

2008

FIELD STATION ANNUAL REPORT

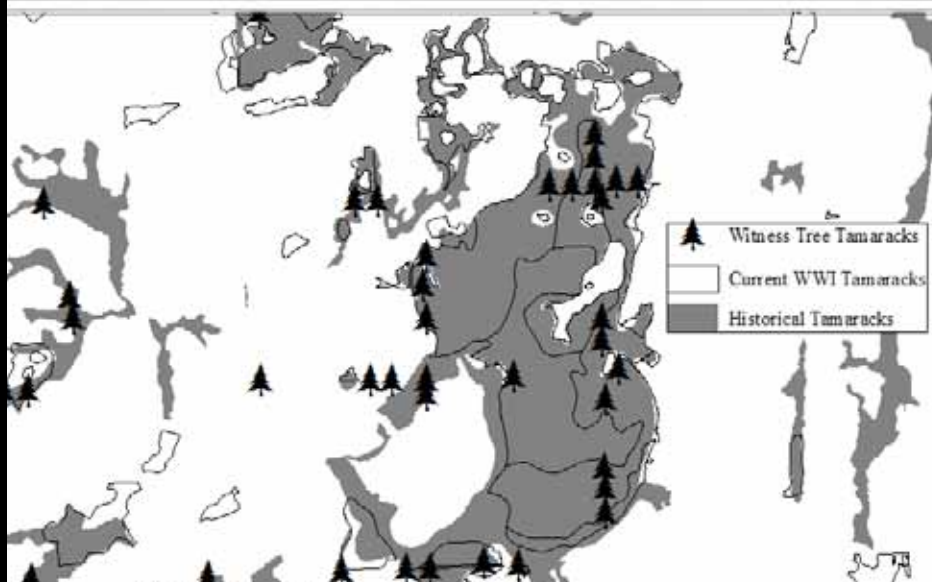


Table of Contents

About Us

| | |
|--|---|
| 2008 Highlights | 1 |
| UWM Field Station. | 1 |
| Natural Areas. | 1 |
| Research and Teaching Facilities | 2 |
| Field Station Programs | 3 |
| The Friends of the Cedarburg Bog | 4 |

| | |
|------------------------------------|----------|
| Abstracts of Research | 5 |
|------------------------------------|----------|

| | |
|---|-----------|
| Recent Publications & Theses | 35 |
|---|-----------|

Outreach Services

| | |
|--|----|
| Cooperation with Other Groups and Agencies | 38 |
| Class and Group Use | 40 |

| | |
|---------------------------------------|-----------|
| Natural History Workshops..... | 39 |
|---------------------------------------|-----------|

| | |
|---|-----------|
| Meteorological Data for 2008 | 42 |
|---|-----------|

On the Cover: The modern distribution of tamarack swamps in southeastern Wisconsin is compared with the distribution of tamarack swamps reconstructed from the original surveyor's records of tamarack witness trees in the mid-1800s. Wetland boundaries were defined as the boundaries of hydric soil types; and pre-settlement wetlands were called tamarack swamps if they contained tamarack witness trees. Tamarack witness trees are shown as tree symbols in the figure. See abstract by Reis and Reinartz for a more complete description of the study

| | |
|---------------------------|---|
| Director: | James A. Reinartz |
| Manager/Staff Biologist: | Gretchen A. Meyer |
| Maintenance: | Lou A. Nelson |
| Administrative Assistant: | Cynthia K. Boettcher |
| Field Station Committee: | Douglas Cherkauer, Peter Dunn, Timothy Ehlinger, Glen Fredlund, Tim Grundl, Jeffrey Karron (Chairman), Craig Sandgren, Stefan Schnitzer, Thomas Schuck, Linda Whittingham, Erica Young |

About Us

2008 Highlights

- The first Wisconsin population of Emerald Ash Borer was discovered in Newburg; infested trees were found less than 2 miles from the Field Station.
- Larvae of the federally-endangered Hine's emerald dragonfly were found living in the bog mat in the string bog. The Cedarburg Bog is only the second site known where larvae occur in bog mats.
- The Natural History Workshop program was expanded to include a January "Winterim" course.
- The Field Station Website (www.fieldstation.uwm.edu) was completely redesigned.
- Construction of the Cedarburg Bog and Beech-Maple woods boardwalks was completed.
- 48 research projects conducted in 2008.
- Over 10,000 student hours of instruction and group use in 2008.

The UWM Field Station

The UWM Field Station is used as an outdoor laboratory by researchers from various disciplines, including plant and animal ecology, evolutionary biology, ethology, taxonomy, geology, hydrology, and climatology. Located in the Town of Saukville, Wisconsin, about 30 miles (45 minutes) north of Milwaukee, the main Station facility has about 2000 acres including a wide variety of habitats available for research and teaching. The University of Wisconsin-Milwaukee owns approximately 320 acres, most of which were donated by The Nature Conservancy in 1965. Research at the Station has produced 277 scientific publications and 135 theses since 1969.

Natural Areas at the Field Station

The Cedarburg Bog State Natural Area - One of the largest and the most

biologically diverse of the wetlands in southern Wisconsin, is accessible to researchers and classes by the Field Station's boardwalk. Shallow and deep lakes, marshes, shrub carrs, sedge meadow, hardwood swamp, conifer swamp, and the southernmost string bog in North America are just some of the vegetation types of the Cedarburg Bog. Populations of at least 35 species of higher plants and 19 birds are at or near the southern edge of their range in the Bog. The Bog is part of the national system of Experimental Ecological Reserves established by the National Science Foundation and The Institute of Ecology. A "Guide to the Natural History of the Cedarburg Bog," which serves as a ready introduction and reference source for researchers and educators using the Bog, is available from the Field Station and on our website.

The Cedarburg Beech Woods State

Natural Area – 80 acres of one of the finest mature beech-maple forests in southern Wisconsin. The beech-maple forest and the Cedarburg Bog are each State Natural Areas, and are classified as National Natural Landmarks by the Department of Interior.

The Sapa Spruce Bog State Natural

Area – 12 acres of highly acidic black spruce/tamarack bog and 11 acres of swamp hardwoods. The southernmost black spruce bog in Wisconsin, the small, acidic, Sapa Spruce Bog provides an ecological contrast to the large, neutral-pH, Cedarburg Bog, with which it shares most of its flora.

Old Agricultural Fields – Over 100 acres in various stages of succession are available for experimental research. A history of the use and management of the fields over the past 39 years is maintained. Six separate areas in the old fields have been planted with prairie species native to Wisconsin. A new experimental prairie area planted in the "North Hay Field" in the fall of 2005 has become very well established during the 2008 growing season.

Management – The primary management that Field Station natural areas receive is maintenance of trails and control of invasive exotic plants. Glossy buckthorn (*Rhamnus frangula*), common buckthorn (*Rhamnus cathartica*), Tartarian honeysuckle (*Lonicera tatarica*), autumn olive (*Elaeagnus umbellata*), multiflora rose (*Rosa multiflora*), meadow parsnip (*Pastinaca sativa*), purple loosestrife (*Lythrum salicaria*), sweet clover (*Melilotus* spp.), motherwort (*Leonurus cardiaca*), Oriental bittersweet (*Celastrus orbiculatus*) and garlic mustard (*Alliaria petiolata*) are all present, and being controlled in the Field Station natural areas. Friends of Cedarburg Bog volunteer workdays and our regular stewardship volunteer, Dennis Goldsmith, contributed about 50 person days during 2008 to help Field Station staff with our efforts to control invasives. Only glossy buckthorn in the Cedarburg Bog and Oriental bittersweet in the southeastern portion of the Station and private properties to the south, are currently so widespread and abundant that their control seems intractable with the hand and mechanical methods we are using elsewhere. Fruiting-sized glossy buckthorn has been removed, and continues to be excluded, from a 6-acre plot and a 45-acre plot at the center of the Bog. The Wisconsin Department of Natural Resources also removed glossy buckthorn from large areas of the northern portion of Cedarburg Bog during the winters of 2006-07 and 2007-08.

Research and Teaching Facilities

General Facilities

- Office/classroom building with meeting rooms, teaching lab, and computer lab.
- A new Research Lab constructed in 2004
- Service building – machine shop & woodshop
- The Farm House for researcher & student housing – The kitchen was redecorated/painted in 2008
- Natural areas marked with a permanent grid – Accurately GPS-located in 2005

- Boardwalk to the center of the Cedarburg Bog
- 14 aquatic mesocosms (200 gallon tanks)
- Several small boats, canoes, and trailers
- Global Positioning System equipment
- Extensive map and aerial photo collection
- Geographic Information System (GIS) for the Field Station area

Hydrology, Meteorology & Phenology

- Extensive array of environmental sensors recorded by a digital data logger
- Phenological observation garden & native plant observations maintained
- Lysimeter pit in the old-growth forest
- Transect of piezometers from upland to Bog

Animal Ecology & Behavior

- Large outdoor experimental aviary
- Sound analysis lab & recording equipment
- Video equipment, cameras, night vision scope
- Live traps & animal holding facilities
- Extensive arrays of bird nest boxes
- Insect collection, small mammal & bird study skins

Experimental Garden

- 9 fenced research gardens
- 1 acre Experimental Garden with water & electricity
- A 30' x 60' screen house, constructed in 2005, for studies of pollination biology
- A screen house for studies of plant-insect interactions
- Greenhouse & garden building
- High capacity irrigation well
- Farm & cultivating machinery

Plant Ecology

- Herbarium & Plant lists
- Plant identification lab
- Vegetation sampling & surveying equipment

- Fenced deer exclusion plots in various plant communities and habitats

Outlying Natural Areas

Neda Mine Bat Hibernaculum State Natural Area

- An abandoned iron mine, located on the Niagara Escarpment near Mayville and Horicon, Wisconsin, is the largest bat hibernaculum in the Midwest. Up to 200,000 bats of four species (Little brown bats, Big brown bats, Eastern pipistrelles, and Northern long-eared bats) use the hibernaculum. The hibernaculum has the infrastructure and instrumentation to be a productive facility for research on the behavioral ecology of bats at a major hibernaculum. An infrared beam system provides continuous counts of bat flights through the entrances to the mine and we have monitored bat activity continuously since 2000. The mine is also of geological interest; its cliffs provide an excellent exposure of the Niagara Dolomite and the only accessible exposure of the Neda Iron formation.

Neda Beechwoods State Natural Area

- Lies on the Niagara Escarpment, just north of Neda Mine and is a well developed stand of American beech (*Fagus grandifolia*) at the western boundary of its range.

Benedict Prairie - Near Kenosha, is a 6-acre tract of virgin prairie along a railroad right of way that has a remarkably diverse flora. A vascular plant species list for Benedict Prairie has been published in the Field Station Bulletin.

Downer Woods Natural Area - An 11.1-acre fenced woodlot, is an island of forested natural area in an intensely urbanized setting on the UWM campus. The Field Station assumed management of Downer Woods in 1998. Since that time we have been working very hard to control the garlic mustard, buckthorn, and honeysuckle with funding provided by the University.

Field Station Programs

- 48 active research projects conducted at the Field Station in 2008.

- Including: 5 M.S. thesis, 9 Ph.D. and 23 studies by researchers from outside of the University.

- 12 papers published during 2008. Several others are in press.

Database Development

The collection of a variety of long-term data is an important part of the Field Station's research program. The Station gathers long-term records, which include species lists, weather data, phenological observations, hydrologic studies, small mammal population studies, population fluctuation of certain avian species and ecological studies of various plant communities. Examples of our databases include:

- Vascular plant flora of the Field Station area (including approximately 720 taxa) & excellent herbarium.
- A complete stem map and diameter measurements of all trees in 5.5 acres (2.25 hectares) of the beech-maple woods first censused in 1987.
- Repeated surveys of the entire beech-maple forest at the permanent grid locations.
- A complete, quantitative, survey of the vegetation of the Cedarburg Bog, first conducted in 1991 and repeated in 2006.
- Phenological observations on leaf-out and flowering of standard genotypes of 6 species in a phenological garden, and 26 naturally occurring species at the Station since 2001.
- Long-term weather records from a standard US Weather Service weather station and a Bowen-Ratio energy flux monitoring system.
- Continuous monitoring of bat activity levels at the Neda Mine Bat Hibernaculum since 2001 and of temperatures in the mine since 1996.
- The Charles Weise 30-year study of Dark-eyed Juncos, including mark-recapture estimates of population size, age and sex composition, and seasonal and daily physiological changes in the wintering population.
- The Charles Weise 27-year intensive study of the Black-capped Chickadee, with a color-marked population of approximately

300 birds. This study involved precise monitoring of population changes throughout each year, analyses of dispersal mechanisms of juvenile birds, survival rates of juveniles and adults, dominance rank of flock members, and key-factor analyses of causes of fluctuation.

- The Charles Weise 26-year breeding bird survey of the Cedarburg Bog & upland woods from 1971 to 1996, repeated in 2006, 2007, and 2008.
- The Charles Weise 30-year bird-netting and banding program conducted in fall.
- The Field Station is a major site for long-term studies of avian vocalizations, including their organization and function.
- GIS system developed for the Field Station area.

Educational Programs

- Over 10,000 student hours of instruction and group use in 2008.
- Eight workshops on advanced topics in natural history were filled to capacity, including our first winter course offering.
- Four undergraduate student interns or independent research studies (699 projects).
- Programs for the general public on: Winter ecology, Spring frogs and woodcocks, Bird migration, Spring flora, Medicinal plants, Mud Lake ecology, Bird banding, and the Ecology of the Cedarburg Bog.
- The guidebook to the Bog is available to teachers using the boardwalk for instruction.
- Several field ecology exercises developed for the Field Station are available to instructors

The Friends of the Cedarburg Bog

The mission of the Friends of Cedarburg Bog is to help preserve and study the Cedarburg Bog and to make the public more aware of its uniqueness. Specifically, their objectives are:

- To support research, including long-term monitoring.

- To assist in land preservation, management and stewardship.

- To develop formal and informal opportunities for public education.

- To generate volunteer labor for natural area management, education, public events, monitoring and research, and facility development and maintenance.

- To raise funds to support the activities of the group as defined above.

