



Clough Island: A Summary of Inventory and Monitoring

Wisconsin's Natural Heritage Inventory Program
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Cover Photo:

Clough Island, looking north toward Lake Superior. Richard Hamilton Smith.

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Introduction

Purpose and Objectives

This report is intended to be used as a source of information for existing inventory and monitoring projects conducted on Clough Island. Regional ecological context and a brief history of the island are also provided for background and context. This summary is intended to help guide the design of future research, monitoring, and management on the island. Taxa-specific data and interpretation in this report are limited to those data collected by NHI. For methods, data, and interpretation of inventory and monitoring conducted by partners, please see their corresponding reports.

Partners and Projects

Inventory and monitoring on Clough Island has been conducted collaboratively by several organizations. A list of the partners and projects who have conducted work in 2013 and 2014 is presented in Table 1; for a summary of work by taxa, see Table 2.

A detailed summary of these efforts is presented in separate reports by each partner organization. Please refer to the appropriate organization report for information on the background, methods, results, and discussion of each project.

Table 1. Partners Conducting Biological Inventory and Monitoring on Clough Island 2013-2014.

Partner Organization	Project Description	Target Taxa/Communities
WDNR Natural Heritage Inventory	Coarse-level biotic inventory and rapid ecological assessment to identify and evaluate ecologically important areas, document rare species occurrences, and document high quality natural communities to inform WDNR master planning	Natural communities, rare plants, breeding birds (marsh, forest, & grassland), migratory birds, small mammals, herptiles
WDNR Waters	Wetland/aquatic plant communities and aquatic macroinvertebrate monitoring and quality assessment	Wetland/aquatic plant communities and aquatic macroinvertebrates
Natural Resources Research Institute (NRRI)	Great Lakes Coastal Wetland Monitoring	Wetland/aquatic plant communities, aquatic macroinvertebrates, fishes, wetland birds, autumn migrating birds, water quality
Leaning Pine Natives	Identify and map invasive plant species	Invasive plant species on mainland

Table 2. Surveys Conducted on Clough Island 2013-2014 by survey type.

Survey Type	Methods	Partner Organization
Natural Communities	Meander surveys, plant species lists, GIS boundaries, condition, threats	WDNR-NHI
Great Lakes Coastal Wetlands Monitoring	GLCWC protocol	NRRI
Rare Plants	Meander surveys	WDNR-NHI
Invasive Plants	Meander surveys	Leaning Pine Natives
Birds		
Marsh Birds	GLCWC timed point counts with broadcast caller	WDNR-NHI, NRRI
Breeding Land Birds (forest passerines and grassland/shrubland)	Timed point counts	WDNR-NHI
Migratory Birds	Timed point counts	WDNR-NHI
Small Mammals	Transects w/ Sherman Traps	WDNR-NHI (contracted to Northland College)
Herptiles	Visual encounter surveys, frog calling surveys	WDNR-Waters
Aquatic Invertebrates	EPA protocol (WDNR) GLCWC protocol (NRRI)	WDNR-Waters, NRRI

Wisconsin Natural Heritage Inventory Rapid Ecological Assessment

From 2013 to 2014, Wisconsin Natural Heritage Inventory (NHI) conducted a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities in order to establish baseline biotic inventory to inform WDNR master planning. This effort focused on assessing areas of potential habitat for rare species and identifying natural community management opportunities.

The resulting report, “Rapid Ecological Assessment for the St. Louis River Planning Group” (SLRPG), is intended to be used as a source of information for developing a new master plan for the property group that includes the St. Louis and Red Rivers Streambank Protection Area (including Clough Island) and Pokegama Carnegie Wetlands State Natural Area.

The NHI program is part of the Wisconsin DNR’s Bureau of Natural Heritage Conservation and a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see www.NatureServe.org for more information), coordinates the network.

Natural heritage programs track certain elements of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The NHI Working List

(WDNR 2011) contains the elements tracked in Wisconsin. They include endangered, threatened, and special concern plants and animals, as well as the natural community types recognized by NHI. The NHI Working List is periodically updated to reflect new information about the rarity and distribution of the state's plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR website (*Wisconsin Natural Heritage Working List*).

The Wisconsin NHI program uses standard methods for biotic inventory. Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Prior to this project, NHI data for Clough Island were limited to Biotic Inventory of the St. Louis River Estuary and Associated Lands (Epstein 1997); and reports of specific taxa submitted by partners.

The most recent taxa-specific field surveys for the study area were conducted during 2013 and 2014. Surveys focused on documenting high quality natural communities, rare plants, breeding birds (terrestrial, marsh, forest raptors) and migratory birds, aquatic invertebrates, small mammals, and herptiles (Table 2).

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the SLRPG, key inventory considerations included the identification of Boreal Forests, migratory bird stopover sites, high-quality open wetlands, clay-lined springs and seeps, and the location of habitats that had the potential to support rare species. Private lands, including easements, surrounding the SLRPG were not surveyed.

Past Conservation Planning Efforts and Designations

Various large-scale research and planning efforts have identified Clough Island as being ecologically significant. Sites in the planning group have received numerous designations or have been discussed in other planning efforts.

Clough Island lies within several Conservation Planning designations for the St. Louis River estuary region. Explained in more detail below, they include:

- Lower St. Louis River Habitat Plan
- Wisconsin Wildlife Action Plan Conservation Opportunity Area (St. Louis River Estuaries Aquatic COA)
- WDNR Legacy Place (St. Louis Estuary and Pokegama Wetlands Legacy Place)
- The Nature Conservancy Great Lakes Ecoregion Conservation Plan (St. Louis River Estuary)
- Wisconsin Wetlands Association Wetland Gem Designation (St. Louis River Estuary Marshes)

Lower St. Louis River Habitat Plan

This plan was prepared to facilitate protection of the ecological diversity of the Lower St. Louis River (St. Louis River Citizen Action Committee 2002). Clough Island is included within the Project Area Boundary. The plan was the result of a comprehensive science-based conservation planning process and contains four elements:

1. A detailed and comprehensive synthesis of existing information.
2. An estuary-wide guide for resource management and conservation that would lead to adequate representation, function, and protection of ecological systems in the St. Louis River, so as to sustain biological productivity, native biodiversity, and ecological integrity.

3. A list of conservation and management objectives that reflects a consensus of the Committee.
4. A suite of specific, obtainable, prioritized conservation and management actions that address specific threats.

Wisconsin Wildlife Action Plan: Conservation Opportunity Area

Conservation Opportunity Areas (COA) are places in Wisconsin containing ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective. The Wisconsin Wildlife Action Plan (WAP; WDNR 2006a) identifies two Conservation Opportunity Areas (COA) within which SLRPG sites occur (see Appendix B for a map):

- **Pokegama-Nemadji Wetlands COA**, which includes Clough Island and the rest of the St. Louis and Red Rivers Streambank Protection Area, identified as having Continental Significance for being a Boreal Forest Transition and having extensive related communities, including Boreal Forest, Northern Dry-Mesic Forest, Northern Mesic Forest, and Great Lakes Savanna.
- **St. Louis River Estuaries Aquatic COA**, which includes the Emergent and Submergent Marshes of the Island as well as areas upstream within the St. Louis and Red Rivers Streambank Protection Area, noted as having State Significance for diverse aquatic communities.

Legacy Place

The Land Legacy Report (WDNR 2006b) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The following site was identified:

- **St. Louis Estuary and Pokegama Wetlands Legacy Place**, which includes Clough Island and the rest of the St. Louis and Red Rivers Streambank Protection Area.

This site is recognized for its wild character, large block of rough, deeply dissected, red clay landscape drained by the Red River, and extensive emergent marshes, open sedge meadows, forested wetlands, and uplands supporting aspen, pine, white spruce, birch, and fir. The area provides habitat for a very large number of diverse plant and animal species.

The Nature Conservancy's Great Lakes Ecoregion Conservation Plan

- **The St. Louis River Estuary** was noted as a priority conservation area in The Nature Conservancy conservation plan for the Great Lakes Ecoregion (The Nature Conservancy 2000).

Lake Superior National Estuarine Research Reserve (NERR)

The Lake Superior NERR is one of 28 areas across the United States designated for long-term research on coastal resources. The Lake Superior NERR is located along a river-to-lake gradient at the confluence of the St. Louis River and Lake Superior. The Reserve works in partnership to improve the understanding of Lake Superior freshwater estuaries and coastal resources and to address the issues affecting them through an integrated program of research, education, outreach, and stewardship. The Reserve is comprised exclusively of public lands and waters and contains ~16,000 acres of representative terrestrial and aquatic habitats. Because Clough Island was not under public ownership at the time the NERR boundaries were established, it was excluded from the Reserve. In 2012 the island was acquired by the Wisconsin DNR, and inclusion of the island within the NERR should be strongly considered in the future, as the island lies near the geographic center of the NERR and has very high potential for research and monitoring that could inform not only management of the island but the entire region.

Special Management Designations

Priority Navigable Waterways

Priority Navigable Waterways (PNWs) are a broad category of officially designated lakes and streams that includes ORWs and ERWs as well as Areas of Special Natural Resource Interest (ASNRI) waterways, and waterways that sustain breeding populations of trout, walleye, musky, or sturgeon.

- **St. Louis River** (including the area surrounding Clough Island) is designated as a **PNW Musky Area** and **PNW Sturgeon Area**.

Wisconsin's Impaired Waters (303d)

Section 303(d) of the federal Clean Water Act requires states to develop a list of impaired waters ("303(d) list"). The identification and listing of waters as impaired is one step in a continual process of waterbody classification, assessment, and management, the ultimate goal of which is to protect, restore, and maintain the full potential of each waterbody to the maximum extent possible.

- St. Louis River is an Area of Concern (AOC) that is listed for contaminated sediment (DDT and Dieldrin), contaminated fish tissue (mercury and PCBs), and chronic aquatic toxicity (PAHs and unspecified metals). A Total Maximum Daily Load (TMDL) has been developed for mercury.

Forest Certification

Forest Certification is established on all DNR-managed lands, including state parks, wildlife and fishery areas, and natural areas. Certified forests are recognized by the Forest Stewardship Council and the Sustainable Forestry Initiative as being responsibly managed (WDNR 2009). This certification emphasizes the state's commitment to responsibly managing and conserving its lands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

Regional Ecological Context

Text largely reproduced from Ecological Landscapes of Wisconsin (WDNR 2014).

Overview of Ecological Landscapes

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

Clough Island falls within the **Superior Coastal Plain Ecological Landscape** (Figure 1).

The Superior Coastal Plain is Wisconsin's northernmost Ecological Landscape, bordered on the north by southwestern Lake Superior and strongly influencing the local climate, resulting in cooler summers, warmer winters, and



Figure 1. Clough Island within Ecological Landscapes of Wisconsin.

greater precipitation compared to more inland locations (WDNR 2014). The major landform in this Ecological Landscape is a nearly level plain of lacustrine clays that slopes northward toward Lake Superior (WDNR 2014).

