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Biodiversity in Selected Natural Communities Related to Global Climate Change

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RESEARCH SUMMARY:

Biodiversity in Selected Natural Communities Related to Global Climate Change Project

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To help gauge the effects on climate change on the species and natural communities in Wisconsin, systematically collected baseline data are needed. Information on multiple taxa will provide a better opportunity to detect changes in biotic communities in future inventories.

Wisconsin peatlands provide a good opportunity to detect change in a natural system that results from global climate change. These natural communities include many specialized plants and animals that are not typically found in other habitats, including rare species. As these habitats contain many species south of their normal range limits, one might expect to detect a response due to a changing climate.

The primary goals of this project were 1) to provide baseline data on the presence/absence, abundance, and distribution of species in taxon groups associated with peatland communities, and 2) to document selected variables that could potentially influence the organisms being studied. Taxon groups were breeding passerine birds, amphibians, small mammals, selected invertebrates, secretive marsh birds, rare anurans, and rare plants. Data were collected a replicable manner.

We designated our two levels of survey sites Intensive or Extensive. Intensive Sites were comprehensively surveyed for selected taxon groups each year. Extensive Sites were surveyed one season out of the four field seasons. Some taxon groups surveyed a subset of the Extensive Sites instead of all sites. Varying levels of surveys will provide a broad range of information and quantification that will allow rare species status surveys and comprehensive species inventories to be conducted simultaneously.

Intensive Sites were purposely selected based on specific criteria including distribution by Ecological Section for a more even geographic dispersal. Extensive Sites were randomly selected across the state using grids based on 7.5 minute topographic maps. We designated 64% of our sites in the north and 36% in the south, roughly mirroring the distribution of potential peatland natural communities across the state. Selection criteria for Extensive Sites were less restrictive than those used for Intensive Sites.

Once potential sites were delineated, we physically evaluated the sites because we couldn't ascertain the suitability of particular sites using the available remote resources.

Point counts were used to assess the presence and relative abundance of breeding passerine birds. Point-count stations were established along a transect running through the midsection of each site. Vegetation was sampled at each point-count station. These data were used to model two aspects of breeding passerine birds: 1. explanatory models of bird presence and abundance in peatlands, and 2. habitat relationships for three bird species strongly associated with peatlands.

Several different amphibian survey techniques were used to increase the likelihood of adequately sampling the most species. Pitfall traps were used to capture both amphibians and small mammals. At each Intensive Site, pitfall traps were installed along two 300m transects. One transect ran from open canopy peatland into surrounding uplands; the second transect ran from the forested peatland into surrounding uplands. Visual encounter surveys used the pitfall transects and all individual amphibians observed were recorded. Additionally, field technicians recorded any amphibians they incidentally observed at the survey sites.

Terrestrial invertebrates groups surveyed were the Lepidoptera, Orthoptera, and Hemiptera. The most time was spent searching for adult Lepidoptera. Some species required special survey techniques. All the Orthoptera are found as adults after midsummer. Long-winged Orthoptera were caught with aerial nets while short-winged species were collected with minnow nets or by hand. Identification by sound was also used during the project. For plant-dwelling insects (such as leafhoppers) sampling methods included hand-collection, small aspirators, and sweep netting.

For Odonata a meander search pattern was followed in open areas when other life stages were not present or could not be captured using aerial nets. Frequency of surveys depended on how well other life stages were represented at that time. For other aquatic invertebrates search patterns and sampling were largely restricted to microhabitats where there was enough open water extensive enough for sampling with a dip net or placing a bottle trap. On two peatland sites parallel transects were surveyed for exuviae to document the precise locations occupied by odonate nymphs. These search patterns was repeated until the emergence season was over. Each location where an exuvia was collected was marked with a numbered flag and later using a professional grade GPS.

Pitfall trapping for other taxa captured a number of invertebrates, especially ground beetles. These specimens were kept for subsequent determination and analysis.

Standard survey methods were used for secretive marsh birds. As many points as possible were placed at least 400m apart along adjacent berms or in the wetland-upland interface. For sites surveyed by boat, points were established in the wetland-open water interface. At each survey point, surveyors played an audio recording and listened for a response. Anurans heard were documented using standard amphibian call index values.

Rare plant surveyors used a meander technique that covered areas most likely to have rare taxa, based on habitat type and the judgment of the investigator. As surveyors transited to and from sites, they documented any other rare species they encountered.

