GLIC: Implementing Great Lakes Coastal Wetland Monitoring

Semiannual Progress Report

October 1, 2010 - March 31, 2011

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INTRODUCTION

This project officially began on 10 September 2010. Most subcontracts were signed and in place with collaborating universities by late December 2010 or early January 2011. This project has the primary objective of implementing a standardized basin-wide coastal wetland monitoring program that will be a powerful tool to inform decision-makers on coastal wetland conservation and restoration priorities throughout the Great Lakes basin. Project sub-objectives include 1) development of a database management system; 2) development of a standardized sample design with rotating panels of wetland sites to be sampled across years, accompanied by sampling protocols, QAPPs, and other methods documents; 3) development of background documents on the indicators, and 4) timely submission of all project reports and publications.

There have been no changes to our project's objectives.

Our primary activities for this reporting period have involved developing our Quality Assurance Project Plan (signed March 21, 2011), developing the site selection mechanism, selecting our sites, and preparing for field work (wetland sampling) to begin in late April/early May. Wetland sampling is currently underway. All primary project personnel met in mid-January to work through methods and details of all aspects of the project.

Preparations for continued field work are well underway, with amphibian and bird training complete, and all other trainings scheduled. The majority of our field work will begin in the most southerly portions of the Great Lakes and proceed northward following the phenology as well as the protocols of the Great Lakes Coastal Wetland Consortium (GLCWC) .

PROJECT ORGANIZATION

Please note that since our project started we have had two changes in primary personnel (both approved by US EPA). Ryan Archer of Bird Studies Canada has been replaced by Doug Tozer. At the Michigan Department of Environmental Quality, Peg Bostwick has retired and been replaced by Anne Hokanson. No other major personnel changes have taken place during this reporting period. Team leaders are hiring additional crew members in preparation for the bulk of the field season.

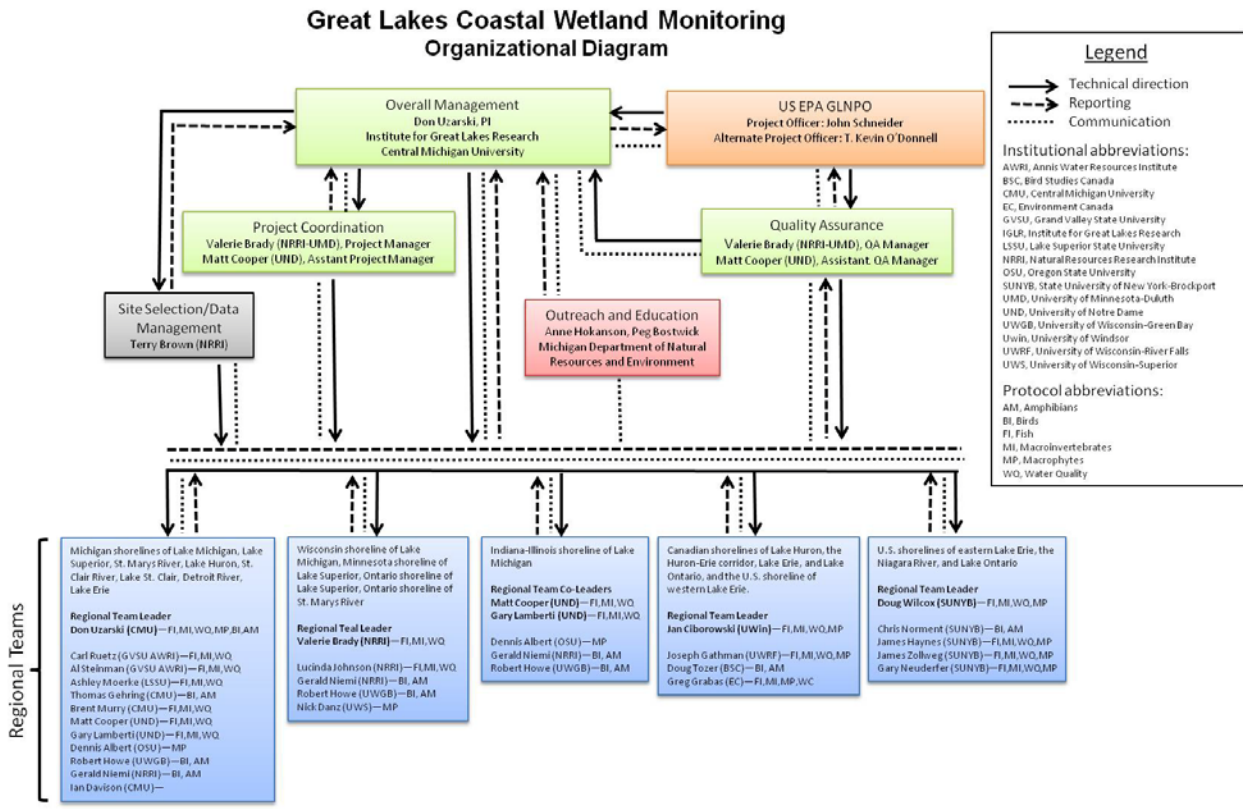


Figure 1. Organizational chart for the project showing lines of technical direction, reporting, and communication separately.

PROJECT TIMELINE

The project timeline remains unchanged and we are on-schedule (Table 1). Site selection has been completed and all teams have their list of sites to be sampled for 2011. All institutions involved are on schedule for field training and testing, and for fieldwork to begin as appropriate for each location and taxonomic group. Each PI has provided details of their work thus far. These can be found under "Team Reports".

Table 1. Timeline of tasks and deliverables for the Great Lakes Coastal Wetland Monitoring Project.

Tasks	'10	2011				2012				2013				2014				2015			
	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F
Funding received	X																				
PI meeting		X					X				X				X				X		X
Site selection system designed		X																			
Site selection implemented			X				X				X				X				X		
Sampling permits acquired			X				X				X				X				X		
Data entry system created			X	X																	
Field crew training			X	X			X	X			X	X			X	X			X	X	
Wetland sampling			X	X			X	X			X	X			X	X			X	X	
Mid-season QA/QC evaluations				X				X				X				X				X	
Sample processing & QC					X	X			X	X			X	X			X	X			X
Data QC & upload to GLNPO						X	X			X	X			X	X			X	X		X
GLAS database report		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Report to GLNPO			X		X		X		X		X		X		X		X		X		X

TRAINING

Training for bird and amphibian field crews began in March. At that time, the training materials and on-line testing system were employed. Amphibian call training has been completed and sampling is underway. Bird sampling training will be completed in May. Training sessions are taking place at 3

locations (east, central, and west) across the basin to minimize crew travel costs and ensure that as many crew members as possible can attend.

Training for fish, macroinvertebrate, and vegetation sampling will also take place at 3 locations across the basin to minimize costs. These training sessions will take place in May and June and will include training in water quality sampling and sample processing. Testing and certification materials for these training sessions are being developed. Crew members either unable to attend a training session, or are hired on in mid-season, will be trained and tested by their regional team leader and field crew chief.

Documentation and Record

All site selection decisions and comments are archived in the site selection system created by Dr. Terry Brown (see "site selection"). This includes comments and revisions made during the QA oversight process.

Regional team leaders are/will be archiving copies of the testing and certification records of all field crew members. Summaries of these records will also be archived with the lead PI (Uzarski), and the QA managers (Brady and Cooper).

SITE SELECTION

Site Selection Tool Development

A web based database application was developed to facilitate site identification, stratified random selection, and field crew coordination for the project. Thirteen regional experts from 10 collaborating institutions spent many hours reviewing 2768 sites, ultimately selecting 1039 for randomized sampling over a five-year rotating panel design.

Original data

The site list used was a product of the Great Lakes Coastal Wetlands Consortium (GLCWC) and was downloaded from http://www.glc.org/wetlands/data/inventory/glcwc_cwi_polygon.zip on December 6, 2010. See http://www.glc.org/wetlands/inventory.html for details.

The downloaded data contained 8648 records and 35 fields:
<Shape> OBJECTID AREA PERIMETER GLCWC_CWI_ GLCWC_CWI1 OTHER
USGS_QUAD LK_BASIN WETLAND_NA HGM_CLS1 HGM_CLS2 COMMENTS
X_CENTROID Y_CENTROID HECTARES NWI WWI OWI HWI LOWI H_NUM
DITCH_CONS DYKES DAMS DREDGING JETTY ROAD_CONST FILLED
MARINA WASTE_SEWA GEO_ID COUNTRY Shape_Leng Shape_Area

Only 2-3 trivial differences were seen between records with common GEO_ID values, so this field was used to merge data into 2768 records. It seems likely that this merge undid an unintended multi-part to single-part conversion at some point in the dataset's history. The fields are explained in the metadata, located at: http://www.glc.org/wetlands/data/inventory/glcwc_cwi_metadata.htm#5

Selection rules

The following rules were used for site selection:

Wetlands selected for sampling under the random site selection process should meet the following criteria:

1. *4 ha or larger;*
2. *have a direct, obvious, unregulated surface water connection to a Great Lake or connecting channel (this is difficult to determine for many wetlands);*
3. *be close enough to that lake or connecting channel to be influenced by it (e.g., seiches);*
4. *contain herbaceous or standing-water wetland zones; and*
5. *have safe access for field crews (e.g., public boat launch within 5-7 km; public access).*

Distance from the lake for lake influence is difficult to quantitatively define, but may be understood by these two examples. In general, influence of the lake does not transmit more than about 1 km upstream or away from the lake, so if the wetland is less than this distance from the lake or connecting channel, and there is no major elevation gradient between the wetland and the lake (< 3 m rise in elevation), the wetland should be selected for sampling. The exceptions tend to be for drowned river mouths such as those that occur along the eastern coast of Lake Michigan where water is at the same level across these drowned river-mouth lakes. Wetlands at the inland end of the lake will be influenced by Lake Michigan and the most downstream end of these wetlands should be sampled regardless of distance from the Great Lake.

All riverine systems will be sampled at the most downstream end, closest to the Great Lake.

Lack of sampleable fish habitat is NOT a reason to reject a site. Also note that a wetland not selected by the fish/invertebrate/vegetation crews may be selected by the bird/amphibian group for sampling. The reverse is less likely, but allowed with justification.

Finally, ***benchmark sites*** *only need to meet the criteria of being/becoming a Great Lakes coastal wetland (e.g., they will have lake influence), and the crews can sample safely. We recommend that shrubby and ridge-swale sites be avoided at this point simply because we do not yet have indicators calibrated for these areas, nor have our sampling methods been tested for these wetland types (at least for fish/invertebrates/vegetation).*

Strata

Geomorphic classes

Geomorphic classes (riverine, barrier-protected, and lacustrine) were identified for each site in the original GLCWC data, in the field HGM_CLS1. Many wetlands inevitably combine aspects of multiple classes, with an exposed coastal region transitioning into protected backwaters dissected by riverine elements. The original data included a secondary wetland type in the field HGM_CLS2, but that was not used by this project's experimental design.

Regions

The proposal identified a need to stratify the Great Lakes' basin by region. Existing ecoregions (Omernik 1987, Bailey and Cushwa 1981, CEC 1997) were examined. None were found which stratified the Great Lakes' shoreline in a manner that captured a useful cross section of the physiographic gradients in the basin. The existing ecoregion delineations either divided the basin into only two parts, or two major parts plus a minor part, or, moving down a level, into too many finely divided sections, to be useful for this project. To achieve the intended stratification of physiographic conditions, a simple regionalization dividing each lake into northern and southern components, with Lake Huron being split into three parts and Lake Superior being treated as a single region, was adopted (Figure 2). The north-south splitting of Lake Michigan is common to all major ecoregions systems (Omernik / Bailey / CEC).

