



30th Natural Areas Conference

September 24-27, 2003

MADISON, WISCONSIN

Defining a Natural Areas Land Ethic

Schedule of symposia and contributed paper sessions*

Thursday morning, September 25

- ◆ Fire Forum
- ◆ Landscape Ecology Symposium
- ◆ Private Lands Symposium
- ◆ Big Rivers Ecology Symposium
- ◆ Natural Area Management
- ◆ Small Streams
- ◆ Essential Information for Protection Planning

Thursday afternoon, September 25

- ◆ Fire Forum
- ◆ Landscape Ecology Symposium
- ◆ EPPC Forum
- ◆ Signs Workshop
- ◆ Lockport Prairie Ecosystem Restoration
- ◆ Floristic Quality: Establishing a Baseline
- ◆ Effective Conservation Partnerships

Saturday morning, September 27

- ◆ Invasive Plants Symposium
 - Impact of Invasives
 - Control Methods
 - Prediction, Inventory, and Monitoring
 - Policies at the Federal & Local Levels
 - Biocontrol Efforts
 - Aquatic Invasives
 - Reed Canary Grass Spread and Control
- ◆ Fire Forum
- ◆ Invertebrate Diversity
- ◆ Vertebrate Conservation
- ◆ Rare Plant Conservation
- ◆ *Ethics for a Small Planet* Workshop
- ◆ Fen and Meadow Management
- ◆ State Natural Area Programs

Saturday afternoon, September 27

- ◆ Invasive Plants Symposium
 - Control Methods
 - Education Projects
 - Volunteer Programs
 - Phragmites Genetics and Identification
 - Prediction, Inventory, and Monitoring
 - Industry Perspectives
 - Herbicide Use
 - Resources for Landowners
 - Policies at the State Level
 - Aquatics ID Workshop
 - Forest Invasives
- ◆ Natural Area Restoration
- ◆ Land Ethics and a Sense of Place
- ◆ Effective Communication in Conservation

A general poster session is scheduled for Wednesday and Thursday. An invasive plant poster session will run on Saturday.

* This is a preliminary schedule and is subject to change. Refer to the conference packet at the conference registration booth for the final agenda and event locations.

Abstracts are first arranged by date (Thursday, then Saturday) beginning with symposia. They are further organized alphabetically by session topic. Within each session, abstracts are alphabetical by presenting author. Posters are also alphabetical by author and may be found at the end of the document. To view this page in outline form, press "Show Navigation Pane" located above on the toolbar.

Thursday, September 25

Symposia and Concurrent Sessions

BIG RIVERS ECOLOGY SYMPOSIUM: DIVERSITY, DYNAMICS AND CHALLENGES

Thursday, September 25 - morning

LARGE-SCALE FLOODPLAIN RESTORATION ALONG THE ILLINOIS RIVER AT SPUNKY BOTTOMS AND EMQUON

K. Douglas Blodgett and Tharran Hobson, The Nature Conservancy, Illinois River Project Office at the Emiquon Preserve, 11304 N. Prairie Road, Lewistown, IL, 61542. dblodgett@tnc.org

ABSTRACT: In 1998, The Nature Conservancy completed a site conservation plan for preserving the natural biological diversity of the Illinois River. The plan was developed with partners from local, state, and federal agencies, academia, and other non-governmental organizations. Habitat loss was identified as a key threat to the ecological integrity and conservation of this large floodplain river ecosystem. To help abate this threat, the Conservancy has initiated two large-scale floodplain restoration projects. The Spunky Bottoms project is a partnership between the Illinois Department of Natural Resources (833 acres) and the Conservancy (1193 acres). Most of this property was originally river floodplain but was leveed and drained for agriculture 80 years ago; it provides an opportunity to restore and protect bluff-to-channel habitats and natural communities nearly eliminated from the valley over the last century. Restoration began on the Conservancy property in 1999 with efforts focused on upland prairie, bottomland hardwood, and wetland habitats; since then, 13 new county records for amphibians and reptiles and 15 threatened and endangered species have been documented. Fifty miles upriver from Spunky is Emiquon where in 2000, the Conservancy purchased 7604 acres—the largest private conservation purchase in Illinois' history. Combined with adjacent lands owned by the U.S. Fish and Wildlife Service and their Chautauqua National Wildlife Refuge across the river, this provides an opportunity to restore and conserve over 13,000 acres—bluff-to-bluff habitats once considered among the most productive fish and wildlife areas in the Midwest. Planning is ongoing with restoration scheduled to begin in 2005.

DEFINING CONSERVATION PRIORITIES IN THE UPPER MISSISSIPPI RIVER: A COMPREHENSIVE ASSESSMENT OF FRESHWATER BIODIVERSITY

Mary L. Khoury¹, Roy E. Weitzell, Jr.², Paula J. Gagnon¹, and Brian Schreurs³. ¹The Nature Conservancy, Freshwater Initiative, 8 S. Michigan Ave., Suite 2301, Chicago IL, 60603, mlammert@tnc.org ²NatureServe, 1101 West River Parkway, Suite 200 Minneapolis, MN 55415. ³The Nature Conservancy, Great Plains Division, 1101 West River Parkway, Suite 200, Minneapolis, MN 55415

ABSTRACT: NatureServe and The Nature Conservancy have conducted a comprehensive assessment of freshwater biodiversity in the Upper Mississippi River Basin (UMRB). The purpose of this assessment was to identify the areas of freshwater biodiversity significance that together represent the full array of aquatic ecological settings as well as key places to protect the rare and imperiled aquatic fauna of the UMRB. We identified a network of stream systems as Areas of Biodiversity Significance that contain high quality examples of imperiled species, system types, and intact natural assemblages based on expert recommendation and environmental quality. This network includes approximately 450 headwater and creek systems, 75 small river systems, 41 medium river systems, 27 large river systems, and the entire mainstem Upper Mississippi River, and will be used to set priorities for the conservation of aquatic species, communities, and ecosystems across the entire basin. To identify the aquatic ecological settings, we developed a standardized classification of aquatic ecosystems with approximately 215 aquatic system types across all size classes. Along with aquatic systems, nearly 200 imperiled or declining aquatic species were specifically addressed. The presentation will provide an overview of the methods and results of the assessment, as well as the datasets that will be made publicly available, including a biological database of fish and mussel samples and the spatial data developed for the assessment.

AN ECOLOGICAL MEANS TO FLOOD DAMAGE REDUCTION IN THE UPPER MISSISSIPPI RIVER BASIN

Deanna L. Montgomery, Donald L. Hey, The Wetlands Initiative, 53 W. Jackson Blvd, Suite 1015, Chicago, IL 60604. dmontgomery@wetlands-initiative.org

ABSTRACT: Flooding and, more importantly, flood damages in the Upper Mississippi River Basin have increased over the past century - in the past ten years alone national annual riverine flood damages have averaged an unprecedented 5.6 billion annually, and the losses due to catastrophic-type floods have been rising precipitously. As flood damages have increased, so has federal spending on flood control costs. Since increased federal spending has not resulted in a corresponding decrease in flood damages, other strategies must be considered. We propose a different solution to the flooding problem: reconnect some leveed floodplains to the parent rivers and restore portions of the floodplain to reflect presettlement hydrology. An estimated 31 million-acre feet of floodwater could be stored within the five-state Upper Mississippi River Basin using this strategy. This estimate is based on The Wetlands Initiative's study in which the potential flood storage volume was computed in 80 counties and extrapolated to the entire 5-state basin. This extrapolation offers a clear indication of the magnitude of floodwater storage that can be accomplished utilizing the economically efficient technique of wetland restoration within the bottomlands. The figures were compiled using the aerial extent of hydric soils and previously mapped wetlands on non-urban lands within the FEMA 100 year flood zone. A cost-benefit analysis and discussion of the potential wildlife benefits of this strategy are incorporated into the results.

LANDSCAPE ECOLOGY SYMPOSIUM: PRINCIPLES, APPLICATION AND IMPLEMENTATION

Thursday, September 25 – morning and afternoon

LINKING LANDSCAPE AND HABITAT MODELS TO SPECIES VIABILITY FOR WILDLIFE CONSERVATION AND MANAGEMENT

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ABSTRACT: Planning for the conservation and management of species in natural landscapes is often approached with three questions: (1) how the landscape will change, (2) how the wildlife species uses the different aspects or components of the landscape, (3) what is the viability of the species in the landscape. The first question is often addressed with landscape models, the second question with wildlife-habitat models, and the third question with population viability analysis (PVA), which, in the case of species living in heterogeneous landscapes, often employs metapopulation models. A new approach that integrates these three models allows the transitional dynamics of the landscape (brought about by processes such as succession, disturbances, and silviculture) to be incorporated into assessment of viability and threat. This approach combines methods of landscape prediction with those of metapopulation simulation and habitat modeling. The landscape component of the model predicts forest landscape dynamics in the form of a time series of raster maps. These maps are converted to habitat maps using a habitat model, and combined into a time series of patch structures, forming the dynamic spatial structure of the metapopulation component. Preliminary results indicate that the viability of species living in dynamic landscapes depends both on landscape dynamics and on demographic variables such as fecundity and mortality. Ignoring the landscape dynamics gives overly optimistic results, and results based only on landscape dynamics (ignoring demography) lead to a different ranking of the management options than the ranking based on the more realistic model incorporating both landscape and demographic dynamics.

WESTERN PONDEROSA PINE NATURAL AREAS: ANOTHER LOOK AT THE LANDSCAPE ECOLOGY OF FIRE

William L. Baker, Department of Geography, University of Wyoming, Laramie, WY, USA 82071. bakerwl@uwyo.edu

ABSTRACT: The prevailing image of western ponderosa pine forests before EuroAmerican settlement is one of great beauty, if some monotony. Large, widely-spaced old-growth trees or clumps of trees are thought to have occurred in vast park-like groves with a grassy understory. This structure is thought to have been maintained by frequent, large surface fires that swept away most young trees. However, in the Colorado Front Range and the Black Hills of Wyoming and South Dakota, new research suggests this concept does not fit the ecology of these forests, which naturally had a richer and more diverse spatial structure from landscape-scale variation in the severity of fire and other disturbances. Moreover, in much of the West, I suggest that past research has missed the possibility of similar landscape-scale variation in fires and other natural disturbances by assuming the image of a park-like forest is correct everywhere. Evidence is actually weak or absent in most places, and errors in setting restoration goals can be significant if the wrong landscape model is chosen—uniformly thinning landscapes subject to variable fire severity to attempt to reduce fire severity would not restore the natural landscape. Moreover, the visual simplicity of ponderosa pine landscapes is deceiving, and there likely are more models to be discovered. Researchers and managers can only identify the correct model or new models in ponderosa pine landscapes by sampling and analysis at the landscape scale.

INTRODUCTION TO LANDSCAPE ECOLOGY

Jeffrey A. (Jeff) Cardille. University of Wisconsin-Madison. 430 Lincoln Drive, Birge 436. Madison, WI 53706. cardille@wisc.edu

ABSTRACT: Landscape ecology focuses on the interactions between spatial patterns and ecological processes, and thus can be of great use to natural resource managers. Increasing interest in broad-scale environmental issues and land management, the advent of GIS and availability of remotely sensed imagery, and inexpensive high-powered computing have greatly increased our ability to consider the impact of spatial heterogeneity on our ecological understanding. How will the configuration of a timber harvest encourage or inhibit movement of animals along corridors? Which arrangements of land cover types might allow tree species to migrate during future climate changes? How do the spatial patterns of suburban development influence nutrient uptake in wetlands? These questions, in which spatial pattern is believed to influence some process of interest, are the sorts of problems addressed by landscape ecologists. This presentation introduces the key approaches and terminology in the discipline of landscape ecology. With a focus on providing a basic familiarity with common terms and concepts, we describe the ideas often encountered in landscape ecology studies: scale, grain, extent, edges between habitat types, land cover classifications, patches, corridors, and spatial heterogeneity.

LANDSCAPE PATTERNS: CAUSES AND QUANTIFICATION

Jeffrey A. (Jeff) Cardille. University of Wisconsin-Madison, 430 Lincoln Drive, Birge 436. Madison, WI 53706. cardille@wisc.edu

ABSTRACT: Landscape ecology studies commonly try to answer two very broad questions: How do the patterns we see influence ecological processes? How do processes operate to influence spatial patterns? In this presentation, we first describe and give examples of some of the basic abiotic, biotic, and human factors that can cause spatial pattern seen in landscapes. Yet the specifics of spatial pattern can be hard to assess, and landscape ecologists often seek to objectively quantify what human observers assess subjectively as, for example, "clumpy", "relatively non-forested", "patchy", "diverse", or "fragmented". With quantification of landscape traits, practical applications include describing how a landscape has changed through time; making predictions of the amount and pattern of future landscape change; determining whether patterns on two or more landscapes differ from one another; and evaluating alternative land management strategies with respect to landscape patterns that may result. In this presentation, we describe the data and analysis techniques common to many analyses, and present several of the landscape metrics used to quantify both the composition and configuration of landscapes. Along with metric equations and the range of possible values, we present critical caveats that govern our use of landscape metrics in real-world applications.

USING LANDSCAPE ECOLOGY TO IDENTIFY SAMPLING SITES ACROSS LARGE AREAS: SELECTION AND COMPARISON BASED ON LANDSCAPE CRITERIA

Jeffrey A. (Jeff) Cardille. University of Wisconsin-Madison. 430 Lincoln Drive, Birge 436. cardille@wisc.edu.

ABSTRACT: What parts of the Midwest have the most edge between different land cover types? What areas with the most lakes also have the most forest cover? Where is forest cover the most fragmented? How is a given landscape different from surrounding landscapes? What other landscapes are the most similar to a given study area, and under what set of criteria? To answer these and similar questions, we have undertaken a project to understand the statistical and spatial distribution of common landscape metrics using real-world land cover classifications. This project provides a flexible public web-based interface where resource managers use principles of landscape ecology to identify prospective sampling sites and compare landscapes across large areas. The approach centers on dissecting the land cover of the conterminous United States into tens of thousands of square mini-landscapes (6km x 6km), computing landscape metric values, and interpreting the results both statistically and graphically. This presentation describes the project in general terms, shows results from the Midwest, and provides a demonstration of the use of the web-based interface to select landscapes based on landscape criteria. Such an interface allows resource managers to quickly and flexibly access those parts of their domain that satisfy a given set of criteria, with selected landscapes and their characteristics easily located through GPS-compatible coordinates. These capabilities can be used, for example, to improve inventories of species that respond to aspects of landscape composition or configuration.

CONNECTING LANDSCAPES: GOOD, BAD, OR INDIFFERENT?

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ABSTRACT: Do dispersal corridors between relatively isolated patches or preserves, help, hinder, or even matter to the population dynamics of a given species? Evidence mounts that they may matter, and perhaps help, but the evidence is often circumstantial, rarely complete, and open to different interpretations. Here, I try to break down the mechanisms that may underlie the functionality of a dispersal corridor, by asking in what ways may corridors affect the behaviors of individuals? Given these behaviors, or the lack thereof, how might a species' population dynamics be affected in simple landscapes with just a few corridors and patches? Are there places in a landscape where corridors are more effective and other places where they could even be detrimental? And finally, what do we see in the real world where there are many patches and a diversity of different landscape contexts to consider? I use simulation models to predict the population consequences of discrete behaviors. These behaviors are then assayed for a variety of species (e.g., butterflies, small mammals, birds, plants) using a replicated experimental system created in the Savannah River National Forest. Finally, I use surveys of the distributions of abundance of butterflies and small mammals across the entire National Forest to compare to model results and, most especially, to use in determining whether the behavioral responses of individuals to landscape features really matter.

PREDICTION OF SPECIES OCCURRENCE IN MANAGED LANDSCAPES ACROSS SPACE AND TIME

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ABSTRACT: Scientists and land managers are charged with maintaining native species and ecosystem processes and with measuring ecological responses to environmental change. My colleagues and I have developed a general method to link validated models of species occurrence with GIS-based models of alternative land-cover patterns. To predict species occurrence, we use an iterative, Bayes-based process of model building, testing with independent data, and refinement. Species occurrence is modeled as a function of environmental variables that can be measured using remote sensing and GIS at grain sizes on the order of several km over extents of hundreds to thousands of km. Successful occurrence models are then linked with models of land-cover patterns that might result from changes in disturbance regimes, invasion of non-native species, active restoration efforts, and so forth. We are able to estimate the quantity and spatial arrangement of suitable habitat for each species that would be available under each alternative. By treating models for individual species as probabilistic, we can generate ranges of outcomes for each alternative. Thus, we can gauge the potential of each alternative to achieve specified ecological objectives. I illustrate this approach with ongoing work on the response of butterflies and birds in the Great Basin of western North America to invasion of cheatgrass and increasing dominance of woody species. I also examine the extent to which variation in annual 'snapshots' of species composition and species richness of butterflies and birds can be interpreted as an ecologically meaningful trend versus a reflection of stochasticity.

IDENTIFYING SIGNIFICANT ECOLOGICAL SITES: HARNESSING THE LOCAL KNOWLEDGE OF BIODIVERSITY

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ABSTRACT: The Bureau of Endangered Resources (BER) is charged with the inventory and analysis of biotic and ecological resources across Wisconsin. However, given the size of the state, the ecological complexity of the landscape, and the resources needed to compile meaningful inventory results, it is a task that depends on information gathered from a variety of sources. In order to create new approaches to comprehensive inventory, BER conducted a pilot "Experts Workshop" for the Fox River Headwaters Ecosystem Significant Ecological Areas (FRHE) in east central Wisconsin by inviting 60 individuals with first-hand knowledge of the local resources. The goals of the workshop were to increase the common understanding of the ecological resources of the area and to recommend ecologically significant sites. Coarse filter/GIS analysis of vegetation and natural community patterns and targeted field analysis of the study area complemented the workshop. The workshop was successful in gathering significant local knowledge on 192 potential hot-spots of biodiversity in a short period of time within the study area, providing opportunities to personally discuss ecological issues and share information, identifying future conservation planning opportunities, and forging new public/private partnerships. Conservation priorities were then assessed by attendees and formed the basis for BER's Ecological Assessment Report for Conservation Planning of the FRHE.

USING LANDSCAPE CHARACTERISTICS TO HELP DEVELOP A SYSTEM OF REPRESENTATIVE REFERENCE AREAS

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ABSTRACT: The Wisconsin legislature charged the Department of Natural Resources with the task of providing benchmark or reference areas for comparison with areas subjected to environmental disturbance. To fulfill this mandate, the Department's State Natural Areas Program developed goals and criteria to address the full range of ecological diversity in the state. Detailed inventory and a system of protected sites formed a basis for system development, however many regions of Wisconsin had neither basic inventory nor consideration of abiotic and landform features as factors in reference area establishment. The Wisconsin State Natural Areas Program embarked on an evaluation process that considered the principles of landscape ecology, ecological units, enduring features, and biotic inventory to develop a system that would fully comply with the legislative charge. Results from the evaluation forecasts what the reference area program will look like upon completion and it also indicates a high level of protection for the rarest species capturing 97% of the endangered/threatened list in some fashion with many species found in the reference areas and nowhere else.

CREATING A FIFTY-YEAR VISION: WISCONSIN'S ATTEMPT TO IDENTIFY PLACES CRITICAL IN MEETING FUTURE CONSERVATION AND RECREATION NEEDS

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ABSTRACT: The Wisconsin Department of Natural Resources recently completed the *Wisconsin Land Legacy Report: an inventory of places critical in meeting Wisconsin's future conservation and recreation needs*. This report, developed over the past three years, used a two-step, subjective-based process to identify 229 "Legacy Places" and 8 "Statewide Needs and Resources" believed to be most important in meeting the state's future needs. The report helps define Wisconsin's "green infrastructure" and provides a central resource for non-profit conservation groups, local governments, regional planning commissions, businesses, state and federal agencies, and others to work from as they approach decisions about land protection, use, and management. The report is arranged by the 16 Ecological Landscapes in the state. This presentation will focus on the development of the report and potential applications.

