Summary of Cofrin Student Research Grant Projects (1989-2020)

Year = year grant awarded. Reports were generally written the following year. Project titles may vary based on provided document.

Student	Year	Project	Abstract
Nicholas Boulanger	2020	A survey of resident bats at the new Wequiock Creek Natural Area in Brown County, WI	Bats are a diverse and ecologically valuable group, but they are increasingly threatened. Responsible conservation and management efforts require information about how bats use different habitats, yet habitat associations among different Midwestern bat species are still poorly understood. The objective of this project is to use acoustic monitoring to conduct a baseline survey of bats along the Wequiock Creek stream corridor in the new Wequiock Creek Natural Area. This site is the subject of a variety of restoration plans, and an enhanced understanding of habitat use by bat species will help inform restoration priorities. Additionally, this study will investigate the presence of the threatened Northern Long-Eared Bat Myotis septentrionalis, and contribute to the body of knowledge regarding the range and habitat needs of common and rare bat species.
Max Chung	2020	The Cryptic Gray Treefrog Species Pair in UW-Green Bay Natural Areas	Prior to the 1960s the *Hyla chrysoscelis*/*Hyla versicolor* cryptic species pair (commonly known as Cope's Gray Treefrog and the Eastern Gray Treefrog, respectively) was believed to be a single, species that populated much of the United States along with regions of northern Mexico and Southern Canada. Overtime, the distinction between these species has become considerably clearer, but whether or not both of the species reside in certain areas is still unknown. For this project, we propose using call characteristics to document the occurrence of gray treefrogs in the Cofrin Arboretum at UW-Green Bay and, potentially, some of the other natural areas owned by the university. Gray treefrogs are known to breed in ponds in the Cofrin Arboretum, so initial efforts will focus on the many ponds in the arboretum. By making recordings and examining sonograms from a sufficient sample of frogs we will greatly increase the level of confidence in our understanding of the composition of treefrogs in these areas.
Jessica Cook	2020	Great Lakes Children's Book	Experiences and knowledge in the hands of children, is what this project is all about. The development and work put into this children's book is specifically written for children in the Great Lakes basin/watershed. The idea behind this book is to develop a high-interest book for children to gain their interest in the Great Lakes and areas around the Great Lakes. Through research, and finding a lack of interesting children's books about the Great Lakes, this will provide families and teachers a resource to start teaching about the Great Lakes Standards. While writing this narrative-informational book with fictional characters, the process of formally editing, publishing and getting it into the hands of children is the next task at hand...which requires some funding and the help of the Printing Press on the UWGB campus. The vision with this book is to incorporate it into lessons and have it be part of the Great Lakes Basin curriculum. As a teacher, (not a trained author) this vision needs help with local and state resources, which again require some funding! This book will touch on each of the Great Lakes as well as well known areas around the Great Lakes to encourage interest in the sciences, history, invasive species, waterways, and great space and water that incorporates our amazing Great Lakes!
Nathan Knutson	2020	The Influence of 20th Century Hunter-Conservationist Efforts on the Public Park System of Northeast Wisconsin	Public parks have long been exclusively designed for human rest and relaxation. Manicured urban green spaces dominated the popular idea of what a "park" was for much of American history. Taking after the trends of wealthy east coast cities Northeast Wisconsin followed down this path creating stylized natural areas specifically designed for human residents in the mid-19th century. While this singular idea of what qualified as a park continued into the 20th century it did not last long after the rise of hunter-conservationist concern in the early 1930s. The names known today for popularizing this new take on public land use and wildlife management center on Aldo Leopold, Gifford Pinchot, and other nationally recognized figures, however these popularly recognizable figures were not the only ones working to change the declining prospects of our wildlife. Northeast Wisconsin was home to many private citizens who worked to protect the land and wildlife immediately around them. Their locally focused conservation efforts in turn influenced the way government actors viewed public parks, making for a more inclusive philosophy of land use which looked beyond strictly the desires of humans when creating and expanding the public park system of Northeast Wisconsin. These personal efforts to save wildlife and the habitats they rely on radically shifted the way public spaces were perceived. My research will shed light onto the methods, motivations, and impacts these hunter-conservationists had on the public park system and along with the system's continued conservation efforts up into the present day.
Alicia Krause	2020	A Survey of Freshwater Gastropods of Northeastern Wisconsin Streams	Freshwater gastropods are important aquatic invertebrates that provide numerous ecological functions. They provide resources for lower trophic levels and stabilize ecosystem population dynamics. Freshwater gastropod species are understudied within Wisconsin and are decreasing in population numbers due to the introduction of multiple invasive snail species. This survey will report the distribution of the freshwater snail species in various northeastern Wisconsin creeks.
Collete LaRue	2020	A Photo Journal of the Natural World Along the	The Point au Sable Nature Preserve provides a rich opportunity to visually communicate the results of the decade long clean water mitigation effort of the lower Fox River.

		Shoreline of Point au Sable Nature Preserve	This project's goal is to document the variety of bird and other wildlife activity against the backdrop, and within the interior of, the Point Au Sable Nature Preserve. Through a series of images, I will create a portrait of this area that communicates the seasonal changes in wildlife activity, water and landscape. This collection of photographs will underscore the importance of water conservation and land preservation as a means to provide stop-over points for bird migrations and safe refuge for year-round inhabitants. To enhance the efficacy of this project, I am exploring collaborations with faculty and graduate students of the UWGB Center for Biodiversity, Cofrin Library staff, and personnel at Open Door Bird Sanctuary of Sturgeon Bay. The final result will be photographic series for educational purposes and artistic enjoyment that can be accessed digitally and in print for both academic use and public exhibition. Ultimately, I wish to positively impact public sentiment by reinforcing visually the value of this natural area. Although this area is surrounded by one of Wisconsin's densest population centers, it remains an underappreciated resource. Many residents are unaware of the beauty and ecological significance of the lower bay in general and Point au Sable in particular. This collection of images will provide a glimpse into this understated natural area and will be available to bolster continued public support to maintain and sustain this outstanding ecological resource.
Jacob Pelegrin	2020	Mapping the links between ectomycorrhizal fungi and red pine in northern Wisconsin	Ectomycorrhizal fungi pervade forest ecosystems and are critical to forest function, health, and regeneration. Transfer of resources and signaling molecules between plants has been shown in greenhouse and field conditions, but spatial scale and diversity of these complex networks in the field are still poorly understood. Recently developed technologies, including a variety of microscopic and molecular methods, have allowed advances in knowledge. This study proposes to show belowground, fungi-to-fungi connections between roots of different red pine individuals in the field. Our overall goal is to use molecular techniques to show that fungal genets, or individuals of the same genotype, are present on roots of different red pines. This would provide evidence that the trees are connected, most likely by fungal hyphae within the soil. Mycorrhizal roots will be sampled in red pine stands within the Peninsula Sanctuary and the Cofrin Arboretum. Ectomycorrhizae will be examined, subjected to DNA isolation and PCR of the ITS region, and sent for sequencing. To identify individuals of the same genotype, I plan to use SSRs (single sequence repeats). This will allow us to show spread of one individual fungal genet through the network. This will also allow us to use DNA from tree roots matched to tree boles, to confirm the connection of ectomycorrhizae to certain trees.
Olivia Salm	2020	Educating the public on ecological processes within Cofrin Memorial Arboretum	The Cofrin Memorial Arboretum is a 290 acre boundary around the University of Wisconsin – Green Bay campus (uwgb.edu, Cofrin Memorial Arboretum). It's range in elevation from the Bayshore Woods on the Lake Michigan shore to the Niagara Escarpment on the Southeast side of campus features a range in biodiversity and ecological processes. The Bayshore Woods are part of Lake Michigan's watershed; Mahon Woods to the West of campus feature floodplains; Keith White Prairie and The Gateway are prairie restoration areas, and the Niagara Escarpment is a prehistoric land feature that stretches from the East side of Lake Winnebago, through Door County, and into Ontario before terminating in New York (brookfieldbackstory.com, Niagara Escarpment). Many people, often students on campus and local residents, frequent the trails within the Cofrin Memorial Arboretum for personal enrichment. However, with the lack of on-site information about these important land features and ecological processes, many visitors miss out on the aforementioned combination of an immersive experience and readily available information that's been proven to motivated people to support biodiversity. Without on-site information about the important features and processes within the Cofrin Memorial Arboretum, many visitors' perception towards the arboretum is limited to their own experiences of recreation on the trails. If on-site information was placed throughout the arboretum via info panels, visitors will be able to engage with information as they walk the trails, and thus connect their experiences to the larger concepts of biodiversity and environmental conservation. This will deepen their appreciation for local biodiversity and make them more inclined towards supporting environmental policies (Bjorkland and Pringle, 2001).
Jarod Siekman-VerBoort	2020	A Survey of Great Blue Heron, Black-crowned Night-Heron, and Great Egret Concentrations in Green Bay	Herons and Egrets are not only just beautiful birds, but they play a huge role in being an indicator for ecosystem health (Watts and Watts 2018). These species have been in decline since the 1900s due to plume hunting, chemical pollutants, and the loss and change of habitat (Kushlan and Hancock 2005). This has initiated conservation efforts to help the species and their degrading habitats. I will be going to various Green Bay shorelines and watersheds to do surveys of Great Blue Herons, Great Egrets, and Black-crowned Night-Herons to compare with past eBird surveys done in past years. My surveys during the nesting, incubation, and feeding time of year should provide evidence of what natural areas may need to be restored, or what natural areas are functioning properly.
Malynn Tarczewski	2020	Aquatic plant survey and investigation of submerged macrophyte root associated fungi in the Cofrin Arboretum	The Cofrin Arboretum surrounds UW-Green Bay, and has 8 small ponds. The ponds are spread across the campus, and some are located in wetlands and oak savannas. It is to my understanding that an aquatic plant survey has never been completed on the Cofrin Arboretum ponds. This project will include a comprehensive survey of aquatic plants in the Cofrin Arboretum, and an analysis of different species of root associated fungi that interact with submerged macrophytes.
Brandon Byrne and Noah Nei	2019	Spatial Distribution and Ecological Importance of Muskrats (*Ondatra zibethicus*) at the Point au	Our study focuses on use of structures created by muskrats and the ecological importance of these structures in coastal wetland ecosystems. Muskrat houses protruding over 30 cm above water are generally active, housing one or more muskrats (Proulx and Gilbert, 1984). We will conduct more detailed observations of muskrat activity by marking and monitoring all structures within a 13 ha (30 acre) coastal wetland at the Point au Sable Nature Reserve on the east shore of lower Green Bay, Lake Michigan. Our goal will be to estimate the local populations of muskrats and to document use of muskrat houses during different times of the year and compare to previous years to assess fluctuation. Measurements of structure size and height above water level will allow us to map preferred areas of settlement within the lagoon, as well as provide baseline population

		Sable Nature Reserve in Northeastern Wisconsin	estimates from the number of active houses. Camera trapping will be used to supplement muskrat house studies to gain a better understanding of Point au Sable's ecological inhabitants. Standard structure activity surveys will be conducted to monitor interactions between muskrats, waterfowl, and other species present.
Jessica Kessler	2019	Baseline Monarch Population and Plant Survey on University of Wisconsin Green Bay Natural Areas	Monarch butterfly populations are threatened for a variety of reasons, one being the loss of their host plant milkweed. The focus of this study was gathering baseline data on Monarch adult and larva abundance as well as blooming plant and milkweed presence on University of Wisconsin Green Bay Natural Areas. Three plots were established and visited at least once a month where surveying using Monarch Joint Venture Integrated Monarch Monitoring Program (IMMP) protocols took place. Results indicate that areas with more milkweed and blooming plants attract more adult Monarchs, resulting in larva also being present in those areas.
Jason Miller	2019	Genetic Diversity of *Cypripedium parviflorum* in Door County, Wisconsin	*Cypripedium parviflorum* is one the 12 *Cypripedium* species found in North America and while being found across almost all North America, current populations are under threat from poaching and loss of habitat from human expansion. By utilizing microsatellite markers to assess the levels of genetic diversity within and amongst populations will give insight into a species adaptability and potential for long term survival. Currently there have been no SSR primers developed for this species so initial testing began with microsatellite loci developed for four closely related *Cypripedium* species and while some loci positively amplified DNA samples, the subsequent sequencing revealed that the microsatellite motif was not present.
Mari Mitchell	2019	Incidence and Mitigation of Bird/Window Collisions on the UW-Green Bay Campus	Both reflective and clear type windows are a major source of bird deaths. Both reflective and clear type windows exist within the architecture of the academic buildings on the University of Wisconsin – Green Bay campus. It has been observed that several bird species are impacted by the windows on the UW Green Bay campus. It also was observed that at UW Green Bay, it is possible to implement measures to prevent bird-window strikes. American Bird Conservatory BirdTape is one example of a preventative measure that was applied to a small span of windows in campus. To reduce the environmental impact of the UW Green Bay campus, the impact of the windows on bird populations should be considered.
Noah Nei	2019	Historical Changes and Effects of Ecological Succession on Midwestern Grassland Avifauna within the University of Wisconsin-Green Bay Arboretum	Wisconsin's landscape has changed dramatically since European settlement and one of the most notable changes has been seen within its grassland communities. Wisconsin prairies and open habitat, which once thrived, have now been reduced to less than one percent of their original abundance in the state. As a result, avian grassland specialist populations have taken a significant hit as their habitat continues to be reduced by various factors. One of these factors includes ecological succession, which occurs in open habitat wildlife areas where prairies are not managed properly or are fire suppressed. Within the confines of the Cofrin Memorial Arboretum ecological succession has diminished the amount of grassland habitat that it historically once had. Subsequently, historical data on the Arboretum shows a decline in many prairie bird specialists that are sensitive to these kinds of changes. These species of interest include, but are not limited to, Eastern Bluebird (*Sialia sialis*), Clay-colored Sparrow (*Spizella pallida*), Field Sparrow (*Spizella pussilla*), Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*). The primary purpose of this study is to determine the relative abundance and species richness of avian grassland specialists. Secondly, this study will also seek to determine a correlation between prairie habitat composition and species presence. This study will provide an objective census of avian biodiversity, as well as assess habitat suitability and potentially breeding success of grassland specialists.
Jacob Pelegrin	2019	Mapping the links between ectomycorrhizal fungi and red pine in northern Wisconsin	Ectomycorrhizal fungi pervade forest ecosystems and are critical to forest function, health, and regeneration. Transfer of resources and signaling molecules between plants has been shown in greenhouse and field conditions, but spatial scale and diversity of these complex networks in the field are still poorly understood. Recently developed technologies, including a variety of microscopic and molecular methods, have allowed advances in knowledge. This study proposes to show belowground, fungi-to-fungi connections between roots of different red pine individuals in the field. This report shows the findings from the first year of research of a Master's thesis. Our overall goal is to use molecular techniques to show that fungal genets, or individuals of the same genotype, are present on roots of different red pines. This would provide evidence that the trees are connected, most likely by fungal hyphae within the soil. Mycorrhizal roots were sampled in red pine stands within the Peninsula Sanctuary and the Cofrin Arboretum. Ectomycorrhizae were examined, subjected to DNA isolation and PCR of the ITS region, and sent for sequencing. Indicated by smeared bands or multiple bands in many PCR products, multiple species of fungi appear to be present within a single root tip in these cases. 25 samples had strong evidence for a genus or species match. High percentage matches include *Tomentella longisterigmata*, *Amphinema byssoides*, *Agrocybe erebia*, *Tomentella* spp, *Wilcoxina* spp, and *Tuber* spp. Of the samples found in the Peninsula Sanctuary and the Arboretum, the yellow, bifurcated morphotype, and the black morphotype were relatively common, roughly corresponding with *Tuber* and *Tomentella*, respectively. For this study to accomplish its eventual objectives, the focus will have to be on a fungal species that is widespread throughout the plot. To identify individuals of the same genotype, I plan to use SSRs (single sequence repeats), similar to the methods of Beiler et al. (2010). This will allow us to show spread of one individual fungal genet through the network. This will also allow us to use DNA from tree roots matched to tree boles, to confirm the connection of ectomycorrhizae to certain trees.

