Boquet Watershed Wetland Monitoring

Boquet River - Essex County, NY

Final Report for the Lake Champlain Basin Program

December, 2012

NEIWPCC Job Code 0100-306-010

Project Code LS-2011-032

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Executive Summary:

Background

A wetland monitoring program with an emphasis on invasive species in the Boquet River watershed was begun in 2005, funded by an Environmental Protection Agency (EPA) Wetland Program Development grant. Initially, a hydrologic and vegetation survey of forty wetlands was conducted. Of these, twenty wetlands were selected for long-term monitoring and a hydrologic and vegetation survey was conducted again in 2006. In 2010, BRASS funded a vegetation survey of ten of the twenty wetlands. This 2011 LCBP-funded project consisted of a vegetation survey, with an emphasis on invasive species, of the remaining ten wetlands. Wetland data collection for this project occurred during the growing season between June 15th and August 15th, 2011.

Sampling Locations

Permission was not received from the owner of the 'Hurricane Road East and West' wetland(s) in Elizabethtown. For that reason, two NYS wetlands in Keene surveyed in the 2005 study ('Branch Outwash East' and 'Branch Outwash West') were monitored as an alternative. Therefore, eleven wetlands were surveyed in 2011. All wetlands are located in Essex County, NY within the Boquet River watershed communities of Essex, Elizabethtown, Keene, Lewis, Westport and Willsboro.

Objectives

By surveying vegetation in eleven wetlands in 2011 and combining the data with results of the BRASS-funded 2010 survey of the other ten wetlands, this project promotes the establishment of a long-term watershed wetland monitoring program begun in 2005. The data from 2005/2006 and 2010/2011 were integrated with current data management protocols and sampling sites within the twenty sampling locations were standardized by Global Positioning System (GPS) and, on private land, also identified by a stake. The purpose was to enable long term trend analysis in the future. The data collected was also analyzed for possible emerging trends, such as changes in prevalence or relative dominance of an invasive species in each sampling site.

Results

The primary objective of this project was to enable a long term monitoring effort of wetlands in the Boquet watershed towns. Normalizing the data and standardizing the sampling sites between the initial sampling years of 2005 and 2006 with the 2010 and 2011 accomplished the primary objective. Additionally, while not scientifically significant with only two time points five years apart, initial sampling results indicate some invasive species changes in the wetlands. For example, purple loosestrife (*Lythrum salicaria*) appeared to decrease at three wetlands located not far from the release sites of the Galerucella beetles in 2002 and 2004. Other changes were also noted although less intriguing at this early point in a long term monitoring project (See, especially, Tables 4 and 5 on pages 9 and 10).

Table of Contents:

*****All Monitoring Data and Tables 1-5 are on the enclosed CD and include:

1. 2011 Wetland Monitoring Data
    a. Includes archived data, as well as 'current' reconciled data
    b. Within the 'current' data files, there is the following information:
        i. Wetland image
        ii. Data summary
        iii. Invasive trends
        iv. Sampling points
        v. Species list composite
2. 2011.12.01 appendices
    a. Table 1 = *Presence of Invasive Species in All Forty Wetlands*
    b. Table 2 = *Percentage of Sites with Invasive Species*
    c. Table 3 = *Changes in Invasive Species Presence and Relative Dominance*
    d. Table 4 = *Changes in Invasive Species by Wetland*
    e. Table 5 = *Changes in the Most Common Invasive Species by Wetland*

Project Introduction:

This 2011 project conducted a vegetative survey on eleven of forty previously identified and surveyed wetlands in the Boquet River watershed on both public and private lands with an emphasis on monitoring wetland invasives. In addition, previous data collected from 2005, 2006 and 2010 was integrated with current data management protocols. The goals of this project were to establish a foundation for a long-term monitoring effort and to support wetland invasive species management recommendations in the Boquet River Watershed Management Plan (in progress, funded by the NYS Department of State).

A wetland monitoring program with an emphasis on invasive species in the Boquet River watershed was initiated in 2005 under the direction of Dr. Mei Yin Wu (SUNY-Plattsburgh) in cooperation with BRASS and funded by an Environmental Protection Agency (EPA) Wetland Program Development grant. Initially, a hydrologic and vegetation survey of 40 wetlands was conducted in 2005. Of these, twenty wetlands were selected for long-term monitoring and a hydrologic and vegetation survey was conducted again in 2006. In 2010, BRASS funded a vegetation survey of ten of the twenty wetlands. With LCBP funding, a vegetation survey of nine of the remaining wetlands and two alternates was conducted in 2011. Vegetation was assessed during a single visit to the site. The visit was carried out at each wetland site during the growing season, between June 15th and August 15th, 2011.

Wetlands owned by NYS in the Adirondacks are protected by the NYS Constitution as Forever Wild. Wetlands on private property in the Adirondacks are also protected from development by Adirondack Park Agency (APA) regulations but are frequently near developed areas, roads, farms and timber operations. Because many of the wetlands monitored in the Boquet watershed are on private property, the data collected may be correlated with nearby land uses. By monitoring wetlands, both public and private, the broader community benefits because data gathered on these protected wetlands informs natural and resource scientists, managers, and private property owners of natural conditions and changes over time due to environmental influences such as climate change and invasive species. The data will also help guide management decisions, as in a watershed management plan, to protect the ecological values of wetlands such as fish habitat, water quality, flood mitigation and biodiversity.

Tasks Completed:

All tasks identified in the approved project workplan as well as a few necessary additional tasks were completed. These were:

1. Developed the project workplan
2. Developed the Quality Assurance Project Plan (QAPP) - approved in June 2011
3. Submitted all required status reports
4. Entered into a contract with Dr. Dennis Kalma, field/data director (project consultant)
5. Entered into a contract with Tim and Mary Burke, fieldwork assistants/scribes
6. Secured written permission from private landowners
    a. Did not receive permission from one landowner, therefore substituted two NYS wetlands for the privately-owned wetland
7. Secured a NYS Department of Environmental Conservation Temporary Revocable Permit to allow monitoring on NYS-owned wetlands (permit #6566, TRP file #1717)
8. Integrated/reconciled data from 2005, 2006 and 2010
9. Monitored vegetation in eleven wetlands – started in mid-June 2011 (see Appendix 1 for a list and description of the eleven wetlands)
10. Analyzed 2005-2011 vegetation data
11. Provided a summary of project findings to Dr. Meiyin Wu and Dr. Gary Chilson for their review and comments
12. Submitted paperwork regarding a change in the quality control officer
13. Submitted paperwork for a grant extension
14. Received the quality assurance project review information
15. Mailed a thank you letter to every landowner, along with a list of species found in their wetland (in progress)
    a. If an invasive species was found in their wetland, species-specific information, including management recommendations (prepared by the Adirondack Park Invasive Plant Program) was also included
16. Created a poster presentation (in progress)
17. Prepared a final project report

Methods:

Survey methods are based on the U.S. Army Corps of Engineers "Wetlands Delineation Manual" and the EPA's "Using Vegetation to Assess Environmental Conditions in Wetlands." The Field/Data Director of the 2005, 2006, and 2010 wetland surveys utilized plant identification and nomenclature references in the original QAPP (approved by EPA in 2005). For each vegetation community at each sample site the parameters included cover type (Cowardin System), species richness, density, abundance, diversity, relative dominance and importance, percent native species and percent invasive species (defined by the NYS Invasive Plant Council).

Quality Assurance Tasks Completed:

There was a change in the quality control officer for this project in February 2012 due to a staff transition at the Ausable River Association. BRASS staff met with the new officer in April to review protocol and the quality control report was submitted in July 2012. The quality control officer randomly chose two wetlands, which was more than 15% of the field data sheets. The officer misinterpreted the directions for the FAC neutral test, which can be seen in Appendix 4. A response was written to make clear that none of the errors noted in the report resulted in a change of wetland status for the sample location (See Appendix 5). This project was in compliance with the approved Quality Assurance Project Plan (QAPP).

Results / Conclusions:

In 2005 the Boquet River Association (BRASS) began to monitor long-term changes in wetlands in the watershed of the Boquet River. Forty wetlands were selected initially. These wetlands were selected to represent a cross section of the types of wetlands in the watershed but are not statistically representative of all wetlands in the watershed. Species lists were compiled for the wetlands (See Appendix 6 for a sample; and see enclosed CD for all species lists) and in each wetland, sampling locations were selected where quantitative data were gathered on the relative species dominance in each of the four vegetative layers (herbaceous, shrub, vine and trees) using the U.S. Army Corps of Engineers protocols. Data were gathered on the wetlands in 2005 and on twenty wetlands selected for long-term monitoring in 2006. Twenty-two of the wetlands were revisited in either 2010 or 2011.

One of the goals of the monitoring was to assess the presence and abundance of invasive species in the wetlands. In this report, invasive species are those that the Adirondack Park Invasive Plant Program (APIPP) classifies as invasive. As defined, eleven invasive species and two additional species which have many invasive traits, were found in the forty wetlands monitored in the Boquet watershed and are listed, along with their Natural Resources Conservation Service (NRCS) code, below:

Alliaria petiolata ALPE4	garlic mustard
Centauria biebersteinii CEBI2	spotted knapweed
Iris pseudacorus IRPS	yellow flag aka yellow iris
Lonicera morrowii LOMO2	morrow's honeysuckle
Lonicera tatarica LOTA	tartarian honeysuckle
Lythrum salicaria LYSA2	purple loosestrife
Pastinaca sativa PASA2	wild parsnip
Polygonum cuspidatum POCU6	japanese knotweed
Phragmites australis PHAU7	common reed
Rhamnus catharctica RHCA3	common buckthorn
Salix fragilis SAFR	crack willow

In addition, data was collected for two exotic species that, although not on the official list, seem to be acting in an invasive fashion in these wetlands. They are:

Lysimachia nummularia LYNU	creeping jenny
Typha angustifolia TYAN	narrowleaf cattail

PRESENCE OR ABSENCE OF INVASIVE SPECIES IN THE WETLANDS:

Table 1, which is too large to be printed (see enclosed CD), indicates the presence of each of these invasive species in each of the forty wetlands. Note that Hurricane Road is shown as one wetland; however there are two separate wetlands within this location (Hurricane Road 'East' and Hurricane Road 'West'). The wetlands are arranged so that those with the greatest number of invasive species are toward the top and so that the invasive species present in the greatest number of wetlands are toward the left. Although several of the wetlands have no invasive species, or a single invasive species, others have several – up to a maximum of seven at one wetland.

Table 1 also shows that some invasive species are much more prevalent than others. *Lythrum salicaria* (LYSA2), *Rhamnus catharctica* (RHCA3), *Lysimachia nummularia* (LYNU),

and – if one lumps *Lonicera tatarica* (LOTA) and *Lonicera morrowii* (LOMO2) – the two *Lonicera spp* are the most commonly found species.

The above data are taken from the species lists and indicate only the presence or absence of the species in the wetland.

PREVALENCE OF INVASIVE SPECIES IN THE WETLANDS:

It is also important to know in which wetlands the invasive species are most prevalent. Table 2, which is too large to print (see enclosed CD), separates out the wetlands that have at least one invasive species and indicates the percentage of sampling sites within the wetland that contain one or more of the invasive species. The wetlands are arranged so that those with the greatest percentage of sites containing invasive species are at the top. Notice that there are four wetlands at the bottom of the table that have no sampling sites that contain invasive species although an invasive species was recorded as being present at some other location in the wetland.

In general, the sequence of wetlands arranged by number of invasive species found in the wetland is similar to the sequence of wetlands arranged by the percentage of sampling sites that contain invasive species. This is only a tendency, to which there are numerous exceptions.

Table 2 also indicates, for each invasive species in each of the wetlands, the percentage of sampling sites that contain that invasive species. In this table the sequence of invasive species is the same as in Table 1 – i.e. arranged so that the invasive species present in the greatest numbers of wetlands are to the left. In general, the species that are present in the greatest numbers of wetlands are also present in the greatest percentages of sampling sites within those wetlands: *Lythrum salicaria* (LYSA2), *Rhamnus catharctica* (RHCA3), and *Lysimachia nummularia* (LYNU) are the most commonly found invasive species within the wetlands monitored.

CHANGES IN PREVALENCE AND RELATIVE DOMINANCE:

At twenty-two of the wetlands, data were collected in either 2005 or in both 2005 and 2006, then again in either 2010 or 2011. It is possible to look for changes in the status of the invasive species over time at seventeen of the twenty-two wetlands where invasive species were found in the sampling sites. Only two points in time (after lumping the data from 2005 and 2006), approximately 5 years apart, are available for comparison. This is insufficient for a

statistical trend analysis and only relatively large changes in the percentage of sites affected or in the average relative dominance in the sites may be discernible. The results of this analysis are given in Table 3, also too large to print (see enclosed CD). On the basis of changes in the percentage of sampling sites in which the species is found and changes in the relative dominance of that species in the sites, the invasive species in each wetland were categorized in one of five ways: decreasing, possibly decreasing, no apparent change, possibly increasing, or increasing.

It is noticeable in Table 3 that there does not appear to be any pattern of changes within most of the wetlands – some invasive species increase, others decrease within the same wetland. Due to the difficulty in assuring that sampling locations are exactly identical over the approximately five year interval, sampling error makes drawing broad conclusions on an individual wetland's sampling sites difficult.

A clearer pattern, however, can be seen when the data for all of the wetlands are combined (Table 4).The table shows that in the seventeen wetlands most of the invasive species show little or no change, but of the remainder more have increased than decreased.