PRE-EUROAMERICAN FORESTS IN NORTHERN WISCONSIN: HISTORICAL VARIABILITY AT THE REGIONAL SCALE

Lisa A. Schulte¹ and David J. Mladenoff². ¹North Central Research Station, USDA Forest Service, 1831 Highway 169 E., Grand Rapids, MN, USA 55744. laschulte@fs.fed.us ²University of Wisconsin-Madison, 1630 Linden Dr., Madison, WI, USA 53706. djmladen@wisc.edu

ABSTRACT: Pre-Euroamerican settlement offers an informative ecological baseline as it represents conditions just prior to rapid and unprecedented land use change. We characterize forest, heavy windthrow, and stand-replacing fire disturbance patterns in northern Wisconsin during this period using the U.S. General Land Office original Public Land Survey (PLS) records. Our work shows much more regional-scale variability than previous studies. Whereas *Betula alleghaniensis* (yellow birch) was thought to be only subdominant or co-dominant within Lakes States *Tsuga canadensis* (hemlock)—northern hardwoods forests our quantitative analysis reveals that this species prevailed on many of the glacial moraines. Maps also show broad areas dominated by *Pinus strobus* (white pine), and that *P. banksiana* (jack pine) had a more limited distribution than previously suggested. Analysis of disturbance records shows that windthrow was the predominant disturbance dynamic structuring forests across the region, but fire was of strong sub-regional importance, largely on glacial sandy outwash and along the 'tension zone'. Given that long periods passed between major wind perturbations, mature to old forests of late successional species dominated much of this region, and areas of pine-dominated vegetation were limited to ecoregions that supported more frequent fire. A hypothesized interaction between these two disturbances on mesic systems, in which fire followed windthrow, was uncommon; hence, early successional hardwoods (*Populus tremuloides* and *B. papyrifera*) were also uncommon across much of the region. This retrospective work informs both scientific and management communities by detailing ecological interactions at a critical time period, and by setting a baseline for current trajectories.

DELINEATION OF TERRESTRIAL BUFFERS AND CORE HABITAT AROUND WETLANDS FOR AMPHIBIANS AND REPTILES

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ABSTRACT: Terrestrial habitats surrounding wetlands are critical to the management of natural resources. Although the protection of water resources from human activities such as agriculture, silviculture, and urban development is obvious, it is also apparent that terrestrial areas surrounding wetlands are core habitats for many semi-aquatic species that depend on mesic ecotones to complete their life cycle. For purposes of conservation and management, it is important to define core habitats used by local breeding populations surrounding wetlands. My objective is to provide an estimate of the biologically relevant size of core habitats surrounding wetlands for amphibians and reptiles. I summarize data from the literature on the use of terrestrial habitats by amphibians and reptiles associated with wetlands (19 frog and 13 salamander species representing 1363 individuals; 5 snake and 28 turtle species representing more than 2245 individuals). Core terrestrial habitat ranged from 159 to 290 m for amphibians and from 127 to 289 m for reptiles from the edge of the aquatic site. Data from these studies also indicated the importance of terrestrial habitats for feeding, overwintering, and nesting, and thus, the biological dependence between aquatic and terrestrial habitats that is essential for the persistence of populations. The minimum and maximum values for core habitats, depending on the level of protection needed, can be used to set biologically meaningful buffers for wetland and riparian habitats. These results indicate that large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity.

ECOREGION BIODIVERSITY ASSESSMENT AND IMPLEMENTATION: EXAMPLES FROM THE UPPER MIDWEST.

Paul C. West. The Nature Conservancy, 633 West Main Street, Madison, WI 53703. Pwest@tnc.org

ABSTRACT: Many conservation organizations and agencies are developing regional conservation plans that provide a strategic vision for conserving biodiversity. The Nature Conservancy coordinates ecoregion assessments in 29 countries, using a coarse filter-fine filter approach to design a network of reserves that represents all biodiversity within ecoregions. Using examples from the Upper Midwest, this presentation illustrates the steps of the assessment process: identifying conservation targets, setting conservation goals, assessing viability, and selecting conservation areas. These conservation assessments provide a base for identifying regional threats to biodiversity and developing strategies to abate threats and restore ecological integrity. Large scale strategies create the context for local action and the results of local action forms the goals for regional strategies. Examples of integrating local action and basin scale strategies will be given for abating impacts from agriculture and restoring floodplain habitat within the Upper Mississippi River basin.

THE NEED FOR A LANDSCAPE ECOLOGY OF INVASIVE SPREAD

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ABSTRACT: The greatest threats to biodiversity are the wholesale destruction and fragmentation of habitat and the introduction of nonindigenous, invasive species. Anthropogenic land-use activities, which typically result in the destruction and fragmentation of native habitat, favor the establishment and spread of invasive species. Some of the ways in which landscape disturbance may affect the spread of invasive species and the invasibility of communities include 1) enhancing spread above some threshold level of disturbance; 2) differentially facilitating key stages of the invasion process (dispersal vs. establishment); 3) creating sink landscape populations in fragmented landscapes in which the adaptive potential of native species to resist invasion is compromised, or alternatively, the adaptive response of invasive species is enhanced; and, 4) alteration of the disturbance regime to affect the dynamics of resource availability in ways that enhance system invasibility. Invasive species, in turn, can alter landscape structure and dynamics (e.g., increased fire frequency) which makes the landscape susceptible to further invasion. The management of invasive species is thus primarily a problem in landscape management. Developing a landscape ecology of invasive spread may afford new opportunities for managing and restoring landscapes to control the spread of invasive species and for minimizing the invasibility of natural areas.

FIRE FORUM

Sponsored by NAA's Management and Technology Committee
Thursday, September 25 morning and afternoon
Saturday, September 27 morning

CONTROLLED BURNING IN THE CHICAGO REGION

Jim Anderson. Lake County Forest Preserve District, 32492 North Almond Road, Grayslake, Illinois 60030. janderson@co.lake.il.us

ABSTRACT: In the past two decades controlled burning has been a critical tool for land managers to restore biodiversity to the holdings they manage. As the need for burn management increases the need for training and public education has greatly increased. A group of Chicago Wilderness members (the burn task force) meet to discuss the needs of implementing more controlled burns in the Chicago Wilderness region. Several needs and goals were identified, which included local training, public education, regional policy, equipment, and fire department education. With these goals in mind the task force hired contractors to develop a S-130/S-190 crew member burn training course and to research public perception of controlled burns. The Midwest Ecological Prescription Burn training program was developed and has been taught at least eight times in the last three years. A research program to assess public perception of controlled burns was completed by local researchers. In the past year the burn task force has targeted the remaining needs in the Chicago region. Communicating and educating with local fire departments has become a critical issue in the Chicago region and the task force is seeking ways to improve working relationships with these local fire departments. Discussion of the past three years efforts will be outlined and discussed.

UW-SP FIRE CREW: A NOVEL RESOURCE FOR FIRE MANAGERS IN WISCONSIN

James E. Cook. College of Natural Resources, University of Wisconsin @ Stevens Point. jcook@uwsp.edu

ABSTRACT: In the mid 1980's a faculty member in the College of Natural Resources organized a group of students into a formal student organization, the UW-SP Fire Crew. This organization has grown over the years and is now able to provide fire suppression assistance to the Wisconsin DNR while, more or less simultaneously, conducting prescribed burns for a number of public agencies and private landowners. This is possible because of a Memorandum of Understanding between the university and the WI DNR. The DNR provides regular training for the students, at no cost to the university, and in exchange, the Fire Crew assists the DNR with their suppression. For the last few years, the Fire Crew has been able to conduct about 15-20 prescribed burns per year on their own, as well as assist the DNR (Buena Vista), the USFWS and others. This training opportunity for students has led to a few graduating with considerable fire experience, making them highly desirable employees for a number of agencies.

DETERMINING AN APPROPRIATE FIRE FREQUENCY TO RESTORE AND MAINTAIN OAK SAVANNAS IN TWO ONTARIO PROVINCIAL PARKS.

Tracey Etwell and D. Bazely. York University, Biology Department. 4700 Keele St., Toronto, ON, Canada. M3J 1P3. etwell@yorku.ca

ABSTRACT: Oak Savanna habitats are amongst the most rare in North America. In an attempt to restore the historic disturbance regime now realized to be required to maintain native species and abiotic conditions, prescribed fire has been re-introduced in many natural areas. In southwestern Ontario, there are two provincial parks, Rondeau and Pinery, which are located in the Carolinian zone and contain much of this rare habitat. Ontario Parks management efforts in recent years have involved introductory steps to carry out prescribed burn activities. This has involved the development of detailed burn plans for both parks over different time scales. Research in this project surrounds evaluating the success of this action, through quantitatively sampling plant communities and their responses. The prediction of an ecologically appropriate frequency to burn these areas will be attempted through the comparison of species diversity and abundance in differing areas with different fire return intervals. Our results will be compared to another protocol developed in the park, for internal long-term monitoring in a less rigorous manner. In addition, data on the propagules in the seed bank will reveal the potential for regeneration with minimal re-planting efforts. The use of existing long-term plant data will also be included in the evaluation. At the time of the conference, preliminary results will be presented.

MAKING THE CASE FOR PRESCRIBED BURNING LEGISLATION

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ABSTRACT: Prescribed burning is recognized as an important and effective land management tool. Over the last 50 years, scientists and land managers have been re-introducing fire into a variety of community types with great success. In most states, including Illinois, the law governing prescribed burning is not well defined. Despite this legal uncertainty, prescribed burners continue to use this valuable tool on forests, grasslands and wetlands. Currently, there is a trend toward state legislatures enacting laws that govern prescribed burning. Florida was one of the first states to enact prescribed burning legislation. The Florida statute considers the use of prescribed burning in the public interest and also considers it a property right of the landowner. Florida establishes its negligence standard as "gross negligence" which is defined by Black's Law Dictionary as the "intentional failure to perform a manifest duty in reckless disregard of the consequences affecting the life, health or property of another". When developing prescribed burning legislation, planning is extremely important. It is important to be proactive, not to wait for a bad situation to occur. A short white paper should be developed that outlines the purpose and need for prescribed burning legislation. The concept of the legislation must be sold as benefiting all interest groups - consensus among constituent groups is key. At a minimum, the legislation should establish standards for the safe and effective use of prescribed burning and require that it be conducted by trained, certified and experienced people to accomplish many land management objectives and ecological goals.

FIRE AND COMMUNITY STRUCTURE: 25 YEARS OF CHANGE IN A GREAT LAKES PINE FOREST

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ABSTRACT: Birds and vegetation were surveyed in spring 1976 on a permanent 6.25 ha plot in a mature *Pinus banksiana* (jack pine) forest in northern Minnesota. A 10,000 ha wildfire burned across the plot in autumn 1976. The plot was resurveyed periodically through 2002. Before the fire, birds with the highest importance values were *Dendroica fusca* (blackburnian warbler), *Seiurus aurocapillus* (ovenbird), *Vireo olivaceus* (red-eyed vireo), and *Dendroica castanea* (bay-breasted warbler). Following the fire, canopy tree cover decreased from approximately 75% to 10% and shrub cover from 55% to 6%. Overall bird species richness doubled while bird territory density remained constant. Loss of the canopy was related to reduced warbler and vireo diversity and density, but woody debris and re-growth of near-ground vegetation attracted more ground-brush foragers, especially *Zonotrichia albicollis* (white-throated sparrow) and *Spizella passerina* (chipping sparrow). *Certhia americana* (brown creeper) populations increased briefly as trees died, and for five years following fire there was an increase in woodpeckers and secondary cavity nesting species. Twenty years after fire, tree cover had increased to >50% and shrub cover to >70%. White-throated sparrow continued to be the most important bird species followed by *Dendroica magnolia* (magnolia warbler) and *Vireo olivaceus*. Twenty-five years after fire, as the tree canopy increased and shrub cover declined the dominant birds were *Mniotilta varia* (black-and-white warbler), *Vermivora ruficapilla* (Nashville warbler), and *Seiurus aurocapillus*. Overall bird species richness and territorial densities were over 40 and 25% higher, respectively, than in the unburned forest.

COMPATIBILITY OF SUMMER BURNING WITH INSECT CONSERVATION

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ABSTRACT: There seems to be increasing interest in the use of summer fires in maintaining the natural balance of tallgrass prairie communities. The extent to which this practice might threaten prairie-inhabiting insects however, is entirely unknown. In the spring of 2001, I began a two-year study examining the effects of summer burning on insect species on three prairies in Cook County, Illinois. I established paired 40m x 40m plots on each site. I randomly selected one plot from each prairie and burned them in July 2001. Sweep nets and a vacuum sampler were used to gauge initial impacts and to track recovery for 25 species. All species were extirpated initially from each burned treatment. The first signs of recovery were observed within one week following the burns. Most species (88%) responded consistently to burns. Post-fire responses ranged from negative (56%) to positive (20%) for 25 species representing 11 families and 6 orders. Seventeen populations representing twelve species recovered in 12 months or less, including the remnant-dependent leafhoppers *Chlorotettix spatulatus* and *Flexamia prairiana*. Six populations representing four species, including *Polyamia caperata* (r-d leafhopper) and *Tebenna silphiella* (r-d moth), did not recover as compared with adjacent unburned plots and will clearly require two or more years to do so. The implications of these results for insect conservation will be discussed.

VEGETATION RESPONSE OF AN OZARK *PINUS ECHINATA* (SHORTLEAF PINE) WOODLAND TO PRESCRIBED FIRE AND THINNING

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ABSTRACT: Due to unregulated harvest and fire suppression, shortleaf pine dominated woodlands have become a rare feature of the Missouri Ozarks. Shortleaf pine remains a codominant canopy species across several ecological subsections, yet only a handful of sites under active restoration approach the structure and floristic diversity of the original pine woodlands. Initial inventory of the study area revealed an old-growth pine woodland shifting to an oak (*Quercus spp.*) dominated forest. Woodland indicators such as *Parthenium integrifolium* (wild quinine), *Schizachyrium scoparium* (little bluestem), *Andropogon gerardii* (big bluestem), *Liatris aspera* (rough blazing star), *Coreopsis palmata* (prairie coreopsis), *Eryngium yuccifolium* (rattlesnake master) and *Amorpha canescens* (leadplant) were present but existed only as widely-scattered and suppressed plants. Restoration of the study site focuses on using prescribed fire and mechanical thinning to reduce the sapling and small tree component. Pre- and post-treatment data was recorded from the canopy, midstory, and groundflora layers using plots comprised of nested quadrats: respectively a 400M² quadrat (overstory data), a 200 M² quadrat (sapling layer and ground flora species richness), and twelve 1M² quadrats (ground flora cover). Following treatment; the canopy layer showed a decline in mean basal areas for shortleaf pine (13% reduction) and oaks (25% reduction), the density of sapling layer declined 57%, groundflora species richness increased 32%, and herbaceous cover classes and importance values were stable.

ACHIEVING COMMUNITY CONSENSUS ON FIRE MANAGEMENT: A MATTER OF ETHICS OR EXPEDIENCY?

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ABSTRACT: There is general agreement that land management policies should be developed with the full participation of all relevant stakeholders. Fire management and protection often are among the greatest land management challenges because fire policies have potentially profound impacts on neighbors, and because agreements with neighbors are necessary for project implementation. Our attempts to pursue fire management planning at a 4600-acre field station in southern California have forced us to recognize the diversity of perceptions and ethical viewpoints among our stakeholders. Like many land managers, we see fire as a natural ecological process, a tool to sustain biodiversity, and an inherent risk sustained by people living in wild areas. Many of our stakeholders view wildfire as a disaster that can be prevented by landscape alteration and for which someone must be liable. The dilemma has parallels in other situations where the dynamism of nature conflicts with human concepts of ownership – volcanic regions, floodplains, sea bluffs, and outer islands. The disagreement reduces to ethics: What are the obligations of a nature reserve to its neighbors and of neighbors to the reserve? To reach a consensus and bring the local community to accept solutions that are not ecologically damaging, it will be necessary to build an ethically defensible case, working from generally accepted principles to ecologically ethical conclusions.

FIRE TEMPERATURE REGIMES IN MIDWESTERN WETLANDS

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ABSTRACT: This study focused on providing the first record of fire behavior and temperature during three Midwestern wetland fires. Collected data provides wetland managers with information necessary to more accurately design fire prescriptions in wetland environments. Using thermocouple technology, fire temperatures were measured and recorded. A minimum of three Campbell 21X Data Microloggers, were employed to gather temperature measurements at different heights above and below the surface. Soil moisture, wind speed, relative humidity, temperature and fuel type were monitored. Highest temperatures reached 871°C. This value rivals those measured in previous prairie fire temperature studies.

RESTORING OLD GROWTH PINE FORESTS WITH PRESCRIBED BURNS

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ABSTRACT: The pine forest ecosystems of the Upper Great Lake States were created and maintained by fire and other disturbances until about 100 years ago when European settlers succeeded in stopping almost all wildfires. Significant forest change and fuel build-ups have occurred since then and without aggressive reintroduction of fire, these ecosystems will be lost. Resource managers at Itasca State Park, a 32,000ac (12,950ha) old growth *Pinus resinosa* (red pine) and *P. strobus* (and white pine) forest in Minnesota, USA have been experimenting with restoring fire to the forest and carefully monitoring for ecosystem effects using burned and unburned permanent plots and repeatable fire effects monitoring protocols. Burns of 1000ac to 3500ac (400 to 1400ha) have been done annually since 1997. Some post-burn analysis of plots indicates: units need multiple burns for successful pine regeneration; old growth pine mortality is the same between burned and unburned areas; in pine dominated areas pole-size hardwoods are significantly reduced and *Corylus sp.* (hazel) is top-killed with fewer re-sprouts following two burns; and, with proper precautions, large jackpot fuel piles can be burned without killing the surrounding trees.

FIRE HISTORY OF A POST OAK (*Quercus stellata* Wang.) WOODLAND IN HAMILTON COUNTY, ILLINOIS

William E. McClain¹, Terry L. Esker², Bob R. Edgin³, and John E. Ebinger⁴. ¹1916 West Washington, Auburn, Illinois 62615. fidheall@yahoo.com ²Illinois Department of Natural Resources, One Natural Resources Way, Springfield, Illinois 62702. ³Illinois Nature Preserves Commission, One Natural Resources Way, Springfield, Illinois 62702. ⁴45 Heather Drive, Charleston, Illinois 61920. ABSTRACT: Cross-sections of 40 trees, 34 *Quercus stellata* Wang. (post oak), three *Quercus velutina* L. (black oak), and three *Carya spp* (hickory), were examined to determine the fire history of a post oak woodland in Hamilton County, Illinois. Three mean age cohorts were identified, including 215 year (10 individuals), 134 year (22 individuals), and 100 year (8 individuals) age classes. A total of 101 fires were identified, 36 from 1776 to 1850, a fire free interval from 1851 to 1885, and 65 between 1886 and 1995. The fire free interval corresponds with the rapid settlement of the township during 1845-1870, allowing the 134 and 100-year age classes to grow large enough to survive fire. Increased scarring was evident during drought years such as the 1790s, 1920, 1930s, and 1950s, suggesting more intense fires. Prior to European settlement, the site probably was an open woodland characterized by scattered post oaks and an herbaceous prairie/forest understory maintained by frequent fires.

WILDLAND FIRE IN ILLINOIS AND ADJACENT MIDWESTERN STATES, 1673-1865

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ABSTRACT: Historic literature sources were searched to determine the occurrence of wildland fires in the Midwest, with emphasis on Illinois. A total of 120 records of prairie or woodland fires were identified. Indian tribes used fire for hunting deer and bison in the autumn. Prairie and woodland fires destroyed rail fences, crops, and buildings, and resulted in the deaths of pioneers and their livestock. Laws were passed prohibiting the burning of prairies, and numerous fire suppression measures, including late spring burns were implemented. Most fires occurred during autumn during the dry, mild season known as Indian Summer, and were driven by a south or southwest wind. Records of large, fast moving fires, burning hundreds of thousands of acres, were documented from Illinois, Iowa, and Wisconsin. Fire suppression and cultivation of the prairies ended most wildland fires by the 1860s.

FIRE ECOLOGY AND MANAGEMENT FOR AN ENDANGERED MINT

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ABSTRACT: We use extensive demographic data (10 years, 7 populations, thousands of plants, 10 seed bank/germination experiments, 4 prescribed fires) to determine fire management needs for *Dicerandra frutescens* (scrub mint), a narrowly endemic, endangered Florida scrub plant. Scrub mint demographic patterns are driven mainly by fire. Although most plants are killed by fires, populations recover rapidly from a persistent seed bank. Recruitment, survival, and growth of plants is highest shortly after fire. Population growth rates (λ) calculated from 79 stage-structured transition matrices are highest shortly after fire and decline sharply through 10 years postfire. Populations begin declining about 6 years postfire, probably related to rapid shrub growth. In long-unburned sites, populations declined at similar rates to sites 9-10 years postfire, suggesting some degree of persistence of scrub mint in long-unburned sites. Firelanes, road edges, and other disturbed areas also provide habitats where scrub mint populations may increase but such sites may not offer stable environments for species persistence. Prescribed fires will periodically decrease shrub cover and provide suitable microsites to assure the long-term persistence of scrub mint in the Florida scrub landscape.