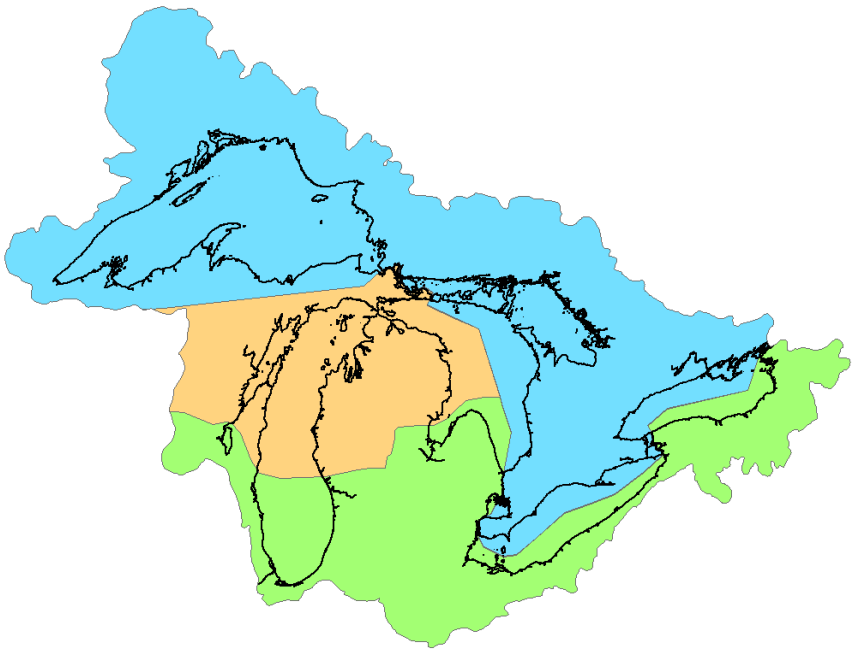


Figure 2. Divisions of lakes into regions. Note that stratification is by region *and* lake, so northern Lake Erie is not the same region as Lake Superior, etc.

Database schema

The PostgreSQL database server with PostGIS spatial extensions is used for storing and querying data and performing spatial analyses. The schema used by the web tool is shown in Figure 3.

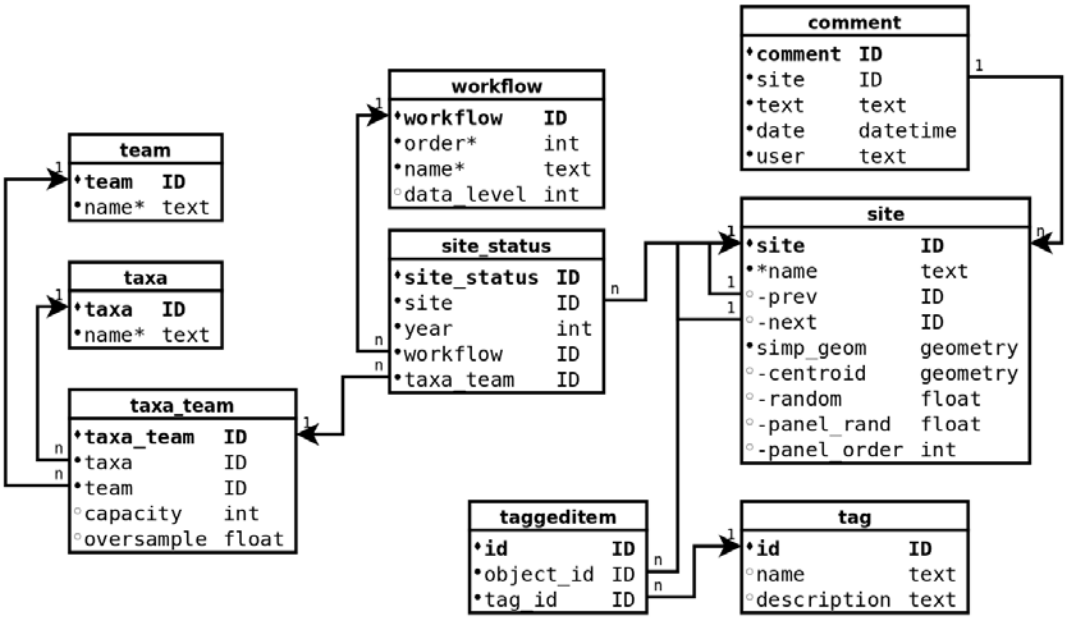


Figure 3. Database schema showing tables, fields, and relationships.

The site field in the site table was taken from the original GLCWC data's GEO_ID field, and used to link back that data (not shown here) for context information for each site. When new sites were added, site ID values of 7000 and up were assigned, making it easy to distinguish new sites from the original data, which had a maximum GEO_ID value of 6081.

The key site record can have multiple tags and comments associated with it. Four site_status records (one for each taxonomic group: amphibians, birds, fish/invertebrates, and vegetation) can also be assigned to each site each year. Taxa_team records included a sampling capacity derived from the team's budget and proposal, and an oversample rate, used to reflect the estimated proportion of sites that will be rejected in the field. The random, panel_rand, and panel_order fields of the site record are explained in the 'Panelization' section.

Tags

To identify sites to be included in the stratified random sampling, the web tool allowed users to 'tag' each site record with various tags indicating various attributes of the site (Table 2). Some tags were initially derived from the original GLCWC data set, or defined by the site's location. Others were set by users interactively to refine the pool of potential sites for sampling. Tags were added and removed from site records in the web tool's Site editor.

Table 2. Site record tags and their descriptions.

Name	Description
class: barrier (protected)	Wetland class barrier-protected (original GLCWC CWI data)
class: lacustrine (coastal)	Wetland class lacustrine (original GLCWC CWI data)
class: riverine	Wetland class riverine (original GLCWC CWI data)
exclude: 4ha	Automatically excluded because it's < 4ha. If also tagged "status: merge candidate", needs to be reviewed for possible merging
exclude: barrier swale ridge	Automatically excluded because it's a Swale Ridge formation and therefore unlikely to have a surface water connection to the lake or connecting channel
exclude: forested	Excluded during review because it's a primarily forested wetland
exclude: no access	Excluded during review due to lack of access
exclude: no lake influence	Excluded during review because the wetland is unlikely to be influenced by a Great Lake or connecting channel
exclude: not connected	Excluded during review due to lack of surface water connection
exclude: no wetland	Uncommon tag used mostly to mark imported polygons which don't seem to be coastal wetlands.
exclude: St. Lawrence	Automatically excluded because site is too far down the St. Lawrence Seaway
info: 10ha+	Site is larger than 10 ha
info: island	Site is on an island, access may be difficult
info: private land	Site is on or surrounded by private land without public access
info: reservation land	Native American reservation land, special permission and permits will be needed
no access: by canoe	Indicates lack of canoe access
no access: by motor boat	Indicates lack of motor boat access
no access: by road	Indicates lack of motor vehicle access
panel: A 2011	Randomized sampling panel for 2011
panel: B 2012	Randomized sampling panel for 2012
panel: benchmark	A benchmark site outside of the main study design
panel: C 2013	Randomized sampling panel for 2013
panel: D 2014	Randomized sampling panel for 2014
panel: E 2015	Randomized sampling panel for 2015
region: LEN Erie North	Sampling strata region
region: LES Erie South	Sampling strata region
region: LHNE Huron Northeast	Sampling strata region
region: LHSW Huron Southwest	Sampling strata region
region: LHW Huron West	Sampling strata region
region: LMN Michigan North	Sampling strata region
region: LMS Michigan South	Sampling strata region
region: LON Ontario North	Sampling strata region
region: LOS Ontario South	Sampling strata region
region: LS Superior	Sampling strata region

status: merge candidate	Site is too small but requires review to see if merging with nearby sites makes sense. Either this tag or the "exclude: <4ha" tag should be removed during review
status: mistake - needs deletion	Apply this tag to sites created in error; site will be deleted after review, within 24-36 hours
status: needs expert review	Can be used to indicate unresolved issues with selection process, deferring site for later review
status: needs merge	Tagged for merging, should be merged and this tag removed within 24-36 hours
status: NO GO: bird/amphib	Indicates that bird/amphibian has rejected the site
status: NO GO: fish/bug/veg	Indicates that fish/invertebrate/vegetation has rejected the site
status: OK: bird/amphib	Indicates that bird/amphibian has selected the site for possible sampling and the site will be included in panel randomization
status: OK: fish/bug/veg	Indicates that fish/invertebrate/vegetation has selected the site for possible sampling and the site will be included in panel randomization
status: split - needs edit	Tag automatically added when a site is split; remove after making appropriate post-split edits
zone: Brady - Danz - Howe	Zone being sampled by these Fish / Bug and Bird PIs
zone: Brady - Danz - Niemi	Zone being sampled by these Fish / Bug and Bird PIs
zone: Ciborowski - Archer	Zone being sampled by these Fish / Bug and Bird PIs
zone: Grabas - Archer	Zone being sampled by these Fish / Bug and Bird PIs
zone: Lamberti - Cooper - Gehring	Zone being sampled by these Fish / Bug and Bird PIs
zone: Lamberti - Cooper - Howe	Zone being sampled by these Fish / Bug and Bird PIs
zone: Uzarski - Gehring	Zone being sampled by these Fish / Bug and Bird PIs
zone: Uzarski - Howe	Zone being sampled by these Fish / Bug and Bird PIs
zone: Uzarski - Niemi	Zone being sampled by these Fish / Bug and Bird PIs
zone: Wilcox - Norment	Zone being sampled by these Fish / Bug and Bird PIs

Shoreline ordering

To allow site reviewers to work through sites in an intuitive "along the shore" order, it was necessary to order the wetland polygons spatially along the shoreline. The *next* and *prev* fields in the site record for each wetland indicate which wetland is closest in clockwise (*next*) and counterclockwise (*prev*) directions. The "NOAA's Medium Resolution Digital Shoreline" (http://www.glerl.noaa.gov/data/char/glshoreline.html) was used to define the shoreline. A copy of the wetland polygons was transformed to the same Albers projection used by the shoreline data to allow spatial indexing to be used to achieve reasonable run times (1-2 minutes). Lake by lake, the point on the shoreline closest to each wetland polygon was determined, and the linear position of that point along the shoreline used to order the wetland polygons.

Islands were excluded from the shoreline data, and narrow bays and drowned river-mouths were often oversimplified. Consequently point ordering may jump from mainland to island and back again, or from one side of a river to another, rather than following separate shorelines. However overall the objective of presenting wetlands to users in a logical sequence was achieved. Wetland sequence was linked in a logical order from one Great Lake to the next, so that small sets of sites spread across multiple lakes could also be efficiently reviewed.

Panelization

Randomization

During the development of randomization, algorithms systems which constantly re-randomize sites present the user with a large number of random configurations. This creates the opportunity for the user to select a randomization that "looks good", or, by running the algorithm "just one more time", to discard a randomization which appears to be inconvenient or doesn't conform to the user's expectations. To avoid generating many different randomizations, and the associated possibility of subjective selection of a particular randomization, random numbers (0 - 1 range with 10 decimal places) were assigned to the random field in the site record, effectively giving each site a single permanent random number.

The first step in randomization was the assignment of selected sites from each of the project's 30 strata (10 regions x 3 geomorphic classes) to a random year or panel in the five-year rotating panel. Because the number of sites in some strata was quite low (a few cases less than 5, more in the 5-20 range), simple random assignment would not produce the desired even distribution of sites within each strata over time. Instead it was necessary to assign the first fifth of the sites within a stratum, defined by their pre-defined random ordering, to one year, and the next fifth to another year, etc. Dividing small numbers by five will give distributions such as 8/5 = 2+2+2+1+1; there is no more even distribution of 8 sites among 5 years. If the sequential fifths of the sites within each strata where always assigned to the five years in the same order, the early years would always receive more sites, and the latter years fewer sites. To avoid this imbalance, the order in which fifths were assigned to years was also randomized.

