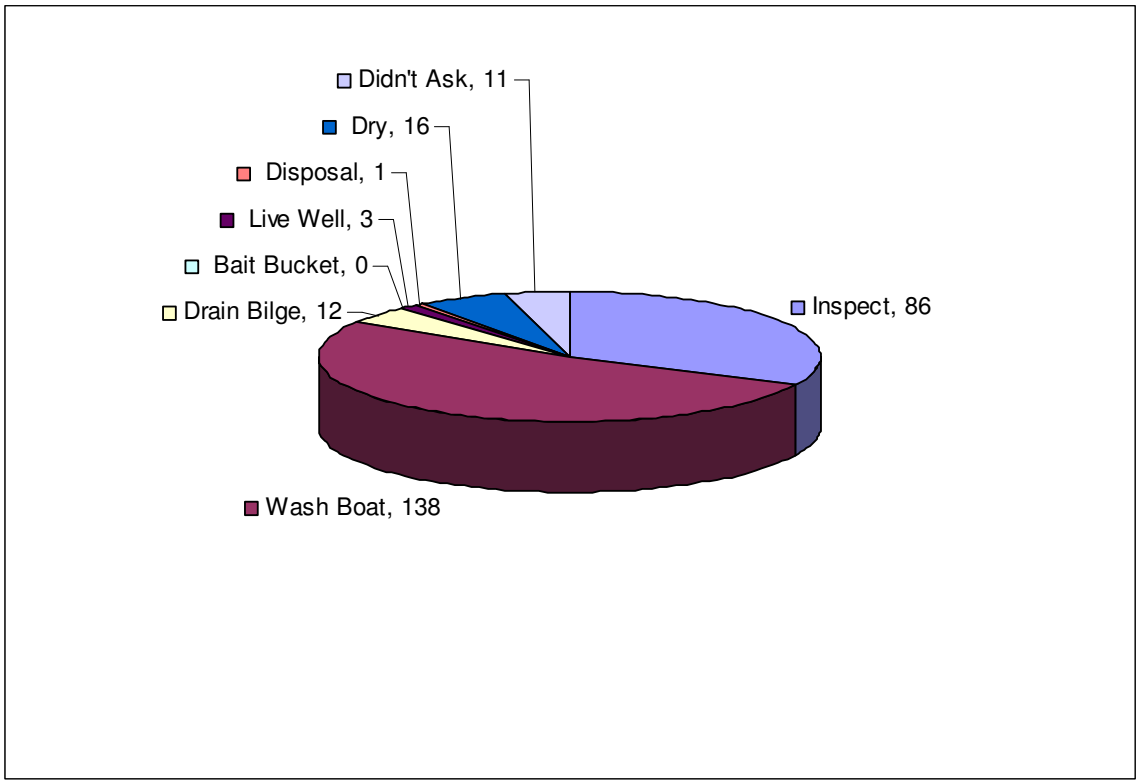


Figure 7: Invasive species spread prevention measures taken by boaters using Rainbow Lake waterway, 2009.

Watershed Stewards visually inspect each boat and trailer launching or retrieving from Rainbow Lake waterway. If any hanging or clinging organic material is found, it is removed, and when possible, identified. Then it is disposed of on dry land, or in a dedicated disposal location at the launch area. The Steward records the find on the data sheet, and it is entered into the database for analysis. In 2009, Stewards removed material from boats and trailers 19 times. Most of the material consisted of Southern naiad which is currently growing in the Rainbow Lake system. Southern naiad is considered a species of concern due to its habit of forming very large, thick patches. Southern naiad was removed from crafts retrieving from the Rainbow Lake public launch 8 times. Grass sp. was removed from boats entering 4 times, pine needles once and native bladderwort was removed from one boat leaving Rainbow Lake. In five total instances of Stewards removing material, the material was not identified.

Organisms Removed	Launching	Retrieving
Bladderwort sp.		1
Grass sp. (terrestrial or aquatic)	4	
Southern naiad		8
Unidentified	4	1
Pine Needles	1	
Total	**9**	**10**

Figure 8: Organisms removed from boats and trailers by Watershed Stewards 2009.

The Watershed Stewardship Program has been operating at the New York State Boat Launch into Lake Kushaqua and Rainbow Lake for five seasons. Figure 7 displays the usage by boats and people in each of those seasons. The 2009 season showed slightly below average numbers for total usage.

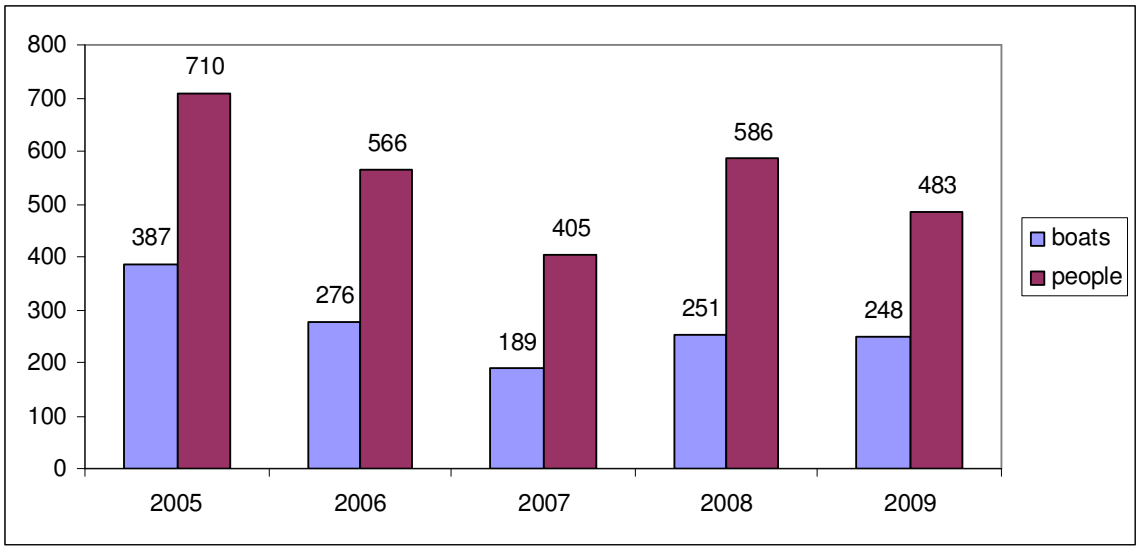


Figure 9: Multi-year comparison of boat and visitor totals at the State Boat Launch for the Rainbow Lake Waterway.

Discussion:

The 2009 Watershed Stewardship Program's season at the Rainbow Lake waterway public boat launch represented some significant differences from as well as similarities to previous years. However, the overall objective of education through direct interaction, the gathering of data, and the prevention of species being introduced through recreational boating were all successful.

The peak of usage in 2009 was comparatively later, occurring in the middle of August. This is likely due to a trend of cold, wet weather in the area until that time. While the majority of crafts observed at this launch were motorboats, as they were in 2008, that majority grew from 45% to 52% of all boats launched. The percentage of kayaks also increased from 27% in 2008 to 30% in 2009. Canoe usage observed in 2009 was 9% lower than in 2008. Other results in this category were similar.

In 2008, 72% of all boats observed were from New York State. This number rose to 77% in 2009. Registrations in 2009 also showed that people were travelling from distant locations including California, North Carolina, and Michigan in addition to the usual visitors from Canada, Pennsylvania and New England.

Boats using this waterway in 2009 were 10% more likely than in 2008 to have been used somewhere other than Rainbow Lake in the preceding two weeks (up from 26% to 36%). 11% of all boats observed this season by stewards, had been used in a known infested water body within the prior two weeks. This is comparable to 2008 in which 12% of boats had been used in infested waterways in the prior two weeks. Despite this clear risk of transportation and introduction of new and potentially destructive organisms, Stewards did not observe any known invasive organisms on boats or trailers during

their inspections. In five instances, Stewards removed material that was not, or could not be identified, and 8 times, Stewards removed southern naiad from boats coming out of Lake Kushaqua, significantly reducing the risk that this species of concern would be introduced elsewhere.

Tracking the measures that boat owners and users take on a regular basis in order to reduce the risk of carrying organisms from one place to another is important in order to understand the true risks of a new infestation, as prevention measures reduce the probability of introducing viable organic matter. The Watershed Stewardship Program focuses so much on education and modeling of proper prevention techniques for this reason. In this category, the number of boats on which the operator claims to have taken spread prevention measures increased from 63% in 2008 to 81% in 2009. The fact that so many boaters are conscious of this issue, and are being careful, is beneficial to the goal of reducing the risk of infesting new waters.

Volunteer Steward Report (Submitted by Dr. Joseph Deignan, Rainbow Lake Association)

This summer marked the third consecutive season that RLA member volunteers monitored the state boat launch at the Buck Pond Campground. The volunteers interacted with boaters entering and leaving the Rainbow waterway, searching boats for invasive species. None were detected.

Figure 10: Rainbow Lake Association Volunteer Stewards

Usually teams served 3-hour shifts with three teams scheduled each day. A total of 31 members served during the season. Eight teams covered two duty shifts, eight teams covered three shifts, and one team covered four shifts. This season six new volunteers served their first shift.

Volunteer stewards, in their distinctive yellow tee shirts, not only searched boats for invasive species but also talked to boaters about invasives. They recommended boat washing and alerted boaters about specific infested Adirondack waters. Over the course of the season our volunteers interacted with 82 groups of boaters.

This season Jim Hauber served as cochairman and is primed to take over leadership during the 2010 summer season. For the fifth consecutive season, Paul Smiths College Watershed Stewardship Program staffed the same boat launch on Saturdays and Sundays over 15 weeks. This service was offered thanks to a U.S. Fish and Wildlife grant to PSC and the leadership of Professor Eric Holmlund.

Conclusion:

The 2009 season was another great one for the Watershed Stewardship Program and our relationship with the Rainbow Lake Association. This summer Watershed Stewards had direct contact with 248 boats and 483 people. This opportunity to share our philosophy of protection and stewardship was not wasted. Each boat was inspected, and each boater was given the example and reinforcement of positive prevention techniques. While 11% of the boats that the Stewards observed had been last used in infested waters, the combination of the boaters prevention measures, Stewards inspections and use of the boat wash station served to provide the best possible protection to the Rainbow Lake waterway against unwanted introductions. Additionally Stewards presence created a barrier to the export of southern naiad.

The WSP would like to thank the Rainbow Lake Association and Buck Pond State Campground for the continued support and access to the launch and its visitors. We look forward to continued success in 2010.

Rainbow Lake Waterway Recreation Study 2009

	Boat Type							total #	Weekly Avg	Four	Group	Repeat	number	number
Week	M	PWC	S	C	K	B	R	boats	HP Outboard	stroke	Size	Vis?	launching	retrieving
5-23-09 to 5-27-09	7	0	0	1	0	0	0	8	57	4	24	3	7	1
5-28-09 to 6-3-09	5	0	0	2	0	0	0	7	11	1	17	2	4	6
6-4-09 to 6-10-09	3	0	0	2	0	0	0	5	N/A	0	9	1	4	0
6-11-09 to 6-17-09	8	0	0	1	0	0	1	10	38	1	25	2	8	4
6-18-09 to 6-24-09	9	0	0	1	0	0	0	10	24	0	23	7	8	2
6-25-09 to 7-1-09	8	0	0	4	1	0	0	13	30	1	34	7	11	4
7-2-09 to 7-8-09	10	0	0	2	5	0	0	17	37	1	36	8	9	7
7-9-09 to 7-15-09	10	0	0	3	2	0	0	15	50	3	28	7	0	0
7-16-09 to 7-22-09	8	0	0	6	1	0	1	16	53	0	36	11	14	5
7-23-09 to 7-29-09	6	0	0	3	13	0	0	22	13	0	33	13	12	0
7-30-09 to 8-5-09	11	0	0	1	15	0	2	29	63	1	43	13	9	8
8-6-09 to 8-12-09	10	1	0	2	12	0	0	25	25	3	34	10	11	2
8-13-09 to 8-19-09	15	0	0	6	8	0	1	30	66	2	75	16	20	7
8-20-09 to 8-26-09	10	0	0	2	18	0	0	30	81	2	47	17	15	11
8-27-09 to 9-2-09	7	0	0	3	0	0	1	11	63	3	19	6	7	5
totals	127	1	0	39	75	0	6	248	Summer Avg = 48	22	483	123	139	62
									Median HP = 30					

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat

	organisms found		organism type									Boat	Measures Taken to Prevent Inv. Species							
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	SN	other	Wash	took steps	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-23-09 to 5-27-09	0	0	0	0	0	0	0	0	0	0	0	1	3	0	2	0	0	0	0	1	0
5-28-09 to 6-3-09	0	0	0	0	0	0	0	0	0	0	0	0	5	2	4	1	0	0	0	0	0
6-4-09 to 6-10-09	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	1	0	0
6-11-09 to 6-17-09	0	2	0	0	0	0	0	0	0	2	0	0	4	3	3	0	0	0	0	0	1
6-18-09 to 6-24-09	0	0	0	0	0	0	0	0	0	0	0	0	7	4	4	1	0	0	0	0	3
6-25-09 to 7-1-09	0	0	0	0	0	0	0	0	0	0	0	3	12	4	11	1	0	0	0	1	1
7-2-09 to 7-8-09	0	0	0	0	0	0	0	0	0	0	0	4	14	5	10	3	0	0	0	0	1
7-9-09 to 7-15-09	1	0	0	0	0	0	0	0	0	0	1	5	13	9	8	0	0	0	0	1	0
7-16-09 to 7-22-09	0	1	0	1	0	0	0	0	0	0	0	7	14	1	12	0	0	0	0	1	0
7-23-09 to 7-29-09	1	2	0	0	0	0	0	0	0	1	2	4	19	9	16	0	0	0	0	1	0
7-30-09 to 8-5-09	4	0	0	0	0	3	0	0	0	0	1	0	20	5	14	5	0	1	0	0	2
8-6-09 to 8-12-09	1	1	0	0	0	0	0	0	0	1	1	5	21	12	10	0	0	0	0	7	1
8-13-09 to 8-19-09	0	1	0	0	0	0	0	0	0	1	0	7	27	11	17	0	0	0	0	3	0
8-20-09 to 8-26-09	2	2	0	0	0	1	0	0	0	3	0	9	29	16	20	1	0	0	0	1	1
8-27-09 to 9-2-09	0	1	0	0	0	0	0	0	0	0	1	2	9	5	7	0	0	0	0	0	1
totals	9	10	0	1	0	4	0	0	0	8	6	47	200	86	138	12	0	3	1	16	11

Rainbow Lake Association Volunteer Steward Recreation Study 2009

	Boat Type			total #	Group	organisms found		Yes, is aware of	visitor prevention steps							
Date	M	PWC	NM	boats	Size	entering	leaving	EWM threat	yes	I	WB	DB	BB	LW	Dis	didn't ask
7-2-09 to 7-8-09	5	0	1	6	12	0	0	6	0	6	0	0	0	0	0	0
7-9-09 to 7-15-09	5	0	2	7	15	2	0	7	0	7	0	0	0	0	0	0
7-16-09 to 7-22-09	4	0	8	12	30	0	0	8	0	12	0	0	0	0	0	0
7-23-09 to 7-29-09	3	0	6	9	18	0	1	0	5	9	0	0	0	0	0	0
7-30-09 to 8-5-09	3	0	8	11	16	0	0	0	7	11	0	0	0	0	0	0
8-6-09 to 8-12-09	6	0	7	13	29	0	0	10	0	13	0	0	0	0	0	0
8-13-09 to 8-19-09	3	0	1	4	6	0	0	4	0	4	0	0	0	0	0	0
8-20-09 to 8-26-09	4	0	9	13	27	0	0	11	0	13	0	0	0	0	0	0
8-27-09 to 9-2-09	5	0	5	10	22	0	0	10	0	10	0	0	0	0	0	0
9-2-09 to 9-8-09	8	0	5	13	25	0	0	13	0	13	0	0	0	0	0	0
Summer Totals	46	0	52	98	200	2	1	69	12	98	0	0	0	0	0	0

Key: EWM = Eurasian Watermilfoil; BW = native bladderwort; NM = native milfoil; GRS = grass; WC = water chestnut; ZM = zebra mussel; VLM = variable leaf milfoil; SN = Southern Naiad; I = Inspected boat; WB = washed boat; DB = drained bilge; BB = emptied bait bucket; LW = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Recreation Use Study: St. Regis Lakes

By Evan Rea, Watershed Steward

Introduction

Paul Smith's College Watershed Stewardship Program is a part of the Paul Smith's College Adirondack Watershed Institute, and seeks to prevent the spread of invasive plants. The main way of accomplishing this goal is by having Stewards inspect boats and boat trailers as they enter or leave a waterway for clinging plant fragments. The other method Stewards used to prevent the spread of invasive species was public education and distribution of educational materials to teach boaters why invasive species are damaging to bodies of water. Watershed Stewards also taught various prevention steps boaters can use to prevent spreading invasive species, such as washing their boat. Stewards have been stationed at the Upper St. Regis Lake boat launch each summer since 2000.

Methods

Stewards were posted at the Upper St. Regis Lake boat launch from Memorial Day to Labor Day, seven days per week from 7:00am-4:00pm. When approaching a vessel, Stewards gave a short message about invasive species and gave out educational materials when warranted. Then, they inspected the boat for organisms. During this time, Stewards recorded time of inspection (launching and retrieving), determined the number of people in the group, horsepower of motor, if it was 4 stroke, public or private use, and state of registration. After the inspection, Stewards asked if the watercraft had been in any body of water in the previous 2 weeks to determine any possible sources of invasive species. They also asked the boat owner if they took any measures to prevent spreading invasive species (these include: washing boat, inspecting boat, draining bilge, draining livewells, disposing of bait, or drying the boat for at least 5 days). At the end of the encounter, Stewards directed each boater to the boat wash station and explained why this was a useful precautionary step to prevent an invasion on this otherwise uninfected lake. All this data was later transferred into a Microsoft Excel database to be used in the continued recreational study by the Watershed Stewardship Program.

Results

Usage at the Upper St. Regis launch rose steadily all summer, until rapidly reaching its peak during the week of 8/13/09-8/19/09 (figure 1). This peak usage saw 239 people using the launch, and 152 boats launching and/or retrieving. This summer, there were 64 four-stroke motors observed at the launch, which comprises 19% of the total motorboat population (342). This is a 8% decrease from last

year, where 27% four-stroke motors were seen (84 of 309 motorboats). Horsepower of all outboard motors was also collected, when possible, and the average was found to be 52.9 (out of 244 motors). The median horsepower was 40, with a high of 225 and a low of 2.

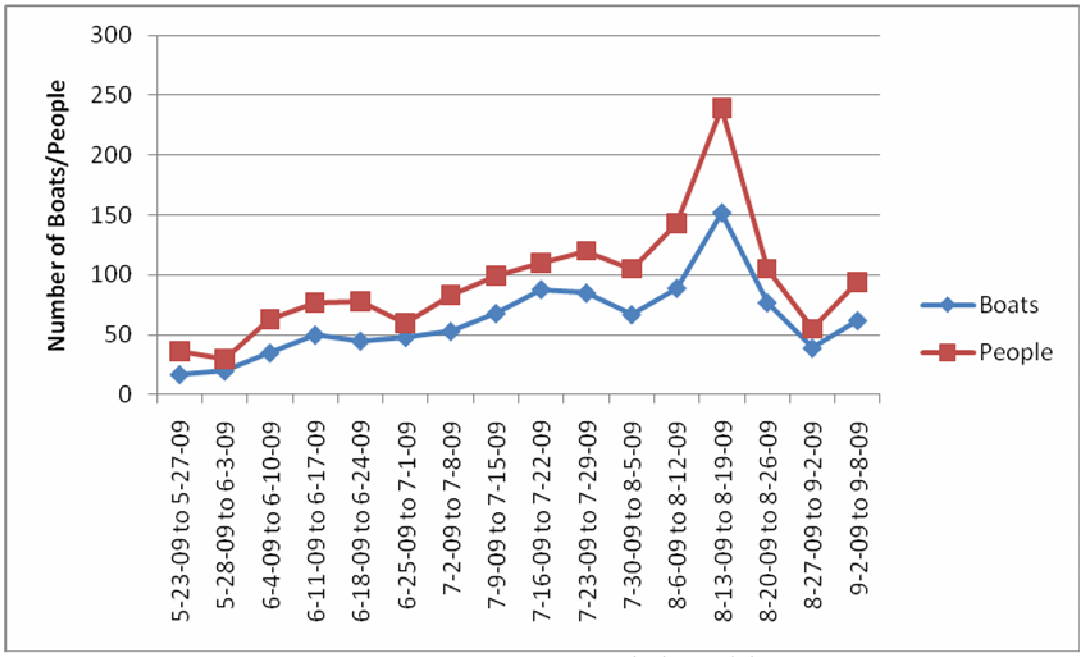


Figure 1. Usage by week of the NYSDEC Upper St. Regis boat launch, 5/23/09 to 9/8/09. N boats= 1005, N people=1497.

Motorboats were seen the most at the Upper St. Regis launch, at 342 (34%), but were closely followed in frequency by canoes (326 representing 33%). These two groups represent two thirds of the watercraft launched. The third most numerous vessel was kayaks (252), which represent 25% of the total boat types launched. The rest of the watercraft make up 8% of the usage- barges representing 6% (64 in number) being most of the remainder, while 10 sailboats make up the last 1%. Only 1 personal watercraft was seen at the launch, which only represents a fraction of a percent of the total usage. Total non-motorized vessels numbered 598 (56%), whereas motorized boats were 407 (44%) in number.

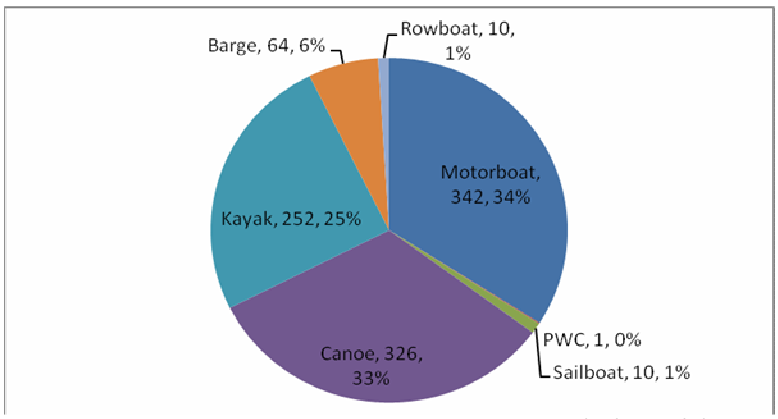


Figure 2. Boat types, seen at the NYSDEC Upper St. Regis boat launch, 5/23/09 to 9/8/09. N= 1005.