PLANNING FOR PRESCRIBED FIRE: PAST, PRESENT AND FUTURE

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ABSTRACT: Many North American ecosystems burned regularly for thousands of years. After an interval of fire suppression, in the last several decades fire has once again become an important tool for natural areas management. I reviewed historic and modern fire regimes in the Chicago region, the Missouri Ozarks, and northwestern California. The extent of knowledge about past fire frequency and seasonality varies among regions. At most sites examined, how often and when to burn is currently determined by an urgent need

to check encroachment of woody vegetation on long unburned preserves, and by staff and budget considerations. Land managers are urged to think beyond the intervention stage. Fire frequency and season affect plant community structure and wildlife habitat. If a sustained departure from historical fire regimes is necessary, then assumptions and rationale should be thoroughly documented.

FIRE DISTURBANCE AND VEGETATION HISTORY IN THE NORTHERN LAKE STATES, WITH EMPHASIS ON NORTHERN WISCONSIN

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ABSTRACT: At the broadest scale, disturbance regimes of the Northern Lake States region reflects several continental influences, as exemplified by the boreal forests to the north, prairie-forest border to the SW, and more humid, mesic forests of the east. Within the region, climatic constraints are modified by the presence of the Great Lakes. I will set this regional disturbance regime and vegetation picture, and then focus on Wisconsin, and further on northern Wisconsin in particular. At this scale, glacial geology historically (late Holocene--pre-industrial) interacted with climate and human caused fire ignition to produce a mosaic of fire controlled vegetation on sands, and mesic forest on heavier soils. Severe cutting of the entire region in the late 1800s-early 1900s created conditions for a brief (decades) period of unusual fire conditions, resulting in what we see today. Finally, future projections suggest that in the next century climate will again assert greater control, possibly increasing fire conditions again, and driving some tree species out of the region, while facilitating increase of others. Each period results in changes in disturbance and vegetation that are in part controlled by current conditions, and also strongly influenced by the past.

FIRE AND FIRE SURROGATES FOR MANAGEMENT OF SOUTHERN COASTAL PLAIN FLATWOODS

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ABSTRACT: The Southern Coastal Plain flatwoods historically burned at frequent intervals, primarily during the growing season, with low intensity surface fires. A period of fire control followed by dormant season prescribed burning changed the composition of the understory. Re-establishment of a frequent growing season fire regime is a necessary part of restoration and management for these communities, but additional treatments may be needed. This study located on Myakka River State Park in southwest Florida, compares burning plus roller drum chopping and mowing to burning only for effectiveness in reducing *Serenoa repens* (saw palmetto) and shrub cover on operational sized treatment units of 32 ha each. Although tree cover was sparse, they did make some of the area inaccessible and only about 70% of the units actually received the mechanical treatments. One year following treatments, fire alone reduced palmetto cover by one-third while chopping reduced palmetto by an additional one-third. Chopping also reduced shrub cover. Average palmetto height was reduced by all treatments except the fire and mow, while burning alone or in combination with mechanical treatments was most effective at reducing average shrub height. Grass cover increased following roller drum chop treatments. The best treatment appears to be a combination of fire followed by chopping, which decreased palmetto and shrubs while increasing grass cover, but further evaluation will be required to verify longer-term effectiveness. Caution should also be exercised as using too heavy a chopper can result in excessive soil disturbance resulting in mortality of grass and other desirable herbaceous species.

EFFECTS OF SUCCESSIVE FIRES ON INSECTS

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ABSTRACT: Prairie litter can build in volume for 4-5 years, producing progressively hotter fires that may increase mortality rates for duff-inhabiting invertebrates. The frequent fire hypothesis (FFH) predicts that the reduced quantity of fuel present in annually-burned prairies will result in cooler fires and substantially lower mortality levels for fire-sensitive inhabitants, insects included. In accord with FFH, negative post-fire insect responses are expected to be substantially lessened following the second of two consecutive burns. I began a study in 1994 on six sites in northeast Illinois, northwest Indiana, and southeast Wisconsin to test this prediction. This study extended over 4 seasons, included 12 burns, and included 31 species representing 8 families and 3 orders. Two-way contingency analyses between years on 6 sites involving 48 populations failed to provide support for this hypothesis. In disagreement with FFH, second-year post-fire population responses were usually similar to first year responses or were more severe, suggesting that annual fires are more likely to threaten, than to protect, fire-sensitive insect species. A more thorough test of FFH would involve a greater number of taxa and a series of consecutive fires conducted over several years. However, pending the results of more comprehensive trials, the annual burning of entire sites should be avoided.

IMPACT OF PRESCRIBED BURNING ON PRAIRIE SPIDERS.

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ABSTRACT: Twelve prairies in northeastern Illinois (Will, Grundy and Kankakee counties) have been sampled for three years to investigate the impact of prescribed burning on prairie spider species abundance and richness. The study sites included prairies with multiple burn units representing a diversity of prairie sizes and burn regimes. All prairies were scheduled to have no more than half the site burned. Prairies were sampled by sweep net during June and July each summer of the study. Prescribed burns during the study were all cold-season burns. There was no significant difference overall in spider populations between prairies that were burned and those not burned. However, there was a significant decrease in spider abundance and species richness the summer following a cold season burn. This appears to be a temporary decrease with recovery occurring by the second or third year. Preliminary results from a 100%+ burn (entire prairie and surrounding areas) will be presented. Implications for prairie management and possible impact on prey species will be discussed.

EFFECTS OF PRESCRIBED BURNING AND THINNING ON GROUNDLAYER VEGETATION IN A DRY-MESIC AND DRY OAK FOREST IN SOUTHERN WISCONSIN

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ABSTRACT: Changes in understory woody and herbaceous vegetation structure and composition were measured over time in response to prescribed burns and mechanical thinning in a southern dry-mesic and southern dry forest in The Nature Conservancy's Hemlock Draw Nature Preserve, Baraboo Hills, Wisconsin. Treatments included removal of all 5 cm – 13 cm diameter understory saplings with a follow-up herbicide application to remaining stumps and the 13 cm – 25 cm diameter saplings. Four low-intensity prescribed burns occurred every spring from 1997 – 2000. Vegetation was sampled for cover and frequency during the summer in 1996, 1997, 1999, and 2002. Tree seedling and shrub cover indicated a negative response to burning. Burning had no effect on overall forb cover, but had a positive effect on the cover of opportunistic species, *Amphicarpaea bracteata* (hog peanut). No positive increase in *Quercus rubra* (red oak) or *Quercus alba* (white oak) was detected in response to the treatments. Removal of substantially larger portions of the canopy followed by periodic prescribed burns to reduce unwanted understory growth may be necessary to increase oak regeneration in these forests.

THE RELATIVE ROLE OF FIRE ON PLANT DIVERSITY IN OAK SAVANNAS

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ABSTRACT: It has long been understood that fire plays a dominant role in shaping prairies and oak savannas in the Midwest. Until recently, there have been few tools to adequately assess the relative importance of fire in relation to other environmental drivers. I used structural equation modeling to assess the how plant species richness varies along gradients of prescribed burning (frequency and time since last burned), soil quality, standing biomass, and tree canopy cover in prairies and oak savannas in western Wisconsin. The final structural model showed that the independent effects of disturbance by fire were about twice as strong as the effects of production, soils, or tree canopy cover. Species richness in 0.25 m² quadrats was maximal at intermediate fire frequency (between 0.2 - 0.4 yr⁻¹) and intermediate time since burned (1-2 years). However, the importance of fire diminishes with increasing sampling scale. In a separate study, we scaled up our sampling from 0.25 m² to 1023 m² and found that the relationship between fire and richness weakened, while the relationship between tree canopy cover and richness strengthened. The results suggest that fire plays an important role in determining species richness in small patches, where intermediate disturbance facilitates coexistence. However, at increasing spatial scales, fire may become less important. Our next goal is to assess how fire regime, as well as soil and tree canopy cover, affect functional plant traits.

ESSENTIAL INFORMATION FOR EFFECTIVE NATURAL AREAS PLANNING

Thursday, September 25 – morning

SELECTING EFFECTIVE UMBRELLA SPECIES FOR PROTECTION AND MANAGEMENT: THE UMBRELLA SPECIES INDEX

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ABSTRACT: The concept of umbrella species offers an attractive short cut for land managers who want to manage for a select few species in the hopes of conferring protection on a much larger number. In theory, selecting umbrella species should be a proactive measure. In practice, it is usually retrospective with umbrella species being selected because they are imperiled or have legal protection. In this session, we will present a method for proactively selecting species for use as umbrellas in management based on initial species inventories. We will illustrate the use of an umbrella species index with data on birds and butterflies and demonstrate its effectiveness in both urban and rural systems.

UTILIZING THE MINNESOTA LAND COVER CLASSIFICATION SYSTEM (MLCCS) AS PART OF AN ADAPTIVE NATURAL RESOURCE INVENTORY STRATEGY FOR NATURAL AREAS MANAGEMENT AND PROTECTION AT THE LOCAL GOVERNMENT LEVEL

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ABSTRACT: Across the United States, urbanization accounts for a substantial loss of natural areas. In the Twin Cities metropolitan area of Minneapolis-St. Paul, Minnesota alone, approximately 40 acres of open space are lost to development each day. With this remarkable rate of development, local governments increasingly find themselves on the front line of conserving natural areas. To effectively protect natural areas in rapidly developing areas, decision makers at the local level need natural resources information adapted to their political and financial landscape. Using the recently developed Minnesota Land Cover Classification System (MLCCS) to conduct Natural Resource Inventories (NRIs) provides an adaptive framework for collecting solid, field-based data that meets this challenge. MLCCS was developed by the MN DNR, along with federal, state, regional, and local units of government. It is a five-level hierarchical classification system based on a combination of vegetation type and human land uses (i.e. parking lots, roofs, lawns) within a particular area. MLCCS incorporates the MN DNR Natural Heritage methods for classifying natural areas, and classifies semi-natural and cultural areas, providing a single framework from which all land cover can be mapped. MLCCS is flexible and can incorporate additional data, based on local needs. We will share our experiences using MLCCS methodology to conduct NRIs in the Twin Cities area of Minnesota. We will discuss how communities have utilized this information for the planning of parks, trails, natural areas; greenway corridors; surface water management; conservation development; natural resource ordinances; and other natural resource protection and management tools.

MONITORING AND CONSERVATION OF BIRD POPULATIONS IN THE CHEQUAMEGON-NICOLET NATIONAL FOREST

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ABSTRACT: Forests of northern Wisconsin and nearby states in the Great Lakes region support some of the richest breeding bird faunas in North America. In the eastern portion of the Chequamegon-Nicolet National Forest, a volunteer bird monitoring program has been in place for 17 years, the longest-running regional volunteer monitoring program in the U.S. national forest system. This paper will describe some of the findings of the Chequamegon-Nicolet bird surveys and will discuss implications of the information for bird conservation in forest landscapes of the western Great Lakes region. Use of GIS vegetation data provides new opportunities for landscape planning and identifying critical needs of sensitive species. Similar approaches can be used in landscape planning outside the national forest.

EFFECT OF AREA AND ISOLATION ON SPECIES RICHNESS AND INDICES OF CONSERVATION VALUE IN ILLINOIS WETLANDS

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ABSTRACT: The Floristic Quality Index (FQI) is a tool used to assess conservation value of natural areas and monitor restoration success. Each native plant species is assigned a coefficient of conservatism, a subjective rating that describes its affinity for remnant natural areas. To calculate FQI, mean coefficient of conservatism (mean C) at a site is multiplied by the square root of native species richness. However, use of FQI is sometimes problematic, mainly because it incorporates species richness, which often varies with factors other than site quality. We surveyed wetlands in a contiguous landscape that included the Beaucoup Creek floodplain near Pinckneyville, Illinois. We digitized all 231 wetlands, and determined area and isolation variables for each site with GIS software. Using a series of multiple regressions, we investigated the influence of landscape and site characteristics on species richness, mean C, and FQI. In forested wetlands, ponds, shrub wetlands, and all wetlands combined, both species richness and FQI increased significantly with area, indicating a bias toward higher assessments of quality in larger areas. Species richness and FQI in emergent wetlands increased with sampling date, suggesting that these sites should only be surveyed late in the growing season. Mean C decreased with increasing site isolation in forested wetlands, emergent wetlands, ponds, and all wetlands combined, indicating that isolation affects species composition. Both decreasing area and increasing isolation decreased FQI. Mean C was less strongly affected by sampling date and area, and may provide a more robust indicator of relative site conservation value than FQI.

FROM DESIGN TO DESIGNATION: AN ECOLOGICAL REFERENCE AREA FOR THE CHEQUAMEGON-NICOLET NATIONAL FOREST

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ABSTRACT: In 1992, the Chequamegon-Nicolet National Forest, located in northern Wisconsin, set a goal of establishing a natural area network that would include all native ecosystem types of the Forest. The objectives of this network are to provide reference or benchmark conditions for baseline monitoring and research, protect remnant and exemplary sites, and provide refugia and high quality habitat for many rare species. An extensive inventory of the Forest identified the most significant or highest-quality examples most of the ecosystems of the Forest. All areas have now been officially proposed for one of three designations (Research Natural Area, Special Management Area, and Old Growth & Natural Features Complex), but are collectively referred to as Ecological Reference Areas because of their common ability to provide reference conditions. This network of sites represents 86% of the vegetative plant communities of the Forest and contains nearly half of all the known rare plant sites on the Forest. The designation of these areas will occur when the Forest's Land and Resource Management Plan is signed (Fall 2003). The proposed plan would designate 246 ecological reference areas, totaling 185,000 acres (approximately 13% of the Forest). A large portion of these sites are further embedded within much larger Alternative Management Areas, which have a focus on ecosystem restoration. The focus on providing reference-condition ecosystems for monitoring and research, the high degree of ecosystem representation, and the design of complementary management zones represents a significant departure from the traditional approach to natural area planning on National Forests.

RECOGNIZING RESTORABLE OPEN OAK WOODLANDS AND OAK SAVANNAS BY USING UNDERSTORY INDICATOR SPECIES

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ABSTRACT: Some woodlots are better candidates for the restoration of open oak woodlands and/or oak savannas than are others. Some of the best sites for such restoration are those sites which retain populations of understory plants that are characteristic of open oak woodlands and oak savannas. This presentation provides a list of characteristic/indicator species of open oak woodlands and oak savannas, describes how, where and when to most easily identify these indicator species, and discusses methods of surveying larger regions/landscapes to identify large-scale landscapes with high restoration potential for open oak woodland and/or oak savanna.

FLORISTIC QUALITY: ESTABLISHING A BASELINE

Thursday, September 25 – afternoon

VASCULAR FLORA OF HOOPER BRANCH NATURE PRESERVE AND THE IROQUOIS COUNTY CONSERVATION AREA, IROQUOIS COUNTY, IL

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ABSTRACT: The vascular flora of Hooper Branch Nature Preserve and the Iroquois County Conservation Area was studied during the 2001 growing season. A total of 593 taxa were found: 16 fern and fern-allies, one gymnosperm, 167 monocots, and 405 dicots. Nine of the species are listed as threatened or endangered by the Illinois endangered species protection board (IESPB). The families with the largest number of taxa were the Asteraceae with 85 taxa, the Poaceae with 70, and the Cyperaceae with 51, of which 28 were of the genus *Carex*. A survey of the vegetation was conducted on five community types. The most important taxa in a Grade C sedge meadow were *Carex haydenii* (sedge) and *Carex stricta* (sedge). Most important in a Grade B shrub sand prairie were *Spiraea tomentosa* (meadowsweet), *Rubus hispidus* (blackberry), *C. haydenii*, *C. stricta*, *Schizachyrium scoparium* (little bluestem), *Potentilla simplex* (cinquefoil), *Euthamia graminifolia* (grass-leaved goldenrod), and *Liatris aspera* (blazing star). Most important in a Grade B wet-mesic sand prairie were *R. hispidus* and *Rubus setosus* (blackberry), *Carex* sp. (unknown sedge), *Sorghastrum nutans* (Indian grass), *S. scoparium*, *E. graminifolia*, *P. simplex*, and *Solidago canadensis* (Canada goldenrod). Most important in a Grade B dry sand prairie were *R. hispidus*, *Vaccinium angustifolium* (early low blueberry), *Carex pensylvanica* (sedge), *S. scoparium* and *S. nutans*, and *Aster simplex* (aster). Most important in a dry sand savanna were *Quercus velutina* (black oak), *Quercus alba* (white oak), *Prunus serotina* (black cherry), *S. scoparium*, and *Chamaecrista fasciculata* (partridge pea).

VASCULAR FLORA OF THE PEMBROKE SAVANNAS, KANKAKEE COUNTY, ILLINOIS

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ABSTRACT: The Pembroke Savannas of northeast Illinois encompass an area of approximately 20,000 acres and contain much high quality sand savanna. The IDNR and the Nature Conservancy have been working together to acquire and protect as many of the remaining sand savanna communities here as possible and they presently manage a number of sites. The vascular flora of five of these sites was studied during the 2002 growing season in order to document the composition and structure of the vegetation and assess the quality of the natural communities. A total of 574 taxa were found at all sites combined including six state endangered species and three species thought to have been extirpated from Illinois. Overstory and ground layer analysis of mature second growth sand savanna was undertaken at each site. Tree density averaged 135 stems/ha, with an average basal area of 7.94 m²/ha. *Quercus velutina* (black oak) ranked first in the overstory with an average importance value of 170.6 (out of 200). *Schizachyrium scoparium* (little bluestem) and *Carex pensylvanica* (Pennsylvania oak sedge) ranked first and second in the ground layer with importance values of 24.1 and 21.1 (out of 200), respectively. The Floristic Quality Index of each site was calculated. Values ranged from 43.5 to 73.5, indicating that these sites are of high quality. These results provide land managers with useful information about the sites and baseline data for future monitoring.

CANOPY COMPOSITION AND SOIL CHARACTERISTICS OF FALL-LINE SANDHILL COMMUNITIES

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ABSTRACT: Twenty-six sandhill woodlands were selected for survey at the Savannah River Site in South Carolina and at Fort Gordon and Fort Benning in Georgia. Preliminary investigations to characterize sandhill communities included measurements of dominant canopy species, soil texture, soil moisture, and soil nutrient content. Importance values of canopy species were generated for each field site. Cluster analysis distinguished six sandhill community type groups and a multi-response permutation process was used to validate the groups. A Duncan's multiple range test was used to examine differences in canopy species importance values, soil texture, and soil moisture values between the groups to further identify distinguishing characteristics. Based on the results, groups range from a site with a more mixed hardwood canopy and high soil clay content; to dry pinelands; to transitional sandhill communities with increasing clay, calcium, and phosphorous content; to typical xeric sandhills with soils of high sand content. The variation between the groups of sandhill community types can be attributed largely to a soil moisture gradient. In addition, higher diversity of sandhill community types supported on a landscape may be due to an increasing range of percent sand content with increasing proximity to the Fall Line. These data will be used to aid in distinguishing sandhill communities from near-by or adjacent pine communities.

CHARACTERISTICS OF BIODIVERSITY AND CONSERVATION IN CUBA – SITUATION OF THE ORIENTAL REGION

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ABSTRACT: The knowledge of Cuban biodiversity and conservation has had important breakthroughs in the last decade with significant aspects being the Biodiversity Country Study, the National Strategy of Biological Diversity, the Law of Protected Areas and the constitution of National System of Protected Areas (NSPA). We give the fundamental aspects and the valuation of the results until the moment. Emphasis is made in the SNAP, its goals and categories. I present the results of the most recent investigations of BIOECO, in the Oriental Region, where several indicators of the values of Biodiversity are offered, explaining the gaps in knowledge and conservation. Specific data of the mountains Nipe Sagua Baracoa and Sierra Maestra are presented and include information about National Parks, Natural Reserves and Ecological Reserves.

IT'S A BIG TASK: EFFECTIVE PARTNERSHIPS FOR NATURAL AREAS CONSERVATION

Thursday, September 25 – afternoon

LAKE MICHIGAN SHORELANDS ALLIANCE: A REGIONAL LAND TRUST COLLABORATION

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ABSTRACT: Development pressures, exotic species and inappropriate land management pose serious threats to the conservation of biodiversity, habitat and water quality within Wisconsin's Lake Michigan Basin. In general, individual groups or agencies working in isolation are not able to effectively respond to these threats. Therefore, to achieve greater conservation leverage, Gathering Waters Conservancy is facilitating the development of a basin-wide, action-oriented land trust collaboration -- the Lake Michigan Shorelands Alliance (LMSA) -- to work regionally, strategically and collaboratively to protect high quality land and water resources. LMSA includes seven non-profit, local and regional land trusts and The Nature Conservancy of Wisconsin. By also partnering with the Wisconsin Department of Natural Resources, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the Wisconsin Coastal Management Program, three regional planning commissions, local units of governments and others, the Alliance intends to leverage their experience and expertise to more strategically protect high quality resources. Two of the primary goals of the Alliance are to establish regional conservation priorities and implement high quality resource protection based on existing resource plans and assessments. This collaboration also provides the opportunity for partnering organizations to share and exchange resources, ideas and information, access monies that individual groups could not access alone, and establish a mechanism for a well-integrated and coordinated approach to implementing conservation priorities within the basin.