Norah Swenson	2019	Resurveying Bee Communities at UWGB and Toft Point Natural Areas	Native bee populations are important pollinators of wild herbaceous plants and thrive in a habitat that has sufficient floral resources and is appropriate for nesting. There has been mounting evidence of the increasing decline in native bee species around the world, a notable species being the Rusty Patched Bumble Bee (*Bombus affinis*). Loss of habitat and floral resources are predominant issues in this large-scale decline. This decline is not only concerning from a conservation standpoint, but also an economic standpoint as bee loss would be detrimental to crop yield due to native bees' role in pollination. Monitoring of bee populations is an integral step in further understanding this decline and identifying the issues at hand. This study looked at bee populations at Toft Point Natural Area in Door County, WI and the University of Wisconsin- Green Bay Cofrin Arboretum in Brown County, WI. These are sites that hold critical habitat for declining bee species. In the in the summer of 2019 these natural areas were re-surveyed to gain knowledge about the current composition of families/genera of bees and analyze at how it has changed over time compared to baseline data from 2005. Results showed that there were fewer families of bees found in 2019 at each site in comparison to 2005 data from the same sites. At each site, except for Toft Point Lichen Site, there was a noted decline in total genera. Aerial images were also researched and found of all sites from 2005 and present time to look at reduction in open area, and loss of open habitat over the past 14 years. Findings suggest that there may be a correlation between loss of open habitat and succession of the natural areas over time, as seen in aerial photos, and the decline of bee diversity due to this loss of habitat.
Brandon Byrne and Noah Nei	2018	Spatial distribution of muskrats (*Ondatra zibethicus*) at the Point au Sable Nature Reserve in Northeastern Wisconsin	Muskrats are essential inhabitants in wetland ecosystems despite often being perceived as varmints and a nuisance. Their structures provide nesting habitats for waterfowl, as well as microhabitats for invertebrates found in these ecosystems. Measuring the height of muskrat structures above water level determines structure activity and an approximate count of the musky tenants occupying the structure. A count of active houses provides a basic population estimate of the muskrats. Mapping of these structures displays general distribution and potential hotspots of activity. The first year of this study serves as a baseline estimate of the muskrat population and its distribution at the Point au Sable Nature Reserve that allows for future documentation of fluctuations in muskrat numbers in subsequent years.

Matt Kugel	2018	Assessing the Distribution and Ecology of Eastern Leatherwood on a Multiple Censused Forest Dynamics Plot (*Dirca palustris* L. Thymelaeaceae)	• Goal: Explore factors associated with the distribution of *Dirca palustris*
			• Goal: Get a better understanding of the *D. palustris* population at the Wabikon plot
			• Investigative Factors
			  ○ Associations, both positive and negative, with dominant tree species and the density of woody seedling members
			  ○ Topography and elevation
			  ○ Soil type, soil moisture, pH, and other soil chemistry variables
			• Supplementary data will be utilized from previous studies and sampling conducted at the study location

Rebecca Malcore	2018	A Preliminary Investigation of the Coralroot Orchid Mycorrhizae at Toft Point	In order to germinate, orchids require the presence of specific mycorrhizae fungal symbionts in the soil, and fungal abundance may be associated with orchid dormancy periods. *Corallorhiza*, commonly known as coralroots, depend almost entirely on mycorrhizal symbionts to obtain nutrients, as they produce no chlorophyll. This study aims to characterize the fungal symbionts of *Corallorhiza* species at Toft Point using orchid root samples and soil core samples. Using quantitative PCR, fungal abundance can be determined at different distances from a coralroot plant. Determination of mycorrhizae abundance may help to identify orchid hot spots and allow for better monitoring of dormancy periods.
Jared Pahl	2018	Cofrin Center for Biodiversity Video Program	The final goal for this summer is to create video introductions and virtual tours of the natural landscapes around Wisconsin via various research projects and stories culled from around the biodiversity center and its outlets. We want to produce a wide variety of videos that touch on subjects such as project promotion, natural area tours, and stories from the Center, the museum, and the herbarium. From those broader topics, we will narrow the focus to specific areas and specific stories. Some of those stories are: The Bay of Green Bay restoration around Lambeau Cottage, drainage problems in Mahon Creek, the research at Wabikon, irises and dragonflies at Toft Point, the purchase of the Wequiock property, and the continuing Carl's Curiosities videos. What this will do is educate people on what the biodiversity center is and what we do. Seeing the stories told in a compellingly cinematic way will also tangentially encourage people to support the center, recruiting new soldiers in the fight for a brighter future.
Makayla Swain	2018	Conservation genetic analysis of coralroot orchid (*Corallorhiza* spp) populations at Toft Point and the Ridges Sanctuary	Often it is assumed that orchids only inhabit tropical ecosystems, however, Door County has approximately 33 native orchid species. *Corallorhiza striata* or commonly known as the striped coralroot orchid, is a non-photosynthetic orchid that relies on its relationship with a symbiotic mycorrhiza. Due to this, the striped coralroot orchid is sensitive to environmental changes. A prime way of analyzing how they are adapting to these changes is by observing population genetic diversity. The goal is to observe a high genetic diversity which suggests that populations are adapting well. This study looks at populations of striped coralroot orchids at both Toft Point and the Ridges Sanctuary located in Door County, Wisconsin. Bracts were collected and dried on silica packets from 20 flowering plants from Toft Point and 3 from the Ridges Sanctuary. Physical and locational observations were recorded for each plant. DNA isolation and polymerase chain reaction (PCR) with eight simple sequence repeat (SSR) loci was completed for each sample. Evaluating and scoring the microsatellite allele sizes and other analyses will be completed. Through this we can get a comprehensive look at the genetic diversity of the populations in these areas. Knowing

			how well they are genetically adapting to changes will provide information if conservation efforts need to be established. This orchid is a great way to observe the health of forests and to get a better idea on the relationships non-photosynthetic orchids have. Native orchids are play an integral and key role in our Wisconsin forests and it's our duty to make sure they are adapting well.
Jacob Woulf	2018	Distribution and Ecology of Eastern Wild Turkeys (*Meleagris gallopavo*) within the University of Wisconsin-Green Bay Arboretum	Since the establishment of human settlement in Wisconsin, Wild Turkeys have experienced ebbs and flows in populations statewide. By the mid-1900s, Wild Turkeys were completely extirpated from the state. With the help from the Wisconsin Department of Natural Resources, Wild Turkeys were able to be successfully re-established in their natural habitats. In some areas, prime habitat has caused these birds to become a nuisance, prompting management action. We hypothesize this may be the case in our study area. Through the use of camera trapping, we were able to estimate population numbers, sex ratio and local hotspots of Wild Turkeys within the University of Wisconsin-Green Bay arboretum. This pilot study laid the groundwork for future studies and management plans for the delicate habitats of this natural area.
Colton Tanner	2017	Understanding the Genetics of *Iris lacustris*	Population genetics can be a powerful tool to make inferences about past events that happen to that species. With using that powerful tool, we proposed to characterize the rare dwarf lake iris (*Iris lacustris*) populations. As well as determining what if one of those populations was the one that propagated all the others. Using PCR to screen the microsatellite marker needed and performed a genotyping of the samples through a third-party lab. From that testing we found that the two populations tested showed signs of genetic variation; however, there wasn't enough data to make a convincing argument.
Vanessa Brotske	2016	Pollination, seed dispersal, and germination of the federally threatened dwarf lake iris (*Iris lacustris*)	Dwarf lake iris (*Iris lacustris*) is a rare, endemic plant with populations restricted to the northern shores of Lakes Michigan and Huron. Much is known about *I. lacustris* when it comes to population size, genomics, and habitat, yet little is known about species interactions and factors affecting seed germination and seedling survival. This study aims to identify visiting pollinators, identify species involved in dispersal and predation of seeds, and to determine the effect of soil scarification on seed germination and seedling establishment. Standardized pollinator observations were conducted in Brown and Door counties at four sites during May 2016 with plots being observed for a total of ten minutes. Throughout the ten-minute observation period any visitation to a flower was recorded and the species visiting was described. During early July 2016 seed dispersal observations were conducted at the same four sites. *I. lacustris* seeds were collected and placed on wooden planks in an area containing adult plants. The number of seeds were counted at the beginning, one hour after, and 24 hours after each experimental depot was placed. Video cameras were used to record any movement of seeds by potential dispersers. A sample of each species observed removing seeds from the experimental depots was also collected for identification to the species level. Soil disturbance was also investigated to determine potential influence on seed germination and seedling establishment. Thirty plots with three treatments (fall scarification, spring scarification, and a control) were established at three sites. Fall scarification occurred in October 2016 with spring scarification set to occur in March 2017. Each plot will be visited throughout the spring and summer to track seed germination and seedling establishment. Results from this study will contribute new knowledge to the current understanding of *I. lacustris* and will hopefully raise questions for additional avenues of research and future conservation efforts.
Willson Gaul	2016	Odonata (dragonfly and damselfly) monitoring in the Lower Green Bay and Fox River Area of Concern, including University of Wisconsin-Green Bay natural areas	Objectives • Select and mark permanent Odonata monitoring transects at six sites within the Lower Green Bay and Fox River Area of Concern (LGBFR AOC). • Sample adult Odonata (dragonflies and damselflies) and exuviae in the LGBFR AOC, including sites within University of Wisconsin - Green Bay natural areas. Record species present and relative densities. • Determine the usefulness of Odonata as indicators of wetland and ecosystem health within the LGBFR AOC. • Contribute observations to the Wisconsin Odonata Survey.
Katie McDonald	2016	Macrofungi Diversity Study of University of Wisconsin-Green Bay Natural Areas: A preliminary investigation and record into the fungal community of Northeast Wisconsin	Understanding the fungi that live in forest ecosystems is crucial to making good conservation and land management decisions. Many trees and other plants depend on fungi to release nutrients back into the nutrient cycle and to help with water uptake and retention. Furthermore, fungi are intimately involved in plant competition not only through mutualistic relationships, but also through parasitism and the breakdown of lingocellulosic material. Some fungal species can be used to indicate the health of an ecosystem but without a baseline study to indicate what fungal species are present in an area, land management plans may not be focusing on cornerstone fungal species. A baseline study was conducted to survey the macrofungi in two University of Wisconsin-Green Bay natural areas to establish a record of species present. The survey resulted in 131 fungal collections across 6 plots. This survey is the first of its kind in Northeast Wisconsin and the results will help identify and categorize fungal species in the Midwest. This study will also provide baseline data to establish which species are rare or endangered in Northeast Wisconsin and to track species assemblage through time. This study will set the stage for future research and conservation of fungi in Northeast Wisconsin, if not the entire Midwestern United States.
Jeremiah Shrovnal	2016	Bat diversity and abundance in the coastal zone of lower Green Bay, Lake Michigan	White-nose syndrome was first documented in Wisconsin during the winter of 2014 and as a result most of Wisconsin's bats have already been added to the state's threatened species list (*Eptesicus fuscus*, *Perimyotis subflavus*, *Myotis lucifugus*, and *Myotis septentrionalis*) or watch list (*Lasionycteris noctivagans*, *Lasiurus borealis*, and *Lasiurus cinereus*). During summer 2016 we sought to demonstrate critical habitats for bat conservation through nocturnal acoustic

			surveys near the shores of northeastern Wisconsin's Lower Green Bay and Fox River Area of Concern (AOC), an area that is potentially critical for both migratory and resident bats. Results provided baseline information on the bat abundance, species richness, and community composition of bats within the estuary, showing that the riverine habitat along the Fox River was less supportive of bat activity.
James Wise	2016	Physiological and Psychological Effects of a "Green Exercise" Training Program on Undergraduate Students	"Green exercise" is a relatively new field of study that involves physical activity undertaken in natural environments. Exposure to nature and chronic exercise are both individually associated with numerous physical and mental health benefits, but there are proposed synergistic benefits when they are combined. The purpose of this pilot study was to investigate the physiological and psychological effects of an eight-week "green exercise" training program on untrained undergraduate students from the University of Wisconsin -Green Bay (UWGB). There were two groups of participants (aged 19-23) in the study. The control group, exercised indoors at the Kress Event Center on the UWGB campus, and the experimental group exercised outdoors on the Cofrin Arboretum surrounding the campus. The training protocol for all participants in the study included 3 days per week of walking/running for 30-60 minutes at 65-85% of their maximum heart rate. The physiological parameters monitored in the study included heart rate, pre- and post-exercise blood pressure, heart rate recovery, heart rate variability (HRV), and ratings of perceived exertion (RPE). Through the use of various questionnaires, the psychological variables assessed include self-esteem, mood, and well-being. We hypothesized that SBP, DBP, HR, HR recovery, HRV ratio, RPE scores, and psychological measurements would all be more improved in the outdoor group ('green exercise' group) than the indoor group. Although significant differences were not found for the majority of the measurements between groups, there was a significant increase in 5-min HR recovery for both groups, and 1-min HR recovery for the indoor group. RPE scores also significantly increased for the indoor group but not the indoor group. A larger sample size and equal male to female ratio in future studies could aid in achieving significance and better representing the population.
Maxwell Larsen	2015	Lichen Biodiversity of Cofrin Center Arboretum	A lichen is a photoautotrophic composite of photosynthetic partner (photobionts) and fungi (mycobionts) in a symbiotic relationship (McCune 1997). They exist in a large number of habitats all around the planet including even harsh environments (Lamb, 1959). Lichens are also used as food, Nitrogen and Carbon fixers, and are known for their sensitivity to pollution (Elbert et al., 2012). Because of this, they can be very useful in testing habitats to determine pollution levels. Polluted areas could impact their role in the ecosystem as food for herbivores, whether from the pollution degrading or from them contaminating the food web. For these reasons, this project set out to find the biodiversity of lichens in the area. This knowledge will hopefully help future projects and research on both lichens and on local pollution levels. This distribution list will also hopefully be used to help expand the Wisconsin species record list. This species distribution list could then be used to research the levels and effects of pollution in in different habitats throughout Wisconsin.
Samantha Nellis	2015	Distribution and composition of nectar-dwelling microbe communities in five flowering plants in Northeastern Wisconsin	The primary objectives of this study are (1) to investigate and describe the microbial community found in the floral nectar of five Wisconsin wildflowers, (2) to determine the extent that pollinator species shape the composition and distribution of nectar-dwelling microorganisms, 3) to investigate the potential limitations of microbial dispersal and (4) to examine how nectar-dwelling microorganisms alter the sugar concentration and sugar proportions. My underlying goal is to better understand the interactions between microbes and pollinator syndromes in native plants of the north temperate zone. This study is one of the first investigations to use next-generation DNA sequencing to evaluate microbes in nectar samples from wild plants in North America. (Field sampling took place throughout Brown and Marinette Counties in Wisconsin, USA. Site locations included the Cofrin Memorial Arboretum (Niagara Escarpment, Mahon Woods, Bayshore Woods, and Keith White Prairie), which surrounds the University of Wisconsin-Green Bay campus, as well as ditches and residential areas. Habitat types ranged from mesic forest, restored prairie, and Great Lakes beachfront.)
Jeremiah Shrovnal	2015	Search for an Exotic Spider, and spider diversity in burned and unburned Phragmites at Ken Euers	A survey of spider populations done in 2004 revealed a spider species, *Clubiona pallidula* (Clerck), that was discovered for the first time in the Great Lakes region (Draney and Jaskula 2004). This spider species is native to Eurasia and, in the United States, it has only been previously reported in Washington. The 2004 survey of three coastal sites on the west shore of Green Bay containing *Phragmites australis* and revealed a total of 88 adult spiders belonging to eight families, with the highest abundance of the survey, 12.5%, being *C. pallidula* (2004). In 2010, A Cofrin Grant was awarded to Draney's students Emily Castellanos and Kelli Briski, to determine the range and abundance of *C. pallidula*. This study surveyed 18 sites, including the three sites originally surveyed by Draney and Jaskula (2004), 13 sites occurring from both 60 km north and south of the original west shore site, and a few sites on the east shore of Green Bay. This survey resulted in 963 adult spiders belonging to 86 species in 12 families, none of which were *Clubiona pallidula*. However, the 2010 samples did yield 8 male specimens of a *Clubiona* species that puzzled us which appeared to be similar (but not identical to) a North American species, *C. kulczynskii*, In 2015, we wanted to re-sample the locations that had previously yielded *C. pallidula* or *C. near kulczynskii* in order to find females or *C. kulczynskii* and determine the status (extinct or not) or *C. pallidula*. Some of the original sites were not accessible due to highway construction, construction of the Cat Island chain, and due to higher water levels than in 2010. A large unintended fire at Ken Euers in the spring of 2015 allowed us to compare spider diversity in burned and unburned areas at the same time as we sampled for the exotic spiders.