Of the 628 registrations and license plates noted to determine state of origin, New York makes up the overwhelming majority, with 508 boats representing 81% of the total. The next numerous state of origin is New Jersey, with 22 boats, which is closely followed Pennsylvania's 19- together representing 7%

of the total. The high amount of New York boaters was expected due to the location of the launch, and the wide spread of states seen in accordance with last year's data.

State	Visits	State	Visits
CAN	1	NY	508
CT	14	OH	1
FL	6	ON	1
MA	11	PA	19
MD	4	QC	1
ME	1	RI	2
MI	4	TX	1
NC	5	VA	2
ND	1	VT	16
NH	3	WI	1
NJ	22	WV	4
		Total	**628**

Table 1. State of origin of watercraft launched at the NYSDEC Upper St. Regis boat launch, as taken by boat registration or vehicle license plate. N=628.

Stewards were stationed at the launch each day. Saturdays held the most usage, with 219 watercrafts. The next closest day was Sunday, with 206, which was followed by Wednesday with 150. Fridays saw an unexpectedly low number of boats at 138, which is only 1 more than Thursdays. It is important to note that staff meetings were held each Thursday at 7:00am and often lasted over an hour, so the Thursday data may be diminished.

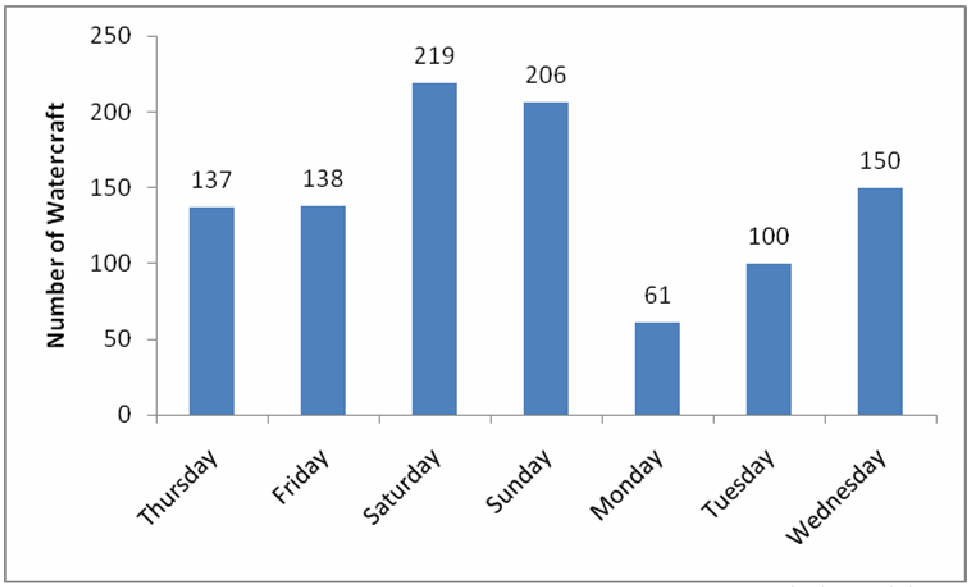


Figure 3. Total number of watercraft seen at the NYSDEC Upper St. Regis boat launch, 5/23/09 to 9/8/09.

The Upper St. Regis boat launch has a boat wash station that Stewards asked each boater to use. A total of 372 boats were washed, out of a total of 1005 watercraft (37%) that launched or retrieved. Boat

storage providers frequented the launch. Those that have a boat washing policy were expedited through the process, and not asked to wash their boats, as this would be redundant.

Again this year, boaters were asked if they take any steps to prevent spreading invasive species when boating. Choices for prevention steps were: washing the boat, visually inspecting the boat and trailer, drying the boat for at least 5 days, disposing of bait, emptying live wells, emptying bait buckets, and draining the bilge. Of the 1005 boats launched, 511 'yes' responses were recorded (51%) and 594 prevention steps were taken. The difference between total yes responses and prevention steps taken is explained by the fact that some boaters do multiple things to prevent spreading invaisve species. The overwhelmingly most popular prevention step was boat washing, 416, making up almost three quarters (70%) of all responses. The next most popular response was inspection, with 123 responses, which makes up one fifth of the total.

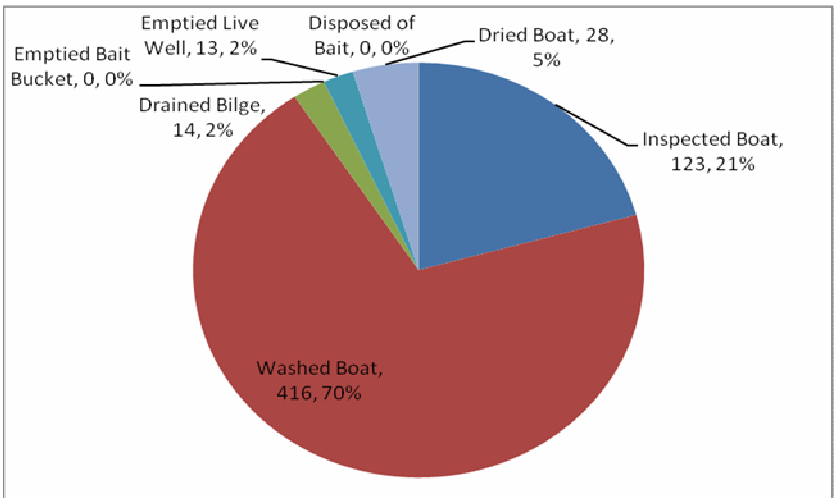


Figure 4. Prevention steps taken by boaters at NYSDEC Upper St. Regis boat launch, 5/23/09 to 9/8/09. N=594.

Boaters were asked if they had been in any water bodies in the previous two weeks before launching into the St. Regis Lakes. This allowed the Watershed Stewardship Program to get an idea of where possible threats could be coming from, as well as the likelihood of infection. Of the 1,005 boats launched, 409 were reported to have been in 103 different water bodies previously, which represents 41% of total boats. Of these 103 lakes, 23 are known to contain invasive species, and thus represent a threat to the St. Regis Lakes. The number of watercraft coming from known infected waters totaled 110 (27% of all launches that have been in water in the previous two weeks).

The single most frequented lake was Upper St. Regis, with 119 reported visits. Combining that with the other St. Regis lakes (Spitfire-0, Lower St. Regis-3, St. Regis Lakes-20), there were 142 St. Regis Lake Chain visits, comprising 35% of all lakes visited. The next most numerous response was the Saranac Lakes Chain, which was similarly grouped (Lower Saranac-8, Middle Saranac-4, Upper Saranac-18, and Saranac Lakes-6), and totaled 36. The next most numerous lakes visited were Meacham Lake-11 and Lake Placid-11. It also bears mentioning that there were many boats reported to not have been in the water in the previous two weeks. Since the majority of boats that had been in water in the two weeks previous were in the St. Regis Lakes, a lot of boat traffic was not threatening to bring in invasive species due to the uninfected nature of the chain. The use from the Saranac Lakes and Meacham Lake is a threat, however, as they are both known to be infested with Eurasian Water Milfoil.

Water Body	Infected	Total Visits	Water Body	Infected	Total Visits
Barnum Pond		1	Little Clear Pond		4
Bear Pond		1	Little Hope		1
Beltzville Lake (PA)		1	Little Long		1
Black Lake		1	Little River		1
Black Pond		2	Little Tupper Lake		1
Blake Pond		1	Long Lake		5
Blake Reservoir		1	Long Pond	1	8
Blue Mountain Lake		1	Loon Lake		1
Bog River		2	Lower Chateaugay Lake	1	1
Buck Pond		5	Lower Higley		1
Carry Falls Reservoir		3	Lower Saranac Lake	1	8
Cayuga Lake	1	2	Lower St. Regis Lake		3
Cazenovia Lake	1	1	Madawaska Lake		1
Cedar River Flow		1	Meacham Lake	1	11
Charles River (MA)	1	1	Middle Lake		1
Chateaugay Lake	1	1	Middle Saranac Lake	1	4
Chazy Lake	1	4	Mill Pond (MA)		1
Chazy River		1	Mirror Lake		3
Chubb River		2	Montgomery Lake		1
Clear Pond		1	Moose Pond		1
Cranberry Lake		2	Mountain Pond		1
Curtis Pond (VT)		1	Mountain View Lake		3
Deer River Flow		3	Mohawk River	1	1
Eagle River		1	Orange County Lake		1
East Branch Croton River		1	Oseetah Lake	1	3
Fellow Falls		1	Osgood Pond		4
Fish Creek	1	2	Pine Pond		1
Fish Creek Pond		2	Pollywog Pond		3
Floodwood Area	1	1	Rainbow Lake		8
Follensby Clear Pond	1	7	Raquette Lake	1	2
Franklin Falls	1	1	Raquette Reservoir		1
Grasse River		1	Raquette River		8
Green Pond		1	Rollins Pond		7
Hoel Pond		1	Round Lake		2
Hudson River	1	2	Saranac Lakes	1	6
Indian Lake		1	Saranac River	1	2
Jones Pond		4	Saratoga Lake	1	1
Kiwassa Lake	1	4	Second Pond	1	2
Lake Champlain	1	11	Seneca River		2
Lake Clear		3	Soft Maple Reservoir		1
Lake Colby	1	4	St. Lawrence River	1	3
Lake Flower	1	4	St. Regis Lakes		20
Lake George	1	3	St. Regis Canoe Area		1
Lake Henderson		1	St. Regis River		3
Lake Kushaqua		4	Stillwater Reservoir		1
Lake Lila		4	Tupper Lake		4
Lake Ozonia		1	Union Falls Reservoir		2
Lake Placid	1	11	Upper Saranac Lake	1	18
Lake Titus		1	Upper St. Regis Lake		119
Lincoln Pond	1	1	Utowana Lake		1
Little Clear		1	Wilson Hill Wildlife Area		1
			Wolf Pond		1

Table 2. List of the last water body visited by boaters in the previous two weeks, and total number of boats coming from each lake. Infection status listed only if known. NYSDEC boat launch at Upper St. Regis Lake, 2009.

Discussion

During the summer of 2009, the Upper St. Regis boat launch saw a noticible increase in usage from 2008 (figure 5). There were 195 more boats and 173 more people in 2009 than in 2008. Non-motorized vessels comprised the majority of the use at 56%, which is diminished when compared with last years data (62%). There were less four-stroke engines seen this year (64) compared to last year (84). Boat washing became more popular this year, with 372 boaters (37% of all boats) using the station compared to last year's 282. Stewards found 44 organisms attached to watercraft this summer, only **2** of which were invasive, and both were Eurasian Water Milfoil. Last year, 46 organisms were found, similarly with only 2 invasives that were both Eurasian Water Milfoil. More people this summer took some form of prevention steps than last year. This summer there were 511 people taking some form of prevention step compared to last year's 363. The fewer organisms found, the increase of boat wash station use and the more frequent prevention steps taken should all be interpreted as successes in the Watershed Stewardship Program's goal of public education and awareness.

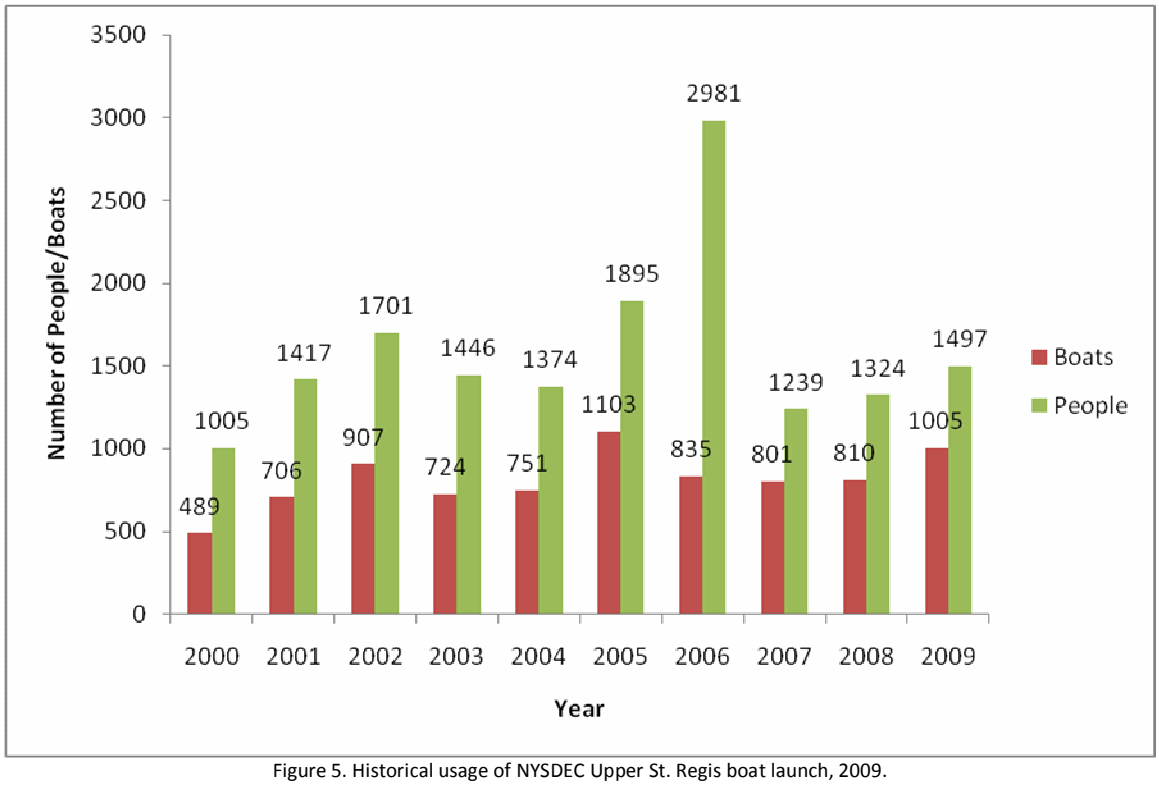


Figure 5. Historical usage of NYSDEC Upper St. Regis boat launch, 2009.

Conclusion

During the summer of 2009, the Upper St. Regis launch saw 1,497 people launching 1,005 watercraft. There was a greater percentage of compliance this summer with boat washing and with people knowing about invasive species and taking steps to prevent spreading them. While there were few instances of uncooperative boaters, there became a problem for Stewards where people would drive past without stopping, usually on the way out. Getting people to stop is an important issue when the fact that 110 launches were reported to come from known infested lakes. This number represents one quarter of all boats that have been in any body of water two weeks prior to launching at Upper St. Regis. Furthermore, this number could be larger if lakes are in fact infested unbeknownst to the Stewardship Program.

Since 2000, the Watershed Steward Program has been funded and supported byt the St. Regis Foundation as well as the St. Regis Property Owner's Assosciation. Again this year we extend our heartfelt

thanks to these groups for their support in our mission to educate the public about the threat that invasive species present to lakes everywhere, and the simple ways everyone can stop them.

Summary of Season: Upper St. Regis Lake Recreation Study 2009

	Boat Type							total #	Weekly Avg	Four	Group	private	number	number
Week	M	PWC	S	C	K	B	R	boats	HP Outboard	stroke	Size	side	launching	retrieving
5-23-09 to 5-27-09	12	0	2	2	1	0	0	17	74	5	36	4	15	5
5-28-09 to 6-3-09	10	0	0	7	3	0	0	20	91	2	30	4	16	5
6-4-09 to 6-10-09	17	0	0	13	3	2	1	36	56	4	63	6	31	15
6-11-09 to 6-17-09	27	0	0	11	12	0	3	53	33	2	77	11	40	22
6-18-09 to 6-24-09	28	0	0	13	0	4	1	46	44	8	78	5	32	14
6-25-09 to 7-1-09	18	0	1	19	3	7	0	48	57	3	60	6	25	15
7-2-09 to 7-8-09	29	0	0	13	6	5	1	54	55	3	83	10	31	20
7-9-09 to 7-15-09	19	0	3	23	15	8	0	68	55	5	99	7	44	22
7-16-09 to 7-22-09	28	0	1	21	30	8	0	88	50	5	110	13	48	31
7-23-09 to 7-29-09	28	1	1	27	22	6	0	85	52	4	120	11	43	28
7-30-09 to 8-5-09	23	0	0	16	23	5	0	67	53	1	105	7	45	24
8-6-09 to 8-12-09	25	0	0	36	23	5	2	91	35	5	143	9	51	35
8-13-09 to 8-19-09	26	0	2	62	58	4	2	154	56	4	239	14	80	54
8-20-09 to 8-26-09	20	0	0	30	23	4	0	77	48	8	105	9	44	29
8-27-09 to 9-2-09	10	0	0	10	16	3	0	39	65	3	55	1	21	12
9-2-09 to 9-8-09	22	0	0	23	14	3	0	62	73	2	94	4	38	14
totals	**342**	**1**	**10**	**326**	**252**	**64**	**10**	**1005**	**Summer Avg = 53**	**64**	**1497**	**121**	**604**	**345**
									Median HP = 40					

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat

	organisms found		organism type								Boat	visitor prevention steps								
Week	entering	leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	Wash	yes	I	WB	DB	BB	LW	Dis	Dry	didn't ask
5-23-09 to 5-27-09	0	0	0	0	0	0	0	0	0	0	8	8	0	10	0	0	3	0	0	0
5-28-09 to 6-3-09	0	0	0	0	0	0	0	0	0	0	12	14	5	12	1	0	1	0	0	0
6-4-09 to 6-10-09	4	1	0	0	0	3	0	0	0	2	12	27	5	17	0	0	0	0	0	4
6-11-09 to 6-17-09	1	1	0	0	0	0	0	0	0	2	27	28	9	22	0	0	0	0	2	14
6-18-09 to 6-24-09	0	2	0	0	0	0	0	0	0	2	22	28	5	25	0	0	1	0	1	4
6-25-09 to 7-1-09	1	1	0	0	0	1	0	0	0	0	11	23	5	20	0	0	0	0	1	3
7-2-09 to 7-8-09	2	0	0	0	0	1	0	0	0	2	17	26	9	18	1	0	0	0	1	7
7-9-09 to 7-15-09	0	0	0	0	0	0	0	0	0	0	27	36	8	29	1	0	2	0	0	4
7-16-09 to 7-22-09	1	2	0	1	0	1	0	0	0	1	32	41	7	37	0	0	0	0	4	13
7-23-09 to 7-29-09	5	2	1	0	0	5	0	0	0	2	28	41	14	32	2	0	1	0	2	10
7-30-09 to 8-5-09	0	3	0	0	0	1	0	0	0	2	25	35	8	30	3	0	1	0	0	6
8-6-09 to 8-12-09	3	1	1	1	1	2	0	0	0	2	31	44	8	35	1	0	0	0	3	11
8-13-09 to 8-19-09	2	1	0	0	0	2	0	0	0	1	58	74	13	65	0	0	0	0	3	17
8-20-09 to 8-26-09	1	2	0	0	0	1	0	0	0	2	31	39	13	30	1	0	1	0	7	7
8-27-09 to 9-2-09	3	1	0	0	0	1	0	0	0	4	11	17	7	12	1	0	1	0	2	1
9-2-09 to 9-8-09	2	2	0	0	1	2	0	0	0	1	20	30	7	22	3	0	2	0	2	2
totals	**25**	**19**	**2**	**2**	**2**	**20**	**0**	**0**	**0**	**23**	**372**	**511**	**123**	**416**	**14**	**0**	**13**	**0**	**28**	**103**

Key: EWM = Eurasian Watermilfoil; BW = native 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 = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Recreation Use Study: Second Pond/Lower Saranac Lake

By WSP Staff

Introduction:

The Watershed Stewardship Program (WSP) educates the public about invasive species and other conservation issues that pertain to specific Adirondack water bodies and their surrounding areas. Stewards are stationed at several boat launches in the Adirondacks to educate boaters, and also to gather recreation use and scientific data.

Figure 1: Second Pond State Boat Launch

The primary focus of the program is to prevent the transport of aquatic invasive species (AIS) between and within watersheds. Watershed Stewards ask boaters coming into and going out of the lakes a series of questions: horse power of motorized boats, if these motors are two stroke or four stroke, if the boater takes measures to prevent the transport of AIS, and the last water body the boat was in. Stewards also record general information such as type of boat, state and registration number, if organisms were found on the boat or trailer, and type of organism found.

This wide variety of data allows stewards to analyze and study recreation use pressure and characteristics over time, which aids in the development of management responses by the Department of Environmental Conservation (DEC), helps AIS managers in New York and New England better understand the pace of the spread of AIS, and helps the WSP to continually improve its own program delivery.

The WSP has stationed Watershed Stewards on weekends at Second Pond in 2005, 2008 and again in 2009. Second Pond is a critical regional source of Eurasian watermilfoil (*Myriophyllum spicatum*) and attracts visitors from across New York and surrounding states. Second Pond is one of the main entrances to the Saranac Lakes chain for motor boats. It is also the access point for the Saranac Lake Islands public campground which is accessed and used by a variety of people from all over the country. As such, Second Pond is one of the most important posts for boat inspection and public education in the northern Adirondack region. The WSP is able to provide a steward at this location in years when funding allows it. There is no local lake association or other funding source to underwrite the Second Pond steward.

Saranac Lake Islands Campground

Saranac Lake Islands public campground is formed by two adjacent lakes, Middle Saranac Lake and Lower Saranac Lake. This campground was established in 1934 with only one cabin on Crescent Bay. Lower Saranac Lake became increasingly popular because of the quality of camping areas along the lake. Because of this, 62 camp sites were built on the lake designated for overnight camping. Each site has a fireplace, picnic table and outhouse. As the popularity grew, in 1992, 25 extra sites were added on Middle Saranac Lake, making 87 campsites in total. The Saranac Lake Islands provide a vast area for boating recreation, and direct access to four other lakes through a set of locks, and one canoe and kayak carry into Weller Pond.