Historically this Ecological Landscape was almost entirely forested with a mixture of white pine (*Pinus strobus*), white spruce (*Picea glauca*), balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), trembling aspen (*Populus tremuloides*), and northern white-cedar (*Thuja occidentalis*) (WDNR 2014). The present coastal plain forest has been fragmented by agricultural use, and today approximately one-third of this landscape is non-forested. Aspen and birch forests occupy about 40% of the total land area, having increased in prominence over the boreal conifers (WDNR 2014).

Description of the Study Area

Location and Size

Clough Island is located in Douglas County, Wisconsin, and has a land area of approximately 358 acres. All acreages are based on fee simple ownership from DNR Facilities and Lands GIS records as of November 2013; acreage may not include some permanent water bodies.

Physical Environment

Land Type Associations

This section is reproduced in part from Ecological Landscapes of Wisconsin (WDNR 2014).

Land Type Associations (LTAs) of Wisconsin represent a further definition of the NHFEU (Cleland et al. 1997). The NHFEU is a classification system that divides landscapes into ecologically significant regions at multiple scales. The study area is located entirely within the Douglas Lake-modified Till Plain LTA. (Figure 3).

In general, LTAs nest within Ecological Landscapes, although there is imperfect alignment between the two classification systems. The Douglas Lake-modified Till Plain LTA, sometimes also called the Superior Clay Plain, lies within the Superior Coastal Plain Ecological Landscape. The characteristic landform pattern of the Douglas Lake-modified Till Plain LTA is undulating modified lacustrine moraine with deep v-shaped ravines. Soils are predominantly somewhat poorly drained clay over calcareous clay till or loamy lacustrine.

The red lacustrine clay so characteristic of the study area derives from a complex glacial history of a repeated series of glacial advances, retreats, and glacial lakes. The current landscape resulted from deposition of lacustrine clay in a large glacial lake, reddish in color from ground-up Precambrian sandstone, of which un-eroded outcrops can be seen on the Bayfield Peninsula and Apostle Islands. This clay deposition was followed by a glacial readvance approximately 11,000 – 9,500 years ago, during which ice sheets scraped up the clay and spread it over land in a process sometimes compared with spreading peanut butter on a piece of bread. The ice retreated once again, forming Glacial Lake Duluth, which deposited additional lacustrine sediment over the clayey till. The resulting clay plain has been bisected by the Red River and numerous smaller tributaries, creating numerous deeply incised ravines.

Finally, a process known as differential crustal (isostatic) rebound created the "drowned river mouth" of the St. Louis River estuary and its extensive wetlands. During glaciation, the heavy weight of ice over a

mile thick depressed the earth's crust, which rebounded and rose following deglaciation. However, the eastern portion of the Lake Superior basin is rising faster than the western portion (due to later deglaciation and thicker ice deposits), resulting in a tipping of the Lake Superior basin. The differential crustal rebound makes the land area near Superior appear to be sinking by about 27 cm per century (approximately 1 inch per decade) (Bruxer and Southam 2008). Slowly rising water levels also increase sediment accumulation in the already low gradient lower main stem of the St. Louis River (Fitzpatrick et al. 2006).

Soils

This section is reproduced in part from the Ecological Landscapes of Wisconsin (WDNR 2014).

The soils of the SLRPG are strongly associated with the Superior Coastal Plain Ecological Landscape and influenced by topography. Most upland soils of the Superior Coastal Plain are formed in reddish clay or silty clay loam till, and are slightly calcareous. The dominant soil is moderately well drained and clayey, with a clay loam surface, very slow permeability, and very high available water capacity. Soil drainage classes range from well drained to somewhat poorly drained. Surface textures are generally clay to silt loam; permeability ranges from very slow to moderately slow and available water capacity ranges from moderate to very high. Along the higher elevations of the Ecological Landscape some wave-action sand is intermingled with the clayey till. Most lowland soils are poorly drained, and are also formed in reddish calcareous clay to silty clay loam till. The St. Louis River valley and lower part of the Red River consist of moderately well drained to very poorly drained soils formed in sandy to clayey alluvium. Soils in swamps, sloughs, and emergent marshes are very poorly drained non-acid muck or mucky peat.

The fine textures and slow permeability of these soils give them many of the functional characteristics of wetland soils, even when they occur on uplands. Water moves out of them very slowly, and surface ponding from runoff can be common in basins and lower-lying areas. Vegetation communities on these soils typically contain species characteristic of wetlands, including northern white cedar, black ash (*Fraxinus nigra*), and speckled alder (*Alnus incana*). Special management considerations for many of these soils are warranted, as they are seldom completely dry. The Natural Resources Conservation Service gives ratings of “severe” for rutting hazards for many of the red clay soils, and some are rated “poorly suited” for forest harvesting equipment. When these clay soils are rutted or compacted, the effects can be long-lasting. Land managers should utilize guidelines such as those found in the Best Management Practices for Water Quality manual (WDNR 1995), and in the Forest Management Guidelines (WDNR 2003, WDNR 2007), to minimize damage to these soils.

Hydrology

The St. Louis River is the largest stream entering Lake Superior from the United States and also forms one of the largest estuaries in the lake basin. Due to differential crustal rebound, an extensive drowned river mouth has formed in the Lower St. Louis River, and the river has a very low gradient. At the time of Euro-American settlement, the portion of the river near Fond du Lac, MN, was described as being very wide and shallow, with marshes so extensive it was difficult for explorers to follow the main channel (St. Louis River Citizen Action Committee 2002). A large hydroelectric dam has been in operation since 1907 just northwest of the study area, although the flow regime of the river is still subject to extreme events such as the June 2012 flood. The Lower St. Louis River, including the area surrounding Clough Island, is an Area of Concern (AOC) and is listed as an impaired water under Section 303(d) of the federal Clean Water Act.

Vegetation of Clough Island

Historical Vegetation

A reconstruction of historical vegetation shows most of the region surrounding Clough Island was dominated by a unique type of boreal forest dominated by conifers with a hardwood component.

Sometimes called the "white forest" due to the combination of white pine, white spruce, paper (white) birch, and northern white-cedar, this extensive forest covered much of the Superior Clay Plain. Other trees present included aspen, tamarack (*Larix laricina*), and balsam fir. Early logging of the forests in the region began in 1860, and, based on the number of local saw mills, reached a peak in the 1890s, and rapidly declined by the 1920s as the cut-over period wound down.

Small open marshy areas, sedge meadows, and hardwood-conifer swamps were also likely present near seeps and small streams. Though the extensive wetland vegetation along the St. Louis River was not recorded in Public Land Surveys, anecdotal historical accounts from early explorers indicate the area contained extensive emergent marshes, floating bogs, and wild rice beds (St. Louis River Citizen Action Committee 2002).

These data are based primarily on notes and maps from the original Public Land Surveys (Finley 1976), which were conducted for the area comprising SLRPG in 1853-1865. It is important to note that Public Land Surveys served to clearly establish a standardized grid for land ownership, not to describe early vegetation and natural communities. This data is most informative by looking for patterns at a landscape scale; analyzing data only at the scale of a small property like Clough Island is likely to have too few sample points to draw valid conclusions on historical plant communities.



Conifer-dominated Boreal Forest, such as this area near the confluence of the Red River and St. Louis River, was formerly much more common on the Superior Clay Plain. Photo by Eric Epstein.

There is, however, value in determining the nature of a site's vegetation prior to widespread European settlement as well as its historical alterations and uses. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally. Maintaining or restoring some lands to more closely resemble historic systems and including some structural or compositional components of the historic landscape within actively managed lands can help conserve important elements of biological diversity.

History of Clough Island

Though a gem in the St. Louis River estuary from a landscape conservation perspective, Clough Island is far from pristine ecologically, reflecting its past human land use history. Originally owned by Solon S. Clough, most of the island was purchased by Robert B. Whiteside in 1904, after which the island was known as Whiteside Island. A nationally known investor in timber and mining, Robert Whiteside logged the island, built a summer house, and farmed approximately 200 acres, growing oats, potatoes, peas and hay. He and his family later built a small resort and bred and grazed race horses on the island until the 1950s, when the farm was abandoned. A second cutting of timber is estimated to have occurred during or prior to the 1950s.

The island remained in the Whiteside family until the early 2000s when it was sold to a development company who proposed building a resort, high-end condominiums, and a golf course, accessed by ferry and tram service from the mainland. In 2010, the island was purchased by The Nature Conservancy and transferred to the Wisconsin DNR in 2011, at which point it became part of the St. Louis and Red Rivers Streambank Protection Area.

Natural Community Surveys

Introduction

Natural communities are a framework for understanding plant and animal habitats. They are associations of species that share similar requirements for climate, soils, moisture, and nutrients, and occur in generally discrete distributions across the landscape. Three major natural communities occur on Clough Island: Boreal Forest, Northern Sedge Meadow (intergrading with Surrogate Grassland), and Emergent Marsh (Figure 2).

Methods

Office-based analyses were conducted to determine target communities and locations for survey. These analyses integrated interpretation of aerial photos and 7.5 minute USGS topo maps, interviews with local experts, and searches of digital and hardcopy files from previous field investigations. Target plant communities included Boreal Forest, Northern Sedge Meadow, and Emergent Marsh.

In the field, observers conducted meander surveys of target plant communities. Sites surveyed were marked with a waypoint on a handheld GPS unit and the ecological characteristics were recorded in a field notebook. Characteristics noted included dominant, indicator, and invasive species composition (for tree, shrub, and herbaceous layer), forest/shrub canopy coverage, average tree diameter at breast height (DBH), forest structural attributes, slope, aspect, microtopography, soil moisture regime, hydrology, and evidence of disturbance (natural or anthropogenic). Where high-quality natural communities were found, a more detailed plant species list was recorded and any additional characteristics were noted.

Waypoints were recorded wherever a noteworthy change was encountered, particularly when leaving one natural community and entering another, where quality changed significantly, and where other notable features were encountered. During all natural community surveys, observers also documented any rare taxa encountered, especially plants, but also birds, small mammals, and herptiles. Natural community surveys were conducted on May 23 and June 27, 2013.

Boreal Forest and Forested Seep

Boreal Forest is the predominant forest type on Clough Island, but most of the forest is highly degraded due to past landuse history including grazing, logging, and current prevalence of invasive shrubs. Paper birch and trembling aspen dominate much of the forest on the periphery of the southern portion of the island along with species such as balsam fir and red maple (*Acer rubrum*), and in moist pockets, black ash and northern white-cedar. The understory of the forest contains locally dense infestations of invasive shrubs including honeysuckle (*Lonicera* spp.) and common buckthorn (*Rhamnus cathartica*). Beaked hazelnut (*Corylus cornuta*) is also common, along with scattered thimbleberry (*Rubus parviflorus*).

Embedded within the matrix of low-quality Boreal Forest is a small (<1 acre) Forested Seep that originates in the northwestern portion of the island. Dominated by black ash and a diverse ground layer of ferns, sedges and forbs, the seep feeds a small stream flowing north through a large ravine, into a sedge meadow and into the St. Louis River. In addition, a small Ephemeral Pond is located on the southern end of the island, near the junction of the southwestern peninsula with the main body of the island.