Jacqueline Corrigan and Tessa Moeller	2014	Snake survey on the University of Wisconsin – Green Bay arboretum: Is there a more effective sampling strategy?	As middle-position organisms, snakes provide a useful insight into the stability and health of an ecosystem. In Wisconsin, however, these organisms are rarely studied. Very little is known about their activity habits or preferences making it difficult for researchers to collect information on their behaviors. This study is an attempt to better understand snake movement and habits on the University of Wisconsin Green Bay through an on-going population census. Snakes were collected via a cover board method at various times during active seasons to determine if snakes are more likely to be found during certain time periods. Additionally, this study focused on this year's population to see if the harsh 2014 winter had a strong negative impact on snake presence. The study found that snakes are more likely to be found under boards during the night in summer months and during the afternoon in the spring and fall months. The low capture rates compared to other years also demonstrates a noticeable drop in the snake population. More research will be needed to determine if this is a constant behavior or if it was unique to that year. This information could increase capture rates for scientists hoping to gather more information on Wisconsin snakes in the future.
Lindsay Hansen	2014	Migratory birds at river mouth and shoreline habitats along the Lake Michigan coast in Manitowoc County, Wisconsin	This study was conducted to compare bird use of shoreline habitats at river mouths with other shoreline points along the Lake Michigan shoreline. Also, to gain insight on how riparian systems contribute to the value of shorelines for waterfowl, shorebirds, and other species of the near shore environment. Standard, 10-minute point counts were conducted bi-weekly at each of the four sites. During these surveys each bird seen or heard was recorded on a data sheet along with the bird's species, detection code, habitat code, distance, and site data such as weather conditions. Overall, the highest number of birds observed at the creek sites were Herring Gulls, which had the highest total counts of all the species observed. The Point Creek site had the largest diversity of species compared to the other three sites. It was also determined that human presence had a negative impact on the total number of bird species observed, particularly at the Fischer Creek sites. Overall, this study shed light on what species are utilizing these areas and showed that river mouth habitats are important for a variety of different species.
Cassondra Kollatz	2014	Zooplankton community structure before and after controlled burning of *Phragmites australis* and water level restoration in the lagoon at Point au Sable Nature Preserve in Brown County, WI	The goal of this study is to understand the impact of the wetland restoration plan at Point au Sable on zooplankton communities. By analyzing the impact on or changes in zooplankton communities at Point au Sable we can then better predict impacts on other important species such as fish that consume zooplankton as a food source. From June to October 2014, zooplankton samples were collected once a month from the creek mouth where the water pump will be located and the lagoon at Point au Sable. Creek samples were collected on each sampling day by towing a one meter vertical tow using a 63 micron Wisconsin net. Lagoon samples were collected at each of five staff gauges and from two additional locations within the lagoon by filtering one to five liters of water depending on water depth into a 53 micron mesh dolphin bucket to concentrate samples. Zooplankton were identified and enumerated using a Bogorov counting chamber under a dissecting microscope at 60x power. Diversity was measured calculated using the Berger-Parker dominance measure. Differences in diversity were compared using ANOVA. There were significant differences in species dominance with Wequiock Creek showing more even species distribution. Wequiock Creek was significantly different from only two of seven lagoon sites. There was no significant correlation between major taxonomic groups to temperature and water depth. The results indicate that there are differences between zooplankton communities in Wequiock Creek and in the lagoon, and there are probably differences in species diversity between locations in the lagoon. More samples need to be collected and other water quality parameters should be measured to better understand the contribution of zooplankton to the ecology of the system.
Amber Konrad	2014	Proposal: Survey and mapping of ant mounds in selected Cofrin Arboretum management areas	**Objectives**: In the Arboretum on the University campus, we have an abundance of ant mounds that could provide useful information related to prairie, agricultural and soil restoration processes. Beginning the mapping process will provide valuable information about a soil macrofauna that has been shown to affect the distribution and abundance of other organisms (Sanders and van Veen 2011). Entering the GPS coordinates of the mounds into ARCGIS, will allow me to examine any spatial relationships that are present. Specifically, questions that can be answered with the mapping data include: 1. Are the ant mounds randomly distributed or aggregated within the management areas? 2. Is there a different distribution if we examine a smaller scale? 3. Is there an ideal distance from water? By collecting a resident ant from each mound, we can get a good idea of the number of species of ants present within each management area. This will increase our understanding of the ecology of the arboretum on campus and of the mound building ants. Using the mapping data we will be able to examine whether a spatial relationship exists among species of ants: 1. Are mounds aggregated by species? 2. How many species? 3. Does the locational preference – in the open or under a canopy, differ among species? 4. Is there a difference in the architecture of the mounds?
Linda Vang	2014	Seed dispersal of *Trillium grandiflorum* on the	Myrmecochorous plants produce seeds with fleshy, lipid-rich appendages (elaiosomes) that serve as food rewards for seed-dispersing ants (Beattie 1985). However, ants are not the only animals attracted to elaiosomes. In seed dispersal studies of myrmecochorous plants, harvestmen (Arachnida: Opiliones) were listed as seed removers and

		University of Wisconsin – Green Bay Cofrin Arboretum	observed eating elaiosomes (Gunther and Lanza 1989; Kalisz et al. 1999; Ruhren and Dudash 1996). During a previous experiment, I observed harvestmen transporting the seeds of *Asarum canadense* and *Trillium grandiflorum* for up to one meter. Therefore, I hypothesize that harvestmen are alternative dispersal agents for seeds that are primarily ant-dispersed. Although most harvestmen species prefer soft-bodied invertebrates, plant matter is also a dietary component (Halaj and Cady 2000). Accordingly, the potential for harvestmen as seed dispersers depends on factors such as seed damage or predation. Whether harvestmen consume the soft elaiosome or prefer the entire seed is unknown. The objectives of this study are to determine if harvestmen are predators of *A. canadense* and *T. grandiflorum* seeds and to assess the role of harvestmen in seed dispersal of *A. canadense* and *T. grandiflorum*.
Tim Flood	2013	Monitoring and Assessment of the Cat Island Chain Restoration Project in Lower Green Bay, Brown County, WI	To gain a better understanding of the water quality and habitat benefits the created island chain is or is not providing, an assessment of water quality samples and macrophyte vegetation surveys was conducted. The main objective of this project is to examine the ecological effects of the created barrier island chain and relate these results to the expectations of the Cat Island Chain Restoration Project. Specific objectives for this research are to (1) examine potential changes in water quality and wave energy variables (i.e. light extinction, total suspended solids, volatile suspended solids, chlorophyll *a,* wave velocity) on each side of the island chain, (2) survey aquatic vegetation density behind the barrier and in a control area (i.e., Dead Horse bay), (3) evaluate the existing seedbank under controlled greenhouse parameters, and (4) monitor the succession of transplanted germination trays and hardstem bulrush (*Schoenoplectus acutus*) plugs on each side of the island chain.
Amanda Johnson	2013	The Ecology of Woodchuck (*Marmota monax*) Burrows on the UW-Green Bay Campus	Woodchucks provide shelter and other essential needs to surrounding wildlife similar to other mammals and are important to the ecology of the area. The purpose of the study was to locate woodchuck burrows on the University of Wisconsin Green Bay Campus in Green Bay, WI, to determine the ecology of these burrows, and to record the different species that manipulate and use the burrows. The ecology of woodchuck burrows was studied between March 2013 and January 2014. The study area was divided into plots of relatively equal area (2 m^2) using a handheld GPS unit. Within these plots, burrows with diameters greater than 10 cm were located and mapped with the GPS receiver, marked with flags, and visited multiple times during the study period. Thirty different burrows were found and monitored using direct observation and the Primos Hunting Truth CAM35. Ten of these burrows were found to be woodchuck burrows. A total of 20 different species were observed using and foraging around these burrows including eastern chipmunks, grey squirrels, and eastern cottontails. Woodchucks were observed at the burrows in the summer months, but were rarely seen between the months of October and January when other species were observed using the burrows. Eastern cottontails were observed using the burrows in the winter months (between October 2013 and February 2014). From the results, it was gathered that burrows are unevenly distributed, many species are active in and around each burrow, and they use the same burrow. The use of these woodchuck burrows during the winter months by other animals suggests that it is an important survival tool for many of these animals. Woodchucks appear to be important contributors to mammal ecology in the ecosystem.
Sravani Karnam	2013	Modeling Trophic Dynamics in Pond habitats on the Cofrin Arboretum	The primary objective of this study is to understand the trophic organization in the ponds by evaluating the density and composition of phytoplankton and zooplankton at different times of the year. I will use the results to create models of trophic interactions that predict the nutrient conditions and roles of higher level predators in these systems. Modeling these results will help analyze which factors (abiotic and biotic) drive the feeding relations and which trophic levels are the most vulnerable to disturbance. A comparison of phytoplankton and zooplankton assemblages among ponds will help identify factors that are important in driving the trophic dynamics of these communities.
Jessica Kempke	2013	Acoustically Evaluating Migration Patterns of Bat Species Along the Wisconsin, Lake Michigan Coast	The Wisconsin/Lake Michigan coast is a very significant flyway for migrating bird species. In addition, many studies have shown this flyway to be important for migrating bats as well. The purpose of this study is to evaluate the presence and distribution of different bat species that use this popular corridor. By placing a set of two detectors (Wildlife Acoustics' SM2 acoustic/ultrasonic detector) at twenty different transects among preselected locations along the lakeside of Door County, south from Door County along the coast, along the shoreline of Brown County in the University of Wisconsin-Green Bay's Point au Sable site, and the bay side of Oconto and Marinette Counties, Wisconsin, we will be able to record bat calls and subsequently identify the species using the area. As a result, with the placement of these detectors, we will be able to compare bat species migrating and foraging along the coastline as well as 3-5 kilometers inland. In addition, this study will emphasize the use of uncluttered coastline sites by foraging and migrating bats and consequently compare them to the use of more cluttered sites located 3-5 kilometers inland. These sites will be monitored from spring migration through the end of fall migration and will consist of recordings each night from sun-down to sun-up. With the collected data from these sites, we hope to contribute to the knowledge concerning the distribution of bat species as well as trends in migration and habitat use.

Brianna Kupsky	2013	Monitoring Bats at University of Wisconsin-Green Bay Natural Areas	The purpose of this study was to examine the presence and diversity of resident and migratory bats at two of the natural areas managed by the University of Wisconsin-Green Bay including the Point au Sable Nature Preserve located within Brown County, Wisconsin, as well as Toft Point located within Door County, Wisconsin. Bats were passively monitored using an Anabat SD1 echolocation detector within a number of different habitats, as this type of monitoring is suggested to maximize the quantity of recorded sonograms. Sonograms were then identified using Analook software to qualitatively determine species diversity at each natural area using shape and frequency as the criteria. Of the seven species known to reside in Wisconsin, seven were encountered within the months of August through October. While bats were encountered within every habitat, forested areas nearest to water were clearly favored, suggesting that the preservation of this habitat will be necessary for the health of our migratory and local bat population. As the impending threat of White-Nose Syndrome looms ever closer on the horizon in Wisconsin, collecting data on species diversity and preferred habitat will give biologists much needed information on how this disease will impact our local hibernating bat population.
Christa Meyer	2013	Ecology and behavior of red fox (*Vulpus vulpus*) on the UW-Green Bay campus.	The purpose of this study is to follow a fox family through the breeding season, documenting the timing of important family events and interactions with other species in conjunction with, documenting the ecology and behavior of the family of red foxes at their den sites on the University of Wisconsin-Green Bay campus. Interspecific relationships between foxes and other animals such as woodchucks have been reported; in some cases, the woodchuck and the red fox live together in the same den (Chapman & Feldhamer 1982). Camera traps are an effective and rapidly growing method for studying animal behavior, and today they are commonly used in surveys of secretive species like red foxes (Cove et.al. 2012).
Amanda Nothem	2013	Developing a Hands-On Science Curriculum for Middle and High School Science Students	Inquiry based learning in the field can greatly enhance any educational experience. Local middle school teachers in the Green Bay area have been searching for fieldtrip areas and curriculum that can give their classes this valuable learning tool. Through this project a curriculum is being developed that will allow students to analyze the health of four aquatic areas, and the atmosphere around them in the Cofrin Arboretum. Then students will discuss what makes those environments healthy or not. The tests that will be performed to determine the health of the area will be for temperature, dissolved oxygen, nitrates, pH, salinity, dew point, cloud cover/type, wind speed/direction, and aerosols.
Tom Prestby	2013	Spatiotemporal Analysis of Migratory Shorebirds in the Coastal Zone of lower Green Bay, Lake Michigan	Shorebirds are threatened continentally and globally by loss of habitat, invasive species, and climate change. Combined, these ongoing threats and the already threatened status of many species make shorebirds a critical group for research and informed conservation action. The vast majority of shorebird research in North America has been conducted on the ocean coasts and most interior studies have focused on the Great Basin and Great Plains. Few studies of shorebirds have been conducted in the Laurentian Great Lakes, even though millions of shorebirds migrate through this region every spring and fall, and the total length of shoreline (17,549 km) of the Great Lakes rivals that of either coast. Because of its large size and extensive and dynamic shorelines, the embayment of Green Bay serves as a potentially critical refuge for migrating shorebirds in the interior of North America. Lower Green Bay in particular, is a known staging area, but like most of the Great Lakes, no study has systematically documented numbers and distributions of migratory shorebirds in this region. I propose to apply both traditional and Bayesian hierarchial statistical models to study the relationship between shorebirds and measurable environmental attributes of the lower bay, including weather variables, small-scale and large-scale habitat characteristics, presence of invasive species such as *Phragmites australis*, geographic location, presence of other waterbirds, and chronology. These multivariate analyses using both community and individual species response variables will help identify factors that are critical for shorebird use of Lower Green Bay. Results will help guide management strategies for conservation of migratory shorebird habitat here and in other embayment systems in the Great Lakes Basin.
Mary Quade (formerly "Mary Dishnow"; now is "Mary Brandner")	2013	Comparison of epiphytic moss abundance and diversity in the Wabikon Forest Dynamics Plot and the Mahon Forest Dynamics Plot	The primary objective of this study is to acquire baseline information on tree moss diversity and abundance at two long-term forest dynamic research plots (Mahon Woods and Wabikon Forest Dynamic plots). Results will be important for longitudinal studies looking at the effect of climate change on diversity and abundance of moss, understanding the role of moss as pollution indicators and monitoring the impact of habitat change on this important group of plants. Specifically, I will compare moss diversity and abundance between these two research sites as well as among tree species and DBH size classes.
Haley Sharpe	2013	Are Woodpeckers a Vector Species of Wood-Decaying Fungi in North Eastern Wisconsin?	This study was conducted as a pilot study to see if woodpeckers in Northeastern Wisconsin carry fungi. Swabs were taken of the bill and feet of cavity and non-cavity nesting bird species which were transferred to an agar plate in the lab. Data was then run through ANOVA. There was statistically significant differences between the bill and feet of both categories of birds, non-cavity species carried many more bacteria then cavity nesters, and overall the feet of birds carry more species than the bills. If there had been more funds, the study would have gone into more detailed DNA sequencing to differentiate the species. The finding of this study may also turn out different in the future based on the fact that this was only taken during one season in 2013 and there were not many samples to indicate an entire population. This study also did not take into consideration migratory birds which may carry different microbes than what can be found in Northeastern Wisconsin.