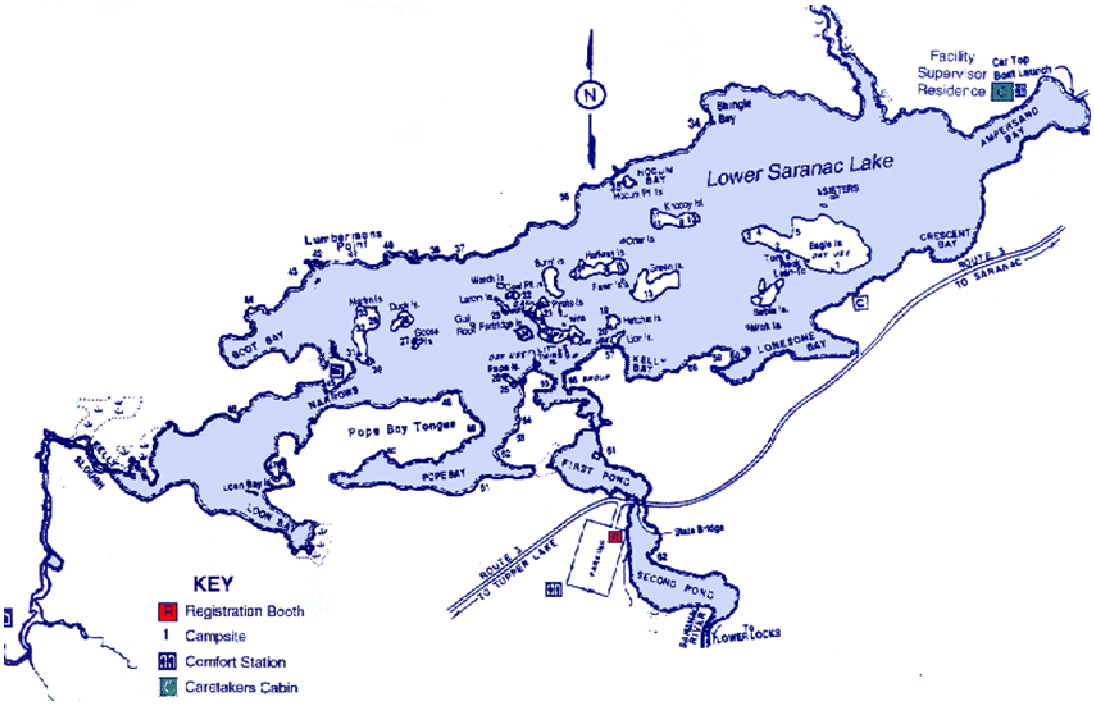


Figure 2: Saranac Lake Islands Campground Map

Second Pond

Although there are several boat launches located on the lakes, Watershed Stewards are stationed at Second Pond due to its popularity. This location is where all campers must register with the DEC park rangers, therefore stewards are able to check the majority of the boats going in and coming out of the lake.

Unfortunately this area is infested with invasive species. There is a large amount of Eurasian watermilfoil in the lake, and there is curly leaf pondweed and variable leaf milfoil in the Saranac chain of lakes. For these reasons, it is extremely important to inspect each boat coming out very thoroughly. Milfoil accumulates near the shores in sandy areas so boats coming in and out of the launch are easily contaminated. Also, it spreads by fragmentation; if small fragments are caught on a boat they can be easily transported to other lakes. It is the stewards' duty to make sure each boat is cleaned so that the milfoil will not reach and contaminate another water body.

Methods:

One steward was stationed at the Second Pond boat launch on Fridays, Saturdays and Sundays from 7 am – 4 pm for a total of 8 hours each day. The steward would approach boaters and ask them a few questions about their boat. These questions included what other lakes the boat had visited in the past two weeks and what steps they had taken to prevent the spread of invasive species. The steward would then ask if they could check over the visitor's boat and talk to them about invasive species. The steward would then proceed to check over the boat and educate the boater about invasive species focusing on Eurasian watermilfoil, the main invasive in the Saranacs which has the potential to spread quickly throughout the Adirondacks. Stewards would then give the boater an idea on how to improve their prevention steps against invasive species.

Results:

Between May 23 and September 5, 2009 (1-3 days per week of monitoring) there were 1,771 boats encountered by Watershed Stewards using the Second Pond New York State Boat Launch. Of these

6 were row boats, 593 were kayaks, 561 were canoes, 1 was a sail boats, 25 were personal watercrafts, and 590 were motor boats (Figure 3). 206 of these motorboats had four stroke engines (35%).

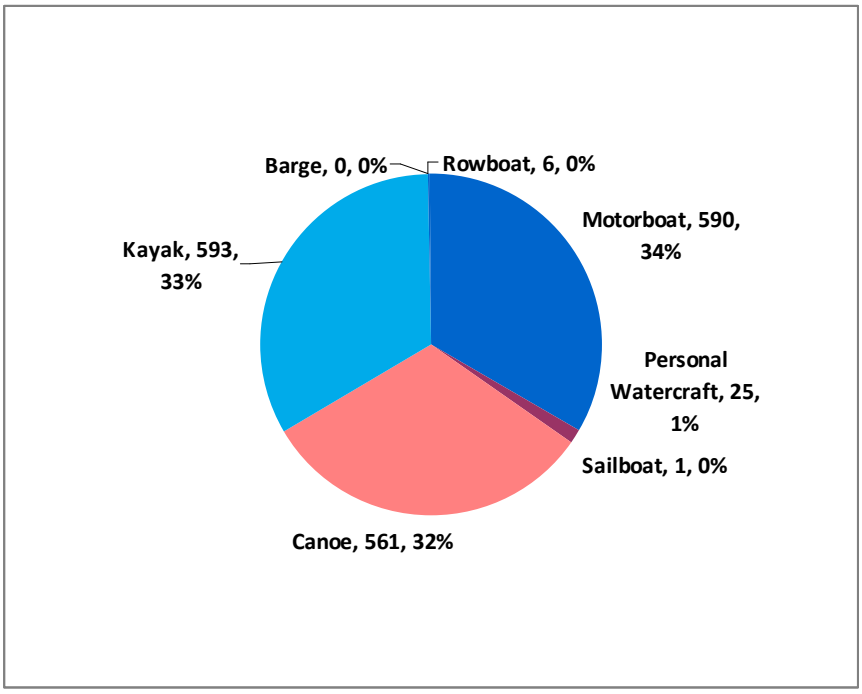


Figure 3: Types of Watercraft observed at Second Pond during summer season, 2009, Fridays-Sundays

Along with these boats there were a total of 3,405 people traveling in 1,279 groups. The weekend of August 14-16 was the busiest weekend of the summer with 453 visitors. July had 986 weekend visitors while August had 1,456.

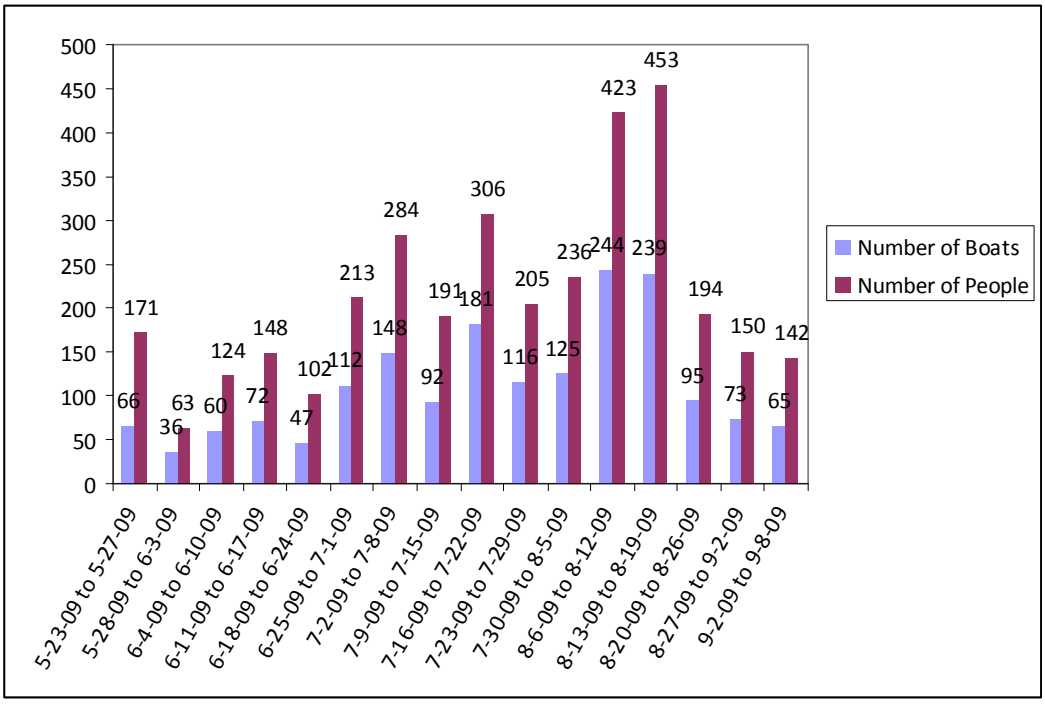


Figure 4: Second Pond visitation pattern, summer, 2009

The Stewards found 33 organisms on boats going in and 66 on boats leaving making a total of 99 organisms found on boats, of a total of 1,771 boats inspected (5.6% presence rate). Of these organisms stewards found that 34 were Eurasian watermilfoil, that 1 was bladderwort, that 3 were native milfoil, 23 grass, 0 zebra mussels, 0 water chestnuts, and 39 other samples that were either unidentifiable or were just non-invasive native plants. This is a large amount of organism samples being found considering stewards were on duty only about half of the time. This number is similar to what stewards found in 2008.

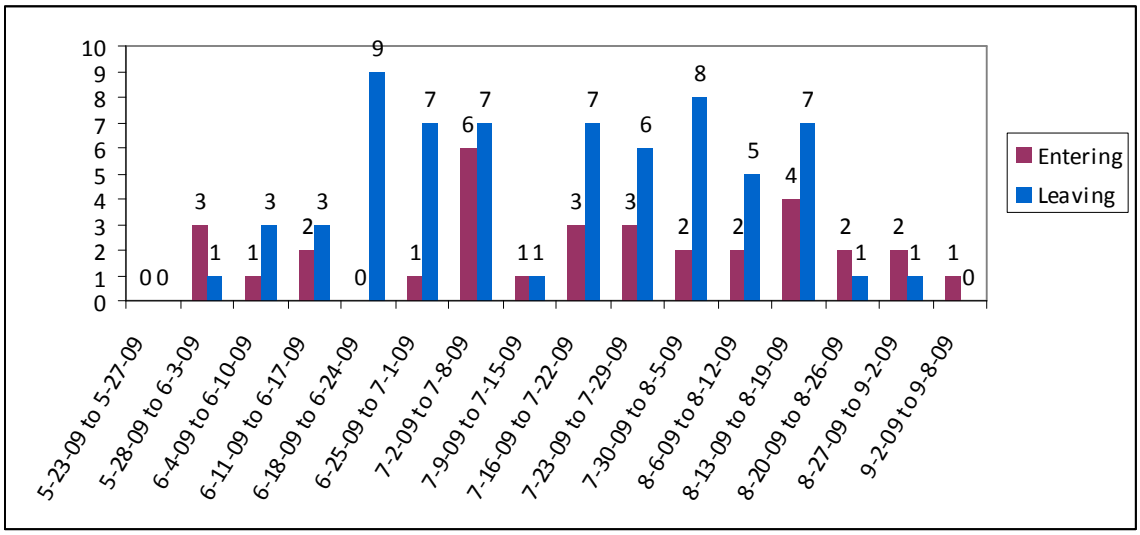


Figure 5: Organisms found on boats by week at Second Pond, summer, 2009

Measures Taken to Prevent Invasive Species Introduction:

Stewards also asked visitors whether they had taken steps to prevent transporting invasive species, and if so, what steps they had taken. A total of 896 visitor groups reported having taken some steps, out of 1,279 total groups. This is a 70% compliance rate. These 896 visitor groups took a variety of steps to prevent invasive species transport (Table 1).

Visitor AIS Prevention Steps	% of Groups
Wash boat	42%
Inspect boat	34%
Dry boat	5%
Drain bilge	2%
Empty live well	0%
Drain bait buckets	0%
Dispose of bait	0%

Table 1: Invasive Species Prevention Steps taken by 896 visitor groups at Second Pond, 2009

Conclusion:

This is the third summer the Watershed Stewardship Program has been able to post a steward at Second Pond State Boat Launch. 2005 featured coverage only on Saturdays and Sundays. In 2005, stewards saw 1,676 boats (compared with 1,765 in 2008 and 1,771 in 2009) and 3,691 people (compared with 3,223 in 2008 and 3,405 in 2009). While 2009's numbers appear comparable, they reflect a significant increase in visitation from 2008, when one considers that in 2008, the coverage included Mondays, while it did not in 2009. It is clear that there are large numbers of people using the Second Pond boat launch, driving from many points of origin, bringing with them, at a 5.6% rate, various organisms on their boats, trailers and tackle. The threat of both exporting Eurasian watermilfoil, curlyleaf pondweed and variable leaf milfoil from the Saranac chain and importing new aquatic invasives from elsewhere remains as urgent a concern as ever.

Second Pond Recreation Study 2009

	Boat Type							Number	Weekly Avg	Four	Number	number	number
Week	M	PWC	S	C	K	B	R	of Boats	HP outboard	stroke	of People	Launching	Retrieving
5-23-09 to 5-27-09	26	0	0	23	17	0	0	66	48	5	171	38	22
5-28-09 to 6-3-09	16	0	0	12	8	0	0	36	53	9	63	20	10
6-4-09 to 6-10-09	32	0	0	19	9	0	4	60	55	11	124	42	25
6-11-09 to 6-17-09	24	0	0	21	27	0	0	72	58	7	148	37	23
6-18-09 to 6-24-09	25	0	0	13	9	0	0	47	49	4	102	26	38
6-25-09 to 7-1-09	41	1	0	22	48	0	0	112	44	15	213	50	34
7-2-09 to 7-8-09	46	1	0	35	66	0	0	148	62	82	284	66	48
7-9-09 to 7-15-09	34	5	0	32	21	0	0	92	57	6	191	86	61
7-16-09 to 7-22-09	49	4	0	65	63	0	0	181	61	4	306	72	54
7-23-09 to 7-29-09	41	3	0	33	39	0	0	116	61	7	205	35	46
7-30-09 to 8-5-09	37	0	0	53	35	0	0	125	61	6	236	52	41
8-6-09 to 8-12-09	61	3	1	80	99	0	1	244	42	13	423	91	79
8-13-09 to 8-19-09	92	1	0	76	70	0	0	239	60	20	453	0	0
8-20-09 to 8-26-09	26	5	0	34	29	0	1	95	84	5	194	48	33
8-27-09 to 9-2-09	22	0	0	21	30	0	0	73	54	6	150	0	0
9-2-09 to 9-8-09	18	2	0	22	23	0	0	65	74	6	142	0	0
totals	590	25	1	561	593	0	6	1771	Summer Avg = 55	206	3405	663	514
									Median HP = 50				

	organisms found		organism type								visitor prevention steps								group
Week	Entering	Leaving	EWM	BW	NM	GRS	WC	ZM	VLM	other	yes	I	WB	DB	BB	LW	Dis	Dry	count
5-23-09 to 5-27-09	0	0	0	0	0	0	0	0	0	0	32	5	28	0	0	0	0	1	54
5-28-09 to 6-3-09	3	1	0	0	1	1	0	0	0	2	24	8	19	1	0	0	0	0	26
6-4-09 to 6-10-09	1	3	1	0	0	3	0	0	0	1	35	24	26	3	0	0	0	1	53
6-11-09 to 6-17-09	2	3	2	0	0	2	0	0	0	1	34	20	17	0	0	0	0	0	54
6-18-09 to 6-24-09	0	9	6	0	0	1	0	0	0	2	22	10	12	0	0	0	0	0	52
6-25-09 to 7-1-09	1	7	7	0	2	0	0	0	0	3	51	23	33	1	0	0	0	1	75
7-2-09 to 7-8-09	6	7	4	0	0	2	0	0	0	7	75	30	48	2	0	0	0	6	95
7-9-09 to 7-15-09	1	1	0	1	0	0	0	0	0	1	47	24	29	2	0	0	0	1	117
7-16-09 to 7-22-09	3	7	4	0	0	2	0	0	0	2	89	16	71	5	0	1	0	8	109
7-23-09 to 7-29-09	3	6	4	0	0	2	0	0	0	2	60	34	34	2	0	0	0	3	71
7-30-09 to 8-5-09	2	8	0	0	0	2	0	0	0	8	53	24	29	2	0	0	0	4	83
8-6-09 to 8-12-09	2	5	2	0	0	2	0	0	0	3	120	60	63	6	0	0	0	19	157
8-13-09 to 8-19-09	4	7	1	0	0	3	0	0	0	6	136	69	82	3	0	1	0	11	167
8-20-09 to 8-26-09	2	1	2	0	0	1	0	0	0	0	57	39	23	2	0	0	0	4	72
8-27-09 to 9-2-09	2	1	1	0	0	1	0	0	0	1	29	14	16	0	0	0	0	2	49
9-2-09 to 9-8-09	1	0	0	0	0	1	0	0	0	0	32	29	5	0	0	0	0	2	45
totals	33	66	34	1	3	23	0	0	0	39	896	429	535	29	0	2	0	63	1279

Table 2: Second Pond Recreation Study Results, 2009. **Key:** M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat; EWM = Eurasian Watermilfoil; BW = native 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 = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Recreation Use Study: Tupper Lake State Boat Launch

By Althea Marks, Watershed Steward

Introduction

The Watershed Stewardship Program, under the Paul Smiths College's Adirondack Watershed Institute, works to maintain and preserve the quality of the region's waterways. The program focuses on preventing the spread of nuisance and invasive species, flora and fauna, from one body of water to another. Invasive species are non-native species that are unnaturally introduced into the watershed, via human activity, and out-compete already present native species. The advantageous invasive species grows rapidly, swarming the watershed, and drastically changing its dynamic and ecology. Stewards are trained in depth about the detrimental effects of invasives, how to identify them, how to take preventative measures with boats, and how to properly inspect boats for clinging invasives. The Watershed Stewardship Program not only trains and educates its stewards, but also educates the public. At the boat launch, Stewards talk to boaters, conveying key points about the treat that invasive species pose on the watershed, and what boaters can do to protect the waterways they use. Since the year 2000, the program has stationed stewards at various boat launches to protect the watershed, but the summer of 2009 was the first year Tupper Lake was added to our list of boat launches.

Methods

Every week on Saturday, from 7:00 AM to 4:00 PM, a steward was stationed at the Tupper Lake boat launch from May 23rd to August 6th. Volunteer stewards from Tupper Lake covered the boat launch on Sundays. Stewards were responsible for collecting data on boats using the launch such as, boat type, engine horse power for outboard motors, boat registration, group size, time of launching and/or retrieving of boat, species of any organism found on the boat or trailer, measures taken to prevent the spread of invasive species, and the last body of water the boat has been in within the preceding two weeks. Data that could be collected through observation was done so as the steward approached the boater. Next the Steward introduced themselves and the Watershed Stewardship Program to the boater. If the boater was familiar with the program and invasive species the steward would reinforce the importance of prevention and update the boater with any news in the subject matter. If however the boater was unaware or knew little about invasive species, the steward would present a concise talk about the subject, and answer any questions. After talking to the boater, the steward would then guide a visual inspection of the boat and trailer to ensure that no plants or animals would be transported into or out of the lake. Data collected was recorded on a prepared data sheet, which was entered into the Watershed Steward Programs' database for analysis.

Results

Within the dates and hours covered by a steward, the Tupper Lake boat launch had a total of 870 people use the launch with 417 boats. According to Figure 1, the peak usage was Saturday August 1st recorded the highest number of boats (55) and people (131) using the launch. Figure 1 also shows that typically there are multiple people on each boat. Levels of use fluctuated throughout the summer, primarily due to weather conditions.

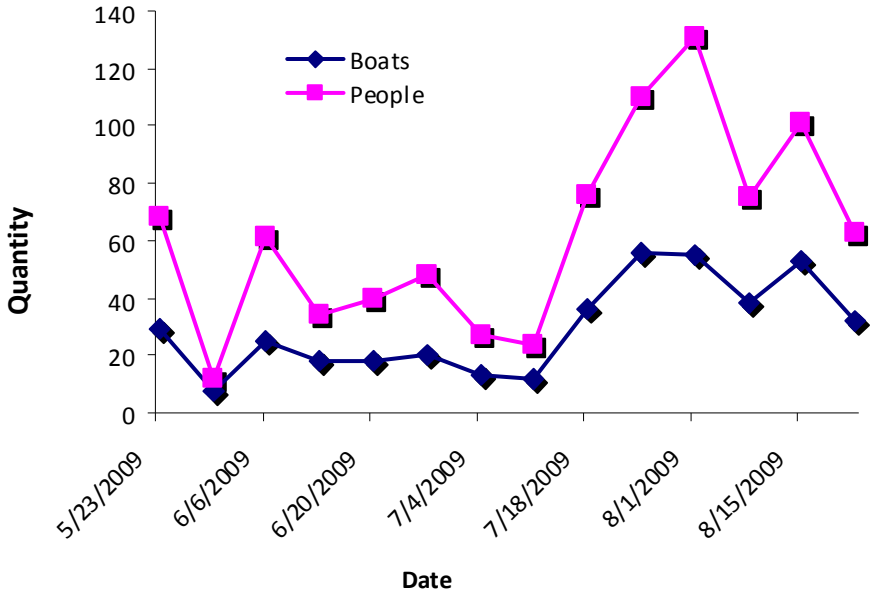


Figure 1: Saturday boat traffic: Tupper Lake State Boat Launch

Among the seven boat types recorded in the data, motorboats were by far the most abundant on Saturdays at the Tupper Lake launch, accounting for 75% of the boats, as displayed by Figure 2. Personal Watercrafts accounted for 5%, sailboats 0%, canoes 10% and kayaks 10% of total boats launched. Of the 306 motorboats that entered and exited Tupper Lake through the Tupper Lake boat launch, the average horsepower of the outboard motors for the summer was 75, while only 38 of the boats had more efficient and environmentally safe 4-stroke outboard engines. Of the total boat groups using the boat launch the majority of users were launching (283 launches, 112 retrieving).