TENNESSEE VALLEY AUTHORITY NATURAL AREAS PROGRAM: MANAGING SENSITIVE NATURAL RESOURCES AND PROVIDING PASSIVE RECREATION OPPORTUNITIES ALONG THE TENNESSEE RIVER

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ABSTRACT: The TVA Natural Areas Program coordinates the development of management strategies appropriate for the protection of sensitive natural resources on TVA land. The TVA network of natural areas is regionally recognized for protecting sensitive species and critical habitats, representative natural communities, and areas of aesthetic significance. Such areas provide opportunities for scientific research, wildlife observation, and low-impact forms of public recreation in natural sanctuaries. TVA's natural areas are managed to restrict or prohibit activities that might alter or destroy significant natural elements, however, because this network of natural includes a wide range of habitat types, seasonal uses, and management needs, decisions regarding management are area-specific. The inherent sensitivity of these areas requires boundaries that include sufficient buffers to ensure the long-term protection of significant resources. Developments or other land use changes proposed for TVA lands adjacent to designated TVA natural areas are reviewed by the TVA Natural Heritage Project biologists and other TVA staff. Where appropriate, multiple uses for sites are considered. For example, part of a natural area may be used for ecological research while other portions may be open to low-impact recreation. Protection of sensitive natural resources is always given highest priority when considering recreational uses. As of May 2003, TVA's natural areas network includes 136 parcels, comprising approximately 14,000 acres. These areas are located on TVA lands in Tennessee, Alabama, Mississippi, and Kentucky. An overview of TVA Natural Areas will be provided along with a discussion on identification methodologies and management challenges.

MICHIGAN'S STEWARDSHIP NETWORK

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ABSTRACT: The Stewardship Network began four years ago under funding provided by the University of Michigan and is modeled after the Chicago Wilderness in the Greater Chicago area. It is a diverse partnership of individuals, non-profit organizations, businesses, and governmental units working to foster land and water stewardship dedicated to preserving and restoring natural areas in Southeast Michigan by increasing individual and collective capacity for this work. Stewardship groups are working to manage important natural areas. Local land conservancies, park systems, and private individuals have acquired special pieces of property and are often just beginning to realize their responsibility to care for these natural areas. They are seeking the knowledge, skills, and equipment to maintain and restore these special natural places. The Stewardship Network was formed to provide support and training for these stewards, to increase on-the-ground stewardship, as well as to link volunteers with natural areas in need of management. The Stewardship Network is meeting a critical need for supporting and engaging these people in local action.

INNOVATIVE PARTNERSHIPS FOR CONSERVATION: THE LACROSSE BLUFFLANDS PROTECTION PROGRAM

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ABSTRACT: In 2001, the Mississippi Valley Conservancy, a regional land trust, and the City of La Crosse, Wisconsin, launched an innovative public-private partnership for protection of the 8-mile corridor of blufflands above the City. During the City's comprehensive planning process, bluffland preservation ranked as one of the top concerns of local citizens. The land trust and the City joined forces to create the La Crosse Blufflands Protection Program to conserve the natural, scenic and recreational values of this unique and threatened landscape. Although within an urban landscape, these blufflands contain large areas of rare and threatened habitat harboring a variety of forest and prairie flora and fauna, including the protected *Crotalus horridus* (Timber Rattlesnake). The Conservancy acts as the "broker" for the voluntary protection program by coordinating landowner contact, accepting land donations, and purchasing land and easements. The City provides funding for the program (\$449,000 thus far) and works with the Conservancy to develop management plans for each property. The lands are transferred to the City as parkland and the Conservancy retains a

conservation easement on each property to ensure long-term protection. The Conservancy has finalized purchase or donation of almost 60 acres, including almost a mile of contiguous bluffland, and has verbal commitments on another 800-1000 acres. Due to the large number of landowners interested in the program, the Conservancy is further leveraging the City's funding with grants from the Wisconsin Department of Natural Resources' Stewardship program and other private funding.

PATHS OF SUPPORT: DEEDS AND DIRECTIONS OF THE NATURAL AREAS ASSOCIATION

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STATE COMPREHENSIVE WILDLIFE CONSERVATION PLANS: BIG OPPORTUNITIES FOR NATURAL AREA CONSERVATION

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ABSTRACT: Every state wildlife agency must submit a State Comprehensive Wildlife Conservation Plan to the U.S. Fish and Wildlife Service by October 2005. These plans are required by legislation that established State Wildlife Grants and provided \$80 million to states in FY 02. There is support in Congress to continue and perhaps to increase the State Wildlife Grants in future years. Natural area and related programs could contribute to these plans and could gain support and funding by becoming stronger partners with state wildlife agencies. The plans must identify and be focused on "species of greatest need of conservation" and address the "full array of wildlife" and wildlife-related issues. Among the elements that plans must address are descriptions of locations and relative condition of key habitats and community types essential to conservation of species; descriptions of problems that affect species and habitats; research and survey efforts needed to conserve species and habitats; and conservation actions needed to conserve species and habitats. Additionally, wildlife agencies are asked to coordinate the development of these plans with other agencies that manage land or waters within the state or administer programs that affect the conservation of identified species and habitats. This is an invitation to the conservation planning table for natural area programs, including programs that are not housed within the state wildlife agency. This paper will further describe these plans and the opportunities they present for conserving natural communities and wildlife species within natural areas.

STRINGING THE PEARLS – PROTECTING SPECIAL PLACES ALONG WISCONSIN'S WEST COAST

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ABSTRACT: The Mississippi River blufflands stretch for more than 200 miles along western Wisconsin. Rising majestically above the floodplain, the bluffs offer spectacular views of America's greatest river and harbor a host of rare species ranging from Pleistocene snails to timber rattlesnakes. Bluffland protection efforts in Wisconsin began in the early 1900's with the establishment of several state parks. During the 1950's, protection efforts continued with the establishment of numerous State Natural Areas. More recently, the advent of local land trusts has served as a catalyst for increased protection efforts. Strong partnerships resulting from an alliance forged between land trusts and the Department of Natural Resources have significantly accelerated protection of the bluffland's threatened natural heritage.

NATURAL AREAS PROTECTION AND CONSERVATION DISTRICTS IN MINNESOTA: AN UNTAPPED RESOURCE

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ABSTRACT: Although many institutions—including nonprofit organizations, local governments, and state and federal agencies are involved in protecting land in Minnesota, their combined resources are inadequate to the task. There is an institutional resource whose natural areas protection capacity is underutilized—the Soil and Water Conservation District in each county. The Districts are, in many ways, well positioned to become more involved in land protection. It is posited that the most resource-efficient approach to increasing the land protection capacity in the State is to build on existing capacity in the Districts and to foster collaboration between Districts and other governmental institutions, as well as the nonprofits with more experience. Alternative solutions will take more time to develop; yet, 'the need is now'. Only a few Districts in Minnesota have some experience with conventional conservation easements, although many are now very experienced with state and federal agricultural land retirement programs, including the Conservation Reserve Enhancement Program. Examples of District land protection activities in Minnesota are described. The results of a preliminary effort to characterize such activities in other states are shared. Recently initiated county, Metro Area, and statewide initiatives to protect habitat are described. Related areas suitable for District involvement are briefly addressed. These include: natural resource inventory and classification; monitoring and managing invasive species; selection of suitable plants for shelterbelts, erosion control, and wildlife.

LOCKPORT PRAIRIE: WHEN BEST INTENTIONS MAY NOT BE ENOUGH

Thursday, September 25 – afternoon

LOCKPORT PRAIRIE: THE ROLE OF GROUND WATER IN SUSTAINING A UNIQUE ECOSYSTEM AND THE NEED FOR UNDERSTANDING SYSTEM DYNAMICS TO PROTECT THIS RESOURCE

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ABSTRACT: Lockport Prairie Nature Preserve is roughly 250 acres in size, and is located approximately 45 miles southwest of Greater Chicago along the banks of the Des Plaines River. The Prairie is a unique ecosystem consisting of several endangered plant and animal species. This ecosystem is supplied by life-sustaining groundwater, which is rich in dissolved calcium and magnesium, picked up from a local dolomite aquifer known as the Niagara Dolomite. The Niagara Dolomite out-crops along a 40-foot high bluff scoured by glacial flooding. The groundwater enters the Prairie through seeps along the bluff and springs within the Prairie. Recent studies have shown that one endangered species, *Somatochlora hineana* (Hines Emerald dragonfly) is rapidly diminishing in numbers, and researchers have observed that groundwater seepage along the bluff has diminished over time. Unfortunately, there have been several anthropogenic interferences with the natural conditions within the watershed and within the Prairie over time. Determining which of the interferences have had the critical effect on groundwater supply and the Hines Emerald dragonfly has been challenging; however, several likely contributors have been identified. It has become clear that a detailed understanding of how ground water is supplied to the Prairie, and how that supply may be interfered with, is critical to planning any future restoration efforts.

HYDROLOGIC MODELING FOR ECOSYSTEM RESTORATION, LOCKPORT PRAIRIE, ILLINOIS

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ABSTRACT: Lockport Prairie Nature Preserve, located about 45 miles from Chicago along the Des Plaines River, is one of the few remaining protected natural areas along the river that represents pre-settlement conditions of a dolomite prairie community. The site is home to several Federally and State-listed endangered species. A Section 206 Aquatic Ecosystem Restoration Project seeks to restore and rewet approximately 300 acres of degraded wetland and associated aquatic ecosystems, as well as breeding habitat for the federally threatened *Somatochlora hineana*, the Hine's Emerald Dragonfly, and habitat for the federally endangered *Dalea foliosa*, the Leafy Prairie Clover, along with numerous state listed species. Groundwater seepage from steep rock outcroppings west of the prairie and from highly fractured bedrock exposed throughout the prairie contributes to prairie surface water. The presence of these seepage zones creates habitat for the prairie's rare species. As part of the project feasibility study, both groundwater and surface water data are being collected for two to three years. Groundwater monitoring continues at six well nest locations, while surface water flow through culverts, rivulets and French drains is being measured at 10 locations within the prairie. An HEC-HMS model is being developed using the Soil Moisture Accounting method. Because of the importance of groundwater to the prairie ecosystem, a groundwater model will also be developed. Data collection efforts, hydrologic model development and the importance of hydrology to Lockport Prairie ecosystem function will be described during the presentation.

AN INTRODUCTION TO U.S. ARMY CORPS OF ENGINEERS ECOSYSTEM RESTORATION PROGRAMS AND TO THE LOCKPORT PRAIRIE PROJECT

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ABSTRACT: The U.S. Army Corps of Engineers (Corps) has an ecosystem restoration mission. But what does it really accomplish? A multiple year project at Lockport Prairie Nature Preserve, a premier natural area managed by The Forest Preserve District of Will County, serves as an example of the multiple ways in which Corps regulatory and civil works programs can provide substantive assistance in partnership with natural area managers in the identification, planning, and implementation of ecosystem restoration projects. Chicago District Corps pioneered in the development of innovative regulatory branch programs that assisted in ecosystem evaluation, preservation, and restoration on behalf of the Corps. It now has a number of aquatic ecosystem restoration projects in its planning branch, including a complex and highly sensitive one that endeavors to describe, understand and restore the Nature Preserve at Lockport Prairie. Lockport Prairie lies in the lower Des Plaines River valley, in an area shaped by complex glacial actions. It has a number of systems within it, and provides breeding habitat for *Somatochlora hineana* (Hine's emerald dragonfly), *Dalea foliosa* (leafy prairie clover), and *Actinia herbacea* (lakeside daisy). All of these systems and federally listed species are at risk from recent changes in the hydrology of the prairie. A large team of biologists, geologists, and hydrologists has been assembled by the Corps to study the site and reduce the threats to the site through several possible restoration alternatives. This presentation will serve as the introduction to the rest of the presentations about Lockport Prairie.

PLANT COMMUNITIES AT LOCKPORT PRAIRIE NATURE PRESERVE, THEIR QUALITY AND LANDSCAPE DISPOSITION

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ABSTRACT: Plant communities at Lockport Prairie are delineated across the 249-acre preserve. The landscape is generally characterized as riparian dolomite prairie, where dolomitic residuum is exposed along outwash flats of the Des Plaines River. The site provides habitats for two federally threatened species, *Petalostemum foliosum* (Leafy Prairie Clover) and *Somatochlora hineana* (Hine's Emerald Dragonfly). Plant communities are delineated with the aid of GPS instrumentation, aerial photography, and ground-truth assessments; 16 relatively distinct plant communities are described. Guidance was provided by a similar study done in 1986 by

Marcella DeMauro, of the Will County Forest Preserve District. The plant communities range in grade from ruderal to high-quality remnant. Their character varies from hydric to xeric, with notable interspersions of seepage zones of groundwater recharge. Assessments are made with respect to qualitative changes that the various plant communities have experienced since restoration activities began in the late 1980's. Observations on changes in stormwater influences are also discussed. Controlled burning has been a frequent management tool, as has the removal of prolific woody growth. Generally, those areas that lie topographically above frequent flood levels have held their integrity, or even improved in quality in those areas where active removal of adventive trees and shrubs has been undertaken. In those areas that experience frequent flooding from the river or receive stormwater from ambient upland areas, serious degradation of habitat is evident.

PRIVATE LANDS, PUBLIC INTEREST SYMPOSIUM

Thursday, September 25 – morning

IMPORTANCE OF PRIVATE LANDS IN THE MANAGEMENT OF CHRONIC WASTING DISEASE

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ABSTRACT: On February 28, 2002 Chronic Wasting Disease (CWD) was discovered in wild *Odocoileus virginianus* (White-tailed deer) in Wisconsin. The initial cases, later confirmed by a massive statewide sampling program, suggested that the disease was confined to an area of 500-800 square miles, west of Madison, Wisconsin. Land in the area is primarily in private ownership. The initial response of landowners was one of fear and uncertainty. The severity of the threat posed by CWD and the initial response of landowners suggested to wildlife managers that any plan developed to control CWD would receive broad support and cooperation. As the situation became better understood and the CWD management plan, which included eradication of deer in the area, was conveyed to the public, suspicion and resistance by some landowners and hunters became apparent. At least 2 well organized opposition groups formed and the outlook for achieving management objective became much less certain, even with the strong support of some landowners. The presence of wildlife, a public resource, on private lands has always been a challenge for wildlife managers. In the case of CWD, the range and depth of landowner's opinions and actions was surprising, but does not change their pivotal role in the success of CWD management in Wisconsin. New outreach programs and materials for landowners were developed during the summer of 2003 to build support for CWD management thru a renewed sense of resource stewardship and confidence in professional resource managers.

BRINGING COMMUNITY INTO COMMUNITY-BASED CONSERVATION: TWO CONTRASTING CASE STUDIES

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ABSTRACT: Over 50 years ago, Aldo Leopold eloquently defined the 'Land Ethic'. In the Midwest, where the majority of the land is held in private ownership, it is critical to foster this ethic in private landowners to maintain the integrity of our native ecosystems. We will discuss two contrasting community conservation initiatives. The Blufflands Project, with a history of actually implementing conservation practices (in particular, prescribed burning) for over 10 years, and the Farming And Conservation Together (F.A.C.T.) conservation initiative, which has recently begun implementation after several years of planning. While these two projects were initiated under very different circumstances and presented substantially different challenges, we have found that landowner empowerment ensures certain outcomes. These include an increased appreciation for their responsibilities as stewards, a greater confidence to take on stewardship activities, and an overall improvement of their understanding of ecological processes.

WHAT THE FUTURE MIGHT HOLD FOR CONSERVATION ON PRIVATE LANDS

Paul Johnson. Former Chief, Natural Resources Conservation Service.

PRIVATELY OWNED LANDS IN THE ILLINOIS NATURE PRESERVE SYSTEM - AN ENCOURAGING TREND

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ABSTRACT: Natural areas in Illinois are preserved through legal dedication of land as an Illinois Nature Preserve or registration as an Illinois Land and Water Reserve. In both cases the owner retains title to the land but gives up development rights and most use rights in order to preserve the area. Both public and private landowners can dedicate or register lands, though most of the preserves and reserves are owned by conservation agencies such as the Illinois Department of Natural Resources, county forest preserve districts, county conservation districts and park districts. An encouraging trend of private individuals and families dedicating or registering their land began in 1982 when two families dedicated wooded land they had owned for many years. Today more than 50 of Illinois' 318 nature preserves are owned entirely or in part by private individuals and families. 30 of the 90 Land and Water Reserves are privately owned. Since more than 90% of Illinois is in private ownership, this trend is good news for the future of natural area protection in Illinois.

RECOGNIZING THE PUBLIC INTEREST IN PRIVATE LAND: BUILDING ON ALDO LEOPOLD'S LEGACY

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ABSTRACT. For decades conservationists, environmental advocates, and resource managers have dedicated themselves to issues of public land protection and management. Only recently has conservation on private lands begun to gain the attention it needs and deserves. What accounts for this disparity? In 1935, Aldo Leopold called for "the formulation of mechanisms for protecting the public interest in private land." Our limited success in formulating such mechanisms and articulating a vision for conservation on private lands reflects shortcomings in our conservation science, philosophy, policy, and practice. Leopold's work is an essential starting point for understanding how much ground we have lost, literally and figuratively, over the last half-century; but it also allows us to recognize positive trends that have taken hold more recently. Leopold defined the land ethic as an expression of evolution within the "thinking community." Conservation's "thinking community" is coming to understand the vital role that private lands must play in sustaining healthy, diverse, and beautiful landscapes. In looking toward the necessary enhancement of that role, we ought to be sobered by "the magnitude of the task" (as Leopold once wrote). But we should also be encouraged by the fact that private lands are no longer taken for granted in conservation.

SMALL STREAMS: HEADWATERS ARE IMPORTANT, TOO

Thursday, September 25 – morning

RELATIONSHIPS BETWEEN ENVIRONMENTAL SETTING AND VEGETATION TYPES ALONG STREAMSIDE SLOPES WITHIN THE SANDHILL COASTAL PLAIN PROVINCE

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ABSTRACT: Upland hardwood forests of the Coastal Plain occupy a limited portion of the landscape, but provide habitat for a wide variety of plant and animals. These areas are often steeply sloped and have fertile, mesic, loamy soils. Fifty-three areas were sampled using replicated continuous-plot transects that extended from the adjacent uplands to stream bottoms. In addition to vegetation, 23 soil and topographic features were also sampled. Using various combinations of environmental parameters, we found that predictive linear models could be developed for most species. Using multivariate techniques we identified 23 canopy types and 34 understory types. Most canopy and understory types were strongly associated with soil and topographic features as well as landscape setting. The strongest relationships between canopy and understory types occurred under four general settings; 1) steep slopes, 2) fertile slopes and bottoms with near-neutral pH, 3) slope bottom seeps, and 4) permanently wet, seasonally flooded slope bottoms. The weakest correlations between canopy and understory types occur along small stream slopes, slope ridges, and the adjacent upland forest.

EFFECTS OF ACIDIFICATION, CRAYFISH, AND FOREST SERAL STAGE ON LEAF PROCESSING IN AN ALLEGHENY PLATEAU HEADWATER STREAMS

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ABSTRACT: Stream ecosystems throughout the eastern United States continue to suffer from acid deposition. One important consequence of stream acidification is a slowing of leaf processing rates. Although a number of studies show that acidification retards leaf processing, the potential ameliorative effects of forest seral stage or large shredders (crayfish) on this key ecosystem function are not well understood. We evaluated the combined effects of acidification, crayfish, and forest seral stage on leaf breakdown rates in two headwater streams in the Allegheny National Forest, Pennsylvania. Previous studies of these streams showed a significantly higher abundance of crayfish (*Cambarus bartonii*) in the acidified stream. We hypothesized that crayfish would have a greater effect on leaf breakdown rates in the acidified stream than in the circumneutral stream. We placed *Betula spp.* leaf packs in primary and secondary forest reaches in both streams such that we allowed crayfish access to half the leaf packs. There was a significant stream effect on breakdown rates, with leaves in the acidified stream decomposing at a much slower rate. The effect of crayfish was dependant on the stream. Crayfish-excluded leaf packs broke down more slowly in the acidified stream, but more quickly in the circumneutral stream. Forest seral stage did not have a significant effect on leaf breakdown rates. In summary, the effects of stream acidification on leaf processing overwhelmed any effects of forest stage, but the effect of acidification on leaf processing was less pronounced in the presence of crayfish.