Table 4: Changes in Invasive Species by Wetland

Wetland:	decreased	possibly decreased	unchanged	possibly increased	increased
Crater Club Marsh			1	1	
Crater Club Pond			1	2	
Essex Bottoms			1		1
Hanna Slang		2	1	1	
Jamie Phillips		1			2
Kapper 2	1		3	1	
Libby Treadwell					1
Manning Pond					1
New Russia North				1	
New Russia South			1		
Paine Slang			2		1
Sherman Stream			4	1	
Sherman Upper Oxbow	1			1	1
Sycamore Floodplain			3		1
Thrall Dam			1		
Wagg's Pond	1				
Webb-Royce			1		1
SUMS	**3**	**3**	**19**	**8**	**9**

The invasive species are analyzed on a species by species basis in Table 5. The data were tabulated for the more common invasive species: *Lonicera tatarica* (LOTA) /*Lonicera morrowii* (LOMO2) – combined as (LOMO2/LOTA), *Lysimachia nummularia* (LYNU), *Lythrum salicaria* (LYSA2), and *Rhamnus catharctica* (RHCA3). The other invasive species are present in so few wetlands that it is not possible to detect a pattern. Three of the four species (LOMO2/LOTA, LYNU, and RHCA3) increased in more wetlands than those in which they decreased. The reasons for the changes are unknown. The fourth, *Lythrum salicaria* (LYSA2), has more decreases than increases. It should be noted that Galerucella beetles were released at two sites in 2002 (Elizabethtown and Wadhams) and at two sites in 2004 (Willsboro and Wadhams) to control purple loosestrife. All three of the wetlands where decreases took place are within one-half mile of areas where beetle releases had occurred; both of the areas where increases or possible increases took place were at least 5 miles from beetle release sites. This may be an indication that beetle releases are having an effect on *Lythrum salicaria* populations well beyond the boundaries of the original release sites.

Table 5: Changes in Invasive Species by Wetland

	decreased	possibly	unchanged	possibly	increased
Invasive Species:		decreased		increased	
Lonicera morrowii and L. tatarica (LOMO2/LOTA)		1	1	1	3
Lysimachia nummularia (LYNU)		1	3	2	2
Lythrum salicaria (LYSA2)	3		4	1	1
Rhamnus catharctica (RHCA3)		1	5	2	1

CONCLUSIONS:

The data indicate some trends in the presence and abundance of the invasive species in the wetlands surveyed. The analysis can be useful for planning remedial actions, but targeting a specific wetland or invasive species would depend on a number of factors such as the availability of control methodologies for the various species, the amount of field labor available, and the skill set of the field labor.

BRASS' primary goal with this project was to establish a long-term wetland monitoring project in the watershed. By normalizing the data from 2005, 2006 and 2010, with the 2011 data protocols used in this LCBP-funded project, we have accomplished this objective. Funding will be pursued to monitor wetland vegetation again in 2014-2016. The data collected since 2005 is now organized in a manner to allow any other qualified wetland botanist to continue the monitoring project.

NEXT STEPS:

- pursue funding to monitor wetland vegetation in 2014-2016
- continue efforts to educate highway departments, residents and visitors about the negative impacts of invasive species, as well as practices for removing them or reducing their spread
- work with volunteers to perform a roadside invasive species survey in 2013
- incorporate invasive species information and data into the Boquet River watershed management plan to help prioritize and manage invasive species. This might include releasing additional Galerucella beetles.

Appendix 1

Vegetation Sampling Locations (coordinate system: NAD83)

- Crater Club Marsh and Pond – Essex Township – The site is in a shallow depression in the underlying limestone. The center of the marsh has cattails in the deeper areas, but is predominantly sedges. These give way to shrubs in the peripheral areas. e631245 n4904420

- *Did not receive written approval from the Hurricane Road wetland landowner, so substituted with two Branch Outwash sites below.*
  Hurricane Road 'East' and 'West' – Elizabethtown Township – This combined site on both sides of the road is formed on a section of a gravel-choked stream that ultimately drains into The Branch. It has semi-open woodland; a moderately well developed shrub layer; and a well-developed herbaceous layer dominated by sedges. e606300 n4898500

- Branch Outwash East – Keene Township - This site is a low lying gravel outwash in a mountainous area. The sand/gravel soil is moist. The site is covered with an open woodland with well developed shrub layers and a sedge dominated herbaceous layer. e603493 n4896089

- Branch Outwash West – Keene Township - The site is a slightly elevated terrace of gravel outwash in a mountainous area. The sand/gravel soil is moist only in the spring. The site is covered with a closed woodland and has minimal shrub and herbaceous layers. e603194 n4896083

- MacMahon Road – Westport Township – A small flat-bottomed valley in a small stream draining directly to Lake Champlain. The periphery of the area has a closed canopy woodland and minimal shrub and herbaceous layers. In the center of the area, the canopy is much more open and the vegetation dominated by the sedges and grasses of the herbaceous layer. e621347 n4891438

- New Russia Sedge Meadow North – Elizabethtown Township – This is a section of stream, including one beaver pond, between the highway and the Main Stem of the Boquet. It has an extensive sedge-dominated floodplain with the more elevated areas dominated by meadowsweet shrubs. e606781 n4885842

- Sherman Stream – Westport Township – This site is the mouth of a low-lying side stream to the Main Stem; portions of the site are also waters backed up behind beaver dams. There is some open water, but much of the site consists of sedges and shrubs peripheral to the open waters. e624027 n4897572

- Sherman Upper Oxbow – Westport Township – This site is a shallow oxbow cut off from the Main Stem. There is open water in the center that often persists

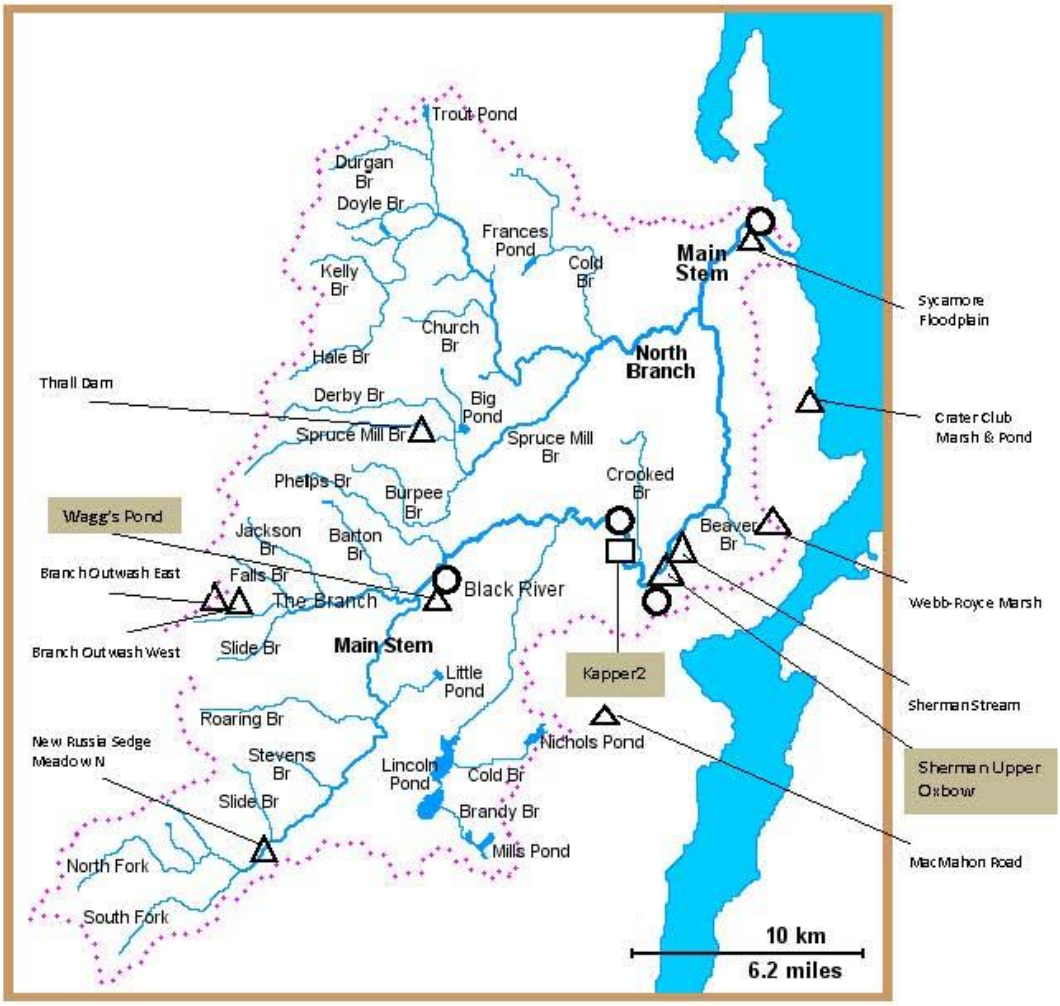
through the summer. Rushes dominate the periphery of the oxbow. e623576 n4897310

- Sycamore Floodplain – Willsboro Township – This site is a mix of abandoned river channels and associated levees along the lower Boquet. Although one of the channels retains water throughout the summer, most of the area is vegetated by a closed-canopy forest of large old-growth trees. The shrub layer is poorly developed and ferns dominate the herbaceous layer. e629073 n4913871

- Thrall Dam – Lewis Township – A topographically complex site formed by beaver dams along a feeder stream of the North Branch. Part of the site is open water with an organic bottom, but the majority of it is dominated by different associations of sedges and alders. e615225 n4902283

- Wags Pond – Elizabethtown Township – The pond is mostly open water, the vegetation dominated by floating leaved and submerged plants. Around the periphery are areas of sedge and alders. e614256 n4896466

- Webb-Royce Marsh – Essex Township – This site is in a large flat-bottomed valley. Most of the marsh is dominated by cattails but there are areas dominated by sedges on the periphery of the marsh. e629500 n4900656



In 2011, eleven wetlands were monitored. They are shown above as △

There are four sites in the watershed where Galerucella beetles were released in 2002 and 2004. They are shown above as ○

The three wetlands that are showing a reduction in purple loosestrife in some of the monitoring sites are highlighted above. They are Sherman Upper Oxbox, Wagg's Pond and Kapper2. Kapper2 was monitored in 2010 and is shown above as □

Appendix 2
WORKPLAN (1/3/11)

Contact Information

Name of Contact Person:	**Julie A. Martin, *Executive Director***
Authorized Signatory and Title:	**Schelling McKinley, *Board Treasurer***
Organization:	**Boquet River Association (BRASS)**
Mailing Address:	**P.O. Box 782, Willsboro, NY 12996**
Phone and FAX numbers: ph. /fax.	**518-963-4710**
Electronic Mail Address:	**info@boquetriver.org**

Project Location (coordinate system: NAD83)

- Crater Club Marsh and Pond – Essex Township – The site is in a shallow depression in the underlying limestone. The center of the marsh has cattails in the deeper areas, but is predominantly sedges. These give way to shrubs in the peripheral areas. e631245 n4904420

- Hurricane Road – Elizabethtown Township – This combined site on both sides of the road is formed on a section of a gravel-choked stream that ultimately drains into The Branch. It has semi-open woodland; a moderately well developed shrub layer; and a well-developed herbaceous layer dominated by sedges. e606300 n4898500

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- Webb-Royce Marsh – Essex Township – This site is in a large flat-bottomed valley. Most of the marsh is dominated by cattails but there are areas dominated by sedges on the periphery of the marsh. e629500 n4900656

Project Summary

This project will continue a Boquet River watershed monitoring program of 20 wetlands with an emphasis on invasive species for watershed management purposes. By surveying vegetation in 10 wetlands in 2011 and combining the data with results of a BRASS-funded 2010 survey of the other 10 wetlands, this project will help promote the establishment of a long-term watershed wetland monitoring program begun in 2005. The data, which includes information on aquatic invasives such as *Lythrum salicaria* (purple loosestrife), will be analyzed for possible trends that will facilitate watershed wetland invasive species management planning and recommendations in the Boquet River Watershed Management Planning process currently in progress.

Introduction

This project will conduct a vegetative survey on 10 of 40 previously identified and surveyed wetlands in the Boquet watershed on both public and private lands with an emphasis on monitoring wetland invasives. In addition, previous data collected will be integrated with current data management protocols. Accomplishing this project will establish a foundation for a long-term monitoring effort and the inclusion of wetland invasive species management recommendations in the Boquet River Watershed Management Plan (in progress, funded by the NYS Department of State).

BRASS does not have the resources to monitor and manage invasive species throughout the 280 square miles of the Boquet River watershed. Therefore, focusing our invasive species management efforts on our wetlands is a more feasible approach at this time. This project dovetails, in a timely way, with BRASS' other on-going projects. For example, BRASS is currently facilitating the process to update the 1984 Boquet River Watershed Management Plan and has completed a culvert assessment project throughout the watershed that aims to reconnect the river to allow fish passage and improve the trout and salmon fishery.

A wetland monitoring program with an emphasis on invasive species in the Boquet River watershed was initiated in 2005 under the direction of Dr. Mei Yin Wu (SUNY-Plattsburgh) in cooperation with BRASS and funded by an Environmental Protection Agency (EPA) Wetland Program Development grant. Initially, a hydrologic and vegetation survey of 40 wetlands was conducted in 2005. Of these, 20 wetlands were selected for long-term monitoring and a hydrologic and vegetation survey was conducted again in 2006. Funding constraints allowed a vegetation survey on only one of the wetlands in 2007 and 2008. In 2010, BRASS funded a vegetation survey of 10 of the 20 wetlands. This project is a vegetation survey of the remaining 10 wetlands.

A measurable outcome of this project is a vegetation survey of 10 wetlands in 2011. The data from the 20 wetlands monitored in 2005 and again in 2006 will be integrated with current data management protocols enabling a long-term monitoring effort. The final report of the 20 selected and monitored wetlands (10 monitored in 2010 and 10 in 2011) will include possible trends observed since 2005/2006. A poster presentation of the results will be presented at local libraries, the 2012 Adirondack Research Consortium and Lake Champlain Research Consortium's conferences.