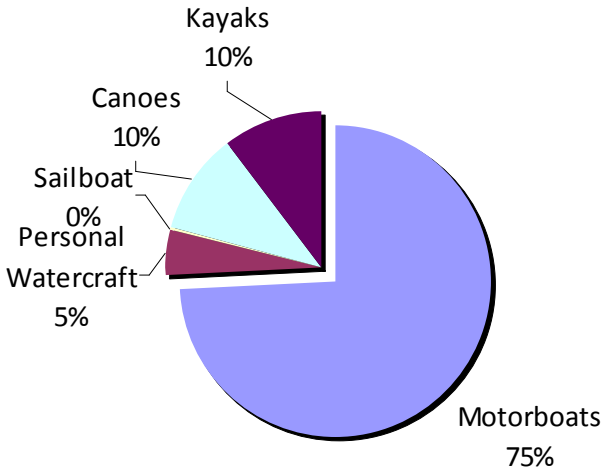


Figure 2: Watercraft types: Tupper Lake State Boat Launch, 2009

When performing a visual inspection of boats using the launch, 17 inspections found organisms on boats that entering Tupper Lake, while 28 inspections found organisms on boats leaving the lake. The most common organism found was common lawn grass. This does not pose a threat to the lake's health. Native milfoil was found 3 times, twice on launching boats and once on a retrieving boat within four weeks (5/23/09 – 6/13/09). Eurasian water milfoil was found once on a launching boat (6/27/09).

Bladderwort was found once on a retrieving boat (8/8/09), and Water chestnut was found once on an entering boat (8/8/09). The remaining organisms found were labeled as "other."

State/Province of Origin

As Tupper Lake is located within New York State, it was expected that most watercrafts using the launch were registered or from New York state (317 boats). State/Province origin quantities inversely correlated with the state/province's distance from the Tupper Lake boat launch, as shown in (Table 1). Origin information was gathered from motorboat's displayed registration, asking boaters, or looking at license plates.

State	Boat Quantity	State	Boat Quantity
AZ	1	NJ	15
IN	1	MA	2
MD	1	MD	1
MS	2	MS	2
NY	317	NC	1
OH	3	VT	2
PA	6		

Table 1: State of Origin: Tupper Lake State Boat Launch, 2009

Previously visited water bodies

The significance of the question "Which bodies of water has your boat been on in the past two weeks?" may not be immediately apparent. However this question is formulated from the fact that many aquatic invasive species can survive out of water for extensive amounts of time. Once reintroduced to a water body, the seemingly dried and dead plant or fragment can revitalize and begin growing again. By asking boaters their previously visited water bodies allows the stewards to surmise the likelihood that a particular boat is transferring invasive species.

225 of 413 boats (54%) encountered by paid stewards reported being on a water body in the past two weeks. 67 of those boaters (16%) reported being on a different water body than Tupper Lake, and 20 of those water bodies are infested with an aquatic invasive species, as displayed by Table 2. This means that 45 of these prior visits were to lakes known to be infected with invasive species, or at least 11% of boats (45 of 413 boats) using the Tupper Lake launch, while a paid steward was present, had previously visited an infested lake prior to entering Tupper Lake. These figures do not include volunteer steward findings.

Figure 3: Watershed Steward marching in Tupper Lake community parade

Water body	Infected	Total Visits	Water body	Infected	Total Visits
Barnegat Bay, NJ	yes	1	Manawa Pond	unknown	1
Cananadaigua Lake	yes	1	Minnewaska Pond	unknown	1
Cayuga Lake	yes	1	Mohawk River	yes	2
Connecticut River	yes (Waterchestnut, Didymo	1	Ohio River	yes (Zebra mussels)	1
Cranberry Lake	yes (variable leaf milfoil)	3	Piseco Lake	not observed	1
Delaware River	yes (Zebra mussels)	2	Raquette Lake	yes (VLM)	1
Elma Pond	unknown	1	Raquette River	unknown	6
Forked Lake	none observed	1	Rollins Pond	none observed	1
Green Lake	unknown	1	Sacandaga Lake	yes	1
Greenwood Lake (NJ)	yes	1	Saranac Lake Chain	yes (Eurasian Water milfoil	8
Higley Flow	unknown	2	Saratoga Lake	yes (Eurasian	4
Hudson River	yes (Water Chestnut, Zebra	2	Schroon Lake	yes (Eurasiam Water milfo	1
Indian Lake	none observed	1	Silver Lake	none observed	1
Lake Delta	unknown	1	Simon Pond	none observed	1
Lake George	yes (Eurasian Watermilfoil,	8	St. Lawrence River	yes (Eurasian Water milfoil	3
Lake Kushaqua	none observed	1	St. Regis/Spitfire Lak	none observed	1
Lake Placid	yes (variable leaf milfoil)	1	Tupper Lake	yes (variable leaf milfoil)	158
Little Tupper Lake	none observed	1	Waneta Lake	yes (Eurasian Water milfoil	1
Long Lake	yes (variable leaf milfoil)	2	**total visits**		**225**

Table 2: Prior water body visits as noted by paid stewards on Saturdays, Tupper Lake 2009

Preventing the Spread of Invasive Species

Asking boaters if they actively take any measures to prevent the spread of invasive species also allows the steward to assess the likelihood that a particular boat is transporting invasive species. This question also provides valuable information on the public's knowledge of preventing invasive species spread, and if they actively take measures to stop the spread. Prevention steps recorded by the Steward included visually inspecting, drying, and/or washing the boat, draining the bilge, emptying live wells, disposing of live bait properly. Of the 293 boaters that practiced prevention measures with their watercraft, the most popular measure was washing the boat (69%), followed by a visual inspection which accounted for (25%) (Figure 3).

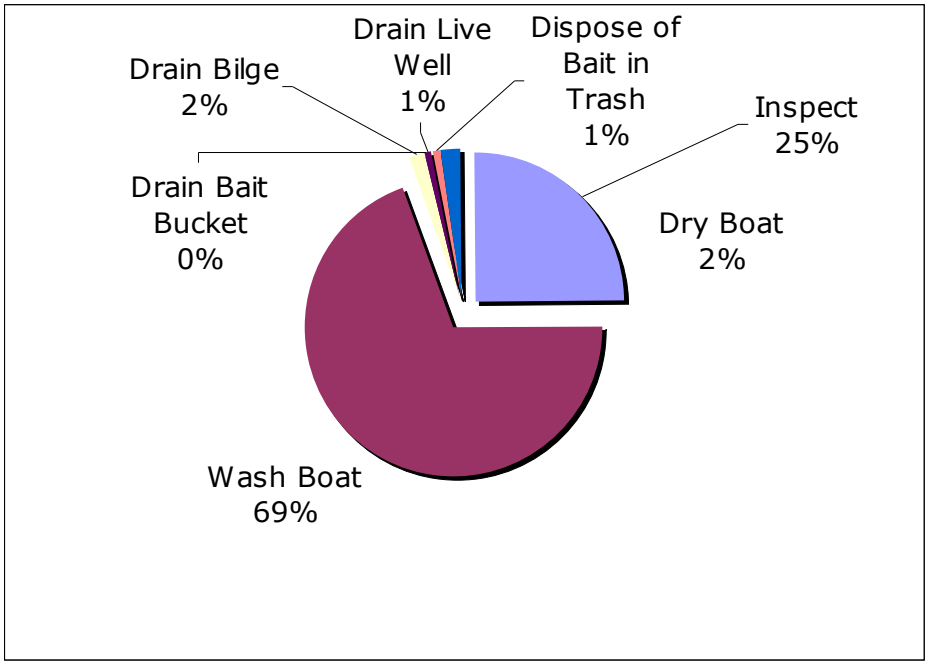


Figure 3: Aquatic invasive species spread prevention steps taken by visitors to Tupper Lake Launch, 2009

Discussion:

Due to the fact that 2009 was the first year that Tupper Lake boat launch was incorporated in the Watershed Stewardship Program, there are is no previous data on the launch to compare with. It is also important to comprehend that a Steward was positioned at the launch every Saturday for only 8 hours along with various hours from volunteer stewards, and that launch usage is heavily dependent on the weather. The data analyzed is only a small portion of the total usage of the Tupper Lake boat launch.

From our data we can see that motorboats primarily use Tupper Lake. Motorboats have the highest probability of transporting invasive species if not attended to by prevention measures. This is because motorboats often catch organisms in their propellers and bilges, and are launched from trailers that also act as vectors of invasive species. We can also see that the number of inspections that found organisms on the boats did not vary much from launching boats compared to retrieving boats. This means that both kinds of inspections should be executed with the same care.

According to the Adirondack Park Invasive Plant Program, Tupper Lake contains one invasive plant species; Variable leaf milfoil. Of the inspections preformed, 2 inspections of boats entering Tupper Lake found invasive species that were not currently present in Tupper Lake, Eurasian water milfoil and Water chestnut. All organisms found by the steward's inspection were removed and properly disposed of.

Asking boaters what body of water the boat was in the presiding two weeks shows travel patterns. These patterns allow the Watershed Steward Program to map out popular travel routes that also may be a likely pathway of spreading invasive species. If boaters are coming from an infested lake, it necessary that they understand that they need to perform preventative measures to ensure a clean boat when entering another body of water. When evaluating the percentage of boater that did or did not take preventative measures, one needs to understand that the results are situational. A significant portion of boaters that reported not engaging in preventative measures solely use their boat on one body of water, therefore not transferring any organic matter between water bodies.

Conclusion:

The first year stationing a steward at the Tupper Lake boat launch, was overall successful. 1358 total people were approached by a steward and educated with the Watershed Stewardship Program's message of protecting and conserving the watershed. With increased public knowledge and understanding, the probability that boaters will engage in prevention measures increases. The Stewards inspected 638 boats, removing and disposing of organisms 45 times. 2 of these inspections removed invasive species not currently present in Tupper Lake, preventing a possible infestation of a new invasive species in Tupper Lake.

A watershed steward was able to prevent 2 potential new invasive plant species infestations by being stationed at the launch eight hours every week. This demonstrates the importance of the Watershed Stewardship Programs actions, even if a steward cannot monitor every boat using the launch, inspecting a fraction of the boats can still effectively prevent detrimental infestations of invasive species in a lake.

Figure 4: Volunteer Steward

The Paul Smiths Watershed Stewardship Program would like to thank the Tupper Lake volunteer steward program, especially Phyllis Thompson, for donating their time and energy towards the communal goal of increasing public awareness and protecting the Adirondack waters. Phyllis and other volunteer stewards covered the launch on five busy Sundays in May, June, July and August. This pilot program was funded in part by a grant from the United States Fish and Wildlife Service, directed toward the Watershed Stewardship Program by the Adirondack Park Invasive Plant Program and the New York State Department of Environmental Conservation.

Tupper Lake Recreation Study 2009

	Boat Type							total #	Weekly Avg	Four	Group	number	number
Week	M	PWC	S	C	K	B	R	boats	HP outboard	stroke	Size	launching	retrieving
5/23/2009	22	0	0	7	0	0	0	29	86	13	68	19	7
5/30/2009	6	0	0	0	2	0	0	8	32	1	12	6	4
6/6/2009	24	0	1	0	0	0	0	25	71	2	61	24	5
6/13/2009	14	1	0	1	2	0	0	18	49	1	34	14	9
6/20/2009	17	0	0	1	0	0	0	18	77	1	40	15	5
6/27/2009	20	0	0	0	0	0	0	20	52	7	48	15	8
7/4/2009	11	0	0	2	0	0	0	13	35	1	27	8	5
7/11/2009	9	1	0	1	1	0	0	12	77	3	24	7	6
7/18/2009	25	4	0	6	1	0	0	36	82	1	76	25	7
7/25/2009	34	5	0	9	8	0	0	56	108	0	110	39	14
8/1/2009	46	2	0	3	4	0	0	55	70	1	131	42	16
8/8/2009	25	3	0	5	5	0	0	38	109	4	75	25	5
8/15/2009	39	4	0	4	6	0	0	53	76	1	101	27	8
8/22/2009	14	0	0	4	14	0	0	32	60	2	63	17	14
Paid Steward totals	306	20	1	43	43	0	0	413	Summer Avg = 75	38	870	283	113
Volunteer Steward data	187	3		35				225	Median HP = 65		488		
Grand total	**493**	**23**	**1**	**78**	**43**	**0**	**0**	**638**			**1358**		

Key: M = Motorboat; PWC = personal watercraft; S = sailboat; C = canoe; K = kayak; B = barge (construction); R = rowboat

Tupper Lake Recreation Study 2009

	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
5/23/2009	1	1	0	0	1	2	0	0	0	0	16	9	10	0	0	0	0	
5/30/2009	1	0	0	0	1	0	0	0	0	0	7	4	3	0	0	0	0	1
6/6/2009	0	1	0	0	0	1	0	0	0	0	21	11	16	0	0	1	0	2
6/13/2009	2	4	0	0	1	3	0	0	0	1	9	5	11	0	0	0	0	
6/20/2009	3	2	0	0	0	3	0	0	0	2	15	5	12	0	0	0	1	1
6/27/2009	2	2	1	0	0	1	0	0	0	2	15	6	14	3	0	0	0	
7/4/2009	0	2	0	0	0	2	0	0	0	0	7	3	7	0	0	0	0	
7/11/2009	0	3	0	0	0	2	0	0	0	1	11	2	9	2	0	0	0	0
7/18/2009	1	0	0	0	0	1	0	0	0	0	26	2	23	0	0	0	0	3
7/25/2009	1	4	0	0	0	5	0	0	0	0	38	8	35	0	0	0	0	
8/1/2009	2	1	0	0	0	3	0	0	0	0	44	10	38	1	0	0	0	1
8/8/2009	0	2	0	1	0	8	1	0	0	0	27	9	26	0	0	1	1	
8/15/2009	2	4	0	0	0	6	0	0	0	0	39	12	37	1	0	0	1	
8/22/2009	2	2	0	0	0	4	0	0	0	0	18	6	14	0	0	0	0	
Totals	17	28	1	1	3	41	1	0	0	6	293	92	255	7	0	2	3	8

Key: EWM = Eurasian Watermilfoil; BW = native 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 = emptied livewell; Dis = disposed of bait; Dry = dried boat.

Purple Loosestrife Monitoring and Control on the St. Regis Lakes, 2009

By Evan Rea, Watershed Steward

Introduction

Purple Loosestrife *(Lythrum salicaria)* originated in Eurasia, but was brought to America in the early 1800's as an ornamental plant (USDA, 2009). It readily established itself in native ecosystems and has since bloomed into a nuisance for every state except Florida. Purple Loosestrife thrives in wet areas such as freshwater meadows, wetlands, marshes, river banks, pond edges and even drainage ditches (USFWS, 2004). If left unchecked in favorable conditions, Purple Loosestrife can quickly form dense patches due to the fact that it can spread by producing a prodigious amount of seeds (100,000-300,000/year/stalk) or by vegetative sprouting from a root stock (USFWS, 2004). Its magenta flowers can be seen blooming from July-September at the top of a square stem that can approach 7 feet tall (WIDNR, 2004). Purple Loosestrife has long, slender, pointed leaves that attach directly to the stem without any stalk (WIDNR, 2004). Seeds need high temperatures and wet soil to germinate, but seeds can remain viable for years (WIDNR, 2004). Purple Loosestrife can also grow for years before it flowers, meaning that it can produce tall stalks that may go unnoticed (WIDNR, 2004).

Like many invasive species, Purple Loosestrife is very hardy, and can adapt to changes in its environment (such as light availability) (WIDNR, 2004). Its various abilities to survive in a foreign land make Purple Loosestrife capable of overtaking wetlands, which are important places of biodiversity.

Figure 1: Purple loosestrife infestation on the St. Regis Lakes. Image taken 2001.

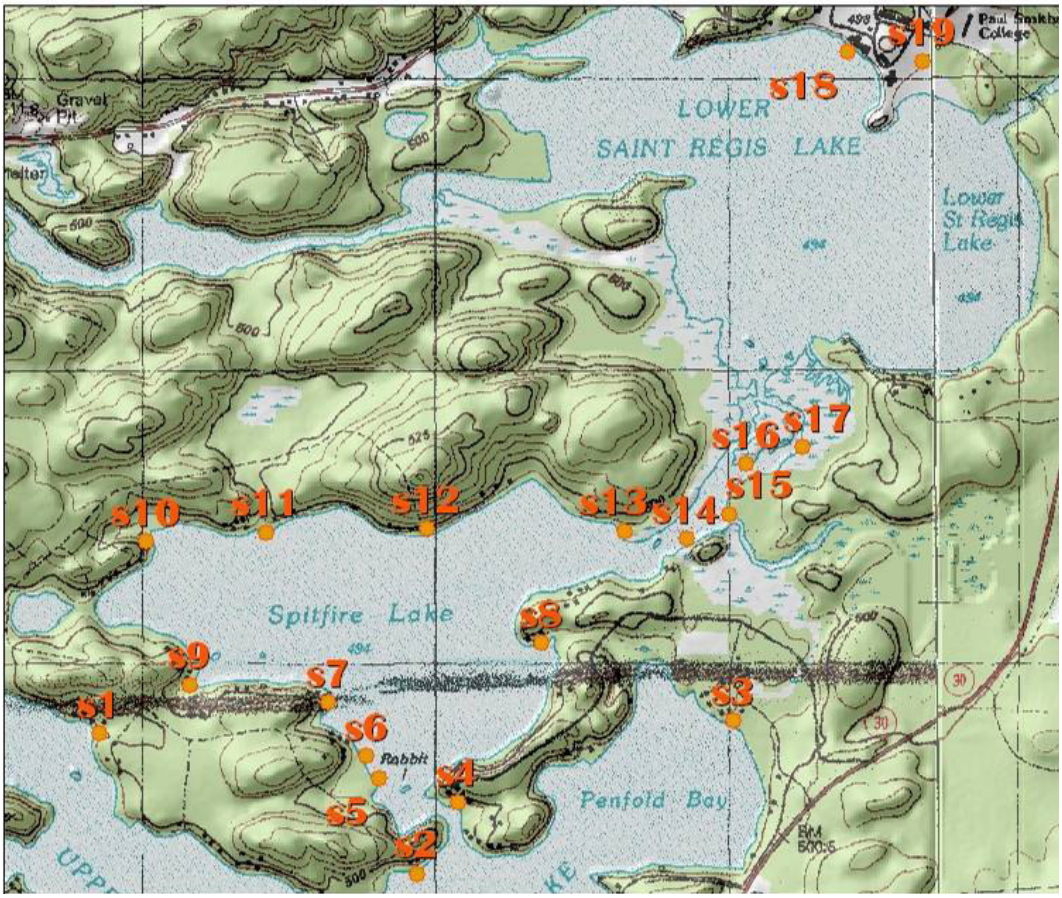


Figure 2. Purple Loosestrife locations 2007.

Methods

The main control method for removing Purple Loosestrife was to manually pull the plant out of the ground. This was accomplished by grasping the stem at ground level, where the roots meet the stem, and pulling up. This method of harvesting gave the best chance of getting as much of the root mass as possible without breaking the stem and thus leaving the roots to sprout anew. Another possible method is to simply clip the stem just above the roots, used when pulling the plant is difficult. A third control method that is possible and effective is chemical treatment with herbicides, but was not used in this study due to the location.

Once harvested, the plants where placed in black garbage bags and kept in the sun in order to expedite the death of the stalks.

The first survey of the lakes was on Friday, July 24, 2009, where Adirondack Watershed Institute Steward Evan Rea met with Dan Mullane from the Adirondack Park Invasive Plant Program (APIPP). Sites were visited by motorboat and a visual inspection of infestation was done. The shoreline of Spitfire Lake was surveyed, while the rest of the lakes only the infested sites were visited. Site 3 was excluded in this survey, to be visited on July 31.

Results

In total, there were a total of 133 plants removed from 8 sites during the first survey, which included a new site on Spitfire Lake's Eastern shore (S22). This is in exclusion of site 3, which was visited on July 31, when 86 plants were removed. A secondary survey was taken on August 14, 2009 as a precautionary measure to ensure that removal efforts were effective. Site 3 was revisited, and 110 more plants (most without flowers) were removed, as well as 3 plants from site 8. In total, 307 plants were removed from the three lakes this summer (table 1). This is a drastic decrease from last year's 450.

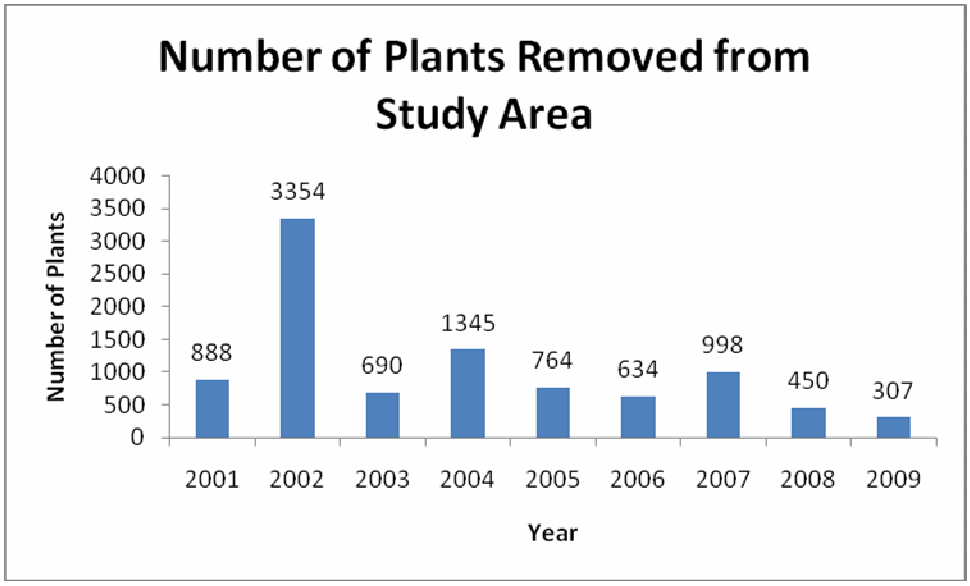


Figure 3. Historical St. Regis Lakes Purple Loosestrife removal data, 2001-2009.

Upper St. Regis Lake

Sites 1-3 lie on Upper St. Regis's Northern shore. Just 1 plant was found on site 1, while site 2 was clear. Site 3, located on Camp Regis/Applejack saw a slight decrease in number of plants removed (13 less) since last year, going from 123 to 110. The historic low for this site, 14 plants in 2006, was still a far way from being reached again this year.