STREAM RESTORATION - TWO MICHIGAN CASE STUDIES

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ABSTRACT: Johnson Creek is recognized as one of the highest quality streams in the Rouge River watershed located in southeast Michigan. Stream characteristics such as cool groundwater discharge, cobble and gravel substrates and a resident trout population lend credence to this rating. Unfortunately, significant erosion is occurring as the watershed develops. The Washtenaw County Drain Commissioner received a grant from the US EPA (administered by Wayne County) to study alternative methods of protecting the banks of Johnson Creek. Smith Group JJR developed a streambank stabilization project to demonstrate various bioengineering techniques. The objectives of the project were to: 1) educate citizens on the benefits of bioengineering; 2) demonstrate the use of various bioengineering techniques; and 3) incorporate in-stream habitat improvements to support brown trout. The project engaged volunteers from local communities in a one-day training session followed by implementation of designed techniques. In the early 1900's Michigan Department of Conservation constructed three concrete raceways in a one-half mile reach of Oden Creek to support trout hatchery operations. In 2002 a new hatchery was constructed allowing restoration of the Oden Creek into a northern Michigan cold-water stream. The restoration included the design of a channel that replicates the original sinuosity as well as construction of riffles, pools and runs. Streambanks were stabilized using bioengineering techniques and natural materials. Oden Creek is now a focal point of a 200-acre Michigan DNR interpretive center that includes an underwater viewing chamber, kid's creek, replica fish railcar, and the hatchery.

WHAT WE DO TODAY MATTERS: NATURAL AREAS MANAGEMENT

Thursday, September 25 – morning

PREVENTING INTRODUCTIONS OF ADDITIONAL FOREST PESTS

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ABSTRACT: North America's forests have been heavily impacted by exotic insects and pathogens over the past 150 years. Examples include *Cryphonectria parasitica*, *Cronartium ribicola* and, more recently, *Adelges tsugae* and *Phytophthora ramorum*. As imports rise, so does the risk that new insects and pathogens will be introduced. Despite the growing risk, governments have adopted trade agreements restricting phytosanitary measures with the goal of promoting free trade. We propose safeguards governing imports of plants and wood products (including wood packaging) that will minimize the threat of new introductions. Our proposed measures are stringent, minimally dependent on inspection, and easy to enforce. They include: limiting plant imports to *in vitro* clones and small shipments of seeds; requiring shippers to use packaging made from composites, plastic, or metal rather than wood boards; and heating all logs, lumber, and wood chips prior to importation. We recommend supporting this stringent exclusion program with a program to detect and respond rapidly to pests that evade border controls.

COMPOSITIONAL AND STRUCTURAL CHANGES IN SOUTHERN WISCONSIN OAK FORESTS OVER THE LAST HALF-CENTURY

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ABSTRACT: We investigated successional changes in remnant oak forests in southern Wisconsin by resampling and reanalyzing stand data from Noe Woods, a 1.87 ha mapped plot established in 1956 and resampled at 3- to 10-year intervals. We found continued decreases in the total basal area and density of *Quercus velutina* Lam. (black oak) and the density of *Q. alba* L. (white oak) as has been reported previously. Oak mortality was not related to conspecific nearest-neighbor distance, indicating that it may not be due to density-dependent pathogen transmission. We also found large increases by more shade-tolerant tree species, primarily *Prunus serotina* Ehrh. (black cherry) and *Ulmus americana* L. (American elm), neither of which seem likely to replace oaks as canopy dominants. Establishment and growth of these species showed little spatial relationship to the gaps formed by oak deaths. To assess the generality of these trends, we resampled 17 additional unmapped stands originally sampled by J.T. Curtis and colleagues in 1949 and 1950. As expected, declines in oaks and increases in shade-tolerant tree species were found across all sites. However, the identities of the shade-tolerant species which increased over the fifty year sampling interval varied among stands. We attribute this variation to prior differences in local assemblages of shade-tolerant species and the insularity of many of these stands, as well as environmental differences between sites. These factors likely limit the number of species available as potential successors at any given site, and may explain the unusual successional trajectory documented in Noe Woods.

SHORT-TERM RESPONSE TO SEVERE WIND DISTURBANCE IN A GREAT LAKES PINE FOREST.

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ABSTRACT: Opportunities to examine the ecological effects of severe wind are rare. We compared the structure and floral composition of a 100 year-old *Pinus banksiana* (jack pine)- *Picea mariana* (black spruce) forest before and for two growing seasons following a windstorm that severely damaged 400,000 ha of forests in northern Minnesota. Although the wind resulted in widely different levels of disturbance in the region, this forest lost more than 84% of its deciduous canopy, mostly *Populus tremuloides* (aspen), and 58% of its evergreen canopy. *Acer spicatum* (mountain maple) cover increased from <1% to >4% in the shrub-layer. Advanced regeneration black spruce increased from about 2% cover to >10%, and balsam fir from nearly 3% to over 7% cover. Jack pine failed to regenerate, while aspen root sprouts increased from none to nearly 4% in the shrub layer. About half of the trees were tipped by the wind, exposing pockets of mineral soil. These micro-habitats resulted in an increase in *Betula papyrifera* (paper birch) in the herb layer from none to nearly 1% cover. Also, birch that was tipped resprouted along the stem, resulting in a 50% increase in shrub-layer birch cover. These changes suggest that the succeeding forest will have scattered surviving jack pine with considerably more black spruce, aspen, balsam fir, and paper birch. Light at the ground did not change greatly. Consequently, response in herb layer was slight. Significant increases, however, occurred in *Clintonia borealis* (bluebead lily) *Cornus canadensis* (dwarf dogwood), and *Diervilla lonicera* (bush honeysuckle).

LAND USE LEGACY EFFECTS: EXOTIC PLANT SPECIES DISTRIBUTIONS SIXTY YEARS AFTER AGRICULTURAL ABANDONMENT

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ABSTRACT: Like much of the eastern United States, most of the forest in the Ridge and Valley Province in East Tennessee is second growth regenerated from cultivated fields, pastures, and woodlots. We measured the distribution of native and exotic plant species, focusing on the forest understory, across the Oak Ridge Reservation near Oak Ridge, TN. This area is unique in that all agriculture ceased in 1942, when the area was acquired for the top secret Manhattan Project during WW II. Aerial photographs ca. 1938 allow determination of the location and condition of the cultivated fields and pastures that covered most of the landscape prior to abandonment. We identified 534 species in our 240 10x10m plots, out of a total of 1245 vascular plant species recorded for the Oak Ridge Reservation. Although our samples covered less than 0.02% of the 14,400 ha Oak Ridge Reservation, we encountered over 40% of the recorded species. We recorded 37 non-native species in our 240 plots, out of a total of 199 non-native species reported for the Oak Ridge Reservation. The two most abundant exotic species were *Microstegium vimineum* (Japan Grass), which was found in 65 of 240 plots, and the exotic vine species, *Lonicera japonica* (Japanese Honeysuckle), found in 147 of 240 plots. Cover of exotic species was generally highest in areas that had been in agricultural use prior to 1942, but most of the non-native species were found at very low frequency and abundance.

THE CHIPS WERE FLYING, A TALE OF STEWARDSHIP OF A NEW TRACT OF LAND AT NACHUSA GRASSLANDS

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ABSTRACT: A recent acquisition with significant brush and tree encroachment coincided with two grants for stewardship to allow The Nature Conservancy to work at a vigorous pace using forestry machines and elbow grease. Hear the tale. See the images. Nachusa Grasslands is a 1500-acre mosaic of habitats from dry, gravel hill prairies to oak savanna and wet sedge meadows. This acquisition is 160-acres of rolling oak savanna and sedge meadow in which we used a "Geoboy" (flail-mower on tracts) and girdling with chainsaws to reduce by 95% the invading woody species in the sedge meadow and some areas of the savanna. We also used a forestry-sized tree "feller-buncher" to remove trees on the boundaries to form the fire breaks. Many hours were spent by volunteers and staff herbiciding the stumps and, also, stem herbiciding invading bush honeysuckle and small diameter trees in the savanna. Two prescribed burns were done. See the results.

VEGETATIVE RESPONSES IN DUPAGE COUNTY, ILLINOIS WOODLANDS

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ABSTRACT: Between 1979 and 1985 a total of 42 one-acre (0.405 ha) monitoring plots were established in woodlands throughout Forest Preserves in DuPage County, Illinois. These plots were established for the purpose of: 1) establishing baseline information on woodlands in the county, 2) to monitor vegetative changes over time and 3) evaluate the effect of various management protocols. These plots have been sampled periodically for tree demographics, floristic quality, plant frequency and cover, and ambient light. Plots have been subjected to a wide variety and intensity of management protocols from none to very intensive. Data from tree demographics has shown that, although oaks, particularly *Quercus alba* (white oak), dominate the canopy of most DuPage County woodlands, mortality is significant while regeneration in the understory (4-8 inches DBH) is low. The understory is now primarily composed of *Prunus serotina* (black cherry), *Acer saccharum* (sugar maple), *Ulmus americana* (American elm), and *Tilia americana* (basswood). Preliminary findings indicate that little or no management is detrimental to native floristic quality, diversity, and cover. More intensive management aimed at the removal of exotic or small, overstocked woody plants and increasing the amount of ambient light increases ground flora (particularly graminoid) quality, diversity, and cover.

MANAGEMENT MATTERS, PLANTS DIFFER, ASSESSMENT METHODS VARY: CHANGE IN WISCONSIN PRAIRIE REMNANTS AFTER HALF-CENTURY

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ABSTRACT. We resampled, using at least 20 1-m² quadrats, 21 prairie remnants that had been similarly sampled during the 1940s and 1950s. We learned each remnant's fire and management history. The sites lie along a fire-frequency continuum from 0 to 17 fires in the last 20 years. We used such continua to examine the differential changes in diversity of plants grouped according to life form, N-fixing potential, photosynthetic pathway, nativity, conservativeness, and so on. For example, on average each 1-m² lost 0.8 native species and gained 2.6 non-native species. For all groups examined, losses or gains were always higher in the least burned sites. It occurred to us that these data provide an opportunity to explore the value of commonly used metrics of vegetation condition. We compared several measures of diversity, Floristic Quality Index and its variants, and other indices of "quality," "health," and condition. In general, use of quadrat data was more robust than qualitative measures. Tracking fine-scale richness of a few guilds is more informative than overall richness. Floristic Quality Index is less informative than is the number of either low or high, but not middle, levels of conservatism. We recommend natural area managers consider using a suite of assessment tools.

QUANTIFYING HISTORICAL LOSS OF PLANT SPECIES DIVERSITY IN MILWAUKEE COUNTY, WISCONSIN

Lawrence A. Leitner. Southeastern Wisconsin Regional Planning Commission, W239 N1812 Rockwood Drive, P.O. Box 1607, Waukesha, WI, USA, 53187-1607. lleitner@sewrpc.org

ABSTRACT: Losses of natural habitat and native plant species have been substantial since European settlement in highly urbanized Milwaukee County, Wisconsin. Historically, 944 vascular plant species are documented as native to the county. Some 346 (37%) are presumed to be extirpated; i.e., they have not been observed for at least 20 years. Losses have been disproportionate among species of different coefficients of conservatism (C value). With landscape degradation, the county-wide C value diminished as more conservative species were lost and replaced by less conservative natives and non-natives. There has been 75% loss of species of C = 10, and 64% loss of species of C = 9. Original flora had mean C = 5.6; species lost had C = 6.7; and extant species C = 5.0. The result is a significant lowering of county-wide C value ($t = -4.848$; $p = 0.000$). Greatest losses among families are Cyperaceae—49 species lost (46%); Poaceae—29 species lost (41%); Asteraceae—28 species lost (25%); Orchidaceae—27 species lost (84%); Fabaceae—16 species lost (64%); and Ericaceae—10 species lost (100%). A large proportion of lost species were associated with tamarack swamps and bogs, community types that have suffered complete destruction. Natural areas with higher C values are now restricted to less land area. 76% of the present area of the county is estimated to have a mean C value of 0-2; 8.5% to have a C value of 2-3.5; 1.3% to have a C value of 3.5-4.4; and only 0.1% to have a C value of 4.5 or greater.

WHAT CHANGES ARE "NATURAL"? – MONITORING PLANT COMMUNITY COMPOSITION IN WETLANDS OF THE APOSTLE ISLANDS NATIONAL LAKESHORE, WI USA

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ABSTRACT: The peat-dominated coastal wetlands of Lake Superior are unique among Great Lakes wetlands. Of particular interest are the wetlands on the islands of the Apostle Islands National Lakeshore (APIS). The insular condition of island habitat has resulted in relatively less disturbance and, more importantly, a natural protection from invasion of aggressive species. Conversely, coastal wetlands of the mainland are experiencing considerable change and represent the "peatland-to-marsh" transition, due to factors such

as increased sedimentation and the increased abundance of aggressive marsh species. The potential for this transitional process on island wetlands suggested the need for ongoing monitoring. The goal of this monitoring was to separate the "natural cyclic variability" of these wetlands from that of directional change (e.g. peatland-to-marsh). We report on an APIS wetland monitoring program that sampled between 1996 and 2002 at a number of spatial scales, from aerial photo analysis and delineating vegetation boundaries with GPS to placing permanent sampling quadrats in the field. There were some predictable responses to hydrologic changes including increases in shrubs at top of gradient, and the loss of 'true' aquatics in drawn down sites. Some wetland types experienced greater shifts than others depending on the metric used, e.g. pools increased the most in percent cover, while pannes showed the most dissimilarity between sampling years. In bog communities the dominants showed no significant changes over time, while in sedge meadows the dominants shifted from high to low water years. We recommend that photographic mapping and GPS map unit delineation would best be re-done every 20-25 years, depending on the observations made during transect monitoring.

FIFTY YEARS OF BIOTIC IMPOVERISHMENT IN WISCONSIN FOREST UNDERSTORY COMMUNITIES: THE IMPORTANCE OF STATE PARKS AND RESEARCH NATURAL AREAS

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ABSTRACT: Long-term ecological change is often hard to document without reliable baseline data. We obtained baseline data for and resurveyed 80 forest understory communities in Wisconsin. We examine percent changes in native species, floristic quality (defined as the mean coefficient of conservatism for the stand), and the fraction of exotics in the flora. Over the past 5 decades, native species richness at the 20-m² scale declined 19% and the mean coefficient of conservatism of the flora declined 8%. Exotic species were absent from 77 of 80 sites in 1950, but present at 61 of 80 sites in 2000-02. Exotics comprise an average 7% of the species present per site, and exceed 25% at 5 sites. State parks are losing more species (-31%) than RNAs (-18%) and unprotected lands (-18%), and they are experiencing a more rapid decline in floristic quality (-16%) than RNAs (-11%) or unprotected lands (-7%). Two-way ANOVA indicates exotic species comprise a greater fraction of the flora in the south (19%) than the north (4%), and in state parks (15%) than RNAs or unprotected lands (9%). The consistent finding of native losses across studies, suggests that such losses may be pervasive and thus of great significance for conservation. Inadequate monitoring may give us the particular false sense that ostensibly protected parks and preserves are secure when they may be vulnerable. Because maintaining forest habitats alone fails to preserve plant diversity at local scales, local biotic simplification seems likely to continue unless more active efforts are taken to protect diversity.

RESTORATION SUCCESS? USE OF SMALL MAMMAL ABUNDANCE AND PHEASANT NEST LOCATIONS AS METRICS TO EVALUATE HABITAT QUALITY IN RECONSTRUCTED PRAIRIES WITH VARYING FLORISTIC DIVERSITIES

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ABSTRACT: Many prairie reconstructions climax as communities dominated by 3-5 species of warm season grasses and minor amounts of a few forb species. If the objective of prairie reconstruction efforts is to reestablish habitat function, the importance of maximizing floristic diversity must be considered. This study uses comparisons of small mammal abundance and pheasant nest locations in a variety of prairie reconstructions as metrics to evaluate the relationship between floristic diversity and habitat function. The main study area is a 30 acre site containing multiple, adjacent plots of three habitat types: old field vegetation dominated by exotic cool season grasses; warm season grass dominated plantings, and diverse plantings with >40 species of forbs. The entire site was burned in April of 2002 and evaluated throughout the summer for small mammal abundance. A total of 335 unique individuals (10 transects, 1920 trap efforts) of five species (*Blarina brevicauda*, *Peromyscus leucopus*, *Microtus pennsylvanicus*, *Sorex hoyi*, *Zapus hudsonius*) was captured. Reconstructions with the highest floristic diversity had significantly greater abundance ($P < 0.05$) of small mammals than plots dominated by warm season grasses or old field vegetation. Two additional sites comparing diverse plantings with old field vegetation showed similar results. Combined data from all transects showed a positive and significant correlation between small mammal abundance and floristic diversity ($r^2 = 0.47$, $P = 0.002$). Following burning of the main site, a grid of 10-meter transects was surveyed for fragments of year-old pheasant nest locations. Twelve of 15 nest remnants were located in the diverse plantings, 3 in old field vegetation and none in the warm season plantings. Increasing floristic diversity is likely a key element to creating successful habitat in prairie reconstructions.

THE CHANGING VEGETATION OF WISCONSIN: LESSONS FROM REPEAT PHOTOGRAPHY.

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ABSTRACT: Repeat photography is commonly used to detect landscape change over time. Photos of "then" and "now" at a site can provide ecological lessons about natural disturbance, succession, effects of management, and development. In addition, the experience of retaking photos provides insights into human nature (personality of the original photographer), a sense of history, and the usefulness of record keeping for long-term studies. To learn about change in Wisconsin landscapes and to experience the potential pitfalls of repeat photography, I attempted to find sites that John Curtis photographed to illustrate "The Vegetation of Wisconsin" (published in 1959). I gleaned site location information from the photos, their captions, and experts familiar with the photos. I grouped the 65 plates in "Vegetation of Wisconsin" into categories based on likelihood of site relocation: "probable" (11), "possible" (28), and "unrealistic" (26). I found 10 of the 11 "probable" sites, using distinctive landmarks (e.g., rock outcrops, gnarled trees) and specific photo captions (e.g., Observatory Woods, Powell Marsh). I was unable to locate sites with unremarkable vegetation and vague captions (e.g., Vilas County). Some "possible" sites could be re-photographed if others know where Curtis had taken the original. It might be possible to narrow searches based on my discovery that Curtis apparently took all photos without stepping off the road or trail. Prairie and beach landscapes showed little change, while forested landscapes showed substantial change. Human developments were more obvious at many photo sites.

RESTORATION OF OAK ISLANDS SANDSCAPE, APOSTLE ISLANDS NATIONAL LAKESHORE.

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ABSTRACT: Apostle Islands National Lakeshore, located in northwestern Wisconsin, has the most diverse collection and among the highest quality sandscapes or coastal features (sand spits, cusped forelands, tombolos, barrier spits) found in the Great Lakes. Sandscapes are very popular visitor use areas within the park - they are accessible, very scenic and have sandy beaches. Sandscape vegetation, however, tends to be easily impacted by human trampling. Results of ten years of monitoring conducted by the park's natural resource staff on the Oak Island sandscape indicated an increase in non-native species and bare ground and a decrease in plant cover. To try to reverse these trends, the park has been working with the Natural Resource Conservation Center (NRCS) to restore this important and fragile sandscape. This paper will discuss restoration efforts on Oak Island from 2000 to 2003, including results of two monitoring efforts. In 2001, plots were created to determine how well plants propagated from locally derived plant materials could be established under various lighting conditions. Onsite restoration occurred in May of 2002 with over 3200 plants that were propagated from locally derived plant materials. Plots were established to determine the effectiveness of the restoration efforts. Results from the 2001 plots indicate that overall success was highest under shady conditions and plants dramatically increased during 2002. Preliminary results from the 2002 plots indicate a decrease in bare ground and non-natives and an increase in natives, both planted and non-planted.