This proposed project does not address the lake-oriented priorities as described in *Opportunities for Action* (*OfA*), 2003 "Managing Nonnative Aquatic Nuisance Plants and Animals." Nevertheless, wetlands host many aquatic species, including rare, endangered, and threatened species that may be lost due to the spread of aquatic invasive species such as *Lythrum salicaria* (purple loosestrife) already identified as present in the Boquet watershed. Moreover, in 2003, the Galerucella beetle was first released as a natural control species of purple loosestrife in the watershed. Thus, this effort to establish a long-term wetland monitoring program and the presentation of interim results addresses several *OfA* objectives: Managing Fish and Wildlife High Priority Actions 3a, 3b, 3c, and Priority Actions 6a, 6g; Protecting and Restoring Wetlands, Streams, and Riparian Habitats High Priority Actions 6a, and 6b; Managing Nonnative Aquatic Nuisance Plants and Animals Priority Action 10; Informing and Involving the Public Actions 1a, 1b, and 1c; and, Measuring and Monitoring Success Action 2b, and 3c.

Project Outline

Task #	Objective	Task	Deliverable	Timeline
1	Establish QAPP and contracts	Meet with LCBP staff, and Field/Data Director	QAPP approved	March 2011
2	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	March 31 2011
3	Secure permission from landowners and integrate data	Contact landowners and integrate data collected from 2005, 2006, and 2010	Permission letters and integrated data sets	Feb.-June 2011
4	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	June 30 2011
5	Vegetation survey of	Visit and survey all sample sites	2011 data	June-Sept

	10 wetlands	within the 10 identified wetlands	collected	2011
6	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	Sept. 30, 2011
7	Quality assurance review	Conduct QAPP review	Approved data sets	Oct 2011
8	Data and trend analysis	Conduct data analysis	2005 – 2011 data and trends obs.	Oct-Dec 2011
9	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	Dec. 31, 2011
10	Complete Final Report and Poster	Compile project summary, graphics, data tables, conclusions and submit poster proposal to consortiums	Final report and Poster	Oct-Mar 2012
11	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	Mar 31, 2012
12	Conduct Poster Presentations	Deliver poster to watershed libraries and research consortium's conferences	Poster Presentations	Mar-June 30, 2012

Task Descriptions

Task #1: Technical issues involved with sample design, data management, analysis of samples, statistical analysis, trend analysis and quality assurance will be developed cooperatively with LCBP technical support staff and the Field/Data Director, Dr. Dennis Kalma. Field Scribes and a quality assurance reviewer will be contracted to assist the Field/Data Director.

Task #2, #4, #6, #9 and #11: Quarterly reports will be developed, written and submitted by the Project Coordinator, Julie Martin, Executive Director of BRASS.

Task #3: Project Coordinator will contact landowners to secure permission to sample wetlands. Field/Data Director will integrate previous data collected with approved QAPP design.

Task #5 and #7: Field/Data Director and Scribes will survey Wetland sample sites. The quality assurance review process will be conducted and paid for by BRASS.

Task #8: Data sets analyzed for trends and associations useful for management purposes based on QAPP procedures approved.

Task #10: Field/Data Director, in consultation with Project Coordinator, will develop and write the Final Report, design the poster, and submit a poster presentation proposal to the Adirondack Research Consortium and the Lake Champlain Research Consortium's conference committees.

Task #12: Project Coordinator and Field/Data Director shall create and mount the poster. Project Coordinator will deliver the poster to watershed libraries on a sequential basis. Field/Data Director and/or Project Coordinator will deliver the poster and attend research consortium conferences. Travel and conference costs will be borne by BRASS.

Appendix 3

QA Project Plan:

Boquet Watershed Wetland Monitoring Program

Prepared by:
Julie A. Martin
Boquet River Association (BRASS)

Prepared for:
Lake Champlain Basin Program
54 West Shore Road
Grand Isle, VT 05458

Julie A. Martin, Project and QA Manager, Boquet River Association	Date
Dr. Dennis Kalma, Field/Data Director	Date
Corrie Miller, Quality Assurance Officer, Ausable River Association	Date
Nicole Grohoski, Project Officer, LCBP	Date
Michael Jennings, Quality Assurance Program Manager, NEIWPCC	Date

Table of Contents

A – Project Management
A3 – Distribution List

NEIWPCC: Michael Jennings, Quality Assurance Program Manager, mjennings@neiwpcc.org
Beth Card, Director of Water Quality Programs, bcard@neiwpcc.org
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LCBP: Nicole Grohoski, Project Officer, ngrohoski@lcbp.org
Kathy Jarvis, LCBP Office Manager, kjarvis@lcbp.org
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Phone: (802) 372-3213

BRASS: Julie A. Martin, Project Manager, info@boquetriver.org
Address: Boquet River Association, PO Box 782, Willsboro, NY 12996
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SUBCONTRACTORS:
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Dr. Carol Treadwell, Quality Assurance Officer, info@ausableriver.org
Address: Ausable River Association, PO Box 217, Elizabethtown, NY 12932
Phone: (518) 873-3752

A4 – Project/Task Organization

NEIWPCC:
Michael Jennings, Quality Assurance Program Manager: Review and approve QAPP and subsequent revisions in terms of quality assurance aspects.

LCBP:
Nicole Grohoski, LCBP Project Officer: Overall coordination of the project and point of communication for BRASS Project Manager and NEIWPCC.

BRASS:
Julie A. Martin, Project and QA Manager: Overall coordination and oversight of project and quality assurance activities, including obtaining permission from wetland landowners, communicating with Dr. Dennis Kalma and reporting to LCBP. Maintains the approved QAPP and is responsible for distributing new version of the QAPP. Communicates with QA Officer to ensure that QA goals are met.

SUBCONTRACTORS:
Dr. Dennis Kalma, Field/Data Director: Coordination and oversight of subcontractors. Responsible for field data collection, analysis, and presentation materials.

Tim and Mary Burke, Field Assistants/Scribes: Accompany Dr. Kalma in the field and log vegetation, including invasive species information, onto data collection sheets.

Dr. Carol Treadwell, Executive Director of the Ausable River Association, is designated Quality Assurance Officer. Dr. Treadwell is responsible for all quality systems and their implementation.

Staff members from the Boquet River Association and contractors will report to their project manager or field/data director for technical and administrative direction. Each staff member and contractor has responsibility for performance of assigned quality control duties in the course of accomplishing identified sub-tasks. The quality control duties include:

- Completing the assigned task on or before schedule and in a quality manner in accordance with established procedures;
- Ascertaining that the work performed is technically correct and meets all aspects of the QAPP.

A5 – Problem Definition/Background
This project will continue a Boquet River watershed monitoring program of 20 wetlands with an emphasis on invasive species for watershed management purposes. By surveying vegetation in 10 wetlands in 2011 and combining the data with results of a BRASS-funded 2010 survey of the other 10 wetlands, this project will help promote the establishment of a long-term watershed wetland monitoring program begun in 2005. The data, which includes information on aquatic invasives such as *Lythrum salicaria* (purple loosestrife), will be analyzed for possible trends that will facilitate watershed wetland invasive species management planning and recommendations in the Boquet River Watershed Management Planning process currently in progress. The measurable outcomes of this project are the monitoring of vegetation in 10 wetlands in 2011; a final report summarizing data and possible trends gathered on 20 wetlands monitored since 2005; and, a poster presentation at local libraries and the 2012 Adirondack and Lake Champlain Research Consortium's annual conferences.

A6 – Project/Task Description
We propose to undertake the following tasks:

Timeline

Task #	Objective	Task	Deliverable	Timeline
1	Establish QAPP and contracts	Meet with LCBP staff, and Field/Data Director	QAPP approved	March - June 2011
2	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	April, 2011
3	Secure permission	Contact landowners and integrate	Permission	Feb.-June

	from landowners and integrate data	data collected from 2005, 2006, and 2010	letters and integrated data sets	2011
4	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	July, 2011
5	Vegetation survey of 10 wetlands	Visit and survey all sample sites within the 10 identified wetlands	2011 data collected	June-Sept 2011
6	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	Oct., 2011
7	Quality assurance review	Conduct QAPP review	Approved data sets	Oct. 2011
8	Data and trend analysis	Conduct data analysis	2005 – 2011 data and trends obs.	Oct.-Dec. 2011
9	Submit Quarterly Report	Develop, write and submit Quarterly Report	Quarterly Report	Jan., 2012
10	Complete Final Report and Poster	Compile project summary, graphics, data tables, conclusions and submit poster proposal to consortiums	Final Report and Poster	Feb.-June 2012
11	Conduct Poster Presentations	Deliver poster to watershed libraries and research consortium's conferences	Poster Presentations	May-June 2012
12	Project completion	LCBP approval of all deliverables and invoices complete	Contract Closed	June 30, 2012

Task Descriptions

Task #1: Technical issues involved with sample design, data management, analysis of samples, statistical analysis, trend analysis and quality assurance will be developed cooperatively with LCBP technical support staff and the Field/Data Director, Dr. Dennis Kalma. Field Scribes and quality assurance reviewer will be contracted to assist Field/Data Director.

Task #2, #4, #6, and #9: Quarterly reports will be developed, written and submitted by the Project Manager, Julie Martin, Executive Director of BRASS.

Task #3: Project Manager will contact landowners to secure permission to sample wetlands. Field/Data Director will integrate previous data collected with approved QAPP design as described in Appendix 3.

Task #5 and #7: Field/Data Director and Scribes will survey wetland sample sites. The quality assurance review process will be conducted and paid for by BRASS.

Task #8: Data sets analyzed for trends and associations useful for management purposes based on QAPP procedures approved.

Task #10: Field/Data Director, in consultation with Project Manager, will develop and write the Final Report, design the poster, and submit a poster presentation proposal to the Adirondack Research Consortium and the Lake Champlain Research Consortium's conference committees.

Task #11: Project Manager and Field/Data Director shall create and mount the poster. Project Manager will deliver the poster to watershed libraries on a sequential basis. Field/Data Director and/or Project Manager will deliver the poster and attend research consortium conferences. Travel and conference costs will be borne by BRASS.

Task #12: Project Manager will work with LCBP Project Officer to ensure completion and approval of all required project deliverables and final invoicing by June 30, 2012.

A7 – Quality Objectives and Criteria for Measurement Data

Objectives:

The project data-quality objective is to collect, maintain, analyze, display, and document valid data from already established wetland sampling sites. The monitoring information that will be collected to support the vegetative assessment of wetland sites will meet the quality assurance objectives outlined in this section. Data quality will be measured in terms of accuracy and precision, completeness, representativeness, comparability, and the required detection limits for the analytical methods.

Precision:

Precision is addressed by gathering the data from the same location more than once, as described in the Standard Operation Procedures (SOPs) "Vegetative Assessment of Wetland Sites," (Appendix 2). It is anticipated that the relative percent difference between measurements will be less than 20% (i.e. precision greater than 80%). A precision of less than 80% will be considered a warning limit (WL) and will require a reconsideration of field practices that may have caused this diminished precision. In this case, Field/Data Director will retrain all project personnel and increase the degree of supervision on monitoring efforts. If these steps do not result in raising the concurrence above the 80% level, field work will be suspended and guidance by the LCBP technical staff will be requested.

The Quality Assurance Officer will independently analyze the data using the same methods and acceptance criteria described in Appendix 3. If the above limits on precision and concurrence are not met field work will be suspended and guidance by the LCBP technical staff will be requested.

Bias:

Bias is addressed in part by comparing the results of sampling by project staff to that of sampling by the Field/Data Director. These results will be treated as quality control (QC) sampling of the same locations, as described in the "Vegetative Assessment of Wetland Sites," (Appendix 2). It is anticipated that the concurrence between sites will be greater than 80%. An accuracy of less than 80% will be considered a warning limit (WL) and will require a reconsideration of field practices that may cause this diminished accuracy. In this case, Field/Data Director will retrain all project personnel and increase the degree of supervision on monitoring efforts. If these steps do not result

in raising the concurrence above the 80% level, field work will be suspended and guidance by the LCBP technical staff will be requested.

The Quality Assurance Officer will independently analyze the data using the same methods and acceptance criteria described in Appendix 3. If the above limits on precision and concurrence are not met field work will be suspended and guidance by the LCBP technical staff will be requested.

Representativeness:

The wetlands selected for monitoring are not intended to be representative of the watershed as a whole. Their selection is "judgment based" using criteria such as size, wetland type, impacts by invasive species and/or agriculture activities, elevation, and geographical location in order to initiate monitoring in a wide variety of wetlands.

The placement of sampling sites within the previously selected wetlands for vegetation sampling followed the Standard Operation Procedures "Maps and Sampling" (Appendix 1). The selection is "judgment based". The sampling points are not intended to be representative of the wetland as a whole. The number of the sampling sites within a wetland and its location will be determined based on the size of the wetland, number of vegetation communities present and the unique situation of each vegetation stratum as outlined in the Standard Operation Procedures.

Comparability:

Comparability of field measurements is ensured by following the developed Standard Operation Procedures "Vegetative Assessment of Wetland Sites" (Appendix 2) based on the techniques and protocols developed by the US Army Corps of Engineers' "Wetlands Delineation Manual and the US EPA's "Using Vegetation to Assess Environmental Conditions in Wetlands.**"** Comparability of species identifications is ensured by adhering to the quality control measures in the SOPs "Vegetative Assessment of Wetland Sites" which includes comparison of collected samples to vouchered specimens whose identification has been confirmed by an independent expert and estimates of percentage accuracy of identification by the method described in SOPs.

Completeness:

It is anticipated that the vegetation of all selected wetlands will be surveyed unless landowner permission is withdrawn part way through the project period. It is not reasonable to assume that this will happen with such a frequency that the study objectives cannot be met. The level of completeness required will be set at 80%.

Sensitivity:

Since no chemical analyses of samples are included in the study, sensitivity (required detection limit) is not a quality assurance issue.