We selected a total of 13 Intensive Sites distributed across 11 of the 13 ecological sections. Two ecological sections did not have suitable sites and were excluded from this study. Each of the remaining ecological sections had one site with the exception of the two largest sections that had two sites each to provide greater geographic coverage.

We evaluated 1385 grid blocks remotely for potential Extensive Sites using a combination of GIS layers and other resources. We assessed 335 sites in the field and found that 234 sites met the project criteria, 163 in the north and 71 in the south.

Passerine breeding bird models indicated that the probability of bird occurrence increased in areas with shrub cover. In general, the foliage height diversity seems to be the most important factor for supporting a wide range and abundance of species which are associated with different habitat types. Little variation was observed between Intensive and Extensive Sites, but models for

Intensive Sites often had stronger explanatory power. Repeated visits to Intensive Sites may be beneficial for long-term studies of presence and abundance of individual species in peatlands but a single visit to each Extensive Site was sufficient for purposes of creating habitat models to explain the relationships between birds and microhabitat components.

A total of 700 amphibians and reptiles were documented. About 98% of these were of 13 species of amphibians with three species (wood frog, American toad, and northern leopard frog) representing the majority. Relatively low species richness at peatland sites in Wisconsin followed the general pattern for north temperate herpetofaunal assemblages. Amphibians dominated the captures, while very few reptiles were captured or observed. While peatlands are not as rich in species and do not have as great of an abundance of individuals as other habitat types, they do represent an important habitat for amphibians.

Nearly 2600 small mammals were captured with masked shrews accounting for half of all specimens. There was a lot of variation between sites in abundances and distribution of species. The insectivore foraging group was the most commonly captured group at 9 of the 12 Intensive Sites surveyed. Samples from the small mammals were sent to the Marshfield Clinic Research Foundation for genetic identification.

Boloria titania remains the least common of the bog-obligate butterflies in Wisconsin. No new sites were found for the species. Butterflies were still present at all the known sites. *Boloria freija* has the largest number of sites of the three tundra fritillaries. Two new sites have been added for *Boloria frigga*. However, *Boloria eunomia* is the most commonly observed of these bog fritillaries. Three additional sites were added for *Lycaena dorcas*, 20 for *L. epixanthe*, and 24 for *Oeneis jutta*. The latter two species have been removed from Special Concern status.

Ten species of grasshoppers might be found in peatlands in northern Wisconsin and five additional species in southern sedge meadows. The latter group was not recorded during the study. None of the band-winged grasshoppers were found in peatlands as they are primarily species of open country or sandy barrens and beaches. Four spur-throated grasshoppers could potentially be found in peatlands. *Melanoplus islandicus* was recorded on Stockton Island, but *M. punctulatus griseus* was not seen. *Melanoplus borealis* and the wingless grasshopper, *Booneacris glacialis*, were recorded during the study at 12 and 9 sites, respectively.

In both ecological provinces the average number of target aquatic invertebrate species found was five at a site. The maximum number found at a single site was ten species at a site in Jackson County. Nine target species were found at a site in Douglas County. Total biological diversity at a site does not appear to correlate with the presence of target species on a site by site basis. On average, sites where six or more target species were found had greater aquatic diversity (average 30.25 species) than the sites where less than four target species were found (average 20.38 species). The most productive sites for targeted species were predominantly open bog or muskeg. Target species decreased at site with shrub-carr, sedge meadow, or marsh. Four other insects were recorded for the first time.

The most commonly documented secretive marsh bird was the American bittern followed by the Yellow Rail. Nelson's Sharp-tailed Sparrow was the least documented. While all of the target marsh bird species where found at one or more sites, other uncommon species were also documented at several sites. Rare frogs were documented at a relatively low rate, with the most common being mink frogs. Pickerel frogs were only recorded at one site.

Each Extensive Site was surveyed for rare plants at least twice in a given field season. Botanists found populations of 50 different rare species totaling 283 rare plant occurrences at 128 sites. Of the 50 species, four are state Endangered, 9 state Threatened, and 37 Special Concern.

We developed methods such that this study can be replicated in 10-20 years and periodically thereafter. We gathered large amounts of baseline data for all of the taxon groups at the Intensive Sites. Most of the taxon groups were able to collect baseline data at a subset of the Extensive Sites. Through combined efforts, we obtained vegetation data that can also help researchers detect changes in the natural communities at individual sites. Data gathered on rare animals has already led to changes in the NHI working list, and it's anticipated that further changes will occur for animals and plants. Value-added projects, such as the habitat models that were developed for passerine birds, can be a valuable tool for natural resource professionals and may be especially useful in light of climate change.