While the project aims to sample 100% of the sites selected in each year for at least some indicators, project PIs knew in advance that the more time-consuming sampling methods could only be applied at a subset of the sites selected for a particular year. Therefore it was necessary to create a random ordering within each year's sites, so that indicators which cannot be applied to all sites can still be applied to a random subset identified by working down the list from the top without gaps until the logistic capacity of the methodology is exhausted. This avoids the bias or non-representative sample which might be generated by simply sampling the most convenient sites from each year's list.

An additional complication arises from the need to cover all 30 strata in a representative manner. If there are 20 sites in stratum A and 5 sites in stratum B, the goal is to sample approximately 1 stratum

B site for every 4 stratum A sites sampled (note than this applies only to methodologies which cannot be applied to 100% of sites). If the sites were simply randomly ordered within each year, then, over the long term, the coverage of strata in the part of the list covered by the more time consuming methods would converge on the distribution of sites among strata (1:4 in the above example). However, "long term" implies many more iterations than the five in a complete cycle of sampling - representative strata sampling may not occur for 10+ years with simple random ordering of sites within years. To achieve both random ordering and representative sampling of strata, the sites selected within each year were ordered according to the following algorithm:

- All sites are assigned a random number, which is used for ordering the list of sites (list A).
- Sites are transferred from this simply-random-order list (list A) to a stratified-random-order list (list B) as follows:
    1. take the top site on list A
    2. if no sites from that site's strata have so far been selected, remove this site from list A, place it at the end of list B, and return to step 1
    3. if sites from this strata have been selected before, calculate the strata's "overdueness" for selection, O = D / S * C - U; D = sites on list B, S = total number of sites in year, C = sites in this strata, U = sites from this strata already on list B
    4. Compare O for this strata with O for all other strata
    5. If O for this strata is equal to the maximum for any strata, remove this site from list A, place it at the end of list B, and return to step 1
    6. Otherwise, leave this site on list A, and consider the next site on list, starting at step 2.
    7.

The *panel_rand* field holds a second random number assigned to each site to provide the random ordering of list A above. This is an implementation detail - the randomized assignment of fifths to years in the first step above meant that the random field for a particular strata in a particular year was constrained to a band similar to 0.0-0.2, or 0.6-0.8. For the second step, the random ordering of list A, it was necessary to either re-normalize the values in the random field, or assign a second random number. The second option was selected, adding the field *panel_rand*.
Finally, the within year ordering from list B was stored in the field *panel_order*.

Workflow states

Each site is assigned a particular 'workflow' status. During the field season, sites selected for sampling in the current year move through a series of sampling states in a logical order, as shown in Table 3. The *data_level* field is used for checking that all data has been received. Values have the following meanings; -1: site will not generate data, 0: site may or may not generate data, 1: site should generate data, 2: data received, 3: data checked. Users can set the workflow state for sites in the web tool.

Table 3. Workflow states for sites.

Name	Description	Data_level
too many	Too far down randomly-ordered list, beyond sampling capacity for fish / invertebrates / vegetation.	-1
listed	Place holder status; indicates status update needed.	0
web reject	Rejected based on regional knowledge or aerial imagery in web tool.	-1
will visit	Will visit with intent to sample.	0
could not reach	Proved impossible to access.	-1
visit reject	Visited in field, and rejected (no lake influence, etc.)	-1
will sample	Interim status indicating field visit confirmed sampleability, but sampling has not yet occured.	1
sampled	Sampled, field work done.	1
entered	Data entered into database system.	2
checked	Data in database system checked.	3

Team assignment

With sites assigned to years and randomly ordered within years, the remaining step was to assign specific sites to specific teams. The web tool's interactive interface for making these assignments is described in the 'Site Status' section. There is no relationship between the distribution of the project's logistic capacity to visit sites and the distribution of wetlands. In particular there are many sites in north eastern Lake Huron, some distance from any of the project's team's bases. Sites were assigned to teams initially based on expected zones of logistic practicality, and the interface described in the 'Site Status' section was used to exchange sites between teams for efficiency. The web tool generates a KMZ file viewable in GoogleEarth to assist with site exchange (Figure 4).

Field maps

Three-page PDF maps were generated for each site. The first page depicts the site using aerial imagery and a road overlay with the wetland site polygon boundary (using the polygons from the original GLCWC file, as modified by PIs in a few cases). The image also shows the location of the waypoint provided for the site, which helps with orientation in the field. The scale of the image depends on the size of the site, with a buffer to show access roads. The second page indicates the site location on a road map at local and regional scales. The third page lists information from the database for the site, including tags, team assignments, and the history of comments made on the site.

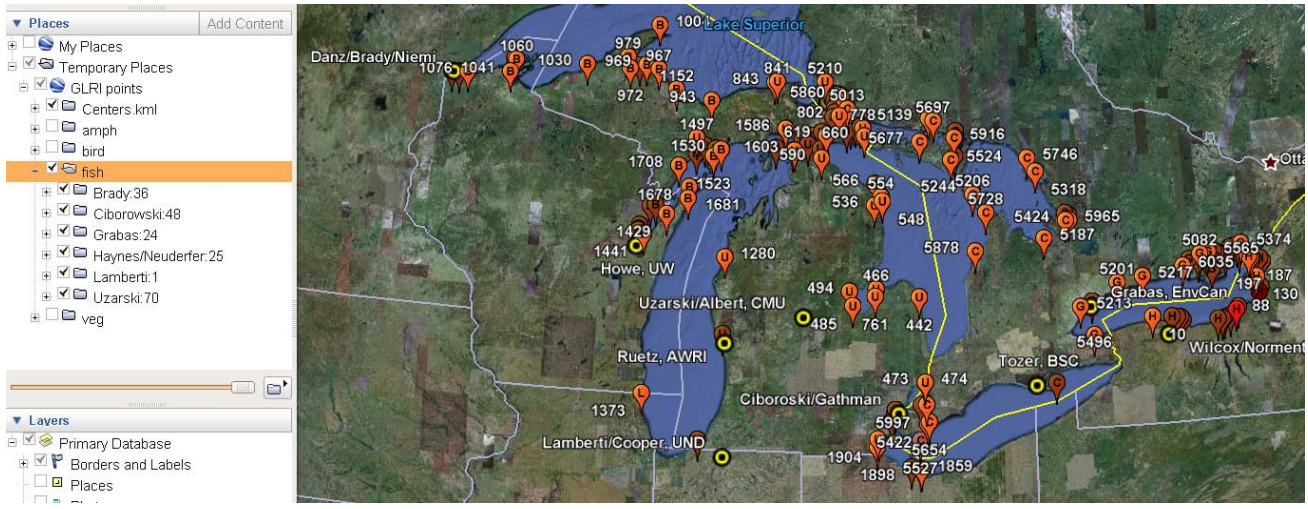


Figure 4. Wetland distribution (orange teardrops) versus regional team bases (yellow circles, one obscured at Ste. St. Marie, Michigan. The Google Earth view is shown.

Web Tool

In addition to the features described in the following subsections, the web tool developed for site selection includes the following functions:

- Quick entry to view a site by number in the Browse map
- Quick entry to view a edit by number in the Site editor
- Addition of a completely new site
- Listing of all tags and their interpretations
- Listing of recent changes to assist with coordination
- Download of selected sites in GPX (for GPS), KMZ and KML (for GoogleEarth), and CSV (general use) formats. These downloads include site number, name, coordinates, and various levels of information appropriate to the format.

Browse map

The web tool's browse map feature allows the user to see sites in context with other sites, overlaid on either Google Maps or Bing Maps road or aerial imagery (Figure 5). Boat ramp locations are also shown when available. The browse map provides tools for measuring linear distance and area. When a site is clicked the tool displays information about the site, the tags and comments applied to it, the original GLCWC data, links for the next and previous site (see Shoreline ordering and Filter sites), and a link to edit the site in the site editor.

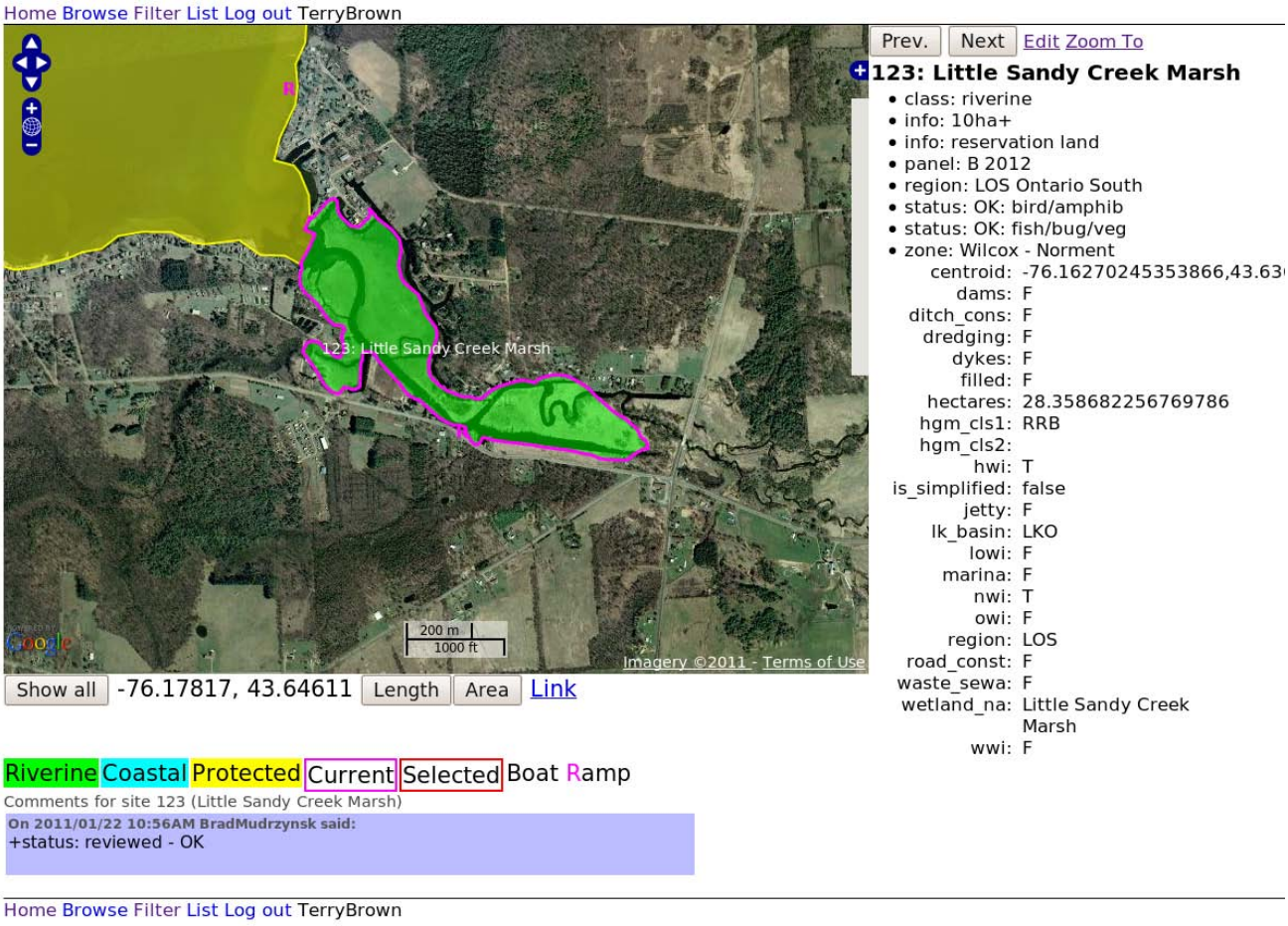


Figure 5. Screen capture: Site browse, site level.