The Friends of Cedarburg Bog raised over \$13,000 in 2007 for materials to reconstruct the Field Station boardwalk east of the "east island" in the Bog. Much of this funding was donated by family and friends in the memory of Don Bezella, long-time lover of the Bog and Mud Lake, who died late in 2006. Don was a founding member of the Board of Directors of the Friends. The Friends also obtained grants from the James J. Schwabe Endowment Fund, the Norma & Stanley DeBoer Quiet Trails Fund, and a Besadny Conservation Grant.

In 2008 the Friends helped sponsor 14 educational events for the general public. Volunteers from the Friends contributed over 100 person-days of labor, including natural area management and boardwalk construction, publishing a newsletter, raising funds, and sponsoring and providing staff for events. If you are interested in the Field Station's programs and activities, or you wish to support the preservation of the Cedarburg Bog State Natural Area, please consider joining the Friends group. Contact the Field Station for information on how to become involved!



Abstracts of Research

Invasion and Displacement of Native Vegetation by *Rhamnus cathartica*: Toward a Mechanistic Understanding

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Rhamnus cathartica (common buckthorn) has aggressively invaded many Eastern Deciduous forests of the United States, including those in Wisconsin. Buckthorn commonly forms dense thickets and appears to exclude native woody vegetation by reducing light to levels below which natives can regenerate. Alternatively, buckthorn may exclude native vegetation by below-ground competition or allelopathy. The extent to which buckthorn excludes natives and the exact mechanisms by which it accomplishes this remain unknown. Using a combination of experimental approaches, we are testing the degree to which buckthorn excludes the regeneration of woody plants and by what mechanism. In one experiment, we are testing whether buckthorn does indeed exclude native vegetation and whether this effect varies among species. To accomplish this, we are following the growth of buckthorn recruits and native woody species in 12 paired plots; for each pair, we have removed existing buckthorn from one plot but allowed it to remain in the other. In a

second experiment, we will test whether buckthorn prevents native vegetation from establishing via above- or below-ground effects. To test for below-ground competition from this invasive, we will monitor the growth of buckthorn seedlings and woody plants in buckthorn thickets in which the buckthorn is tied back to reduce above-ground competition from it. We will compare seedling establishment and growth from this treatment to that of seedlings in paired plots in which we have removed buckthorn but simulated above-ground competition using shade frames. Preliminary results show that removing buckthorn significantly increased native seedling recruitment (Wilcoxon, $p = 0.011$). Removal also increased buckthorn recruitment, but the difference between treatments was only marginally significant ($p = 0.077$). These findings show that buckthorn is excluding native species and its own seedlings, but to a lesser extent. M.S. Thesis research, Stefan Schnitzer, Major Professor.

Macroinvertebrate Community Structure Surveys of Selected Ephemeral Ponds in Support of a Long Term Monitoring Strategy

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The Wisconsin Ephemeral Pond Project (WEPP) supports conservation of ephemeral pond wetland habitat. WEPP has several components including mapping potential ephemeral ponds, ground-truth and baseline surveys, and in-depth monitoring at selected ephemeral pond reference sites. Reference ephemeral ponds are chosen across Wisconsin to represent a variety of pond

types, disturbance levels and landscape settings, and are on permanently protected lands.

Here we collect basic inventory data on freshwater macroinvertebrates at six reference sites in Ozaukee County, including three ephemeral ponds associated with the UWM Field Station and the Cedarburg Beech Maple Woods State Natural Area.

The objectives for this inventory are to complete macroinvertebrate community structure surveys in order to characterize different types of ephemeral pond habitats based on their hydrologic regime, plant community and associated wildlife; to collect physical and chemical information to support the community structure survey; and to document the presence of any invertebrate species listed in Wisconsin's Strategy for Wildlife Species of Greatest Conservation Need.

Each pond was surveyed monthly during the growing season, until the pond dried, using multi-habitat searches, bottle traps and dip net collections. Taxa represented include mollusks, annelids, fresh water sponges, 27 insect families and 8 non-insect arthropod



families. Voucher identification to genus (and species whenever possible) is in progress. The project plans to continue surveys in 2009 at the same sites and at additional reference sites in southeast Wisconsin.

Evaluating the Roles of Propagule Pressure, Biotic Resistance and Environmental Conditions in the Spread of an Invasive Wetland Plant

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The success of invasive alien species is determined by their ability to disperse, followed by the establishment of a self-sustaining population and finally, expansion of geographic distribution. To predict patterns of invasion for an exotic plant, it is necessary to measure propagule pressure and germination success and how the two mechanisms may interact with one another. Germination success is determined by both biotic and abiotic factors. These factors control the resistance to invasion at a given site. A site with high resistance to invasion will require more propagule pressure by the invader to become established at that particular site. In this study, we will measure propagule pressure (using seed traps) and germination success (by sowing establishment plots) of an invasive woody shrub in a relatively undisturbed wetland. Sites that have either high densities or low densities of the invader will be studied to determine how propagule pressure is able to overcome site resistance. For a model, we will study glossy

buckthorn (*Rhamnus frangula*), a woody shrub native to Eurasia that has become a noxious invader in many wetlands in the United States. The Cedarburg Bog is one of the largest intact and undisturbed wetlands in Wisconsin. For the last few decades, glossy buckthorn has been aggressively spreading throughout the Cedarburg Bog. This situation presents an ideal opportunity to study the early stages of invasion by quantifying both dispersal ability and germination success simultaneously. This data will allow us to answer the following questions: 1) Why do some sites remain uninvaded or have low densities of glossy buckthorn? 2) How do propagule pressure and site resistance interact to determine susceptibility to invasion? 3) Which of these two mechanisms of invasion limits the spread of buckthorn? The results of this study will provide information on the early stages of invasion by an exotic species. M.S. Thesis Research; Dr. Gretchen Meyer and Dr. Erica Young, Major Professors.

Influence of Plumage Characteristics and Personality on Extra-pair Mating in Tree Swallows

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There is considerable interest in identifying benefits females gain from multiple mating, and traits that make some males more successful than others. We began a study of tree swallows (*Tachycineta bicolor*) to test the effects of plumage traits on male extra-pair fertilization success, determine whether those traits are associated with the immunocompetence of their young, and examine how personality influences extra-pair mating. Field research was conducted between April and July 2008 at the UWM Field Station, where 100 nest boxes have been occupied by tree swallows since 1997. Blood was collected from 564 birds, and DNA has since been extracted from all captured males and from females and nestlings from 22 nests. Specific loci from extracted samples will be amplified via PCR to use in assigning parentage. To test how brightness influences extra-pair fertilization success, we manipulated male plumage with non-toxic markers. Plumage brightness for 29 males was measured in the field before and after color-marking using a spectrophotometer. These values will be compared to paternity data to determine how brightness is related to extra-pair mating success. We evaluated immunocompetence of nestlings using a bactericidal assay. Plasma from nestlings at 50 boxes was added to bacteria plates and incubated overnight. The number of colonies killed indicates individual immunocompetence.

These values will be compared to paternity data to determine whether extra-pair young have higher immunocompetence than



within-pair young. To determine how personality influences extra-pair mating, we presented 22 pairs of swallows a taxidermic swallow mount and counted the number of times each bird attacked the intruder in two minutes. We then assigned each bird an aggression score. These values will be compared with parentage data to determine whether more aggressive birds have more extra-pair young. Regardless of results, this study will improve our understanding of the adaptive significance of multiple mating. Funded by Animal Behavior Society, American Ornithologists' Union.

Habitat Restoration and Wildlife Monitoring in Ozaukee and Washington Counties, Wisconsin

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The Ozaukee Washington Land Trust (OWLTL) initiated a Milwaukee River Basin project in the Lake Michigan watershed in 2004, to protect, restore, and enhance land in cooperation with local communities,

through acquisition, protection, seeding, planting, and invasive species control. The project also addresses quality assessment through habitat and wildlife monitoring. In 2008 we continued reforestation, wetland

restoration and invasive species control on OWLT properties. We began a herp monitoring program and hosted training workshops on herp monitoring, invasive species control, and habitat restoration. We continued data analyses on herp detection probabilities for use in modeling herp trends in the Milwaukee River Basin. We began

background research into bird monitoring methods and detection probabilities, and continued disseminating project results through project reports, lectures, conference presentations, and workshops. Funded by: National Fish and Wildlife Foundation, Great Lakes Watershed Restoration Grant

Conservation, Genetics and Morphology of the Butler's - Plains Gartersnake Complex

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Butler's gartersnake, *Thamnophis butleri*, is found in a fairly contiguous range involving lower Michigan, northern Indiana and Ohio, and western Ontario. There is also a disjunct population found in at least five counties in southeastern Wisconsin. This population is in an area of rapid development and the species needs some protection in Wisconsin. The issue is complicated by our observations on molecular, morphological, and behavioral traits. Wisconsin *T. butleri* differ significantly from both Michigan *T. butleri*, and their closest relative the Plains Gartersnake (*Thamnophis radix*), found to the west and south of *T. butleri* in Wisconsin. In order to determine if Wisconsin *T. butleri* have closer affinities with the more eastern *T. butleri*, or, alternatively, with *T. radix*, we are performing taxonomic investigations utilizing standard morphological measures, and molecular DNA analyses (ND2 mitochondrial DNA sequencing and nuclear DNA fingerprinting), in order to compare Midwest *T. radix* and Michigan area *T. butleri* with animals from both "pure" and "hybrid" populations of *T. butleri* in Wisconsin. The results of this research could potentially change the range limits or taxonomic designation of Wisconsin *T. butleri* populations. Results will also provide the needed guidance for directing appropriate conservation measures, and avoiding preservation of the "wrong" snakes in the "wrong" areas. We are examining out groups from Michigan, Indiana, Illinois, Nebraska, Iowa and Montana. In 2008 we analyzed data from over 200 snakes from



within the hypothesized hybrid zone, and drafted preliminary reports. Mitochondrial DNA analyses revealed a clustering of unique haplotypes in the putative hybrid zone, as well as segregation of haplotypes supporting earlier morphology based



conclusions on the hybrid zone geography. Nuclear DNA results revealed a surprising bimodal distribution of genotypes within hybrid populations, suggesting that the two

species maintain incomplete but significant sympatry. Continuing analyses and results should better delineate the hybrid zone, taxonomic relationships, conservation

issues, and identification of southeastern Wisconsin gartersnakes. Funded by Wisconsin DNR.

Wisconsin Herp Atlas

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The Wisconsin Herp Atlas tracks the distributions of amphibians and reptiles in Wisconsin. The Atlas was initiated in 1986 at the Milwaukee Public Museum, with the cooperative support of the Natural Heritage Inventory Program (WDNR) and The Nature Conservancy (Wisconsin Chapter). The Atlas is a computerized database of amphibian and reptile distribution, based on records obtained from museum collections, field surveys, literature, and field notes provided by volunteer observers throughout the state. Over 450 new county records have been confirmed by the project. The data collected helps to map species distributions, document rare species occurrences, analyze distribution trends, examine habitat requirements, and plan conservation priorities. In 2006 the Atlas was abandoned by the

financially troubled Milwaukee Public Museum, and in 2007 it was re-established through the UWM Field Station, where it now resides.



HerpNET

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HerpNET is a collaborative effort by natural history museums to establish a global network of herpetological collections data. Currently, 58 institutions are participating in the HerpNET community, with an open-ended invitation to institutions who would like to join. Fifty-three institutions are available on the specimen searching portal, with data from over 5.5 million specimens available for searching. The mission of HerpNET is to bring the accumulated knowledge from more than four million specimens in worldwide museum collections into currency for science and society by creating a distributed database with access from various portals. HerpNET will connect large repositories of information with smaller collections that

have regional specializations. Similar efforts (e.g. MaNIS, FishNetII, MaPSTeDi, ORNIS) are being accomplished for other taxa and regions and the herpetological community is poised to make its own contribution to the study of biodiversity. HerpNET will bring together researchers from diverse institutions and will initiate and strengthen collaborations among natural history collections, conservation biology, phylogenetics and biodiversity informatics. A database was posted in 2008 and georeferencing should be completed in 2009. Funded by the National Science Foundation and a Global Biodiversity Information Facility DIGIT grant to the University of Kansas Center for Research Inc.

Butler's Gartersnake Monitoring Along a Reconstructed Highway

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During recent expansion of State Highway 164 from two lanes to four lanes in Waukesha County, Wisconsin, conservation planning for the state-threatened Butler's gartersnake was incorporated into roadway design and quality assurance plans. Preconstruction surveys in 2000 provided baseline data on snake relative abundance along four stretches of the roadway, where snakes were utilizing side-slopes for thermoregulation and foraging (especially gravid females). Measures taken to minimize impacts during construction included barrier

fencing, habitat restoration along the new side-slopes, and ecopassages to maintain genetic flow across the new roadway. For quality assurance we conducted post-construction snake monitoring at three sites along the new side-slopes in 2008. Butler's gartersnakes had re-occupied all sampled habitats in 2008, and relative abundance decreased at one site and increased at two sites. An identical pattern held for all snake species combined. Funded by Wisconsin Department of Transportation.

Wildlife Ecopassage Monitoring for State Highway 164 in Waukesha County

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Wildlife ecopassages are designed to afford safe passage for wildlife across roadways, thereby reducing road mortality and improving traffic safety. Ecopassages allow wildlife to pass underneath the highway lanes, and maintain habitat and population connectivity on the landscape. This can be especially important in maintaining genetic interchange across highways for more sedentary wildlife such as amphibians and reptiles. Little data are available for evaluating the conservation effectiveness of these structures. During recent expansion of State Highway 164 from two lanes to four lanes, four ecopassages were installed (enhanced box culverts or stream spans), designed to reduce wildlife mortality on the roadway and maintain genetic interchange across the roadway. This project installed wildlife cameras within each ecopassage in 2007 to collect data on

patterns of wildlife use. In 2008 we analyzed 1,947 images from 27 Oct 2007 through 26 Nov 2008. Species documented were: raccoon, opossum, eastern cottontail, house cat, mink, woodchuck, gray squirrel, weasel (probably long-tailed), white-footed or deer mice, white-tailed deer, American robin, house sparrow, song sparrow, dark-eyed junco, barn swallow, and American toad. In 2009 we plan to launch a longer term monitoring study with trapping and roadway visual surveys for herps (primarily snakes) to quantify both road mortality and use of the ecopassages, and examine if opportunistic predation is promoted (where predators such as raccoons may learn to hunt at ecopassages to capture prey concentrated at these crossing points). Funded by C.D. Besadny Conservation Grant, Natural Resources Foundation of Wisconsin.