Spitfire Lake

Sites 4-17 are situated on Spitfire Lake and the slough that connects to Lower St. Regis Lake. A new site that was discovered, S22, held 25 plants that were removed. While no plants were found at site 4 this year, site 5 had 12 more plants than last year (15). Only 3 plants were removed from S6, down from last year's 22. Site 7, a historically heavily infested site, continued its downward trend this year with only 8 plants having been found. Since its peak of 250 plants in 2005, site seven's Purple Loosestrife population has thinned every year. A similar story is displayed by site 8, with a surprising 3 plants found compared to last year's 132. The next site, number 9, had 87 plants last year, but none were discovered in 2009. Only 1 plant was found on site 10, 0 on site 11, and S12 had no plants for the second consecutive year. Another surprise was S13, where 55 plants were removed, a jump from last year's 11. The last site on Spitfire Lake had no plants on it this summer.

Lower St. Regis and slough

No Purple Loosestrife plants were found on any of the Lower St. Regis sites or in the slough that connects to Spitfire Lake.

Table 1. Number of plants found at each location on the St. Regis Lakes, site numbers correspond to points in figure 1, 2001-2009.

Site/GPS UTM	2001	2002	2003	2004	2005	2006	2007	2008	2009
S1 N4917982, E556881	0	14	0	0	0	0	0	0	1
S2 N4917503, 557965	0	0	0	0	0	0	1	0	0
S3 N4918026, E559045	450	1400	330	742	130	14	380	123	196
S4 N4917748, E558103	5	63	5	26	5	0	7	10	0
S5 N4917831, E557837	0	74	23	50	15	54	12	3	15
S6 N4917905, E557790	0	0	0	0	0	0	7	22	3
S7 N4918087, E557660	250	915	117	146	250	200	89	34	8
S8 N4918290, E558390	110	49	3	74	150	101	375	132	3
S9 N4918149, E557190	0	437	143	116	25	117	107	87	0
S10 N4918636, E557038	0	123	5	34	25	11	7	3	1
S11 N4918668, E557451	0	0	0	0	10	0	0	3	0
S12 N4918680, E5579988	18	11	13	3	10	23	1	0	0
S13 N4918673, E558675	25	260	35	111	100	96	8	11	55
S14 N4918647, E558887	0	0	0	0	0	15	0	4	0
S15 N4918731, E559028	30	8	16	42	40	0	4	9	0
S16 N4918901, E559086	0	0	0	0	0	3	0	0	0
S17 N4918960, E559279	0	0	0	1	0	0	0	0	0
S18 N4920309, E559434	0	0	0	0	4	0	0	0	0
S 19	0	0	0	0	0	0	6	0	0
S 20	0	0	0	0	0	0	0	6	0
S 21	0	0	0	0	0	0	0	3	0
S 22	0	0	0	0	0	0	0	0	25
Total	**888**	**3354**	**690**	**1345**	**764**	**634**	**998**	**450**	**307**

Discussion

This year saw a decrease in not only number of plants found, but in number of infested sites as well (Figure 5). Even with the addition of a new site, there were 9 total infestations, 5 less than last year's 14. The discovery of a new site means that the plant continues to spread, but the fewer number of sites means that control efforts are succeeding. The decline in plants and sites is quite possibly due to the large amount of precipitation received this summer.

Figure 4: Purple loosestrife root mass

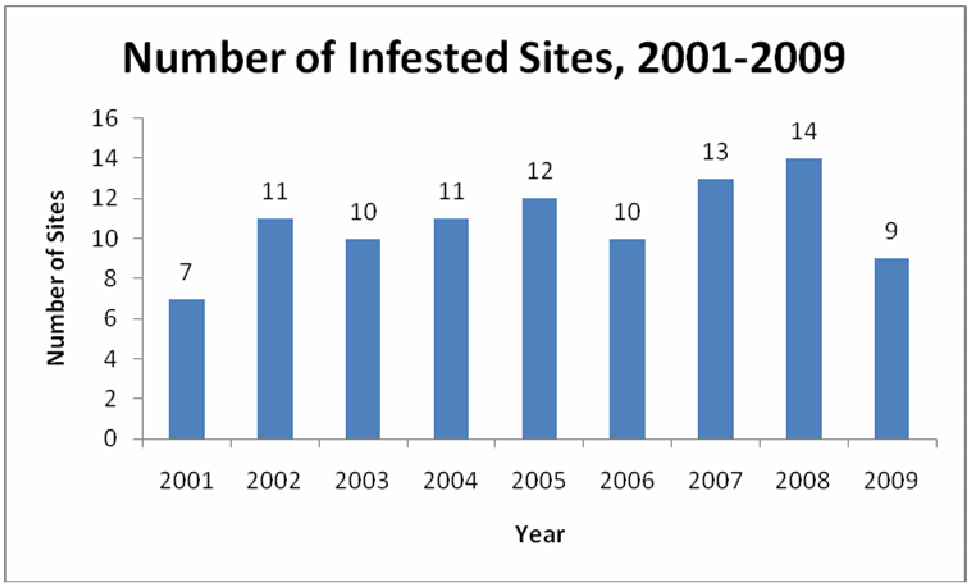


Figure 5. Historical number of infested sites on the St. Regis Lakes, 2001-2009.

Using the same arbitrary classification system from last year, sites were classified according to how many plants were removed. The three levels of infestation are: low- 1-20 plants, medium- 21-75 plants, or high- 76+ plants (Figure 6). Although not at first evident from the figure, a general trend is beginning to emerge which shows more low intensity sites and less high intensity sites. But, future monitoring will be the only way to discern any actual trends.

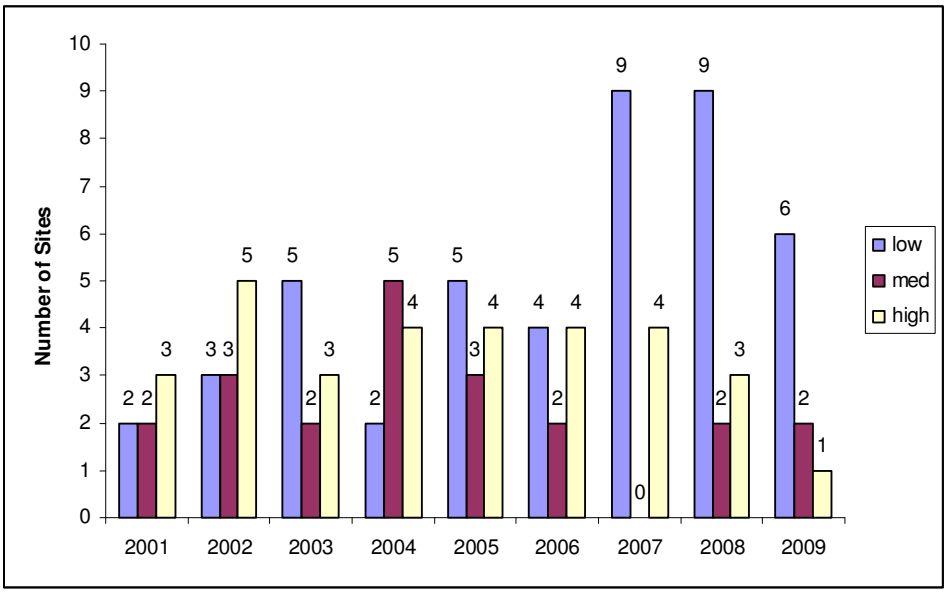


Figure 6. Site intensity by year of the Purple Loosestrife sites on the St. Regis Lake, New York, 2001-2009.

The sites bear mentioning due to the large jump in plants found this year as compared to last year. Site 3 had 73 more plants this year, which could possibly be explained by identification issues. This year, many plants were not flowering, so when there was a question of identification, the stalk was pulled. This could have led to non target removals, but this was justified by the precautionary principle. This discrepancy could also be due to the fact that this site is in a swampy area, and may have been able to resist the effects of the excessive precipitation that plagued other sites. Site 8 saw 129 less plants-132 in 2008 to 3 in 2009- which is the largest change in any of the sites. This site is dominated by woody

sedges that stand around 6 feet in height, and may actually be shading out the Purple Loosestrife invader. It also is a very wet spot, often emerging from the water, and may have been extremely affected by the wetness of this summer. Site 9 saw a complete absence of plants this year, meaning that the 87 plants removed last year was a possible eradication. However, only future monitoring can confirm this speculation.

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Educational Programming for St. Regis Lakes Area

By Evan Rea, Watershed Steward

Introduction

The Paul Smith's Watershed Stewardship Program is designed not only to prevent the spread of invasive species, but to also educate the public about the damages they can bring. The St. Regis lakes are not only the setting of Paul Smith's College, but they are also a closely monitored area by the Program, with Stewards having been stationed at the Upper St. Regis Lake state boat launch every day in the summer for the past 10 years. For this reason, two groups were targeted for educational programming on Upper St. Regis Lake- Camp Regis/Applejack (a youth summer camp) and the St. Regis Jr. Yacht Club (children of the private Yacht Club). One day for each group was arranged, and activities ran for about one hour. Due to the different age groups of the two audiences, different activities were planned accordingly. For the younger audience at Camp Regis/Applejack ("The Willows", ages 8-9, group of 10), predator-prey games were played. For the Jr. Yacht Club members, who were aged 13 (group of 2), a quick lesson on invasive species was given, and then followed by an insect identification walk.

Goals

- The goal of the Camp Regis/Applejack activities was to educate children about the hazards of invasive species through predator-prey games.

- The goal of the St. Regis Jr. Yacht Club activity was to convey the concept of indicator species, then lead the group in an insect identification walk. Also, the goal included more specific invasive species knowledge.

Activities

Since predator-prey games display the dynamic relationship between native and invasive species very well, while remaining easy for children to interpret, two such games were run for Camp Regis/Applejack. One game played was created by Steward Evan Rea, and focused on the necessity to prevent the spread of invasive species before they can infect a water body (see Appendix 1). The other game was taken from Project Wild ("Oh Deer!" p. 44), and taught habitat requirements. The game displayed how fish need certain things (food, space, shelter) to live, and how an invasive fish (northern pike) could disrupt the native fish's quest for survival. Lastly, educational materials were passed out for the children to keep, such as "Stop Aquatic Hitchhikers" stickers and Emerald Ash Borer factsheets and temporary tattoos.

Since the St. Regis Jr. Yacht Club was older and already had a firm understanding of invasive species, the focus changed to indicator species-specifically insects such as dragonflies and damselflies. Since insects are relatively easy to find and capture, nets were provided and a 'bug walk' ensued. Insect identification and the use of a dichotomous key were taught, as well as various facts about the insects captured.

Discussion

Both of the programs were met with enthusiasm and seemed to be very well received. The Willows of Camp Regis/Applejack enjoyed both games, and could recite the overall message in the end when asked to sum up the topic of invasive species. The group size was quite small for games to have the full effect, but any larger groups would prove to be unwieldy. The trends expected in these games actually came about much quicker with the small group, which is mainly what allowed for two different full games to be played. This worked to be quite advantageous, and was met with great zeal.

The pair from the St. Regis Jr. Yacht Club was very eager to go on a bug hunt, and enjoyed themselves immensely. They knew a good deal of information about invasive species, and we discussed a few specific ones that they hadn't heard about. They readily grasped the concept of indicator species, and were soon providing hypothetical situations where biological indicators could be used. Even though a

disappointing group size was procured, due to an unforeseen sailboat race, it should be viewed with success because of the attention that was able to be devoted to the two very willing participants.

Recommendations

Future activity planners should be aware that scheduling events is quite difficult, and is often restricted to a few time slots. With this in mind, planning should take place as early as possible. The St. Regis Camp and the Jr. Yacht Club only meet for a certain period of time in the summer, so this interval should be found out ahead of time. Also, phone contact should be avoided when possible, as personal meetings are much more efficient, especially in a camp setting where time is often not devoted to being in an office (or, if it is, find this time period out to plan calls).

Conclusion

The activities run by Steward Evan Rea for Camp Regis/Applejack and the St. Regis Jr. Yacht Club were quite successful, and were thoroughly enjoyed by participants. Predator-prey games proved to be an astoundingly powerful tool for conveying the topic of invasive species to the children of Camp Regis/Applejack. An insect identification walk for the Jr. Yacht Club members was also a great tool for introducing indicator species, as well as providing a basic knowledge of insect identification.

Appendix 1: Lake Invaders! Educational Game

Lake Invaders!

Invasive species game

Created by Evan Rea for the Paul Smith's Watershed Stewardship Program

Getting Started:

- Mark an area as the 'lake' (adjust to number of players)
- Assign *Invasive, Steward* and *Diver* cards (consider using a trivia game to select who gets what card)
- Everyone else is a *Boater*
- NOTE: Number of cards should vary depending on number of participants, but there should always be many more *Boaters* than the others. Also consider having the moderator be the *Steward* or *Diver*

Gameplay:

- *Boaters* must try to 'catch' fish by collecting randomly scattered fish tokens (plastic spoons, poker chips, etc…) throughout the lake, and put them in their buckets back on shore
- *Invasives* try to tag *boaters*. Once a *boater* is tagged, he must immediately drop all fish he is holding and becomes an *invasive*. All *invasives* must hold hands to form a dense patch of vegetation.
- *Divers* are able to remove, one by one, *invasive*s from the lake (who then become *boaters)*
- *Stewards* can grant immunity to *boaters* from *invasives*, but this only lasts until they come back to shore

Ending:

Once all fish are caught (or there are no more boaters, or a time limit is reached), everyone sits down and the moderator leads the group in a discussion as to the current health of the lake. Or, consider stopping several times during the game to 'stock' more fish, induce a 'storm' that moves the invasive plants or breaks them apart, or do a short interpretation as to what is currently happening in the lake.

Loon Monitoring Report: St. Regis Lakes

By Althea Marks, Watershed Steward

Introduction

The breeding and summer range for the common loon, *Gavia immer*, is a broad band across North America that contains most of Canada, Alaska, and parts of the Northern United States. The common loon's typical habitat is fresh oligotrophic lakes that support fish populations and have rocky shorelines and are surrounded by forest. Nesting loons prefer lakes with islands, floating bogs, and protected bays, which protect against predation (Mcintyre and Barr, 1997). During the winter months, the common loon migrates to inland costal waters along the Pacific, Atlantic and Gulf of Mexico coasts in Canada, and the United States (Mcintyre and Barr, 1997) (Kenow, Meyer, Evers, Douglas, and Hines, 2002).

The common loon's diet consists mostly of small fish, which it catches by surface diving. Aquatic invertebrates and vegetation also make up a small portion of the bird's diet (Mcintyre and Barr, 1997). Because the common loons are Secondary and Tertiary consumers in the food chain, they are highly susceptible to bioaccumulation of hazardous compounds such as methylmercury. High levels of mercury adversely change behavior, neurochemistry, hormones, and reproduction in the common loon (Sheuhammer and Meyer, 2007). The common loon typically has a clutch of two eggs per breeding season, but the number of surviving fledglings determines the breeding success of a pair. Due to the low reproductive rate, and detrimental effects of human activity, the common loon is subject for observation and study. The BioDiversity Research Institute's Adirondack Center for Loon Conservation annually captures common loons, bands them, and performs overall health exams that include blood mercury levels, before releasing the birds. Staff in the Adirondack region monitors the progress and reproductive success of the banded birds. One steward from the Watershed Stewardship Program is responsible for weekly monitoring of loon pairs on Upper St. Regis Lake, Spitfire Lake, and Lower St. Regis Lake for June, July and August months.

Methods

The Watershed Steward under the BioDiversity Research Institute's Adirondack Center for Loon Conservation started monitoring Upper St. Regis, Spitfire, and Lower St. Regis Lakes for the 2009 summer season of June 11, 2009, and ended August 19, 2009. Once a week, depending on weather conditions, the Steward used a kayak and corresponding gear provided by the Watershed Stewardship Program, to paddle through three territories; Birch Island, North Bay (Upper St. Regis) and Rock Island (Spitfire). Observation started in the morning around 8:00 am to take advantage of calm waters, and lasted 4 to 5 hours. Using 10 x 42 binoculars, provided by the BioDiversity Research Institute's Adirondack Center for

Loon Conservation, the Steward observed and recorded loon behavior. Data recorded included; particular behaviors, such as fishing or preening, colored bands that identify individual loons, the presence of a mate, successful hatchlings and fledglings, nest location and type, and clutch size.

Results

Upper St. Regis Lake

Upper St. Regis Lake contains two loon territories; North Bay and Birch Island. In the North Bay territory a single pair was observed from June 11th to August 8th. An unbanded pair was observed in this territory the previous year as well, however we can only speculate that it is the same pair as neither of the birds had bands on their legs. No nest site or chicks were observed for this pair. The pair displayed normal behavior and seemed to be healthy.

Within the Birch Island territory a single pair was also observed from the dates of July 14th to August 19th. A single loon was observed in the territory throughout June as early as June 11th, but no bands or mate were observed. On three separate occasions fishing groups of multiple loons were observed (composed of 3 and 5 loons) before the territorial pair was observed. A chick was observed with the pair by July 14th until August 5th. On July 22nd orange and yellow bands were observed on the left leg of the female of the pair, while the male was unbanded. Clutch size and nest site were not observed for this pair. This banded female occupied the same territory last year, so it is expected that the male is the same returning bird. The pair was last seen on August 19th.

Spitfire Lake

Spitfire Lake contained one territorial pair in the summer of 2009. The pair was observed on the lake from June 11th to August 19th. The pair built a scrape nest on the bare rock island, and produced a clutch of 2 eggs. One chick successfully hatched and was observed on the lake with the pair on June 11th, but was not seen again throughout the summer, for reasons unknown but most likely due to predation. The pair did not re-nest or produce a second clutch. Leg bands were observed on both birds in the territorial pair. One bird had green/orange on the left leg, and blue with a dot/silver on the right leg, while the other bird had white/white on the left, and white with a stripe/silver on the right leg. The pair was last seen on August 19th and appeared to be healthy.

Lower St. Regis Lake

Lower St. Regis Lake had one territorial pair throughout the summer of 2009, which was observed in the Lower St. Regis River. The pair was observed from June 30th to July 26th, and seen with two chicks, although no nest site was observed. The male was observed with yellow/red bands on the left leg and silver/blue on the right leg. The pair was last observed July 26th with two chicks and doing seemingly well. This pair was observed by a Biodiversity Research Institute's Adirondack Center for Loon Conservation volunteer Hilary Appell. Hilary forwarded her data to the Steward, who then entered and submitted the data to the Adirondack Center for Loon Conservation.

Discussion

Four territorial pairs of common loons were observed throughout the three lakes. Four of the eight loons were banded, and included in the Biodiversity Research Institute's Adirondack Center for Loon Conservation's long-term research of the common loon. Three pairs hatched four chicks, of which three survived the observation season. During the summer 2008 monitoring season, four pairs of loons were also observed within the same territories. The orange/yellow banded loon resided in the same Birch Island territory on Upper St. Regis Lake for the 2008 and 2009 monitoring seasons. The green/orange banded loon also resided in the same Rock Island territory on Spitfire Lake for both the 2008 and 2009 monitoring seasons. In 2008, four chicks were observed, but only from two pairs of loons, compared to the four chicks observed from three loon pairs in 2009. However one chick from each reproductive pair was apparently lost to predation. The mean reproduction rate remains constant between the two years, but the number of reproductive pairs has increased since last year. This shows that the more loon pairs are finding suitable nesting conditions, returning to previous territories and producing offspring, which will hopefully increase the successful reproduction of Adirondack common loons.

Conclusion

The ratio between successful fledglings and clutch sizes, displays the delicate nature of loon reproduction, further emphasizing how detrimental human activity, such as physical disturbance and unnatural levels of mercury, can be. The Biodiversity Research Institute's Adirondack Center for Loon Conservation captures loons to run blood tests in order to take an initial reading which can then be compared to the birds behavior and reproductive success later observed by loon monitors. This correlation allows use to better understand the effects of mercury levels on loon behavior. If banded birds are recaptured, the levels of blood mercury can be compared, displaying the rate of accumulation in the bird. Falling levels of blood mercury in the common loon will allow them to increase reproductive success and repopulate many northern lakes (Scheuhammer, Meyer, Sandheinrich, and Murray, 2007).

The mean reproduction rate between the 2008 and 2009 field seasons remained constant, but the number of reproductive pairs has increased. This shows that the more loon pairs are finding suitable nesting conditions, returning to previous territories and producing offspring, which will hopefully increase the successful reproduction of Adirondack common loons.

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Eurasian Watermilfoil Viability Study

By Jessie Gardner and James Parmeter, Watershed Stewards

Introduction

Eurasian watermilfoil is a submersed, aquatic perennial that is native to Eurasia. It is believed to have been introduced to the United States in the 1880's through the Chesapeake Bay. However, there is evidence that it was introduced to the United States in the late 1940's (Eiswerth, et al. 2000). Eurasian watermilfoil grows rapidly and can grow in a variety of water bodies and water conditions. As a result of it growing rapidly and in many conditions, it quickly overtakes native plant communities. This, in turn, affects the native plant and animal communities. Eurasian watermilfoil also reduces the water quality, decreases the quantity and quality of aquatic recreational activities, and decreases the profitability and productivity of agriculture by clogging ditches, canals, and irrigation equipment. Eurasian watermilfoil can also increase the costs of electricity generation and decrease the value of property (Eiswerth, et al. 2000).

Eurasian watermilfoil is spread by fragmentation through multiple vectors, including boat traffic and waterfowl. Once a lake is infected, several management techniques are employed to keep populations down. These include mechanical harvesting, physical removal, chemical treatments, biological control, and educating the public (Eiswerth, et al. 2000). However, a more comprehensive and holistic approach to managing Eurasian watermilfoil may be needed to prevent and control the species (Leung, et al. 2002). This will require a more complete understanding of the response of milfoil fragments to desiccation (drying out), that would occur when fragments are transported via boats, trailers, or waterfowl over distances. In order to understand the viability of Eurasian watermilfoil, after different degrees of drying, we set out to determine if the plant would elongate and/ or produce rootlets after being dried for various lengths of time in a laboratory setting.

Methods

Cage construction

To study the viability of Eurasian water milfoil after the certain drying periods, cages were constructed out of material purchased from Ace Hardware in Saranac Lake, NY. The funding for the materials was provided by Paul Smith's College. The cages were one meter tall by 1/2 meter wide. Wooden stakes supported the cages. Steel hardware cloth was used around the top and the bottom of the cage for support and fine mosquito netting was used in the center of the cage to allow flexibility. Five cages were constructed then placed in the littoral zone of Second Pond, Saranac Lake, NY. The sediment of the location was mixed sand and organic matter. Different colored yarns (donated by Mountain Gift and Powder Company store in Saranac Lake, NY) were tied on each of 10 replicate fragments for each of 5 drying times (0, 2, 5, 10, and 20 days at room temperature in a non-temperature controlled lab). Lengths of yarn were tied to a stick, which was then placed in a cage.