Linda Vang	2013	Seed dispersal of spring ephemeral wildflowers by ants in the University of Wisconsin – Green Bay Cofrin Arboretum	Over 3,000 plant species depend on ants for seed dispersal (Beattie 1985). I examined seed dispersal of *S. canadensis, A. canadense,* and *T. grandiflorum* in the Cofrin Memorial Arboretum. Objectives were to determine 1) dispersal agents, 2) the effect of plant density on seed removal rates, and 3) the effect of location on seed removal rates. Seeds depots were placed on the ground throughout the Cofrin Arboretum in June—August 2013. Removal activities were recorded using Sony HD camcorders. Seed removal rate was measured as the proportion of seeds removed after a six hour period. Plant density was measured as the number of stem in a 3.14 m^2 circular plot. Ants were the primary dispersal agents for all three plants. However, harvestmen were also observed removing seeds of *A. canadense* and *T. grandiflorum*. There was a negative relationship between plant density and seed removal rates. Seeds in lower plant density plots were more likely to be removed than seeds in higher plant density plots. There was no difference in seed removal rates between sites, suggesting seed dispersing ants are present throughout the Cofrin Arboretum.
Brianna Kupsky	2012	Monitoring Bats at University of Wisconsin-Green Bay Natural Areas	SUMMARY OF PROPOSAL The purpose of this project will be to develop and implement a systematic monitoring program of migratory and resident bat populations at the Pt. Sable Nature Preserve and other UW-Green Bay managed natural areas, particularly the Toft Point Scientific Area in Door County. This work will build on earlier student surveys by Stephani Herman, Sara Gossfeld-Benzing, and Adrianne Wacker (2001), Courtney Lewis (2006) and Richard Novy (2009). My primary focus will be the Pt. Sable Nature Preserve in northern Brown County, but I also will conduct surveys at the Toft Point Scientific Area and other UWGB-managed natural areas, time permitting. This information will create a baseline for future studies and will help verify the composition of resident and migratory bat assemblages at these areas.
David Lawrence	2012	Continued baseline study of fish assemblages in the Wequiock Creek Estuary, at Pt. au Sable Wisconsin	SUMMARY OF PROPOSAL The objective of this study is to continue my 2010-2011 baseline survey of the fish populations using the Wequiock Creek Estuary for spawning, foraging, and protection. I also will assess the associated water quality of the estuary by taking standard measurements of temperature, pH, and conductivity. The water level will be recorded with a fixed measuring stick, located under the bridge. The collected data will establish the baseline water quality of the Wequiock Creek Estuary for future research. Finally, I hope to identify current management practices that are adding to the degradation of the estuary for the future management and preservation of the Wequiock Creek estuary.
Jesse Weinzinger	2012	Mammalian Assemblages at the Wabikon Lake Forest Dynamics Plot	SUMMARY OF PROPOSAL In this study I propose to continue my research from last year by conducting a survey of all mammals at the 25 ha Wabikon Forest Dynamics Plot in Forest County, Wisconsin. I will use a variety of methods during all seasons of the year in order to catalogue a list of mammal species, their relative abundance between upland and lowland forest types, and their distribution within the natural area.
Rachael Weldon	2012	Inventory of Macromycetes and the Development of Standard and Repeatable Protocols	SUMMARY OF PROPOSAL The need to develop and test standard and repeatable protocols applied to macrofungi have recently emerged; especially in tropical ecosystems where fungal diversity is high but poorly known (Braga-Neto et al. 2008, Djelloul and Samraoui 2011). Yet, most protocols do not limit the collection time that crucially alters data regarding the number of species and individuals collected and counted in a specific site (Gilbert and Sousa, 2002, Mueller et al. 2004, Rodriguez Estrada, personal communication). The Cofrin Memorial Arboretum offers an excellent opportunity to further improve and test collection protocols while studying fungal diversity and changes in species composition over time. Objective: Improve and develop standard and repeatable protocols to study macromycetes diversity and changes in species composition at the Cofrin Memorial Arboretum.
Lindsey Bender	2011	Effects of understory herbaceous community composition on soil microbial respiration, soil nutrient cycling, and microbial community composition	I will address several plant-microbe interaction questions in my thesis research in northern Wisconsin at the Wabikon Forest Dynamics Plot. My objectives are as follows: 1. To determine whether soil microbial respiration varies between three levels of diversity: low (2-4 species), medium (8-10 species) and high (14-16 species) in herbaceous understory plant communities. 2. To determine whether understory herbaceous layer diversity influences soil microbial nutrient cycling. 3. To determine whether understory herbaceous layer diversity influences the composition of soil microbial communities. 4. To determine whether herbaceous community influences on soil microbial respiration and nutrient cycling are detectable in a northern hardwood forest ecosystem.

Alicia Brunner	2011	Monitoring Eastern Bluebird (*Sialia sialis*) nesting boxes at the University of Wisconsin-Green Bay campus	PROJECT OBJECTIVES 1. Are the nest boxes being used by bluebirds or other species? 2. Do cavity nesting species compete for the boxes? What habitat features affect nest box use?
Ashley Fehrenbach	2011	Patterns of herbaceous plant species assemblage, distribution and richness within the Wabikon Lake Forest Dynamics Plot in northern Wisconsin	PROJECT OBJECTIVES 1. Do understory herbs occur in predictable species assemblages? 2. Which plant species are associated with different soil types? 3. Which plant species are associated with different topography categories? 4. Are environmental variables predictors of species richness?
Kari Hagenow	2011	Examining the potential for density-dependent seedling mortality within a temperate forest plot in northern Wisconsin	The factors influencing tree recruitment are critical to identifying and protecting rare species, conserving forest biodiversity, and guiding sustainable forest management. Although the ecology of tree seedlings has been widely studied in tropical forests, very few community-wide surveys of seedlings have been reported for temperate forest systems. I measured and marked tree seedlings in 316 2x1 m subplots stratified by topography and elevation at the Wabikon Forest Dynamics Plot in northern Wisconsin. My primary objective was to determine factors influencing the density, species richness, diversity and mortality of seedlings. Measurements for individual seedlings included age, length of the main stem, new growth, diameter, browse, and insect herbivory. I also collected light availability data and GIS-derived information on soil type and the composition of adult trees for each subplot. I documented 31 species among 5,038 sampled tree seedlings. *Fraxinus americana* comprised 42% of all seedlings sampled and ranked first in abundance and basal area. *Acer saccharum* ranked second in abundance and basal area. Canopy openness and herbaceous cover were significant predictors of seedling density. Seedling density, soil map unit, and adult tree composition were shown to significantly influence species richness, with seedling density alone predicting the majority of the explained variation. Seedling diversity was significantly affected by herbaceous cover, soil type, and slope aspect. Seedling density and soil type were significant predictors of mortality among subplots while a logistic regression showed four variables to be significant predictors of mortality at the individual seedling level: seedling age, insect herbivory, canopy openness, and elevation. Browse is also likely to be an important influence on seedling growth, density, and diversity at the Wabikon Forest Dynamics Plot. Resource availability and competition appear to significantly shape the composition of the seedling layer. Density-dependent mortality was not observed in the two most common understory species. This contradicts recent studies that have found density-dependent effects in some temperate species and suggests that other mechanisms may be important for maintaining diversity within northern mesic forests like that of the Wabikon Forest Dynamics Plot.
Nick Janak	2011	The effect of dead fine root inputs on soil microbial biomass and enzyme activity – the path to soil organic matter accumulation	In this study, we seek to understand the effect of dead fine roots on soil microbial activity by asking how differences in dead fine root inputs alter the microbial biomass and activity of microbes found in bulk soil, near, but not directly associated with decaying fine roots. This question has impacts beyond the effects on the decaying roots themselves, as plant inputs are known to both increase, and decrease, resident soil organic matter losses through a process known as soil priming (Blagodatskya and Kuzyakov 2008). Thus a better understanding of how plant inputs affect the microbial processes responsible for generating soil organic matter are fundamental to improving our ability to restore the soil environment. Our main objective is to evaluate the effects of root decomposition on microbial biomass and enzyme activity. Our study took place on the Cofrin Arboretum on the UW-Green Bay campus.
David Lawrence	2011	Continued baseline study of fish assemblages in the Wequiock Creek Estuary, at Pt. au Sable Wisconsin, including quatrefoil light traps	SUMMARY OF PROPOSAL The objective of this study is to continue my 2010 baseline survey of the fish populations using the Wequiock Creek Estuary for spawning, foraging, and protection. In addition to my 2010 baseline survey I will be using Quatrefoil larval light traps (Figure 2) to collect phototaxis larval fish. Many species of fish including larval and juvenile Northern Pike (*Esox lucius*), have been found to be phototaxis, or drawn to light during various life stages (Zigler 1995). Prior research has shown that Northern Pike start to become phototaxis at around 15 mm TL (Total Length), or right after they finish absorbing their egg yolk sacs, and become predatory feeders (Morrow et al. 1997). My proposed trap design (5 mm opening) should be able to catch Northern Pike ranging in size from 14 mm to 50 mm TL (Morrow et al. 1998). I also will assess the associated water quality of the estuary by taking standard measurements of temperature, pH, and conductivity, with the use of 4 to 6 Hydrolab Datasode MS4a's, at latitudinal increments downstream. These instruments will record data continuously throughout the summer. The water level will be recorded with a fixed measuring stick, located under the bridge. The collected data will establish the baseline water quality of the Wequiock Creek Estuary for future research. Finally, I hope to identify current management practices that are adding to the degradation of the estuary for the future management and preservation of the Wequiock Creek estuary.
Gary Wauters	2011		This study will provide a survey of the mammals found within the Brussels Hill Pitt Cave sediments, and utilize the sediments found within the cave to provide a partial ecological reference point for Door Peninsula mammals. This partial reference point will specifically address pre-industrial mammal populations. A

			catalog of all sediments examined will be provided. Multiple carbon dates will provide a better context for understanding the changes that may have taken place over time.
Jesse Weinzinger	2011	Mammal Survey of the Wabikon Lake Forest Dynamics Plot	PROJECT OBJECTIVES 1) To create a master list of species for the Wabikon Dynamics Plot by using field cameras, live trapping, ANABAT, and snow tracking/identification. 2) Is there a difference in small mammal assemblages between upland and lowland forest types? Is there a correlation between small mammals caught and live trap placement?
Mark Wolf	2011	Spatial and Temporal Variation in Frog Breeding Activity at the Toft Point Natural Area in Door County, Wisconsin	I propose to conduct an in-depth analysis of anuran calling patterns at three coastal wetlands along the shore of Lake Michigan. My goal will be to examine the relationships between environmental and ecological variables and the spatial and temporal variations in anuran vocal activity. Although the three wetlands are within 2 km of one another, they differ in size, landscape context, and exposure to Lake Michigan. These differences will lead to variation microhabitat conditions (temperature, wind, species composition), which I will measure and compare with recorded patterns of anuran calling activity.
Matthew Abrahamzon	2010	Mahon Creek Hydrology and Water Quality: Initiation and collection of baseline data from an automated monitoring station	Main objectives: • Initiate operation of an automated water monitoring station on Mahon Creek • Compare and contrast initial baseline data with the Baird Creek station. Specific objectives: • Assist in the planning, design and installation of an automated water monitoring station. • Initially characterize flow and water quality dynamics (T, pH, DO, conductivity) of Mahon Creek during the fall of 2010. • Collect water quality samples during events and low flow conditions to estimate event and daily loads – Total Suspended Solids (TSS) or Suspended Sediment Concentration (SSC) – Total Phosphorus (TP) 3) Dissolved Phosphorus (DP)
Lindsey Bender & Gary Wauters	2010	A proposal for the continuation of the snake survey on the University of Wisconsin-Green Bay campus and Cofrin Arboretum	PROJECT'S OBJECTIVES • What snake species are present on the UW-Green Bay campus? • What is the snake population on campus? • Where is the location of the winter hibernaculum? • What are the seasonal movement patterns and home ranges of the snake species present on campus? – What is the demography of the snakes on campus?
Kelli Briski & Emily Castellanos	2010	Spiders of Lake Michigan coastal marshes--The Search for *Clubiona pallidula* in Coastal Populations of *Phragmites*	• The main objectives were to determine where *Clubiona pallidula,* a new invasive spider, exists in northeast Wisconsin and its abundance, to compare sites that previously contained *C. pallidula* to sites that did not contain *C. pallidula* to see what effect the invasive species had on other spider assemblages, and to develop an effective method to sample for spiders in *Phragmites australis*. Eighteen sites were sampled in June and July of 2010 by pan traps, beat sheets, and sweep nets. In addition, the 3 sites sampled in 2004 by tomato stand traps were resampled by those traps. Adult spiders (N=1029) were identified to genus or species level. No *Clubiona pallidula* were identified. ANOVAs were run and no significant differences were found in total spiders, total families, or total species per level of *Phragmites* or per type of trap.
Erin Gnass (now Erin Giese) & Nicholas Walton	2010	Optimizing Avian Surveying Effort Using a Model-based Approach at Point au Sable, Wisconsin	In Brown County, Wisconsin, avian field surveys have been conducted at Point au Sable Natural Area since the 1990s, but little work has been done to summarize these data and to evaluate avian survey effort. Our objectives were to assess evenness and completeness of survey effort at different temporal and spatial scales and to provide recommendations for future field researchers. We constructed species accumulation curves to assess the completeness of survey effort for the following: (i) annual and seasonal survey effort of all sites combined and (ii) annual survey effort of individual sites. We also performed a non-metric multidimensional scaling ordination to evaluate similarities among sites for each season using bird assemblages. We found that avian survey effort has been variable with more surveys being conducted during spring and fall migrations than other times of the year. Two of the eleven bird survey sites were surveyed more completely than the other sites. Despite the variability in survey effort, we found that Point au Sable has been sampled adequately to identify

			bird species that use the Point during a given year and to describe seasonal avian community turnover. Interpretation of trends in species turnover may be complicated by the seasonal variability in survey effort. Surveying more evenly throughout the year will help separate the effect of survey effort on observed bird species richness. Therefore, we recommend that each site be surveyed at least twice a month and that researchers avoid surveying sites on the same day that are geographically too close to each other. We also created a monitoring tool that will track survey effort per site in order to assist researchers in surveying sites more evenly.
Aaron Groves	2010	Method Analysis of Bee Trapping Techniques (Vane Traps vs. Bowl Traps)	PROJECT OBJECTIVES (differ from proposal) - Discover what insects pollinate *Tilia americana* (basswood). - Determine differences in insect assemblages between the ground and canopy layers. - Determine differences in insect assemblages between a secondary northern hardwood forest and a disturbed mixed woodland. - Determine if the color of the bowl trap makes a difference in the taxa of insect attracted. Study sites: Mahon Woods and Wabikon forest
Andrea Gruen	2010	Estimating effects of land use on the frequency of amphibian malformations in UWGB natural areas	PROJECT OBJECTIVES • To determine the frequency of amphibian malformations within Cofrin Memorial Arboretum Perform visual surveys of recent amphibian metamorphs
Nicholas Hamus & Zachary Moureau	2010	Environmental factors that affect fish species distribution along the shore of the Bay of Green Bay	• The effects of varying environmental conditions on near shore fish communities are poorly known, even though these conditions can be important determinants of population dynamics and species interactions. I hypothesize that the fish community structure along the Lake Michigan shoreline will respond to changes in dissolved oxygen content, water temperature, turbidity, and temporal conditions. Fish were collected between June 2010 and November 2010 using a seine along a 30 meter section of the Lake Michigan shoreline adjacent to Kingfisher Farm Natural Area in Manitowoc County, WI. All fish were identified, measured, and released. Community structure appeared to change throughout the year as some fish species were present at the beginning of the sample period and others present at the end. Neither species richness nor fish abundance was significantly associated with dissolved oxygen content, water temperature, or turbidity. However, the sample size was relatively low (9 samples) so the statistical power of my analysis is very limited. Further research is needed in this area to determine the effects of environmental conditions on fish species community composition.
Andrew LaPlant	2010	Exotic slug abundance in four contrasting NE Wisconsin Forests	PROJECT OBJECTIVES - To determine the abundance of exotic slugs within five contrasting forest habitats in northeastern Wisconsin. - Correlate slug abundance with soil properties expected to influence slug abundance. To identify whether slug abundance is affecting plant community composition.
David Lawrence	2010	Diversity and breeding status of fish assemblages In the Wequiock Creek estuary	- The Wequiock Creek Estuary is the largest remaining sizable estuarine system along the east shore of Green Bay. The system suffers from siltation due to farming practices, as well as an invasion by the common reed (*Phragmites australis*), which has replaced native cattails (*Typha latifolia* and *Typha angustifolia*) and other native submergent vegetation along the shore. Nevertheless, this estuary may provide critical nursery habitat for several species of fish because of wetland loss and degradation of coastal and riverine habitats in the Green Bay watershed. Little research has been done on the Wequiock Creek Estuary, making it an ideal area to assess how fish assemblages use coastal wetlands for spawning, foraging, protection, and as a nursery. Fish assemblages were surveyed using a Fyke net and minnow traps (N=15). Results yielded 13,848 fish representing 26 species. The vast majority of individuals (87 %) consisted of young-of-the-year yellow perch (*Perca flavescens*), suggesting that the Wequiock Creek Estuary plays a significant role as a nursery for this species. Yellow perch contribute to an important commercial and recreational fishing industry in the Green Bay area, and they are a significant element of the bay's native fish fauna. This study of the Wequiock Creek Estuary provides an important baseline for better understanding and managing Great Lakes estuarine systems for future success of not only fish species like yellow perch, but also for other native species of amphibians, birds, mammals, invertebrates, and plants.