Reproduction in Cedar Lake Blanding's Turtles

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This radio telemetry study is monitoring female Blanding's turtles to determine nesting sites and collect data on reproductive

success in Washington County, WI. Study objectives are to build upon past data defining critical habitat needs for this population,

and specifically identify nesting areas and collect data on nesting success. Prior studies in this area have documented activity ranges, unsuccessful nesting, and important foraging and over-wintering sites. In 2008 two adult females were tracked throughout the season and into hibernation. One did not reproduce but successfully recovered from injuries suffered when hit by a car in 2007. This ordeal likely prevented reproduction in 2008, although we did observe a male actively courting her on August 12, which hopefully will result in reproduction in 2009.

The second adult female was captured on June 13, 2008, and probably had already nested. Activity of both adults was tracked, and both hibernated in deep holes in a cattail marsh, which were frequently used in the past by these and other radioed turtles. A young (ca. 6 years old) Blanding's turtle was also found dead on the road in late July, 2008. The study is being conducted with volunteer participation. Any nests found in 2009 will be monitored for predation and hatching success. Funded by Cedar Lakes Property Owners Association.

Bog-Fen Carex of the Upper Midwest

Linda Curtis

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Carex species at Benedict Prairie, Cedarburg Bog, and Chiwaukee Prairie were collected, scanned, and imaged in 2007. Additional visits were made to Cedarburg Bog and Chiwaukee Prairie in 2008. The labeled specimens were sent to UW-Madison Herbarium, UW-Milwaukee Herbarium, and UW-Milwaukee Field Station Herbarium.

Cedarburg Bog *Carex* species that were collected on 6-6-07, imaged and labeled, were *Carex aquatilis*, *C. aurea*, *C. chordorrhiza*, *C. hystericina*, *C. interior*, *C. leptalea*, *C. limosa*, and *C. livida*. Species collected on 6-12-2008 were *C. diandra*, *C. gracillima*, *C. lasiocarpa*, *C. lacustris*, *C. pellita*, and *C. stricta*. Specimens believed to be *C. gynocrates* were scanned and micro-imaged but revealed as *C. chordorrhiza*, a similar

species. The site along the boardwalk where *C. gynocrates* has previously been found (Dr. Anthony Reznicek, pers. comm. 2007) could not be examined in 2008 because of the reconstruction of the boardwalk. This site will be visited in 2009.

Chiwaukee Prairie in Kenosha County was visited 6-22-2007 and sedges *C. stricta* and *C. bicknellii* were collected. On 6-17-2008, the author visited Chiwaukee Prairie and collected *C. buxbaumii*, *C. meadii*, *C. granularis*, *C. haydenii*, *C. pellita*, *C. sartwellii*, and *C. viridula*. (The rare *C. schweinitzii* was still not located). All were photographed individually and with associates, then later scanned, and digitally micro-imaged fresh.

Small Mammal Community Composition as it Relates to Tall Grass Prairie Succession

Dan Dembkowski, Carthage College

The tall grass prairie ecosystem has experienced greater losses in land area than any other major ecosystem in North America. According to some estimates, the land area historically covered by tall grass prairies has declined as much as 99%. This significant

decline in land coverage can be attributed to changes in land use and habitat fragmentation due to agriculture and development. The few native tall grass prairies that are still in existence are few and far between and many of them are in a highly degraded state.

Such holds true for Benedict Prairie, located off Highway 50 in western Kenosha County. Benedict is in the mid-successional stages of becoming a woodland, as it has dense stands of buckthorn and honeysuckle, as well as several mature, interspersed oak trees. The property has reached this vegetative state due to lack of two important prairie management processes: fire and grazing. Changes in the vegetative community are reflected in the small mammal community. It is expected that the small mammal community has transitioned from one dominated by prairie species to one dominated by woodland species. In order to test this hypothesis, small mammals will be trapped

throughout the property to determine relative abundances of both prairie and woodland species (forming a small mammal index). The data collected will be analyzed using the rank-sum test. As a secondary objective, population estimates will be formed using the mark-recapture method. The population sizes and small mammal index will be used as a baseline to provide a framework for an aggressive schedule of restoration events in the form of cutting and controlled burns that will eventually restore Benedict Prairie to its pre-settlement condition. Undergraduate Senior Thesis Proposal in Biology, Carthage College.

Interspecific Pollinator Movements Reduce Pollen Deposition and Seed Production in *Mimulus ringens* (Phrymaceae).

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We investigated the effects of invasive *Lythrum salicaria* on conspecific pollen deposition and seed set in *Mimulus ringens*, a wetland plant native to southeastern Wisconsin. We used experimental arrays of potted plants to address the following questions: (1) Does inconstant pollinator foraging decrease conspecific pollen deposition and resulting seed set in *Mimulus*? (2) Does inconstant pollinator foraging increase heterospecific pollen deposition on both *Mimulus* and *Lythrum*? To quantify interspecific pollen transfer between *Mimulus* and *Lythrum*, we placed potted plants of each species in linear arrays, each with two *Mimulus* plants on either side of a single *Lythrum* plant. We removed a total of 44 arrays one at a time from a pollinator-free greenhouse and placed them outside, allowing the first free-flying bumblebee worker that arrived to forage solely on the array. We recorded the species and sequence of flowers that each pollinator visited and tagged the final *Mimulus* flower visited in each array. We collected the stigma

of each tagged *Mimulus* flower 48 hours following pollination to compare the number of *Mimulus* and *Lythrum* grains on *Mimulus* stigmas resulting from a *Mimulus* to *Mimulus* transition versus a transition in which there were visits to an intervening *Lythrum* plant. To quantify the relationship between pollen deposition and *Mimulus* reproductive success, fruits on tagged flowers were left to ripen and seed number per fruit was counted. Pollinator movement between species significantly reduced conspecific pollen deposition on *Mimulus* stigmas and significantly lowered *Mimulus* seed production. Although pollinators deposited small amounts of *Lythrum* pollen on *Mimulus* stigmas, such deposition did not appear to influence reproductive success. Instead, the reduction in seed was due to pollen loss, which was exacerbated by grooming when pollinators foraged on intervening *Lythrum* flowers. This research was supported by a grant from Applied Ecological Services. Ph.D. Dissertation research, Jeffrey Karron, Major Professor.

Riparian Zone Vegetation along the Fifth Order Main Branch of the Milwaukee River

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There is a great deal of interest in preserving and restoring natural communities along the Milwaukee River corridor, and several groups and organizations are focused on revitalizing or providing stewardship for various aspects of the river corridor. Information about the current status of the vegetation in the riparian zone along the Milwaukee River is lacking, and would be



useful for restoration efforts. This project is funded by the Eastern States Field Office of the US Bureau of Land Management to assess the current condition of 11 BLM-owned islands in the Milwaukee River. The project has been expanded, and will describe the vegetation along the whole fifth order branch of the Milwaukee River from Kewaskum to Milwaukee by surveying a number of floodplain forests along this stretch of the river. In addition, elevation data will be collected in these study sites to help determine a relationship between elevation and species distribution. Sample unit elevations, base flow of the river and 2008 flooding level elevations will be collected at each site. This information will be useful in determining species that persist in frequently inundated areas of lower elevations, and those that may persist better in higher elevations. Much data has been collected in the 2008 field season, and is being compiled in order to ordinate and classify the plant communities of the riparian zone.

More data will be collected in the 2009 field season to increase sample size, and to better represent more northern and southern locations along the fifth order branch of the river. Current sample unit locations have been marked using GPS, and these points have been mapped in ArcGIS. Once data is processed, more summary information will be entered into ArcMap attribute tables for vegetation mapping and trend visualization. The maps of the plant communities on the 11 BLM-owned islands will pay special attention to invasive species, which will be used as a basis for future monitoring, and to formulate recommendations for management of the vegetation of each island. We will correlate environmental factors in the riparian zone, especially various forms of disturbance, to the current distribution of native and exotic plant species. We have and will continue to examine some of the most pristine forested areas along the riparian zone to serve as reference sites. These will provide some picture of the processes in the original plant communities of the islands and riparian zone before major environmental disturbances occurred. The effects of stream flow, erosion, farming practices, and urban settings along the river will be considered when evaluating the vegetation types of the riparian zone. Funding provided by a cooperative Agreement with the Bureau of Land Management. MS Thesis research, J. A. Reinartz, Major Advisor.



Gypsy Moth Suppression Treatment on the UWM Campus

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The UWM grounds department applied to the Wisconsin Department of Natural Resources, voluntary Gypsy Moth Suppression Program, for aerial treatment of 47 acres for the spring of 2008. The treatment block covered the northern two thirds of campus, including Downer Woods. Egg mass densities averaged approximately 1,040 egg masses per acre on campus, above the minimum of 500 egg masses per acre to qualify. In addition, four County Parks participated in 2008 aerial treatments for a total of 260 acres in Milwaukee County. The

goal of the suppression program is to reduce the gypsy moth population, in a given year, below damaging levels of defoliation. The program goal is to prevent more than 50% defoliation, the threshold that predisposes trees to secondary pests. Aerial defoliation surveys conducted in early July indicated little to no defoliation in Downer Woods and scattered light defoliation in the north east portion of the treatment block. No applications for treatment were received from the University of Wisconsin Milwaukee for 2009.

Robust Population Estimation, Demography, and Spatial Analysis of Butler's Gartersnake

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The objective of this study is to estimate Butler's gartersnake (*Thamnophis butleri*) populations within three equivalent suitable habitat patches using robust mark-recapture methodologies. A second objective is to identify and characterize biotic and abiotic factors within survey sites that influence

earthworms), and annelid diversity and abundance data related to these coordinates will be collected and analyzed. Collected data will be extrapolated to infer density estimates for similar habitat patches within the state of Wisconsin and their potential for supporting sustainable populations.

Coverboards made of 2 X 122 X 81cm plywood were emplaced in a grid formation every 15 m. The ground vegetation beneath cover boards was removed using a weed-wacker, metal rake, and pruning shears. Coverboards were inspected for the presence of snakes 1-2 days/week, with a minimum of 2 days between sampling periods. Dominant plant species will be determined using visual estimates of cover; stem densities will be derived via framed quadrat sampling. Soil organic content will be measured by taking 5-10 g dry soil samples and grinding them (with a pestle and mortar) before overdrying in a furnace at 375 C° for 16 hours. Annelids will be sampled in spring and fall, when soil temperatures are optimum for earthworm



population density and spatial distribution of Butler's gartersnake. Vegetation (dominant plant species and stem densities), soil organic content (the food source for

movement (10-15 C°), using mustard (allyl isothiocyanate) extraction methods. In 2008, there were a total of 154 captures, of which 39 were unique recaptures. The unique recaptures included 5 adult males, 13 adult

females, 9 male neonates, and 12 female neonates. Funded by a Wisconsin State Wildlife Grant. MS thesis research, James Coggins, Major Professor.

Reinforcement and Behavioral Plasticity

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In the evolution of reproductive isolation, an important source of selection is thought to arise when species that have diverged in allopatry, but are still partially inter-fertile, come into secondary contact. The process of reinforcement is then predicted to lead to reproductive character displacement (RCD), a pattern of geographic variation in sexual traits wherein species differ more in areas of sympatry (where selection against inter-breeding is present) than in allopatry. When testing for RCD, geographic variation is usually interpreted as genetic divergence. However, work showing that mate choice can be influenced by experience suggests that the pattern of RCD may also arise from plasticity in the expression of sexual traits. Consequently, tests of RCD should evaluate plasticity in sexual communication traits.

I evaluated whether experience of communication environments (conspecific / heterospecific calls) influences the expression of mate preferences and contributes to patterns of geographic variation resembling RCD. The focal species was the tree frog *Hyla cinerea*, the subject of one of the most comprehensive tests of RCD to date. The research presented *H. cinerea* females from Texas (allopatric) and Georgia (sympatric) with playbacks of simulated conspecific or heterospecific communication environments, and tested for variation in their preferences due to variation in their experiences.

Preliminary results from experiments conducted in 2008 strongly suggest that experience can alter female preferences, and that the pattern of RCD (i.e. stronger preference in sympatry) could arise from plasticity in sexual traits. Data from the two populations tested so far show that females that experienced the heterospecific communication environment had stronger post-experience preference for the conspecific call than females that experienced the conspecific environment. This is an ongoing



project, with the goal of testing 6 additional populations over the next 3 years. This project is supported by a grant from the Research Growth Initiative at UWM.

Comparison of Terrestrial Isopod Collection Methods

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During 2008 we collected terrestrial isopods (Crustacea, Oniscidea) from the Cedarburg Beech Woods. Trail-side sites were pre-treated in two ways and subsequently re-visited to collect the oniscideans present for comparison of the numbers of specimens and species represented. The use of pre-treatments differed from our quadrat sampling method of prior seasons, which involved removing loose litter and soil in a meter by meter area, placing it onto an adjacent ground cloth, and sorting through it by hand. In 2008 we compared the effectiveness of two simple attractants in drawing isopods from the surrounding habitat: a piece of moist corrugated cardboard versus an equal-sized area covered with potato slices, both types of attractants being placed among the leaf litter on the forest floor. On ten such test sites, the cardboard and potato slices drew equal numbers of individuals,

with *Trachelipus rathkii* being the only species collected. These results provided some initial evidence that neither of these attractants as used was an effective means of increasing our collecting efficiency, in comparison to the quadrat method used previously. The North American prevalence of this isopod in forested habitats differs from the distribution pattern for *Trachelipus rathkii* in Europe, where it is generally a grassland species and far less abundant. In North America it has been categorized as a post-European settlement invasive, but an alternate hypothesis suggests that refugia just south of the glacier's maximum may have harbored this isopod and other remnants of a pre-glacial Holarctic fauna, from which subsequent re-colonization of more northerly regions could have been initiated at the time of glacial retreat approximately 10,000 years ago.