Milfoil collection and fragment preparation

Ninety strands were collected from a milfoil bed near the Second Pond boat launch and taken to a biology laboratory at Paul Smith's College. Ten strands were designated as the desiccation control. They were first patted dry, weighed, and were then placed in envelopes in a laboratory oven. The oven was set to about 100 degrees Fahrenheit. After they were completely dry, they were weighed again to determine the average percentage water of fresh milfoil strands. Ten fragments were designated as the control group. They were patted dry, weighed, and measured. They were then marked with a different color yarn. They were placed directly into a bucket of lake water and placed in a cage in Second Pond. This was repeated for 10 replicate fragments (per treatment) that were left to dry for 2, 5, 10, and 20 days respectively. There were a total of 60 fragments used in the experiment and 5 cages used to hold them in the pond.

Sample collection and design issues

The cages at Second Pond were checked about once per week for approximately three weeks to make sure that the cages were holding up. However, due to a large amount of wave action caused by boat activity, the cages were in poor shape. The milfoil strands could not be found. It is

assumed that the strands drifted away through the cages or the strands were washed out of the top. Due to cage construction flaws and inadequate amounts of checking on the cages, we were able to collect minimal, but valuable, data.

Stewards removed and dismantled the cages. The materials were cleaned and salvaged. The stewards designed a new cage and built a prototype. The cage was constructed out of the steel hardware cloth and was approximately twelve inches long, eight inches wide, and eight inches deep. Wooden stakes were used to provide support and structure to the cage. The cage was placed at Second Pond and the cage was entirely submerged. Ten floating milfoil strands were collected and measured. The milfoil strands were marked with different colored yarns and placed in the cage to determine if they would be contained in the cage and not was out. The cage and strands were checked on several days after they were deployed and they were still present and intact in the cage.

Results

Due to cage construction flaws and losing the milfoil strands, we were unable to determine if they strands would produce elongate or produce rootlets. However, we did discover several things. Eurasian water milfoil is an average of 89% $\pm$ 0.35% percentage moisture by weight. There was no effect of the drying time beyond 2 days on the degree of desiccation. The strands dried out nearly completely after just 2 days (Figure 1). We discovered that over time, the drying is slightly variable. Within that variability, longer strands dried to a greater degree.

However, there is a relation between fragment length and percent total desiccation. We discovered that as fragment length increases, the degree of desiccation increases. Twenty-seven percent of the variance in total desiccation could be related to fragment length (Figure 2, p=0.001).

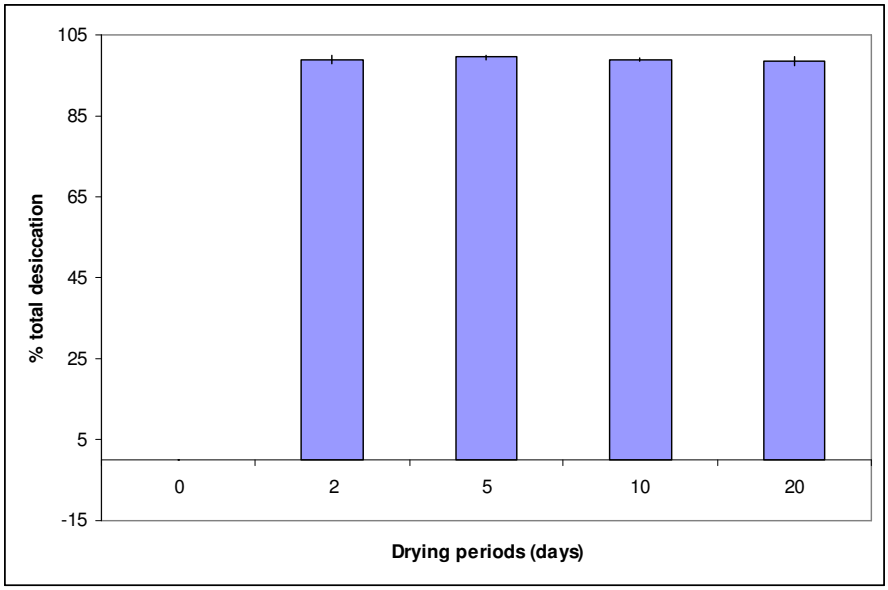

Figure 1: The percent of total desiccation of Eurasian Water Milfoil fragments after 5 different drying times in a laboratory setting. For each drying period, there were 10 replicate fragments. The average of the 10 replicates $\pm$ 1 standard error of the mean is shown for the percent total desiccation. Most fragments had 10 nodes (with some exceptions where there were 7-9) but had different initial starting lengths. Fragments were collected from Second Pond in the Saranac Lake chain in the Adirondack Park in NY. Fragments were collected in June, 2009.

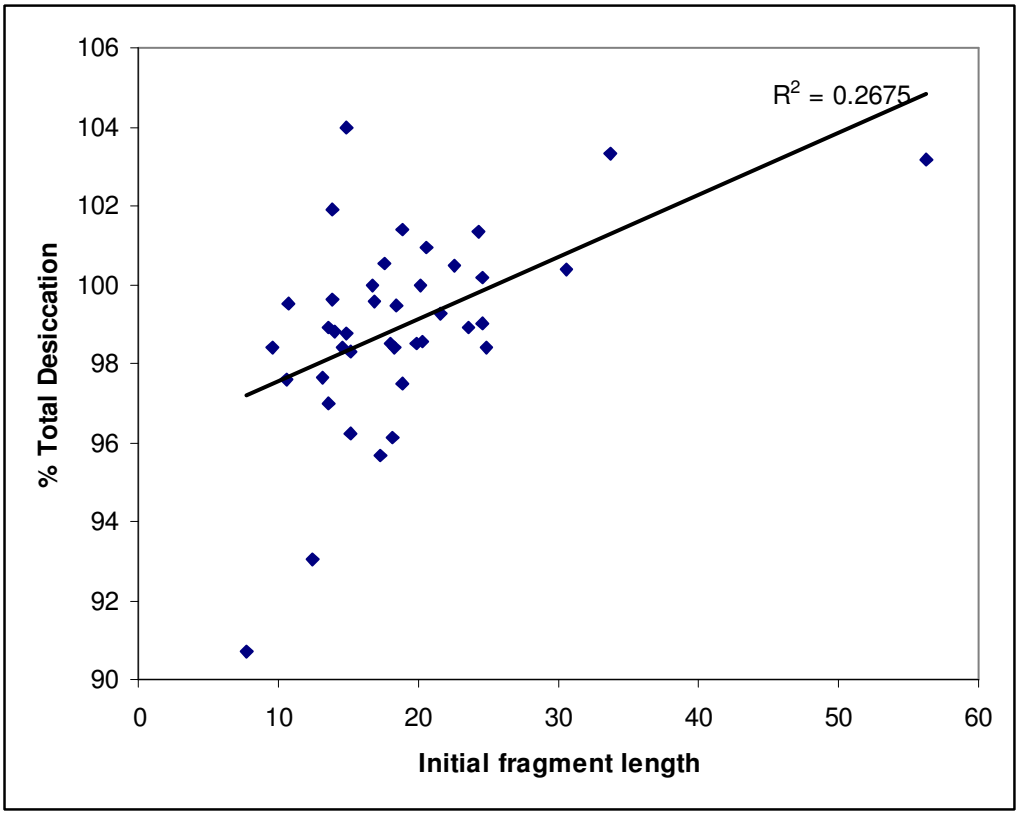

Figure 2: The relationship between % desiccation and initial fragment length for all experimental fragments regardless of drying time. Drying time after 2 days was shown not to be significantly related to the degree of desiccation (n= 40 fragments).

Discussion

Fresh EWM is approximately 90% water. When reintroduced to water after different drying times we did notice that water was quickly reabsorbed. Due to the findings that the fragments of the size we used in our study were totally desiccated after just 2 days of drying, we will add a 1 day drying time to our protocol when we re-run the experiment with the new cage design in the summer of 2010. There are no published data with which to corroborate or contrast our findings that there is some increase in drying in longer strands. We will see if it occurs next year.

A new prototype cage was tested and appears to be a good design so it will be adopted so that next season we can begin the experiment immediately when milfoil is grown enough to collect fragments. What remains to be seen is if milfoil can rehydrate from different degrees of desiccation or, as the case may be after two days, total desiccation and begin to grow again when placed in the lake environment. This preliminary study was useful in that we learned the speed at which fragment appear to desiccate so that we can re design the drying times to have fragments that are not 100% desiccated when they are reintroduced. These data put us a step closer to understanding the physiology of this aggressive invasive weed. When we know more, we can suggest critical time frames over which the fragments can likely be transported on a boat, or trailer and still be viable. This experimental approach could also be used to test additional invasive species .

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A preliminary study of the effects of silivicultural practices on the physical condition of plethodontid salamanders

By James Parmeter and Celia Evans, PhD

Introduction

Keystone organisms are defined as organisms that are often, but not always, a dominant predator whose removal has a great affect on other populations, and overall biodiversity (Mills, Soule, and Doak 1993). Welsh and Droege (2001) stated that because of difficulty in monitoring every organism, surrogate species should be used to monitor ecosystem changes. Longevity, territory size, and low sampling costs, along with sensitivity to disturbance make plethodontid (lung-less terrestrial) salamanders great indicators of environmental change (Welsh & Droege 2001, Grialou et al. 2000). Due to their roles as keystone and indicator species amphibians can be an important part in both aquatic and terrestrial ecosystems; they can serve as regulators of invertebrate and amphibian populations and as prey for other species.

Plethodontids are lung-less terrestrial salamanders in the Order Urodela. Due to the permeable nature and role in gas exchange, amphibian skin makes these species highly susceptible to dehydration (Waldick 1997). Canopy cover loss and shade reduction can cause extreme temperature fluctuations and evaporative loss, which can result in a less suitable habitat (Bennett, Gibbons, & Glanville 1980) for amphibians. Waldick (1997) noted that long periods exist when amphibian species cannot reestablish in a site due to poor microhabitat conditions (low levels of moisture and leaf litter); this is particularly true in clear-cuts. The interval of recovery in amphibians likely reflects the time necessary for habitat features to recover to levels that are tolerable for amphibians (Waldick 1997). Davic et al. (2004) noted several reasons for the study of salamanders as indicator species: (1) salamanders serve as mid-level vertebrate predators, (2) connect energy between aquatic and terrestrial systems, (3) contribute to soil dynamics, and (4) provide a food source for tertiary consumers. Many studies have shown that salamanders decline in areas where clear-cuts have occurred, and propose that opening of the canopy, lack of suitable ground cover, and soil structural differences caused by skidding maybe causing these declines in salamander abundance (Grialou et al. 2000; Knapp et al. 2003; Waldick 1997; & Bennett et al. 1980). Within clear-cuts, course woody debris (CWD) is often highly desiccated and incapable of supporting terrestrial plethodontid salamanders, especially as breeding habitat (Waldick 1997). Ash (1997) found that salamanders colonizing clear-cuts were adults, which are better able to withstand dryer conditions.

While there is a great deal of research on the abundance of salamanders in different habitats and the factors that may influence abundance, there is little research that examines the physiological condition of salamanders in sites where abundance is low due to lower habitat suitability. This study focused on the ratio of mass to length in *Plethodon cinereus* as an indicator for overall physical health of this species of salamander. Although adult salamanders are generally more abundant in a clear-cut than juveniles (Sattler and Reichenbach 1998), the masses of these salamanders should be lower than those in the control plot. We hypothesize that, on average, the salamander mass to snout to vent length (SVL) ratio will be the lowest in the clear-cut plot and the highest mass to SVL length ratios will occur in the control plot, a less stressful physical environment and possibly one with more food availability. The assessment of abundance, physiological status, and estimates of total biomass of a population of salamanders under different management scenarios can provide more information to interpret the way in which these animals can be used as environmental indicators.

Methods

Study Area: The study was conducted in four forested treatments; two hectare (100X 200m) clear-cuts and control plots located at each of the Paul Smith's Adirondack Visitor Interpretative Center (VIC) and off Keese Mill Road (KM) in the town of Brighton in Northern New York. Each of these treatments in both areas is part of the forest Ecology Research and Demonstration Area (FERDA) Plots initiated in 1999 by the USDA Forest Service in collaboration with Paul Smith's College. The clear-cut plots were approximately 9 years old and dominated by new growth (berry-bushes, ferns, and small shrubs; mostly beech (*Fagus grandifolia*). The controls were approximately 80-year-old second growth hardwood forest dominated by beech and sugar and red maple (*Acer saccharum* and *Acer rubrum*) with some yellow birch and striped maple (*Betula allegheniensis* and *Acer pennsylvanicum*, respectively) and balsam fir (*Abies balsamea*) and red spruce (*Picea rubens*) dispersed through the area. These plots were picked because they have not been subject to recent (less than 50 years prior) disturbance.

Field Sampling: Sampling of salamanders occurred bi weekly or weekly during summers of 2008 (17th of August until the 30th of September) and 2009 (11^{th} of June to 6^{th} of August), on a rotating basis (VIC then KM). In the summer of 2008, three randomly selected 3 x 10 meter plots (total of 6 plots) were selected within each treatment, by random point selection in Arc GIS. These plots were re-sampled continuously without the addition of different plots. In the summer of 2009, the 3 X 10 meter plots were randomly selected each week, and so a larger area of each 2 Ha plot was sampled.

Salamanders were sampled using a time-constrained area search method, effective for capturing terrestrial salamanders due to their low movements and small territory size (Welsh & Droege 2001). Area searches were conducted in 45 minute intervals. Litter depth was measured at 3 and 5 locations in each plot in 2008 and 2009 respectively. Rocks, logs, and leaf litter were overturned by hand in search of salamanders. All debris was returned to its original position to reduce the effects of disturbance. Captured salamanders were placed into a small 5 x 3 inch fishing tackle container with a moist sponge to avoid desiccation of the salamanders and placed in an area within the capture site (home range). Salamanders were then identified to the species level. Snout to vent length (SVL) was measured and animals were weighed (nearest 0.1 gram) using a portable scale (Moore et al. 2001). Captured salamanders were then placed back in the immediate vicinity of capture. Cover type (rock, log, leaf litter, moss, etc.) and decay class (CWD) were recorded when salamanders were captured.

Data Analysis: Data were entered into a Microsoft Excel spreadsheet. We examined the relative abundances of salamanders in each treatment and looked for differences between the length to mass ratios for salamanders found in each harvest treatment.

Results:

Salamander abundance

The control plots had a higher estimated abundance of red-back salamanders than the clear-cut in both study areas (Figure 1). The controls had a total of 80 (VIC 67, KM 13) individuals and the clear-cut

had 9 (VIC 8, KM 1) individuals. These data were calculated from the original values (control 80; clear-cut 9) to estimate the number of salamanders per hectare for both study areas.

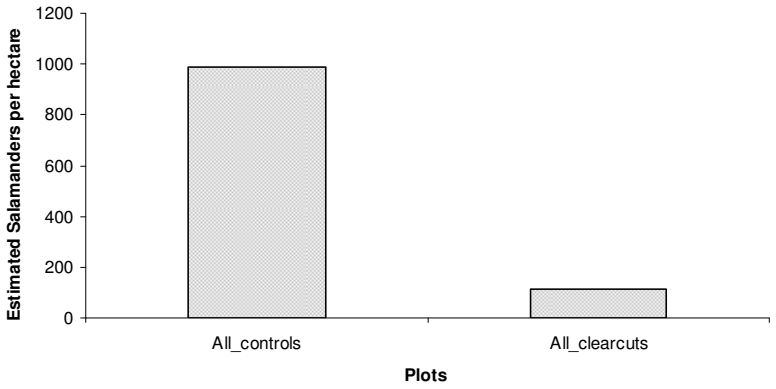

Figure 1: Relative abundance of salamanders from the control and clear-cut plots in the summer of 2008 and 2009. Data were extrapolated to estimate abundance over the entire study area (2ha). There was a significant difference in the relative abundances between the control and clear-cut. Data were collected from the Paul Smith's VIC (Visitor Interpretive Center) located in the town of Brighton, NY from August to September 2008 and June to August in 2009.

Salamander Physiological/Morphological data

Salamanders had substantially lower body mass and were shorter in the clear-cut than in the control plots when data for 2008 and 2009 are combined. Statistical analysis of these data is questionable because of the large difference in sample sizes between salamanders collected in the two treatments (n=90 salamanders in control, n= 10 salamanders in clear-cut), however, there is a trend here that matches what we have seen in previous study of these plots (Figure 2).

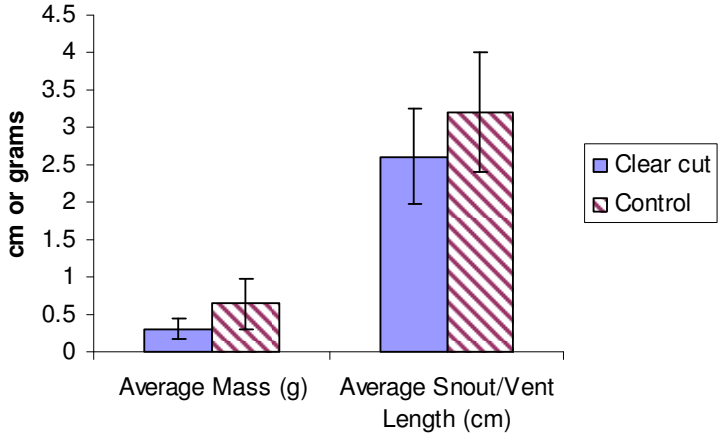

Figure 2. Average mass and length of salamanders from the control and clear-cut plots in the summer of 2008 and 2009. Data were collected from the Paul Smith's VIC (Visitor Interpretive Center) located in the town of Brighton, NY from August to September 2008 and June to August in 2009. Bars represent $\pm$ 1 standard deviation of the mean.

In total, eighty-nine red-back salamanders were captured by hand. Eighty of these were captured in the control plots and nine were captured in the clear-cut plots. A strong correlation ($r^2 = 0.7835$) existed between the length to mass ratio for the control with a sample size of eighty. There was a strong correlation ($r^2=0.8885$) for the clear-cut with a sample size of nine. The ratio of the slopes of the linear regression lines was 7:4 for both the VIC and when all of the plots were combined (KM clear-cut only had one sample so a graph for this ratio is not merited). A statistical power test was conducted to determine

the sample sizes needed for each plot. From the sample size estimate analysis a sample size of thirty salamanders were needed for the control and fifteen were needed for the clear-cut.

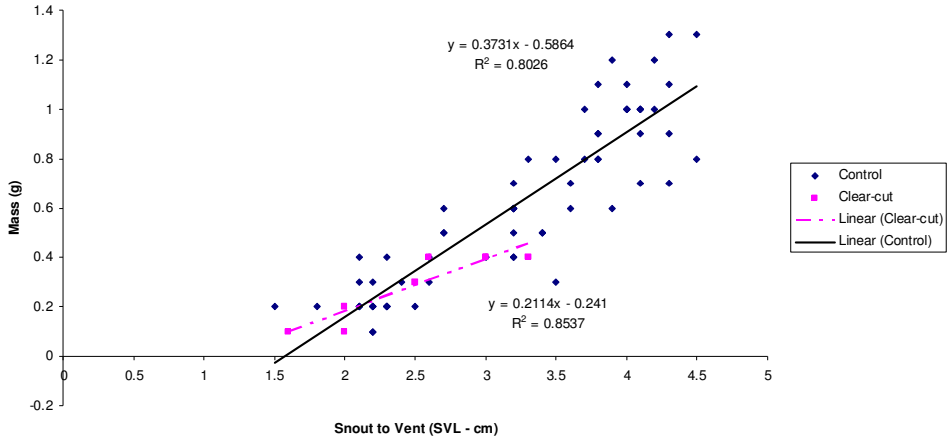

Figure 3: Graph of length to mass ratios of red-back salamanders (*Plethodon cinerus*) in twenty-seven control sub-plots and twenty-seven clear-cut sub-plots. The blue diamonds represent the length and mass in the control plot. The pink squares represent the length and mass in the clear-cut plot. Data were collected from the Paul Smith's VIC (Visitor Interpretive Center) from August to September 2008, June to August 2009 and Keese Mill Road FERDA plots (KM) from June to August 2009, both located in the town of Brighton, NY.

Leaf Litter Depth

On average litter was shallower in the clear-cut plots than in the control plots during the two seasons of the study. Variability in litter depth was much greater in the clearcut plots. This was a result of some plots in the clearcut having little to no litter and others having much more.

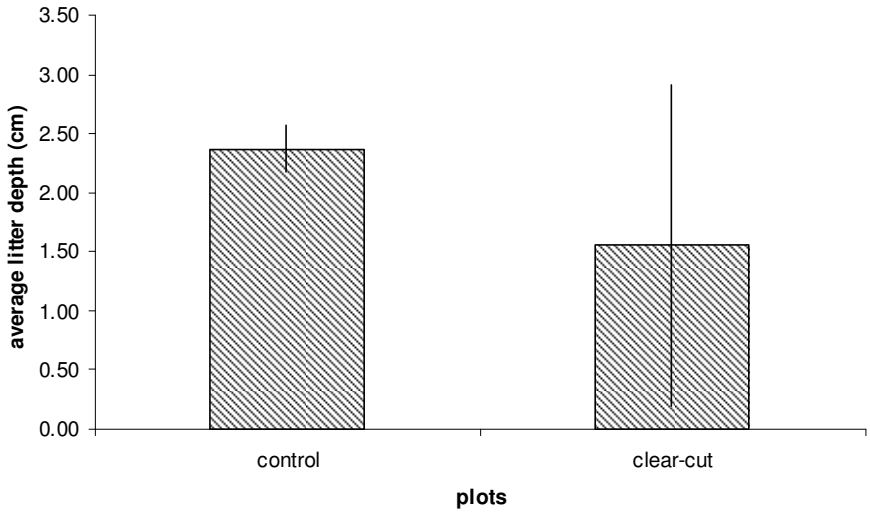

Figure 3: Average values for all sub-plot's (control and clear-cut) litter depth. Data was collected from the Paul Smith's VIC (Visitor Interpretive Center) located in the town of Brighton, NY from August to September 2008 and June to August of 2009.