Assessments/Oversight:

Self assessments of adherence to the QAPP will be performed by the Field/Data Director on each of the selected wetlands. Independently, the Quality Assurance Officer will also assess adherence to the QAPP on 15% of the parcels.

Comparison of plant materials gathered in the field to vouchered specimens whose identification has been confirmed by an independent expert will independently assess the accuracy of species identification. Corrected identifications will be noted on the data sheets and reports where applicable. Plant material, like a strand of grass, a reed or a leaf, will only be gathered if the

Field/Data Director has difficulty identifying the type in the field. The plant material will then be compared to vouchered specimens whose identification has been confirmed by an independent expert.

Intended use of the data:

The data gathered during the field work of this project will provide ongoing data on wetland vegetation in selected wetlands in the Boquet River watershed.

Performance and acceptance criteria:

Precision is addressed by gathering the data from the same location more than once, as described in the Standard Operation Procedures (SOPs) "Vegetative Assessment of Wetland Sites," (Appendix 2). It is anticipated that the relative percent difference between measurements will be less than 20% (i.e. precision greater than 80%). A precision of less than 80% will be considered a warning limit (WL) and will require a reconsideration of field practices that may have caused this diminished precision. In this case, Field/Data Director will retrain all project personnel and increase the degree of supervision on monitoring efforts. If these steps do not result in raising the concurrence above the 80% level, field work will be suspended and guidance by the LCBP technical staff will be requested.

Bias is addressed in part by comparing the results of sampling by project staff and volunteers to that of sampling by the Field/Data Director. These results will be treated as quality control (QC) sampling of the same locations, as described in the "Vegetative Assessment of Wetland Sites," (Appendix 2). It is anticipated that the concurrence between sites will be greater than 80%. An accuracy of less than 80% will be considered a warning limit (WL) and will require a reconsideration of field practices that may cause this diminished accuracy. In this case, Field/Data Director will retrain all project personnel and increase the degree of supervision on monitoring efforts. If these steps do not result in raising the concurrence above the 80% level, field work will be suspended and guidance by the LCBP technical staff will be requested.

The Quality Assurance Officer will independently analyze the data using the same methods and acceptance criteria described in Appendix 3. If the above limits on precision and concurrence are not met field work will be suspended and guidance by the LCBP technical staff will be requested.

A8 – Special Training Requirements/Certifications

No special training or certification will be required for this project. The Field/Data Director has extensive experience in the identification and quantification of wetland vegetation and in the analysis of such data. He is the coauthor of the two volume "Wetland Plants of the Adirondacks" (Wu & Kalma, 2011. See page 13). Training of other project personnel will take place during the field work. All field work will be done under the direct supervision of the Field/Data Director.

A9 – Documentation and Records

All analysis of field data and preparation of reports on wetlands will follow the SOP "Analysis of Field Data & Preparation of Reports on Individual Wetlands" (Appendix 3).

Included in this SOP are provisions ensuring that field data sheets are inspected and signed by the Field/Data Director before leaving the site and that any significant errors or omissions will be corrected before leaving the site.

All original field data sheets will be retained by the Field/Data Director. Data will also be stored in computers. As described in the SOP "Analysis of Field Data & Preparation of Reports on Individual Wetlands" (Appendix 3), 15% of the field data sheets will be independently analyzed by a second person. Comparison of the two analyses will be used to assess the accuracy of the results. Copies of these data analysis sheets will be forwarded to the Field/Data Director.

Data from each season's field work will be entered in the STORET system.

100% of transcriptions (copying) of data (from paper to paper or from paper to electronic format) will be independently verified by a second person. All errors will be corrected. The frequency of errors will be used to assess the accuracy of transcription.

A copy of each field data sheet, data analysis sheet, and digital file will be deposited with the Project Manager and the Boquet River Association Project Manager for archival purposes where they will be retained for a minimum of five years.

B – Measurement/Data Acquisition

B1 – Sampling Process Design

1) No physical/chemical samples will be collected for the project.

2) The sample sites are listed in Appendix 4. These sites were selected using the US Army Corps of Engineering (CDE) guidelines (data) and were described in the attached SOP "Maps and Sampling" Appendix 1.

3) Data recorded in the field will utilize the data sheets in SOP "Vegetative Assessment of Wetland Sites" Appendix 2.

B2 – Sampling and Data Acquisition Methods

Data for the vegetative assessment of wetlands will be recorded during a single visit to the site as described in the SOP "Vegetative Assessment of Wetland Sites" Appendix 2.

B3 – Sample Handling and Custody

No samples will be collected.

B4 – Analytical Methods

No samples will be analyzed.

B5 – Quality Control Requirements

All data acquired or generated will be fully documented as to original source, quality, and history.

Sampling QC excursions are evaluated by the Field/Data Director and Project Manager. Field duplicate sample results are used to assess the entire sampling process, including environmental variability; therefore the arbitrary rejection of results based on predetermined limits is not practical. The professional judgment of the Project Manager and QA Officer will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Evaluation criteria noted in

this section and in Section A7 above will be used for data review. Notations of field duplicate excursions will be noted in the final report.

Corrective action will involve identification of the cause of the failure where possible. Response actions will typically include re-analysis of questionable samples, if possible. In some cases, a site may have to be re-sampled to achieve project goals.

B6 – Instrument/Equipment Testing, Inspection, and Maintenance

Field analytical equipment that may be used in this project includes instruments for measuring the location of sampling sites (see B7). Testing, inspection and maintenance will be conducted in accordance with manufacturer instructions. Maintenance logs will be submitted to and kept by the Project QA Officer. The log will document any maintenance and service of the equipment. A log entry will include the following information:

- Name of person maintaining the instrument/equipment
- Date and description of the maintenance procedure
- Date and description of any instrument/equipment problems
- Date and description of action to correct problems
- List of follow-up activities after maintenance
- Date the next maintenance will be needed

Laboratory instrumentation and equipment will follow manufacturer instructions and accepted procedures associated with the selected analytical methods and SOPs.

B7 – Instrument/Equipment Calibration and Frequency

Field analytical equipment that may be used in this project includes instruments for measuring the location of sampling sites.

Global Positioning Unit:

A commercially available Global Positioning Unit (GPS) (a Garmin GPSmap 76CSx with an external antenna to improve accuracy when used under vegetative cover) will be used to document the location and positions of sampling points within the wetlands. All locations will be recorded in UTM (NAD83) coordinates.

Atmospheric conditions may cause random variations in the coordinates given for a single location. The precision and accuracy of the GPS used will be assessed by comparing the reported position with a known position such as a Natural Resource Conservation Service survey marker or a U.S. Geological Survey bench mark. Daily position fixes will be taken over the course of a ten-day period, and the bias and precision of the GPS will be calculated.

B8 – Inspection Acceptance of Supplies and Consumables

All supplies and consumables for field and laboratory activities will be inspected for compliance with the acceptance criteria by qualified laboratory staff prior to use. Supplies or consumables not meeting the acceptance criteria upon inspection will not be used. Any equipment determined to be

in an unacceptable condition will be replaced. Supplies and consumables will be stored in accordance with identified storage requirements of each item.

B9 – Data Acquisition Requirements for Non-Direct Measurements
No secondary data will be acquired during the project.

B10- Data Management
All documents generated during the project will be deposited with the Field/Data Director, who will be responsible for forwarding copies of such documents to the Project Manager and to the Boquet River Association Project Manager.

The Project Manager will send quarterly progress and final reports to Nicole Grohoski, LCBP Project Officer. The quarterly progress reports will be submitted by April 15, 2011, July 15, 2011, October 15, 2011 and January 15, 2012. The final project report will be submitted to the LCBP Project Officer within 90 days after the end of the project period. The final project report will also be distributed to the appropriate agencies including the Adirondack Park Agency, The Nature Conservancy, and New York Natural Heritage Program.

Data generated through field activities will be included in a trend analysis comparing (between 2005/2006 and 2010/2011) the incidence and percent coverage of invasive species at the sampling sites in the 20 wetlands BRASS is monitoring. The trend analysis, along with the presence of rare, threatened, endangered or vulnerable species, will help determine priority wetlands for invasive management efforts. The BRASS Project Manager will be responsible for organization and oversight of data generation, disbursement, processing and storage so that the data will be documented, accessible and secure for the foreseeable time period of its use.

Instrumentation used to generate, process and store data will be configured, maintained and operated in accordance with manufacturer recommendations and accepted industry standards. Generated raw data will be stored in formats compatible with the method or instrument of generation. Processed data will be stored in Microsoft Word and Excel files. Electronic data will be stored in project directories on a BRASS computer network server that is compatible with this software and that is backed up regularly. Data reported in paper format will be stored in the project files at BRASS.

All electronic files will be backed up on a regular basis. At the conclusion of the project all relevant information, project files and electronic data will be turned over to the LCBP Project Officer for archiving. The files will be archived for a minimum of 5 years following completion of the project.

C – Assessment/Oversight

C1 – Assessments and Response Actions
The QA Manager will review all project output. The QA Manager (or designee) will have the authority to issue a stop work order upon finding a significant condition that would adversely affect the quality and usability of the data. The QA Manager will document, implement, and verify the effectiveness of corrective actions, such as an amendment to the QAPP, and take steps to ensure that everyone on the distribution list is notified.

NEIWPCC may implement, at its discretion, various audits or reviews of this project to assess conformance and compliance to the quality assurance project plan in accordance with the NEIWPCC Quality Management Plan.

C2 – Reports to Management
Quarterly reports will be submitted to the LCBP Project Officer, per the standard LCBP reporting process for review and approval.

Julie Martin, Project Manager will submit quarterly progress reports and a final project report to the LCBP Project Officer. This final report will include a complete discussion regarding the appropriate use and limitations of the data in terms of quality, as well as all datasets developed within the scope of this project. Additional reports or other information related to project status, concerns, completed deliverables, or any other project needs will be provided when requested.

D – Data Validation and Usability

D1 – Data Review, Validation, and Verification Requirements
The data quality will be reviewed for logical consistency and coding errors as identified in appropriate standards. The BRASS QA Officer will be responsible for overall validation and final approval of the data in accordance with project purpose and use of the data.

D2 – Validation and Verification Methods
The QA Officer will provide review and approval of the data before closure of the project. Datasets lacking appropriate metadata will not be used in any analysis or delivered to outside agencies. Documentation of provisional datasets will be reviewed to verify references to the use and limitations of the data.

The Project Manager will review QC reports as applicable to ensure they are acceptable. The QA Officer will also compare final datasets with original source information for consistency.

D3 – Reconciliation with User Requirements
Once the data results are compiled, the QA Officer and Project Manager will review the data quality to determine if it falls within acceptable limits per user requirements. Applicability of the data will be evaluated on a site by site basis when necessary. Limitations of the data will be discussed with the end user and documented within the project final report. Completeness will be evaluated to determine if the completeness goal for this project has been met. If the quality of the data does not meet the project's requirements, the data may be reevaluated to determine why the data quality did not meet the goals. Efforts will be made to determine inconsistencies in the base data or correct errors in the attribute data. If inconsistencies are found in the quality of the base data, an effort will be made to identify and obtain more accurate base data.

Literature Cited:
Wu, Meiyin & Kalma, Dennis. 2011. Wetland Plants of the Adirondacks: Ferns, Woody Plants and Graminoids. Trafford Publishing, 133p.

Wu, Meiyin & Kalma, Dennis. 2011. Wetland Plants of the Adirondacks: Herbaceous Plants and Aquatic Plants. Trafford Publishing, 169p

APPENDICES

Appendix 1

Standard Operation Procedures: Maps & Sampling

I. Wetland Maps and Sampling Locations:

1. Produce a general map of the wetland of a large enough scale to show the area surrounding the wetland and the adjacent roads and to allow indication of access to the site and where vehicles can be parked while the field work is being done. This map will normally be a selection from a 7.5' USGS topographic map. The USGS topographic map will be considered the "best" map and other maps and aerial photos will be registered to it. The UTM NAD 83 coordinate system should be used.
2. Produce a base map of the wetland by registering the boundaries of the wetland as described by the most current DEC wetland map on to a 7.5' USGS topographical map. The map should be sized so that the boundaries of the wetland cover an appreciable portion of an 8 ½" x 11" sheet of paper.
3. For use in the field produce a photo image of the wetland from the 2003 CIR aerial photos. The image should be sized so that the boundaries of the wetland cover an appreciable portion of an 8 ½" x 11" sheet of paper.
4. Other maps, such as the 2003 CIR aerial photos of the site will be reviewed to evaluate the validity of the DEC wetland maps. When possible these materials will be reviewed by specialists from the NYS APA.
5. Determine the area covered by the wetland. The wetlands will be divided into three size categories: small, medium, and large. Small wetlands are those with an area of 2 hectares (~5 acres or less); medium wetlands are those with an area between 2 and 6 hectares (~5 to 15 acres); large wetlands are those with areas greater than 6 hectares (~ 15 acres or more).
6. The layout of the grid for assessing vegetation is determined by the size of the wetland. The placement of all wetland grids is based on judgment. The goal is to assess vegetation at multiple locations, from all cover types and species associations, in what are thought to be representative locations.

II. Procedures to Survey Small Wetlands:

1. Using the aerial photos and local knowledge of the wetland, locate what appears to be the deepest or, vegetatively, the most central portion of the wetland. On the base map draw a north-south or an east-west line through this point to the edges of the wetland, choosing the orientation of the line to maximize its length. This is the transect line. The name of the transect line is the agreed upon abbreviation of the name of the wetland followed by the number "1". For example North Swamp might have a transect named "NS1"
2. On the same transect line position the vegetation sampling points so that at least two points lie within each vegetative cover type, with a total of at least 5 points.
3. Points on the line are labeled sequentially with lower case Roman letters, e.g. NS1-a, NS1-b, etc.