Poriferans from Mud Lake

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In June 1978, as part of a three year survey conducted by invertebrate zoologists from the Milwaukee Public Museum, Guy M. Johnson collected a small freshwater sponge from the submerged surface of a log near the northern shore of Mud Lake adjacent to UWM Field Station property. Lacking the gemmules which have the species-distinctive spicules, this specimen's specific identity could not be determined. On 24 September 2008, we re-visited this collecting site to search for gemmule-bearing specimens. Using a garden rake, we retrieved a weathered chunk of discarded lumber floating near the wooden pier and on its underside found several poriferan colonies attached. After



microscopic examination in the laboratory, these were determined to belong to the species *Ephydatia muelleri* and *Rackiella ryderi*, records which will be

used to contribute Ozaukee County data to the Wisconsin Department of Natural Resources monitoring program for sponges in the state.

Use of Mark-Recapture Techniques to Estimate Milksnake (*Lampropeltis triangulum*) Populations in the Upper Midwest

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In Wisconsin, relatively little research has been conducted on native snake species in the sub-family Colubrinae, including milksnakes (*Lampropeltis triangulum*). Published data on population characteristics for this species are particularly rare, focusing mostly on estimates of density per area in populations from the western portions of its range. Information on Wisconsin populations does not exist, despite the importance of such baseline data for future conservation efforts. The University of Wisconsin-Milwaukee Field Station contains a rich herpetofauna that previous surveys have determined includes milksnakes. This research represents an ongoing attempt to study several population parameters of these snakes through the use of mark-recapture methods (e.g., un-biased Lincoln-Petersen estimator). Annual sampling efforts are constrained to a two to three-day period in late May/early June of each year, when individuals have been found to be active and frequently encountered on-site. Both cover board and visual encounter surveys are employed. Upon capture, snakes are marked with Passive Integrated Transponder (PIT) microchips, which are commonly employed by researchers to mark snakes for future identification. Sex ratios are also determined in surveyed individuals via probing.

This work began in June 2006 in association with a field herpetology class and has continued for several years. To-date, three

annual sampling efforts have been completed (2006, 2007, and 2008). In 2006, a total of 14 adult individuals were captured, with five being recaptures. This resulted in an estimated adult population of 12.4 individuals, and a density of approximately 2 individuals per hectare. In 2007, a total of 12 adult individuals were captured, with 4 being recaptures. This yielded an estimated adult population of 9.3 individuals, and a density of approximately 1.5 individuals per hectare. In 2008, only five individuals were captured (0.82 individuals per hectare), none of which were recaptures. Therefore, a population estimation was not possible. Because surveys have resulted in variable success, and small sample sizes have been achieved, I believe it will be important to continue conducting this research. In this way, long-term trends in population size and characteristics of milksnakes at this location can be assessed, which will produce valuable information.



Pollinator Visitation Patterns Strongly Influence Among-flower Variation in Selfing Rate

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Adjacent flowers on *Mimulus ringens* floral displays often vary markedly in selfing rate. We hypothesized that this fine-scale variation in mating system reflects the tendency of bumble bee pollinators to probe several flowers consecutively on multi-flower displays. When a pollinator approaches a display, the first flower probed is likely to receive substantial outcross pollen. However, since pollen carryover in this species is limited, receipt of self pollen should increase rapidly for later flowers. In order to link floral visitation sequences with selfing rates of individual flowers, we established replicate linear arrays, each composed of plants with unique genetic markers. This facilitated unambiguous assignment of paternity to all sampled progeny. We permitted a single wild bumble bee to forage on each linear array, recording the order of floral visits on

each display. Once fruits had matured, we harvested 120 fruits (four flowers from each of five floral displays in each of six arrays). We genotyped 25 seedlings from each fruit and unambiguously assigned paternity to all 3000 genotyped progeny. The order of pollinator probes on *Mimulus* floral displays strongly and significantly influenced selfing rates of individual fruits. Mean selfing rates increased from 21% for initial probes to 78% for the fourth flower probed on each display. Striking among-flower differences in selfing rate result from increased deposition of geitonogamous (among-flower, within-display) self pollen as bumble bees probe consecutive flowers on each floral display. The resulting heterogeneity in the genetic composition of sibships may influence seedling competition and the expression of inbreeding depression.

An Investigation of the Potential for *Lonicera japonica* to Spread Beyond its Current Northern Range

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The purpose of my research is to determine the growth and survival of the invasive vine Japanese honeysuckle (*Lonicera japonica*) beyond the current North American range edge. With this work, I am asking several questions. First, can *L. japonica* survive beyond the current range edge, and if so, what life history stages are most likely to survive conditions beyond the range edge? To answer this question I am tracking the survival and growth of seeds, seedlings, and juveniles through two winters. Seeds were planted in the spring of 2008. Seedlings and juveniles were planted in the fall of 2008. Survival and growth are being measured in the spring, summer and fall

of 2009, and the spring of 2010. Second, are *L. japonica* populations pre-adapted to conditions beyond the current range edge or are they evolving to adapt to new conditions during the course of the range expansion? Plant stock for the entire experiment was collected from naturalized populations from the northern edge and the core of the current North American range. If populations are evolving to new conditions then plants from the edge of the range should perform better than plants from the core, whereas if the *L. japonica* is pre-adapted plants with different geographical origins should survive equally well. Together, these data will indicate whether

the range of *L. japonica* will continue to expand northward, as well as help identify

life history stages which land managers can target to help slow the spread.

Long-term Monitoring of the Eastern Prairie White-fringed Orchid, [*Platanthera leucophaea* (Nutt.) Lindl.] at Cedarburg Bog

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P. leucophaea is one of the largest and showiest of the native North American orchids. Loss of wet prairies and fens, where the orchid was once widespread, greatly reduced the orchid's range and led to its listing as a Federal Threatened and a State Endangered Species.

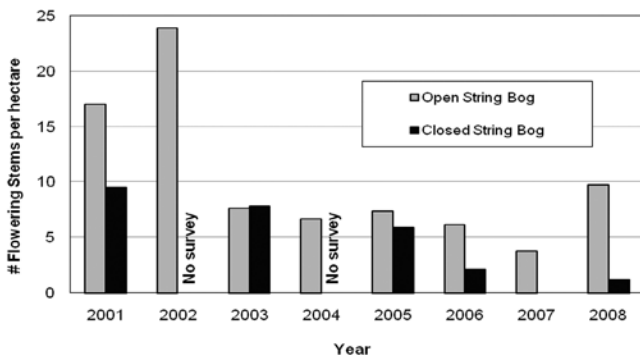
Populations rely on pollination by sphinx moths for long distance out-crossing, which is more effective where many orchids grow over a large area. Insuring the stability of these highly viable populations is a major objective for recovery of the species and for removal of its threatened and endangered status. The Cedarburg Bog population is the largest in Wisconsin and the largest in a peatland plant community nationwide.

The orchid occurs in two distinct habitat types within the string bog. In the 'open' string bog, where the linear hummocks of trees and shrubs are relatively far apart and the canopy is open, the plants are more abundant, compared to in the 'closed' string bog, where linear hummocks of woody



plants are closely spaced. Monitoring in both habitats includes an annual census of flowering plants, and tracking the demographics of individual plants for life span, flowering history, pollination success and impacts of herbivory.

Based on tracking individual plants for 6 years most plants take at least 2 years to flower and then flower for 2 or 3 consecutive years before they disappear. One plant has flowered for at least 5 years. Plants



Annual flowering stem density of eastern prairie white fringed orchids in two habitat types at Cedarburg Bog.

that flower after being dormant through one growing season have been noted at other locations, but not observed at Cedarburg Bog.

Threats to the population continue to be the invasive shrub, glossy buckthorn (*Rhamnus*

frangula), and lack of legal protection to the State Natural Area. The extent and density of giant reed grass (*Phragmites australis*), a native but potentially invasive species, has increased in the open string bog since 2006 and may pose an additional threat.

Atlas of North American Amphibians

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This is a book project with the University of California Press. The Atlas of North American Amphibians will present detailed distribution maps and brief species descriptions of each of the 293 currently recognized amphibian species in the United States and Canada. The intended audience will be professionals, including researchers, teachers, land and wildlife managers, natural resource technicians and administrators, nature center staff, zoo staff, wildlife health staff, various federal and state agencies such as forest service, park service, environmental quality and agricultural departmental staff, and amateur naturalists. Funded by the Indiana University School of Medicine.



Genetic Studies of the Hine's Emerald Dragonfly Population at Cedarburg Bog

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Previous studies have examined the mitochondrial DNA of Hine's Emerald Dragonfly from populations along the Des Plaines River, Illinois, and from wetlands in Door County, Wisconsin. Only one genetic variant was recovered from several individuals sampled from Door Co and the Door County variant was not found in Illinois, despite the fact that this latter population contained a number of other variants. The population of Hine's Emerald at Cedarburg Bog is located between those in Door County and the Des Plaines River valley. Genetic analysis of the first specimen

discovered from the Cedarburg Bog area recovered the same haplotype as found in Door County, suggesting possible recent contact between these areas. The availability of 16 specimens recovered in 2001 and 5 in 2002 from Cedarburg Bog provides an opportunity to expand these genetic studies on Hine's Emerald and perhaps resolve some long-standing problems, such as past dispersal patterns and normal levels of genetic diversity for populations. Samples from the Cedarburg Bog population will be included in on-going genetic studies of Hine's Emerald Dragonfly.

The Structural and Functional Characteristics of Ecosystems Dominated by Exotic Plants

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Recent work on exotic species in island ecosystems has revealed that many exotic woody plants are capable of totally dominating forests where they occur, resulting in significant changes to forest structure and nutrient cycling. Despite some observational accounts, however, few empirical examples of exotic dominance exist in northeastern forests. Common buckthorn (*Rhamnus cathartica* L.) is known to choke temperate forest understories but its degree of dominance has been described only anecdotally. In a series of studies at several mesic and wet sites in Southern Wisconsin, including the UWM Field Station, we found evidence for monotypic dominance by buckthorn, which we found has caused several dramatic changes to forest structure and ecosystem function. In sites where buckthorn attains canopy dominance, we found that nearly all forest biomass is allocated to small-sized buckthorn trees (30 cm dbh and smaller) rather than large native trees (> 50 cm

dbh) that constitute most forest biomass in Southern Wisconsin. As a result, we found that buckthorn-dominated sites are likely to store significantly less carbon in aboveground forest biomass than the native forests that are being replaced. Buckthorn-dominated sites are also nearly devoid of leaf litter throughout the year, as their nitrogen-rich leaves are consumed almost immediately by earthworms. Although buckthorn is shorter in stature than a majority of native and some exotic trees, mean relative density and basal area for buckthorn among the eight exotic sites exceed that reported for four other woody invaders found in the northeast United States, suggesting a prominent role for this species in forest leaf area, biomass, and functional characteristics, including nutrient and carbon cycling. Funded by Applied Ecological Services and UWM. Ph.D. Dissertation research, Stefan A. Schnitzer, Major Professor.

Long-term Monitoring of Bat Activity and Temperature at the Neda Mine Bat Hibernaculum

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The Neda Mine, an abandoned iron mine located near Iron Ridge in Dodge Co., supports about 150,000 bats each winter, making it among the largest hibernacula in the midwest. The mine is used primarily by little brown bats (*Myotis lucifugus*), with Northern Bats (*M. septentrionalis*), Eastern Pipistrelles (*Pipistrellus subflavus*), and Big Brown Bats (*Eptesicus fuscus*) found in smaller numbers. We have been monitoring bat activity at the mine since 2001 using an infra-red photo beam-break detection system that records the number of bats entering and leaving the mine on a 5-minute interval 365 days per year. We have been collecting temperature data since 1996

using 18 battery-powered temperature dataloggers spread within the mine and 2 dataloggers outside. We are also monitoring airflow in the mine. We are currently using these data to examine trends over time in winter temperatures in the mine, and the phenology of bat emergence in spring. Our data suggest that the interior of the mine has been warming over time (1996-2007). Temperature increases within the mine have not yet affected bat phenology: there was no evidence that bats are emerging earlier, although we have a shorter run of data for bat activity (2001-2007). The dates of bat emergence from the mine were very consistent: the range from the earliest to

the latest date of 50% emergence from the mine was 7 days over the 8 years of the study. We are currently collecting data on nocturnal aerial insect abundance at the Field Station to determine the relationship between night-time temperatures in spring

and insect activity. These data will help us to interpret patterns of bat activity in the spring by providing information on how their aerial insect prey is affected by spring temperatures.

Below-ground Defenses of Native and Invasive Genotypes of *Solidago gigantea*

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When plants are introduced to new areas, they may leave their specialized herbivores and pathogens behind. The evolution of increased competitive ability (EICA) hypothesis holds that this escape from natural enemies allows introduced plants to reduce their investment in defense, thereby freeing resources for growth and reproduction and increasing their potential for invasiveness. Most tests of the EICA hypothesis focus on above-ground plant defenses and herbivores; however plant roots and other below-ground structures are also subject to herbivory. In this study, we measured secondary chemistry and herbivory on rhizomes of late goldenrod (*Solidago gigantea*), which is native to North America and is an invasive exotic in Europe. Plants derived from 10 North American and 20 European populations were grown in a common garden at

the UWM Field Station, where they were exposed to naturally-occurring above and below-ground herbivores. At the end of the growing season, rhizomes were harvested and densities of a root and rhizome feeding wooly aphid (Eriosomatidae) were estimated. Rhizomes were retained for chemical analysis, which is currently in progress. Below-ground secondary chemistry and levels of herbivory will be compared to levels seen in leaves, which have previously been measured for the same clones of goldenrod used in this experiment. These data will provide a more complete picture of how defenses have changed in *S. gigantea* in its invasive range in Europe compared to native genotypes, as there are few studies that have examined both above-ground and below-ground chemistry and herbivory in an invasive plant.