Tag cross tabulate

This tool allows classes of tags to be cross tabulated. Although, at a database level, tags are simply pieces of text, informally classes of tag have common prefixes like "exclude: forested" and "exclude: not connected" etc. The cross-tabulate tool allows the user to select up to three such prefixes, and then displays tables of site counts for each set of tags. Images below show prefix selection and example output. When three levels are selected, the third level is displayed as a space-separated series of counts within the table cell (Figure 6).

Home Browse Filter List Log out

Tag cross check

2746 sites - totals may exceed this if tag sets are not mutually exclusive. If a subset of sites is currently selected, only that subset will be reported in these tables. Clear the current filter to see tables for all sites.

Run another

Cell contents are, in order: class: barrier (protected), class: lacustrine (coastal), class: riverine

Region:	LEN Erie North	LES Erie South	LHNE Huron Northeast	LHSW Huron Southwest	LHW Huron West	LMN Michigan North	LMS Michigan South	LON Ontario North	LOS Ontario South	LS Superior
panel: A 2011	1 4 5	1 3 7	3 22 10	1 5 1	3 18 11	10 15 6	0 0 4	4 11 13	7 2 12	6 4 15
panel: B 2012	1 3 5	2 4 7	4 22 9	1 5 1	3 18 11	3 15 6	1 0 4	3 11 14	7 1 13	12 5 15
panel: C 2013	1 4 6	2 3 7	4 22 9	1 6 0	4 19 12	6 15 7	0 0 4	4 12 13	7 1 12	9 5 14
panel: D 2014	1 4 5	1 3 7	4 22 10	1 6 0	3 19 11	7 16 7	1 0 4	4 12 14	7 1 12	9 4 15
panel: E 2015	1 4 5	1 3 7	3 22 10	2 6 1	3 18 11	7 15 7	0 1 3	4 12 13	7 2 12	9 5 14
panel: benchmark	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 2

Figure 6. Output from the tag cross-tabulate tool. This shows counts of wetland types in each region for each sampling year panel.

Site editor

The site editor allows users to change the site's name, add and remove tags from the site, and log comments about the site and their changes (Figure 7). Even if the user does not explicitly log a comment for a particular change, an automatic comment is generated to record the nature of the changes (tags changed, polygon edited, name changed), who made them, and when. The site editor also allows users to edit the site polygon using Google Maps or Bing Maps background imagery.

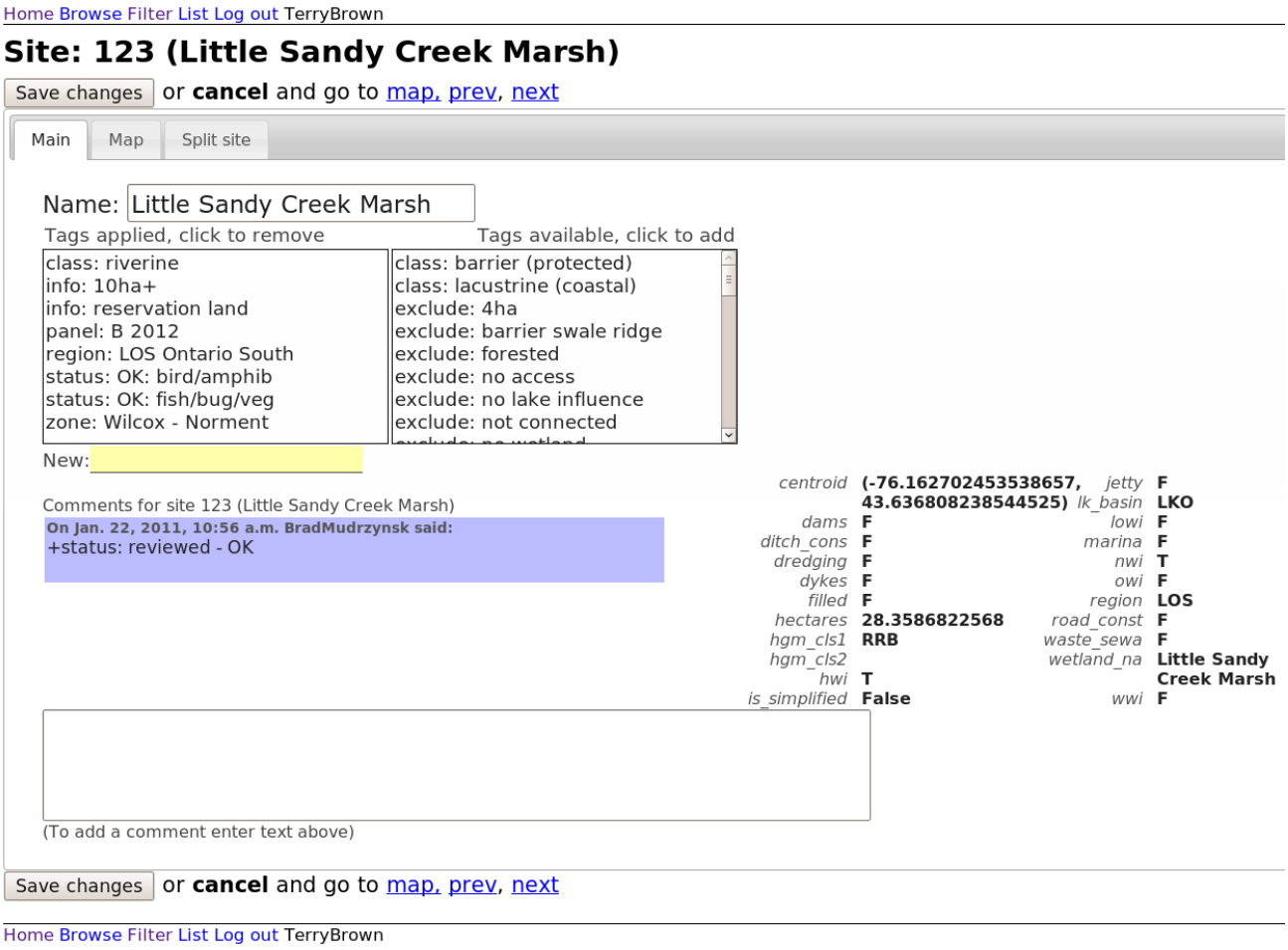
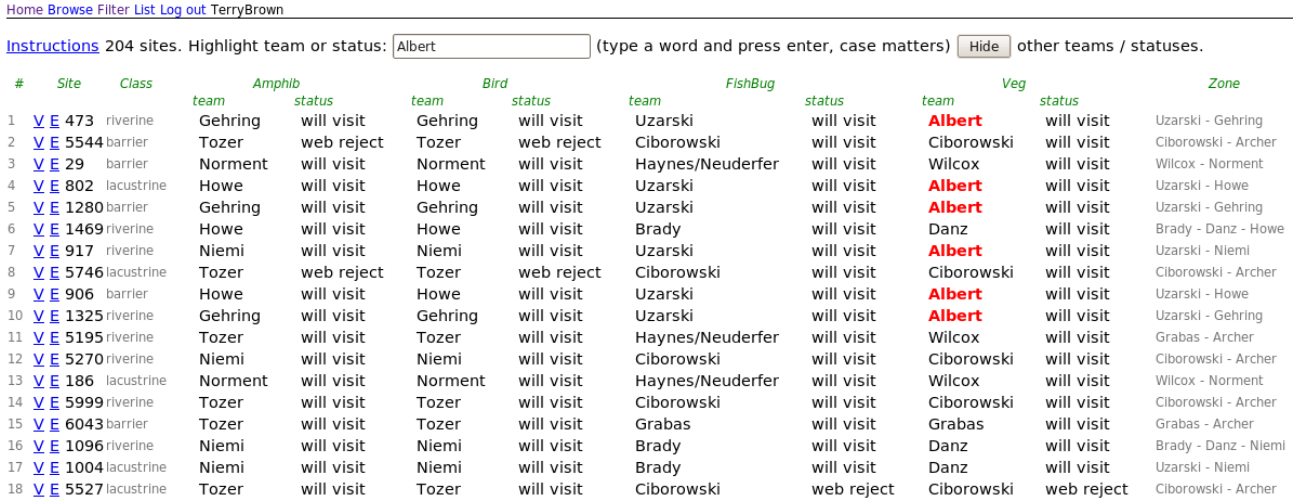


Figure 7. Screen capture of the tag and comment section of the site editor tool.

Site status

The site status tool uses a javascript/AJAX-powered table to display the current team assignments and workflow states for each site scheduled for possible sampling in the current year (Figure 8). Clicking on a team name or workflow state turns the table cell into a drop down list (with 800+ cells in the table, it would not make sense for all cells to be drop down lists all the time). Changing a cell's list selection sends an AJAX request to the server to update the database without forcing the user to reload the page. Additional javascript controls allow the user to highlight and / or filter table entries containing a particular team name or workflow state.



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Instructions 204 sites. Highlight team or status: Albert (type a word and press enter, case matters) Hide other teams / statuses.

#	Site	Class	Amphib		Bird		FishBug		Veg		Zone
			team	status	team	status	team	status	team	status	
1	V E 473	riverine	Gehring	will visit	Gehring	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Gehring
2	V E 5544	barrier	Tozer	web reject	Tozer	web reject	Ciborowski	will visit	Ciborowski	will visit	Ciborowski - Archer
3	V E 29	barrier	Norment	will visit	Norment	will visit	Haynes/Neuderfer	will visit	Wilcox	will visit	Wilcox - Norment
4	V E 802	lacustrine	Howe	will visit	Howe	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Howe
5	V E 1280	barrier	Gehring	will visit	Gehring	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Gehring
6	V E 1469	riverine	Howe	will visit	Howe	will visit	Brady	will visit	Danz	will visit	Brady - Danz - Howe
7	V E 917	riverine	Niemi	will visit	Niemi	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Niemi
8	V E 5746	lacustrine	Tozer	web reject	Tozer	web reject	Ciborowski	will visit	Ciborowski	will visit	Ciborowski - Archer
9	V E 906	barrier	Howe	will visit	Howe	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Howe
10	V E 1325	riverine	Gehring	will visit	Gehring	will visit	Uzarski	will visit	**Albert**	will visit	Uzarski - Gehring
11	V E 5195	riverine	Tozer	will visit	Tozer	will visit	Haynes/Neuderfer	will visit	Wilcox	will visit	Grabas - Archer
12	V E 5270	riverine	Niemi	will visit	Niemi	will visit	Ciborowski	will visit	Ciborowski	will visit	Ciborowski - Archer
13	V E 186	lacustrine	Norment	will visit	Norment	will visit	Haynes/Neuderfer	will visit	Wilcox	will visit	Wilcox - Norment
14	V E 5999	riverine	Tozer	will visit	Tozer	will visit	Ciborowski	will visit	Ciborowski	will visit	Ciborowski - Archer
15	V E 6043	barrier	Tozer	will visit	Tozer	will visit	Grabas	will visit	Grabas	will visit	Grabas - Archer
16	V E 1096	riverine	Niemi	will visit	Niemi	will visit	Brady	will visit	Danz	will visit	Brady - Danz - Niemi
17	V E 1004	lacustrine	Niemi	will visit	Niemi	will visit	Brady	will visit	Danz	will visit	Uzarski - Niemi
18	V E 5527	lacustrine	Tozer	will visit	Tozer	will visit	Ciborowski	web reject	Ciborowski	web reject	Ciborowski - Archer

Figure 8. Screen shot of part of the site status table for 2011 in which teams indicate who will sample which sites, and where sites are in the sampling process.

Team status

Team status is a simple table view from the database showing the distribution of assigned sites among teams and their nominal sampling capacities (Figure 9).