III. Procedures to Survey Medium and Large Wetlands:

1. Draw a north-south or an east-west baseline on the base map. The orientation of the line should be chosen to maximize its length. The line should be to one side of the wetland. The initial point of the baseline should be at a point perpendicular to one end of the wetland; the final point should be perpendicular to the other end. Determine the length of the baseline.
2. Draw transect lines, perpendicular to the baseline. The number will depend on the length of the baseline.

baseline length	**number of transect lines**
< 300 m	3
300 to 1500 m	5
1500 to 3000 m	7
> 3000 m m apart	≥ 8 (number adjusted so no transect lines are more than 500

3. The base line is divided into a number of segments equal to the transect lines; the transect lines are placed approximately at the center of these segments but may be adjusted if appropriate.
4. The name of the transect line is the agreed upon abbreviation of the name of the wetland followed by an Arabic numeral. The transect lines are numbered sequentially from one side of the wetland to the other. For example South Swamp might have transects named "SS1", "SS2", "SS3", etc.
5. On these transect lines position the vegetation assessment points. The number of points depends on the length of transect line within the wetland boundary. The points should be spread out within the wetland boundary so that they are approximately equally spaced and at least two assessment points should be located within each vegetative cover type.

transect length	**# of vegetation sampling points**
< 300 m	1-5, so points are approximately 60 m apart
300 – 3000 m	5, so points are approximately equidistant
> 3000 m	>5, so points are approximately 600m apart

6. The goal will be to have a total of approximately 15-20 assessment points in a medium size wetland and approximately 20-25 assessment points in a large wetland.
7. Points on the line are labeled sequentially with lower case Roman letters, e.g. NS1-a, NS1-b, etc.

IV. UTM Coordinates of Assessment Points:

1. While in the field determine the UTM coordinates for all assessment points using the GPS unit. This determination should be made each time the point is visited and an average determined at the end of the season.
2. Copies of the general map, the base map, and the 2003 CIR orthophoto should be printed for use in the field.

V. Document Control:

The data sheets will be delivered to the Field/Data Director who will sign off on each data sheet. The original copy of the field data sheets will be retained by the Field/Data Director for the duration of the project and deposited with the Project Manager at the end of the project. All data gathered in the field should be recorded on the data sheets in black or blue indelible ink. All calculations and analysis and any additional data added later should be recorded in green indelible ink. Any corrections to the original data should be recorded in red indelible ink.

Appendix 2

Standard Operation Procedures
Vegetative Assessment of Wetland Sites

Vegetation will be assessed during a single visit to the site. The visit will be carried out at each wetland site during the growing season, between June 15 and August 15. The visit will produce a general survey and quadrant sampling data. The sampling procedures below were based on the Army Corps of Engineers' "Wetlands Delineation Manual - Comprehensive Determination" (1987) and the Environmental Protection Agency "Methods for Evaluating Wetland Condition, #10, Using Vegetation to Assess Environmental Conditions in Wetlands" (2002).

Appendix 2-1 General Survey

The survey will create a general area map of the wetland and its surroundings (including a buffer zone of 100m surrounding the wetland boundary) based on NYS orthophotos. Information about the use of the surrounding lands and their vegetative cover will be recorded.

Major wetland species associations will be delineated on the maps and the representative species in those communities determined. A list of the vascular plant species, identified by scientific name, ITIS number, and NRCS symbol in the wetland will be created.

Appendix 2-2 Quadrant Sampling Protocol

I. Purpose:

The dominant species of vegetation is an indicator used to evaluate and delineate wetlands. The goal of the quadrant sampling protocol is to gather the information necessary to determine the dominant species present at the sampling sites. Special attention will be paid to non-native and invasive plant species because they alter ecosystem health.

II. Equipment:

1. data sheet & clipboard
2. pencils
3. orthophoto map of wetland showing sampling points
4. one meter square quadrant frame made up of PVC pipe & connectors
5. inelastic cords, measuring 3.09 and 8.92 meters, to attached to center stake
6. metric diameter breast high (dbh) tape measure
7. plant identification handbook
8. global positioning unit (GPS)

Additional items which may be useful:

9. waterproof hip waders or hip boots or wading shoes
10. raincoat
11. long sleeved shirt and long pants
12. insect repellant
13. hat
14. head net
15. drinking water

III. Common Terms:

1. Site: The name of the wetland area being sampled.
2. Point: A location at which the vegetative assessment will be carried out.
3. Quadrant: The area around the sampling point within which vegetation is assessed
4. Transect: Lines along which sampling points are situated.
5. Strata: Four layers of vegetation: herb, shrub, woody vine, and trees
6. dbh: Diameter at breast height, a standard tree dimension, 1.37m above ground

IV. Procedure:

At each sampling point:

1. Use separate data sheets for each point. Fill in the information at the top of each data sheet: site name, date of visit, lead investigator, assistant investigators, GPS unit used, transect number, and site number.
2. Locate each point using the base map and GPS unit. Each wetland site is laid out with long lines called transects, which are identified by Roman numerals. The individual sampling points, identified by lowercase letters, are positioned along each transect. Together a Roman numeral and lowercase letter make up the name of an individual sampling point. In addition to being marked on the base map, points are marked by orange-tipped PVC pipes standing between 1.22 and 1.83 meters above ground. Each marker is labeled with point name and approximate GPS coordinates.
3. As you approach each sampling point be careful not to disturb the vegetation right around the point where you will be describing the herb layer.
4. Determine the UTM coordinates of the site using the GPS unit.
5. Determine the strata present at each site. A maximum of four strata can exist (Figure 1):
    a. Herb: all non-woody plants and woody plants less than (<) 1m. tall
    b. Sapling/Shrub: any woody plant greater than or equal to(≥) 1m. tall, but with a dbh < 8cm
    c. Tree: any woody plant with a diameter breast high (dbh) ≥ 8 cm
    d. Woody Vine: woody climbing plants ≥ 1m. tall

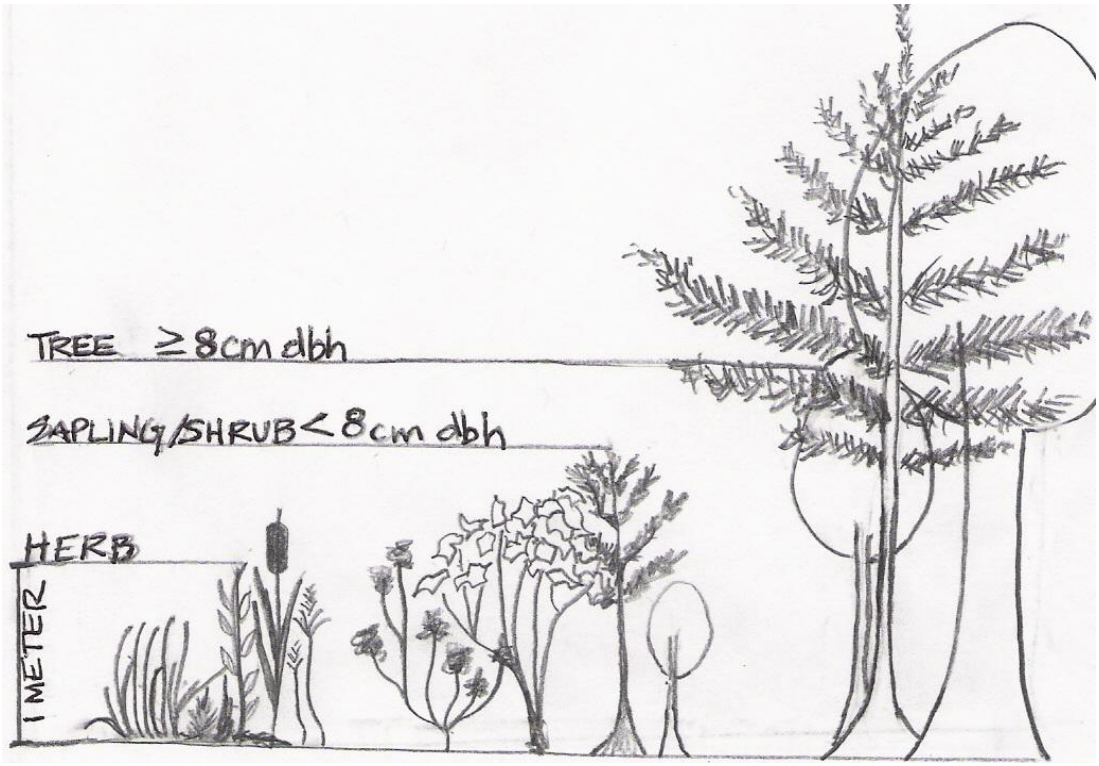


Figure 1. Strata at a wetland site.

6. Note: More than one stratum usually exists at a point. For example, you often have a herb layer, a shrub layer, and a tree layer at a point.
7. Note: The names of the strata can be a little confusing. For example, in the Herb layer non-woody plants such as cattail may exceed the one meter height limit and still be counted in the herb layer. However, woody plants, if they measure less than 1 meter tall, are also considered a part of the Herb layer. Plants in the shrub layer may be of any height greater than 1 meter as long as their dbh is less than 8 cm.
8. For each stratum use a quadrant of the appropriate size:

Stratum	**Distinction**	**Quadrant Size**	**Method of Forming Quadrant**
Herb	All non-woody plants and woody plants < 1m tall	$1m^2$	Use 1m x 1m quadrant constructed of PVC
Sapling/ Shrub	Woody plant ≥ 1m tall, but with dbh < 8cm	$30m^2$	One end of a 3.09m length of inelastic rope is anchored at the center of the quadrant; the other end circumscribes the quadrant
Tree	Woody plant with dbh ≥ 8cm	$250m^2$	One end of a 8.92m length of inelastic rope is anchored at the center of the quadrant; the other end circumscribes the quadrant
Woody Vine	Woody climbing plants ≥ 1m tall	$250m^2$	One end of a 8.92m length of inelastic rope is anchored at the center of the quadrant; the other end circumscribes the quadrant

9. For the herb stratum quadrant fit the PVC piping together to form a square measuring 1m x 1m on the inside of the square and place it over the sampling point. The enclosed square delimits your quadrant.
    a. Determine and record the total percentage of the quadrant surface covered by herb stratum vegetation. This number is not used in the determination of wetland status but is important for understanding the nature of the wetland.
    b. Now using only the area covered by vegetation, determine the percentage of the area covered by each species. Using a separate line on the data sheet for each species of herb found in the quadrant record this percentage coverage for each species.
    c. Sample herbaceous plants growing beneath the water (submerged) and those with most vegetative parts above water (emergent) using this square meter quadrant technique.
10. In the shrub/sapling stratum Height Class is an indication of dominance used for the sapling/shrub layer. Taller species, or those with greater biomass, control or influence the amount of light the rest of the community receives. Use estimated heights and the following table to determine height class. For example, if you observed a shrub that you estimated to be say 2.4 meters tall, the table shows you that range of heights corresponds to Height Class 2.

Height Class	Height Range (m)	Midpoint (m)
1	1-2	1.5
2	2-3	2.5
3	3-4	3.5
4	4-5	4.5
5	5-6	5.5
6	>6	6.5

11. For the shrub/sapling stratum quadrant anchor an inelastic rope so that the end of the rope is 3.09m from the pole marking center of the sampling point.* The area enclosed by moving the end of the rope in a circle around the pole delimits your quadrant.
    a. Determine and record the total percentage of the quadrant surface covered by shrub/sapling stratum vegetation.
    b. Identify each species of sapling/shrub occurring within the $30m^2$ quadrant. Estimate height of individuals and record the number of individuals of each species (using the scientific name) of each height class. Use one line for each species of each height class.
12. In the tree stratum the diameter breast high is used as an indication of dominance. The basal area of the tree trunk at that height is calculated back in the lab and used as an indication of biomass. Trees with greater biomass are thought to be more dominant in the community.
13. For the tree stratum quadrant anchor an inelastic rope so that the end of the rope is 8.92 m from the pole marking the center of the sampling point.* The area enclosed by moving the end of the rope in a circle around the pole delimits your quadrant of 250 m^2.
    a. Determine and record the total percentage of the quadrant surface covered by tree stratum vegetation.
    b. Record the identity of each individual tree by scientific name using one line for each individual tree Include each individual's diameter at breast high (dbh). Breast high is defined as 1.37m (4.5 feet) from the ground. Mark that height with chalk, pin, etc. on your chest for consistency in dbh measurement. Standing close to and facing the tree,

wrap diameter tape around tree to measure dbh (cm) at this height. The diameter tape is calibrated to measure the trunk's diameter (rather than its circumference) based on a pre-defined conversion factor. Make sure you use the side of the tape that measures diameter. Where multiple trunks arise from a common basal point, each trunk is treated as a separate individual if it has diverged from the others below breast height, or 1.37m, from the ground.

14. For the woody vine stratum use a circular quadrant with an area of $250m^2$ to sample areas just as you did with the tree stratum. Utilize a smaller circular quadrant, with an area of $30m^2$, to sample for Sapling/Shrub. Woody vines are not likely to be very common in our area. If any are present, record the number of stems at 1 m. above the ground for each species in the $250m^2$ quadrant.
15. In some sites, where the vegetation exists as linear bands, using the circular quadrants for shrubs/saplings, tree, and woody vine quadrants is not appropriate. In these cases lay out a rectangular quadrant so that it covers only one vegetation type. The area of this quadrant should be the same as that of the circular quadrants, i.e. 30 m^2 for shrubs/saplings strata and 250 m^2 for the tree strata and for the woody vine strata.

V. Quality Control:

1. Quadrant Sampling Precision and Accuracy:

Two measures are used to assess the quality of the data:

a. Two measures are used to assess the quality of the data at 15% of the vegetation sampling points.
b. At 15% of the wetland sites the data for that site will be gathered twice, the second time by immediately revisiting the sampling points after the completion of the first determinations.