Land Cover and Land Use Changes (1941 to 2000) on the Landscape Surrounding Cedarburg Bog

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Landscape history and structure determine the quantity and quality of natural areas in human-dominated landscapes, and wetlands are particularly sensitive to landscape context. We examined landscape changes between 1941 and 2000 on the landscape (96 km²) surrounding the Cedarburg Bog. Having developed historical and

contemporary land use/cover maps from digitized aerial photographs, we quantified changes in landscape composition and configuration using landscape metrics that measured attributes such as patch size, shape complexity and nearness to one another. The majority of the landscape was used for agriculture in both 1941 and

2000, but agricultural area decreased by 16% between sample dates. Nearly all of the abandoned agricultural land transitioned to forest (wetland or upland) by 2000, and (more than 60%) of reforested area was within 100 m of a 1941 wetland forest patch. Total wetland forest area increased by 31%, although mean patch size did not significantly change. The number of wetland forest patches increased by 16%, and the mean distance between patches decreased. When upland and wetland forest classes were combined, total forest cover increased in area by 58%, and the number of patches

decreased as formerly distinct patches coalesced. For the combined upland-wetland forest class, mean patch size increased while the mean nearest-neighbor distance decreased. The decreases in agricultural land use and subsequent reforestation resulted in a more extensive network of forests on the landscape surrounding the Cedarburg Bog. The increased continuity of forests should benefit native species, although the agricultural history of the second-growth forests may favor weedy native species or invasive exotic species.

Collection of Water-Quality Data from Occupied Hine's Emerald Dragonfly Larvae Habitat

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Water-quality samples are being collected from multiple locations where Hine's emerald dragonfly larvae are currently found in Wisconsin and Illinois. Locations in Door County, Wisconsin, and Will and DuPage County, Illinois, are being studied along with one location at Cedarburg Bog. Samples are being collected quarterly, beginning in Summer 2008 and continuing through Summer 2009. Major ion chemistry is being analyzed, including anions, cations, and

nutrients. Water-quality dataloggers have been installed at all monitoring locations, and are collecting pH, specific conductance, dissolved oxygen, turbidity, and temperature several times per day. No analysis has been performed on the data at present, and no publications have been released. Funding is being provided by the Illinois Department of Transportation and the Illinois Toll Highway Authority.

Basin Depths in the Cedarburg Bog

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Research was conducted at the Cedarburg Bog to collect data on the depth of the basin. Set transects on an East/West heading were walked and studied. The data was collected by pushing a steel probe into the basin until point of resistance every 50 meters along these transects. When point of resistance was reached, a measurement was taken to determine the depth of the basin at that specific point. These results and data collected in the future will be used to construct a topographic layout of the

basin depth. These results will be useful to future studies including vegetation growth patterns, hydrology of the Cedarburg Bog, geological history, and the formation of the bog. Further data collection is needed in order to provide a detailed topographic map of the basin depth but sufficient data was collected to construct a profile diagram of the basin depths for the East/West transects. Undergraduate independent study project, James Reinartz and Erica Young, advisors.

Ecological and Phylogeographical Approach of a Biological Invasion: *Prunus serotina*, a Case Study

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Invasion by non-indigenous plant species is currently a major threat for biodiversity, economy and health. Prediction and anticipation of future biological invasions are central to avoid or mitigate such impacts. Here, we combined niche modeling with phylogeography to assess the ongoing invasion of the native North-American tree species *Prunus serotina* in Europe. First, ecological niche models were developed from 6983 occurrences distributed in the native and invasive ranges, by relating observed occurrences to eight climatic variables. We further performed a principal components analysis to investigate the ecological requirements of the species in the space of climatic parameters. Second, the phylogeography of the species was investigated by analyzing cpDNA polymorphisms from 50 populations distributed in both ranges to determine which chlorotypes were introduced in Europe.

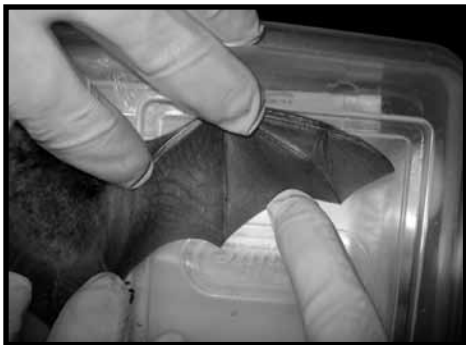
Then, both approaches were combined to distinguish how chlorotypes differed in their environmental settings. Prediction accuracy of the models calibrated in the native range was low when projected on the invaded range. It was dramatically increased when models were calibrated with data from both ranges, keeping a high predictive ability in the native range. Six chlorotypes were found. Four of them were common to both ranges, supporting multiple introductions. We found a pronounced climatic niche shift between the occurrences in the two ranges, but also between the European and American distribution of every chlorotype introduced in Europe. Such a climatic shift may limit the utility of ecological niche models in predicting the full extent of biological invasion. MS thesis research, Supervised by Guillaume Besnard, Olivier Broennimann and Antoine Guisan.

Pre-hibernation and Spring Emergence Weight of Bats Using Four Hibernacula in Wisconsin.

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White-nose syndrome (WNS) is an emerging issue for cave dwelling bat species and was recently discovered in the eastern United States. One sign associated with the syndrome includes bats exiting hibernacula earlier than expected (late winter/early spring) with depleted fat reserves. Thus, one question is whether bats are entering hibernation with sufficient fat stores to survive through the winter. The USFWS Region 3 coordinated a study for the currently unaffected area and distributed the protocol for minimum data collection and handling procedure



outlined by the associated WNS working group. Our goal was to collect baseline weight and standard measurement data on bats from select hibernacula in Wisconsin for comparison with concurrent studies in both the affected and unaffected region. Our specific objectives were as follows: 1) Trap a sample of bats late in the pre-hibernation period at select hibernacula in an effort to capture bats near the end of the fall weight gain cycle. 2) Collect standard measurements (weight; forearm length; species; sex) on all captured bats. 3) Repeat measurements during spring emergence. 4) Collect temperature and humidity measurements at each hibernaculum. These data will provide baseline data from unaffected region on

natural conditions. Four Wisconsin study locations were selected: 1) Bay City Mine State Natural Area, Pierce County, 2) Neda Mine State Natural Area, Dodge County 3) Maiden Rock Sand Mine, Pierce County, and 4) Atkinson Mine, Grant County. During fall 2008 bats were captured on multiple nights at each site. The focal species is *Myotis lucifugus*, though *Myotis septentrionalis*; *Eptesicus fuscus*; and *Perimyotis subflavus* were also captured and processed. All individuals were measured with the goal to get a representative sample from adult and juvenile as well as male and female bats. This project will continue at the same sites during spring 2009 emergence.

Growth Patterns of Glossy Buckthorn (*Rhamnus frangula*) and Tamarack (*Larix laricina*) in Cedarburg Bog

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The invasive plant, glossy buckthorn (*Rhamnus frangula*), is a small tree that has invaded much of the Cedarburg Bog SNA, where it has been naturalized since at least 1955. Even in parts of the wetland characterized by nutrient-poor, water-logged soils and by low primary productivity, buckthorn has spread rapidly and has growth rates that exceed those of native woody species in the same community. The native coniferous tree tamarack (*Larix laricina*), dominates much of the forest canopy and grows with buckthorn in the Bog. To compare the growth patterns of an invader and a relatively conservative native species, we collected stem sections or cores from individuals growing in close proximity at sample points throughout the wetland. We measured diameter of each stem and counted annual rings, from which we estimated mean annual rates of radial growth. The sample plot mean annual growth increment of tamarack varied by almost 14-fold; ranging from plots with very small trees over 225 years old to plots with much larger trees in their 30s. While we found a weak positive correlation between

the tamarack and buckthorn growth rates in samples, buckthorn maintained a relatively more constant growth rate across a wide



range of habitats than did tamarack, varying less than 3-fold in mean plot growth rate in the same plots in which tamarack showed that tremendous range of growth rates (coefficient of variation of tamarack growth rate = 69% versus buckthorn 33%). Stem diameter was a much better predictor of age in buckthorn than it was in tamarack. In both species, the oldest stems had relatively slow growth rates. We will also relate buckthorn and tamarack growth rates to vegetation composition and abiotic conditions.

15 Years of Change in the Vegetation of the Cedarburg Bog

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In 1991 we conducted the first complete vegetation survey of the Cedarburg Bog State Natural Area. We located 10, east-west transects across the Bog at ¼ mile intervals



from north to south. The northernmost transect was just south of Highway 33 and the southernmost transect was ¼ mile

north of Cedar Sauk Road. Sample units were spaced at 100 m intervals along each transect for a total of 170 sample points. At each sample point the species and DBH of each tree were recorded in a 100 m² circular quadrat; number of saplings of each tree species was recorded in two, 4 m² quadrats; herbaceous species presence and cover were recorded in two, 1 m² quadrats; and shrub species cover was recorded along a 10 m line intercept. Transects were placed in reference to landmarks and permanently marked so that the sample units could be approximately relocated. In the summer of 2006, we resurveyed the vegetation of the Bog, using the same sample units and following identical methods to those of the original survey in 1991. The data provide a quantitative description of change in this complex wetland over a 15-year period. After classification and ordination of the sample units, we have constructed a map of the plant communities of the Bog. Funded by Research Growth Initiative, UWM.

Depth of Water Table Affects Growth and Physiology of Two Year Old Tamarack Saplings.

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We investigated the effects of three water depths on the growth and total biomass of potted tamarack saplings in a mesocosm experiment. Using nine cattle tanks buried in the ground at the Field Station we manipulated the water levels using various layered brick heights to create high saturation conditions at 7 inches, medium saturation at 5 inches and low saturation 2.5 inches. A total of 258 potted tamaracks were maintained for five months (April through September) during the growing season. At harvest, we

measured total height, leader height, number of branches, dry weight of stems and dry weight of shoots. As expected, an ANOVA showed a significant difference among all treatments, with low saturation levels producing the most growth and biomass. Interestingly, the number of branches for medium water levels did not vary significantly between high or low treatments. Some saturated trees grew adventitious roots so that there was a dead root zone below the soil level and a live root zone just

above the soil surface of the pot. This study provides evidence that tamaracks are able to tolerate high water levels throughout the growing season and that they adapt to these

conditions by producing adventitious roots, though the total biomass is less than what is physiologically possible. Further study on water table fluctuations will be conducted.



Comparing the Distributions of Pre-settlement and Present Day Southern Tamarack Swamp in the Southeast Glacial Plains.

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We developed a map of the pre-settlement distribution of tamarack swamps in the Southeast Glacial Plains (SGP) Ecological Landscape of Wisconsin using the data from the original land survey records. Comparison of the original distribution of tamarack swamps with the present day distribution as mapped by the Wisconsin Wetland Inventory and the hydric soil data from the Soil Survey Geographic database (SSURGO) allow us to estimate the extent of tamarack loss.

Wisconsin Wetland Inventory has recently been updated for all counties in the SGP. Tamarack communities covered approximately 178,000 acres during pre-settlement times, with a potential to cover almost 350,000 acres. WWI indicates that 51,000 acres of tamarack swamp remain, which constitutes a 70% loss of tamarack in the SGP landscape. This map helps us prioritize conservation and restoration practices in the region.

Evaluating Five Site Preparation Treatments for Tamarack Seedling Establishment in the Cedarburg Bog

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We manually seeded 320 hummocks in three 30 X 10 meter plots within the Cedarburg Bog to test different site preparation methods for tamarack restoration. Treatments included burning, one herbicide (Rodeo only), two herbicides (Garlon Rodeo), soil scarification (raking) and two control plots. After one summer season, overall two-way ANOVA results show that the Rodeo only and burning treatments provide significantly more germination across all three plots. Treatment success also varied among plots. The Boardwalk Plot had significantly more germination than either the Island Plot or the St. Augustine Plot. This is most likely due to seeding the Boardwalk plot prior to the major flooding event of June 2008. Water levels on June

10th were almost 2 feet when average levels are usually 1.25 to 1.5 feet. Additionally, St. Augustine hummocks are considerably smaller than those of the Boardwalk and Island Plots. Competition for space among seeds may explain the lower overall germination in this plot. In the Boardwalk Plot, burning and Rodeo only treatment provided the highest germination compared to other treatments. In the Island Plot, raking and Rodeo only provided the highest germination. In the St. Augustine Plot, raking and Garlon + Rodeo provided the most germination. Overall, the control plots provided the least amount of germination. We will follow germination and survival for another season and reanalyze the results and will include analysis of vegetation cover.



Health and Loss of Tamarack Swamps in the Southern Glacial Plains Ecological Landscape

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We identified two types of tamarack wetlands in the Southern Glacial Plains (SGP) Ecological Landscape that are currently healthy and that have been extirpated or are severely declining. We are looking for the factors that affect the health and decline of tamarack swamps in the SGP. We will describe dominant vegetation along with a detailed history of past disturbance. For species comprising >5% of cover in each stratum, cover estimates of trees, shrubs, and herbaceous species will be recorded.

Experience has shown that, at most, there are 30 to 40 species that comprise the dominants across all strata; these provide an ecologically useful description of the community's influence on the ecology and reproduction of *Larix*. Mean Coefficients of Conservatism (CC) of these dominants will be calculated. A GIS of the project area will be constructed to compare land use within wetlands and watersheds supporting and lacking *Larix*, and in wetlands with divergent mean CC of dominant vegetation.



Behavioral Ecology of Vibrational Communication in Membracidae

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In 2008 I collected *Publilia* treehoppers (ca. 50 individuals) at the UWM Field Station for a preliminary survey of their systems of vibrational communication. These

experiments with the Fall generation resulted in no recordings, probably because of limited or absent mating behavior in that season.

Intercomparing Multiple Measures of the Onset of Spring in Eastern North America

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Measuring the onset and progress of vegetative growth during the spring season in temperate climates can be accomplished using multiple ground and satellite-based techniques. While all these measurements are valid (i.e., record a real characteristic related to plant development), they typically are poorly intercorrelated due to incompatible levels of spatial representation and differing methodologies. Given recent and likely future impacts of climate change on spring plant growth, the need to reconstruct past patterns, and the lack of standardized vegetation growth measurements around the world, more work is needed to determine the relationship between the various measures, and the degree to which they may serve as substitutes for each other.

We use measurements at two phenology “super-sites” in eastern North America (one is the UW-Milwaukee Field Station) and several other supporting sites to evaluate the relationships among multiple spring

vegetative growth measures, and explore strategies to standardize their intercorrelation. The results show that correlations among satellite-derived start of season (SOS) measures are generally high, and correlations among ground phenology measures are also high, but when ground phenology and satellite SOS are compared, there are few strong correlations, even at sites with extensive native species phenology available. Modeled phenology, based on daily temperature data (Spring Indices first bloom date) does as well as any of the direct native species measures, and is better suited to facilitate intercomparisons. In order to effectively compare ground-based and satellite-derived SOS measures, it is clear that employing limited numbers of individual plants will be less effective. Given that satellite-derived measures are areal and at a scale of 250 m and larger, we suggest collecting ground phenology data at the same areal scale to make effective comparisons.