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Taxa	Team	Assigned	Capacity	Oversample%	Capacity+	Excess
Amphib	Gehring	28	30	10.0	33.0	5.0
Amphib	Howe	49	50	10.0	55.0	6.0
Amphib	Niemi	48	50	10.0	55.0	7.0
Amphib	Norment	20	24	10.0	26.4	6.4
Amphib	Tozer	53	40	10.0	44.0	-9.0
Bird	Gehring	28	30	10.0	33.0	5.0
Bird	Howe	49	50	10.0	55.0	6.0
Bird	Niemi	48	50	10.0	55.0	7.0
Bird	Norment	20	24	10.0	26.4	6.4
Bird	Tozer	53	40	10.0	44.0	-9.0
FishBug	Brady	28	30	15.0	34.5	6.5
FishBug	Ciborowski	35	30	15.0	34.5	-0.5
FishBug	Grabas	18	10	15.0	11.5	-6.5
FishBug	Haynes/Neuderfer	23	24	15.0	27.6	4.6
FishBug	Lamberti	1	None	15.0	0.0	-1.0
FishBug	Uzarski	53	40	25.0	50.0	-3.0
Veg	Albert	51	35	15.0	40.25	-10.75
Veg	Ciborowski	34	30	15.0	34.5	0.5
Veg	Danz	25	30	15.0	34.5	9.5
Veg	Grabas	17	10	15.0	11.5	-5.5
Veg	Wilcox	23	24	15.0	27.6	4.6

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Figure 9. Regional sampling team status table, sampling capacity, and assigned sites.

Filter sites

The filter sites tool allows users to select subsets of sites with arbitrarily complex set membership rules, base on the tags applied to the sites (Figure 10). A single filtering step may select sites with either all of or at least one of a particular set of tags, and without any of another set of tags. For selection criteria not easily represented in a single step, multiple filtering steps may be chained together with addition, subtraction, or intersection operations. Site filtering can be used to restrict the sites accessed with the next / previous links elsewhere in the web tool to a particular subset, greatly speeding up the process of reviewing sites.

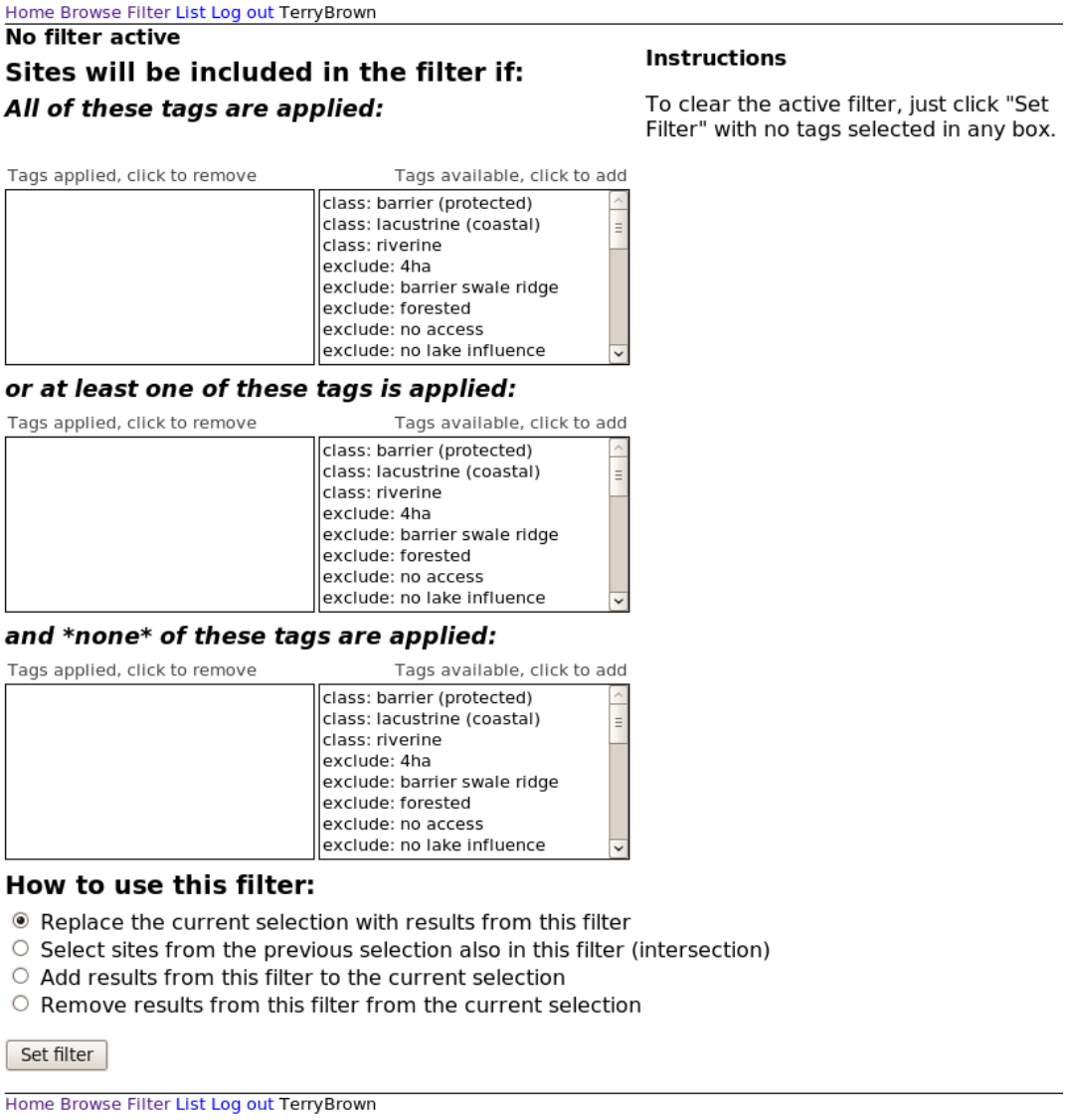

Figure 10. Filter tool part of the site selection system.

Site Selection in Practice

Regional team leaders and their staff each worked through all of the sites in their zone using the site selection tool. It was necessary for all sites to be evaluated for selection/rejection prior to sites being randomized into panels to preserve the validity of the statistical design. Thus all 2768 sites (Figure 11) were scrutinized multiple times by multiple people to ensure adherence to the site rejection rules.

Individuals primarily responsible for site selection/rejection by regional field team:
Western Great Lakes Valerie Brady/Gerald Niemi

Central Great Lakes (US side)	Don Uzarski/Carl Ruetz/Robert Howe/Tom Gehring/Matt Cooper
Central Great Lakes (CA side)	Jan Ciborowski/Joseph Gathman/Ryan Archer/Gerald Niemi
Eastern Great Lakes (US side)	Doug Wilcox/ Brad Mudrzynski/Chris Norment
Eastern Great Lakes (CA side)	Jan Ciborowski/Joseph Gathman/Greg Grabas/Ryan Archer

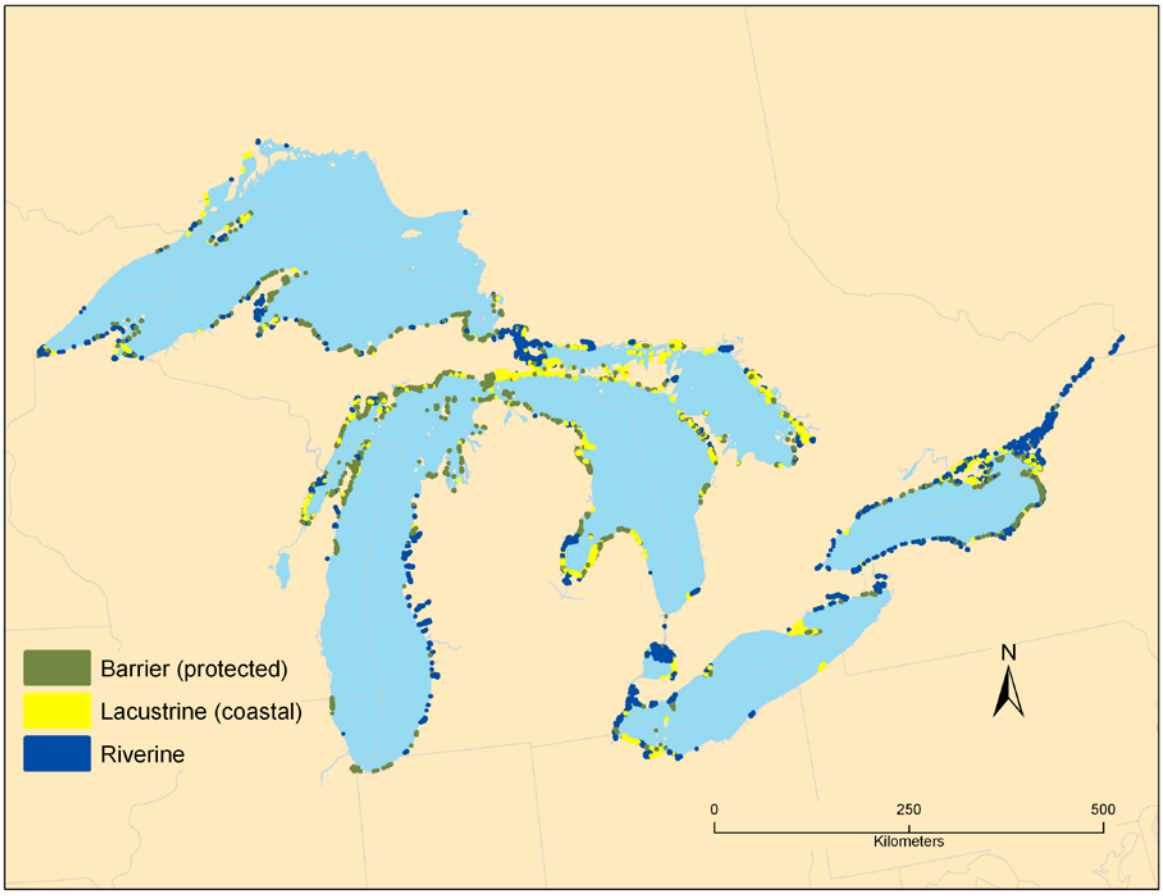

Figure 11. All 2768 wetland polygons in the original GLCWC wetland polygon layer, color-coded by wetland type.

Many sites were rejected because they were below the 4 ha cutoff, with lesser numbers rejected because of lack of lake connection or influence, and even fewer sites rejected because of access issues (Table 4). The result was 1039 sites selected for sampling over the next 5 years (Figure 12). All rejected sites were subjected to extra scrutiny by the QA managers (Brady and Cooper) to ensure that site rejection rules were being applied consistently across the basin. When inconsistencies were noted, regional team leaders were asked to re-examine the sites in question and either accept the sites back into the sampling pool or provide additional justification for site rejection. Only a few dozen instances of inconsistent site rejections were found, and most were easily rectified.

Table 4. Site exclusion reasons and counts. Many sites had multiple reasons for exclusion.