2. Document Control:

The data sheets will be delivered to the field investigator who will sign off on each data sheet. The original copy of the field data sheets will be retained by the field investigator for the duration of the project and deposited with the Project Manager and the Boquet River Association at the end of the project.

All data gathered in the field should be recorded on the data sheets in black or blue indelible ink. All calculations and analysis and any additional data added later should be recorded in green indelible ink. Any corrections to the original data should be recorded in red indelible ink.

3. Accuracy of Species Identification:
   a. In the field the identity of all species will be determined using the data sheets in the field identification manual.
   b. In any cases where there is doubt about the accuracy of identification specimens will be collected in plastic bags and kept as cool as possible. At the end of the field session they will be preserved (normal pressing and drying) and identified in the laboratory by the principal investigator.
   c. Representatives of all species of Poaceae, Cyperaceae, and Juncaceae will be similarly collected and preserved as these can be difficult to identify accurately in the field.
   d. The identity of plant species will be confirmed by comparison with vouchered herbarium specimens whose identity has been independently confirmed.
   e. When the species is categorized as rare, threatened, endangered by the NYS DEC, or where there are fewer than 20 individuals in the area, the plants will be described and

photographed, but not collected. Digital photographs of plants characterized as rare or endangered will be taken with a Nikon d70s camera coupled with a 60 mm Micro Nikkor lens capable of producing an enlargement ratio of up to 1:1 (image:object). The camera will be set to produce a 3008x2000 pixel image. The camera associates each image with a unique identification number. A photo log will be maintained and will include the identifying number (or numbers if multiple images are taken) of the picture along with any relevant descriptive notes. The identifying number will also be entered on the data sheet in place of the species identity. When the identity is determined the scientific name of the species will be added to the data sheet.

f. Accuracy of identification will be defined as the percentage of specimens correctly identified in the field when compared to independently identified specimens in the herbarium.

VI. Literature Cited:

Corps of Engineers. 1987. Wetlands Delineation Manual. U.S. Army Corps of Engineers, Vicksburg, MS, Technical Report Y-87-1.

U.S. EPA. 2002. Methods for Evaluating Wetland Conditions: Using Vegetation to Assess Environmental Conditions in Wetlands. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA-822-R-02-020.

Vegetative Assessment of Wetland Sites
Data Form – General Survey

Wetland Name: page 1 of 2
Date of Visit: GPS Unit:
Lead Investigator:
Other Investigators:

General Area Map:

Vegetative Assessment of Wetland Sites
Data Form – General Survey

Wetland Name: page 2 of 2

Notes:

Boquet River (Essex County, NY) Watershed
Vegetative Assessment of Wetland Sites Data Form – Quadrant Sampling

Wetland Name:
Date of Visit: Transect #:
Lead Investigator: Site #:
Other Investigators: GPS coordinates

HERBS: 1 m^2 quadrant (- % area covered by vegetation)

Species	% cover (by area)	rank*

(- * indicates values may be calculated later)

Boquet River (Essex County, NY) Watershed
Vegetative Assessment of Wetland Sites Data Form – Quadrant Sampling

Wetland Name:
Date of Visit: Transect #:
Lead Investigator: Site #:
Other Investigators: GPS coordinates

VINES: 250 m^2 quadrant

Species	number of stems	rank*

Additional Notes:

Boquet River (Essex County, NY) Watershed
Vegetative Assessment of Wetland Sites Data Form – Quadrant Sampling

Wetland Name:
Date of Visit: Transect #:
Lead Investigator: Site #:
Other Investigators: GPS coordinates

SHRUBS: 30 m^2 quadrant (- % area covered by shrub vegetation)

Species	# of individuals	average height of individuals	midpoint of height class for individuals*	midpoint of height class x # individuals*	species rank*

(- * indicates values may be calculated later)

Boquet River (Essex County, NY) Watershed
Vegetative Assessment of Wetland Sites Data Form – Quadrant Sampling

Wetland Name:
Date of Visit: Transect #:
Lead Investigator: Site #:
Other Investigators: GPS coordinates

TREES: 250 m^2 quadrant (- % area covered by tree vegetation) (breast high =1.37m)

Species	dbh (cm)	basal area (cm^2)*	basal area for species (cm^2)*	species rank*

Appendix 3
Standard Operation Procedures
Analysis of Field Data &
Preparation of Reports on Individual Wetlands

I. Purpose:

Data gathered during field work and reported on the wetland vegetation data forms (please refer to SOPs "Vegetative Assessment of Wetland Sites" for examples of data forms) must be analyzed and presented in a standardized fashion to allow comparisons and to facilitate communication with other agencies that use them. Quality control measures must be followed so that arithmetical and/or recording errors do not degrade the quality of the data. The procedures described below are based on the U.S. Army Corps of Engineers' "Wetlands Delineation Manual" (1987) unless otherwise noted.

II. Analysis of Field Data:

1. Analysis of Vegetation Data Sheets:

Analysis of vegetation will be performed by surveying four strata (trees, woody vines, shrubs/saplings, and herbs) of each sampling point. The vegetative community information will be summarized on the data sheets included at the end of this SOP. Summarization and analysis of the data gathered in the field must be done before the wetland status of the site can be determined.

Herbs:

a. The percentage cover is used as an indication of the importance of the species. The species which has the largest percentage cover is ranked the highest.
b. Determine the rank of each species - the species which has the largest percentage of the total is ranked the highest (#1), etc.
c. Determine the dominant species based on the 50/20 rule. The dominant species are those whose cumulative percentage (when added from highest to lowest rank) exceed 50% of the total. However, the dominant species must also include any herb species whose percentage cover makes up 20% or more of the total for the quadrant.

Shrubs & Saplings:

a. Each individual of each species in the quadrant was placed in a *height class range* in the field. The range of heights in these designated height classes are listed below on the left:

height class range, m	midpoint nominal height, m
1-2	1.5
2-3	2.5
3-4	3.5
4-5	4.5
>5	5.5

b. The midpoint of the height class is taken as the nominal height of the individual, regardless of where in the range it occurs. The midpoints for the ranges of height classes are given above on the right.
c. The *midpoint nominal heights* for all the individuals of a given species are added together to obtain the *total midpoint height* score for the species. (Note that a species may occur in more than one height class.)
d. For each species the percentage of the *total midpoint nominal height score* for that species is then calculated as a percentage of the sum of the *total midpoint height scores for all of the species*. (i.e. percentage importance = percentage cover = total midpoint nominal height score for given species/ total midpoint nominal height score for all species combined) The species which has the largest percentage of the total is ranked the highest, etc.
e. Determine the rank of each species - the species which has the largest percentage of the total is ranked the highest (#1), etc.
f. Determine the dominant species based on the 50/20 rule. The dominant species are those whose cumulative *total midpoint of height scores* (when added from highest to lowest rank) exceed 50% of the *total of midpoint height scores for all the species*. However, the dominant species must also include any shrub/sapling species whose total of height scores makes up 20% of more of the total of midpoint of height scores for all the species.

Trees:

a. The basal area of each individual tree is used as an indication of the importance of that individual. It is calculated from the formula:
b. Basal Area (cm^2) = π $(dbh/2)^2$ = dbh^2 x 0.7854 where the dbh is in cm
c. The total basal area of each species is calculated by adding up the basal areas of each individual of the species.
d. The total basal area of all species is calculated by summing up the basal area of all of tree species in the quadrant.
e. Determine the percentage of the total basal areas of each species compared to the total basal areas of all species in the quadrant.
f. Determine the rank of each species - the species which has the largest percentage of the total is ranked the highest (#1), etc.
g. Determine the dominant species based on the 50/20 rule. The dominant species are those whose cumulative basal areas (when added from highest to lowest rank) exceed 50% of the total basal area. However, any tree species whose basal area makes up 20% or more of the total basal area for the quadrant is also considered a dominant.

Woody Vines:

a. Count the total number of stems of each species. This total is then calculated as a percentage of the sum of the stems of all the species. The species which has the largest percentage of the total is ranked the highest. Determine the rank of each species - the species which has the largest percentage of the total is ranked the highest (#1), etc.
b. Determine the dominant species based on the 50/20 rule. The dominant species are those whose cumulative number of stems (when added from highest to lowest rank) exceed 50% of the total number of stems. However, any woody vine species whose

basal area makes up 20% or more of the total number of vine stems for the quadrant is also considered a dominant.

Determining Whether the Vegetation is Hydrophytic:

a. Record all of the dominant species for each vegetation layer in the "Analysis of Data Vegetation" worksheet. Obtain the NRCS Region 1 wetland indicator status of each species and record on the worksheet.
b. A quadrant will be considered to have hydrophytic (wetland) vegetation if more than 50% of its dominant species are categorized as OBL, FACW+, FACW, FACW-, FAC+, or FAC.

Comparison of 2005-2006 and 2010-2011 Data on Invasive Species:

a. Create, for each of the 20 wetlands being monitored, a tabulation of the sampling sites that contain any of the invasive species (as defined by the Adirondack Park Invasive Plant Program) in any of the years for which BRASS has collected data. The tabulation will list the percentage coverage by each invasive species for each of the years. Percentage coverage and relative dominance of each vegetation type were collected at each sampling site in 2005, 2006 and 2010. These data will also be collected in 2011. The 2005 and 2006 projects were done according to an EPA-approved QAPP titled "Quality Assurance Project Plan of A Volunteer Wetland Monitoring Program and Invasive Species Management Plan for the Boquet River Watershed." For a copy of this EPA-approved QAPP, contact the EPA or BRASS. Although a QAPP was not required for the BRASS-funded 2010 survey, all guidelines in the EPA-approved QAPP were followed.

III. Quality Control

1. Data Quality Control:

a. Two measures are used to assess the quality of the data handling:
b. The calculations on 15% of the vegetation data sheets will be independently reanalyzed by a second person.
c. All data transcriptions (copying of data from one sheet to another, or to a digital format) will be verified by a second person.
d. Any discrepancies noted will be reconciled and the data sheets corrected.

2. Document Control:

a. The original copy of the worksheets, data sheets, and other field notes will be maintained by the Field/Data Director. Additional copies of each data sheet will be deposited with the Project Manager.
b. All data gathered in the field should be recorded on the data sheets in black or dark blue indelible. Changes made in the field should be crossed out (do not completely obscure the original data). All subsequent calculations and analysis as well as any additional data added later should be recorded in green ink. Corrections to data or calculations should be recorded in red ink.

IV Literature Cited:

Corps of Engineers. 1987. Wetlands Delineation Manual. U.S. Army Corps of Engineers, Vicksburg, MS, Technical Report Y-87-1

V. Preparation of Report on the Wetland:

1. Cover Sheet:
   The cover sheet should include:
   a. Agency presenting data
   b. Name of the wetland
   c. Location of wetland – country, state, county, town
   d. Location of wetland – watershed
   e. Location of wetland – in UTM coordinates, including section #
   f. Owner(s) of wetland – tax map numbers, current owners if information available
   g. Date(s) field work was done
   h. Field investigator(s) responsible for data

2. General Area Map:
   An annotated copy of the general area map which incorporates relevant information gathered during field work.

3. Base Map:
   An annotated copy of the base map will incorporate relevant information on the distribution of wetland communities and species associations as well as invasive species if relevant. The base map will show the location of vegetation sampling points.

4. Vegetation:
   General Survey: This section provides a description, with reference to the base map, of the wetland communities and species associations found in the wetland. It also provides a list of the species observed (giving both scientific and common names). Non-native (non-indigenous) and/or invasive species will be clearly labeled.

   Quadrant Sampling: This section will document the hydrophytic status of each dominant species of the sampling point as well as the presence or absence of hydrophytic vegetation community. The report will include as an appendix the "Analysis of Vegetation Data Sheets" worksheet for each of the sampling points.

Summary Analysis of Vegetative Assessment Data Sheets:

Name of Wetland: Transect & Quadrant Sampling Site #:
Data Analyst: Date of Sampling:

Record the dominant species for the quadrant in the table below and indicate the NRCS region 1 wetland status of each species.

Dominant Species	Stratum	Wetland Status (OBL, etc.)

OBL, FACW+, FACW, FACW-, FAC+, or FAC are considered hydrophytic.