Cody Sandahl	2010	The effects of root growth on soil microbial biomass and enzyme activity	PROJECT OBJECTIVE - Determine the effect of live roots on microbial biomass and enzyme activity.
Eric Struck	2010	Investigation of seasonal fish movements in lower reaches of Mahon Creek and Wequiock Creek near the bay of Green Bay	My objective was to determine if there has been a change in the invertebrate and fish communities of Mahon Creek that would indicate a change in water quality. I used data collected by the Wisconsin Department of Natural Resources (WDNR) in the 1990's along with new macroinvertebrate sampling. WDNR protocol was followed for kicknet sampling. Specimens were ID'd to family. FBI values ranged from 3.9 (very good) to 5.2 (fair). There was a siginificant difference in EPT between the earliest and late sample periods, showing a considerable loss in the sensitive EPT species. The FBI showed a trend of increasing values in the 1990's and then decrease more recently which could be attributed to construction that occurred in the watershed in the 1990's. The fish community was also surveyed using electroshock and compared to earlier WDNR data. All fish were ID'd and weighed, with weights taken on Sunfish and Burbot. The Wisconsin Small and Intermittent Stream Index of Biotic Integrity was used to compare the samples. All samples fell within the urbanized range and all species found were intolerant species.
Justin Vincent	2010	Microbial Communities in Floral Nectar of Two Spring Flowering Plants in the Cofrin Arboretum	N/A
Jacqueline Krall	2009	Temporal and spatial patterns of seed production by woody species in the Cofrin Arboretum forest dynamics Plot	My objectives are to 1)describe temporal and spatial distribution of seed production within the plot, 2)establish a baseline for monitoring forest change, and 3)compare seed dynamics with other plots in North America, China, etc. From July-Nov, contents of 21 seed traps were collected. Material from 4 dates were weighted and identified to species.
Josh Martinez	2009	The effect of herbivory by White-tailed deer on native forbs planted in a matrix of native grasses in urban parks	I tested the hypotheses that 1)the presence of non-palatable plants facilitates growth of palatable species, 2)the presence of non-palatable plants facilitates the fitness of palatable species, Six replicate blocks, with 6 plots/block using *Elymus virginicus* as non-palatable and *Eupatorium rugosum* as palatable species, were monitored at Bay Beach Wildlife Sanctuary. Deer activity was measured by fecal group transect counts surveyed every 2 wks.
Santiago Ocariz	2009	Comparison of canopy and sub canopy arthropod communities on the Cofrin Arboretum	My objectives were to study arthropod communities in trees in the UW-Green Bay Cofrin Arboretum and to compare arthropod distribution in the sub-canopy and canopy. Three replicates of 2 tree species were sampled at the 2 heights for 3 two-week collection periods using Lindgren traps. Over 1500 invertebrates were collected, with the most abundant being Diptera and Araneae. In both tree species, spiders dominate in the subcanopy and flies in the canopy. More Homopterans were found in *Populus deltoides*. *Quercus alba* had more beetles in the subcanopy and more Lepidoptera in the canopy. Three new Brown County records for spiders were collected. A non-native spider accounted for 79% of all spiders caught and was found in 96% of traps.
Adam Snippen & Kymberly Draeger	2009	The fungus among us: a snapshot of Mahon Woods' hidden kingdom	The Mahon Woods Forest Dynamics Plot was surveyed for fungi. Photos or samples were taken, and notes on weather, abundance, growth habit, substrate, surrounding vegetation, GPS waypoint or distance from nearest tagged tree, browse damage, and morphology. Spore prints were made in the lab and identification is ongoing, with most specimens ID'd to order level, 65% ID'd to genus.
Eric Struck	2009	Bioassessment of Mahon Creek	The objective is to add additional samples of the macroinvertebrate community and water quality in areas previously sampled by WDNR, and sample additional areas. Additionally, a survey of the fish community of Mahon Creek was done. Following WDNR protocols, kicknet samples of invertebrates were taken from fall 2009 and spring 2010. Fish were sampled using an electrofishing unit, identified to species and weighed.

		using macroinvertebrate and fish communities	
Pao Vue	2009	Snake species richness, abundance, and distribution on the University of Wisconsin-Green Bay Campus and Cofrin Arboretum	I initiated a long-term study utilizing coverboards, active search, and capture-mark-recapture methods to investigate snake species richness, abundance, distribution, and dispersal patterns. I captured 47 specimens representing three snake species (common garter snake, northern redbelly snake, eastern milksnake) during the six month study period. I tested the effectiveness of sampling methods (coverboards vs. active search) and found that at least for two snake species, coverboards improved the chance of detecting snakes. I also monitored an artificial hibernaculum but was not able to collect significant data on active use by snakes. Population estimation and dispersal patterns were not obtainable due to the low number of recaptures. Capture-mark-recapture data from this study will be combined with future studies to estimate the local snake population size and turnover ratio; as well as determine the effect of roads on dispersal patterns.
Meagan Davis	2008	Research on Cliff Swallows in the Cofrin Arboretum	The Cliff Swallow colony at the University of Wisconsin-Green Bay has been studied since 1997 by UWGB researchers Gregory and Jennifer Davis. Cliff Swallows have nested on all the large buildings on the UWGB campus. The swallows feed on flying insects over old-field habitat areas on and near the campus. House Sparrows (*Passer domesticus*) compete for Cliff Swallow nests. Davis and Davis (2002) noted that House Sparrows often usurp Cliff Swallow nests and destroy swallow eggs, young, and juveniles. I was able to document the current status of Cliff Swallows on the UW-Green Bay campus and Cofrin Arboretum, I identified critical feeding areas and sources of nest-building materials, and described important interactions between the campus population and other species (including humans). The project will help determine the effect, if any, of human activity near nesting Cliff Swallows.
Linda Filo	2008	Mapping and assessing campus populations of *Phragmites australis*	The invasion of *Phragmites* into new areas can displace native vegetation and destroy habitat for invertebrates, fish, and birds. As a result, control of *Phragmites* has become a priority for resource managers in many areas. Common control methods include spraying herbicide (glyphosate or imazapyr), mowing and spraying, and burning. Despite the widespread use of these control techniques, published accounts on the effects of these treatments are limited. Repeated use of these control methods may be costly, time consuming, or even detrimental to other species. Evaluating the various approaches of control and continuing the search for improvements in the way *Phragmites* is managed is necessary to conserving natural areas. In partnership with the Green Bay U.S. Fish and Wildlife Service, this projectanalyzed the effect of the timing of mowing pretreatments on the ecology of a *Phragmites* dominated wetland. Our goal is to assess whether different mowing schedules (early vs. late) affect the success of herbicide treatment in controlling *Phragmites* and whether timing of treatment affects the capacity of native species to recolonize the wetland.
Matthew Flentje	2008	An owl survey of UWGB natural areas	Owls are usually poorly known, and we tend not to study them as much as their diurnal counterparts. Even so, there has been a website founded for a statewide owl survey. In 1994, another student named Michael Jaccard did an owl survey and found only two different species, the Great Horned owl and the Barred Owl. We believe that two more species of owls could also be found in an owl survey, the Saw-whet Owl and the Eastern Screech Owl. I believe that a more through survey of owl populations in the area would be beneficial to the natural areas that UWGB has. With a more accurate survey, perhaps we can understand more on their migration and nesting behaviors that will perhaps draw more potential bird watchers and researchers into the area. The purpose of this project was to document and record the owl occurrences in the natural areas of Green Bay. I used standardized playback surveys and will be monitoring in the early spring to fall, and all the routes will be mapped using standard GIS.
Ethan Kaiser	2008	Earthworm abundance in annually burned vs. unburned grasslands in the UW-Green Bay Cofrin Arboretum	Very few studies have rigorously examined the effects of burning on invasive earthworms. Burning and its accompanying impact on leaf litter and microhabitats has a potentially profound effect on surface-dwelling and even shallow-dwelling earthworms. compared earthworm abundance and diversity at three types of grasslands on the UW-Green Bay campus: 1) Planted native grassland that is burned annually, 2) planted prairie grassland that is unburned, and 3) unburned grassland dominated by non-native species. The planted native grasslands are part of the Keith White Prairie in UW-Green Bay's Cofrin Arboretum. I tested whether earthworm abundance, species richness, and biomass differed among plots from annually burned native grassland, unburned native grassland, and unburned non-native grasslands in the Cofrin Arboretum.
Hannah Aplin	2007	Plant species associated with dense stands of *Phragmites australis* at the Pt. au Sauble	UW-Green Bay's Point au Sauble Natural Area has experienced dramatic changes in water levels and vegetation since it was acquired by The Nature Conservancy in 1997. One of the most important yet dynamic features of the area is an open lagoon of approximately 10 ha. In the mid-1990's the lagoon was filled almost entirely with open water, supporting feeding flocks of American White Pelicans, Sandhill Cranes, and large flocks of waterfowl during spring and fall migration periods. During the low water period of the past decade, however, cattails been replaced by the widespread invasive grass, *Phragmites*

		Nature Preserve in Brown County, Wisconsin	*australis*. This research project monitored changes in plant communities in the lagoon following last year's spraying of *Phragmites* by the WI DNR. This research at Point au Sauble is important in order to document the extent of *Phragmites* invasion at this site. Results will serve as a benchmark for research after the U.S. Fish and Wildlife has treated the *Phragmites* stand and will enable a spatially explicit description of the plant recolonization process.
Lana Athorp	2007	Bird species associated with Phragmites australis at the Pt. au Sauble Nature Preserve in Brown County, Wisconsin	The invasive plant species, *Phragmites australis*, has become the dominant vegetation along the Green Bay shoreline and in a 10 ha coastal lagoon at UW-Green Bay's Point au Sauble Natural Area in Brown County, Wisconsin. The U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, and others have attempted to remove *Phragmites* from affected wetlands, and currently research is underway on the west shore of Green Bay to assess different treatment methods. My proposed project will sample the birds in the lagoon and along the shoreline during summer 2007, prior to experimental control measures to eradicate *Phragmites* to provide baseline data to determine whether birds are impacted by the removal of this invasive plant.
Christina Brady	2007	Effects of garlic mustard, deer browsing, and ecological restoration on deciduous forest leaf litter invertebrates	Our study looked at the effects of three mustard (Brassicaceae) species on ground-dwelling macroarthropod communities. We studied three sites, each with areas of dense growth of a mustard species: Native toothwort in Mahon Woods, non-native dame's rocket in the escarpment woods, and non-native wintercress in old field west of Laboratory Sciences building. At each site, three 3 x 3 m "in" treatments were placed where the mustard grew densely, and an adjacent 3 x 3 m "out" plot had no mustard growth. One covered pitfall trap placed in the center of each plot ran for two weeks in June-July and two weeks in September-October, 2007. We collected nearly 10,000 macro-invertebrates belonging to 19 Orders. 65% were Isopod crustaceans; all these are non-native. Two-way ANOVAS looked for site and treatment (In versus Out) affects and site/treatment interactions of diversity (macroinvertebrate orders and spider species) and abundance (of all taxa with N > 100) response variables. Many groups showed no treatment effects. There were more Invertebrate Orders, Isopods and Hemipterans among wintercress "In" than "Out" treatments, and possibly more macroinvertebrates among "Out" than "In" treatments in dame's rocket. Wintercress may provide a moister, cooler, shadier microclimate in the hot sunny Old Field habitat, whereas in the dame's rocket habitat, the dense mustard growth may impede invertebrate movement and hence lower trap efficiency.
Lori Caelwaerts	2007	Variation in seed rain along a gradient of forest quality	Small-scale community composition results from a balance between species additions resulting from colonization events, and species losses resulting from local extinctions. Few studies have directly addressed the importance of seed rain (colonization) in maintaining local diversity. The paucity of information on seed rain in Midwestern deciduous forests highlights a major gap in our understanding of the factors affecting forest composition and richness. My project measured the differences in annual seed rain among three distinct forests, including an intact, high diversity, mesic forest (Mahon Woods), a lower diversity, lakeshore forest (Bayshore Woodland), and a low diversity, highly invaded woodland (Bay Beach Wildlife Sanctuary).
Susan Orthober Haen	2007	Archeological Cultures at Toft Point	The University of Wisconsin-Green Bay Natural Area at Toft Point is in the same location as a site recorded in the State of Wisconsin Archeological Site Inventory. The site 47DR3, known as the Mud Bay site, was recorded early in the twentieth century by John P. Schumacher, who reported artifacts from the site in the presence of T. Toft. The status of the site at Toft Point and a more exact identification of the types of artifacts will be investigated in the light of more recent excavations, which have established a chronological framework for archeological cultures on the Door Peninsula. I inventoried artifacts from this site in area museums. Identification of the artifacts from the site will give a clearer picture of when the site was occupied, and perhaps of the range of activities which took place there. Awareness of the potential of this archeological site may help plan for future activities for this natural area, and enhance appreciation for past human interactions with the natural world.
Megan Harvey	2007	Florivory in populations of *Gentianopsis procera* in Door County, Wisconsin	*Gentianopsis procera*, or Great Plains fringed gentian, is a plant of special concern in Wisconsin and several other states because it is restricted to habitats with unique characteristics such as limestone substrate. Last flowering season (2006) I found a significantly higher rate of florivory of *Gentianopsis procera* at a shoreline site (Toft Point, Light House Point), compared to an inland site owned and managed by The Nature Conservancy. Presence of florivorous insects (insects that eat flowers) has been shown to significantly reduce lifetime fitness by limiting seed production, seedling recruitment, plant density, and maternal fitness of plants under natural conditions. My study compared morphological characteristics, reproductive success and level of flower and seed predation among several populations of *Gentianopsis procera* in Door County, Wisconsin, including the Toft Point Natural Area. Relationships between these factors and population density, population size, isolation, and degree of disturbance (inland vs. shoreline) were examined. I also identified factors related to high florivory rates of *Gentianopsis procera* and to identify the primary florivores in Door County populations.