Bridging Spatial Scales Using Phenological Measurements to Improve Understanding of Springtime Atmosphere-Biosphere Interactions

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As part of this project, 108 evenly distributed trees have been marked in Downer Woods (on the UW-Milwaukee campus) and are being phenologically observed both in autumn (starting in 2007) and in spring (starting in 2008). In addition, automatic air and soil temperature measurements are being collected at several locations to support analyses of these phenological

measurements. These measurements will also be compared to data being collected on at least one similar species (*Tilia americana*, Basswood) at both the UW-Milwaukee Field Station and at the primary study site of this project near Park Falls, Wisconsin. Funded by the National Science Foundation.

***Somatochlora hineana* Survey and Habitat Assessment at Cedarburg Bog**

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Larval habitat for the Hine's emerald dragonfly has been identified on the grounds of the University of Wisconsin- Milwaukee Field Station in an area referred to as the Cedarburg South Wetland (CSW). One of the primary goals of this study was to quantify the larval population in the CSW streamlet system and to determine if larvae could be found in nearby areas. Searches for additional habitat were necessary because the CSW habitat area is relatively limited, and appears to be too small produce the number of adults observed around the UWM Field Station. In this study, surveying and sampling in the areas adjacent to the CSW streamlet and in the streamlet east of the footbridge did not reveal likely habitat for *S. hineana* larvae. Surveying and sampling for *S. hineana* larvae in several additional small systems on the property were also unsuccessful. Given the hydrology, structure, and low number of crayfish burrows found in these systems, it seems unlikely that they will support significant numbers of *S. hineana* larvae. The stream system that drains from Long Lake in the northern half of the bog was also assessed without success and was not *S. hineana* habitat in the area surveyed. The failure to find any evidence of substantial additional larval habitat in the immediate vicinity of the UWM field station,

combined with recent findings from other studies suggested additional searches of the bog mat. One of the burrows that were pumped near the end of the observation boardwalk on the floating bog mat yielded a *S. hineana* larvae likely older than 3-4 years. The presence of older larvae in the bog mat indicate that these habitats can be used by



S. hineana to complete its life cycle. It is also clear that these are not productive habitats. Understanding the particular features that allow at least some crayfish burrows to be occupied by larvae is of critical importance to conserving this isolated population of Hine's emerald dragonfly at Cedarburg Bog.

An Urban Cooper's Hawk Nesting Study in the Metropolitan Milwaukee Area

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The objectives of this study are to gather baseline data on the reproductive success of Cooper's Hawks (*Accipiter cooperii*) in the urban metropolitan Milwaukee area, to describe urban nesting habitat, and to compare these data with other Cooper's Hawk studies in Wisconsin. Long-term objectives are to determine Cooper's Hawk nest site fidelity, breeding population mortality and recruitment, population growth trends, immigration and emigration patterns, and natal dispersal patterns for the same urban population. In 2008, 33 of 41 laying pairs produced 107 young to a bandable age (ca. 16 days; 2.61 young/laying pair, 3.24 young/successful pair, 80.5% nesting success). All nestlings (62 males, 45 females) were banded. No second nesting attempts (i.e., re-nests) were found (i.e., for first nesting attempts that failed). Blood was drawn and blood slides (smears) were prepared from the blood of 62 nestlings (36 males, 26 females) for blood parasite analysis. Twenty-four adult (i.e., breeding) Cooper's Hawks (14 males, 10 females) were trapped, banded, measured, colormarked, and processed for additional analyses at 15 different nest sites. Blood was drawn on 23 of the 24 adults (13

males, 10 females) and blood slides were prepared for blood parasite analysis. The nest at Downer Woods (UW-Milwaukee) produced two young. The adult male for this breeding area was identified as the same male that occupied this site since 2004 (he was trapped and colormarked in 2004). The adult female was an after second year bird but I was unable to determine whether she was banded or colormarked. This project was supported, in part, through the Wisconsin Society for Ornithology (WSO) Small Grants Program.



Citizen-based Herptile Monitoring Program in Historic Riverside Park, Milwaukee

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We established a long-term citizen-based monitoring program for snakes and turtles in Riverside Park, Milwaukee. The program includes annual snake mark/recapture surveys using plywood cover boards, and tracking individuals of the state-threatened Butler's gartersnake (*Thamnophis butleri*) to determine life history parameters and population trends. Northern brownsnakes and common gartersnakes have also been recorded. We also conduct annual turtle

visual basking surveys and mark/recapture surveys using traps, and radio tracking of turtles to determine activity ranges and nesting sites is under consideration for 2009. To date northern map turtle, painted turtle, common snapping turtle, and spiny softshell turtles have been recorded. Funded by Citizen-based Monitoring Partnership Program, Prairie Biotic Research Program, and the Milwaukee County Zoo.

The Effects of Enemy Exclusion and Enemy Damage on Exotic and Native Plant Species: A Test of the Enemy Release Hypothesis

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One of the major theories proposed to explain the invasiveness of certain exotic plants is the Enemy Release Hypothesis. This hypothesis states that certain exotic plants out-compete natives because the specific natural enemies that regulate their populations in the home range are absent in the introduced range. *Pastinaca sativa* is an exotic species that can reach high densities in natural and restored prairies. This study evaluated the relationship between the degree to which this plant is released from insect and fungal pathogen enemies and its density at a particular site. An enemy exclusion experiment was conducted at an old field prairie site in southeastern Wisconsin to measure the release *P. sativa* is experiencing from its enemies and compared it to that of naturalized exotic and native species it potentially competes with. In addition, foliar herbivore and pathogen damage measurements were obtained on various invasive exotic, naturalized exotic and native species at 5 sites throughout the region. Community surveys were conducted at each site to determine if the lack of enemies on a particular species could be used to predict that species' density relative to others in

the community. Consistent with the Enemy Release Hypothesis invasive exotic plants, including *P. sativa*, had significantly lower levels of foliar damage than potentially competing naturalized exotic and native species. However, *P. sativa* experienced significant gains in leaf area and vegetative biomass when treated with pesticides, indicating its generalist herbivore and pathogen loads are substantial in the introduced range. Meanwhile, certain less-abundant native species received no significant benefits from treatment. No clear relationship was found between the abundance of exotic or native plants and the degree to which they escaped foliar herbivores and pathogens at any one site. However, native plants showed a positive correlation between average leaf damage and plant abundance, while exotic plants showed a negative relationship. The results demonstrate that invasive exotics experience lower levels of foliar herbivory than natives and naturalized exotics. However, measuring foliar damage, a method used by many previous studies, may not be a reliable indicator of a species' release from enemies. M.S. Thesis Research, Dr. Gretchen Meyer, Major Professor.

The Impact of Interpopulation Crossing Distance on the Fitness of First and Second Generation Offspring in *Impatiens capensis* Meerb. (Balsaminaceae)

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Restoration, reintroduction, and hybridization rescue are important tools for the conservation of wild populations. There is currently a great deal of uncertainty in the selection of appropriate populations for use in restorations, reintroductions, population augmentations, captive breeding programs and in nursery establishment efforts that support restoration efforts. Of special concern are possibly detrimental genetic impacts that

crossing between distinct populations could have on often small remnant populations. The potential for hybrid vigor and outbreeding depression limit our ability to apply many of these important conservation tools. Despite these concerns, little research has been conducted using wild populations to explore the relationship between interpopulation outcrossing distance and the level of hybrid vigor and/or outbreeding

depression expressed in the offspring. In this experiment, thirteen wild populations of the common annual plant *Impatiens capensis* Meerb. (Orange jewelweed) are used to examine the effect of interpopulation distance on two generations of offspring fitness. The research design includes the production of first and second-generation offspring by randomized crossing between each of three local populations and two replicate populations from distances of 50, 100, 200, 400 and 800 kilometers. Fitness impacts are being assessed by comparing the fitness of individuals produced by crossing within each population (P1) with the fitness of hybrids produced by crossing between populations separated by increasing distances. The separate effects of hybrid

vigor, and two components of outbreeding depression will be partitioned by comparing the fitness of non-hybrid P1 plants with the fitness of both first generation (F1) and second generation (F2) offspring. In the final field season of this experiment, the fitness of all cross-types was tested during the 2001 growing season at the UWM Field Station. Fitness was measured in the context of both a local parental environment and in a more controlled shade lattice environment. The resulting data are currently being analyzed and will be used to test existing theories in conservation genetics and inform biologists involved in habitat restoration, population reintroduction, and hybridization rescue efforts. PhD Dissertation research, James Reinartz, Major Professor.



Volunteers constructing another boardwalk section.

Recent Publications and Theses

Recent Publications Resulting from Field Station Projects

Pytte, C. L., M. S. Ficken and A. Moiseff. 2004. Ultrasonic singing by the Blue-throated Hummingbird: a comparison between production and perception. *J. Comp Physiol A* 190: 665-673.

Weise, C. M., G. A. Meyer and H. O'Brien. 2004. A long-term survey of the breeding birds of the Cedarburg Bog and Cedarburg Beech Woods State Natural Areas. *Passenger Pigeon* 66: 101-112.

Bell, J. M., J. D. Karron and R. J. Mitchell. 2005. Interspecific competition for pollination lowers seed production and outcrossing in *Mimulus ringens*. *Ecology* 86: 762-771.

Dunn, P.O. and L. A. Whittingham. 2005. Radio-tracking of female tree swallows prior to egg-laying. *Journal of Field Ornithology* 76: 259-263.

Hovick, S. M. and J. A. Reinartz. 2005. Combination of treatments influence survival of woody species planted to suppress reed canarygrass (Wisconsin). *Ecological Restoration* 23: 126.

Hunter, T. A. and J. Picman. 2005. Characteristics of the wing sounds of four hummingbird species that breed in Canada. *Condor* 107: 570-582.

Joppa, L. N. and S.A. Temple. 2005. Use of upland habitat by the Butler's gartersnake (*Thamnophis butleri*). *Bull. Chicago Herp. Soc* 40: 221-227.

Meyer, G. A., R. Clare and E. Weber. 2005. An experimental test of the Evolution of Increased Competitive Ability hypothesis in goldenrod, *Solidago gigantea*. *Oecologia* 144: 299-307.

Mitchell, R. J., J. D. Karron, K. G. Holmquist and J. M. Bell. 2005. Patterns of multiple paternity in fruits of *Mimulus ringens* (Phrymaceae). *American Journal of Botany* 92: 885-890.

Nooker, J. K., P. O. Dunn, and L. A. Whittingham. 2005. Effects of food abundance, weather and female condition on reproduction in tree swallows. *The Auk* 122: 1225-1238.

Stout, W.E., A. Cassini, J.K. Meece, J.M. Papp, R.N. Rosenfield, and K.D. Reed. 2005. Serologic evidence of West Nile virus infection in three wild raptor populations. *Avian Diseases* 49:371-375.

Tarof, S. A., P. O. Dunn and L. A. Whittingham. 2005. Dual functions of a melanin-based ornament in the Common Yellowthroat. *Proceedings*

of the Royal Society of London B 272: 1121-1128.

Torti, V. and P.O. Dunn. 2005. Variable effects of climate change on six species of North American birds. *Oecologia* 145: 486-495.

Whittingham, L.A., P.O. Dunn, and J. K. Nooker. 2005. Maternal influences on brood sex ratios: an experimental study in tree swallows. *Proceedings of the Royal Society of London B* 272: 1775-1780.

Whittingham, L.A. and P.O. Dunn. 2005. Effects of extra-pair and within-pair reproductive success on the opportunity for selection in birds. *Behavioral Ecology* 16: 138-144.

Youngsteadt, E. and P.J. Devries. 2005. The effects of ants on the entomophagous butterfly caterpillar *Feniseca tarquinius*, and the putative role of chemical camouflage in the *Feniseca*-Ant interaction. *Journal of Chemical Ecology* 31: 2091-2109.

Garvin, J., B. Abroe, M. Pedersen, P. O. Dunn and L. A. Whittingham. 2006. Immune response of nestling warblers varies with extra-pair paternity and temperature. *Molecular Ecology* 15: 3822-3840.

Güsewell S., G. Jakobs and E. Weber. 2006. Native and introduced populations of *Solidago gigantea* differ in shoot production but not in leaf traits or litter decomposition. *Functional Ecology* 20: 575-585.

Jass, J.P. 2006. Prevalence of invasive slugs in the leaf litter of Wisconsin State Natural Areas. *Tentacle* 14:7-8.

Jass, J. and B. Klausmeier. 2006. Determining the presence of fairy shrimps (Crustacea: Anostraca) at ephemeral pond sites in Wisconsin. Wisconsin Department of Natural Resources Research Report 188: 1-5.

Kapfer, J. M. 2006. Herpetofauna of the University of Wisconsin-Milwaukee Field Station, (Saukville, Wisconsin): A preliminary report. *Bull. of the Chicago Herpetological Society* 41: 3: 45-49.

Kapfer, J. M. and T. Muehlfield. 2006. The herpetofauna of the University of Wisconsin-Milwaukee Field Station, (Ozaukee County, Wisconsin): an updated report. *Bull. of the Chicago Herpetological Society* 41: 198-202.

Karron, J. D., R. J. Mitchell, and J. M. Bell. 2006. Multiple pollinator visits to *Mimulus ringens* (Phrymaceae) flowers increase mate number and seed set within fruits. *American Journal of Botany* 93: 1306-1312.

Pedersen, M., P. O. Dunn, and L. A. Whittingham. 2006. Extra-territorial forays are related to a male ornamental trait in Common Yellowthroats. *Animal Behaviour* 72: 479-486.

Redell, D., D. Shurilla, H. Guenther, S.R. Craven, J.A. Reinartz, and M. Rowe. 2006. Detecting directional movement at a hibernaculum with an infrared beam-break system. *Bat Research News* 47: 71-80.

Schwartz, M. D., R. Ahas, and A. Aasa. 2006. Onset of spring starting earlier across the Northern Hemisphere. *Global Change Biology* 12: 343-351.

Snyder, B.A., M.L. Draney and P. Sierwald. 2006. Development of an optimal sampling protocol for millipedes (Diplopoda). *Journal of Insect Conservation* 10: 277-288.