Exclusion	Count
< 4 ha	939
Barrier ridge swale	151
Forested	108
No access	132
No lake influence	4
Not connected	411
No wetland	14
St. Lawrence Seaway	243

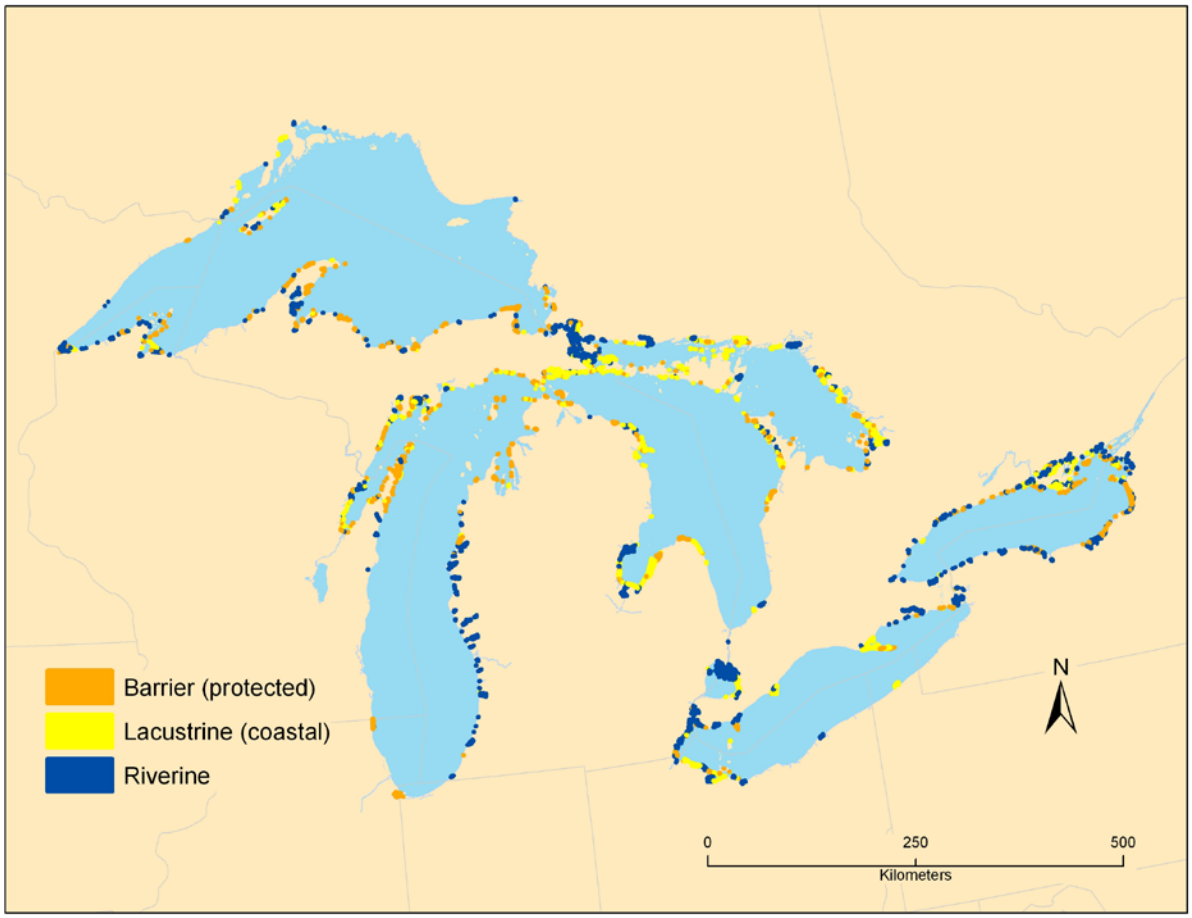

Figure 12. 1039 wetland polygons selected for sampling over the 5 year project, color-coded by wetland type. Note the profound interaction of lake and wetland type.

Once site selection was completed by the regional team leaders, Dr. Terry Brown randomized the sites into panels (sampling years, see previous section), resulting in approximately 208 sites to be sampled per year (Figure 13). Some regional team leaders did not feel that they could get their crews to island sites in the first sampling year because of the logistical difficulties on top of the rigors and logistics of dealing with the first field season. Thus, these teams swapped out island sites into future years for sites of the same type (barrier-protected, lacustrine, or riverine) from the same region of the lake. This will allow island sites to be dealt with in the future without simple "skipping" them, giving teams the time they need to work out sampling logistics in the first year, and finalize safe travel to islands in future years. This will also help to optimize use of field travel funds since access to some islands may require chartering of larger boats, necessitating sampling of all sites on such islands in a single field season.

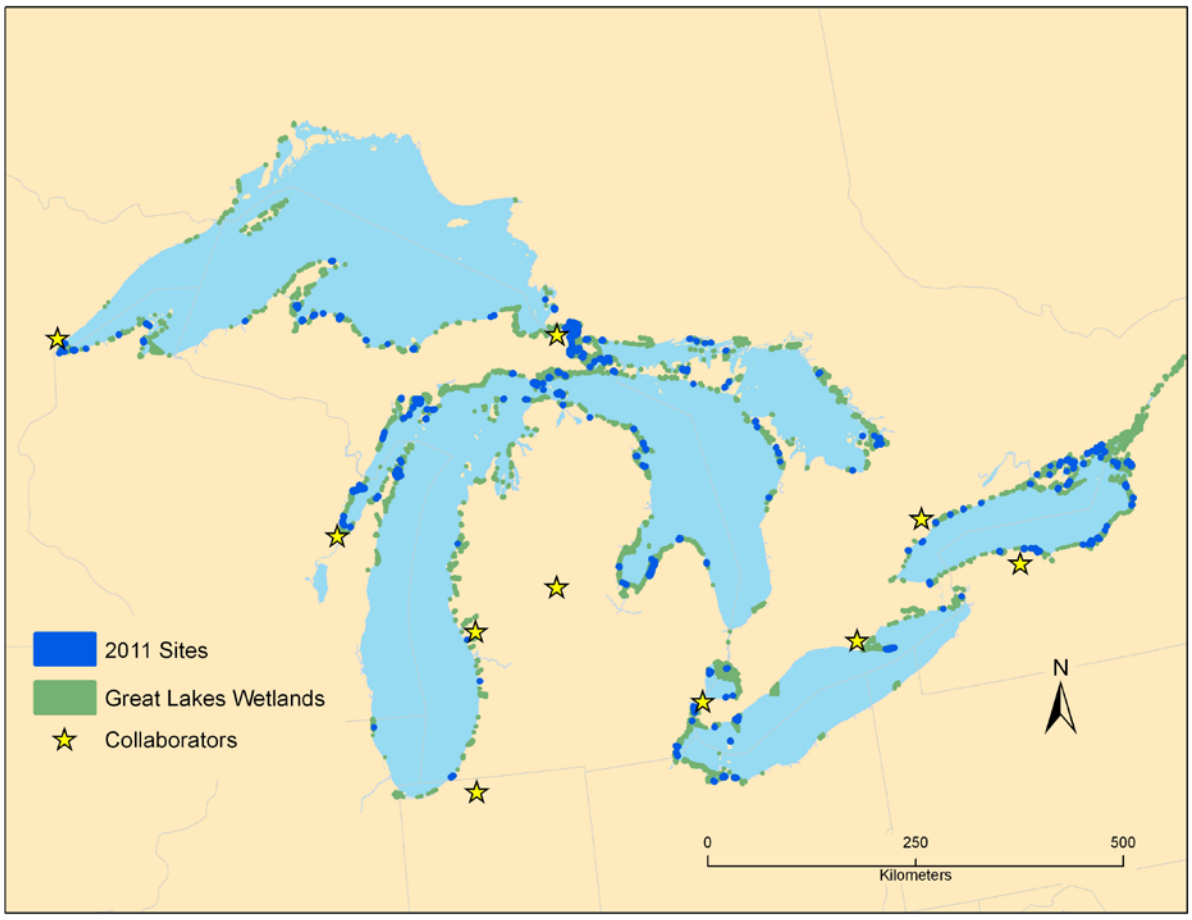

Figure 13. Wetland polygons selected for sampling in 2011, along with location of field crew bases of operation.

As has been previously noted, wetlands have a "clustered" distribution around the Great Lakes due to geological differences. Several teams ended up with fewer sites than they had the capacity to handle,

while other teams number of sites exceeded sampling capacity. Within reason, teams with excess sampling capacity were asked to expand their sampling boundaries to assist neighboring over-capacity teams to maximize the number of wetlands that will be sampled. The site selection and site status tools were used to make these swaps. The final distribution of 2011 sites by teams is shown in Figure 14. Note that all sites will be sampled for birds and amphibians, but some additional sites will be sampled by bird and amphibian crews because they have greater sampling. Sites that will only be sampled for birds and amphibians are marked separately.

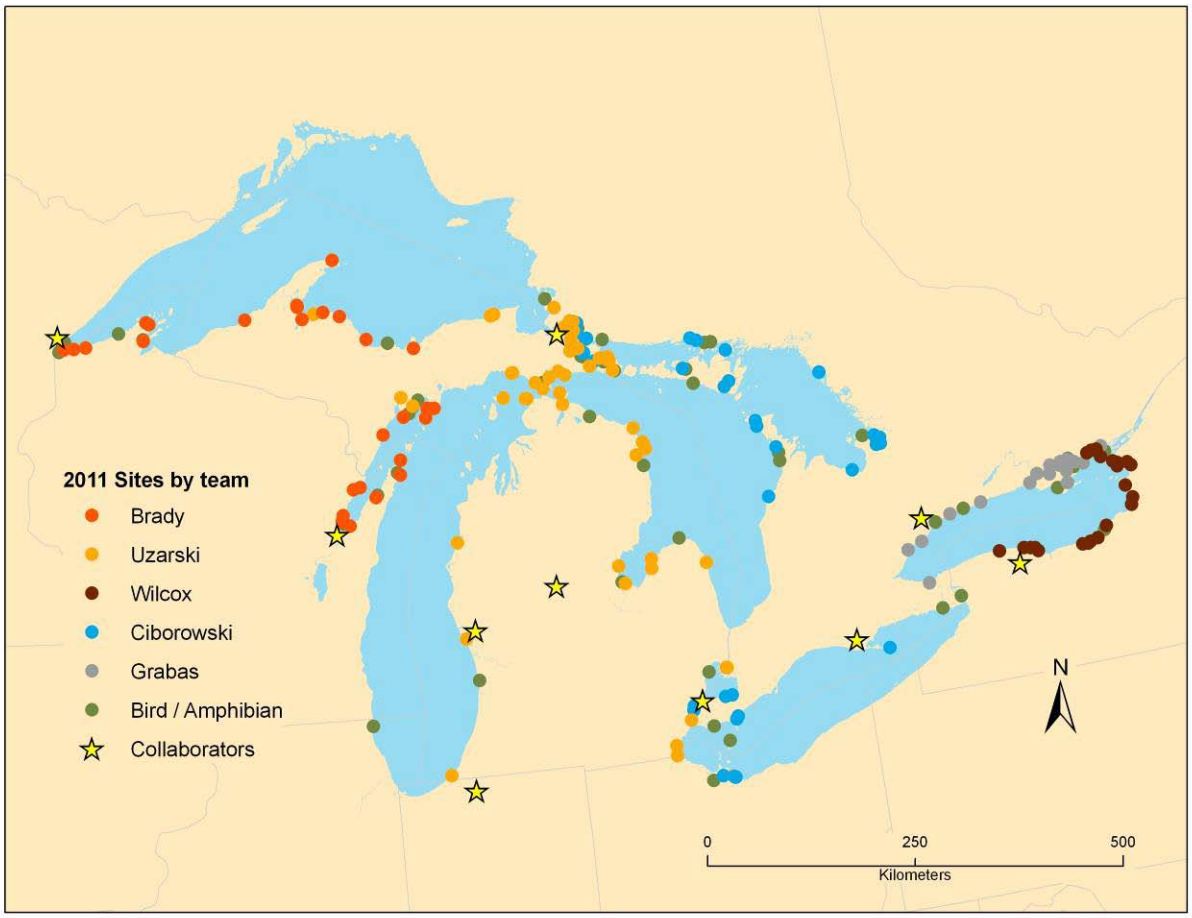

Figure 14. Wetland polygons being sampled in 2011, color-coded by regional team leader. Sites that will only be sampled for birds and amphibians (due to their greater sampling capacity) are shown in green. Field crew bases of operation are also shown.