The highest quality portion of Boreal Forest is a 15-acre area in the northern part of the island, just east of the Forested Seep. Dominated by balsam fir, white spruce, red maple, mountain ash (*Sorbus decora*), and paper birch, trees average 5-10 inches DBH (diameter at breast height), with white spruce up to 15" DBH. Mountain maple (*Acer spicatum*), black cherry (*Prunus serotina*), and paper birch compose the understory, while beaked hazelnut is the dominant shrub. Dominant ground layer plants include species characteristic of Boreal Forests (Curtis 1959) such as big-leaved aster (*Aster macrophyllus*), wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), sweet colt's-foot (*Petasites frigidus*), and nodding trillium (*Trillium cernuum*). For a list of vascular plant species identified in these communities, please see Appendix B.

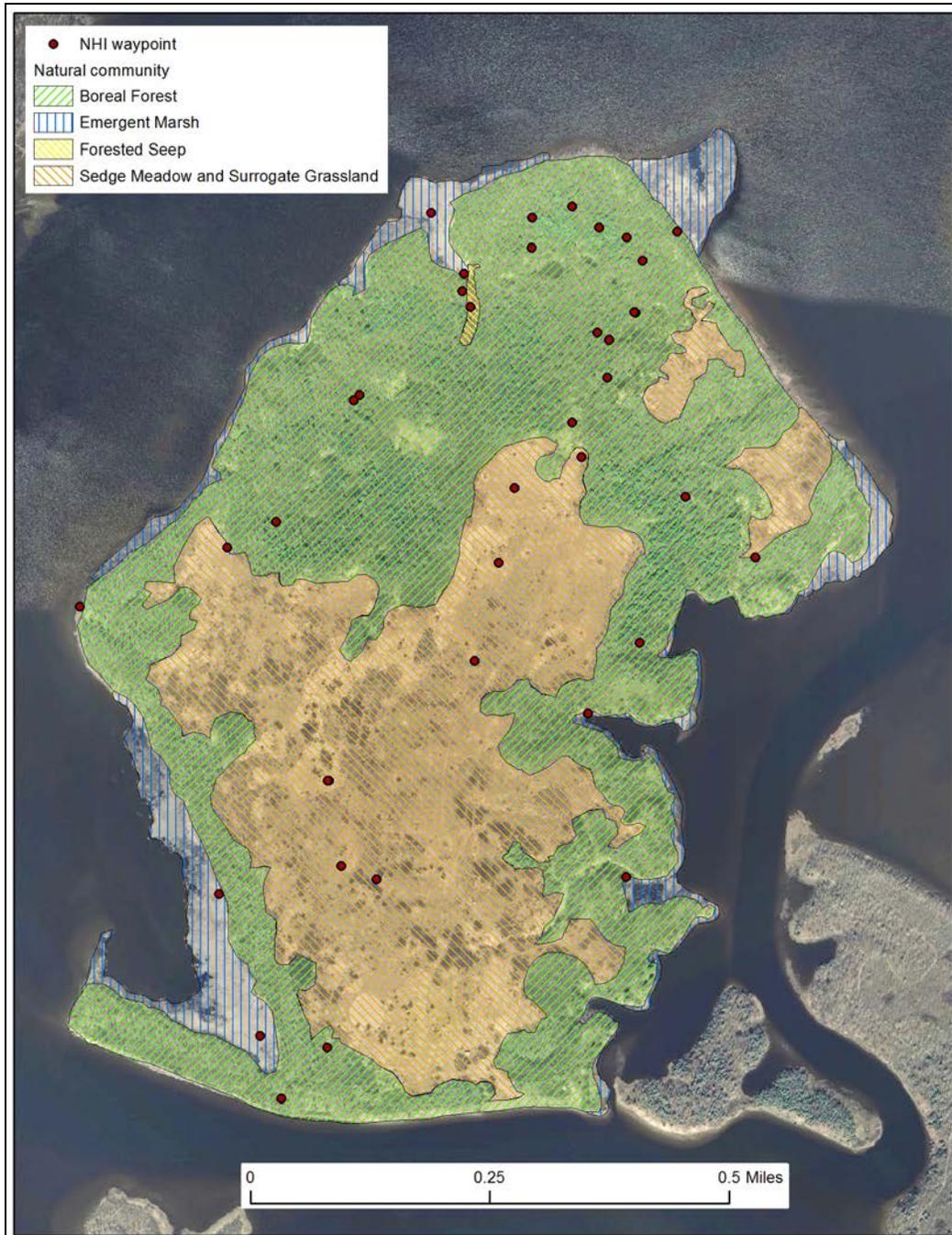


Figure 2. Natural Communities of Clough Island and location of NHI Waypoints on background of 2010 aerial photo.

Northern Sedge Meadow and Surrogate Grassland

The central open portion of the island supports degraded Northern Sedge Meadow and Surrogate Grassland that has generally recovered well from past farming and grazing. Blue-joint grass (*Calamagrostis canadensis*) is common along with Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*) and marsh bluegrass (*Poa palustris*), while wetter areas contain tall manna grass (*Glyceria grandis*) and sedges (*Carex bebbii*, *C. stipata*, and *C. retrorsa*). Open areas are interspersed with thickets of speckled alder, trembling aspen clones, and significant amounts of hawthorn (*Crataegus* sp.) and wild plum (*Prunus americana*). This area is typified by low overall floral diversity, but provides significant habitat for many species, particularly migrating and breeding birds. For a list of vascular plant species identified in this communities, please see Appendix B.

Emergent, Floating-leaved and Submergent Marsh

Wetlands surround Clough Island, particularly on the north, east, and southwest shores. These have received significant study from partner organizations (principally the Natural Resources Research Institute (NRRI), University of Minnesota-Duluth), which sampled three wetland sites using Great Coastal Wetlands Consortium monitoring protocols (Great Lakes Coastal Wetlands Consortium 2008). In addition, the Wisconsin DNR Waters Division sampled deeper water marsh habitat for aquatic macrophytes.-Dominant species of emergent marsh include lake sedge (*Carex lacustris*), sensitive fern (*Onoclea sensibilis*), river bulrush (*Bolboschoenus fluviatilis*), sweet gale (*Myrica gale*), broad-leaved arrowhead (*Sagittaria latifolia*), common spike-rush (*Eleocharis palustris*) and common bladderwort (*Utricularia vulgaris*). Species common in Floating-leaved Marsh and Submergent Marsh included white water-lily (*Nymphaea odorata*), coon tail (*Ceratophyllum demersum*), spiral pondweed (*Potamogeton spirillus*), flat-stem pondweed (*P. zosteriformis*), and floating bur-reed (*Sparganium fluctuans*). Purple loosestrife (*Lythrum salicaria*) and invasive cat-tails (*Typha X glaucophylla* and *T. angustifolia*) were also present at all sample locations, though neither reached high levels of percent cover at the three sample locations: purple loosestrife ranged from 4-11 percent cover; cat-tail (both non-native species combined for this analysis) ranged from 3 – 8 percent cover. For a more thorough discussion of wetlands habitats and their relative quality, please see the NRRI monitoring report (Dumke et al. 2014).

Table 3. Major natural communities of Clough Island by size (acres), based on interpretation of aerial photos taken in 2010 and field surveys in 2013.

Natural Community	Size (acres)
Boreal Forest	191
Northern Sedge Meadow and Surrogate Grassland	131
Emergent Marsh	29*

*Size of Emergent Marsh varies greatly from year to year due to water depth, movement of sediments, and other factors.

NHI Taxa Surveys

Marsh Birds

Introduction

The lower St. Louis River is rich in marsh and wetland habitat, providing an important resource for migratory and resident marsh bird species. Extensive marshes are found just upriver from Clough Island, presenting opportunities for a broader landscape scale approach to marsh bird population management. Although marsh and wetland habitat is limited to embayments and the Clough Island shore that would typically be too small to support marsh birds, resident marsh birds were found utilizing these areas, possibly representing a “spillover” effect from the larger wetlands just to the south. Target marsh birds found during surveys were American bittern, least bittern, sora, and Virginia rail.

Methods

Three replicate marsh bird surveys were performed at Clough Island on May 23, June 19, and July 3, 2013 by multiple observers utilizing consistent survey methods (Conway 2005). See also Appendix A for details on methods.

Results and Discussion

Table 4. Summary of Marsh Birds observed at Clough Island in 2013.

Species	State Status*	Highest daily count	Comments
Alder Flycatcher		1	
American Bittern	SC/SGCN	1	
American Coot	SC	1	
American White Pelican	SC		None at site, but flock of 27 >100m NW of island & flock of 18 >100m N of wetland at SW part of island.
Canada Goose		4	
Common Yellowthroat		8	
Common Tern	END/SGCN		None at site, but 2-5 individuals observed as aerial foragers at all 4 survey points on 7/3.
Least Bittern	SC	1	
Mallard		6	
Marsh Wren		4	
Red-winged Blackbird		18	
Sedge Wren		1	
Sora		3	
Swamp Sparrow		6	
Virginia Rail		1	
Yellow Warbler		10	
Total Individuals		65	
Total Species		13	

*END= Endangered, SC= Special Concern, SGCN= Species of Greatest Conservation Need

Table 5. Summary of non-marsh species of observed during marsh birds surveys.

Bald Eagle	SC/SGCN	Nesting on small island SW of Clough Island.
Barn Swallow		
Double-crested Cormorant		
Merlin	SC	
Song Sparrow		
Veery	SC/SGCN	

The small acreage of marsh habitat on Clough Island supports a surprisingly diverse assemblage of marsh birds and included several Species of Greatest Conservation Need. It is likely that the larger expanse of wetlands within the St. Louis River Estuary attracts diverse numbers of marsh birds and causes a “spillover” effect into these smaller habitats. These marshes are important for breeding birds but may be even more important for supporting hatching insects critical for migratory birds and in protecting the island from erosion. Their small size limits their suitability, but if the marshes at Clough Island are considered within the larger lower St. Louis River marsh complex, there is ample habitat acreage to support good populations of marsh and water birds within the estuary as a whole.

Land Birds

Introduction

The Lower St. Louis River and its associated upland forests and wetlands are home to a diverse array of native bird species. Over 230 species have been documented in the Lower St. Louis River at various times of the year (WDNR 2010). This area is both an important breeding area and a critical migratory stopover location. Clough Island is by far the largest island found in the lower St. Louis River and is made up of aspen forest, shrubby meadow, and small blocks of Boreal and Northern Mesic Forest. Forest and wetland habitats are in various stages of restoration and collecting baseline bird data can aid in assessing restoration success.

Methods

One morning of breeding bird surveys were performed on June 27, 2013 focusing on the Boreal Forest and mixed conifer / hardwood forest patches. A total of nine point counts were conducted (Figure 3). The surveys followed standard 10 minute, unlimited radius point count methodology (Appendix A). In addition, migratory bird surveys in May-June 2014 also detected some species considered resident breeding birds.