Stout, W.E., R.N. Rosenfield, W.G. Holton, and J. Bielefeldt. 2006. The status of breeding Cooper's Hawks in the metropolitan Milwaukee area. *Passenger Pigeon* 68:309-320.

Whittingham, L. A., P. O. Dunn and M. Stapleton. 2006. Repeatability of extra-pair mate choice by female Tree Swallow. *Molecular Ecology* 15: 841-849.

Casper, G. S. 2007. On the herpetofaunal history of the University of Wisconsin-Milwaukee Field Station (Ozaukee County, Wisconsin). *Bulletin of the Chicago Herpetological Society* 42:21-30.

Casper, G. S., J. M. Kapfer, and T. Muehlfeld. 2007. Geographic distribution. *Emydoidea blandingii* (Blanding's turtle). *Herpetological Review* 38:99-100.

Gallant, A. L., R. W. Klaver, G. S. Casper, and M. J. Lannoo. 2007. Global rates of habitat loss and implications for amphibian conservation. *Copeia* 2007:967-979.

Hovick, S.M. and J.A. Reinartz. 2007. Restoring forest in wetlands dominated by reed canarygrass: the effects of pre-planting treatments on early survival of planted stock. *Wetlands* 27: 24-39.

Hull-Sanders, H.M., R. Clare, R.H. Johnson, and G.A. Meyer. 2007. Evaluation of the Evolution of Increased Competitive Ability (EICA) hypothesis: loss of defense against generalist

but not specialist herbivores. *Journal of Chemical Ecology* 33: 781-799

Johnson, R.H., H.M. Hull-Sanders and G.A. Meyer. 2007. Comparison of foliar terpenes between native and invasive *Solidago gigantea*. *Biochemical Systematics and Ecology* 35: 821-830

Mascaro, J. and S. A Schnitzer. 2007. *Rhamnus cathartica* L. (Common Buckthorn) as an ecosystem dominant in southern Wisconsin forests. *Northeastern Naturalist* 14:387-402

Mitchell, D. P., P. O. Dunn, L. A. Whittingham and C. R. Freeman-Gallant. 2007. Attractive males provide less parental care in two populations of the common yellowthroat. *Animal Behavior* 73: 165 -170

Placyk, J. S. Jr., G. M. Burghardt, R. L. Small, R. B. King, G. S. Casper and J. W. Robinson. 2007. Post-glacial recolonization of the Great Lakes region by the common gartersnake (*Thamnophis sirtalis*) inferred from mtDNA sequences. *Molecular Phylogenetics and Evolution* 43:452-467.

M. D. Schwartz. 2007. Development of Intercomparison Strategies for Multiple Measures of the Onset of Spring. Wisconsin Forest Health Highlights 2007, Wisconsin Dept. of Natural Resources.

Stout, W.E., R.N. Rosenfield, W.G. Holton, and J. Bielefeldt. 2007. Nesting biology of urban Cooper's Hawks in Milwaukee, Wisconsin. *Journal of Wildlife Management* 71:366-375.

Yoder, H. R., J. R. Coggins. 2007. Helminth communities in five species of sympatric amphibians from three adjacent ephemeral ponds in southeastern Wisconsin. *J. Parasitology* 93(4): 755-760.

Bott, T, G. A. Meyer and E. B. Young. 2008. Nutrient limitation and morphological plasticity of the carnivorous pitcher plant *Sarracenia purpurea* in contrasting wetland environments. *New Phytologist* 180: 631-641.

Casper, G. S. 2008. Change in amphibian and reptile communities. In: *The Vanishing Present: Wisconsin's Changing Lands, Waters, and Wildlife* (Chapter 20). D. Waller and T. Rooney, eds. The University of Chicago Press, Chicago IL.

Casper, G. S. 2008. An annotated checklist of the amphibians and reptiles of Wisconsin. *Bull. Chicago Herp. Soc.* 43:73-79.

Casper, G. S. 2008. An amphibian and reptile inventory of Isle Royale National Park. Natural Resource Technical Report NPS/GLKN/

NRTR—2008/146. National Park Service, Fort Collins, Colorado.

Casper, G. S., and T. G. Anton. 2008. An amphibian and reptile inventory of Sleeping Bear Dunes National Lakeshore. Natural Resource Technical Report NPS/GLKN/NRTR—2008/147. National Park Service, Fort Collins, Colorado.

Fitzpatrick, B. M., J. S. Placyk, Jr., M. L. Niemiller, G. S. Casper and G. M. Burghardt. 2008. Distinctiveness in the face of gene flow: hybridization between specialist and generalist gartersnakes. *Molecular Ecology* 17:4107-4117.

Kapfer, J. M., G. S. Casper and J. J. Kapfer. 2008. Geographic distribution. *Hyla versicolor* (Gray Treefrog). *Herpetological Review*. 39:478.

Kapfer, J.M., M.J. Pauers, D.M. Reineke, J.R. Coggins, and R. Hay. 2008. Environmental, behavioral, and habitat variables influencing body temperature in radio-tagged bullsnakes, *Pituophis catenifer sayi*. *Journal of Thermal Biology* 33: 174-179.

Kapfer, J.M., J.R. Coggins, and R. Hay. 2008. Estimates of population size, measurements of sex ratios, and reported mortality rates for bullsnakes (*Pituophis catenifer sayi*) at a site in the upper midwestern United States. *Journal of Herpetology* 42: 265-269.

Leitner, L. A., J. H. Idzikowski, and G. S. Casper. 2008. Urbanization and ecological change in Milwaukee County. In: *The Vanishing Present: Wisconsin's Changing Lands, Waters, and Wildlife* (Chapter 25). D. Waller and T. Rooney, eds. The University of Chicago Press, Chicago IL.

Meyer, G.A. and H.M. Hull-Sanders. 2008. Altered patterns of growth, physiology and reproduction in invasive genotypes of *Solidago gigantea*. *Biological Invasions* 10: 303-317

Stout, W.E., R.N. Rosenfield, and J. Bielefeldt. 2008. Wintering location of a Wisconsin Cooper's Hawk and the impact of digital photography on wildlife research. *Passenger Pigeon* 70:373-379.

Recent Theses

Pedersen, Marc C. 2004. Extraterritorial movements of male and female common yellowthroats in relation to a male ornamental trait. M.S. thesis.

Abroe, Betsy. 2005. Do more attractive males have more sons in the common yellowthroat *Geothlypis trichas*. M.S. thesis.

Holmquist, Karsten. G. A. 2005. The effect of floral display and pollinator behavior on pollen-mediated gene dispersal in *Mimulus ringens*. Ph.D dissertation.

Hovick, Stephen M. 2005. Restoring forest in wetlands dominated by reed canary grass: the effects of pre-planting treatments on early survival. M.S. thesis.

O'Brien, Heather L. 2005. Assessment of white-tailed deer (*Odocoileus virginianus* Zimmerman) density and browse damage at University of Wisconsin-Milwaukee Field Station. M.S. thesis.

Redell, David N. 2005 Behavioral ecology of bats using the Neda Mine hibernaculum. M.S. thesis.

Garvin, Julia C. 2006 Male ornaments, extra-pair mating, and immunocompetence in the common yellowthroat. Ph.D dissertation.

Bott, Terry. 2007 Morphological diversity of the northern pitcher plant (*Sarracenia purpurea* L.) in two contrasting wetlands. M.S. thesis.

Hapner, Jill A. 2007. Factors influencing plant community development and wildlife use in small conservation wetlands in southeastern Wisconsin. Ph.D dissertation.

Kapfer, Josh. 2007 The Ecology of Bullsnares (*Pituophis catenifer sayi*) in Upper Midwestern Prairies. Ph.D dissertation.

Maurer, Joan K. 2007 Detection of avian blood parasites in the common yellowthroat (*Geothlypis trichas*): A comparison of multiple methods. M.S. thesis.

Mitchell, Dan. 2007 Attractive males provide less parental care in two populations of the common yellowthroat. M.S. thesis.

Vasquez, Eric C. 2008. The effects of enemy exclusion and enemy damage on exotic and native plant species: a test of the enemy release hypothesis. M.S. Thesis

Cooperation with Other Groups and Agencies

Service to the local community, and to the state-wide community of individuals, groups, and organizations engaged in natural area study and preservation is a major part of the Field Station's mission. To the extent that our staff has time available, we provide natural area consulting services to the community. The demand for these services exceeds our capacity to help, but we feel that these cooperative efforts are a very important part of our mission.

1. Friends of the Cedarburg Bog. The Field Station cooperates with and helps to support this non-profit organization that has a mission to initiate and support activities that will enhance the natural history, public appreciation, and scientific study of Cedarburg Bog in cooperation with the Wisconsin DNR and UWM.

2. Department of Natural Resources. The Station continued its wide range of planning and management activities in conjunction with the DNR. These activities include the day-to-day surveillance of the Cedarburg Bog performed by Station staff and some assistance with maintenance activities such as snowplowing.

3. Natural Areas Preservation Council. The Station participates in the State Natural Areas program, since the Station owns and manages five properties that have State Natural Areas status.

4. Ozaukee Washington Land Trust. The Land Trust is a non-profit, land conservancy for Ozaukee and Washington Counties. The Field Station helps to support the organization's activities in various ways. J. Reinartz served on the Conservation and Stewardship Committees and aids in development of stewardship plans and natural area management.

5. Invasive Plants Association of Wisconsin. This non-profit organization works to stop the spread of invasive plants in Wisconsin. Reinartz serves on the Board of Directors and is editor of the IPAW newsletter, "Plants out of Place".

6. Riveredge Nature Center. Gretchen Meyer and Jim Reinartz both serve on the Riveredge Research and Stewardship

Committee, and Reinartz serves on the Board of Directors and as Chair of the Science and Larsen Legacy Committee. Reinartz also cooperates with Riveredge to organize and direct the Riveredge Speaks Out monthly lecture series.

7. Regional School Systems. Advanced biology classes from several high schools in the region (Milwaukee, Ozaukee, and Washington counties) use the Field Station for ecology field classes.

8. Ozaukee County Department of Environmental Health. The Field Station continues to provide monthly rainfall totals from our weather station for use in soil test requirements.

9. Town of Saukville. J. Reinartz serves on the Town's Gravel Pit Review Committee.

10. Village of Saukville. Daily rainfall totals are provided on a regular basis to the Village of Saukville engineers.

11. Port Washington Power Plant. Weather records are provided monthly.

12. Organization of Biological Field Stations. The Station is an active member of this national organization and cooperates in the exchange of information on programs.

13. Sierra Club-Milwaukee Chapter. The Field Station provides a site for the Club's annual retreat, and volunteer opportunities for members.

14. The Nature Conservancy. J. Reinartz serves on the Science and Stewardship Committee of the Wisconsin Chapter.

15. City of Mequon – Mequon Nature Preserve. J. Reinartz serves on the MNP science and stewardship planning committee.

16. Wisconsin Department of Transportation. The Station raises beetles for biological control of purple loosestrife for WDOT.

17. Urban Ecology Center—Milwaukee. G. Meyer serves on the Science Advisory Board.

18. U.S. Fish and Wildlife Service. G. Meyer assists in surveys for the federally-endangered Hine’s emerald dragonfly (*Somatochlora hineana*), and provides support for monitoring efforts.

19. Wisconsin Governor’s Task Force on Invasive Species. J.Reinartz serves on the

task force and on the Science and Research Subcommittee of the task force.

20. Wisconsin Phenological Society. G. Meyer serves on the Board of Directors.

21. Ecological Society of America. G. Meyer served as local host for the 2008 meeting of the ESA in Milwaukee.

22. Society of Wetland Scientists. Jim Reinartz and Dr. Tim Ehlinger are Program Organizers of the Symposia for the 2009 meeting of SWS to be held in Madison.

2008 Natural History Workshops

This is a series of intensive workshops on specialized topics which provide a continuing education opportunity and a meeting place for biologists. Eight workshop topics were offered in 2008. Each of our workshops was filled to the capacity of 20 people.

| Workshop | Instructor | Date |
|--|-------------------------------|-------------------|
| Ecology and Physiology of Plants in Winter: Surviving the Big Chill | James Reinartz | January 4 & 5 |
| Field Herpetology: Identification of Wisconsin Amphibians and Reptiles | Josh Kapfer | May 30 & 31 |
| Vegetation of Wisconsin | James Reinartz and Marc White | June 9-14 |
| Sedges: Identification and Ecology | Anton Reznicek | June 20 & 21 |
| Ecological Geology | Roger Kuhns | July 7-11 |
| Fishes of Wisconsin: Identification and Ecology | Michael Pauers | July 18 & 19 |
| Common and Nuisance Algae | Craig Sandgren | July 25 & 26 |
| Wetland Delineation | Don Reed | September 12 & 13 |

Class and Group Use

Winter - Spring 2008 Number of Student Hours

| | |
|---|-----|
| Ecology and Physiology of Plants in Winter Workshop | 340 |
| Field Herpetology Workshop | 360 |
| Winter Ecology Hike and Friends Chili Dinner | 410 |
| Friends of Cedarburg Bog – Night hike in the Bog | 30 |
| Friends of Cedarburg Bog – Spring frogs and woodcock | 60 |
| Friends of Cedarburg Bog – Spring Migration Bird Walk | 70 |
| Friends of Cedarburg Bog – Full moon night hike | 40 |
| Friends of Cedarburg Bog – Natural History of the Bog Walk | 60 |
| Friends of Cedarburg Bog – Work Parties | 190 |
| Friends of Cedarburg Bog – Volunteer Orientation | 50 |
| Friends of Cedarburg Bog – Meetings | 80 |
| Friends of Cedarburg Bog – High School service learning | 60 |
| Riveredge Research & Stewardship Committee | 30 |
| Riveredge Larsen Legacy Committee | 20 |
| Schlitz Audubon Center – 5th Grade School group | 140 |
| Ozaukee Washington Land Trust – Monitor training | 50 |
| Wisconsin Wetlands Association – Frogs of the Bog | 50 |
| Milwaukee Area Technical College – Natural Landscaping | 40 |
| Loyola University, Chicago – Ecology | 480 |
| University of Illinois-Chicago– Animal behavior – Neda bats | 120 |
| UW – Eau Claire – Ecology | 450 |
| UW – Parkside – Ecology | 70 |
| UWM – Biology of Invasive Species class | 60 |
| UWM – Plant Systematics and Evolution | 70 |