Discussion:

Approximately 8.9 times more salamanders were uncovered in the control (80) than the clear-cut (9) which supports our hypotheses and is corroborated by several previous studies. Grialou et al. (2000) and Knapp et al. (2003) also documented a decline in salamander abundance after a clear-cut, which was similar to what was found in this study. This difference is likely due the lack of quality microhabitat areas in the clear-cut required by salamanders to prevent desiccation via their sensitive skin. Examples that

have been noted are extreme temperature fluctuations and increased evaporative loss, (Bennett, Gibbons, & Glanville 1980). Another hypothesis is that there may be increased predation in clear-cut areas on salamanders. Snakes are a major predator of salamanders and other amphibians and we did notice a high number of snakes (garter and red-bellies) in the clear-cut; however no quantitative data were collected on these occurrences.

Our estimation of population size should be treated with caution because the area we sampled is relatively small with respect to the overall silviculture treatment we are trying to represent. However, these data correspond with the findings of Burton & Likens (1975), who noted that salamanders had a large biomass within their second growth study area of the Hubbard Brook Experimental Forest in New Hampshire. *Plethodon cinerus* comprised approximately 93.5% of the total 2950 salamanders per hectare or 1770 g/ha wet weight biomass (Burton & Likens 1975), this was approximate to the biomass of small mammals.

While our data are likely representative of the salamander populations in those two different silvicultural treatments, there may have been some re-sampling of the same salamanders in the first summer of the study, due to the fact that we sampled from the same 3, 3 X 10 plots in 2008. However, we changed the sampling design in 2009 to sample a different randomly chosen 3 X 10 m plot and ultimately a larger area and found very similar patterns and outcomes.

The most novel finding of this study is the potential difference in morphology and physiological condition of salamanders in the control versus the clear-cut. Again, with so few salamanders recorded in the clear-cut plots it is difficult to statistically analyze these data with confidence. However, the apparent trend is that salamanders in the clear-cut are on average smaller and less massive than salamanders in the control plots and that the salamanders in the clear-cut plots are light relative to their length in comparison to the control. Two plausible hypotheses for what may be occurring are: 1) salamanders in the clear-cut have increased stress and thus higher metabolic rates and/or, 2) there is less food availability in the clear-cut.

There was a trend of lower litter depth in the clear-cut even after nine years of post harvest vegetation growth. Low litter depth may mean poor microhabitat conditions under which amphibian species may not reestablish for long periods (Waldick 1997). With little to no ground or understory cover the soil and litter could become desiccated due to increased sunlight intensity typical of clear-cut stands.

Conclusion

From the data collected during this study the abundance of salamanders in the control was higher was that found in the clear-cut. This supported the first hypothesis that a greater abundance of salamanders would be found in the control than in the clear-cut. The second hypothesis that salamanders in the control would have a greater mass than those in the clear-cut could not be statistically analyzed due to the small clear-cur data set. However, the data suggests a clear trend of reduced mass, length and mass/length ratio in the clear-cut salamanders. We will continue to collect data on these questions in the future and also attempt to measure respiration/metabolism and food availability in salamanders in these different habitats to more clearly understand more specifically how salamanders are affected by harvest activities and what implications these affects have for these animals as indicators of ecosystem function.

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Preliminary study of odonate abundance and habitat patterns at St. Regis, Rainbow Lake and Osgood Pond Boat Launches

By Stewards Evan Rea and James Parmeter

Introduction

Odonata is the name given to the taxonomical order which is comprised of dragonflies and damselflies (sub-orders *Zygoptera* – Damselflies, and *Anisoptera* - Dragonflies). These insects are considered generalist predators and are often used as biological indicators of water and habitat quality. Odonates (dragonflies and damselflies) are excellent dispersers (have high mobility) and opportunistic predators. Habitat selection might play an essential role in odonate community structure. Bried and Ervin (2006) suggest that changes in odonate abundance with distance from water bodies and wetlands may be useful in determining the width of buffer zones necessary to preserve these organisms around their breeding habitats.

Within New York state odonates are often observed and recorded using the New York State Dragonfly and Damselfly Survey (NYSDDS) Protocol. The Watershed Steward Program has adapted the NYSDDS model to monitor odonates at three area boat launches (Buck Pond Campground, Osgood Pond and Upper St. Regis Lake). We examined which taxa were most common at the different launches, the relative abundance of odonates, and whether or not habitat structure seemed to be correlated with where they were found.

By observing species found at these boat launches over several years, we may eventually learn more about habitat quality, and the relationships between taxa present and the aquatic and shoreline environment.

Methods

Study sites

This study observed and recorded data on odonates at three sites in the Adirondack Mountains of Northern New York each site was located within close proximity to a water-body (lake, pond, wetland, etc.). These sites were the Upper St. Regis, Rainbow Lake waterway, and Osgood Pond Public Boat Launches. The Upper St. Regis site was a hardwood/conifer area located off County Route 30 in the town

of Harrietstown. The Rainbow Lake waterway site was also a mixed forest located at the New York State Department of Environmental Conservation (NYSDEC) Buck Pond Campground in the town Onchiota off County Route 55. The Osgood Pond site was dominated by conifers and located in the town of Brighton off the White Pine Camp Road which connects to County Route 86.

Data Collection

Data were collected a minimum of once weekly at Osgood Pond (due to time constraints), and twice weekly at the other launches (Rainbow Lake waterway and Upper St. Regis Lake) during July and August, 2009. Search time was a minimum of forty minutes each time and was recorded for each search. Search time was occasionally broken-up over the day, if necessary due to boater usage at the launch. Searchers visually inspected areas for odonates and used a standard insect net to capture dragonflies and damselflies. Captured individuals were placed in a small container for visual inspection or held in the hand, depending of observer's preference. Odonates were then identified to family (species if possible) by observing wing structure, eye orientation, coloration, and abdomen segment characteristics. Method of identification (capture, observation, photograph), estimated abundance (few, frequent, and abundant), habitat (hardwood, conifer, mixed), surrounding landscape (road, pathway, lake, bog, and forest), vegetation type (grass, shrub), and height of vegetation were recorded. Stewards did not kill any odonates and therefore final determination to species was not possible in all cases. Time started and time ended was recorded to determine search effort. Specimens that could not be identified by the observer were photographed and sent by e-mail to Janet Mihuc a Paul Smith's College entomologist and professor.

Odonates were classified using a guide developed by Steward Evan Rea that included a dichotomous key and pictures. The following is excerpted from the field guide:

Damselflies

Calopterygidae (broad-winged damselflies)

- metallic green bodies
- Male wings clear, with tips of hindwings colored
- Females' wings uniformly amber or sometimes clear.
- ten or more antenodal crossveins
- wings not stalked at the base.

Lestidae (spreadwinged damselflies)

- Abdomen extends more than 1cm beyond end of wings.
- Wings lacking color and usually held open when at rest
- Only two antenodal crossveins
- M_3 vein arises closer to arculus than to nodus

Coenagrionidae (Bluets, Sprites, Etc…) or narrow-winged damselflies

- Abdomen extends no more than 1cm beyond end of wings
- M_3 vein arise just behind the nodus rather than closer to the base of the wing

Dragonflies

Aeshnidae (Darners)

- Eyes meet broadly at top of head
- unmatched antenodal crossveins
- triangles of the front and hind wing being of similar shape
- having a brace vein extending from the proximal end of the stigma

Gomphidae (Clubtails)

- Eyes separated along top of head
- widened ("club" like) tip of abdomen

- small and widely separated eyes
- green or yellow in color with black strips
- enlarge area in the end of abdomen giving them the name Clubtails

Cordulegastridae (Spiketails)
- Eyes meet at one narrow point on top of head

Macromiidae (Cruisers)
- Males have a brown thorax with pale hairs, and a single yellow lateral stripe
- There is also a pale dorsal bar at the base of the wings
- dorsal surface of the abdomen there are paired yellow spots, sometimes fused.
- The terminal appendages are pale on the dorsal surfaces.
- abdomen is mildly clubbed, primarily at segments 8 and 9
- The eyes are brown to pale green

Corduliidae (Emeralds)
- metallic green, black or yellow body
- They have emerald eyes (brown when immature)
- When perched, they hang suspended vertically.

Libellulidae (Skimmers, Meadowhawks, Etc…)
- matched antenodal crossveins
- triangles of the front and hind wing being of dissimilar shape.
- boot-shaped anal loop in the hind wing.

Identification information and pictures were obtained from http://www.entomology.ualberta.ca, http://bugguide.net/node/view/15740, http://www.stephencresswell.com/, and http://www.insectsofwestvirginia.net/.

Data Analysis

Data were entered into a Microsoft Excel spreadsheet. Communities were characterized by enumerating the number of families and species present at each launch. These data were categorized into a table and then pie charts were developed as graphic depictions of data. Habitat, vegetation type, and vegetation height were analyzed to determine if there was a habitat preference by family or species. Because we may have observed an individual more than once in the 40 minute search period, we do not make any estimates of absolute abundance for any taxa or species. We present relative patterns of abundance and potential relationships to habitat variables.

Results

The families of damselflies (*Zygoptera)* most commonly found in the study areas for this report were from three groups: *Calopterygidae, Lestidae*, and *Coenagrionidae*. The families of dragonflies (*Anisoptera)* most commonly found in the study area were from the following six groups: *Aeshnidae, Gomphidae, Cordulegastridae, Macromiidae, Corduliidae,* and *Libellulidae*.

Upper St. Regis Lake

Three families of odonates were observed at the Upper St. Regis boat launch *Coenagrionidae, Lestidae,* and *Libellulidae* (Figure 1). The *Coenagrioidae* had the highest abundance with 22 observations, followed by *Libellulidae* (4), and then *Lestidae* (2). Higher species richness (# of species) was found at the Upper St. Regis launch (10) than the other two launches (Figures 2 and 9).

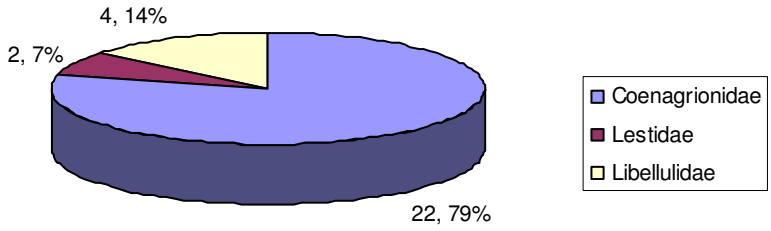

Figure 2. Odonate family relative abundance over entire capture effort. Data collected from St. Regis Boat launch area, Harrietstown, NY. The first number in the set for each section represents sample size (n), the second is the % of total observed. Data collected in July and August 2009

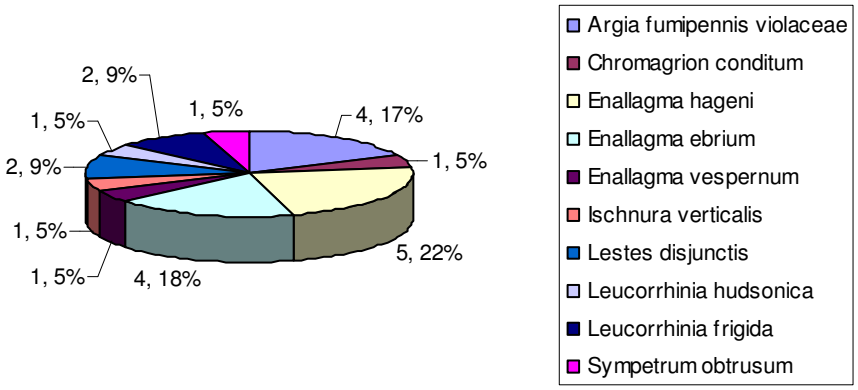

Figure 3 Odonate species abundance over entire capture effort. Data collected from St. Regis Boat launch area, Harrietstown, NY. Data collected in July and August, 2009

Ninety-one percent of odonates were captured on vegetation that was between 0 and 70 cm high (class 1-3; Figure 3). Most specimens were observed on grasses and shrubs and very few were captured on emergent vegetation or on un-vegetated surfaces (Figure 4).

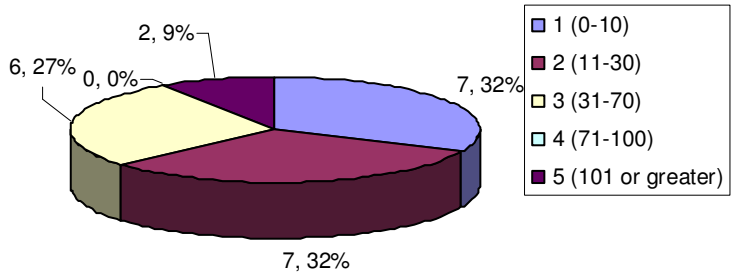

Figure 4. Height of vegetation on which odonates were captured. Data collected from St. Regis Boat launch area, Harrietstown, NY. Data collected in July and August 2009

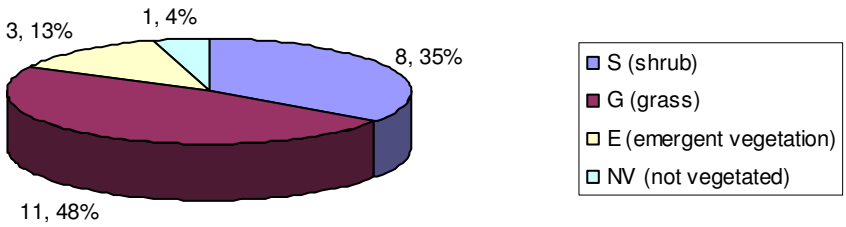

Figure 5. Type of vegetation on which odonates were captured. Data collected from St. Regis Boat launch area, Harrietstown, NY. Data collected in July and August 2009

Osgood Pond

Sampling effort was much lower at Osgood Pond than at St. Regis due to the amount of time stewards were on duty there. Two families of Odonates were observed at the Osgood Pond boat launch *Coenagrionidae* and *Lestidae.* The *Coenagrioidae* were most common with 3 observations in 4, 40 minute observation periods. The other family observed was the *Lestidae* (n=1). A larger number of *Coenagrionidae* (bluets, sprites, and dancers) were observed than any other group. Three of the 4 sighting occurred on vegetation that was between 70 and 100 cm tall. Two of these were on shrubs and two were on emergent vegetation.

Rainbow Lake waterway

A total of 17 sightings were recorded over Three families of Odonates were observed at the Upper St. Regis boat launch *Coenagrionidae, Lestidae,* and *Libellulidae* (Figure 1). The *Coenagrioidae* had the highest abundance with 12 observations, followed by *Libellulidae* (4), and then *Lestidae* (1). Seven species of odonates were observed at the Rainbow Lake waterway Boat launch (Figure 9), second in abundance after Upper St. Regis (Figure 2).

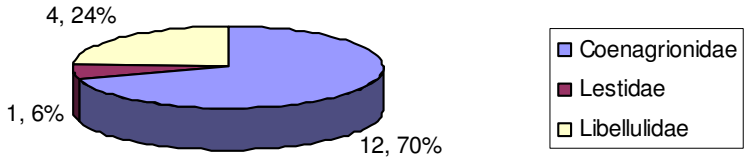

Figure 6. Odonate family abundance over entire capture effort. Data collected from Buck Pond Boat launch area, Onchiota, NY. Data collected in July and August of 2009

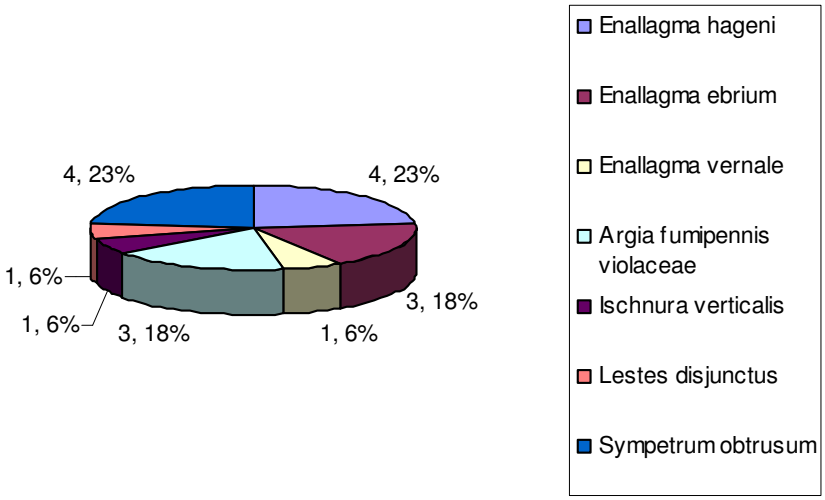

Figure 7. Odonate species abundance over entire capture effort. Data collected from Buck Pond Boat launch area, Onchiota, NY. Data were collected in July and August, 2009.

Stewards observed odonates on vegetation that was between 0 and 70 cm high (class 1-3) with most observations occurring on vegetation between 31 and 70 cm (Figure 7). Most specimens were observed on shrubs followed by grasses (Figure 8) which were in close proximity to water.

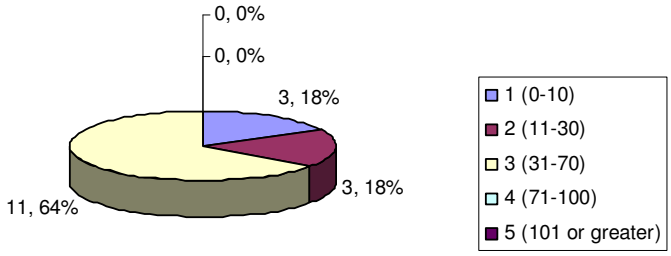

Figure 8. Height of vegetation on which odonates were captured. Data collected from Buck Pond Boat launch area, Onchiota, NY. Data collected in July and August , 2009

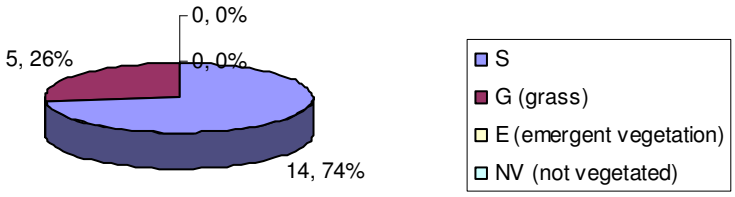

Figure 9. Type of vegetation on which Odonates were captured. Data collected from Buck Pond Boat launch area, Onchiota, NY. Data collected in July and August, 2009

Combined Data

Enallagma hageni (9), *Argia fumipennis violaceae* (7), and *Enallagma erbium* (7) were the most abundant species captured when analyzing all of the study location data together (Figure 9). Ten species were identified at Upper St. Regis lake and 7 at the Rainbow Lake waterway boat launch. There were no

significant differences between boat launches in the number of observations per time (F= 0.09, P = 0.91). At each launch sampled there were approximately 3 odonates sighted per hour.

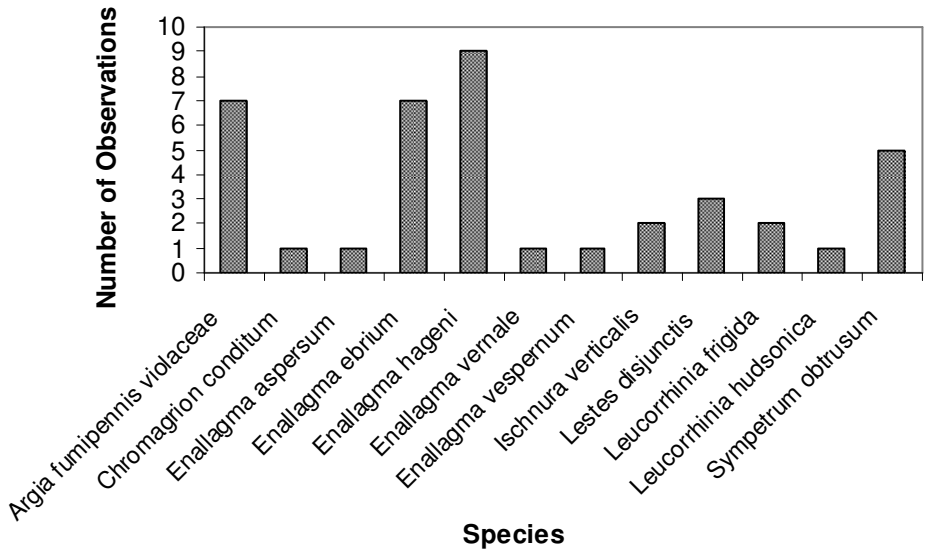

Figure 10. Total number of species observations over entire study period. Data collected from Upper St. Regis, Osgood Pond, and the Rainbow Lake waterway, summer 2009.

Discussion

The families *Coenagrionida* (bluets, sprites, and dancers) and*, Lestidae* (spread-winged damselflies) were observed at all three study sites. Bluets were the most commonly observed specimens (37 of 49 total). Most specimens appeared to prefer vegetation between 0 and 70 cm in height (Figures 3 and 10), with Osgood Pond being the exception, where the few animals identified were on taller vegetation. Sample size is so small at Osgood this year we shouldn't consider these data representative. Due to the high observation rates of *Enallagma hageni* (9), *Argia fumipennis violaceae* (7)*,* and *Enallagma erbium* (7) one might speculate that these three species are highly mobile and abundant within the region of study. These three species were however, not identified at the Osgood Pond boat launch, but it is difficult to know if they are present or absent due to a small data set (due to time constraints and rainy weather). In future study, it will be interesting to examine differences in surrounding landscape (i.e. wetland area adjacent to lake versus, forested shoreline) at these launches and see if there is a relationship to the species that are common. For future study, we will continue to standardize sampling sampling methods and perhaps stratify sampling in particular habitat types at all launches. Shorter sampling times could help ensure that we do not resample the same odonates at a location on the same day and using photographs for species ID quality control could be valuable. These data give us a baseline from which to build and compare with the scientific literature as we gain more information in future years.

Odonates, like many arthropods, depend on habitat complexity for breeding, hunting, hiding, and resting. With shoreline development, vegetation complexity often decreases which could result in a decline of odonate taxa. As noted earlier, Strong and Robinson (2004) stated that due to the lengthy period of the larval stage odonates may be susceptible to acidification of lakes. Monitoring community structure will help demonstrate temporal and spatial variability between boat launches over time. These changes, if occurring, can provide important insights for habitat and water quality change. Since this was a "no-Kill" study captured damselflies and dragonflies were released, so as to not affect the breeding potential for the species and the individuals themselves.