Megan Jacobi	2007	Competition and Predation among Great Lakes Invasives: A study of the relationships between Round Gobies, Zebra Mussels, and Quagga Mussels at two UWGB Natural Areas	Zebra mussels, quagga mussels, and round gobies are all invasive species brought to the Great Lakes region from ballast water in transoceanic vessels. Zebra mussels constitute a major part of the diet of round gobies. This might have benefits for Great Lakes ecosystems because few other resident species eat the exotic mussels. My study investigated the competitive relationships between zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena bugensis*) and the influence of round goby (*Neogobius melanostomus*) predation on relative abundance of these two mussel species in Green Bay and Lake Michigan. Experimental structures along Green Bay (Point Au Sauble) and one site in Door County, Wisconsin (Toft Point Natural Area) were followed over the growing season. The objective was to test whether 1) quagga mussels out-compete zebra mussels on a local scale and 2) round gobies have an effect on the mussel populations.
Sarah Rauen	2007	Endocrine disruptors in neonatal American toads in the Cofrin Arboretum	Recently, it has been discovered that certain frog populations on UW-Green Bay land exhibit elevated rates of morphological abnormalities. Manmade chemicals that interfere with hormone signaling are often referred to as *endocrine disruptors* or *hormone mimics*. Amphibians are thought to be particularly susceptible to the effects of environmental endocrine disruptors due to their highly permeable skin, and due to the fact that they spend a significant portion of their life history in an aquatic environment. A preliminary study conducted by Dr. Dan Meinhardt at the University of Wisconsin – Green Bay provided evidence that newly metamorphosed frogs existing in an area of UW-Green Bay land that is likely to contain significant levels of herbicides (the UW-Green Bay golf course) exhibit a significantly higher rate of abnormalities in skeletal development than frogs living in other areas less likely to be contaminated (16% vs. 8% of the population, respectively, exhibiting abnormalities). The goal of the present study is to build upon these preliminary findings in order to 1) gather more extensive data regarding the rates of morphological abnormalities in amphibian populations at a variety of sites on UW-Green Bay land, and 2) to examine whether these morphological abnormalities are correlated with disrupted reproductive processes (another sign of endocrine disruption), such as the ability of the gonads to synthesize sex hormones and the ability of the brain to make the reproductive factor GnRH.
Christian Sorden	2007	Effect of grassland ant activity on soil nutrient availability, C cycling, and plant biomass and community composition	I propose to evaluate the composition of the ant community and to evaluate the effects of ant activity on ecosystem processes within the Arboretum grasslands. In four 50 m^2 plots, 8 active ant mounds will be selected. Half will be used for soil sampling, measuring aboveground cover % and belowground biomass. The other half will be used for measuring CO_2 flux. All ant mounds within each plot will be mapped, marked, height and volume measured, and ant species identified. All trees within each plot and their dBh will be mapped.
Ryan Wachtl	2007	Effects of Brassicaceæ dominance on fungal biomass and soil phosphorous - A family based mechanism for competitive superiority	Since 2000, *Alliaria petiolata* (garlic mustard), a member of the Brassicaceæ family, has been on the Nature Conservancy's Red Alert list because of its rapid colonization of mesic North America forests. Roughly 80% of terrestrial plants have mycorrhizal fungal associations that increase the effective surface area of roots and aid in the absorption and acquisition of immobile nutrients like phosphorus. To understand A. petiolata's competitive advantage, I propose that a broader examination at the family level (Brassicaceæ) is needed. I investigated differences in soil fungal biomass, acid phosphatase activity, and soil available phosphorous under two native Brassicaceæ, *Cardamine diphylla* (Michx.) A.W. Wood and *Cardamine concatanata* (Michx.) O. Schwarz, growing on the University of Wisconsin-Green Bay Arboretum, and under *A. petiolata*, growing in replicated research plots in the Bay Beach Wildlife Sanctuary. Examining fungal biomass, soil acid phosphatase levels, and plant available phosphorus under *A. petiolata, C. concatanata,* and *C. diphylla* will add to our understanding of the success of the Brassicaceæ family.
Peter Lembcke	2006	A Gut Content Analysis of Neonate American Toads (*Bufo americanus*)	N/A
Courtney Lewis	2006	Spatial Patterns of Bat Activity in the Cofrin Arboretum on the University of Wisconsin-Green Bay Campus	I examined the spatial patterns of bat activity in the Cofrin Memorial Arboretum on the University of Wisconsin-Green Bay campus in Brown County, Wisconsin during June, August, September, and October of 2006. Specifically I looked at relationships of bat presence with locality, temperature, distance to road, distance to forest, distance to Green Bay shoreline, and distance to the nearest pond. I used a Pettersson ultrasound detector to determine if bats were present or absent at points approximately 100 meters apart. A GPS receiver was used to obtain coordinates for sample points, which were classified into one of 4 geographic units within the Arboretum. The points were converted into a GIS layer, from which I obtained the other spatial variables. Presence of bats was significantly associated with temperature, geographic unit, distance to the shore of Green Bay, and distance to nearest pond. These results identify areas in the Arboretum where bat activity is highest and suggest habitats that might be particularly important for maintaining local populations or bat migration corridors. Areas associated with water, especially near the Green Bay shoreline, appear to be particularly important for bats at this locality.

Eric Weber	2006	A Forest Edge's Effect on Forest Interior Climate	Plant types and animal habitats may be influenced by the changes in temperature and relative humidity from edge to forest interior. This research project was designed to examine if significant changes in air temperature and relative humidity result as distance from the forest edge increase. HOBO Pro RH and Temperature Data Loggers were deployed along transects in 1)a transmission line clear-cut on the UWGB campus, 2)the south side of this same forest, and 3) the bottom of the escarpment near the soccer field on campus. There was a significant change in relative humidity within the first 80 feet of the forest. Data showed decreasing maximum temperature and increasing minimum temperature within the first 80ft of the forest interior at the south forest/powerline in the summer. *Study area: UW-Green Bay campus*
Zach Zopp	2006	Environmental Effects on Pond Microhabitats in the Cofrin Arboretum	This project examined the relationship of twelve pond microhabitats and their surrounding environments over one year. My objective was to measure several microhabitat factors (pond volume, water temperature and pH) and evaluate how they might be affected by environmental factors such as elevation, precipitation and air temperature. A vegetation survey was also conducted.
Carolina Bacelis	2005	Survey of spiders and harvestmen (Arachnida: Araneae, Opiliones) at the Point au Sauble Nature Preserve	This study describes the Spider (Araneae) and Harvestmen (Opiliones) species richness and composition at Point au Sauble Nature Reserve and examines differences between temporal and spatial variability of spiders and harvestmen assemblages. Six sites were sampled once during May, July, and September by pitfall traps, leaf litter collection, and hand collection. The hand collection methods used were sweep nets, beating sheets, and visual search. ANOVA and PCA analyses were run of feeding guild with habitat, season, and collection method.
Greg Brahe	2005	Vertebral Anomalies in Eastern American Toads of the Cofrin Arboretum	The proposed study is the start of a long-term examination of vertebral column variation in frogs and will builds on anomalies collected in 2004. Tadpole specimens will be collected from campus ponds, euthanized, cleared, and double-stained, radiographed by Dr. Katz, and vouchered for storage in the Richter Museum. I will analyze the geographic and temporal distributions of vertebral anomalies among UWGB natural areas.
Craig Destree	2005	Bee Diversity and Plant Associations at Toft Point and Peninsula Sanctuary Natural Areas	My proposed study will provide a general survey and baseline for monitoring bee populations at 2 natural areas. Results will include a list of bees identified to genus, relative abundance at each site, and vegetation in the survey area. Collection will be by netting and pantraps within $100m^2$ plots within a habitat. Vouchered specimens will be stored at the Richter Museum.
Michelle Eis	2005	Patterns of Student Use of the Cofrin Arboretum Trail System	The purpose of this study was to conduct an exploratory research study on the patterns of use and appreciation of the Arboretum Trail. This would provide data that could assist in developing or refining resource management practices. Three research methods were used: 1) Camera data collection using a motion sensor camera, 2) Trail surveys, and 3) Class surveys. Using these methods allowed for both quantitative and qualitative analyses. The data gathered would assist in quantifying how many people use the trail, when and how often they use the trail. The data would also assist in determining the social aspects of trail users including their thoughts about the trail; whether trail users are students, facu1ty, or community members; and why non-trail users prefer not to use the trail.
Nick Walton	2005	A Survey of Dragonflies at the Toft Point Natural Area in Door County	I propose to collect or record the presence of dragonflies and estimate numbers of adults and exuviae in order to provide baseline data on species richness and abundance. Four 1 ha plots in the wetlands will be surveyed 1x/month under favorable weather conditions. Adults will be counted during a timed period. A 10 m transect, along the shoreline will be surveyed above and below the waterline for exuviae. Vouchered specimens will be stored in the Richter Museum.
Jay Watson	2005	Bee and Plant Interactions at University of Wisconsin Green Bay Cofrin Arboretum and Marinette County's Dunbar Barrens State Natural Area	I propose to monitor bee populations at 3 sites. Bees will be collected and vouchered. Results will include lists of bee genus (and species, if possible) and relative abundance at each locality, along with conditions and vegetation. Bees will be collected by 15 pan-traps placed on two 50m transects, and by netting. Sites will be sampled every 2 weeks. Comparisons among the different sites will be made.
Amy Wortman	2005	Status and Habitat Use of Tree Squirrels in the UWGB Cofrin Arboretum	The goal of this research was to conduct a comprehensive survey of tree squirrels in the UWGB Cofrin Arboretum, providing fundamental information about how they use their habitat as well as how abundant populations are in different areas of the arboretum. Research started in May of2005 and concluded in December of 2005. Specifically, I pursued two specific goals: 1) map the distribution and estimate the abundance of gray squirrels in different areas in the

			Cofrin Arboretum, and 2) determine the status and distribution of other squirrel species in the Arboretum. Surveying was done by timed visual searches along transects, drey counts in December, and bait stations to attract flying squirrels. Ground and tree foraging was recorded
Carolina Bacelis	2004	Vegetation of the Pt. au Sauble Nature Reserve	[final study differs from proposal in the files]
Matt Bougie	2004	Use of molt patterns and feather wear for studying migratory birds	[final study differs from proposal in the files]
Brianna Bruvold	2004	Breeding birds of the Kingfisher Farm Natural Area	The objective of this study will be to document the breeding birds at Kingfisher Farm and area nature preserves. I will perform a standard 10 minute point count at 18-20 census points within 4 sites. Data will be recorded in separate segments in order to facilitate comparison with earlier studies using different methods. Census points will be documented with GPS to establish permanent locations.
Justin Heraly	2004	Body size and development in American Toads	I propose to collect breeding adults, tadpoles, and recently metamorphized individuals of *Bufo americanus* from campus ponds. Specimens will be reared to different developmental stages, euthanized, and prepared for examination of bone and cartilage. Digital images of all skulls will be made and skull shape quantified using standard morphometric techniques.
Jenna King	2004	A history of bird banding and bird studies at Pt. au Sauble	This project will summarize and analyze previous bird banding records and point counts.
Ryan Taylor	2004	Patterns of bird migration and breeding birds at Pt. au Sauble	This project aims to document the numbers of migratory and breeding birds at the Point au Sauble Nature Preserve. I will summarize and analyze previous bird banding records and point counts, monitor migratory bird numbers by counts and mist netting in spring and fall, and survey breeding bird populations during June and July.
Crystal vonHoldt	2004	Genetic Diversity in Peripheral versus Core Populations: A Case Study of Three Wisconsin Vole Species	The primary objective of this research will be to evaluate genetic variation of two microsatellite polymorphisms in core and peripheral populations of three North American microtine species. I anticipate that data that will be highly relevant to the assessment of conservation priorities involving peripheral populations, providing meaningful guidelines for efforts to protect genetic diversity across species' ranges.
Nick Walton	2004	The UWGB Campus Bird Survey	The objective of this study is to conduct a breeding bird census using standard protocol for bird point counts and the points established by Paulios in 2000. Results will be compared with previous censuses.
Pam Wendorf	2004	Use of morphological characters for studying migratory birds	[final study differs from proposal in the files]
Katie Hemauer	2003	Soil Temperature: The Effects of Vegetation Cover and Soil Type	The soil provides a thermally regulated environment to a wide array of soil organisms. The effects of soil type and vegetation cover on this thermal buffering effect were examined from 2 Aug 2003 to 17 Dec 2003 in Green Bay, Wisconsin, USA. Temperatures were recorded from the air, soil surface, and at 5cm, 25 cm, 50 cm, and 100 cm depths in vegetated and non-vegetated sandy and clayey plots. An analysis of variance compared noontime air and soil temperature difference and daily standard deviation between plots. Depth was the most important thermal regulator of all, followed by vegetation cover. Soil type is likely important, but the extent of its influence was unclear.
Amanda Malueg	2003	Effects of Fire Management on Small Mammals in a Tallgrass Ecosystem	The purpose of this study will be to assess the effects of fire and mowing management on birds and mammals in the Arboretum grasslands. Focus will be on small mammal and bird responses but changes in plant biomass and ground litter will also be documented insofar as they affect the survival success of the animals. Twenty Sherman traps in each of 9 plots were monitored daily in spring and vegetation samples taken. This was repeated in July and October. Weekly photos were taken from a fixed location in each plot. A GIS layer will be developed.
Jennifer Powell & Amanda Carroll	2003	Analysis of White-tailed Deer Herbivory in Mahon	The objective of this study is to determine the population size of the *Odocoileus virginianus* community at Toft Point and make recommendations regarding the hunting policy in this area.

		Woods and Toft Point Natural Area	
Sarah Wilk	2003	Evaluating the Progress of the University of Wisconsin-Green Bay Northern Barrens Project	I will ascertain the progress of the restoration effort by sampling %cover for vegetation in 98 random quadrats in the barrens restoration area. I will compare my results with the list of species that were present after the original translocation in 2001 and compare with data collected at Spread Eagle Barrens State Natural Area.
Derek Behmke and Bruce Snyder	2002	Nutrient Determination of Surface Waters within the Cofrin Arboretum	The objectives of this study are to 1)determine nutrient composition for surface waters within the Arboretum as a follow-up to Rimal's Master's thesis and to create baseline data for unsampled surface waters, 2)monitor additional parameters: chlorophyll and dissolved oxygen, 3)record plant species at the aquatic environments, and 4)compare results generated by different analytical techniques (atomic absorption spectroscopy and ion chromatograph). Sampling at 15 sites will be done once/month, weather conditions recorded daily.
Ashley Booth	2002	Providing an Environmental Corridor Linking Hutchinson Bog to the Cofrin Arboretum: An Assessment of Feasibility	I propose to assess the feasibility of establishing an environmental corridor to link Hutchinson Bog, a significant natural area, with the Arboretum. I will establish a GIS database for the bog and adjacent land, contact local planners and land owners, and create a design proposal for the corridor.
Kathy Corio (formerly Groves) & Nicole Skiba	2002	A General Plant Survey of the Point Creek Conservancy Property	Our goal is to identify the flora on Point Creek Conservancy, a natural area north of Kingfisher Farm, and suggest management options for Manitowoc County. Sampling will be done in a grid, with random sampling points, in 3 different months. Vouchers will be deposited in the UWGB Herbarium.
Bradley Herrick	2002	The Vegetation at Point au Sauble, Wisconsin: Development of a Long-term Monitoring Program	The major objectives of this study were to: (1) develop a permanent vegetation sampling grid at the Point au Sauble Nature Reserve, (2) conduct a baseline survey of extant vegetation for the 2002 growing season, (3) create a GIS map of the vegetation communities, and (4) develop a standardized protocol for subsequent annual vegetation sampling events. A nested quadrat design was used in which percent ground cover, percent vegetation cover and dbh of trees were taken in each $10m^2$ quadrat. In the middle of this large quadrat was a smaller $1m^2$ quadrat, where the percent cover of each species within cover classes was estimated. Digital photos were taken at each $1m^2$ quadrat.
Angela Opiola	2002	An Investigation of Scale and Human Impacts on Litter Bugs in Old Fields and Adjacent Upland Forests	The purpose of this study is to examine the implications of extent upon species richness and abundance of a subset of terrestrial invertebrates (spiders, beetles, pseudoscorpions, collembola) from mature forests and adjacent old fields on UWGB properties by holding grain constant and varying extent. I will compare distributions and abundance in 2 different habitats to see how these distributions change over space and habitat. Litter samples will be taken every few days from a nested quadrat, and invertebrates extracted using a Berlese funnel.
Angela Sette	2002	Vegetation of Mahon Woods: Establishing a Monitoring Program and Examining Baseline Data	The purpose of this study was to provide baseline data on the understory and the canopy for management purposes and future research and establish long term monitoring plots for herbaceous vegetation. One hundred $1m^2$ monitoring plots were created within the wooded edge of Mahon Woods between June 12 and July 12, 2002. The plots were chosen in a partially structured random process based on a previous 100m grid system. A digital photograph was taken of each quadrat from above, with an attempt at keeping the angle oblique. However, this could be difficult, and some pictures were taken with a more acute angle than expected. The digital photographs were used to determine percent cover of each species. A species list was compiled and a GIS layer of canopy type was created in ArcView.
Sara Gossfeld-Benzing, Stephani Herman, and Adrianne Wacker	2001	Use of Ultrasound to Identify Bats in UW-Green Bay Natural Areas	We propose to survey for bats using the Anabat System, initially identifying locations where they are present. We will record bats for a minimum of 2 hours around sunset or dawn several nights/week from late June to September.