Figure 3: Location of 2013 Breeding Bird Survey Point Counts on Clough Island.

Results and Discussion

Table 6. Summary of breeding land birds observed at Clough Island detected by point counts in 2013 and 2014.

Species	Status*	#Indivs	#Points	Comments
Alder Flycatcher		9	N/A	From 2014 surveys
American Crow		2	2	
American Goldfinch		6	N/A	From 2014 surveys
American Redstart		4	4	
American Robin		1	1	
Black-and-white Warbler		3	3	
Blackburnian Warbler		1	1	Mating pair observed in Boreal Forest; after/en route
Black-capped Chickadee				After count/enroute
Black-throated Blue Warbler	SC/SGCN	1	1	
Black-throated Green Warbler		2	2	After count/enroute
Blue Jay		1	1	
Brown-headed Cowbird		1	1	
Cedar Waxwing		1	1	
Chestnut-sided Warbler		2	2	
Clay-colored Sparrow		11	N/A	From 2014 surveys
Common Raven		1	1	
Common Yellowthroat		3	3	After count/enroute
Great Crested Flycatcher		2	1	After count/enroute, two individuals agitated by presence
Gray Catbird		2	N/A	From 2014 surveys
LeConte's Sparrow		9	N/A	From 2014 surveys
Mourning Warbler		2	2	
Nashville Warbler		1	1	
Northern Flicker				After count/enroute
Northern Parula				After count/enroute
Ovenbird		8	7	
Red-eyed Vireo		7	6	
Red-winged Blackbird		1	1	
Rose-breasted Grosbeak				After count/enroute
Ruffed Grouse				After count/enroute with 3-4 young
Song Sparrow		1	1	Shrub wetlands
Sedge Wren		3	N/A	From 2014 surveys
Swamp Sparrow		3	N/A	From 2014 surveys
Veery	SC/SGCN	6	5	
White-throated Sparrow		5	4	
Winter Wren		1	1	
Yellow Warbler		1	1	
Yellow-rumped Warbler		4	4	

*SC= Special Concern, SGCN= Species of Greatest Conservation Need

Forest patches are limited on Clough Island, but provide habitat for good numbers of wood warblers. The conifer component of these forests is important for many of these warblers including blackburnian, Nashville, northern parula, and yellow-rumped. Efforts to restore Boreal Forest on the island would be beneficial to these species and other birds of conservation interest. Two species of conservation concern were found during these surveys: the black-throated blue warbler and veery with both species reliant upon shrubs for nesting. Continuing to provide structural diversity within forests for these and other shrub nesters at the site is an important consideration.

The shrubby meadow appeared to be an important area for migratory birds and adds to the species diversity at the site by providing nesting habitat for sedge wren, alder flycatcher, and clay-colored sparrow, and supports a good population of Le Conte's sparrow (up to 11 birds seen on a single survey), a Species of Special Concern in Wisconsin. The Le Conte's sparrow population was discovered in May 2014 surveys. Although this species was not detected during 2013 breeding bird surveys, they persisted throughout the 2014 sampling period, and are thus believed to be nesting here. Because many sedge meadows in this region are relatively small and hayed every year, the large sedge meadow is among the most unique features of Clough Island from a bird perspective, and could hold other species of concern such as Yellow Rail or Nelson's Sparrow.

Migratory Birds

Introduction

The western shore of Lake Superior including the St. Louis River Estuary has long been known as an important migratory bird stopover site (Epstein 1997, Grveles and Matteson 2008, SLRCAC 2002). Clough Island's location within the St. Louis River Estuary, large size, and habitats make it a likely high priority migratory bird stopover site. Davis et al. (1978) identified the island's offshore areas as important for fall and spring migrating waterfowl.

Due to the lack of an existing migratory bird survey protocol, a pilot protocol was developed and tested. The goals of the protocol were to:

- Assess the importance of the site for neotropical migratory land birds breeding in the forests of Canada and northern United States, by calculating species diversity, richness, and density
- Assess the important landscape features for migratory birds at the site

Methods

A protocol for conducting migratory land bird surveys was developed. Monitoring areas were determined on Clough Island focusing on forested shorelines, marshes, boreal forests, and sedge meadows interspersed with shrubs. Within the survey areas, Point Count stations separated by a minimum of 250 meters were established *a priori*. Survey protocols were modified to include more flexibility to meander and pursue migrant flocks and the result was more of a traveling count than a stationary point count survey. Surveys were planned over a three week period between May 11 and June 1, 2014, with a goal of surveying once every 4 days (weather permitting) to identify the extent of migration period (start/end dates and pulses). Surveys were conducted from sunrise to 10:00am. Appropriate weather conditions followed standard breeding bird survey methodology.

Each point count consisted of listening and observing for five minutes following Ralph et al. (1993), with all birds seen or heard within an unlimited radius recorded, noting species, method of observation, number of individuals, associated habitat (canopy, sub-canopy, shrub, or ground layer), and behavior of birds observed (i.e. moving, singing, foraging, associating with other species). Species heard or seen between counts were not noted to avoid double-counting and slowing down surveys.

While all species were noted, a list of priority species was developed that included Species of Greatest Conservation Need in Wisconsin (SGCN; WDNR 2006) and those that are long-distance migrants with declining trends that nest in the boreal forest region of Canada (NABCIC 2012).

Priority neotropical migratory species included:

Least Flycatcher	Black-billed Cuckoo
Alder Flycatcher	Yellow-bellied Flycatcher
Olive-sided Flycatcher	Blue-headed Vireo
Swainson's Thrush	Gray-cheeked Thrush
Philadelphia Vireo	Black-throated Blue Warbler
Orange-crowned Warbler	Cape May Warbler
Magnolia Warbler	Bay-breasted Warbler
Blackpoll Warbler	Palm Warbler
Connecticut Warbler	Wilson's Warbler
Northern Waterthrush	Golden-winged Warbler
Canada Warbler	Lincoln's Sparrow

Birds of known resident species from site (based upon the 2013 breeding bird survey) were noted and considered as “Known Residents”. Birds known to nest only from latitudes north of the site (e.g., northern Minnesota, Canada) were considered as “Known Stopovers”. Birds with nesting habitat requirements not present on the island or known to require large blocks of forest for nesting were also considered as “Known Stopovers” (see priority species list above).

Results & Discussion

Table 7. Summary of migratory birds observed May and June 2014 on Clough Island

Date of survey	18-May	21-May	23-May	30-May	3-Jun
Number of Species	54	59	57	52	40
Number of Individuals	375	333	339	348	215
Number of Priority Species	4	10	8	2	2

Several interesting findings were made during five migratory bird surveys of Clough Island. Surveys were performed between May 18 and June 03, 2014 due to weather restrictions early in the migration period. By most accounts, it was a late spring in northern Wisconsin including the survey area where cold temperatures, presence of ice on area waterbodies, and persistent snowfall pushed back the migration of neotropical migrants until mid-May. Survey results show fairly uniform species diversity and richness occurring during the first four surveys (May 18 – May 30) with a large drop off in numbers and species detected during survey five on June 03. It is our belief that the spring migration period was contracted in 2014 due to the late spring, rather than being spread out over the entire month of May as would typically be expected. Most birds moved through the area in the last two weeks of May with nearly all species noted during the final survey on June 03 being suspected as resident breeding birds on Clough Island. It is our belief, based on bird reports from around the state that many migrants were staging south of this region and likely flew over, without stopping, once migration conditions improved late in the season.

During the survey, a total of 95 species and 1,610 individuals were detected (full species list in Appendix B). In total, 13 of 22 (59%) priority migratory species of conservation concern in Wisconsin (SGCN) and Canada (NABCIC 2012) were detected on the island, exemplifying the importance of the island for rare and declining migratory birds. In addition, the island supported high diversity of warblers and sparrows, with 19 species and 10 species recorded, respectively.

Important habitats and landscape features for migratory birds exist on Clough Island and these areas were productive (Figure 4) during migratory bird surveys in spring 2014. Important habitat components for staging and refueling of migratory birds include:

- forested cover providing shelter from predators
- edge or habitat transition zones serving as warming areas where sunshine is prevalent early in the morning
- an abundance of water and wetlands where aquatic insects are emerging serving as an important food source
- the presence of wetlands with native fruit-producing shrubs



Figure 4. Survey route for migratory bird surveys on Clough Island in Spring 2014, noting productive areas for migrating birds.

Small Mammals

Introduction

Small mammals play an important role in ecosystem function by serving as prey for numerous predators, by providing necessary disturbance for plant communities, by spreading mycorrhizal fungi, and by influencing the size and composition of some insect communities. Small mammal surveys were conducted in June and July 2013 with the goal of locating and documenting populations of four mammal species of Special Concern on Clough Island. The four target species were northern flying squirrel (*Glacomys sabrinus*), Franklin's ground squirrel (*Spermophilus franklinii*), woodland jumping mouse (*Napaeozapus insignis*), and water shrew (*Sorex palustris*), all of which have been previously documented in Douglas County.

Methods

Standardized sampling methods for Sherman live-traps were utilized for five overnight trapping sessions. One hundred forty, nine-inch Sherman live-traps were set at one- to two-meter intervals at the two selected sites. Traps were set along features of interest including riparian zones or in habitats of interest, based upon the target species, following standard protocols developed by Dr. Paula Spaeth Anich, Northland College (Appendix A).

Two locations were trapped on Clough Island: traplines C1 and C2. Trapline C1 was in the north-central part of the island and included ecotonal areas: a closed canopy quaking aspen stand, and a spruce, balsam fir and northern white cedar stand. Target species were northern flying squirrel and the woodland jumping mouse. Trapline C2 was in the southwest corner of the island, along a small spring-fed creek under a closed canopy hardwood forest. The target species was the water shrew.

Traps were placed on the ground and were baited with oats and peanut butter overnight, and checked starting at 8:00 a.m. the next morning. All mammals captured were weighed, measured, sexed (if mature) and identified to species if possible. Species that could not be identified and species of special concern were photographed for documentation. Three consecutive trap nights were conducted from June 27 to July 02, 2013.

Survey crews also performed a walking, daylight survey of open grassy habitats in the center and southern portions of the island to detect Franklin's ground squirrel.

Results & Discussion

Table 8. Small mammals trapped or observed on Clough Island, June 2014.

Date	Trapline	Scientific Name	Common Name	Sex
06/27/2013	C1	<i>Zapus hudsonius</i>	Meadow Jumping Mouse	--
06/28/2013	C1	<i>Peromyscus leucopus</i>	White-footed Mouse	M
06/29/2013	C1	<i>Peromyscus leucopus</i>	White-footed Mouse	M

Both species captured, the white-footed mouse and the meadow jumping mouse, are common species in Wisconsin. The white-footed mouse is found in numerous forested and edge habitats, but occasionally is found in open grasslands, though they typically do not stray far from the forest edge. They appear to be moving northward with climate change and are aggressive competitors, often out-competing the woodland deer mouse (*Peromyscus maniculatus gracilis*) a Special Concern species, also found in forested habitats in northern Wisconsin. The meadow jumping mouse is commonly found in open wetland and marsh habitats throughout the state. In more forested or shrub wetlands they can co-occur with our target species, the woodland jumping mouse, often out-competing them. Small mammals have cyclical populations ranging from years of very high to very low numbers of individuals. During low population cycles, trapping is less productive and is not representative of the small mammal community

as a whole. It is likely trapping on Clough Island occurred during a down cycle and future trapping could provide better results and a higher species richness and diversity.