Percentage of Dominant Species that are Hydrophytic: _____
Hydrophytic vegetation present?: (Yes/No)

Appendix 4
Project Locations
Coordinate system: UTM NAD83

- Crater Club Marsh and Pond – Essex Township – The site is in a shallow depression in the underlying limestone. The center of the marsh has cattails in the deeper areas, but is predominantly sedges. These give way to shrubs in the peripheral areas. e631245 n4904420

- Hurricane Road – Elizabethtown Township – This combined site on both sides of the road is formed on a section of a gravel-choked stream that ultimately drains into The Branch. It has semi-open woodland; a moderately well developed shrub layer; and a well-developed herbaceous layer dominated by sedges. e606300 n4898500

- MacMahon Road – Westport Township – A small flat-bottomed valley in a small stream draining directly to Lake Champlain. The periphery of the area has a closed canopy woodland and minimal shrub and herbaceous layers. In the center of the area, the canopy is much more open and the vegetation dominated by the sedges and grasses of the herbaceous layer. e621347 n4891438

- New Russia Sedge Meadow North – Elizabethtown Township – This is a section of stream, including one beaver pond, between the highway and the Main Stem of the Boquet. It has an extensive sedge-dominated floodplain with the more elevated areas dominated by meadowsweet shrubs. e606781 n4885842

- Sherman Stream – Westport Township – This site is the mouth of a low-lying side stream to the Main Stem; portions of the site are also waters backed up behind beaver dams. There is some open water, but much of the site consists of sedges and shrubs peripheral to the open waters. e624027 n4897572

- Sherman Upper Oxbow – Westport Township – This site is a shallow oxbow cut off from the Main Stem. There is open water in the center that often persists through the summer. Rushes dominate the periphery of the oxbow. e623576 n4897310

- Sycamore Floodplain – Willsboro Township – This site is a mix of abandoned river channels and associated levees along the lower Boquet. Although one of the channels retains water throughout the summer, most of the area is vegetated by a closed-canopy forest of large old-growth trees. The shrub layer is poorly developed and ferns dominate the herbaceous layer. e629073 n4913871

- Thrall Dam – Lewis Township – A topographically complex site formed by beaver dams along a feeder stream of the North Branch. Part of the site is open water with an organic bottom, but the majority of it is dominated by different associations of sedges and alders. e615225 n4902283

- Wags Pond – Elizabethtown Township – The pond is mostly open water, the vegetation dominated by floating leaved and submerged plants. Around the periphery are areas of sedge and alders. e614256 n4896466

- Webb-Royce Marsh – Essex Township – This site is in a large flat-bottomed valley. Most of the marsh is dominated by cattails but there are areas dominated by sedges on the periphery of the marsh. e629500 n4900656

Project Budget Table

Expense	LCBP Grant Request	Non-Federal Matching Contribution	Totals
DIRECT Costs:			
Personnel			
Project Coordinator for oversight of project activities [80 hours @ $ 18/hr.]	$ 1,440		$ 1,440
Travel			
Travel to survey sites [500 miles]	$ 250		$ 250
Travel for poster presentations [300 miles]		$ 150	$ 150
Supplies and Materials			
Printing poster materials and easel	$ 300		$ 300
Copying and supplies	$ 200		$ 200
Contracts			
Field/Data Director to survey 10 wetlands with approx. 20 sites per wetland [flat rate agreement]	$ 4,340		$ 4,340
Field Scribe(s) [flat rate agreement]	$ 1,488		$ 1,488
Field/Data Director to manage, process, analyze and summarize data [150 hours @ $ 40/hr.]	$ 6,000		$ 6,000
Other			
Outside data review, trend analysis development, and review of Final Report [40 hours @ $ 40/hr.]		$ 1,600	$ 1,600
INDIRECT Costs:			
General Overhead [10% of project request]		$ 1,400	$ 1,400
Totals	$ 14,018	$ 3,150	$ 17,168

Appendix 4

Lake Champlain Basin Program
Boquet Watershed Wetland Monitoring Program, LS-2011-032
Quality Control Report, *prepared by Corrie Miller (Ausable River Association)*
July 28, 2012

Vegetation Data Sheets reviewed for BRASS Quality Control (#LS-2011-32)

NRSMN

*Note: no data sheets in this site contained "Benchmark" information. Nothing was noted re: Benchmark.

1. 1A: no errors
2. 2A: no errors
3. 3A: no errors
4. 3B: Herbs: % area covered by vegetation should be 55%, not 40%
5. 3C:
    a. Herbs: See note about water depth, did not get transcribed?
    b. Herbs: There is no % cover listed on data sheet; perhaps that means 100% as is on Excel sheet.
6. 3D: Note data duplicated on Transect 3E
7. 3D&E:
    a. Trees: PIST not marked as Dominant = Y, but it is listed in Dominant Species List.
    b. Dominant Species: Note question marks by PISY Status
8. 3E: Dominant Species: Note empty cell
9. 4A: no errors
10. 4B: no errors
11. 4C: no errors

Sycamore Floodplain

*Note: No photo notes were transcribed from data sheets to Excel file

1. 2A:
    a. GPS Coordinates: note correction that looks like a "E628924" to me but is recorded "…29."
    b. Photo note not transcribed
2. 2B:
    a. Trees: Note absence of % area cover data
    b. Wetland status: Should FAC neutral = 2/3 instead of 3/4 since one was not hydrophytic?
3. 2C:
    a. Additional Notes not transcribed
    b. Shrubs: one too many ULRU listed, no CAGL8 listed, no ULAM listed; therefore difficult to verify the other shrub data
    c. Wetland Status: perhaps I don't understand correctly how "FAC neutral is calculated, but I thought this should be 2/3.

4. 2D.
    a. Dominant Species: Note question marks re: Vines
    b. Wetland Status: Same question as above regarding FAC neutral. I don't know what determines the denominator. Sorry!
5. 3A:
    a. GPS Coordinates: Easting should read "629059."
    b. Additional Notes not transcribed
6. 3B: no errors
7. 3C:
    a. Trees: missing one FRPE = 21; therefore the other calculations are off accordingly
8. 3D: no errors
9. 3E:
    a. GPS coordinates: Data sheet reads, "N-4913812" while Excel cell reads, "N-4943812"
    b. Additional Notes not transcribed
    c. Shrubs: Note "Accumulated height *# = 8.8." Should this read "8.5?"
10. 3F:
    a. Additional Notes not transcribed
11. 3G:
    a. Trees: note no % area covered on field sheet
    b. Additional Notes not transcribed.
    c. Wetland Status not calculated
12. 4A:
    a. GPS Coordinates: margin of error is +/- "7m" on field sheet and "4m" in Excel
    b. Wetland status – FAC Neutral – shouldn't this read "2/4"?
13. 4B:
    a. Wetland Status: FAC neutral – same old question. Sorry!
14. 4C: no errors

Appendix 5

Lake Champlain Basin Program
Boquet Watershed Wetland Monitoring Program, LS-2011-032
Quality Control Report response, *prepared by Dr. Dennis Kalma*
December, 2012

NRSMN – no benchmarks could be placed at this location as it is state land and therefore not allowed

NRSMN 3B – error acknowledged and corrected

NRSMN 3C – ancillary data were not transcribed

- % cover is not a datum used in the COE protocol. While we recorded it most of the time it was considered as ancillary data.

NRSMN 3D – data is duplicated on analysis sheet

NRSMN 3D – error on PIST acknowledged and corrected

- Question marks indicated wetland status not determined

NRSMN3E – error acknowledged and corrected

NRSMN SUMMARY – 3 errors acknowledged; no errors resulted in a change of wetland status for the sample location

SF - photo notes were transcribed directly onto the photos.

SF2A – GPS coordinates transcribed correctly

SF2B – see notes on NRSM3C (above)

- Analysis sheet is correct; QC officer has misinterpreted the directions for the FAC neutral test

SF2C - ancillary data were not transcribed

- 2 errors acknowledged; ULAM mistakenly entered as ULRU and CAGL8 entered as CACO8; wetland status not affected
- Analysis sheet is correct; QC officer has misinterpreted the directions for the FAC neutral test

SF2D - analysis sheet correct

- Analysis sheet is correct; QC officer has misinterpreted the directions for the FAC neutral test

SF3A - error acknowledged and corrected

- ancillary data were not transcribed

SF3C - error acknowledged and corrected

SF3E – error acknowledged and corrected

- ancillary data were not transcribed
- error acknowledged and corrected

SF3F - ancillary data were not transcribed

SF3G - % cover is not a datum used in the COE protocol. While we recorded it most of the time it was considered as ancillary data.

- ancillary data were not transcribed
- calculation considered self apparent; have added

SF4A – error acknowledged and corrected

- Analysis sheet is correct; QC officer has misinterpreted the directions for the FAC neutral test

SF4B - Analysis sheet is correct; QC officer has misinterpreted the directions for the FAC neutral test

SF SUMMARY – 6 errors acknowledged; no errors resulted in a change of wetland status for the sample location

Appendix 6

Wagg's Pond Species List: Composite

Scientific Name	Common Name	ITIS	NRCS	Habit	N/A	Invasive	Rarity	NatWet1
Acer rubrum L. *var rubrum*	red maple	28279	ACRUR	T	N	-	-	FAC
Ageratina altissima (L.) King & H.E. Robins. *var altissima*	white snakeroot	182398	AGALA	H	N	-	-	FACU-
Alnus incana ssp rugosa (DuRoi) Clausen	speckled alder	181888	ALINR	S	N	-	-	FACW+
Arisaema triphylum ssp triphyllum (L.) Schott	jack in the pulpit	42526	ARTRT3	H	N	-	-	FACW-
Brasenia schreberi J.F. Gmel.	water shield	18370	BRSC	H	N	-	-	OBL
Carex comosa Boott	longhair sedge	39384	CACO8	G	N	-	-	OBL
Carex crinita Lam. *var crinita*	fringed sedge	39388	CACRC2	G	N	-	-	OBL
Carex intumescens Rudge	great bladder sedge	39403	CAIN12	G	N	-	-	FACW+
Carex projecta Mackenzie	necklace sedge	39425	CAPR9	G	N	-	-	FACW
Ceratophyllum demersum L.	coontail	18403	CEDE4	H	N	-	-	OBL
Cornus obliqua Raf.	silky dogwood	511442	COOB9	S	N	-	-	???
Elodea canadensis Michx.	canadian water weed	38937	ELCA7	H	N	-	-	OBL
Equisetum sylvaticum Michx.	woodland horsetail	17161	EQSY	H	N	-	-	FACW
Eragrostis frankii C.A. Mey. ex Steud.	sandbar lovegrass	40741	ERFR	G	N	-	-	FACW
Fraxinus pennsylvanica Marsh.	green ash	32929	FRPE	T	N	-	-	FACW
Galium asperellum Michx.	rough bedstraw	34798	GAAS2	H	N	-	-	OBL
Galium palustre L.	marsh bedstraw	34903	GAPA3	H	N	-	-	OBL
Glyceria canadensis (Michx.) Trin.	rattlesnake mannagrass	40842	GLCA	G	N	-	-	OBL
Glyceria grandis S. Wats. *var grandis*	american mannagrass	528256	GLGRG	G	N	-	-	???
Juncus effusus L.	soft rush	39232	JUEF	G	N	-	-	FACW+
Leersia oryzoides (L.) Sw.	rice cutgrass	40886	LEOR	G	N	-	-	OBL
Lemna minor L.	lesser duckweed	42590	LEMI3	H	N	-	-	OBL
Lycopus uniflorus Michx.	northern water horehound	32257	LYUN	H	N	-	-	OBL
Lysimachia ciliata L.	fringed loosestrife	23984	LYCI	H	N	-	-	FACW-
Lythrum salicaria L.	purple loosestrife	27079	LYSA2	H	A	Y	-	FACW+
Nuphar lutea (L.) Sm. *ssp variegata* (Dur.) E.O. Beal	variegated water lily	524345	NULUV	H	N	-	-	OBL
Nymphaea odorata Ait. *ssp odorata*	white water lily	529291	NYODO	H	N	-	-	OBL
Nymphaea odorata Ait. *ssp tuberosa* (Paine) Wiersma & Hellquist	white water lily	566057	NYODT	H	N	-	-	OBL
Nymphoides cordata (Ell.) Fern.	little floating heart	29997	NYCO	H	N	-	-	OBL
Onoclea sensibilis L.	sensitive fern	17637	ONSE	H	N	-	-	FACW
Osmunda claytoniana L.	interrupted fern	17220	OSCL2	H	N	-	V	FAC

Osmunda regalis var spectabilis (Willd.) Gray	royal fern	529314	OSRES	H	N	-	V	OBL
Oxalis stricta L.	common yellow sorrel	29095	OXST	H	N	-	-	UPL
Pinus strobus L.	white pine	183385	PIST	T	N	-	-	FACU
Polygonum amphibium L. *var stipulaceum* Coleman	water smartweed	529774	POAMS	H	N	-	-	OBL
Polygonum sagittatum L.	arrow-leaved tearthumb	20863	POSA5	H	N	-	-	OBL
Populus balsamifera L. *ssp balsamifera*	balsam poplar	22454	POBAB2	T	N	-	-	FACW
Potamogeton natans L.	floating pondweed	39008	PONA4	H	N	-	-	OBL
Potamogeton zosteriformis Fernald	flatstem pondweed	39055	POZO	H	N	-	-	OBL
Potentilla simplex Michx.	old field cinquefoil	24751	POSI2	H	N	-	-	FACU -
Prunus serotina Ehrh. *Var serotina*	black cherry	529886	PRSES	T	N	-	-	FACU
Rubus hispidus L.	bristly dewberry	24943	RUHI	H	N	-	-	FACW
Salix bebbiana Sarg.	bebb willow	22507	SABE2	T	N	-	-	FACW
Salix petiolaris Sm.	slender or meadow willow	22567	SAPE5	S	N	-	-	OBL
Scirpus atrocinctus Fern.	blackgirdle bulrush	40243	SCAT4	G	N	-	-	FACW +
Scirpus cyperinus (L.) Kunth	wool rush	40228	SCCY	G	N	-	-	FACW +
Scutellaria galericulata L.	marsh skullcap	32798	SCGA	H	N	-	-	OBL
Solidago canadensis L. *var scabra*	canada goldenrod	530448	SOCAS5	H	N	-	-	FACU -
Sparganium emersum Rehmann	european bur-reed		SPEM2	H	A	-	-	OBL
Spiraea alba DuRoi *var latifolia* (Ait.) Dippel	white meadowsweet	530512	SPALL	S	N	-	-	FACW +
Spiraea tomentsa L. *var tomentosa*	steeplebush	530523	SPTOT	S	N	-	-	FACW
Spirodella polyrrhiza (L.) Schleid.	duckmeat	505347	SPPO	H	N	-	-	???
Triadenum virginicum (L.) Raf.	marsh st. john'swort	21475	TRVI2	H	N	-	-	OBL
Typha latifolia L.	wide leaved cattail	42326	TYLA	H	N	-	-	OBL
Ulmus americana L.	american elm	19049	ULAM	T	N	-	-	FACW
Utricularia minor L.	lesser bladderwort	34457	UTMI	H	N	-	T	OBL
Viburnum nudum L. *var cassinoides* (L.) Torr. & Gray	northern wild raisin	530807	VINUC	S	N	-	-	FACW

Appendix 7

INDEPENDENT CONTRACTOR AGREEMENT

The Boquet River Association, Inc. (hereinafter BRASS) hereby engages Dr. Dennis Kalma, 103 Spear Road, Willsboro, NY 12996, 518-963-4582 (hereinafter Contractor) to perform the following work for BRASS:

Coordinate with BRASS' Executive Director to:

- Prepare the required Quality Assurance Project Plan to be approved by the Lake Champlain Basin Program before any monitoring is done;
- Integrate data gathered from 2005, 2006 and 2010;
- Perform fieldwork on 10 priority wetlands in the Boquet River watershed between June, 2011 and August 31, 2011. Vegetation, including invasive species data will be logged onto data collection sheets and transferred, by the Consultant, to a Microsoft Excel document.
- Integrate 2011 data and analyze data for trends and associations useful for watershed wetland invasive species management purposes; and
- Assist BRASS with the development of the final project report and poster design.