IT'S NOT LIKE IT USED TO BE: 50 YEARS OF CHANGE IN THE NORTHWOODS

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ABSTRACT: Then versus now studies in temperate forests generally report pronounced declines in diversity, but are usually restricted to a single site, often subject to human disturbance and fragmentation. We resurveyed 62 upland hardwood stands in N Wisconsin and the western UP of Michigan to assess ecological changes in forest understories. Our study was only possible because of the quantitative surveys John Curtis and colleagues completed 50 years ago and their fully archived data. We found that most sites are losing native species, gaining exotic species, and becoming more similar to each other. Curtis et al. found 141 native understory species with only 1 exotic and 14-48 herbaceous species present at each site (in 20 m²). We found a total of 123 species (7 exotic) at these sites sampling 6x as intensively (120 m²). In all, 47 species disappeared and 29 new species (6 exotic) appeared. The average sites has lost 18% of the native species present around 1950 with uncommon species declining the most (>80% in *Mitella* and *Streptopus*). In contrast, already common native species and exotics increased greatly in abundance. Ironically, protected areas lost the most species (65% vs. 12% elsewhere) but only when deer hunting was prohibited. Losses of rare species and increases in common and invading species are homogenizing these forest communities. Such systematic changes suggest incipient region-wide declines in plant diversity that deserve prompt attention and a focused response.

Saturday, September 27

INVASIVE PLANTS OF THE UPPER MIDWEST SYMPOSIUM

Co-hosted by the Invasive Plants Association of Wisconsin

Abstracts are first arranged by date (Thursday, then Saturday) beginning with symposia. They are further organized alphabetically by session topic. Within each session, abstracts are alphabetical by presenting author. Posters are also alphabetical by author and may be found at the end of the document. To view this page in outline form, press "Show Navigation Pane" located above on the toolbar.

INVASIVE PLANTS: AQUATIC EXOTIC PLANT IDENTIFICATION WORKSHOP

Saturday, September 27 - afternoon

AQUATIC EXOTIC PLANT IDENTIFICATION WORKSHOP

Laura Herman¹, and Deb Konkel². ¹Wisconsin Department of Natural Resources 107 Sutliff Ave. Rhinelander, WI 54501

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ABSTRACT: We will be holding a 90 minutes hands-on workshop identifying aquatic exotic plants. We will cover aquatic exotics that are in Wisconsin and aquatic exotics that are knocking at Wisconsin's doors. We plan to have live specimens that were collected in Wisconsin and/or ordered through mail order catalogs. The session will cover identification of the following exotics that already have a foothold in Wisconsin: Eurasian water-milfoil (*Myriophyllum spicatum*), Purple loosestrife (*Lythrum salicaria*), Yellow flag (*Iris pseudacorus*), Water lettuce (*Pistia stratiotes*), Water hyacinth (*Eichhornia crassipes*), and Pond water starwort (*Callitriche stagnalis*). We also plan to teach you how to identify those aquatic exotics knocking at Wisconsin's doors including: Parrot feather (*Myriophyllum aquaticum*), Hydrilla (*Hydrilla verticillata*), Fanwort (*Cabomba caroliniana*), Water chestnut (*Trapa natans*), Common waterweed (*Egeria densa*), Frog-bit (*Hydrocharis morsus-ranae*), European water clover (*Marsilea quadrifolia*), and Brittle naiad (*Najas minor*) and Flowering rush (*Butomus umbellatus*)

INVASIVE PLANTS: AQUATICS

Saturday, September 27 - morning

A WISCONSIN PERSPECTIVE ON DEVELOPING A STATE AQUATIC INVASIVE SPECIES PREVENTION AND CONTROL PROGRAM

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ABSTRACT: Many states are developing invasive aquatic species prevention and control programs. An overview of Wisconsin's strategy for prevention and control of invasive aquatic plants will be presented as an example along with lessons learned from past efforts. In this presentation, participants will learn about Wisconsin's new Aquatic Plant Law that is designed to protect and develop diverse and stable communities of native aquatic plants and to regulate how invasive aquatic plants are managed in the waters of the state.

HYDRILLA VERTICILLATA SURVIVE WISCONSIN WINTERS? IT COULD HAPPEN!

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ABSTRACT: In the southern waters of the United States, the invasive plant, *Hydrilla verticillata* (Hydrilla), causes problems by outcompeting native plants, disrupting recreation and industry, and adversely impacting wildlife. The ability to predict the northern range of *Hydrilla* is critical in developing strategies to minimize its spread in the northern U.S. To determine the ability of *Hydrilla* to survive extended lengths in cold water and as newly emerging regrowth, a two-step assay was developed. In the first phase, monoecious and dioecious *Hydrilla* axillary turions underwent overwinter treatments of 0, 28, 63, and 105 days at 4°C. The second phase simulated a 10-week early growing season with long and short daylengths, and rapid and slow temperature increases. A plant native to the northern U.S., *Myriophyllum sibiricum*, was also tested. Overall, monoecious *Hydrilla* has a greater tolerance to long duration overwinter periods than dioecious *Hydrilla*, but both are lower than *Myriophyllum sibiricum*. Survival rates of dioecious *Hydrilla* axillary turions suggest that no stable populations will overwinter in Wisconsin, but in years with minimum ice cover duration survival could occur at latitudes as far north as Eau Claire (45°N). Axillary turions of monoecious *Hydrilla* can survive overwinter periods of 105 days, suggesting survival to at least 45°N during average ice duration years and as far north as Hayward or Minocqua (46°N) in years with minimum ice cover duration. Overall, survival of monoecious *Hydrilla*, based on axillary turion overwintering, may occur in lakes and rivers in the southern two-thirds of Wisconsin.

MANAGING AQUATIC EXOTIC AND INVASIVE SPECIES USING WATER FLUCTUATION

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ABSTRACT: Overwinter drawdown is a management tool for submerged plants where water level is easily controlled. It is not as feasible in waters with no control structure. Freezing, desiccation, and mechanical damage are likely control mechanisms. *Myriophyllum spicatum* L. (Eurasian water-milfoil) is easily controlled with overwinter drawdown in cold climates. Since *Potamogeton crispus* (curlyleaf pondweed) turions "germinate" in the fall, a late fall, to early spring drawdown also appears effective. There is less known about the impacts of overwinter drawdown on aquatic species that may invade Wisconsin. Overwinter drawdown generally doesn't control emergent species except by mechanical damage from ice or frost. A determination of the damage to native plant communities versus the management benefit of controlling invasives is needed when considering drawdown. Often *Najas flexilis*, *Chara* spp., and narrow-leaved pondweeds will invade denuded areas. Removing water during the summer obviously has detrimental impact on submerged species. Exposed mudflats may encourage the invasion of dense stands of invasive emergents like *Typha* spp (cattail), *Phragmites*, *Lythrum salicaria* (purple loosestrife), and *Phalaris arundinacea* (reed canary grass). It may also allow submerged species to grow further out in the lake. Little attention is given to using temporary flooding to control aquatic species. Increased water level should force submerged species shoreward. Cutting and then flooding stems is an effective management tool for cattails. A similar strategy may be effective for controlling other emergents but the technique is largely untested.

LIME SLURRY – AN INNOVATIVE MANAGEMENT TOOL FOR AQUATIC PLANTS

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ABSTRACT: Lime slurry is an innovative tool for the management of aquatic plants. Lime selects for desirable native vegetation and selects against the exotic *Potamogeton crispus* (curlyleaf pondweed). Lime reduces overall plant density, effecting all species. The idea for the use of lime as a lake treatment tool is fairly recent, originating in Canada. A seven-year research project determined that lime treatment effectively controlled macrophyte biomass. Invertebrate communities were unaffected when water pH was kept in its natural range (<10). Results from a pilot study in Big Lake, Polk County, WI indicated lime effectively reduced stem density and macrophyte biomass during two years of treatment and during one year following treatment. *Potamogeton crispus* (curlyleaf pondweed) was not observed in the treated plots even though the plant was found throughout the lake. Two Minnesota lakes received a combined treatment of alum and lime slurry. A very dense curlyleaf pondweed growth was observed in the lakes annually during the early summer period prior to treatment. Following treatment, curlyleaf pondweed was not observed. The Canadian, Wisconsin, and Minnesota projects concluded that lime effectively controls macrophyte growth, but did not determine a mode of action. Suggested hypotheses include (1) alteration of sediment chemistry, (2) changes in ammonia resulting from pH changes, (3) changes in carbon resulting from pH changes, and (4) interference with photosynthesis from precipitation on leaves. The Army Corps of Engineers is currently conducting a lime slurry research project at its Eau Galle Aquatic Ecology Lab to determine the mode of action.

EARLY SPRING APPLICATIONS OF AQUATHOL K FOR CONTROL OF CURLYLEAF PONDWEED AND EURASIAN WATERMILFOIL

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ABSTRACT: The exotic plants curlyleaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*) have become wide spread in many northern lakes. Herbicide applications are in many cases limited to a small percent of the littoral zone because of concern for native aquatic plants, and large stands of the exotic plants remain. Herbicides are usually applied in late spring or early summer when exotic plants reach nuisance levels, and after curlyleaf pondweed has formed reproductive structures. Five lakes infested with curlyleaf pondweed were selected in Minneapolis/St. Paul to demonstrate early spring herbicide applications for control of curlyleaf pondweed. Endothall was applied (as Aquathol K at 1 mg/L ai) for three successive years (2000-2002) to three lakes when water temperatures approached 15°C. Curlyleaf pondweed was controlled on an annual basis, and new turion formation was eliminated. Curlyleaf pondweed has returned each spring from residual turions deposited prior to the initial herbicide application. By summer of 2002, turion numbers had declined by more than 90% and the condition of residual turions has severely degraded. Following repeated whole-lake endothall applications native plant populations have increased coverage, the number of native species has increased, and native plant density has increased. Additional small-scale studies are being conducted to evaluate early spring applications of Aquathol K and 2,4-D to control both curlyleaf pondweed and Eurasian watermilfoil, and another field demonstration is being initiated.

IDENTIFICATION AND INVASIVENESS OF NORTH AMERICAN TYPHA SPECIES

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ABSTRACT: Identification of *Typha* (cat-tail) species is difficult because of hybridization and the unique morphology of the genus, the small size of diagnostic structures (stigmas, bractlets, pistil hairs, compound pedicels on the spike axis, pollen grains, and leaf glands), changes during development, dwarfing and spike abortion, and the loss of stigmas, bractlet tips and leaf auricles due to abrasion. *Typha angustifolia* was probably introduced from Eurasia into the Atlantic Coastal region in colonial times and later into California. In recent decades it has spread rapidly westward from the Atlantic Coast through the Great Plains. Hybridization is likely wherever two species grow together and bare soil is available for seed germination and seedling establishment. Both *T. angustifolia* x *T. latifolia* (*T. x glauca* Godron) and *T. domingensis* x *T. latifolia* hybrids are highly sterile and produce very few seeds, but they can spread by means of rhizomes and produce enough viable pollen to backcross to their parents. *Typha angustifolia* x *T. domingensis* hybrids are fertile and are locally common in south-central U.S. (especially Kansas) and central California. Introgression is probably locally common but is difficult to detect using morphology. *Typha domingensis* often is a troublesome invasive in eutrophic wetlands from the Southeast U.S. into the tropics. *Typha latifolia* is a normal member of many undisturbed wetland communities, but *T. angustifolia* and *T. x glauca* are serious invasive weeds that often colonize disturbed habitats such as ditches and dredge spoil, then spread by rhizomes into adjacent

natural wetlands, where they often appear to outcompete native plants including *T. latifolia*.

INVASIVE PLANTS: BIOCONTROLS

Saturday, September 27 - morning

ROSE ROSETTE DISEASE AS A POTENTIAL BIOLOGICAL CONTROL AGENT FOR MULTIFLORA ROSE IN WISCONSIN

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ABSTRACT: Rose Rosette Disease (RRD) has been shown to reduce populations of the invasive species *Rosa multiflora* Thunb. (multiflora rose) in certain situations. RRD is believed to be caused by a double-stranded RNA particle, vectored by *Phyllocoptes fructiphylus*, an eriophyid mite. The RRD organism is native to North America. The proposed method of using RRD as a biocontrol measure involves grafting diseased plant material into established stands of multiflora rose. In areas meeting conditions for effective control (full sun, plants suitably close together and perhaps sufficient winter protection), RRD will reportedly control multiflora rose infestations within a few years of introduction. Host range concerns have hindered the acceptance of this disease as a biocontrol agent. Reported hosts are restricted to the genus *Rosa*, but *Rosa* is a genus with many friends and fanciers. Despite evidence of limited natural spread, many growers of cultivated roses have expressed concern about use of the disease. To date, the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) has not issued permits allowing the movement of RRD within the state because of inadequate survey data on the occurrence of the disease. Efforts are underway to determine the extent of the disease in the state.

BIOLOGICAL CONTROL OF LEAFY SPURGE (*EUPHORBIA ESULA*) ON FORT MCCOY

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ABSTRACT: *Euphorbia esula* (leafy spurge) is a tenacious, highly invasive Eurasian plant species that is extremely difficult to control outside of its native habitat. With a root system that can spread up to 20+ feet vertically, a complex network of rhizomes with root buds, and a seed dispersal rate of approximately 150-200 seeds per plant, leafy spurge populations create a control dilemma for landowners and managers. Herbicides have had limited success in the control and eradication of leafy spurge. Biological control agents have played a vital role in controlling leafy spurge populations in some western states and are an important part of an integrated weed management approach. Chrysomelid flea beetles (*Aphthona* spp.) have been widely used for leafy spurge control and were first introduced on Fort McCoy in 1991. The flea beetles feed on various leafy spurge vegetative parts. Adults generally feed on the leaves and then lay their eggs in the soil near the stem base. Once the larvae emerge, they borrow into the fine root system to feed. In June and July 2002, *Oberea erythrocephala* (red-headed spurge stem borer) was released on the fort for the first time. The effectiveness of these species depends on various habitat criteria. Variables that are important to the success of the beetles include spurge density, exposed ground, vegetative cover, and possibly soil type. Site preparation (i.e., burning, mowing, raking, and herbicide use) for the release of bio-control agents may enhance their ability to become established and increase their population size. To date, > 50 sites have been established on Fort McCoy where flea beetles and/or stem borer released. Leafy spurge control using these species has varied and may be a function of the initial release population, sandy soils, spurge and other vegetation density, and species selected for release.

THE EDUCATIONAL USES OF PURPLE LOOSESTRIPE BIOCONTROL IN THE HIGH SCHOOL CLASSROOM

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ABSTRACT: Teaching about invasive species and biocontrol provides educators with a great opportunity to involve students in real-life science. Wisconsin teachers use the bio-control of *Lythrum salicaria* (purple loosestrife) to teach about ecological concepts, field work, life cycles, wetlands, predation, water chemistry, and much more. Through the use of project or problem-based learning, students can bring all of these topics together in a meaningful way while contributing to the well-being of their wetlands and their community. Despite the advantages of these hands-on and minds-on activities, there are significant barriers to their wide-spread use in the classroom. With a shortage of time, an excess of students, and an emphasis on the maximum coverage of content, high schools are generally not set up for this type of learning. The increased emphasis placed upon high-stakes testing makes it even more difficult to justify the time required to carry out projects of this type. If we hope to more broadly implement these worthwhile learning opportunities we need to show concrete educational benefits for our students and encourage teacher training.

BIOLOGICAL CONTROL OF GARLIC MUSTARD: A STATUS REPORT AND WHAT'S NEXT?

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ABSTRACT: Invasion of *Alliaria petiolata* presents serious problems for native organisms and development of biocontrol appears the only viable long-term management option. Four European weevils, attacking seeds, stems and roots were evaluated for impact and host specificity. Root-attack by *Ceutorhynchus scrobicollis* appears most significant, reducing survival, biomass, and seed output of garlic mustard. Host-specificity investigations tested approximately 50 non-target plant species. Problems were encountered in growing or synchronizing North American plants with insect activity periods in Europe. Not all host specificity tests have been completed and additional tests are ongoing. Surveys for potential natural enemies in North America encountered a leaf-mining fly, a stem-mining

weevil, a stem-mining fly, and a number of externally feeding species but attack rates were extremely low or inconsequential. In preparation for a potential introduction of insects for biological control of garlic mustard, we developed a standardized monitoring protocol. This protocol incorporates measures of control agent abundance and feeding, garlic mustard performance (height, number of stems and siliques, number of rosettes, cover), and the response of the associated plant community in permanent 0.5m² plots. Only long-term monitoring will be able to detect a sustained impact of the release of biological control agents. We are confident that the remaining tests with additional North American plant species will show the specificity of all agents under investigation. We anticipate that releases of control agents may occur in 2004 or 2005.

BIOLOGICAL CONTROL OF EURASIAN WATERMILFOIL WITH HERBIVOROUS INSECTS

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ABSTRACT: The native *Euhrychiopsis lecontei* (milfoil weevil), is a candidate biological control agent for *Myriophyllum spicatum* (Eurasian watermilfoil). The weevil can cause declines and control the plant when it attains adequate densities ($\geq 0.25/\text{stem}$) that persist throughout the summer. The weevil has been associated with milfoil declines in 4 lakes in Minnesota; declines have persisted (≥ 3 yrs) in two lakes (Cenaiko and Otter) and in the shallow ($<2.5\text{m}$ depth) portion of Smith's Bay. At other lakes and times, weevil densities were too low to control the plant. Our research suggests that in-lake factors are more limiting than overwinter conditions. Because the weevil is iteroparous, laying 2-5 eggs per day, adult reproductive longevity and fecundity is critical to end of summer density. Enclosure/exclosure experiments indicate that sunfish (*Lepomis* spp.) can limit control agents. In enclosure experiments in a lake with high sunfish density, fish suppressed milfoil weevil density. In an enclosure experiment in a lake with low sunfish density, the milfoil weevil and *Parapoynx* sp. (Lepidoptera) were suppressed in fish enclosures. The reduction in *Parapoynx* resulted in a significant increase of *Zosterella dubia*, one of its food plants. On a larger scale, among lakes and years, we found significant negative relationships of sunfish and weevil (total and adult) densities. These results indicate that sunfish can be an important limiting factor in achieving adequate weevil densities for control. Plant nutritional status, which can affect daily fecundity, may also be important and a positive native plant community response is required for longer-term control.

BIOLOGICAL CONTROL OF PURPLE LOOSESTRIFE IN MINNESOTA (1992-2003), AND THE POTENTIAL FOR BIOLOGICAL CONTROL OF EUROPEAN BUCKTHORN

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ABSTRACT: Since 1992, four species of insects including two leaf-feeding beetles, *Galerucella californiensis* and *G. pusilla*, one flower-feeding weevil, *Nanophyes marmoratus*, and one root-boring weevil, *Hylobius transversovittatus*, have been introduced into the United States for control of purple loosestrife, *Lythrum salicaria* L.. Since the first introductions in Minnesota, we have evaluated establishment and control success of *Galerucella* spp. I will discuss: 1) cooperative rearing efforts; 2) establishment success; 3) landscape scale movement of control agents and its affect on insect distribution; and 4) control success and plant community response over the last decade. To date, more than 8 million *Galerucella* spp. have been released into more than 750 loosestrife infestations statewide. *Galerucella* has established at $>85\%$ of release sites visited since 1992. Release sites that have not established may be affected by flood events, habitat preferences, and/or other management practices. More than 45% of the ~ 300 release sites visited in 2002 had $>50\%$ total defoliation of the purple loosestrife plants. This is a 30% increase from 1999. On many sites it took several years of defoliation before loosestrife stem densities were significantly reduced. GPS and GIS technologies were used to map the movement of *Galerucella* spp. over time within four Minnesota wetlands in a small-scale study. We found that the beetles dispersed throughout the purple loosestrife wetlands within 1-2 years after initial release. We also examined the ability of *Galerucella* spp. beetles to disperse from their original point of release to other neighboring, noncontiguous loosestrife infested wetlands. In this large-scale study, over 160 sites were sampled in four distinct geographic areas in Minnesota. The beetles have dispersed up to 20 km and have colonized more than 85% of the sites surrounding the original release points within 4 years. I will also discuss new research efforts to determine the potential for biological control of buckthorn, *Rhamnus cathartica* and *R. frangula*. Exploratory efforts are underway in Europe to survey for insect associated with each buckthorn species and assess their potential as control agents.

INVASIVE PLANTS: CONTROL METHODS

Saturday, September 27 – morning and afternoon

RESTORING NATURAL PROCESSES INHIBITS THE RE-INVASION OF RHAMNUS CATHARTICA L. (COMMON BUCKTHORN) AND LONICERA X BELLA ZABEL (BUSH HONEYSUCKLE)

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ABSTRACT. In the Prairie-Forest Transition Zone large areas of former oak savanna are now choked with non-oak trees and introduced shrubs. In Wisconsin, these shrubs are primarily common buckthorn and bush honeysuckle. In the past, natural areas managers often tried to save the savanna structure by removing trees and shrubs. They called this "day-lighting." Unfortunately, day-lighting often needed to be repeated every few years and often did little to restore the ground-layer flora. In an effort to improve practices, we completed a four-year multi-factor field experiment at the UW-Madison Arboretum in sites where pest shrubs had recently been killed. We used general linear models and structural equation modeling to compare the interactive effects of canopy thinning, fire, deer exclusion, and the sowing of native herbs. Results are displayed in a path analysis chart. Day-lighting alone resulted in the greatest re-growth of shrubs. The combination of canopy thinning and fire best inhibited pest shrub cover and height. We strongly

recommend that the management activities used to control common buckthorn and bush honeysuckle include frequent surface fire, canopy thinning, and enrichment plantings of groundlayer species.