With regards to the mesic forest-dwelling northern flying squirrel, woodland jumping mouse, and water shrew, although some suitable forest elements were found on Clough Island, the forests were dominated by hardwoods, especially trembling aspen. These kinds of habitats are not optimal for the target species. However, although these species were not detected, they may be present in low numbers, or could colonize the island if suitable habitat developed. Habitat for these species could be improved through forest management that maintains or increases the abundance of coniferous species (especially fir and spruce species), as well as the maintenance of wetlands and riparian corridors. Boreal forest restoration taking place on Clough Island should be beneficial to these rare species and bears monitoring as the forest diversifies and matures.

No Franklin's ground squirrel burrows, runways, scat, or vocalizations were detected, probably because the sampled areas lacked ideal habitat (barrens, shrubby uplands, or areas of dense grasses). Although shrub and open sedge or grass habitats were present on Clough Island, these habitats were very mesic (and inundated in places). Franklin's ground squirrel relies on underground burrow systems for shelter and hibernation and requires well-drained soils. In addition, Clough Island is a somewhat small property located several miles from the nearest known populations of Franklin's ground squirrels in Duluth, MN and Superior, WI. Even if the habitat on Clough Island was suitable for the species, limited corridors for dispersal from potential parent populations may prevent colonization by Franklin's ground squirrel.

Bats

Introduction

Bats are a critical member of Wisconsin's ecosystems. A single bat may eat 1,000 insects per hour, providing millions of dollars of pest control each year. The combination of older forests and open meadow on Clough Island and its location within a large river system provide favorable characteristics for bats by offering roosting, foraging, and commuting habitat. One limited mobile survey through the lower St. Louis River was conducted in July 2010 starting near Clough Island and moving downriver into the Duluth / Superior harbor. Surveys detected the presence of two of the seven species currently known from Wisconsin with both being listed as state Threatened species.

Methods

Acoustic surveys for all species of bats in Wisconsin are performed to determine presence / absence throughout the state. As bats fly through an area they can be surveyed with an acoustic recording system capable of detecting a bat's echolocation call. The bat detection system detects and records these acoustic signals as the bats fly past and records the date, time, and location of each encounter. The WDNR currently uses broadband frequency division ultrasound detection equipment with a PDA (Personal Data Assistant) and a Global Positioning System. Acoustic surveys are performed by trained individuals. On all survey nights bat activity is monitored acoustically with an Anabat SD1 bat detector (Titley Electronics, www.titley.com.au). The detector's sensitivity is set at 7, data division ratio is set at 8, and audio division set to 16. Surveys were to begin no earlier than one-half after sunset to maximize likelihood of the survey overlapping with the period of greatest bat activity.

Results and Discussion

Two state Threatened species, the big brown bat (*Eptesicus fuscus*) and little brown bat (*Myotis lucifugus*) were found in good numbers during acoustical surveys (Figure 5). It was particularly surprising to find good numbers of big brown bats at this northerly latitude, as they are more commonly encountered in southern Wisconsin.

Opportunities to promote bat habitat include providing resources for roosting, foraging, and drinking. During summer months, both of these species roost in artificial structures such as barns and attics but will also use crevices and cavities in trees. The proximity of the survey route to urban areas in and around Duluth, MN may actually have provided ample roosting habitat for these species in buildings and other structures. However, older forests with snags of varying decay level, size, and height on Clough Island and surrounding forests on Wisconsin's shores of the St. Louis River are likely also important for roosting individuals.

By feeding on insects, bats are an important component of healthy ecosystems. Foraging is done in and along small to medium forest openings or gaps, such as ponds, natural and artificial openings, roads, or water courses (Taylor 2006). The open shrubby meadow on Clough Island and the St. Louis River itself offer excellent foraging opportunities for these species. The river also offers important resources for drinking and a travel corridor. Due to the emerging threats that bat populations face in Wisconsin from White Nose Syndrome, more surveys (acoustic and roost) are needed to more accurately describe the bats that use Clough Island and the Lower St. Louis River estuary.

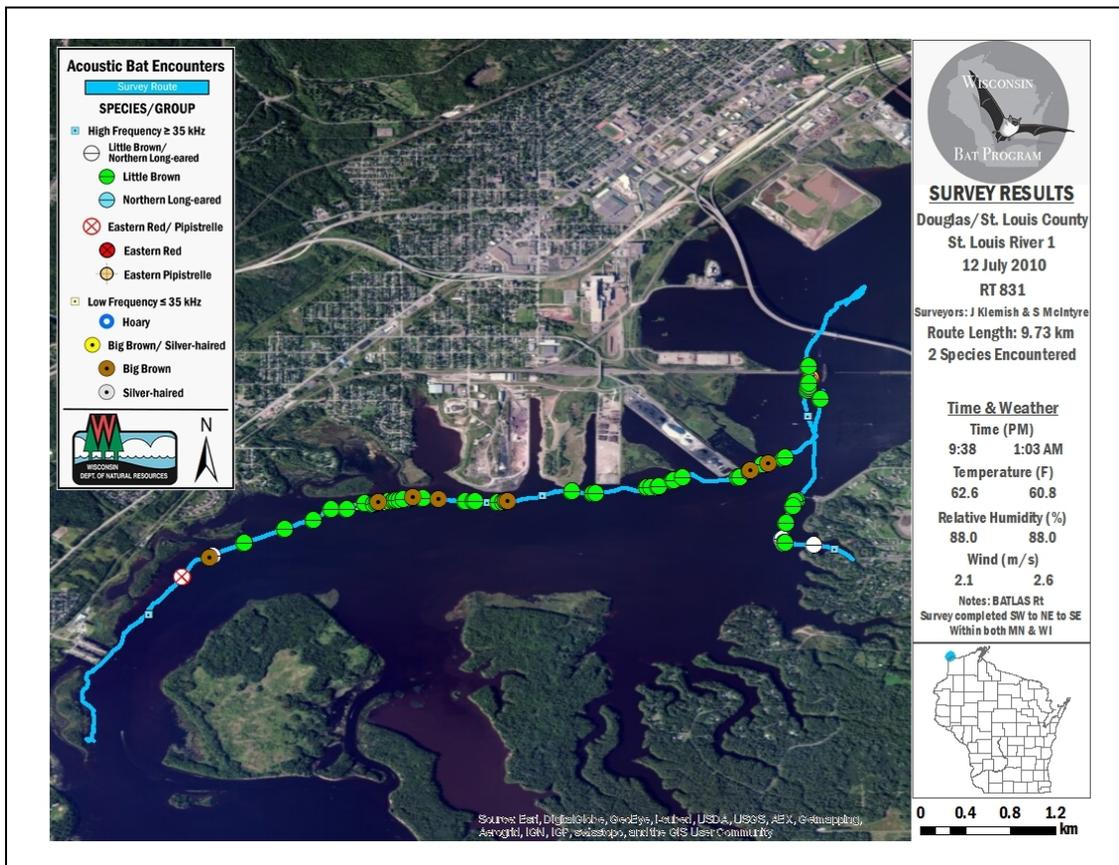


Figure 5: Location of Bat Survey Route and Bat Encounters.

Reptiles and Amphibians

Introduction

Reptiles and amphibians are important indicators of landscape health. As species that are long-lived (e.g., turtles) and/or sensitive to certain types of pollution (e.g., amphibians), they reflect larger ecological trends related to fragmentation, habitat connectivity, wetland quality, and contaminant loads. Target species included all species previously documented in Douglas County: the state Threatened wood turtle (*Glyptemys insculpta*), Special Concern species Blanding's turtle (*Emydoidea blandingii*), four-toed salamander (*Hemidactylium scutatum*), northern leopard frog (*Lithobates pipiens*), pickerel frog (*L. palustris*), bullfrog (*L. catesbeianus*), and mink frog (*L. septentrionalis*).

Methods

Surveys were conducted in May and June 2013 with the goal of locating and documenting all reptiles and amphibians encountered. Standardized methods for reptiles and amphibians were utilized for frog and toad calling surveys and visual encounter surveys. Surveys were performed along riparian zones, marsh habitats, Ephemeral Ponds, and Springs and Spring Runs. All herptile species seen or heard were recorded and are presented below under results.

Visual Encounter Surveys (VES, as described in Casper 2011) were used for herptiles, searching suitable habitat in spring during suitable weather conditions (at least 50° F with no rain or high winds, Appendix A). In addition, frog calling surveys were conducted following Wisconsin Frog and Toad Survey protocols (Appendix A).

Results and Discussion

Table 9. Reptile and Amphibians heard or observed on Clough Island May and June 2013.

Species	Wisconsin Status	Habitat
Painted Turtle	Common	Coastal Wetland/Shore
Common Gartersnake	Common	Shrub Meadow
Northern Leopard Frog	Special Concern	Emergent Marsh, Shrub Meadow
Chorus Frog	Common	Emergent Marsh
Spring Peeper	Common	Emergent Marsh

Frog and toad calling surveys were only performed during the late spring (May 20 – June 5) sampling period due to logistical issues. Nonetheless, several frog species were noted on Clough Island during VES including chorus frog, spring peeper, and the Special Concern northern leopard frog. Reptiles were also found during VES and included common gartersnake and painted turtles. Neither of the uncommon target turtles were found on the island, but suitable habitat exists to support these species. This area would represent the extreme northern range extent for Blanding's turtle. Wood turtles are commonly encountered upriver of the Fond du Lac dam on the St. Louis River, but have not been verified below the dam. Occurrences of either of these species at Clough Island or in the lower St. Louis River would be of conservation significance.

Appropriate amphibian breeding habitats were located throughout the island, increasing the likelihood of additional amphibians to be found here. For example, an Ephemeral Pond was located on the southwest corner of the island. These fishless ponds are critical breeding areas for both early breeding frogs and salamanders like blue-spotted, spotted, and four-toed. Surprisingly, no amphibian adult, larvae, or egg masses were found here on two survey visits. Springs and Spring Runs were noted at several locations on the island providing suitable habitat for the Special Concern Pickerel Frog. Although none were observed, additional surveys would be beneficial.

Emergent Marshes are found in abundance on and around the island. The large central shrubby meadow had northern leopard frogs in high numbers and common gartersnakes were also found here. Perched Northern Sedge Meadows on the northeast side of the island were also very productive areas for northern leopard frogs and are likely to support other breeding frogs as well. Emergent Marshes on the borders of the island provide basking areas for painted turtles, but other turtles likely use these areas as well.