TOTAL3,330

Summer 2008

| | |
|--|-------|
| Vegetation of Wisconsin Workshop | 1,240 |
| Sedges: Identification and Ecology Workshop | 360 |
| Ecological Geology Workshop | 900 |
| Fishes of Wisconsin Workshop | 360 |
| Common and Nuisance Algae Workshop | 360 |
| Ecological Society of America – Meeting field trip | 200 |
| Natural Resources Foundation field trip | 50 |
| Summer Solstice Walk | 50 |
| Blooming in the Bog – walk and tour | 50 |
| Edible & Medicinal plants of the Cedarburg Bog | 60 |
| Friends of Cedarburg Bog – Canoe Mud Lake | 70 |
| Friends of Cedarburg Bog – meetings | 60 |
| Mammology Independent Study Group | 30 |
| Carroll College – Field Botany course | 60 |
| Carroll College – Ecology course | 40 |
| UW-Madison – Plant Ecology | 100 |

TOTAL3,990

Fall 2008

Number of
Student Hours

| | |
|--|---------------|
| Wetland Delineation Workshop | 360 |
| Biological Sciences/Field Station Picnic | 120 |
| Friends of Cedarburg Bog – meetings | 80 |
| Friends of Cedarburg Bog – work parties | 310 |
| Friends of Cedarburg Bog – Annual Meeting & potluck | 160 |
| Friends of Cedarburg Bog – Owl survey & walk | 30 |
| Wild Ones – Vegetation of Wisconsin | 90 |
| Schlitz Audubon Center – Teacher Naturalist Training | 30 |
| Schlitz Audubon Center – School groups | 430 |
| Wisconsin Groundwater Association field trip | 70 |
| United Universalist Church Environmental Club | 100 |
| Kettle Moraine Lutheran High School | 50 |
| Milwaukee Institute of Art and Design – Ecology | 80 |
| Milwaukee Area Technical College – Ecology | 100 |
| Alverno College – Wetland Ecology | 30 |
| University of Illinois-Chicago– Ecology field trip | 320 |
| UW – Platteville – Geology | 260 |
| UWM – Geography – Soils | 110 |
| UWM – Geology – Hydrogeology | 70 |
| TOTAL | 2,800 |
| TOTAL 2008 Class & Group Use Hours | 10,120 |



Photo: Amy Taivalkoski

Meteorological Data for 2008

This yearly summary is modeled, where possible, after the summaries provided by the National Oceanic and Atmospheric Administration (NOAA). Some differences between the two reports reflect differences in available equipment. Records for the Field Station are reported in degrees Celsius and in other metric measures. In addition, growing degree-days at 5° and 10°C, (see below for description) were substituted for the heating and cooling degree-days used by NOAA. The variables reported in the summaries are defined as follows:

Temperature

Average Daily Maximum: Monthly mean of the 30-min period in each day with the highest mean temperature.

Average Daily Minimum: Monthly mean of the 30-min period in each day with the lowest mean temperature.

Daily Average: Monthly mean of all 30-min means. (NOAA uses the midpoint between the daily minimum and maximum for this measure.)

Highest(Date): Highest 30-min mean temperature. (Day of month with highest temperature.)

Lowest(Date): Lowest 30-min mean temperature. (Day of month with lowest temperature.)

Degree Days

Sum at 5°: Sum of the number of degrees by which the daily average temperatures exceeded 5° C.

Sum at 10°: Sum of the number of degrees by which the daily average temperature exceeded 10° C.

Radiation (kW/m²)

Mean: Mean of all 30-min means in the month.

Maximum: Maximum 30-min mean during the month.

Relative Humidity

Monthly mean of the 30-min means for each quarter of the day.

Number of Days

Precipitation of 0.25 mm or more

Temperature-Maximum

32° and above: Number of days with a maximum 30-min mean temperature of 32° C or above.

0° and below: Number of days with a maximum 30-min mean temperature of 0° C or below.

Temperature-Minimum

0° and below: Number of days with a minimum 30-min mean temperature of 0° C or below.

-18° and below: Number of days with a minimum 30-min mean temperature of -18° C or below.

Mean Pressure (mbars)

Mean of all 30-min means in the month.

Precipitation (mm)

Total: Sum of all precipitation during the month.

Greatest (24 hrs) (Date): Total precipitation on the day with the most precipitation and the date on which it occurred.

Wind

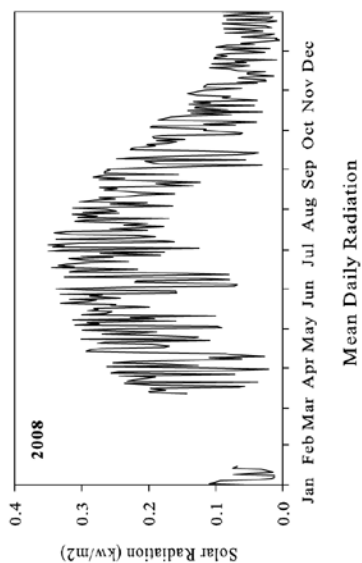
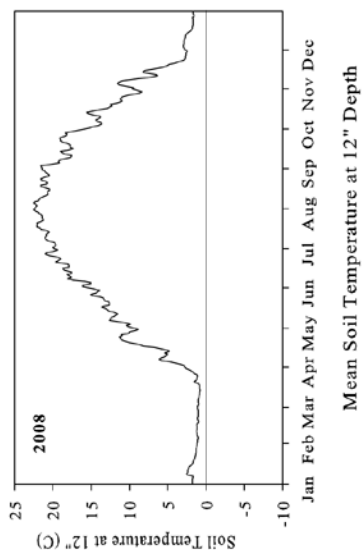
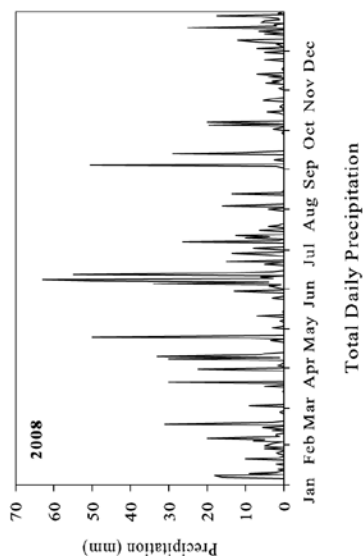
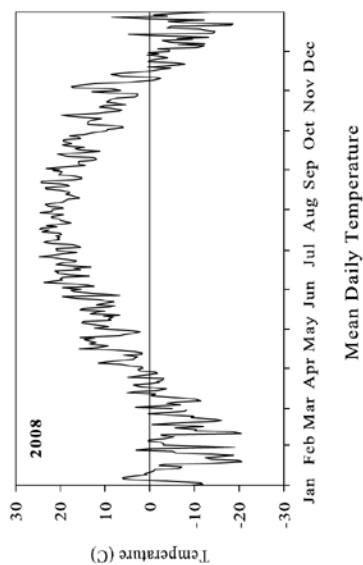
Mean Speed (m/s): Monthly mean of all 30-min means

Maximum Speed (m/s): Highest mean wind speed during a 30-min period.

The Field Station can provide weather data in electronic format; datasets go back to 1989. Please contact us if you would like to receive the weather data.

| | JAN | FEB | MAR | APR | MAY | JUN | JULY | AUG | SEP | OCT | NOV | DEC |
|-------------------------------------|-----------------|------------|-----------|-----------|-----------|----------|-----------|-----------|----------|-----------|------------|------------|
| Temperature (C°) | | | | | | | | | | | | |
| Average Daily Maximum | -2.7 | -3.2 | 2.9 | 12.5 | 17.5 | 23.6 | 26.2 | 25.5 | 21.8 | 14.6 | 6.3 | -2.5 |
| Average Daily Minimum | -11.2 | -11.8 | -6.0 | 2.9 | 4.2 | 13.0 | 14.9 | 13.7 | 11.2 | 4.8 | -1.8 | -12.2 |
| Daily Average | -6.6 | -7.1 | -1.5 | 7.5 | 11.7 | 18.5 | 20.9 | 19.6 | 16.4 | 9.7 | 2.4 | -7.1 |
| Highest (Date) | 12.0 (7) | 2.5 (24) | 11.8 (2) | 24.5 (25) | 28.0 (26) | 29.2 (7) | 30.4 (15) | 29.8 (30) | 31.0 (2) | 27.0 (12) | 23.8 (4) | 11.2 (27) |
| Lowest (Date) | -23.3 (20) | -26.4 (21) | -14.6 (7) | -6.8 (2) | 0.0 (28) | 7.6 (1) | 8.1 (4) | 8.1 (26) | 4.6 (10) | -2.0 (29) | -12.0 (22) | -22.4 (21) |
| Degree Days | | | | | | | | | | | | |
| Sum at 5° | 1.9 | 0.0 | 0.1 | 101.2 | 207.2 | 405.4 | 491.8 | 452.0 | 342.8 | 151.7 | 53.1 | 3.5 |
| Sum at 10° | 0.0 | 0.0 | 0.0 | 33.5 | 70.1 | 255.4 | 336.8 | 297.0 | 192.8 | 44.3 | 21.5 | 0.0 |
| Radiation (kW/m²) | | | | | | | | | | | | |
| Mean | NA ¹ | NA | NA | 0.19 | 0.25 | 0.23 | 0.26 | 0.23 | 0.16 | 0.12 | 0.07 | 0.05 |
| Maximum | NA | NA | NA | 0.92 | 1.00 | 1.01 | 1.00 | 0.95 | 0.81 | 0.70 | 0.62 | 0.46 |
| Relative Humidity | | | | | | | | | | | | |
| Hour 00-06 mean | 84.2 | 87.0 | 83.8 | 79.7 | 81.6 | 88.6 | 88.9 | 92.4 | 92.9 | 83.5 | 82.2 | 84.5 |
| Hour 06-12 mean | 80.1 | 79.6 | 71.3 | 66.6 | 60.4 | 68.3 | 69.3 | 71.5 | 76.2 | 70.4 | 74.6 | 81.4 |
| Hour 12-18 mean | 75.2 | 72.0 | 62.4 | 57.2 | 49.4 | 62.8 | 58.6 | 58.4 | 66.3 | 60.6 | 67.2 | 76.5 |
| Hour 18-24 mean | 82.6 | 81.5 | 78.6 | 73.4 | 68.0 | 80.7 | 82.0 | 86.7 | 89.5 | 80.1 | 79.1 | 82.5 |
| Number of Days | | | | | | | | | | | | |
| Precip. 0.25mm or more | 12 | 14 | 5 | 12 | 7 | 16 | 9 | 4 | 6 | 13 | 12 | 17 |
| Max Temp 32° and above | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Max Temp 0° and below | 16 | 21 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 20 |
| Min Temp 0° and below | 28 | 29 | 26 | 7 | 1 | 0 | 0 | 0 | 0 | 4 | 18 | 30 |
| Min Temp -18° and below | 7 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| Pressure (mbars) | | | | | | | | | | | | |
| Mean | 1015.45 | 1014.30 | 1017.43 | 1014.71 | 1011.40 | 1011.92 | 1014.06 | 1016.53 | 1019.39 | 1020.69 | 1015.37 | 1015.42 |
| Precipitation (mm) | | | | | | | | | | | | |
| Total | 73.5 | 96.0 | 66.6 | 140.0 | 27.5 | 274.4 | 73.5 | 33.8 | 96.7 | 58.4 | 32.6 | 108.5 |
| Greatest (24 hrs) (Date) | 18.0 (8) | 31.0 (17) | 30.0 (21) | 50.0 (25) | 13.0 (30) | 63.0 (8) | 26.3 (7) | 16.0 (4) | 50.5 (4) | 20.0 (7) | 7.0 (13) | 25.0 (19) |
| Wind | | | | | | | | | | | | |
| Mean Speed (m/s) | 1.8 | 1.7 | 2.0 | 2.3 | 2.0 | 1.4 | 1.2 | 1.1 | 1.2 | 1.7 | 1.9 | 2.1 |
| Maximum Speed (m/s) | 5.7 | 7.4 | 5.3 | 6.5 | 7.0 | 5.4 | 4.7 | 3.9 | 4.8 | 5.0 | 5.7 | 6.6 |

1 - NA, not available. Pyranometer removed for maintenance.





Field Station

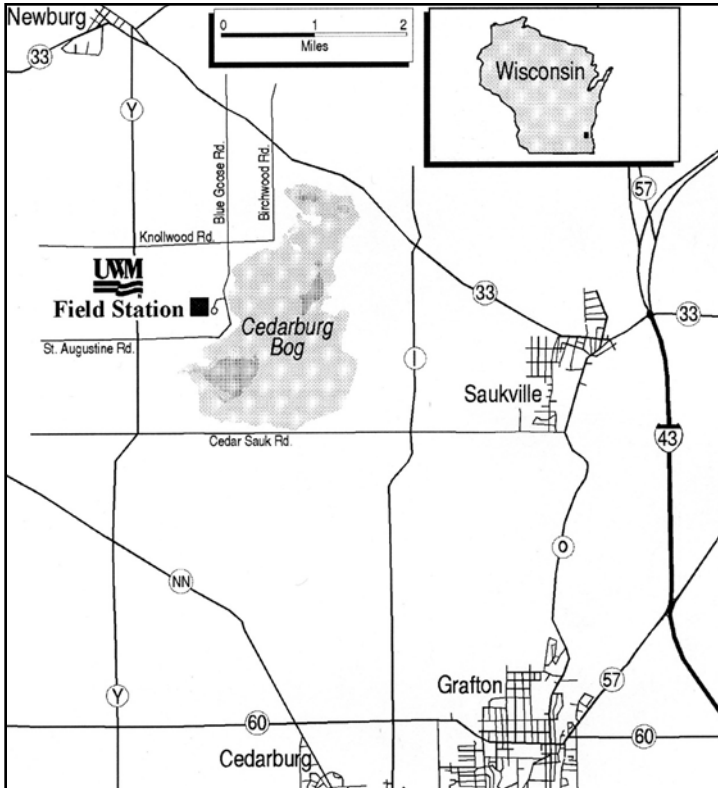
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