Regional teams are now in the process of determining an optimal travel schedule that moves from south to north, following the phenology, and minimizes travel in order to maximize efficiency and conserve resources. Teams are making use of the site map tool to determine access points for each wetland.

WATER QUALITY

Water quality efforts for this reporting period have focused on: WQ sample point determination within wetlands; sampling protocols; field parameters and instrumentation needs; parameters to be measured in the field; parameters to be sent to laboratories; development of detailed Standard Operating Procedures (SOPs) for training of field crews; and the creation and approval of a comprehensive Quality Assurance Project Plan (QAPP).

WQ sampling points

Criteria were established for selecting water sampling points within each wetland site, which group would perform the WQ measurements, and whether samples would be discrete or composites from several locations within a specific location. Discrete samples, based on up to three pooled samples, will be collected from vegetation zones and located adjacent to fish and macroinvertebrate sites. Fish/invertebrate field crew members will perform the sampling and field measurements after receiving proper training.

Parameters

Critical (i.e. "mandatory"), Recommended, and Supplementary sets of field and laboratory water quality parameters and their analysis protocols were established based on the previous GLCWC project (Uzarski et al. 2008), contemporaneous Great Lakes-scale surveys (i.e. GLEI [Morrice et al. 2008; Danz et al. 2007; Reavie et al. 2005]), and EPA's new National wetland condition assessment (NWCA: www.water.epa.gov/type/wetlands/assessment/survey/index.cfm), which is expected to begin in 2011. Protocols were based on those recently developed for the National Park Service's (NPS) Vital Signs Monitoring Program developed by NRRI for the Great Lakes Network of the NPS (Elias et al. 2008). The QAPP now includes the following categories with detailed information for each:

Critical:
- Field: temperature, dissolved oxygen, pH, specific conductivity
- Lab: alkalinity, turbidity, soluble reactive phosphorus (SRP), [nitrate+nitrite]-nitrogen, ammonium-nitrogen, chlorophyll-a

Recommended:
- Field: transparency tube clarity
- Lab: total nitrogen (TN), total phosphorus (TP), chloride, color

Supplementary:
- Field: oxidation-reduction potential (redox), *in situ* chlorophyll fluorescence

- Lab: Sediment percent organic matter

Regional team needs

Determining the capabilities of each field team in terms of prior water quality expertise and instrumentation is well under way. Regional team leaders are currently making decisions regarding field instrumentation and sampling equipment and supplies purchases in coordination with recommendations by Cooper, Brady, Axler, and Uzarski.

A few water quality analyses and initial sample splitting, processing, and packaging will be performed during field training. Subsamples for nutrients will be chilled or frozen and shipped to the "regional" laboratories for analysis (see QAPP for details). Detailed water collection and field measurement SOPs were prepared and will be demonstrated during field training sessions later this spring.

Water Quality portion of the Quality Assurance Project Plan

The QAPP for the project included measurement protocols, recommendations for field instruments and water sampling supplies, and logistical recommendations to achieve QA/QC requirements that conformed to EPA-EMAP, EPA- National Wetland Assessment (new), USGS-NWQA, National Park Service- Great Lakes Network Vital Signs Monitoring Program, and the previous Great Lakes Coastal Wetlands Consortium (GLCWC) and Great Lakes Environmental Indicators (GLEI) projects. The minimum detection limits and Data Quality Objectives (DQO) also conform to the EPA-Clean Water Act (NPDES) requirements for field and lab measurements and, therefore, to the Great Lakes State Lab certification requirements.

TEAM REPORTS

Western Regional Team: Jerry Niemi (Birds and Amphibians), Valerie Brady and Lucinda Johnson (Fish and Macroinvertebrates), and Nicholas Danz (Vegetation)

Site selection

Site selection consisted of carefully assessment of all the sites assigned to our group with the site selection tool. All sites were scrutinized by a bird/amphibian crew chief, a fish/bug crew chief, and the co-PI (Brady). Sites were evaluated for their size, connectivity to a Great Lake or connecting channel, probable lake/channel influence, and safe access. Small sites (< 4 ha) were evaluated for their potential to be combined with a nearby site, while very large or complex sites of many multiple polygons were evaluated for their need to be split into more than 1 site. A number of sites were rejected because they were not connected to the lake or had no lake influence. There were much smaller numbers of sites in our associated area that needed to be combined or split.

After all sites were accepted, rejected, or modified as needed, the sites were put through the randomization process and the list was then truncated to match the combined sampling ability of teams across the basin. This process resulted in our team ending up with fewer sites than our sampling capacity, while the neighboring team (Uzarski group) had more sites than they have resources to sample. Thus, we traded 3 sites along the St. Marys River to the Uzarski group (since they are physically closer to those sites) and then added a number of sites along the Michigan portion of northern Lake Michigan and southern Lake Superior so that more sites could be sampled in total in 2011. Bird and amphibian crews will be traveling even further, sampling sites along Lake Huron to assist the Grabas group.

We also determined that the logistics of sampling island sites in this first year, along with all of the new start-up work and training field crews, was overly ambitious. Thus, we swapped island sites into future sampling years, moving non-island sites of the same wetland type and from the same general area of the lake into 2011 to be sampled. The birds & amphibians group will be visiting 53 sites. The site locations range from the Duluth-Superior harbor area eastward along the south shore of Lake Superior to the eastern end of the Upper Peninsula of Michigan. The fish/macroinvertebrate/ vegetation crews ended up with 33 sites to sample in 2011. These consist of 9 barrier-protected wetlands, 8 lacustrine wetlands, and 16 riverine wetlands. Included in the selection are 3 benchmark sites to be sampled this year (plus 2 extra benchmark sites for birds and amphibians). Benchmark sites were selected because they are of interest for restoration potential. All three of our sites, located in the St. Louis River Estuary, are in some stage of planning for restoration work. Restoration activities for the sites are being coordinated by the Minnesota Pollution Control Agency and the US Fish and Wildlife Service, with many collaborators from multiple agencies and university research groups.

QAPPs and SOPs

In January, 2011, Brady, Danz, Niemi, Johnson, Axler, and Robert Hell (assistant fish/invertebrate field crew chief) met with other coastal monitoring co-PIs and field crew chiefs in Detroit, MI. Sampling issues were discussed and addressed, including work on the QAPP and SOPs for each taxonomic group and WQ sampling. Further work after the Detroit meeting, primarily through email interchange and document editing, finalized the QAPP and SOPs. Field data sheets have also been finalized.

Fieldwork Preparation

The University of Minnesota International Animal Care and Use Committee application was submitted and reviewed in March. Permit approval is pending minor staff Occupational Health and Safety requests to complete online training tutorials and provide updated vaccination records. A Minnesota scientific collection permit was approved, with Ministry of Natural Resources Canada, Wisconsin, Michigan, and Ohio applications pending a final site list.

Maintenance has been scheduled for boats and tow vehicles. Additional Fyke nets where ordered in March, with inventory of all remaining equipment in progress. Field and Laboratory supplies are scheduled to be in place by mid-May.

Based on the approved QAPP, modifications that encompass new equipment and procedures are being incorporated into existing SOP documentation. Specific field and laboratory data entry efforts are being made compatible with an existing web-based program.

The field season for amphibians will begin on Friday, April 29, 2011. Crews will be trained in conducting the survey, travel procedures and field safety. Sunday, May 1 crews will begin the first sample period for amphibians. The start date for bird crew training is Monday, May 23 and will last through the morning of May 26. Surveys will begin on Friday, May 27.

Field efforts based out of NRRI to complete the fish/macroinvertebrate/vegetation sampling will consist of approximately 10 crew members. NRRI currently has staff of 4 full-time appointments to act as crew leaders for the fish and macroinvertebrate crew, coordinated by Dan Breneman. Vegetation sampling efforts will be coordinated by Dr. Nicholas Danz, University of Wisconsin Superior.

Position descriptions have been completed and are awaiting a response from a candidate pool. We are anticipating the hiring of 2 crew leaders specifically for vegetation surveys. Other full-time temporary staff for the field season will consist of 4 individuals with boating experience and aquatic science backgrounds. We have received verbal acceptance from two well-qualified candidates.

Staff will begin University safety training in June, with local field trials scheduled for the week of June 5th. Fish identification testing, final macroinvertebrate field training, and vegetation field training are scheduled to begin on June 13th in Duluth.

Coordination of Field Activities

Our group is coordinating with a separate monitoring program (Wisconsin DNR and Lake Superior Research Institute, funded by GLRI) that will also survey coastal wetland vegetation, macroinvertebrates, birds, amphibians, and water quality. They will be using GLCWC protocols, resulting in very similar datasets, and they will be included in our field training workshops to help insure consistency of data collection and allow data sharing.

Central Basin Regional Team: Don Uzarski, Dennis Albert (Vegetation), Thomas Gehring and Robert Howe (Birds and Amphibians), Carl Reutz (Fish), and Matt Cooper (Macroinvertebrates)

Site Selection

Site selection was completed by first assessing all the wetlands in the research area with the selection tool using Google Earth and Bing imagery. The rejection or acceptance of sites was based on both connectivity to the Great Lakes and size (measured by area). Sites with surface water connection measuring larger than 4 ha were deemed acceptable for this study. Once all sites had been analyzed they were put into the selection tool. A total of 40 sites were randomly selected for fish, invertebrates and vegetation. The site selection consisted of 16 riverine, 18 lacustrine, and 6 barrier wetlands to be sampled. Sites throughout Michigan were selected and range in location from southeastern Lake Superior, northwest lake Michigan (Big Bay de noc area), drown river mouth wetlands on the east coast of Lake Michigan, northern Lake Huron into the St. Mary's river and the entire eastern shoreline of lake Huron have been selected. Several sites have also been selected in Lake St. Clare and the eastern portion of Lake Erie.

The central basin sites have been broken into four groups for the ease of sampling. Sixteen sites will be sampled by Central Michigan University (CMU), 8 by Grand Valley State University (GVSU), 8 by Lake Superior State University (LSSU), and 8 by University of Norte dame (UND).

The CMU crew will handle 16 sites in the Upper Peninsula of Michigan, and Northern Lake Huron. The GVSU crew will sample at least eight coastal wetland sites in Michigan's Lower Peninsula. The LSSU crew will sample coastal wetland sites in the eastern end of Lake Superior and throughout the St. Marys River. The UND crew will sample at least eight coastal wetland sites, one in Illinois, and at least seven in Michigan's Upper Peninsula. The number of Indiana-Illinois sites originally planned was substantially reduced during the site evaluation process because the overwhelming majority of coastal wetlands in this region were found to no longer connect to Lake Michigan. There are currently three wetlands in Illinois and Indiana that meet the criteria for sampling and one of these will be sampled in 2011. The UND team will, therefore, assist the rest of the central Great Lakes Basin team by sampling along the Michigan shoreline of Lakes Michigan and Huron.

CMU has selected 4 benchmark sites. All crews will sample one benchmark site located close to the areas in which they are sampling. To select these benchmark sites we have contacted the Michigan Department of Natural Resources as well as the Nature Conservancy. They have given a list of sites they have current and ongoing coastal wetland restoration projects in the region for us to choose from.

QAPPs and SOPs

Lamberti and Cooper were heavily involved in drafting and revising the QAPP and SOPs for fish, invertebrates, and water quality. Relevant portions have been adopted for the upcoming sampling efforts by the UND crew. Ruetz provided feedback on early drafts of SOPs for fish and invertebrates.

Fieldwork Preparation

The CMU crew has obtained International Animal Care and Use Committee (IACUC) approval for the project. We have received our permit from the MDNR as of April 11, 2011. Two full time technicians (Jessica Sherman and Thomas Clement) have been hired as field leaders and lab managers. Purchasing of supplies is almost complete and equipment purchase orders have been sent out and bids have been received. Summer field crews have been hired and have been trained in CPR and first aid. There is a field training workshop scheduled for May 24th and 25th that the CMU crew will be attending. A tentative calendar for sampling dates for specific sites is in progress. The bird and amphibian crew has started sampling as of April 1st. They have been tested for identification of frog and bird calls and have been trained in proper field procedures.