Rare Plants

Introduction

The Superior Coastal Plain Ecological Landscape harbors a significant number of rare plants, including several species that occur nowhere else in the state. Many of these species thrive in areas that receive periodic disturbance such as old fields, trails, and rights-of-way. Given the suitable habitat at Clough Island, rare plant surveys were conducted to determine which, if any, species were present.

Methods

Prior to conducting field work, the NHI database of rare species and office files were checked for information on previously reported rare plants occurring on Clough Island. In addition, a list of additional target species based on rare taxa found in the surrounding region was compiled.

Table 10. Rare plant survey targets based on suitable habitat and species known from region.

Scientific Name	Common Name	State Status*	S-rank	Number of occurrences in region
<i>Aster modestus</i>	Northwestern Sticky Aster	SC	S1	1
<i>Calamagrostis stricta</i>	Slim-stem Small Reed Grass	SC	S3	3
<i>Caltha natans</i>	Floating Marsh-marigold	END	S1	2
<i>Calypso bulbosa</i>	Fairy Slipper	THR	S2	1
<i>Carex nigra</i>	Smooth Black Sedge	SC	S1	3
<i>Eleocharis mamillata</i>	Mamillate Spike-rush	SC	S1	1
<i>Eleocharis nitida</i>	Slender Spike-rush	END	S2	11
<i>Equisetum palustre</i>	Marsh Horsetail	SC	S2	3
<i>Juncus vaseyi</i>	Vasey's Rush	SC	S3	10
<i>Parnassia palustris</i>	Marsh Grass-of-Parnassus	THR	S1S2	1
<i>Petasites sagittatus</i>	Arrow-leaved Sweet-coltsfoot	THR	S3	16
<i>Ranunculus cymbalaria</i>	Seaside Crowfoot	THR	S2	6
<i>Ranunculus gmelinii</i>	Small Yellow Water Crowfoot	END	S2	10
<i>Salix planifolia</i>	Tea-leaved Willow	THR	S2	2
<i>Sparganium glomeratum</i>	Northern Bur-reed	THR	S2	8

* END= State Endangered, THR= State Threatened, SC= State Special Concern

In 2013, meander surveys were conducted in appropriate habitat for all target species, following methods described by Nelson (1984). Incidental rare plant surveys were conducted on May 23 and June 27, and a targeted rare plant survey was conducted on July 11, 2013.

Results and Discussion

No rare plant species were found on Clough Island, though suitable habitat was noted for several species. Several species including Vasey's rush, northwestern sticky aster, slender spike-rush, arrow-leaved sweet colts-foot, and small yellow water crowfoot reach their highest abundance in the immediate vicinity of the city of Superior, Wisconsin. They thrive in open, moist habitat on clay soils, which is particularly abundant in the Sedge Meadow and Surrogate Grassland area in the south-central part of the island. Additional surveys in future years may be warranted for these species, particularly for northwestern sticky aster, which blooms in late summer and would have been difficult to detect during spring mid-summer surveys.

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Appendix A: Taxa Survey Methodology

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Marsh Birds

Timing of Surveys

Time of Year

Peak marsh bird calling activity occurs during the courtship and egg-laying period in spring and early summer. Thus we will be conducting all surveys in May and June. The survey window will differ slightly for northern versus southern Wisconsin. In northern Wisconsin, separated roughly by a line including Polk, Taylor, and Oconto counties northward, surveys should be conducted between May 20 and June 30. In “southern” Wisconsin, (i.e. St. Croix, Marathon, and Kewaunee counties southward), surveys should be conducted between May 15 and June 30.

Time of Day

Survey points may be surveyed in either the morning or evening. Morning surveys begin 30 minutes before sunrise (at first light) and should be completed by 3 hours after sunrise (e.g., 0500-0830 h if sunrise at 0530). Evening surveys begin 3 hours before sunset and must be completed by dark (don't forget your headlamp or flashlight!). Marsh birds are typically most vocal in the 2 hours surrounding sunrise and sunset.

Point selection

Conduct each survey in morning 30 minutes before to 3 hours after sunrise OR in evening 3 hours before to 30 minutes after sunset.

Placement and Spacing of Bird Point Count Stations within a Site

- Using remote sensing (i.e. aerial photo layer in ArcView), point count stations were placed a minimum distance of 250m apart and were situated to provide maximum coverage of marsh areas within property boundaries. A measured grid pattern was used wherever possible.
- For marsh areas of irregular shape, slight deviations from the grid pattern were allowed to provide adequate sampling of the area.
- The number of stations per site varied depending on site size.

1. Sites to be surveyed from land: Use the provided waypoints OR place the survey points at the interface between emergent marsh and upland. This approach minimizes travel time between adjacent points, reduces trampling vegetation within the marsh, and may increase the distance at which observers can hear vocalizing birds due to increased elevation relative to the marsh vegetation. (If tree or shrub cover is >10%, do not employ marshbird survey protocol. Refer instead to NHI Landbird Survey Protocol for off-road surveys.)

Sites to be surveyed by boat: Place the survey points on the open water-emergent interface.

2. The initial survey point should be randomly chosen based on all possible locations for a survey point (all possible marsh/upland interfaces or open water-emergent interfaces).

3. Subsequent survey points should be at regular intervals of 400m to minimize the risk of double-counting individual birds (this is about 1 point for every 16 ha of marsh). If need be, a 250 m spacing will work (if you feel 400 m spacing results in too few points per site).

5. Assign each survey point a unique identification number.

** If a point is not accessible due to unsafe walking conditions, the surveyor can stop where they are and conduct a census - as long as the new point is at least 250 m from another survey point.

Weather Conditions and Data:

- Surveys should NOT be conducted during rain or heavy fog: continue through light drizzle.
- Surveys should NOT be conducted in steady winds greater than 10 mph – a “3” on the Beaufort Wind Scale.
- The sky code, wind code, and temperature (°F) should be recorded at each point count station at the end of the bird survey.

Field Survey Protocol

Surveys at each point consist of two parts, including an initial 5-minute passive listening period followed by successive 1-minute segments of broadcast calls for certain target species. Each 1-minute broadcast segment consists of 30 seconds of pre-recorded vocalizations and 30 seconds of silence. In southern Wisconsin, six species are included in the call-broadcast (Least Bittern, Yellow Rail, Sora, Virginia Rail, King Rail, and American Bittern), while only five species are included for northern Wisconsin (all of the above except King Rail). Thus, each point at southern Wisconsin sites is surveyed for 11 minutes, while each point in northern Wisconsin is surveyed for 10 minutes.

Pre-recorded calls are broadcasted using the provided mp3 player and portable speaker set. It is very important that you NOT use a different setup for these broadcasts, no matter how much louder other setups may seem to be, as this will affect standardization of the survey effort. Additionally, it is very important that you use the provided 10- or 11-minute sequence and not play species clips individually using different audio files.

The broadcast player should be placed upright on the ground or on the bow of the boat. If the ground is wet, place the speaker on an object as close to the ground as possible. Point the speaker toward the center of the wetland and do NOT change/rotate the speaker's position during the call-broadcast survey. Speakers should be pointed in the same direction for all replicate surveys. In situations, where the “center” of the wetland is not obvious, observers should record the general compass direction (N, NW, SE, WSW, etc.) in which they pointed the speaker. Observers should stand 2 m to one side of the speaker (standing too close can reduce your ability to hear responses).

2. Recording Bird Data:

Date: Indicate the date of the survey. Use separate data sheets for different dates.

Site # and Name: Write the number and name associated with your survey site. These should be provided with your maps and/or other survey materials.

Observer: Provide the name of the individual conducting the survey.

Temperature: Use a thermometer or local weather station to determine temperature at the start and end of your survey outing.

Wind speed: Categorize wind speed based on the Beaufort scale below.

Beaufort #	Wind Speed in km/hr (mph)	Indicators of Wind Speed
0	< 2 (< 1)	Smoke rises vertically
1	2 to 5 (1 to 3)	Wind direction shown by smoke drift
2	6 to 12 (4 to 7)	Wind felt on face, leaves rustle
3	13 to 19 (8 to 12)	Leaves, small twigs in constant motion
4	20 to 29 (13 to 18)	Raises dust/loose paper, small branches move
5	30 to 38 (19 to 24)	Small trees in leaf sway

Cloud cover: Estimate % of sky covered by clouds (0% = clear, 100% = overcast).

Precipitation: Indicate as light rain, rain, heavy rain, light snow, heavy snow, fog, or none.

Point #: Record Lat/Long in Decimal Degrees (WGS 84 projection) of each survey point using a GPS receiver. List the survey point number as given on your GPS unit (e.g., “0-1620”).

Start time: Write the start time for the survey point using military time notation (to avoid confusion between AM and PM surveys).

Background noise: Indicate the level of background noise using the codes given on the bottom of the data sheet.

Species: Write the full name of the species or use the codes given below.

<u>Primary species</u>	<u>Code</u>	<u>Secondary species</u>	<u>Code</u>
Yellow Rail	YERA	Red-necked Grebe	RNGR
Sora	SORA	Wilson’s Snipe	WISN
Virginia Rail	VIRA	Black Tern	BLTE
King Rail	KIRA	Forster’s Tern	FOTE
Least Bittern	LEBI	Marsh Wren	MAWR
American Bittern	AMBI	Swamp Sparrow	SWSP
American Coot	AMCO	Le Conte’s Sparrow	LCSP
Common Moorhen	COMO	Yellow-headed Blackbird	YHBL
Pied-billed Grebe	PBGR		

Responded during: Put a “1” in each column (i.e. minute segment) in which that individual is detected based on vocalizations and put an “S” in each column in which the individual is seen (including flyovers). If the individual is both heard and seen, put a “1S” in that column. Thus if a single Virginia Rail calls during minute 2 and then again in response to its species’ call-broadcast during minute 9, then for that row a “1” should be recorded only for columns “Pass 1-2” and “VIRA 8-9”. If a new individual of the same species or a different species is also detected, start a new row for this new individual and use the same recording method.

Call types: For primary species only, record the call type(s) detected to the best of your abilities. This can help us learn more about breeding chronology, observer bias, detection probability, and more. See the descriptions below.

- **Least Bittern:** *coo-coo* (male advertisement/territorial), *kak-kak-kak* (when feeding young), *ankorert*(given when flushed)
- **Yellow Rail:** *click-click* (in series, primary call), *weese*(female call), *descending cackle* (pair maintenance), *squeak* (given by retreating bird)
- **Sora:** *whinny* (territorial defense and mate contact), *per-weep* (advertisement), *keep* (contact call)
- **Virginia Rail:** *grunt* (pair contact, territorial call), *tick-it* (male advertisement call), *kicker* (female advertisement call), *kiu*(sharp call, contact among individuals)
- **King Rail:** *kek-burr* (territorial), *grunt* (territorial), *kek-kek-kek*(mating call)
- **American Bittern:** *pump-er-lunk*(territorial/advertising), *chu-peep* (given during copulation ceremony), *kok-kok-kok*(given when flushed)
- **Common Moorhen:** *wipeout* (territorial/advertising), *giddy-up* (territorial/advertising), *beep* (communication between pairs), *squawk, yelp, cluck*
- **American Coot:** *burr-up* (territorial/advertising), *hic-up* (territorial/advertising), *cackle* (communication between pairs), *honk* (social interactions), various other calls
- **Pied-billed Grebe:** *owhoop* (primary territorial call), *hyena* (pair formation/territorial), *quaa-aaa-aaa*(wavering, guttural copulation call), *kwah*(alarm call), *ek-ek-ek*(rapid, staccato greeting call)

Distance: Estimate the distance to the bird when it was FIRST detected to the nearest 5 meters. If the bird is any distance more than 200 meters from the survey point, simply write ">200" in this column.