Russell Japuntich & Brennan Haworth	2001	Analysis of Pond Restoration in the Cofrin Arboretum	
Jeanette Jaskula & Steve Price	2001	Terrestrial Patterns of a Pond Breeding Amphibian Assemblage at Toft Point Natural Area	This study demonstrates the importance of terrestrial habitat by investigating the terrestrial spatial patterns exhibited by a pond-breeding amphibian assemblage at Toft: Point State Natural Area, Door County, Wisconsin. Amphibians were found to disperse greater than 100 m away from the closest breeding pond. Local landscape features, specifically the entrance road, influenced the distribution of amphibians within the terrestrial environment. Most amphibians were significantly associated with one another on the forest floor, suggesting that amphibians group within appropriate microhabitats. These results also provide a basis for developing terrestrial core habitat and buffer zones for these species. Finally, detailed terrestrial microhabitat data was taken for the four-toed salamander. We recommend a buffered protected zone of 205 m around the breeding ponds to protect the entire amphibian assemblage.
Bruce Snyder	2001	Terrestrial Non-Insect Arthropods of the Toft Point Natural Area	We conducted a preliminary survey of the terrestrial non-insect macro-arthropods, which include most of the non-aquatic arthropods except insects and mites; specifically, arachnids (spiders and harvestmen), myriapods (centipedes and millipedes), and terrestrial isopods (crustaceans). We sampled on May 2, July 17, and September 22, 2001. One concentrated, spatially integrated litter sample was collected at each of five habitats during each date; these were then Berlese extracted. A timed hand collection was also used, consisting of % person-hour/site/date, using a combination of techniques, including sweeping herbaceous vegetation, brushing/beating woody vegetation, and hand searching with aspirators within vegetation and at ground level, including turning over rocks and logs. The 35 samples collected covered nine different habitats.
Shari Hilding-Kronforst	2000	Monarch Butterfly Host Plant and Offspring Success on Three Species of Milkweeds in the Cofrin Arboretum	The objective is to determine whether 1) monarchs prefer to oviposit on a particular milkweed species or if they use plants in proportion to their local abundance, 2) if monarch larvae display different growth, parasitism or survival rates on different milkweed species, and 3)which insect species parasitize monarchs in the Arboretum and whether they favor larvae from particular host plants.
Stephan Humpal	2000	Hydrology and Water Quality of the Pt. au Sauble Coastal Wetland	The first objective is to determine the overall hydrology of Point au Sauble, concentrating mainly on the dynamics of the lagoon. The second objective is to study the ground water levels of the point. Results will be analyzed along with water level, wind speed, and atmospheric pressure data to determine a relationship between seiche and general water level effects of the bay on the lagoon. A Water Logger will be used for long term data collection. Lagoon water samples will be analyzed for water quality, dissolved oxygen, pH, conductivity, temperature. Ground water data and samples will be collected using mini piezometers and seepage meters.
Andy Paulios	2000	Reviving the UWGB Campus Bird Census	The objective is to adjust the UWGB breeding bird census methodology, used in 1975, to reflect changes in the standard protocol for avian point counts, and to conduct a census for 2000.
Steve Price and Russell Japuntich	2000	Herpetofauna of UW-Green Bay Properties	Despite the numerous threats facing reptiles and amphibians, very little is known about their distribution and status in northeastern Wisconsin. For example, the UWGB natural areas have the potential to contain diverse herptile communities, however very few surveys have ever been conducted. In order to gain a more thorough understanding of the reptiles and amphibians of the UWGB natural areas, we employed several standard herpetological survey methods in order to: 1) inventory the herpetofauna of the UWGB properties, 2) voucher all specimens that have not been recorded on the properties and 3) provide preliminary baseline data about the status, distribution, and habitat preferences of the reptiles and amphibians on UWGB properties. Spring calling surveys were sampled at least 3 times on a route thru each site, 30 minute searches were done in the fall at 50m x 50m quadrats and waterbody periphery, coverboards on transects were monitored weekly at each property, opportunistic observations of movement across roads were recorded, and minnow traps with drift fences were monitored in spring and late summer at the base of the Niagara Escarpment. Nine amphibians and eight reptiles were documented on the UWGB natural areas. We recorded one new county record in finding the four-toed salamander *(Hemidactylium scutatum)* at Toft Point and several new site records. Eighty-five specimens were added to the Richter Museum of Natural History collection.

Lance Jay Roberts	2000	GIS Mapping of the Cofrin Arboretum and UWGB Campus	I propose to develop a working GIS database in the form of an ArcView 3.2 project which will combine multiple sources of data. Data layers will be created for 1)infrastructure, 2)vegetation, 3)streams and ponds, 4)soil types, and 5)UWGB survey grid markers. Paper maps will be digitized, CAD data will be converted, and a GPS unit will locate gridposts and reference points.
Matthew Barthel	1999	Microhabitat Preferences of the Snail, *Vertigo nylanderi*, in the Toft Point Natural Area	*Vertigo nylanderi* is a minute land snail, measuring less than 2mm in length and 1mm in width. Until late 1997, *Vertigo nylanderi* was known from only 5 global locations, the last of which was collected in 1949 (Pilsbry 1948, Oughton 1948, Dawley 1955). *Vertigo nylanderi* is also known from Pleistocence sediments in Illinois (Frest 1991, Miller *et al.* 1994). The first extant colony ofthis species located in the latter half of the 20th Century was found at the Toft Point coastal tamarack wetland in October 1997. Nine additional extant populations have subsequently been identified from the Lake Michigan and Huron watersheds in Eastern Wisconsin and Upper Peninsula of Michigan (Nekola 1998; Nekola, *unpublished data).* All extant sites represent nutrientrich, undisturbed tamarack/sedge wetlands which lie within 50 km of the Lake Michigan Huron. All known extant populations are very small «12 recovered shells per site), and it is not clear what microhabitat factors may correlate with the occurrence of this species. As of yet, no living individuals of this species have yet been seen in the wild. Because of these factors, *Vertigo nylanderi* appears to hold the dubious distinction of being one of the rarest and least understood land snails in eastern North America. I plan to analyze the micro distribution of *Vertigo nylanderi* within the first modem location for *Vertigo nylanderi* at Toft Point Natural Area. This research, along with data from 2 other locations, will help identify the preferred niche for *Vertigo nylanderi,* and will help guide protection efforts for this imperiled species.
Julie Bradshaw	1999	A Study of Mechanical and Chemical Controls for *Gallium mollugo* in the Cofrin Arboretum	This study was designed to determine the distribution of *Galium mollugo*, an invasive species, on the UW-Green Bay campus and to examine the effectiveness of several means of control. The campus was surveyed for *G. mollugo* locations and 60 1m x 1m plots marked. Treatments were randomly assigned as 1)control, 2)mowed once, 3)mowed every time the plant reached 15 cm (about 1x/mo), 4)sprayed with Roundup every 2 wks, 5) sprayed with 2,4-D every 2 wks, or 6)covered with 2 layers of shading cloth for the duration of the experiment (July 12-Sept 26). The stems were counted at the end, and treatments compared.
Steve Engels and David Marks	1999	Bait-Stations as a Method of Studying Mammals	The objective of this study was to explore the distribution and relative abundance of carnivores in the Cofrin Arboretum. We also wanted to develop a simple field method that others can use in the future for surveying these secretive animals. Bait stations were constructed out of chicken wire, hung, and checked daily from Dec. 30-January 31. Temperature, snow depth, tracks, feces were recorded. An automatic camera was installed at the most active stations. Since all tracks of a species were recorded as a single visit on a day, abundance could not be estimated.
Todd McCoy	1999	A Field Guide to Mammals of the Cofrin Arboretum	I propose to create a field guide to assist and inform visitors and students of UWGB about the species of mammals of the Cofrin Memorial Arboretum and the signs which indicate their activities. This guide will consist of an account for each species that has either been found within this area or is currently living on the surrounding land. I will collect and organize the existing information into a field guide, which will display (1) the abundance of the species, (2) the distribution of the species, (3) the habitat of the species, and (4) indicators of species presence. The information will then be displayed into one of two media: a printed guide or a computerized worldwide web site.
Amy Piaget	1999	Soil Organic Matter, Macroporosity, and Infiltration in Abandoned Farm Fields: A Study of the Succession Plots at the University of Wisconsin-Green Bay Cofrin Arboretum	In this study, organic matter stratification, infiltration rate and soil macroporosity of the succession plots on the Cofrin Arboretum will be measured. A correlation between the amount of time the plot has not been farmed and the rate of infiltration will be made. The hypothesis is that with increased time of rest (the plot not being farmed) there will be a change in pore size distribution (more macropores) and an increased rate of infiltration. Organic matter stratification to a depth of 10 cm will be measured to study changes in soil development and to correlate organic matter to changes in porosity (aggregation). The surface bulk density and porosity will also be determined for the studied plots.
Samantha Stoughtenger	1999	Nutrient Determination in Ponds of the Cofrin Arboretum	A total of 14 sites in both the ponds and flowing systems were sampled in the field for pH, total dissolved solids, dissolved oxygen concentration, and water temperature. Nitrates were analyzed using UV-Visible Spectrophoto-metric and samples were sent to the State Lab for analysis of phosphorous, potassium, calcium, magnesium, sulfur, zinc, boron, manganese, iron, copper, aluminum, and sodium. The environmental science parking lot and the Shorewood Golf Course were sampled for the total heavy metal concentration (cadmium, cobalt, chromium, molybdenum, nickel, lead, and arsenic). Two sampling periods

			comprised the study. One was a typical dry stint during the early summer months and the second was a rainy duration in which at least three inches of rain had fallen prior to sampling. Photos were taken of the sites.
Matt Barthel	1998	The Seed Bank Flora of the Cobble Beach at Toft Point Natural Area	My objective is to obtain more information on the species growth patterns and dispersal of the flora as a seed bank by expanding my earlier study of the beach at Toft Point. I propose to collect soil samples along numerous transects and subject them to a simulated low water period in the greenhouse for germination and growth study.
Jeffrey Bell	1998	Tree Species Preferences of Woodpecker Species at Point Sauble	The tree usage for feeding and nesting of the five woodpecker species (Red-headed Woodpecker, Red-bellied Woodpecker, Downy Woodpecker, Hairy Woodpecker, and Northern Flicker) of Point Sable were studied on an 8 ha plot to determine if woodpeckers as a guild or as individual species show any type of tree species preference. Trees showing woodpecker activity were staked, measured, identified, cataloged, and observed to determine the present usage if any and the species involved. Data was also collected on the use of woodpecker cavities by other cavity nesting birds. A quantitative measure of the species abundance and diversity of the woodpecker population was also obtained for the study site. The data for the tree usage was analyzed using Chi square and the 65th percentile sign test analysis to determine is a preference existed, and if it did was due to differences in tree size among the tree species. It was found that a tree preference did exist and that woodpeckers as a guild preferred eastern cottonwood over the other tree species due its large size and not some certain species characteristic. The woodpecker community at Point Sable is both rich and abundant, with 5 species and 7 breeding pairs within my 8 hectare plot. Vacated woodpecker cavities are being used by three species of cavity nesting birds, European Starlings, Tree Swallows, and White-breasted Nuthatches.
Christina Hall	1998	Bryophyte Community Structure of Toft Point Natural Area	-N/A-
Tyrone Rankin	1998	Survey and Identification of Parasitic and Saprophytic Fungi in the Cofrin Arboretum	The purpose of this research project is to collect, identify, preserve, and record mycological specimens obtained from Mahon Woods, Mesic Forest Plantings, and Old Fields in the University of Wisconsin - Green Bay Arboretum from June 1, 1998 to November 1, 1998. Furthermore, to understand the relevance of three types of symbiotic relationships (parasitic, saprophytic, and commensalistic) between the local flora and fungi in their respective ecological systems. Spore printing was conducted (when applicable), followed by dehydration of the mushroom at room temperature in a well-ventilated room. A species list was compiled.
Andy Dickerson	1997	Mammal Dispersal and Conservation Corridors at the Cofrin Arboretum	This study is designed to address mammal dispersal and use of corridors. Data will be collected throughout the summer and into the winter using Sherman traps in a grid pattern for small mammals, large traps, and radio collars. A route around the arboretum will be surveyed to track road-killed animals. A GIS distribution map will be made. The results will be used in conjunction with my thesis project focusing on urban conservation corridors connecting the Wildlife Sanctuary, Baird's Creek, and the Cofrin Arboretum.
Eric North	1997	Land Snail Fauna of Toft Point Natural Area	The purpose of the study was to sample all of the suitable habitats and assemble a comprehensive species list of snails for the Toft property, and then suggest possible management strategies for the perpetuation of maximum land snail diversity. At 8 sites, we collected approximately eight cubic decimeters of leaf litter per site, plus sod samples in woodland sites and hummock organic material in wetland sites.
Michael Jaccard	1996	Soldier Beetle Population Dynamics	The purpose of this study was to examine the local dispersal of soldier beetles. Both the distance and the direction of movement were studied. While this beetle is not an economically significant species, we can use it to learn about insect dispersal. At 5 sites, ten soldier beetles were painted with a blue enamel paint. Each day following the day of marking, visits were made to the site, and the distance and direction of movement of each soldier beetle found were recorded. Return visits to the sites were made for two or three days following the marking until no marked soldier beetles were found. All visits to the sites on the days following marking were made at the same time of day as marking to increase the chance that the beetles' daily activity patterns would not interfere with recapture.
Tamara Smith	1996	Community Ecology of Northeastern Wisconsin Relict Land Snails	-N/A-

Scott Vanevenhoven	1996	A Survey of Parasitic and Saprophytic Fungi in the Cofrin Arboretum	The objective of the project was to collect parasitic and saprophytic fungi present in the wooded areas of the Cofrin Arboretum. The fungal material was collected over the summer, and then documented and preserved as herbarium material for future reference. Spore prints were made of some specimens and permanent slides were made of 3 pathological fungi using standard microtechnique methods. Photographs were attempted but did not turn out well.
Michael Engel	1995	The Effects of Natural Succession on the Soil Ecology of Former Corn Fields	This study examines several soil factors and soil invertebrate populations through a series of successional fields to determine the resurgence of the soil community with agricultural disturbance removal. In each of the five sampled fields 14 samples were taken, except for the pH, percent organic matter, potassium (K), phosphorous, (P), and total nitrogen which all had 4 partial samples combined into one sample for the field and analyzed by the Soil and Forage Analysis Lab in Marshfield. Soil density was tested using a Proctor penetrometer. The amount of cover was estimated using albedo measurements from an underwater photometer taken at 5 feet above the surface and with the sensor held an arm's length away from the collector's body. The temperature at the surface and 2" depth were measured using a digital thermometer to the tenth of a degree centigrade. Soil invertebrates were collected in 2" by 2.8" cores (Edwards, 1991) made of sheet metal, extracted and identified in the lab.
Elizabeth Hartman	1995	Surveying and Monitoring Mammal Populations at Point Au Sable	I propose to inventory the species of small mammals at Point Au Sable, make an initial assessment of their abundance, establish standards for future monitoring, and provide an educational opportunity for the Edison Middle School Environmental Club by soliciting their cooperation with the research. I plan to survey from mid-August thru September, using 4 stations of 10 pitfall traps each and 33 stations of baited snap traps and Sherman traps along 5 transects. Larger mammals will be surveyed by tracking stations. Photographs will document the study.
Daisaku Kiyota	1995	Spatial Dynamics of Old Field Insects in the Cofrin Arboretum	The purpose of this study is to use a GIS to document small scale changes in old field insect populations at the UWGB campus, focusing on soldier beetles on goldenrod. Two sites were marked into a 10m x 10m grid, with density of populations surveyed twice.
Michael Jaccard	1994	Occurrences of Owl Species at the Cofrin Arboretum and Natural Areas	My goal was to collect data that would confirm the existence of healthy owl populations and provide a baseline for future monitoring efforts within Peninsula Sanctuary, Toft Point, and Point au Sable. Recorded calls of each species were played in a series. Six minutes was allowed to pass before beginning the calls for the next species. The method of playing calls and time of day was modified during the survey as experience showed what was effective.
Jim Broetzmann	1993	Monitoring Migratory and Breeding Bird Populations at Point Sable	Point au Sable is one of the only coastal wetland sites on lower Green Bay, and is a natural magnet for migratory birds. I divided it into seven different sections, with the center of each section spaced approximately equidistant apart. Permission was obtained from private landowners to conduct surveys at 5 additional points. A 10 minute visual and auditory survey was conducted at the center point of each section from April to June 22 within 3 hours of sunrise 2-3x/wk. Bird locations were mapped, and weather noted. Mist netting was done twice in May at one site.
Eric Christopherson	1993	A Survey of the Vascular Flora at Point Sable	My objective was to conduct a survey of the vascular plants on a recently acquired tract. The study included (a) collection and preparation of vouchers of all vascular plant species within the preserve, to be housed in the UW Green Bay Herbarium. (b) discussion of community types including the vascular flora and other observations, (c) a map of major vegetation types, and (d) a discussion of possible management ideas for Point Sable.
Deanna Dudley	1993	Raptors of the UWGB Campus and Cofrin Arboretum	The purpose of my study was to document the types and numbers of raptors which used the campus. A circuit route was surveyed from April 24, 1993 until October 27, 1993. I recorded all raptor species seen, location, time, and observed behaviors during intervals of 5 minutes. Incidental sightings were also recorded.
Brian Henrickson	1993	Assessment of the Population Status of the Pigmy Shrew at Kingfisher Farm	The main objective of this study was to determine the population status of the Pygmy Shrew, observed in 1986/7, and the Boreal Redback Vole, *Clethrionomys gapperi,* whose isolated population appears to be limited to a small area of lowland forest and to evaluate critical areas (habitat types) at Kingfisher Farm.. In addition, all specimens of insects collected from the pitfall traps were vouchered at the Richter Museum, and a 10 minute point count of birds at each sampling station was conducted. The capture of all frogs, toads, and salamanders were carefully noted and released. From mid-August thru September, trapping stations were maintained in randomly selected habitats using drift fences, pitfall traps, and snap traps.