UTILIZING ROTATIONAL CATTLE GRAZING IN OAK SAVANNA RESTORATION

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ABSTRACT: The midstory invasion of aggressive native and non-native tree and shrub species contributes greatly to oak savanna degradation. In certain situations fire, a central management tool to reduce this invasion and encourage native species, is not always successful at reducing dense concentrations of shrubs or resprouting species. Under these circumstances, managed grazing may provide a means to reduce this cover, thereby enhancing future fire use. This study compared the effects of rotational grazing using Highland cattle, prescribed burning, and the two in combination on the vegetation structure and composition within an overgrown oak savanna (canopied) and interspersed prairie areas within the Yellowstone Lake Wildlife Area in southwest Wisconsin. Midstory shrub stem density and height and herbaceous vegetation cover and frequency were measured. Overall shrub density and height declined under both grazing and prescribed burning, with no burn-graze interaction. The impacts were species specific and dependent upon the vegetative community. Stem densities of *Rubus* spp. (brambles) and *Xanthoxylum americanum* (prickly-ash) declined under grazing, fire reduced *Ribes missouriensis* (gooseberry) and *Cornus racemosa* (gray dogwood) and each decreased *Corylus americana* (hazelnut) within the canopied areas. Within the prairie areas, prickly-ash density decreased under burning, while decreasing in height under grazing. Vegetative cover of grasses and exotic forbs remained nearly equal in all treatments, while native forb cover decreased with grazing within the canopied areas. Few effects were seen on plant frequency. Exotic forb cover increased under burning and grazing within the prairie areas, with introduced *Cirsium* spp. (thistle) and *Verbascum thapsus* (mullein) increasing in frequency.

MECHANICAL BRUSH MOWERS AND OTHER DEVICES FOR WOODY SPECIES CONTROL

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ABSTRACT: Within the 3,500-acre Scuppernon River Habitat Area located in the Kettle Moraine State Forest – Southern Unit, a large portion of the area consists of wet mesic prairie, sedge meadows, fens, and oak openings. However, until recently, only a small portion of the area had been burned, so some of these areas are covered with dense brush and trees. In 1999, we started to restore this area through the use of extensive controlled burns and large mechanical brush mowers. Controlled burns will continue to be our primary tool in our management activities to restore this area to its pre-settlement vegetation of low prairie, but we also needed a quick and efficient method to rid some selected high-quality sites of their dense brush. In winter, when the ground is frozen, large tracked mechanical mowers are used in those brushy prairies. These mowers chop the woody material into small enough pieces that there is no need to remove the material. Larger trees like buckthorn are sheared and chipped on site, and their stumps treated with herbicides so they don't sprout back. Since our start in 1999, approximately 300 acres of prairie have been mowed using this method. We have found that many of these sites respond immediately to the mowing, and the following spring, these mowed sites are covered with dense stands of herbaceous material including an abundance of low prairie species. By increasing the herbaceous material in place of the woody vegetation, our future fires will be much hotter and more effective in ridding the area of brush.

CREATIVE USE AND MAINTENANCE OF LAND MANAGEMENT TOOLS

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ABSTRACT: Learn some tricks of the trade for mosquito and chigger control, and ideas for maintenance and modification of the hand tools for land management.

SHEEP AND GOAT GRAZING TO CONTROL INVASIVE PLANTS

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HONEYSUCKLE, NOT AS SWEET AS ITS SCENT

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ABSTRACT: Herbicides for controlling *Lonicera* spp. (honeysuckle). Honeysuckle is a growing threat to our forestlands, overgrowing and out competing native vegetation. Control methods include the chainsaw, bow saw, hand pruners, and loppers. While the initial results look great, the honeysuckle soon sprouts back and one year later, the process continues. Today I would like to discuss the various herbicides available to the public, how to apply them, when to apply them, and what to use as an applicator. Herbicides mainly, Glyphosate (Round-Up) has been applied to the cut stumps or the foliage, thinking that Round Up can control any and all living plants. To no avail, Round-Up has been tried at different times, stumps and foliage and it still gives inconsistent results on this species. Most times, it dies back but will resprout. Transline and Garlon manufactured by Dow Agro Sciences, are another very popular herbicide applied to the foliage, fresh cut surface or basal bark, was thought to have some potential in controlling Honeysuckle, seemed to give inconsistent results. Escort manufactured by DuPont sprayed to the foliage or fresh cut surface gave excellent results with both applications.

STATUS OF KUDZU (*Pueraria lobata*) IN ILLINOIS: A FRAMEWORK FOR ERADICATION

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ABSTRACT: Field investigations were conducted in 1996 & 1997 by the Illinois Department of Natural Resources Division of Natural Heritage to determine the extent and distribution of kudzu (*Pueraria lobata*) in Illinois. As a result of this survey, 53 kudzu populations were documented from 23 counties. As a result of this information, the Division of Natural Heritage hosted a meeting on August 18, 1998 at Giant City Lodge to discuss the status of kudzu, a federal noxious weed, in Illinois. Land managers from various state and

federal agencies were invited to discuss several aspects of the threat of kudzu and its control in Illinois. It was also emphasized that all landowners in an infestation area must cooperate in a unified program. IDNR was then challenged to incorporate private landowners into any eradication program. In 1999, the Illinois Department of Natural Resources (IDNR) continued the Illinois kudzu survey and immediately began kudzu control on IDNR properties. Populations were treated using methods recommended by the Kentucky Nature Preserves Commission, which, as an agency, had been treating kudzu in Kentucky since 1990. In March, 2002 State and Federal agencies in Illinois entered into a landmark agreement to implement a formal plan to eradicate kudzu from Illinois. As a result of this agreement, The Illinois Department of Agriculture added kudzu to Illinois list of State Noxious Weeds and IDNR is currently working with State legislators to add kudzu to the list of Illinois State Exotic Weeds.

NEW APPROACHES FOR CONTROLLING GRASSLAND INVASIVE FORBS: A PANEL DISCUSSION

Moderated by Matt Zine¹. Panel members include: Willis Brown², Mike Engel³, and Jerry Doll⁴. ¹WDNR Natural Areas Program, 3911 Fish Hatchery Rd., Fitchburg, WI, USA, 53711. matthew.zine@dnr.state.wi.us. ²Michler and Brown, LLC, 5110 Odana Rd., Madison, WI, USA, 53711. webrown3@hotmail.com ³US Fish and Wildlife Service, 4511 Helgeson Dr., Madison, WI, USA, 53718-6747. mike_engel@fws.gov ⁴University of Wisconsin Weed Science Program, 1575 Linden Dr., Madison, WI, USA, 53706. jddoll@wisc.edu

ABSTRACT: This will be a 90 minute panel discussion format that will focus on novel approaches to controlling our most formidable grassland invasive forbs. Each panel member will do a ten-minute talk on a particular grassland invasive, strictly focusing on the latest control methods. This could be from personal experience, peer experience, or from recent research. Each 10-minute presentation will be followed by 5 minutes of open discussion. This is NOT meant as a review of past control methods or life histories, but rather an update on the latest control protocols. The six invasives/invasive groups are as follows: Brown will cover *Pastinaca sativa* (wild parsnip)/*Daucus carota* (queen anne's lace), *Melilotus* spp. (white and yellow sweet-clover), and *Coronilla varia* (crown vetch)/*Lotus corniculata* (bird's foot trefoil). Engel will cover *Centaurea biebersteinii* (spotted knapweed). Doll will cover the *Cirsium/Carduus* spp. (thistles) and *Euphorbia* spp. (leafy and cypress spurge).

INVASIVE PLANTS: EDUCATION

Saturday, September 27 - afternoon

INVASIVE SPECIES AS RESOURCE FOR ACADEMICALLY-BASED EXPERIMENTATION AND SERVICE LEARNING

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ABSTRACT: We report on an experiment done in our spring Biology 112 classes (Biology for Elementary Education majors) where students evaluate the hypothesis, H₀: One factor that contributes to the proliferation of purple loosestrife (*Lythrum salicaria*) is that its seeds germinate more successfully than seeds from potential co-occurring native species. Academic topics covered by this experiment include scientific method, experimental design, seed morphology, seed dormancy, plant competition, ethnobotany, invasive species, and data collection and processing. The large number of native plants this experiment generates are transplanted into larger containers and utilized at the end of the semester in a habitat restoration service-learning project. Pairs of students are given a bag of seeds to plant by establishing six replicates of 100 seeds each. Germination data are collected for three weeks, after which the data are graphed and analyzed. Students compare overall germination success and timing of emergence. In a final paper students research their species for information concerning habitat preference, distribution, relative abundance, and ethnobotanical usage. In this paper they also formally assess the hypothesis stated above. This project is extremely popular with students because of its pertinence (Purple loosestrife is a problem in the natural areas on our campus), its relevance (this hypothesis is seldom considered in invasive species studies), and because of its service-learning component. Purple loosestrife is an excellent species to use in this experiment because of its rapid and high germination, fast growth and copious seed production, although other non-native invasive species may be appropriate as well.

CLEAN BOATS, CLEAN WATERS

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ABSTRACT: Boater education is the key to preventing the continued transfer of aquatic invasive species between water bodies. With increased state budget cuts, it only makes sense to encourage volunteers to monitor and educate boaters about invasive species. This presentation provides an overview of how volunteer boat launch education started in Wisconsin, and summarizes the training and activities of the volunteers currently acting as the front line defense against invasive species.

NOT IN OUR WOODS: A MODEL FOR EDUCATING WOODLAND OWNERS ABOUT INVASIVES

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ABSTRACT: Workshops have proven effective in teaching forest owners learn how to identify, control, and combat invasive woodland species. This session will present a model for "delivering" practical information to forest owners that has been used with over 300 Wisconsin landowners and resource managers in the past two years. Suggestions will be given for adapting the basic curriculum to groups with varied levels of expertise and regional needs. Emphasis will be on specific ways to provide hands-on classroom and field experiences for participants that enhance learning, ability to prioritize goals, commitment to action, and fun! Non-native invasive species are dramatically altering the composition and structure of our natural communities, displacing native plants, wildlife, and even inhibiting tree regeneration. Training forest owners and resource managers in how to recognize and

control these species—and understand the problems they pose for our woodlands—is a challenge we must confront in a timely and efficient manner if we hope to retain the unique forest communities of the Great Lakes States. Forest owners who are involved in organizations such as Wisconsin Woodland Owners Association (WWOA), Sustainable Forestry Landowner Groups, or are enrollees of the Managed Forest Law (MFL), are more likely to actively manage their lands. They provide a good potential target audience for both disseminating information and recruiting future “invasives educators”.

INVASIVE PLANTS:

FUNDING OPPORTUNITIES AND RESOURCES FOR PRIVATE LANDOWNERS

Saturday, September 27 - morning

WILDLIFE HABITAT RESTORATION ON PRIVATE LANDS: HOW THE U.S. FISH AND WILDLIFE SERVICE CAN HELP COMBAT INVASIVE SPECIES

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ABSTRACT: Private landowners are eligible to receive financial and technical assistance from the United States Fish & Wildlife Service's Partners for Fish and Wildlife Program. The Program's goal is to increase habitat for endangered species, migratory birds, and waterfowl on private lands. Among other habitat restoration practices this includes control or eradication of invasive species. Up to 100% funding is possible.

WISCONSIN'S FOREST TAX LAWS AND THEIR IMPLICATIONS FOR NATURAL COMMUNITY RESTORATION

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ABSTRACT: While many landowners interested in natural community restoration are unaware that they may be eligible for tax savings under Wisconsin's forest tax programs, many already enrolled in the programs are unaware of the programs' implications for restoration. This presentation will outline Wisconsin's major forest tax programs, the rules of eligibility, and the implications for restoration by natural community.

USDA PROGRAM ASSISTANCE OPPORTUNITIES

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ABSTRACT: The United States Department of Agriculture (USDA), Natural Resources Conservation Service offers private landowners technical and financial assistance to restore, establish, and manage various plant communities on their property, including the control of invasive plants. USDA programs like the Wildlife Habitat Incentives Program targets rare and declining habitats, Environmental Quality Incentives Program can cost share invasive species removal, and the Conservation Reserve Enhancement Program helps restore grasslands and wetlands. These programs provide financial assistance in the form of direct payments and/or cost shared funding for implementing practices that benefit certain plant communities or habitat types. This presentation will discuss the various USDA programs available to landowners.

INVASIVE PLANTS:

GENERAL CONTRIBUTED SESSION

Saturday, September 27 – afternoon - Meeting Room

A STRATEGIC APPROACH FOR MANAGING INVASIVE PLANT SPECIES AT NATURE RESERVES

Alan T. Carpenter¹, John M. Randall², and Thomas A. Murray¹. ¹Land Stewardship Consulting, Inc., 2941 – 20th Street, Boulder, CO, USA, 80304. alanc@landstewardshipconsulting.com ²The Nature Conservancy Invasives Program, 124 Robbins Hall, Dept of Vegetable Crops & Weed Science, University of California, Davis, CA, USA, 95616. jarandall@ucdavis.edu

ABSTRACT: Invasive species problems are global in scope and are intensifying. Invasive species affect the species, community, ecosystem, and landscape levels of biological organization. They cause changes in ecosystem structure and function, species extinctions, species declines, and changes in community composition. Conservation organizations must incorporate invasive species management into their on-going operations at nature reserves where invasives pose significant threats to conservation targets. However, approaches to invasive species management have been largely piecemeal and disjointed, without a comprehensive strategy. There is a dire need for strategic approaches to preventing and managing invasions. We propose a five-part, site-based conservation strategy consisting of 1) preventing new invasions by reducing the entry of new invaders; managing natural areas to minimize their invasibility; and detecting and eradicating incipient invasions; 2) setting a high priority for managing invasive species at sites with high threats to conservation targets; 3) developing integrated invasive species management plans for all nature preserves where invasive species significantly threaten conservation targets; 4) working with partners to educate and inform key constituencies about the threats that invasive species pose to biodiversity conservation, and to provide invasive species information and training to natural area managers; and 5) working with partners to help local units of government adopt ordinances and policies that will support invasive species management. Conservation organizations must commit to a concerted, coordinated, and integrated effort to manage invasive species successfully. Without a major effort, invasive species will prevent conservation organizations from achieving their goals at many nature reserves.

MODELS FOR INVASIVE SPECIES CONTROL IN COMMUNITIES: BUCKTHORN BUSTING IN MINNEAPOLIS/ST. PAUL

Mary Maguire Lerman. Minneapolis Park and Recreation Board Environmental Operations Section, 3800 Bryant Avenue South, Minneapolis, Minnesota 55409. mlerman@minneapolisparcs.org

ABSTRACT: Many invasive species in parks and native ecosystems were never directly planted. In most cases these invaders have been bird-transferred from private landscapes to these lands. In order to effectively control these invaders in public lands, private homeowners must assist by removing these plants on their lands. A USDA Forest Service sponsored grant provided to the cities of Minneapolis and St. Paul from 2001-2003 provided funds for removal of invasive woody species on parklands along the Mississippi River that borders both cities. In addition, mini-grants were supplied to adjoining neighborhoods to initiate removal of woody invasives from private lands. Educational materials produced include a resource guide to assist communities in organizing the removal of invasive species from private properties and a report on Global Positioning System and Geographic Information System as an Invasive Weed Species Monitoring Tool.

Neighborhood Invasive Species Roundups provided for the pickup of invasives on specific dates from private properties. These efforts garnered much publicity for the invasive species problem and as a result other adjoining communities are now organizing long term community efforts. Other grants have been obtained resulting in the production of detailed art work of 10 woody invasives that will be available online by the end of 2003.

DOES ESCAPE FROM NATURAL ENEMIES CONTRIBUTE TO INVASIVENESS OF INTRODUCED PLANTS? AN EXPERIMENTAL TEST WITH GOLDENROD (*SOLIDAGO GIGANTEA*)

Gretchen Meyer¹, Robert Clare², and Ewald Weber³. ¹University of Wisconsin-Milwaukee Field Station, 3095 Blue Goose Road, Saukville, WI, 53080 USA, gmeyer@uwm.edu ²Dept. of Biological Sciences, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee WI, 53201 USA, tampopo@execpc.com and ³Geobotanical Institute, Swiss Federal Institute of Technology, Zollikerstrasse 107, CH-8008 Zurich, Switzerland.

ABSTRACT: When plants are introduced to new areas, they 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. We tested the EICA hypothesis using late goldenrod, *Solidago gigantea*, which is native to North America and invasive in Europe. Plants derived from multiple North American and European populations were grown in a common garden for two years. Half of the plants were protected from insect herbivores using a broad-spectrum insecticide, and the other half were exposed to insects that colonized the garden from nearby fields. Insect herbivores and plant pathogens were censused at regular intervals, and plant performance was assessed by measuring plant heights periodically and infructescence biomass at the end of the season. European plants were more heavily attacked by fungal pathogens in both years of the study, but results for insect herbivores were inconsistent between years. European plants supported significantly higher herbivore loads than US plants in the first year but not the second. European plants produced less seed than US plants only if plants were unprotected from insect herbivores; when plants were sprayed, seed production of European and US plants was equivalent. These results generally support the EICA hypothesis: plants from the introduced range were more susceptible to some natural enemies and benefitted more from the insecticide spray than plants from the native range.

INVASIVE PLANTS: HERBICIDE USE

Saturday, September 27 - afternoon

SO YOU'VE DECIDED TO USE AN HERBICIDE: WHAT ARE THE BASICS TO ENSURE SUCCESS AND SAFETY?

Jerry Doll. University of Wisconsin-Madison, Department of Agronomy, 1575 Linden Dr., Madison, WI, USA 53706. jddoll@wisc.edu

ABSTRACT: Herbicides can be an effective and labor-reducing tool in invasive plant management. They can also present problems if not properly selected and applied. Successful chemical weed management has three basic components: selecting the right product to control the target weed while protecting you and the environment. Beyond identifying a herbicide to control your target weed, the selection must also consider the nature of the habitat and adjacent areas where the invasive plant is found, the duration of control needed, and the type of application (foliage, cut stem or soil treatment) that will be made. Learn to read herbicide labels, including the active ingredient statements. Labels give a wealth of information of how to achieve the desired level of control with the least risk to the environment and the appropriate protection measures to ensure your safety. Some products have a groundwater advisory statement and must not be used in sites vulnerable to contaminating groundwater. Others may have a long life in the soil which may or may not be appropriate for the weed and habitat you are working with. Know how to apply the recommended rate and no more. It is legal to apply less than the labeled rate but it is illegal to apply more product than the label allows. Examples of effective and protective herbicide use in invasive weed management will be given.

ALTERNATIVES TO CONVENTIONAL HERBICIDES

Steve Glass, UW-Madison Arboretum, 1207 Seminole Hwy, Madison, WI 53711 USA. sbglass@facstaff.wisc.edu

ABSTRACT: Vinegar solutions, citrus oils, and corn gluten, among other preparations, are being talked about more and more these days as viable alternatives to conventional herbicides. They are reviewed in gardening and horticultural magazines and referenced in restoration and conservation journals. As commercial vinegar-based and corn gluten products are finding their way onto the home center shelf, and as a spray bottle of vinegar or bag of corn gluten is more often found in the typical land manager's pest plant control "toolbox", researchers have begun testing the efficiency and effectiveness of these items. This talk will: 1) examine what the weight of evidence and experience tells us about the effectiveness of these items; 2) talk about their side effects and limitations; 3) examine their usefulness to the professional weed warrior; and 4) discuss what role they might play in an overall pest plant control strategy and plan.

SUBTLE BIOLOGICAL EFFECTS OF COMMON HERBICIDES

Warren P. Porter. Department of Zoology, 250 N. Mills St., Madison, Wisconsin, USA, 53706. wporter@mhub.zoology.wisc.edu

ABSTRACT: Modern research is showing a variety of subtle impacts by herbicide mixtures and their "inert" (or) "other" ingredients on endocrine, nervous, and immune system functions, and developmental functions. I will describe recent data from the open literature and our own mixtures research that demonstrates effects at levels of exposure considered safe. I will also present information on nontoxic alternatives.