Direction: Mark a slash on the oval to indicate in what direction you heard the individual bird. This column is for your personal use to more easily keep track of individuals when several of a single species are detected at a survey point.

Comments: Provide comments as desired. Some examples of information to include here are: (1) total number of individuals for secondary species, (2) whether the listed individual was detected at an earlier point (e.g., an American Bittern detected at the current point also was heard at a previous point), and (3) detections of target marshbirds before or after the survey period at a point or while walking between points.

Note: The number of lines filled out on the data sheet will differ among survey points and will correspond to the total number of individual target marshbirds detected at each point. If no marshbirds are detected at a survey point, record the point number, starting time, and background noise and then write "No birds" in the comment column. This will help you keep track of what survey point you are on and which ones you have completed

3. Habitat Data

When the site is visited during daylight hours, visually estimate the % composition of the marsh plant community for the entire site. Record habitat data for the site at the top of the provided data sheet. This information will assist analyses, inform habitat management/conservation decisions, and perhaps explain observed changes in marshbird populations. Additional habitat notes for individual points can be placed in the comments section.

% trees: 0 1-10 11-50 >50

% shrubs: 0 1-10 11-50 >50

%open water : % wetland

Most Dominant Herbaceous Plants and %

Cattail, grass, sedges, rushes, bur-reed, phragmites, arrowhead, list other species as needed

Major Wetland Habitats: Examples would include Emergent Marsh, Northern or Southern Sedge Meadow, Shrub Carr, Alder Thicket, Open Bog, Fen, or Muskeg

Comments: Record any pertinent notes about the habitat at a survey point (e.g., water levels, recent management actions, etc.).

Land Birds

Placement and Spacing of Bird Point Count Stations within a Site

- Using remote sensing (i.e. aerial photo), topographical maps, and site habitat priorities, identify target habitats for the property and establish random point count stations a minimum distance of 250m apart to provide maximum coverage of target habitat areas within property boundaries. For patches of irregular shape, select largest core areas (if possible within 125m of target habitats) to allow for adequate sampling of the area and limiting number of edge species.
- The number of stations per site varies depending on site size.

Assessment of Point Count Stations:

- Point count stations should NOT be sampled if:
 1. Located within a cultivated field such as corn, soybeans, etc.
 2. Located within a pine plantation
 3. Located within a campground or picnic area
- Point count stations will be geo-referenced by taking a GPS location at each point. Where GPS readings are prohibited by tree cover, a GPS reading will be taken in the nearest canopy gap. A compass and pacing will then be used to find the approximate location of the point relative to the position where the reading was taken.
- For extremely large sites (i.e. sites with more than 10-12 point count stations), sampling may occur over multiple days. Specific instructions on the number of days required and inventory priorities will be provided for each property being surveyed.

Point Count Period and Duration:

- The survey period will begin a half hour before sunrise and end four hours after sunrise.
- The duration of point count surveys at each station will be 10 minutes. Each 10-minute count will be separated into two different segments: from 0 to 5 minutes, and from 5 to 10 minutes.
- Travel time between stations should average from 15 to 20 minutes.
- Recording of birds should begin immediately upon reaching the point count station. Weather conditions, habitat descriptions and other data should be recorded following the 10-minute count.

Weather Conditions and Data:

- Surveys should NOT be conducted during rain or heavy fog: continue through light drizzle.
- Surveys should NOT be conducted in steady winds greater than 10 mph – a “3” on the Beaufort Wind Scale.
- The sky code, wind code, and temperature (°F) should be recorded at each point count station at the end of the bird survey.

Recording Bird Data:

- Record the species code for each individual bird in the location where it is first detected.
- Record all birds seen and heard within a 50-m radius of the point count station and beyond the 50m radius.
- Birds flying over the point count station should be recorded separately as “flyovers”.
- Use standard four letter codes for bird names, see <http://www.uwgb.edu/birds/wso/>.

- Birds seen or heard at a point station after the point count period has ended should be assigned to that station. Likewise, birds seen enroute to the next station will be recorded on the station from which the observer just left. A clean data sheet will always be used to start a new station.

Describing Habitat:

Forests:

- Identify WDNR natural community type (if known), list dominant tree and shrub species, describe canopy, shrub, and herbaceous associates, and estimate tree size class (see below), percent canopy cover and percent understory cover to the best of your ability.
- Describe other features present (e.g., stream, snags, coarse woody debris, non-native species, etc.).

Tree size class:

- Seedling – A usually young tree smaller than a sapling. Trees less than 1 inch dbh (diameter at breast height).
- Sapling – A usually young tree larger than a seedling but smaller than a poletimber tree. Trees ranging from 1 to 5 inches dbh.
- Poletimber – A tree of a size between a sapling and a sawtimber tree. Hardwood trees ranging in size from 5 to 11 inches dbh and conifers ranging in size from 5 to 9 inches dbh.
- Sawtimber -- Trees with minimum diameter and length and with stem quality suitable for conversion to lumber. Hardwood trees larger than 11 inches dbh and conifers larger than 9 inches dbh.

Grasslands and Savannas:

- Identify WDNR natural community type (if known), list dominant herbaceous species, describe tree, shrub, and herbaceous associates, and estimate percent woody cover and percent cover of stiff-stemmed forbes (e.g., mullein) to the best of your ability.
- Describe other features present (e.g., stream, snags, hedgerows, non-native species, etc.).

Herptiles

Visual Encounter Surveys (adapted from Casper 2011):

Seasonal Timing of Sampling

Conduct surveys between April 15 and June 30. Determine when to begin by watching local phenology. Begin after the ground is thawed and several days of sunny temperatures over 50°F have passed.

Proper Conditions for Sampling

Only conduct surveys when temperatures reach at least 50°F. Do not survey during rain, lightning, high winds (>12 mph/19 km/h) or on heavily overcast days. Conduct surveys no earlier than 2 hours after sunrise, and no later than 2 hours before sunset. The conditions favoring maximum detection are shortly after rains, mid-morning when temperatures are rising, and mid-afternoon before temperatures begin falling. These conditions coincide with maximum activity periods for thermoregulation and foraging.

Wisconsin Frog and Toad Survey

Routes are run after sunset under favorable conditions, i.e., relatively warm air temperature, wind <8 mph, and preferably high humidity. Most routes are 10-25 miles in length and take 2-3 hours to complete. At each station the observer listens for 5 minutes (or up to 10 minutes if necessary due to noise interference) and records one of the following call index values for each frog species heard calling:

1. Individuals can be counted; there is space between calls (no overlapping of calls).
2. Calls of individuals can be distinguished but there is some overlapping of calls.
3. Full chorus. Calls are constant, continuous, and overlapping; individual calls cannot be distinguished.

Because the annual calling period of each species is fairly short and is different from the calling period of other species, volunteers run each route a total of 3 times every year, once each during the following sampling periods:

- Early spring (April 8-30 and minimum water temperature of 50°F)
- Late spring (May 20 - June 5 and minimum water temperature of 60°F)
- Summer (July 1-15 and minimum water temperature of 70°F)

Small Mammals

This summarizes the protocol used by Dr. Paula Spaeth Anich and her students at Northland College to live-trap small mammals in terrestrial ecosystems. This protocol has been used to successfully capture northern short-tailed shrew (*Blarina brevicauda*), northern flying squirrel, meadow vole (*Microtus pennsylvanicus*), weasel species (*Mustela* spp.), red-backed vole (*Myodes gapperi*), woodland jumping mouse, *Peromyscus* spp., *Sorex* spp., *Tamias* spp., eastern chipmunk (*Tamiasciurus hudsonicus*), and meadow jumping mouse (*Zapus hudsonius*) in Northern Wisconsin. Several other species of vole, pocket gopher, and ground squirrel have been captured using these techniques in the Rocky Mountains.

Site Selection

Aerial photographs and habitat cover-type maps are used to select appropriate areas for trapping. If possible, a GPS point in the geometric center of the trapping site is created and this GPS point is transferred to a handheld GPS unit and used to locate the point in the field. A compass, handheld GPS, and hard copies of maps are used to locate the selected site in the field.

Setting Traps

Up to 150, 9-inch Sherman live-traps are set at the selected site. Depending on the specific objectives of the study, the traps are placed in multiple transects or grids. In the Chequamegon National Forest, where we are studying the local abundance and habitat use of the Woodland Jumping Mouse, we use three, 50-trap transects in order to sample large areas and target particular habitat features. In previous work in the Rocky Mountains, we used 25-trap grids in several locations to compare the densities of Meadow and Long-tailed Voles in a variety of habitats.

Traps are initially placed on the ground, un-baited and with the trapdoor closed. Traps are marked with flagging and the GPS coordinates of the first and last trap in each transect (or the trap at the northwest corner of each grid) are recorded. At approximately 5 PM, traps are opened and baited with oats and peanut butter.

The traps are not set overnight if temperatures are predicted to drop below freezing.

Checking Traps and Identifying Small Mammals

At approximately 8 AM the next day, the traps are checked. Animals are handled and released at their capture site. Each animal is transferred from the trap to a gallon Ziploc bag and weighed in the bag with a Pesola scale. The animal is removed from the bag and external morphometrics (total body length, tail length, hindfoot length, ear from notch) are recorded in millimeters. Animals are sexed: perforated or lactating females and scrotal males are noted; all other individuals are recorded as juveniles. Animals are identified to species if possible using keys and field guides. Species of special concern and species that cannot be identified are photographed in-hand for documentation. Depending on the specific objectives of the study, animals may be ear-tagged for subsequent identification. Animals are released and the mass of the Ziploc bag is recorded, in order to calculate the mass of the animal.

Traps are generally run for three consecutive nights at a site. On the last day, traps are picked up and all flagging is removed, unless otherwise indicated by the study design.

Leather gloves are always worn when handling small mammals.

Recording Data

A sample data sheet is attached. Data sheets are filled out completely in the field with a pencil.

Trap Mortalities

All incidental trap mortalities are recorded and the specimens are placed in Northland College's Wildlife Freezer as soon as possible. A label with the locality, date, species, and name of collector is included with the specimen. Specimens will be prepared as study skins and / or skulls by student volunteers.

Summarizing Data

After data are entered into a spreadsheet and double-checked for accuracy, total species counts, morphometric summary statistics, sex ratios, and mark-recapture statistics (if applicable) are calculated.