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Snowshoe Hare Home Range Study

By Jessie Gardner

Introduction

Research conducted by Watershed Stewardship Program is not only dedicated to achieving a greater understanding of the lake, stream, and wetland ecosystems of the Adirondack Park, but also understanding the ecology of terrestrial ecosystems that are intimately linked to the waters. We had the opportunity to participate in a long term study of home range size and usage by snowshoe hares (*Lepus americanus*), an important prey species and common herbivore in our watersheds, to more fully understand wildlife habitat use in the Adirondacks.

A snowshoe hare's home range is, at least partially, determined by available habitat and time of the year. Food quality and quantity vary across the watershed and food is scarcer during the winter months than during the summer months. Hares may travel farther during the winter than the summer to find those resources (Ferron, Potvin, & Dussault, 1998).

Hodges and Sinclair (2005) found that hares tend to shrink their home range in the summer because they do not have to travel as far to find resources. They concluded that this occurred because since there are more resources available in the summer. Based on resource availability, differences in home range size are expected. Hodges and Sinclair (2005) determined that snowshoe hares alter their habitat use within their home range from season to season based on movements to available browse. During the winter, hares move farther and expand their home ranges to find resources. They may also spend less time at a single browse site because there is less available to browse on at one browse site (Hodges & Sinclair, 2005).

Snowshoe hares have a proportionally large impact on other species, especially predators and other prey species. (Potvin, Bertrand, & Ferron, 2005; Morris, 2005) and also have a large impact on vegetation (St-Laurent et al. 2008) because they eat a wide range of plant species such as: willow, spruce, birch, shrubs, and non-woody vegetation (Hodges & Sinclair, 2003). By determining the home range size and the uses of home range of snowshoe hare, large areas of residual forests can be protected to conserve wildlife and vegetation in addition to ecological processes (St-Laurent et al. 2008). Since snowshoe hares are a keystone species in boreal forests, acting both as prey for many predator species and as potential agents of change in forest regeneration, it would be beneficial to determine their home range size and uses of their home ranges in different seasons. The goals of this study were to determine

the size and location of hare home ranges in the Adirondacks and examine any changes in these characteristics between the winter and summer seasons. The Watershed Stewardship Program was happy to collaborate on this work that is part of an ongoing study at Paul Smith's College on what influences snowshoe hare browse preferences and behavior in the southern part of their distribution.

Methods

This study was conducted in the Adirondack Park, which is a diverse mountainous landscape with elevations ranging from 30 to 1600 meters. The average summer temperatures range between 18 and 21 °C and the average winter temperatures range between -1 and 5 °C. Average precipitation is 101-122 cm and snowfall is 152-356 cm.

This study was conducted during the spring, summer, and fall months of 2009. Data were collected on two of the hares during March through May. Data was collected on four different hares during March through October. The winter data collection season was defined as the data collection as the time period that had snow present (March – April). The summer data collection season was defined as the time period that did not have snow present (June, July, August, September, and October).

Twelve Tomahawk-live traps (Murray, 2002) were set between the end of February and middle of March. The traps were set off the trails in four groups of three on Dewey Mountain Ski Area, owned by the Town of Harrietstown on the edge of the Village of Saranac Lake. The traps were set in suitable habitat for snowshoe hares with plenty of understory and mature coniferous trees as in St-Laurent et al. (2008). The traps were baited with a sliced apple, which was placed behind the treadle. Rabbit chow was also placed inside the trap and in front of the open door to entice the hares inside the trap (Hodges and Sinclair, 2003) and provide the hares nutrition and energy. The traps were set in the evenings and checked in the early morning (Morris, 2005) until six hares were caught. Once a hare was trapped, it was fitted with a mortality-sensing radio collar (Hodges & Sinclair, 2003). Each snowshoe hare was weighed in kilograms, sexed, and a hind foot was measured in centimeters (Murray, 2002). The snowshoe hare was then released where it was captured (Morris, 2005).

Each individual hare's location was determined through triangulation using a handheld Garmin Global Positioning System, a Yagi, radio receiver, and a hand-held compass (Fieberg & Kochanny, 2005). The signal from the transmitter on the radio collar was detected using the receiver and the Yagi. The location was geo-referenced using a GPS (St-Laurent et al. 2008) and a compass bearing (Fieberg & Kochanny, 2005). Points were taken until the relative location of the hare has been determined using triangulation (de Bellefeuille et al. 2001). A computer program, known as LOAS (Location of a Signal) was used to triangulate the groups of points.

Points were taken weekly during different times of the day to observe behaviors in order to create an accurate home range (Burton & Krebs, 2003). Home ranges were then generated using Hawth's Tools, which is an application in ArcMap. A test collar was also hidden in the forest and triangulated to account for radio telemetry error.

Once the points were uploaded onto the Garmin GPS, the points were downloaded onto the DNR Garmin computer program. The points were then downloaded onto LOAS, which is a computer program designed to triangulate locations. The triangulated points were downloaded into ArcMap. Using Hawth's Tools, a home range will be generated for each snowshoe hare.

Results

Six snowshoe hares were radio tracked. Three hares were lost (likely to mortality) before the end of the study. One hare was tracked throughout March and April, another hare was radio tracked from March through May, and another from March through August and the beginning of September before they were lost. The three remaining snowshoe hares were radio tracked from March through September and the beginning of October. The number of locations determined for each hare through radio tracking ranged between 25 and 54 points.

Home Range Sizes of Snowshoe Hares

As calculated by the minimum convex polygon method, the average winter home range size of the snowshoe hares was 13.74 ha (± 4.29, range 7.25 – 18.24 ha). The average summer home range size was larger at 64.46 ha (± 43.03 ha, range 27.61 – 126.65 ha). As calculated by the kernel density estimator method, the average winter home range size of the snowshoe hares was 27.60 ha (± 13.06, range 11.08 – 49.81 ha). The average summer home range size of the snowshoe hares was 47.85 ha (± 20.51 ha, range 21.66 – 70.92 ha). Regardless of the method of calculation, our preliminary evidence suggests that summer ranges were larger than winter ranges, but there is a large amount of variability between animals.

Winter and Summer Habitat Usage

The snowshoe hares used their habitats differently throughout the winter and summer. During the winter, the hares resided in a dense mixed coniferous hardwood forest. However, two hares resided in a denser hardwood forest than the other hares. During the summer, two hares remained in the mixed coniferous hardwood forest. Two other hares traveled to a separate mountain, which was mostly hardwoods. Once the weather started to change during the middle of October and return to fall like conditions, one of the snowshoe hares that traveled to the hardwood forest, traveled back to the mixed hardwood coniferous forest. The signal on the other hare that traveled to the hardwood forest could not be heard. Whether the animal died or moved out of range is not known. The two hares that died before the summer remained in the mixed coniferous hardwood forest during the winter. All of the hares showed site fidelity.

Seasonal Movements

Two hares traveled a large distance from their winter home range to their summer home range while two hares stayed in the relative area of their winter home range (± 549.55 m, range = 191.00 – 1137.83 m, n = 4).

Radio Telemetry Error

The two test collars had similar error distances of 92.27 m (± 51.63 m, range = 18 – 173 m, n = 12) and 78.46 m (± 95.70 m, range = 7 – 296.0 m, n = 14).

Discussion

Home range size in different seasons

The summer home ranges of the snowshoe hares were larger than their winter home ranges. These results are contrary to the literature. Hodges and Sinclair (2005) stated that snowshoe hares travel farther in winter than in the summer because of the scarcity of food and other resources. If food and other resources are not limiting factors in the Adirondack Park in the winter for snowshoe hares, then snow depth may be. Snow depth could inhibit travel and thus the hares would travel farther in the summer. Yet, snowshoe hares are adapted for travelling on snow. Predator pressures and thermal considerations may also influence movement differently in summer and in winter.

Summer home ranges were larger than winter home ranges because two of the snowshoe hares were on Dewey Mountain and also on Kiwassa Mountain throughout the summer. The other two hares remained on Dewey Mountain during the summer. The winter home ranges were only located on Dewey Mountain. As a result of the summer home ranges including Dewey Mountain and Kiwassa Mountain, the average home range size for the snowshoe hares in both seasons was very large. Dewey Mountain is also used extensively throughout the winter for Nordic skiing and snowshoeing. Extensive human use may influence the snowshoe hare's winter home ranges sizes. Fewer people used the mountain during the summer than the winter and thus the snowshoe hares would have been less impacted by humans.

A parking lot is nearby to the home ranges and several of the kernel density estimators predict that the snowshoe hares were in the parking lot. This is unrealistic and highly unlikely. The minimum convex polygons show where the hares went and do not extrapolate further than that. When using the kernel density estimator method, smoothing factors were manipulated in order to pinch the home ranges so that the snowshoe hares were not shown to travel through the parking lot. However, a few points were in the parking lot. This may be attributed to radio telemetry error and the snowshoe hares may have never been in the parking lot. Changing the smoothing factors did not help with the majority of the home ranges calculated by the kernel density estimator method because of the few points that were in the parking lot. The kernel density estimators predicted that the hares traveled even farther than the parking lot and actually crossed a major roadway. In this study, a minimum convex polygon may have been more accurate because even though it would have shown the point in the parking lot, it would not have made the home range even larger. A point being taken in the parking lot could have been avoided if the radio telemetry error was smaller.

Winter and summer habitat usage

All six of the snowshoe hares remained in the mixed coniferous forest throughout the winter. They may have remained in the mixed coniferous forest because the conifers provided them with sufficient shelter while the foliage was nonexistent on the hardwood trees. The hardwood trees provided the hares with food to eat during the winter. Once summer came, the hares traveled to hardwood forests, where there was sufficient food and coverage.

Radio telemetry error

The difference of errors could be because the topography of the area the first test collar was in was more variable. A more variable landscape would distort the radio telemetry error because the signal would be bouncing off of rocks, hills, and other topographic features. An additional cause of the smaller mean error of the second radio collar could because the person radio tracking was more experienced and thus could more accurately locate the collar. An additional cause of error could be that several different people radio tracked. The perception of where the signal was coming from would be different among people.

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St. Regis Lakes Water Quality Study

By Stewards Jessie Gardner and Evan Rea and Science Director, Celia Evans, PhD

Introduction

Freshwater water bodies are highly sensitive to any changes in the surrounding environment, such as weather, nutrient loading, and invasive species. The changes that occur ultimately affect the natural biota (Elliot et al. 2006). Effective and long term monitoring of the water body provides valuable data over time. With the implementation of long term monitoring, natural or human induced changes can be detected. Phytoplankton (measured as Chlorophyll A concentrations) can also be used to detect any changes because it is the first group to respond to changes in the water body (Nevers and Whitman, 2004).

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 the 2009 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).

Methods

During the months of the July, August, and September of 2009, a steward from the Watershed Stewardship Program was employed to take water samples of Upper St. Regis Lake, Spitfire Lake, and Lower St. Regis Lake for the AWI to analyze. The Steward sampled each lake once per month.

The equipment used was provided by the AWI. The steward took water samples in the deepest parts of the lakes. The transparency was measured with a Secchi disk and water was collected to test the levels of chlorophyll-a, phosphorus, and other chemicals. These parameters are further discussed in the 2008 AWI Water Chemistry Study Summary report.

The steward took the water samples to a Paul Smith's College laboratory, where they were analyzed by AWI personnel using standard methods. Using data from this and previous years analyses by the AWI, we plotted the means and standard deviations of several water quality parameters to include in our report. We include pH, alkalinity, total phosphorus, chlorophyll A, and nitrate from 2002 to 2009. We also show the correlation between nutrient levels and chlorophyll A concentrations. We used 2-way Analysis of Variance (ANOVA) to look for significant differences in the water quality parameters among lakes, across years and to look at the interaction between lake and year. A significant interaction simply means that the way the parameter in question changed across years was different for different lakes.

Results

There were significant differences in pH due to year ($F=5.4$, $p=0.007$) as well as differences among lakes when all years were pooled ($F=7.8$, $p<0.0001$). pH was higher (more basic) in 2008 and 2009 than in the previous 5 years. In some years Lower St. Regis had higher pH than either of the other two lakes. There was no significant interaction between lake and sampling year, thus changes occurred in all lakes in the chain (Figure 1)

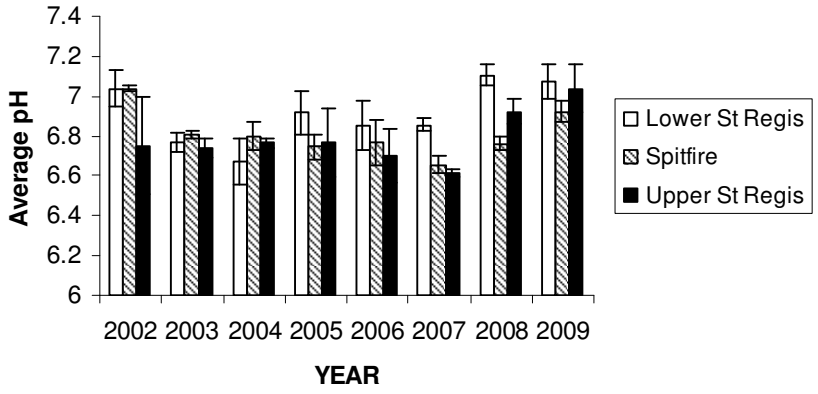

Figure 11. Average pH of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Alkalinity was significantly different across lakes and years ($F=22.4, p<0.0001$, and $F=7.7$, $p<0.0001$ respectively), but there was no significant interaction between lake and year. Lower St. Regis typically had a higher alkalinity than Spitfire and Upper St. Regis lakes and alkalinity seemed to be highest in Spitfire and Upper St. Regis in 2002.

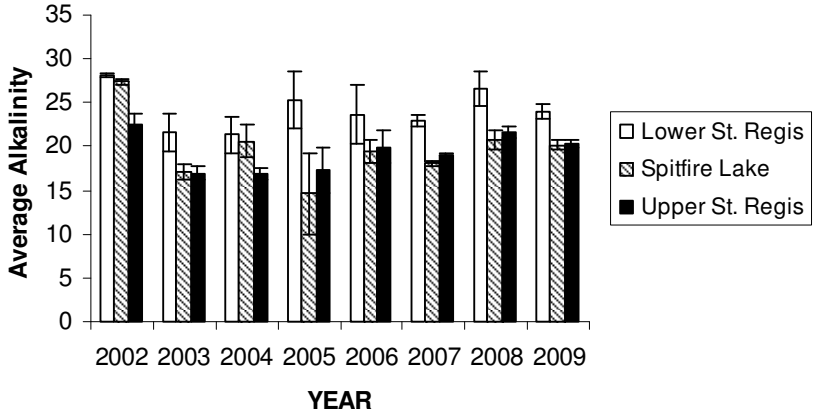

Figure 12. Average alkalinity of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Total P was significantly higher in Lower St. Regis lake than the other two lakes when data from all years was used ($F=13.8$, $p<0.0001$) and concentrations in 2002 were significantly greater than in 2003 but not different from any year since then (Figure 3). In Upper St. Regis Lake a one way analysis of variance showed that there were no significant differences in total P across years.

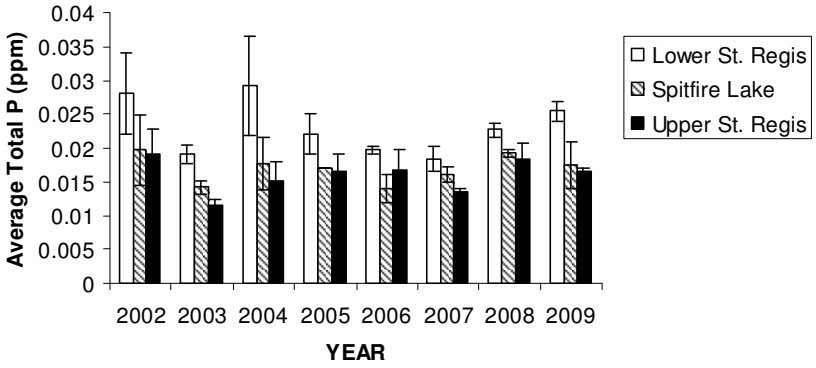

Figure 13. Average total phosphorus of water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Chlorophyll A concentrations were significantly higher in Lower St. Regis lake than in the other two lakes ($F=35.3, p<0.0001$). There were also significant differences across years ($F=6.1$, $p<0.0001$), however this change across years differed for different lakes (there was an interaction between lake and year in these data ($F= 2.4$, $p=0.01$)). In 2002-2004 and again in 2009, the P levels in Lower St. Regis were much higher than those in the other lakes. In Upper St. Regis, there were no significant differences in total P in that lake across years.

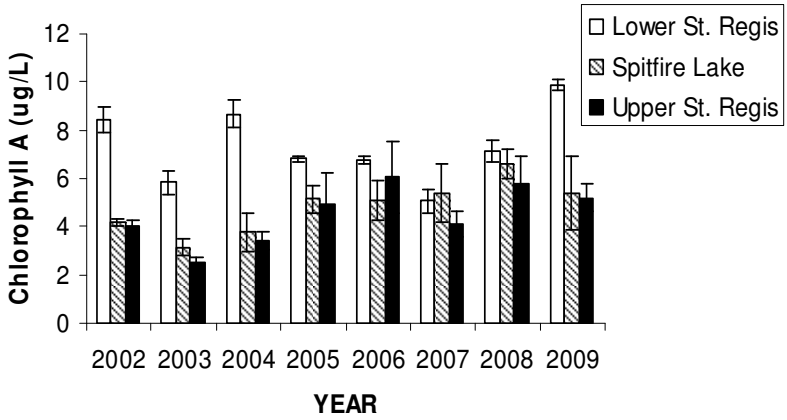

Figure 14. Average Chlorophyll A concentrations in water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Similar to the other parameters except Chlorophyll A, nitrate concentrations were significantly different across lakes ($F= 4.3, p=0.02$) and across years ($F=3.3, p=0.01$), but there was no interaction between lake and year. Nitrate concentrations are also highly variable within lakes each year.

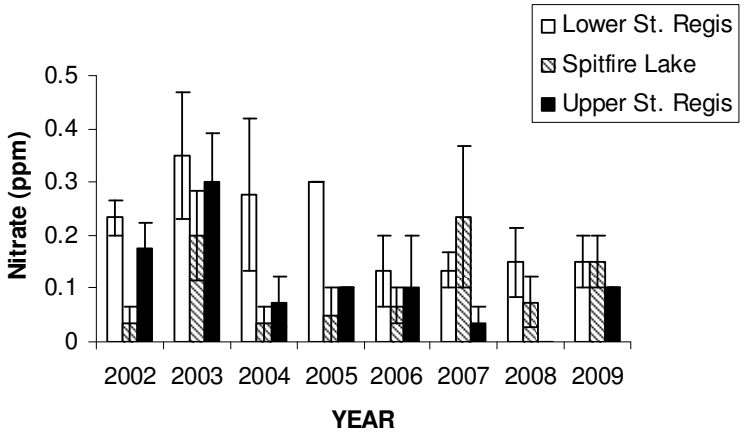

Figure 15. Average nitrate concentrations in water sampled from 3 lakes in the St Regis lake chain. Bars are ± 1 standard deviations. Samples are averaged across different times of year and different sampling depths.

Finally, we looked at correlations between the two macro nutrients we sampled and the Chlorophyll A concentration in lakes. P is typically considered the limiting nutrient in lake ecosystems and nitrogen in terrestrial ecosystems (often they are co limiting in terrestrial systems). As predicted Chlorophyll A concentrations were strongly correlated with total phosphorus (Figure 6). Chlorphyll 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, when we have what is referred to as an algal bloom. Chlorophyll A is not correlated with nitrate levels (Figure 7).

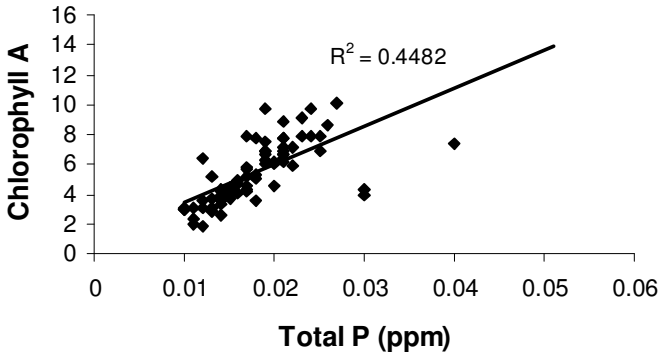

Figure 16. The relationship between phosphorus concentrations and Chlorophyll A measurements in 3 lakes in the St. Regis Lakes chain (Lower St. Regis, Spitfire Lake, and Upper St. Regis). Data are for the years 2002 to 2009. Water samples were collected at different times during the summer and at different depths.

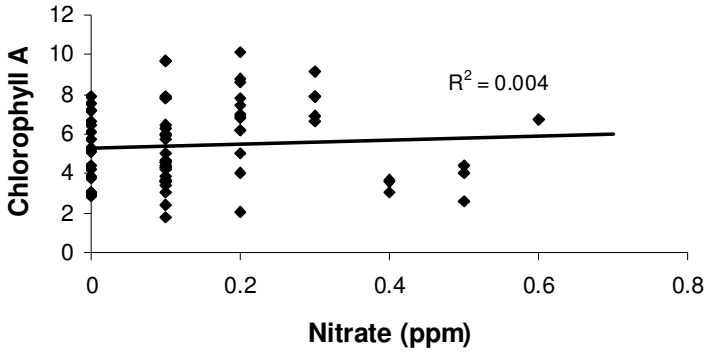

Figure 17. The relationship between nitrate concentrations and Chlorophyll A measurements in 3 lakes in the St. Regis Lakes chain (Lower St. Regis, Spitfire Lake, and Upper St. Regis). Data are for the years 2002 to 2009. Water samples were collected at different times during the summer and at different depths.

Discussion and Conclusion:

The lake with the highest levels of the parameters we reported on in this study was often Lower St. Regis. The chemistry of Upper St. Regis and Spitfire lakes was more similar. Phosphorus, Chlorophyll concentrations and pH have not changed significantly in Upper St. Regis lake over the period we report on in this study. Cholorophyll A concentrations are strongly related to total P in water samples and also likely affected by water temperature. They are not influenced by nitrate levels in water.

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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