BRASS will submit a Temporary Revocable Permit application to the NYS Dept. of Environmental Conservation for approval to monitor wetlands on NYS land. BRASS will mail letters to all wetland landowners for their permission to access their land for wetland monitoring purposes. Wetland data collection will only be done on lands where approval was granted, in writing, by the landowner. Any landowner who requested notification before fieldwork is performed will be contacted by the Contractor before entry onto their property. BRASS will supply the Contractor with contact information for those landowners so desiring. Meetings will be held between the Contractor and BRASS to review wetland monitoring results.

The contract period shall run from February 1, 2011 to August 30, 2012. A total stipend of no more than $10,690 (Exhibit A, #1) will be paid for the above-mentioned services, including travel and needed materials and supplies. The Contractor will choose an Assistant/Scribe to accompany and assist the Contractor in the field. The Assistant/Scribe will have a separate agreement with BRASS. For payment, the Contractor will provide BRASS with an invoice detailing work accomplished and expenses incurred. All final products and data will be saved to a disk and will be the property of BRASS.

The Contractor agrees to hold all proprietary information of BRASS and its clients, members and donors in the strictest confidence. The Contractor agrees that all copies, reproductions or versions of any proprietary information, including but not limited to, any electronic, magnetic or optical versions are the sole and exclusive property of BRASS, and the Contractor agrees to return all such copies, reproductions or versions to BRASS upon the termination of this contract or at any time upon the request of BRASS. The Contractor shall retain an electronic copy of the material generated by this work for a minimum of three years for archival purposes.

As an independent Contractor, the Contractor will not receive any benefits from BRASS, including but not limited to health insurance, sick leave, vacation leave, etc. All other contractors assisting the Contractor in performing his/her obligations hereunder shall not be deemed to be the employees of BRASS or its clients, and each Contractor shall make whatever payments that may be due to or due on behalf of such persons, and comply with all regulations and laws concerning the Contractor's employees.

This agreement may not be changed or modified except in writing and signed by both parties. This agreement may be cancelled by either party with 30 days' written notice.

Julie A. Martin	Dr. Dennis Kalma
BRASS Director	Contractor
February, 2011	

EXHIBIT A

#1 – The work will be performed on the 10 wetland locales known as Crater Club Marsh & Pond; Hurricane Road, East & West; MacMahon Road; New Russia Sedge Meadow North; Sherman Stream; Sherman Upper Oxbow; Sycamore Floodplain; Thrall Dam; Wag's Pond and Webb-Royce Marsh. If landowner approval is not granted for any of the above wetlands, the Contractor and BRASS will choose an alternate site(s).

Cost Breakdown for Independent Contractor Agreement between BRASS and Dr. Dennis Kalma

Contractor		
Survey ten (10) wetlands		$4,340
Manage, process, analyze and summarize data		$6,000
Travel		$ 250
Materials and Supplies		$ 100
	TOTAL	$10,690

*Note: The Assistant/Scribe will have a separate agreement with BRASS for $1,488.

Appendix 8

Agreement between the Boquet River Association and Tim & Mary Burke

The Boquet River Association, Inc. (hereinafter BRASS) hereby engages Tim and Mary Burke, 892 Whallons Bay Road, Essex, NY 12936, 518-963-8305 to perform the following work for BRASS:

Assist Dr. Dennis Kalma with monitoring ten (10) wetlands in the Boquet River watershed between June, 2011 and August, 2011. Specifically, the Assistant/Scribe will accompany Dr. Kalma in the field and log vegetation, including invasive species information, onto data collection sheets. The Assistant/Scribe will coordinate the timing of fieldwork with Dr. Kalma.

A total stipend of no more than $1,488 will be paid. For payment, the Assistant/Scribe will provide BRASS with an invoice detailing work accomplished and expenses incurred.

The Assistant/Scribe will not receive any benefits from BRASS, including but not limited to health insurance, sick leave, vacation leave, etc. The Assistant/Scribe shall not be deemed to be the employees of BRASS or its clients.

This agreement may not be changed or modified except in writing and signed by both parties. This agreement may be cancelled by either party with 30 days' written notice.

_____	_____	_____
Julie A. Martin	Tim Burke	Mary Burke
BRASS Director	Assistant/Scribe	Assistant/Scribe
June, 2011	June, 2011	June, 2011

Appendix 9

***Sample Letter* to Private Landowner(s) Requesting Permission to Monitor Their Wetland**

April 6, 2011

Jerrold & Deborah Sherman
530 NYS Route 22
Westport, NY 12993

Dear Mr. and Mrs. Sherman,

The Boquet River Association (BRASS) was awarded a Lake Champlain Basin Program grant to continue its wetland monitoring program in 2011. We are working with Dr. Dennis Kalma to research vegetation communities in ten (10) wetlands throughout the Boquet River watershed. We wish to study the 'Sherman Upper Oxbow' and 'Sherman Stream' wetlands on your property this summer [tax parcel # 57.3-1-26.000 in the Town of Westport].

A watershed's wetlands are extremely important for a variety of reasons. Watersheds with more wetlands usually have significantly better water quality than those with fewer because wetlands filter and process pollutants. Having healthy wetlands also lowers flood peaks, results in fewer drought periods and provides invaluable wildlife habitat.

We will share with you the findings of our research and you are invited to join us in the field. By completing the letter below and returning it to BRASS in the addressed and stamped envelope provided, we will be able to include your wetlands as part of our project. If you have any questions/comments, please do not hesitate to contact me at 873-3250.

Thank you very much.

Julie A. Martin
Executive Director

……

I/We, _____, hereby grant permission to BRASS, Dr. Dennis Kalma and his assistant to conduct field research on my/our property. The project personnel may have access to my/our property to identify and record wetland vegetation types between June 2011 and September 2011. I/We are exempt from any liability for personal injury or equipment damage as a result of the research activities.

Landowner: _____ _____ _____
[Please print name] [Summer/Fall Phone] [Email address]

Landowner's Signature: _____ Date: _____

Summer/Fall Address:
_____

Comment or Special Requests:
_____

_____

Appendix 10

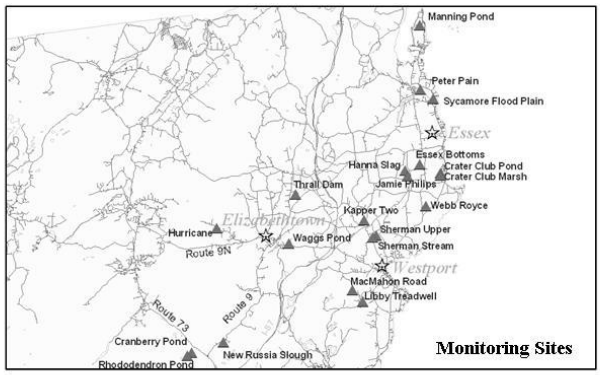
Volume 27 • Issue 1

BRASSnews

Newsletter of the Boquet River Association, Inc. | Spring 2011 Issue

BRASS Awarded Two LCBP Grants

The Boquet River Association (BRASS) was awarded a $14,018 ***Aquatic Invasive Species Spread Prevention*** grant through the Lake Champlain Basin Program (LCBP). The wetland monitoring program, with an emphasis on invasive species in the Boquet River watershed, was initiated in 2005. Initially, a hydrologic and vegetation survey of 40 wetlands was conducted in 2005. Of these, 20 wetlands were selected for long-term monitoring and a hydrologic and vegetation survey was conducted again in 2006. Funding constraints allowed a vegetation survey on one of the wetlands in 2007 and 2008. In 2010, BRASS funded a vegetation survey of 10 of the 20 wetlands. With LCBP funding, a vegetation survey of the remaining 10 wetlands will be conducted in 2011. The data, which includes information on aquatic invasives such as *Lythrum salicaria* (purple loosestrife), will be analyzed for possible trends that will facilitate watershed wetland invasive species management planning and provide recommendations in the Boquet River Watershed Management Plan.



Dr. Dennis Kalma will survey 10 wetlands in 2011 and, once complete, a final report summarizing data and possible trends gathered on 20 wetlands monitored since 2005 will be prepared. BRASS will also create a poster presentation to display at local libraries and the 2012 Adirondack and Lake Champlain Research Consortium's annual conferences.

The Boquet River Association does not have the manpower or resources to monitor and manage invasive species throughout the 280 square miles of the Boquet River watershed. Therefore, focusing our invasive species management efforts on our most sensitive and diverse wetlands is a more feasible approach at this time.

BRASS was also awarded a $23,928 ***Pollution Prevention*** grant through the LCBP. This project seeks to document and demonstrate the effectiveness of an economical approach to the tertiary treatment of effluent from the Willsboro sewage treatment plant utilizing wollastonite tailings (a locally-produced mining waste) as the substrate in a constructed wetland. Grant funds will allow us to test the wetland's effluent levels of phosphorus, nitrogen and Biological Oxygen Demand (BOD) for a period of one year. The samples will be delivered to, and analyzed by Endyne Lab in Plattsburgh. Wetland plants will also be purchased and planted in the pretreatment and treatment cells and a sign will be designed and erected at the popular boat launch site explaining what visitors see, how it works and why utilizing a locally-produced mining waste benefits the environment and the economy.

Over the last decade, point sources of phosphorus loading have been reduced to approximately 10 percent of the current total loading within the Lake Champlain Basin. Further reduction may be possible using wollastonite tailings in constructed wetlands, especially at some industrial and municipal sites. The constructed wetland pilot project was completed in the summer of 2010 and, prior to wetland planting, initial constructed wetland effluent samples indicate phosphorus reduction of 95 percent from the secondary plant's treated effluent (from 3.2 mg/L to 0.16 mg/L). BOD was reduced approximately 69 percent (from 7.8 mg/L to < 2.4 mg/L) and Total Suspended Solids was reduced 86 percent (from 7.8 mg/L to 1.1 mg/L). If these preliminary test results are sus-

A WALK IN THE WETLANDS

By Mary Burke

My husband Tim and I have had the pleasure these past two summers of accompanying Dennis Kalma (Dr. Sedge) and serving as his scribe/assistants while he monitored 20 Boquet River wetlands. This BRASS project was funded by a Lake Champlain Basin Program grant and we were doing a second round of inventory of vegetation on the same sites that were established 5 years ago.

A typical day started at 8 a.m. with Dennis picking up one of us. This was a husband/wife job sharing experience that took us places we had never been (but never together — Dennis needed only one of us at a time). We always wore long pants, long sleeved shirts, hats, socks and tightly tied shoes. At the parking spot we got out our backpacks filled with sunscreen, bug dope, water, snacks and whatever else we thought we needed, plus Dennis would add to it a tape measure, retractable dog leash (no dog though), and metal clipboard box that contained forms for recording our findings. A walking stick was the final necessity. Off toward the wetlands we would head, GPS and site information in Dennis' hands. It was almost always a bushwhack or a hike along the edge of a field until we arrived at a white pvc bench-mark pipe, or, if the benchmark was missing, whenever Dennis stopped, checked the GPS, checked it again and then set his stick into the ground. The research would then begin. Time to record the herbaceous layer within 1 meter of the benchmark, next the shrubs, within 3 meters distance from the benchmark, and then the dog leash came out. Ah hah, it had become a measuring tool. Any trees in a circumference within its reach were recorded. The tape measure would be used to measure the trees' DBH (diameter breast height). Yes, we learned to identify some new plants, but Dennis identified many with shorthand of the Latin names (ULAM, FRPE, …..). Our job was to record the plants that Dennis identified. Some of the waits were longer than others as Dennis would feel a plant, get out a magnifying glass for a closer look, smell, or even taste a plant. Sometimes he had to pull out a copy of one of his own books: **Wetland Plants of the Adirondacks** to confirm identification. There were plenty of sites on dry land, but without hesitation, Dennis would lead us into total muck where tightly tied shoes and a walking stick became vital. How deep is it going to get?? Hmm? There is a little stream up there. Oh, we are going to ford it. Now it's up to my knees, my thighs… The main goal at this point is to stay upright. Right, Tim??

Cranberry Pond - a NYS wetland in Keene.
Photo by Dennis Kalma.

Cardinal Flowers, Canada Lilies, Marsh Milkweed, we saw all sorts of Adirondack beauty, so close to home, but never before experienced in this way. Sloshing through cattails, laced with numerous beaver trails, Dennis would quickly disappear as the plants closed behind him. I could usually hear some swishing noise where he advanced and never really feared being separated. Yes, sometimes mosquitoes and deerflies were annoying, but for me the occasional nettles were maybe the most bothersome. Thankfully, Dennis chose to never head out into the field if the forecast called for more than 80 degrees. Often deep in the wetland it can be 10 degrees hotter than close by places.

A normal outing would include 10 to 15 sites. By the time we were done the idea of going home was appealing. Time to trudge back to the vehicle, hand back our notes to Dennis, get home and power wash our clothes and bodies. It was work, but often so fascinating. I would always have to let Tim know what he had missed, especially what the water depth was. If the opportunity arises again, I wouldn't miss a chance to muddy up my shoes and pants.