Steve Petzke	1993	Bird Species at the Peninsula Center Sanctuary	The purpose of this research project was to determine breeding bird use at Peninsula Center Sanctuary. From June thru August surveys were conducted on a weekly basis, from sunrise until half the sites were sampled, using a standard 10-minute count on calm days only (no wind or rain). All birds observed (heard or seen) and their associated habitats were recorded. Additional notes included nest sites, or interesting behaviors observed (feeding, courtship, territorial displays, etc). Comparison was made to a 1976/77 survey.
Patrick Robinson	1993	A Vegetation Survey of Peninsula Center Sanctuary	I propose to conduct a survey of the vascular plants of the Peninsula Center Sanctuary during the growing season of 1993 (May-August) to provide baseline data which can be applied to management plans and long term monitoring of the site. In addition, I will make a comprehensive collection of voucher specimens, slides of community types, and a vegetation map.
Nancy Schroder	1993	A Quantitative Analysis of Physical-chemical Factors of Mahon Creek	My objective is to obtain current information on the state of Mahon Creek and the relative significance of several constituents of its ecology. I will sample and analyze at 6 locations over 5 months and record pH, water temperature and appearance, sample depth, stream velocity, and weather. Chemical analysis in the lab will include nitrates, ammonia, TKN, specific conductivity, COD, BOD, suspended solids, turbidity, chlorides, and (using atomic spectroscopy) concentrations of Ca+, Mg+, Mn+, K+, Fe++, and Fe+++. Results will be compared from the different sites and with a previous study.
Joel Whitehouse	1993	The Spiders of Peninsula Center Sanctuary	My objective was to establish baseline data on the spider fauna of Peninsula Center Sanctuary by 1) determining the species composition of six of the major vegetation communities found there, 2) the collection of voucher specimens, 3) observations of predation on and by spiders, and 4) observations of spider reproduction. Sampling was done in April, June and September using sweep nets and visual day searches, though not all communities were sampled each time.
Stephanie L. Angell-Feuerstein	1992	A study of species interactions within tree cavities at the Cofrin Arboretum	This Cofrin project was granted by the Biodiversity Center; however, the student was unable to accept the grant due to another commitment.
Paul Bollinger	1992	Vertebrates in Wetlands of the Cofrin Arboretum	My objective was to compile an inventory of the amphibian, reptile, bird and mammal species which use the 6 wetland areas in the Cofrin Arboretum. Frog and toads were identified by their calling between mid-April through June at 3 day intervals, and twice in July. Salamanders and tadpoles were sampled using minnow traps. Bird observations, bird calls, and bird nests were recorded during the same time period as well as the end of August and end of September. Incidental observations of additional reptiles and fish were recorded. Each pond was trapped for mammals using baited snap traps for 2 nights late August through September. A species list was compiled for each site.
Sue Garrity	1992	Reproductive Ecology and Seed Dispersal of *Trillium nivale* Riddell (Liliaceae)	I propose to study the reproductive ecology of *Trillium nivale*, a threatened plant, in a population which was transplanted in 1989. Individual plants will be mapped and monitored every 2-3 days during the growing season for mortality, unifoliate versus trifoliate status, % fruit set, and # viable seeds. In addition, I will set up a study on establishment of a new population by artificially dispersing seeds to 10 quadrats, 5 of which will be covered with hardware cloth to prevent predation, and monitoring an additional 5 quadrats as controls with no seed manipulation.
Jeff Klonowski	1992	Nutrient and Grazing Limited Phytoplankton Rates	The purpose of this study will be to determine the importance of nitrogen, phosphorus, and zooplankton on phytoplankton growth in Upahki Pond. Microcosms of filtered pond water will be set up in 3 replicates (during different months) of 3 nutrient gradients, 3 zooplankton gradients, and a control. Each experiment will run for 3 days and then chlorophyll a will be measured using a spectrophotometer. If there is no change in chlorophyll a levels, pre-test and post-test samples will be examined for changes in species composition.
Gregory & Danielle Pallaske	1992	A Visual Tour of the Cofrin Arboretum	We will produce a 25-30 minute video which can be used as an outreach tool, bridging the aesthetic experience of the Cofrin Arboretum with the scientific studies on the different habitats, to broaden the definition of the Arboretum as perceived by the general student body and public. Color slides, black-and-white stills, and computer graphics will be coordinated with an explanatory narrative.

Catherine Steele	1992	A Comparative Study of the Reproductive Ecology of *Iris versiculor* and *Iris virginica*	The main focus of this study is a comparative study of the reproductive ecology of two species of the genus *Iris, Iris versicolor* and *Iris virginica.* The same perennial individuals, in separate Cofrin Arboretum populations, were followed for two consecutive years. Individual clumps were marked, observations made every other day during flowering of position and day of flower for each bud, fruit set, and insect visits. A randomly chosen subsample of ramets was selected for fruit size and seed count measurement. Patterns of similarity and/or difference both between species and between years were tested for with Two-way ANOVAs using SAS.
Dreux Watermolen	1992	The Search for *Uroblaniulus stolidus* in Northern Door County, Wisconsin	The objectives of this study are to 1) survey the millipede fauna of northern Door County, documenting species presence and composition, 2) verify the occurrence of *Uroblaniulus stolidus* near its 1951 collection site, 3)update a preliminary list of Wisconsin millipede species, and 4)contribute to the Richter Museum reference collection.
Joel Whitehouse	1992	The Spiders of Toft Point	The purpose of this study was to 1) survey the spiders of the Toft Point Natural Area and collect specimens for taxonomic identification, 2) conduct a preliminary study of the ecological roles that spiders play in their faunal community by incidental observations of predation and reproduction. Sampling was done at arbitrarily chosen points in 3 separate months using sweep netting, visual day searches, visual night searches, pit traps, and leaf litter searches. Each of the six vegetation communities studied was sampled with multiple methods. Spiders were identified and correlated with habitat.
Brian Ebert	1991	The Natural History of Tree Cavities and Cavity Fauna of the Cofrin Arboretum	The objective was to study types of cavities and the characteristics of the trees in which they occur. Trees with cavities were identified in a one hectare plot in Mahon Woods and in the Bayshore area by walking transects 20 m apart. Tree height was measured with slope gun, species identified, and DBH measured. Cavities were categorized by type and sites compared. Additional transects were walked in each site and summary data presented. Fauna observed using the cavities were noted.
Don Quinn	1991	Sampling for Aquatic Insects and Crustaceans on Moonlight Bay and Pickerel Pond at Toft Point Natural Area	The purpose of the study was to establish baseline data on aquatic Odonata species at Moonlight Bay and Pickerel Pond. Four sites were sampled by kicknet on 5 dates in the summer. Weather conditions and substrate were recorded and Odonata counted and identified to genus.
Christopher Rotar	1991	The Gastropoda and Pelecypoda of the Near-shore region of Toft Point Natural Area	The purpose of the study was to establish species composition of mollusk fauna of the near-shore region of Toft Point. Three sites were sampled by different methods: kicknet, use of Eckmann dredge and clam brail, walking the creek, and by skin diving, Specimens were identified to species and discussed relative to the specific environmental conditions of the sites.
Michael Simonich	1991	Genetic Diversity Study of *Iris lacustris* colonies on the UW-Green Bay Cofrin Arboretum and Toft Point Natural Areas	For my Master's thesis, I propose to sample and assay the genetic diversity and genetic relatedness within and between most of Wisconsin's *Iris lacustris* colonies by isozyme and allozyme analysis of leaf material using starch gel electrophoresis.
Catherine Steele	1991	A Comparative Study of The Reproductive Ecology of Iris virginica and Iris versicolor	Two planted populations were studied, with 5 randomly chosen ramets from each clone observed every other day during the flowering period, and 2-3 times/week during fruit set. Insect visitors were photographed. Capsule length and circumference were measured and seeds counted and weighed. Fruit set percentages were calculated, temporal and spatial patterns in fruit and seed production analyzed, and predation observations noted.
Dreux Watermolen	1991	The Millipede Fauna of the Toft Point Natural Area	Millipeds are common and conspicuous in the soil fauna of many ecosystems, playing a major role in litter breakdown and soil humification. The objectives of my work were twofold: 1) to survey the Toft Point Natural Area milliped fauna to document species occurrence and composition, and 2) to contribute a substantial local reference collection to the Richter Museum of Natural History. Sampling was done by hand collecting within 3 microhabitats and during 3 separate time periods at 7 different plant communities. Pitfall traps were used along 3 transects during a 4th time period. As the millipede fauna is poorly known, I compiled a list of known and potential species for the area from literature review.

Victoria Zipperer	1991	A Longitudinal Study of Aquatic Invertebrates in Mahon Creek	The purpose of this study was to provide a longitudinal characterization of Mahon Creek based on the taxonomic composition and trophic structure of its aquatic invertebrates. Mahon Creek was sampled at four distinct sites monthly through June, July, August, and September of 1991. At each site, kick-net sampling with 1mm mesh was employed at the riffles to collect 75-100 organisms per site. On October 2 and 9, stream velocity measurements were taken using a Marsh McBirney model 2010 portable water current meter, in addition to width and depth measurements. Organisms were identified and classified according to their trophic category. Based on these results, the structure of the stream community was then characterized according to the structure outlined by Vannote et al., and compared with the expected structure predicted by the River Continuum Concept (1980). Statistical significance of my results was tested by a Chi-squared test. Longitudinal and/or temporal changes in the invertebrate populations of Mahon Creek were analyzed and the stream volume flow and the longitudinal temperature profile were characterized.
Lora Lee Blunk	1990	A Survey of the Coleoptera (beetles) at Kingfisher Farm	I propose to conduct a comprehensive inventory of beetles as baseline for future studies and to provide a reference collection of beetle specimens. Beetles will be sampled weekly from late April until mid-October at different times of the day using sweep net, pitfall traps, nocturnal light traps, carrion sampling, and litter sampling. I will also develop a distribution map showing the habitat association of identified beetles.
Jeffrey Hieb	1990	The Benthic Invertebrates of the Cofrin Arboretum Ponds	The benthic invertebrates of 6 ponds in the Cofrin Arboretum were sampled by kicknet over 4 sampling periods and keyed to genus. Water level fluctuations were measured relative to a steel post placed in each pond. Temperature was recorded several centimeters below water surface. Incidental observations of amphibians and fish were noted, and pond substrate and vegetation was described.
Robert Plamann	1990	A Census of the Grassland Breeding Bird Species in the Cofrin Arboretum	The purpose of the study was to quantify densities of the breeding bird species in Arboretum grassland regions using a reproducible technique since the habitat is undergoing change. Grasslands were censused weekly at the center of 21 50-meter radius circles during June. Each census consisted of a one minute quiet at the site, 10 minutes of stationary observation, and then a perimeter walk to flush unobserved birds. Nests and eggs were recorded, and weekly abundances were totaled. Relative abundance and Census Point Nesting Pair Profiles were calculated.
Jim Rogers	1990	Assessing Sound Levels in the Cofrin Arboretum	I propose to monitor sound sources, levels, and quality. I will 1) establish sites at grid markers already within the Arboretum, 2) identify research needs and establish time periods, 3) document sound levels and source, 4) digitize average sound readings at each site into GIS files, 5) analyze sound data, and 6) produce sound level trend-surface maps.
Robert Rukamp	1990	Deer Ticks, White-Footed Mice and *Borrelia burgdorferi* in the Arboretum and at Peninsula Center	In order to better understand the epidemiology of Lyme's disease, I propose to add to Cleven's 1989 study by 1) trapping mice and looking for a correlation between infection and season, and between infection and age, and 2) drag for ticks in the prairie fields of the Arboretum. Mice will be checked for ticks, blood samples drawn, and tested for Lyme disease with an ELISA test. Ticks will be identified and ELISA tested.
Michael Simonich	1990	A Second Year Habitat Study and Evaluation of Two Colonies of *Iris lacustris* on the Cofrin Arboretum	The objective of the study was to continue quantitative evaluation of transplant site physical characteristics and plant growth and reproduction of *Iris lacustris* , a threatened species. Leaf area was measured using Li-Cor LI3000 Electronic Area Meter for all leaves in fall 1989 & 1990 and correlated to length of longest leaf. Full day light measurements were taken with a Li-Cor LI-190 SA Quantum Sensor connected to a datalogger in spring and again in summer at each site in 1990. Soil moisture readings were taken 9 times during 1990 at 3 depth levels in each site using a Bouyoucos Resistance Meter and buried gypsum blocks. Vegetative buds formed in 1989 were counted in spring of 1990, showing an overwinter survival of nearly 100%, and ramets counted in fall of 1990 showed 94% survival or these buds. Six flowers developed in clones of 10 or more ramets, with one setting fruit.
Thomas Cleven	1989	Is Lyme Disease Amidst UW-Green Bay's Cofrin Arboretum and the Peninsula Sanctuary?	This study set forth to determine the general prevalence of *Ixodes dammini* (deer ticks) and/or *Borrelia burgdorferi* (Lyme disease spirochete) at the UW-Green Bay Cofrin Memorial Arboretum and in Door County by trapping *Peromyscus leucopus*, important hosts for *I. dammini* as well as natural reservoirs of *B. burgdorferi.* Sherman live traps (7.5 x 9.0 x 23.0 cm) baited with peanut butter and oatmeal were placed 10 to 30 meters apart in grids and habitat recorded: 450 traps in the Arboretum, 130 at Peninsula Sanctuary, 130 at Toft Point, 90 at Lighthouse Point, and 140 divided between 2 farms in the Sturgeon Bay area. Blood and urine samples were taken, *Borrelia* cultures made, and examined.

Thomas Hucek	1989	Development of a G/LIS Prototype for the Cofrin Arboretum	This project will develop a G/LIS: digitize Arboretum boundary maps, encode elevation data, plot overlay maps, develop slope zone and orientation zone maps, encode soil types and develop soil zone map, encode habitat by type and plot habitat map.
Jennifer Nieland	1989	A Survey of Breeding Woodcock in the Cofrin Arboretum	This study presents the results of the 1989 survey (late March to early June) of breeding woodcock of the Cofrin Arboretum using census techniques similar to those used the by USFWS to determine woodcock distribution and density. This method involved stopping at 9 fixed census points along a designated route. At each point the number of *peent* calls and *flight songs* of all birds present is recorded during a two minute time span, with separate tallying of the activity of 2 of the birds. The total number of birds believed to have been heard or seen was also recorded. Habitat and the mean weekly temperature were compared with mean bird activity.
Mary Alexis Pfutzenreuter	1989	Diversity and Distribution of Butterflies in the UWGB Cofrin Arboretum	The objective is to make a general vouchered inventory of butterfly species of the Cofrin Arboretum, identify food plants utilitzed, and gather baseline monitoring data. Weekly surveys were made from late April through September 1989. All vouchered specimens were photographed.
Michael Simonich	1989	Habitat Study and Evaluation of Two Colonies of *Iris lacustris* on the UW-Green Bay Cofrin Arboretum	*Iris lacustris* is a threatened plant species in Wisconsin as well as the rest of its range. The primary objective of this project was to establish several *Iris lacustris* colonies on the Arboretum, in suitable habitat. The second objective was to begin quantitative evaluation of the transplant sites in order to elucidate some of this species needs regarding transplant sites. The physical characteristics evaluated include light, soil moisture, and soil quality. Growth characteristics analyzed include leaf area, new ramet production, and bud development.
Amy Wolf	1989	Life History Characteristics of Seaside Crowfoot (*Ranunculus cymbalaria* Pursh.) on the UW-Green Bay Cofrin Arboretum	The primary objective of this project was to find out if a population of *Ranunculus cymbalaria*, an endangered plant, can be established on the Cofrin Arboretum. If established, I proposed to study the populations growth, reproduction, and life history. Fifty individuals were transplanted among five sites and mapped. Sites were visited every other day to record new growth, which was also marked and mapped. Germination of seeds produced was tested under different temperature and light regimes.