Appendix B: Species Lists

Table 1. Plant species observed in natural communities on Clough Island and abundance codes (A=Abundant, C=Common, O=Occasional, U=Uncommon, R=Rare).

Scientific name	Common name	Boreal Forest	Forested Seep	Sedge Meadow & Surrogate Grassland
<i>Abies balsamea</i>	balsam fir	C		
<i>Acer rubrum</i>	red maple	C		
<i>Acer spicatum</i>	mountain maple	C		
<i>Actaea rubra</i>	red baneberry	C		
<i>Alnus incana</i>	speckled alder			U
<i>Aralia nudicaulis</i>	wild sarsaparilla	A		
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	C		
<i>Asclepias incarnata</i>	swamp milkweed			U
<i>Aster macrophyllus</i>	big-leaved aster	A	C	
<i>Athyrium filix-femina</i>	lady fern	C	C	
<i>Betula nigra</i>	river birch		C	
<i>Betula papyrifera</i>	paper birch	C	O	
<i>Botrychium virginianum</i>	rattlesnake fern	U		
<i>Calamagrostis canadensis</i>	blue-joint grass			C
<i>Calla palustris</i>	water-arum		C	C
<i>Callitriche</i> sp.	water starwort			U
<i>Campanula aparinoides</i>	marsh bellflower			C
<i>Carex bebbii</i>	Bebb's oval sedge			C
<i>Carex canescens</i>	gray bog sedge			U
<i>Carex crinita</i>	fringed sedge		A	
<i>Carex gracillima</i>	graceful sedge		C	
<i>Carex lacustris</i>	common lake sedge			U
<i>Carex pedunculata</i>	long-stalk sedge		U	
<i>Carex radiata</i>	eastern star sedge		C	
<i>Carex retrorsa</i>	deflexed bottlebrush sedge			C
<i>Carex stipata</i>	common fox sedge		C	A
<i>Carex vulpinoidea</i>	brown fox sedge			C
<i>Cirsium arvense</i>	Canada thistle			C
<i>Comarum palustre</i>	marsh cinquefoil			U
<i>Cornus stolonifera</i>	red osier dogwood			C
<i>Corylus cornuta</i>	beaked hazelnut	A	C	
<i>Dactylis glomerata</i>	orchard grass			C
<i>Daucus carota</i>	Queen Anne's-lace			C
<i>Dryopteris carthusiana</i>	spinulose wood fern	C		
<i>Epilobium leptophyllum</i>	bog willow-herb			U
<i>Equisetum arvense</i>	common horsetail	C		R

Scientific name	Common name	Boreal Forest	Forested Seep	Sedge Meadow & Surrogate Grassland
<i>Equisetum fluviatile</i>	water horsetail			C
<i>Equisetum hyemale</i>	scouring rush			C
<i>Equisetum sylvaticum</i>	wood horsetail		C	
<i>Festuca subverticillata</i>	nodding fescue		O	
<i>Fragaria vesca</i>	hillside strawberry	C		
<i>Fraxinus nigra</i>	black ash		U	
<i>Galium</i> sp.	bedstraw			
<i>Galium tinctorium</i>	southern three-lobed bedstraw			R
<i>Geum canadense</i>	white avens	R		
<i>Glyceria striata</i>	fowl manna grass		C	
<i>Gymnocarpium dryopteris</i>	common oak fern	O	U	
<i>Impatiens capensis</i>	orange jewelweed		O	U
<i>Iris versicolor</i>	northern blue flag			U
<i>Lactuca biennis</i>	tall blue lettuce	R		
<i>Laportea canadensis</i>	wood-nettle		O	
<i>Lobelia siphilitica</i>	great blue lobelia			C
<i>Lonicera canadensis</i>	American fly honeysuckle	O		
<i>Lonicera X bella</i>	Bell's honeysuckle	U		
<i>Lycopus americanus</i>	common water-horehound			U
<i>Lysimachia thyrsoiflora</i>	swamp loosestrife			C
<i>Lythrum salicaria</i>	purple loosestrife			C
<i>Maianthemum canadense</i>	Canada mayflower	C		
<i>Matteuccia struthiopteris</i>	ostrich fern	A	R	
<i>Milium effusum</i>	American millet grass		C	
<i>Myrica gale</i>	meadow-fern			C
<i>Onoclea sensibilis</i>	sensitive fern	C		R
<i>Osmunda cinnamomea</i>	cinnamon fern		U	
<i>Petasites frigidus</i>	Arctic sweet-colt's-foot	C		
<i>Phegopteris connectilis</i>	Narrow beech fern	U	U	
<i>Phleum pratense</i>	common timothy			U
<i>Phragmites australis</i>	common reed			A
<i>Picea glauca</i>	white spruce	C		
<i>Poa palustris</i>	fowl meadow grass			U
<i>Populus tremuloides</i>	trembling aspen	C	U	C
<i>Prenanthes alba</i>	lion's-foot	C		
<i>Prunus serotina</i>	black cherry	R		
<i>Ranunculus acris</i>	common buttercup			C
<i>Ranunculus hispidus</i>	bristly buttercup		C	
<i>Ranunculus recurvatus</i>	hooked buttercup	R		
<i>Rhamnus cathartica</i>	common buckthorn	O		

Scientific name	Common name	Boreal Forest	Forested Seep	Sedge Meadow & Surrogate Grassland
<i>Rubus parviflorus</i>	thimbleberry	U	R	
<i>Rubus pubescens</i>	dwarf red raspberry	U		
<i>Rumex orbiculatus</i>	great water dock			C
<i>Sagittaria latifolia</i>	broad-leaved arrowhead			C
<i>Salix</i> sp.	willow			U
<i>Schoenoplectus tabernaemontani</i>	great bulrush			C
<i>Scirpus atrovirens</i>	black bulrush			U
<i>Scirpus cyperinus</i>	wool-grass			U
<i>Scutellaria galericulata</i>	common skullcap			R
<i>Solidago gigantea</i>	giant goldenrod			A
<i>Solidago uliginosa</i>	northern bog goldenrod			C
<i>Sorbus decora</i>	northern mountain-ash			
<i>Spiraea alba</i>	white meadowsweet			U
<i>Stachys palustris</i>	hedge-nettle			U
<i>Stellaria longifolia</i>	long-leaved stitchwort			R
<i>Streptopus roseus</i>	rosy twisted-stalk	U		
<i>Tanacetum vulgare</i>	common tansy			C
<i>Thelypteris palustris</i>	eastern marsh fern			R
<i>Thuja occidentalis</i>	northern white-cedar	U		
<i>Trillium cernuum</i>	nodding trillium	C	C	
<i>Typha angustifolia</i>	narrow-leaved cat-tail			U
<i>Typha latifolia</i>	broad-leaved cat-tail			A
<i>Urtica dioica</i>	stinging nettle			C
<i>Valeriana officinalis</i>	garden-heliotrope			U
<i>Viola cucullata</i>	blue marsh violet	C	A	

Table 2. Number of individuals observed by date in 2014 migratory bird surveys at Clough Island, Douglas County, WI.

Species Name	18-May	21-May	23-May	30-May	03-Jun
Canada Goose	10	10	10	23	10
Trumpeter Swan	2	2			
Mallard	5	2	2	1	3
Lesser Scaup	2				
Ruffed Grouse	7	3	2		
Common Loon		2			
Double-crested Cormorant	8	1	1	7	
Green Heron		1			1
Turkey Vulture					1
Osprey	1				
Northern Harrier		1			
Bald Eagle	2	1	1	1	1
Red-tailed Hawk					1
Virginia Rail				1	
Sora	1	3	1	2	
Killdeer	1				
Spotted Sandpiper				2	
Solitary Sandpiper		2			
Lesser Yellowlegs	6				
Wilson's Snipe			2	1	
Ring-billed Gull	8	10	10	10	15
Common Tern	2		4	2	1
Ruby-throated Hummingbird			2	1	
Belted Kingfisher	2		1	2	
Yellow-bellied Sapsucker				1	
Downy Woodpecker	1	1			
Hairy Woodpecker	1	1		1	
Northern Flicker	2	3	4	3	1
Pileated Woodpecker			1	1	
Peregrine Falcon	2		1		
Alder Flycatcher				7	9
Least Flycatcher	5	3	6		
Empidonax sp.		4	1	2	
Eastern Phoebe		2	1	2	
Great Crested Flycatcher				4	5
Blue-headed Vireo		1			
Red-eyed Vireo				24	12
Blue Jay	10	9	15	15	3
American Crow	4	2	5	2	3

Species Name	18-May	21-May	23-May	30-May	03-Jun
Common Raven	3	1	1	1	
Northern Rough-winged Swallow			3	4	2
Tree Swallow	2				
Barn Swallow	1				
Black-capped Chickadee	5	3	2	4	2
Red-breasted Nuthatch	2		1	1	
White-breasted Nuthatch		1			
Brown Creeper	2	2	1		1
House Wren		1	1		
Winter Wren				1	
Sedge Wren		1		4	3
Marsh Wren			2	2	
Eastern Bluebird		2			
Veery	8	11	15	10	14
Swainson's Thrush	1	1			
Hermit Thrush	1				
American Robin	5			2	1
Gray Catbird	10	8	14	4	2
Brown Thrasher	1	3	2		
Cedar Waxwing				12	3
Ovenbird	40	28	13	15	9
Northern Waterthrush	8	2	1		1
Golden-winged Warbler			1		
Black-and-white Warbler	12	11	4	2	3
Tennessee Warbler		1	5		
Orange-crowned Warbler		2	2		
Nashville Warbler	4	1	6	5	7
Common Yellowthroat	8	33	48	29	26
American Redstart	3	8	16	23	15
Northern Parula			1		
Magnolia Warbler		1	3		
Yellow Warbler		5	20	5	7
Chestnut-sided Warbler			7	2	2
Blackpoll Warbler		1			
Palm Warbler		6	2		
Yellow-rumped Warbler		3	1		1
Black-throated Green Warbler			2		
Canada Warbler			1		
Wilson's Warbler		2	2	3	
Chipping Sparrow		2			
Clay-colored Sparrow	10	3	11	12	11

Species Name	18-May	21-May	23-May	30-May	03-Jun
Savannah Sparrow		1	1		
Le Conte's Sparrow	4	11	9	6	9
Song Sparrow	15	16	23	21	4
Lincoln's Sparrow	1	4			
Swamp Sparrow	5	10	3	3	3
White-throated Sparrow	40	36	19	20	11
Harris's Sparrow	1				
White-crowned Sparrow	1				
Scarlet Tanager	1				
Rose-breasted Grosbeak	5	6	4	1	1
Bobolink	1				
Red-winged Blackbird	50	19	6	7	2
Brown-headed Cowbird	10	13	8	24	3
Baltimore Oriole	3	2			
Purple Finch				1	
American Goldfinch	30	8	8	9	6
Number of Species	54	59	57	52	40
Number of Individuals	375	333	339	348	215
Number of Checklists	1	1	1	1	1