The GVSU team has applied for IACUC approval for fish sampling on February 2, 2011. Final approval from GVSU's IACUC is pending but is expected in late April. Ruetz received a scientific collector's permit for fish from the Michigan Department of Natural Resources on February 28, 2011. However, this will likely need to be modified because the GVSU crew will be sampling coastal wetlands outside of the Lake Michigan basin based on the random site selection for 2011 field sampling. Jessica Comben was hired as the crew leader for the GVSU field sampling crew. The GVSU crew also will have two other technicians; however, those individuals have not been selected at this time. Equipment and supplies have not been purchased to date but will begin shortly. No major equipment (e.g., boats or YSI sonde) will need to be purchased by the GVSU crew for the upcoming field season. The GVSU crew will be attending the field training and testing May 24th and 25th.

The LSSU crew has received IACUC approval from LSSU's IACUC committee (#F11S01) for fish collection and handling from 5/1/2011-5/1/2016. A fish collector's permit for Michigan was filed in late March and a permit for Ontario water's was submitted in early April. The LSSU field crew has been hired. Amanda Chambers will be the crew leader and Jake Riley and Ellis Raatz will be field assistants. Equipment and supplies have not been purchased to date but will begin shortly. Two water quality meters (Hydrolabs) were sent to the factory recently for annual inspections and calibration.

The UND team (Cooper and Lamberti) have applied for IACUC approval by UND's Animal Care and Use Committee for fish sampling. Final approval by the committee was granted on April 19, 2011. Matt Cooper and Jessica Koshiara will be the crew leaders for the UND field sampling crew. The UND crew also will have two other technicians, Dayna Smith and K.G. Koch during the 2011 sampling season. Equipment and supplies have not been purchased to date but purchasing will begin shortly. Major equipment purchases include a jon boat and at least one water quality meter.

Eastern U.S. Regional Team: Douglas Wilcox (Vegetation), Chris Norment (Birds and Amphibians), James Haynes (Fish), and Gary Neuderfer (Macroinvertebrates)

Site Selection

The regional team leader and field team Leader reviewed the shoreline of eastern Lake Erie and the U.S. side of Lake Ontario multiple times in Google Earth, BingMaps, WorldWind, and MapQuest, as well as reviewing low altitude aerial videos collected by the regional team leader in the past, and identified 108 potential study sites that were included in the site randomization process to be sampled over the five years of the study.

The regional team leader, Field Team Leader, and two graduate students on the field team completed a field survey of all 2011 study sites on April 11-12 to assess hydrologic connectivity and site access.

The Wilcox team has responsibility for sampling wetlands along the U.S. shore of Lake Ontario and the eastern portion of Lake Erie (21 sites in 2011). In addition, support for other teams will be provided by sampling all but birds/amphibians at four Canadian sites in northeastern Lake Ontario for the Grabas team (5195 Collins Creek, 5531 Little Cataraqui, 5719 Parrot Bay 2, and 5855 Sand Bay 1). Nineteen sites in the U.S. tentatively will be sampled based on priority listing. Six barrier sites to be sampled are 29 Long Pond, 62 Maxwell Bay, 130 Black Pond, 7051 South Pond 2, 7027 East Sodus Bay, and 27 Payne Beach. Two lacustrine sites to be sampled are 186 Long Carry Marsh and 7054 North Isthmus. Eleven riverine sites to be sampled are 187 Fox Creek, 10 Johnson Creek, 124 Blind Creek, 92 18-Mile Creek, 16 Sandy Creek, 66 East Bay/Mudge Creek, 23 East Creek, 163 Perch River, 76 Red Creek, 164 Guffin Creek, and 197 Mud Bay 1.

There are questions regarding the ability to sample 7051 South Pond 2. Hydrologic connection with Lake Ontario is not evident in any of the photographs we have examined, as a road bed seems to isolate the site completely. We were unable to gain access to the road to look for a hidden culvert because it is a private road through an RV camping facility that is closed until May 1. Previous attempts to sample this wetland in other studies were unsuccessful because the landowner (sole access point) was not cooperative. A site visit to 163 Perch River resulted in the conclusion that it should split into two sites; riverine Perch River and lacustrine Perch River Mouth.

Three of the sites on the 2011 assigned listing will not be sampled. A field visit to 88 McIntyre Bluff on April 11 revealed that it lacks hydrologic connection with Lake Ontario. The large barrier beach, mostly composed of cobble, showed no signs of breaching; water levels in the wetland behind the barrier were noticeably higher than lake levels. In an effort to avoid inefficient field activities, sampling of 1941 Thompson Bay at far-distant Presque Isle on Lake Erie will be delayed until 2012 when another nearby site, 1844 Presque Isle Bay, is scheduled to be sampled. Even after dropping two sites higher in the priority listing, 1938 Beaver Island remained below the cut-off line for sampling.

Two benchmark sites were selected based on recommendations from The Nature Conservancy. TNC is planning acquisition of lands surrounding the wetlands of 63 Third Creek and would like an early assessment of the wetland. They are planning restoration activities in 7024 Floodwood Pond and

would like a pre-restoration assessment to be completed. We anticipate follow-up sampling at both sites in future years when they are assigned by the randomization process.

QAPPs and SOPs

Members of the team provided input on preparing relevant portions of the approved QAPP, developing the SOPs for field work, and developing field data sheets.

Fieldwork Preparation

Members of the bird/amphibian crew completed training in early April at a session held in Port Rowan, Ontario. The fish/invertebrate crew has been scheduled for training at nearby Lake Ontario sites during the week of May 16, and the vegetation crew will train as similar sites during the week of June 13. The regional team leader, Co-PIs, field team leader, and field crew members will participate in all appropriate training sessions and tested as required.

All team members have been recruited, and the field team leader has been hired. The field team leader is preparing field schedules and ordering equipment and supplies. Four graduate students to take the lead on field data collection for vegetation, fish, invertebrates, and birds/amphibians have been selected and enrolled. Four field assistants to help in data collection have been identified.

An IACUC was submitted and approved, as has the necessary permit for fish collection in New York. Permits for Pennsylvania and Ontario must be obtained.

Eastern Canadian Shorelines Regional Team: **Joseph Gathman (Vegetation), Doug Tozer and Greg Grabas (Birds and Amphibians), Jan Ciborowski (Fish and Macrinvertebrates)**

Site Selection

The Regional Team Leader and co-PIs reviewed the Canadian shorelines of Lakes Huron, St. Clare, and Erie as well as the U.S. Shoreline of western Lake Erie multiple times in Google Earth, BingMaps, WorldWind, and MapQuest and identified all potential study sites to be included in the site randomization process to be sampled over the five years of the study. Sites were evaluated for their size, connectivity to a Great Lake or connecting channel, probable lake/channel influence, and safe access. Small sites (< 4 ha) were evaluated for their potential to be combined with a nearby site, while very large or complex sites of many multiple polygons were evaluated for their need to be split into more than 1 site. A number of sites were rejected because they were not connected to the lake or had no lake influence.

A total of approximately 45 sampling sites will be visited by the various teams as have been identified by the site selection identifier maintained by NRRI. Visits to several sites have been traded off to

other teams (3 Lake Ontario sites to D. Wilcox (SUNY Brockport; US Lake Ontario team) and 3 northern Lake Huron sites to D. Waters (NRRI; US Lake Superior team)). Two benchmark sites on Lake Erie have been identified by Environment Canada as being of especial interest – Long Point and Hillman Marsh. Wetlands on lakes Ontario and Huron have not yet been identified. Apart from being priority study wetlands, these two locations will also serve as stressor endpoints, representing among the least disturbed (Long Point) and most degraded (Hillman Marsh) watersheds in the Lake Erie basin. The need for sampling such endpoint sites was identified in the original proposal as means of providing calibration data against which the sensitivity of the various bioindicators could be assessed.

QAPPs and SOPs

Most activity accomplished to date has related to reviewing and achieving consensus and compliance with QAPP and SOP requirements. All aspects have been vetted within our teams. An initial 2-day meeting with other project coPIs in Romulus MI has been supplemented with regular e-mail and telephone correspondence to review the suitability of sampling protocols included in the QAPP and SOPs.

Fieldwork Preparations

Field personnel have been identified and offered positions as indicated below. The bird and amphibian teams have started work and have received preliminary training by BSC. Other personnel will begin their work terms through May and will take part in field training and certification at camps in May (Saginaw Bay, MI for fish, invertebrates, water chemistry, general orientation) or June (Erie, PA for plants and/or Duluth MN for all taxa).

Birds and amphibians will be sampled by personnel led by Doug Tozer (Bird Studies Canada). Other variables will be assessed by composite field teams recruited and coordinated by Greg Grabas (Canadian Wildlife Service; Lake Ontario) and by Jan Ciborowski (University of Windsor) and Joseph Gathman (UW-RF) (all other sites).

Canadian Wildlife Service:

Name	Role	Expertise	Training
Greg Grabas	field team leader	I, P, W	Brockport, NY (to follow)
Paul Watton	field assistant	I, P, W	Brockport, NY (to follow)
John Brett	field assistant	I, P, W	Brockport, NY (to follow)

Daniel R-Wojcik	field/plant leader	F, I, P, W	Brockport, NY (to follow)
Ashley Favaro	field assistant	F, W	Brockport, NY (to follow)
Denby Sadler	field assistant	F, I, W	Brockport, NY (to follow)

University of Windsor & University of Wisconsin – River Falls :

Name	Role	Expertise	Training
Joseph Gathman	field team leader	F,I,P,W	Saginaw, MI (to follow)
Janice Gilbert	plant team leader	P,F,W	Erie, PA (to follow)
Jan Ciborowski	field assistant	F,I,P,W	Duluth, MN (to follow)
Rebekah Davis	field assistant	F,I,P,W	Saginaw, MI (to follow)
Justin Landry	field assistant	F,I,P,W	Saginaw, MI (to follow)
Curtis Makish	field assistant	F,I,P.W	Saginaw, MI (to follow)

All animal care permits have been approved, received and forwarded to University of Central Michigan (needed only for universities of Windsor and Wisconsin-River Falls). Fish collection permits and field work permits are being requested for our team and on behalf of the NRRI and SUNY fish and invertebrate field teams (Breneman and Wilcox are contact individuals). Also, we are in the process of ordering new nets and meters that comply with the GLWMP QAPP stipulations.

ASSESSMENT AND OVERSIGHT

The project QAPP was approved and signed on March 21, 2011. Regional team leaders, other co-PIs, field crew chiefs, and technical assistants collectively spent hundreds of hours working on the QAPP, SOPs, and field data sheets in preparation for the first field season. Sampling methods in the QAPP closely follow those from the GLCWC. In those instances where GLCWC protocols had not yet been finalized, PIs worked together to establish the procedures and ensure consistency with GLCWC intent and, where possible, other sampling protocols that have been used historically.

Regional team leaders and co-PIs have maintained close communication throughout the first few months of this project. All major project members met in Detroit in mid-January to discuss all project methodological details, ensure that everyone understood the goals and objectives, and to make sure that all QA requirements and reporting requirements were known and understood by everyone. This 2-day meeting ensured that the QAPP, SOPs, and field data form work was well underway by the end of the meeting.

Since the meeting, regional team leaders and co-PIs have held several conference calls regarding site selection and field work preparation. In addition, email lists have been formed to allow all project participants to easily keep in contact with one another and ask questions of the project leadership or the group as a whole. Thousands of emails have been generated over the past several months, helping to ensure that all project personnel remain in close contact.

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