HERBICIDES: THE DO'S, THE DON'TS, THE HOW'S AND HOW NOTS TO TIMING AND ADDITIVES FOR ACHIEVING THE BEST RESULTS

Rick Schulte. UAP Timberland. N 125, Cty Highway C, Deforest, WI 53532. rschulte@uaptimberland.com

ABSTRACT: Plants have a natural ability to fend off enemies. These natural defenses of waxy cuticles, hairy leaf surfaces, and thick outer bark are protecting them from Mother Nature's own enemies. These natural defenses have also caused mankind some headaches in trying to control plant species with herbicides. A few ways to combat these natural defenses is with the use of adjuvants such as stickers, penetrants, water conditioners, and with different formulations of herbicides. We will discuss the best use conditions of certain herbicides and adjuvants to achieve optimum results.

INVASIVE PLANTS: IMPACTS OF INVASIVE PLANTS

Saturday, September 27 - morning

RHAMNUS CATHARTICA (COMMON OR EUROPEAN BUCKTHORN): REPLACEMENT OR ADDITION OF AN INVASIVE SPECIES INTO THE FLOODPLAIN FORESTS OF THE LOWER WISCONSIN STATE RIVERWAY

Esther M. Alsum¹, Brack W. Hale¹, and Michael S. Adams¹. ¹University of Wisconsin--Madison, Birge Hall, 430 Lincoln Drive, Madison, WI, 53706. emalsum@wisc.edu

ABSTRACT: Ecologically important, river-floodplains are highly vulnerable to habitat alteration and fragmentation, species invasion, and anthropogenic manipulation. As a result, few relatively intact river-floodplain systems remain. One such area is the Lower Wisconsin State Riverway, which encompasses 148 free-flowing km of the Wisconsin River with its adjacent floodplain. However, several factors, including species invasion, threaten the ecological integrity of this system. In this study, we investigate several aspects of the invasion of buckthorn into Riverway floodplain forests. We use data collected in nine study sites to determine whether the invasion of buckthorn functions as a replacement of or addition to the native flora. We explore possible effects of this shrub on plant community composition and differences among sites with buckthorn present and those without. Our results indicate that though species richness and diversity do not differ significantly between invaded and non-invaded sites or plots, total herb cover, mean coefficient of conservatism, and seedling and sapling density do differ. In addition, we found that certain herbaceous species are spatially correlated with the presence of buckthorn, while other species are found significantly less often in invaded areas. Multivariate analyses indicate that the herbaceous species composition in invaded sites and plots differ significantly from those that have not yet been invaded. Finally, our data indicate differences in environmental characteristics between invaded and non-invaded sites.

MICROSTEGIUM VIMINEUM: HOW WORRIED SHOULD WE BE? LIGHT AS A LIMITING FACTOR IN GROWTH OF M. VIMINEUM AND M. VIMINEUM'S EFFECTS ON SPECIES DIVERSITY

Carolyn Cromer. 2217 Alta Ave., Louisville, KY, USA, 40205. cecromer@wisc.edu

ABSTRACT: *Microstegium vimineum* (Japanese stilt grass) is an annual exotic grass that has invaded forests and grasslands from New York to Mississippi and west to Arkansas. Although a C4 grass, it is shade-tolerant and thrives in a broad range of habitats including forest bottomlands, creek beds, meadows, and forest edges. A field experiment was conducted with 50% and 75% shade cloth over 1 m² patches of *M. vimineum* and other forest herbs to determine whether light is a limiting factor in *M. vimineum*'s growth. Photosynthetically active radiation (PAR) light levels of 1-2.5% sunlight were shown to have a significantly negative effect on *M. vimineum*'s growth ($p = .02$). These levels correspond with light measured under juvenile *Acer saccharum* (sugar maple) and *Lindera benzoin* (spice bush) canopies where it has been observed that *M. vimineum* does not grow. PAR levels were also tested in a range of habitats and compared with *M. vimineum* growth. These data showed that *M. vimineum* competes best along forest edges where light levels average 35%. A vegetation survey was conducted to test whether *M. vimineum* is correlated with a reduction in plant species diversity. Results confirm that *M. vimineum* is negatively correlated with the number of plant species across habitat types and suggest that it is negatively correlated with the coverage of other plant species in creeks and forest edges. Recommendations for managers with limited resources are to focus on eradicating *M. vimineum* along forest edges where it has a competitive advantage and the most detrimental effect on species diversity.

USING DATA ON IMPACTS OF INVASIVE SPECIES TO HELP PRIORITIZE THREATS AND DOCUMENT THE NEED FOR PREVENTION AND CONTROL ACTIVITIES

John M. Randall. The Nature Conservancy, Wildland Invasive Species Team & University of California, Weed Science Program, 124 Robbins Hall, University of California, Davis, CA 95616. jarandall@ucdavis.edu

ABSTRACT: Although many invasive plant species have dramatic visual impacts and are strongly suspected of having significant harmful impacts on native species populations, communities and ecosystems, there was a dearth of quantitative data on these impacts and their intensity just a decade ago. This lack of information was a sorely felt by land managers who needed to determine which invaders and infestations were most threatening to the species and systems they sought to protect. Fortunately, in recent years more and more studies of the ecological effects of different invasive plants have appeared. I will provide an overview of these studies from across North America, which reveal that a surprising number of invasive plants have significant impacts on ecosystem processes and abiotic parameters including fire regimes, nutrient cycling, hydrology and soil chemistry. These studies also provide solid evidence that

some invaders have significant impacts on biotic communities and populations such as changing the structure of vegetation, reduced recruitment of native species and promotion of other non-native animals and plants. Some have also revealed that certain species have less impact than had been suspected and thus may not need to be targeted for control in some situations. Together, these studies not only provide data that helps land managers better allocate resources to addressing the most severe threats, they can also provide solid evidence for the importance of management efforts to control and prevent selected invaders. Studies on whether and how impacts of an invasive plant vary with its abundance or across its range remain rare but could yield both important basic ecological information and useful practical insights on whether there are thresholds of abundance below which an invaders impacts may be acceptable.

IMPACTS OF INVASIVE PLANTS ON NATIVE AMPHIBIANS

Victoria Nuzzo¹, John Maerz², Carrie Brown², and Bernd Blossey². ¹ Natural Area Consultants, 1 West Hill School Road, Richford, NY, USA 13835. vnuzzo@earthlink.net ² Department of Natural Resources, Cornell University, Ithaca, NY, USA 14853.

ABSTRACT: Amphibian populations are declining worldwide due to multiple causes, including habitat loss, pollution, and disease. Invasive plants may contribute to amphibian decline by altering habitat structure and food webs. Using a combination of field studies and experimental venues we tested for impacts of *Lythrum salicaria* (purple loosestrife), *Alliaria petiolata* (garlic mustard), and *Fallopia japonica* (Japanese knotweed) on *Bufo americanus* (American toad), *Plethodon cinereus* (red backed salamander), and *Rana clamitans* (Green frog), respectively. Purple loosestrife had a negative effect on the development and survival of American toad tadpoles, and Japanese knotweed had a negative effect on the foraging success of Green frogs during their migrations from ponds to terrestrial overwintering habitats. However, garlic mustard had no measureable effect on red-backed salamander abundance. Garlic mustard invasions were associated with increased abundance and impacts of nonnative earthworms on forest floors. Nonnative earthworms reduced leaf litter levels, reducing the abundances of many invertebrate species that are important salamander prey.

INVASIVE PLANTS

PANEL DISCUSSION: SESSION TO SHARE OBSERVATIONS AND DATA ON IMPACTS OF INVASIVE PLANTS IN THE UPPER MIDWEST

Facilitated by James Reinartz, University of Wisconsin-Milwaukee Field Station, 3095 Blue Goose Road, Saukville, WI, 53080, USA.

ABSTRACT: Participants should come prepared to share any data or observations on the impacts of invasive plants on wildlife, native plants, natural communities, recreation, aesthetics or economic values. This type of data can be used to help convince decision-makers and funders of the severity and urgency of this issue.

INVASIVE PLANTS: INDUSTRY PERSPECTIVES ON INVASIVES

Saturday, September 27 - afternoon

REED CANARY GRASS: FRIEND AND FOE

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ABSTRACT: *Phalaris arundinacea* L. (Reed canary grass) represents one of the important dichotomies between natural and agricultural areas. In natural areas, it is highly persistent, invasive, and nearly impossible to control. It tolerates mowing, fire, and competition from other species. In agriculture, it is highly persistent, productive, and adaptable, but can be controlled by a combination of herbicide and tillage. *P. arundinacea* is tolerant of a wide range of environmental conditions, including drought, waterlogged soils, acid soils, and extreme cold. *P. arundinacea* easily propagates itself sexually, by seed, and asexually, by rhizomes and axillary buds. Both rhizomes and seed can persist under a wide range of soil conditions, contributing to longevity of the species. *P. arundinacea* has no serious natural pests, reducing the options for biological control. Most populations of *P. arundinacea* found in wild or natural areas are "wild" types that possess antiherbivory mechanisms. Relatively high cell-wall and lignin concentrations reduce feeding by insects, while several indole alkaloids reduce herbivory by mammals, including livestock. Plant breeders have developed cultivars of *P. arundinacea* with modified alkaloid profiles and concentrations, increasing palatability and quality of herbage to grazing livestock. These efforts have transformed most of the seed market for *P. arundinacea* from "wild" types to low-alkaloid cultivars, increasing demand and usage of the species for livestock agriculture. The high herbage yields, broad environmental adaptation, and long-term persistence of the species are also responsible for interest in *P. arundinacea* as a bioenergy feedstock.

LINKING HORTICULTURE AND ECOLOGY TO PREVENT PLANT INVASIONS: VOLUNTARY CODES OF CONDUCT

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ABSTRACT: In a series of workshops hosted by the Missouri Botanical Garden and Chicago Botanic Garden, a variety of stakeholders have been meeting to address the invasive plant problem. The group agreed to a number of principles, including that plant introduction should be pursued in a manner that acknowledges and minimizes unintended harm and that research, education, and professional training are essential to understanding the invasive plant issue and to positively affecting consumer demand, proper plant use, and development of non-invasive alternatives. The group has developed voluntary professional codes of conduct for government, nursery professionals, landscape architects, botanic gardens and arboreta, and the gardening public. The codes are designed to curb the use and distribution of invasive plant species through self-governance and were developed recognizing that that future government regulation may be needed if such efforts prove insufficient. Proceedings from these workshops are posted at:

<http://www.mobot.org/invasives/welcome.html>

IDEAS FOR AN IMPROVED RELATIONSHIP BETWEEN THE NURSERY INDUSTRY AND NATURAL AREAS MANAGERS

Michael Yanny--plant propagator. Johnsons Nursery, W180 N6275 Marcy Rd., Menomonee Falls, WI., 53051.
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Abstract: The presentation will illustrate the strained relationship between the nursery industry and natural areas managers, especially as it concerns invasive plant species. Ideas for improved relations will be suggested.

INVASIVE PLANTS

PANEL DISCUSSION: INDUSTRY PERSPECTIVES

HOW DO PLANT RELATED INDUSTRIES VIEW THE PROBLEM OF INVASIVE PLANTS AND HOW WILL THEY RESPOND?

Facilitator: Susan Lehnhardt, Applied Ecological Services, Inc, 17921 Smith Rd., Brodhead, WI, USA 53520. Panelists: Michael Yanny, Johnsons Nursery, W180 N6275 Marcy Rd., Menomonee Falls, WI, USA 53051; Michael Casler, U.S. Dairy Forage Research Center, 1925 Linden Dr. West, Madison, WI, USA 53706-1108, mdcasler@wisc.edu; Kayri Havens, Institute for Plant Conservation, 1000 Lake Cook Road, Glencoe, IL, USA 60022. khavens@chicagobotanic.org; Juris Repsa, Domtar Industries, Inc., 100 Wisconsin River Drive, Port Edwards, WI, USA 54469.

ABSTRACT: Panelists from major plant related industries, including nursery, agriculture, forestry, and horticulture will discuss industry concerns regarding invasive species, how they perceive their role in the problem, the economic costs to the industry and to society, and their level of commitment to addressing this problem. Panelists will also field questions from the audience.

INVASIVE PLANTS: INVASIVES AFFECTING FORESTS

Saturday, September 27 - afternoon

NON-NATIVE INVASIVE SPECIES ON EASTERN NATIONAL FORESTS

Nancy Lizette Berlin¹ and Rita Beard². ¹USDA Forest Service Eastern Region, 626 East Wisconsin Avenue, Milwaukee, WI 53203. nberlin@fs.fed.us ²USDA Forest Service Rangeland Ecology Unit, 2150 Centre Avenue, Fort Collins, CO 80526. rbeard@fs.fed.us

ABSTRACT: The U.S. Forest Service Invasive Plants Program has been active since the 1970's with initial emphasis on noxious weeds found on rangelands in the western U.S. Approximately four million acres of National Forest System lands are infested with invasive plants nationally with 350,000 acres in eastern national forests. Up to 1700 acres of noxious weeds have been treated annually in eastern national forests since 1997. Figures for invasive forest animals are not available although there is growing concern over the effects of non-native earthworms on native species in eastern forests, as well as exotic birds replacing native species and restoration of native fisheries. The Eastern Region of the Forest Service released a Non-Native Invasive Species Management Plan for plants and animals. NNIS Budgets are expected to increase at least four-fold in the next few years as forests become more engaged in NNIS management. Partnerships with local agencies and organizations are also expected to expand. At the regional level, training is provided on international inventory and monitoring protocols, herbicide application and preparation environmental documents under NEPA. Online and pocket NNIS field guides have been developed. Prevention and control of NNIS via timber, recreation and special uses management practices on national forest lands is being addressed. NNIS issues and management are summarized for national forests in Minnesota, Wisconsin, Michigan, Illinois, Missouri, Ohio, Indiana, Pennsylvania, New York, Vermont, New Hampshire, and West Virginia.

INCORPORATING INVASIVE SPECIES IN FORESTRY PLANNING AND PRACTICE ON PRIVATE LANDS

Fred Clark, Clark Forestry, Inc. PO Box 88, Baraboo, WI 53913 fclark@clarkforestry.com

ABSTRACT: Southern Wisconsin supports a very productive hardwood forest resource, however the majority of that resource consists of first generation oak and mixed hardwood forests which arose from oak savanna and oak woodlands following fire suppression. While many of these forests still support high value timber, numerous stresses including fire suppression, fragmentation and isolation resulting from agricultural conversions, and histories of grazing and high-grade logging have resulted in high disturbance levels and the presence of numerous exotic/invasive species that threaten both biotic integrity and forest productivity. Practicing sustainable forestry in this landscape requires targeted field assessment to identify current infestations of invasive/exotic species, and planning for potential threats which may be increased as a result of timber harvesting or other related cultural practices. Incorporating these needs into forestry practice will be discussed, as well as the economic implications of this work for owners managing with an expectation of positive economic returns.

NORTH CENTRAL WOODLAND INVASIVE SPECIES SURVEY

Christopher W. Evans. Iowa State University Department of Natural Resource Ecology and Management, 253 Bessey Hall, Ames, IA 50011-1021. evanscw@iastate.edu

ABSTRACT: Many natural resource managers hold the assumption that invasive species are a major threat to woodland ecosystems. However data that supports this assumption are often lacking. Without quantitative data that clearly demonstrates that invasive species are posing a threat to native systems, funding and legislation aimed at control of invasive species is difficult to acquire. The North Central Woodland Invasive Species Mapping Project is a volunteer based survey that collects data about the distribution and severity of four woodland invasive species throughout Iowa, Wisconsin, Indiana, and Michigan. The four target invasive species are: *Alliaria petiolata* (garlic mustard), *Rhamnus cathartica* (common buckthorn), *Lonicera tatarica* and *L. maackii* (bush honeysuckle), and *Rosa multiflora* (multiflora rose). While this is an ongoing project, a two-year pilot study was conducted in Iowa throughout the summers of 2002 and 2003. Maps, produced from the results of the pilot study, show the distribution as well as severity of invasion for each

invasive species throughout the state of Iowa. The presentation will focus on the formulation of the survey methodology along with results from the pilot study in Iowa.

WEEDS IN THE WOODS

Gary Fewless. Cofrin Center for Biodiversity, University of Wisconsin-Green Bay, Green Bay WI USA 54311-7001.

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ABSTRACT: The spread of invasive species into forests can directly impact the forest by decreasing plant diversity, with the potential for cascading effects on the dependent fauna. Where management of the forest includes concerns for biodiversity, secondary impacts may involve loss of function to forest users and increased costs and management responsibility for rare species imperiled by loss of habitat due to the invasives. Historically it has been difficult to mobilize resource managers until the problems are so large that they become very expensive long-term processes or become completely uncontrollable. The best control program includes monitoring and early detection with appropriate action based on the experience of previous invasions in that forest type.

SKID TRAILS AND HAUL ROADS AND THEIR INFLUENCE ON PLANT RICHNESS AND COMPOSITION: A RESEARCH STUDY

Elizabeth A. Nauertz¹, David S. Buckley², Thomas R. Crow³, and Kurt E. Schulz⁴. ¹USDA Forest Service, North Central Research Station, Rhinelander, WI 54501, USA. enauertz@fs.fed.us ²Primary author, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, P.O. Box 1071, Knoxville, TN 37901, USA. dbuckley@utk.edu ³USDA Forest Service, North Central Research Station, Grand Rapids, MN 55744, USA. tcrow@fs.fed.us ⁴Department of Biological Sciences, Southern Illinois University at Edwardsville, Edwardsville, IL 62026, USA. kschulz@siue.edu

ABSTRACT: We evaluated impacts of disturbance in interior haul roads and skid trails on understory vegetation by documenting the area extent of these features and plant composition along 10m x 100m belt transects in managed northern hardwood forest landscapes in Upper Michigan, USA. Soil compaction, canopy cover, photosynthetically active radiation (PAR), and the richness and composition of trees, shrubs, and herbs were quantified within each feature (haul road, skid trail, and forest without soil disturbance). These variables were also quantified in unmanaged northern hardwood stands of comparable age (approx. 80 years). On average, skid trails and haul roads comprised up to 16% of total managed stand area. Compaction, PAR, and soil moisture were highest in haul roads. Understory plant richness was significantly greater in haul roads than in skid trails and forest, and resulted from significantly greater percentages of introduced species (13%) and wetland species native to the area, but not normally abundant in northern hardwood stands (23%). The impact of haul roads on understory vegetation has received far less attention than impacts on soil properties and water quality. Although haul roads comprise a relatively small proportion of total stand area, they serve as primary conduits for the dispersal of introduced species into the interior of managed stands, which may contribute to significant shifts in plant richness and composition at the stand level.

ELIMINATING AND HARVESTING BLACK LOCUST FROM YOUR FOREST

Juris Repsa. Domtar Industries Inc. Wood Procurement, 100 Wisconsin River Drive, Port Edwards, Wisconsin, 54469-1492.

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ABSTRACT: *Robinia pseudoacacia* (black locust) is not native to Wisconsin, but was planted extensively in the late 1930's for erosion control. It has now become a serious threat to forest stands by aggressively shading out desired tree species. Transline can be used as a basal bark application to the bole of pole-sized black locust trees to effectively control and eliminate this specie without damaging other nearby conifer or hardwood trees. Treated black locust that have died from the herbicide application can be harvested for pulpwood without the fear of resprouting from stumps or root suckering and can be utilized at Domtar's Nekoosa Paper Mill.

EXOTIC SPECIES IN WISCONSIN FOREST UNDERSTORY COMMUNITIES: WHAT A DIFFERENCE 50 YEARS CAN MAKE

Tom Rooney¹ Dave Rogers², Shannon Wiegmann³, and Don Waller⁴. ¹²³⁴Department of Botany, University of Wisconsin, 430 Lincoln Drive, Madison WI, USA 53706. ¹tprooney@wisc.edu ²darogers@wisc.edu ³smwiegmann@wisc.edu ⁴dmwaller@wisc.edu

ABSTRACT: From 1942 to 1956, the Plant Ecology Laboratory at the University of Wisconsin conducted a statewide vegetation survey of over 1100 sites in 28 community types that culminated in John Curtis' (1959) influential book *The Vegetation of Wisconsin*. Individual species were identified in a quantitative, replicated sampling scheme. Between 2000-02, we resurveyed 80 forest understory communities throughout the state that were originally surveyed by the Plant Ecology Laboratory. Sixty-two sites were in the relatively unfragmented northern Wisconsin, and 18 were in highly fragmented southern Wisconsin. We assessed changes in the identity and abundance of native and exotic (i.e. non-native) species. In the 1950s, 1.6% of northern and 16.7% of southern sites contained exotics. By 2000, 71% of northern sites and 94% of southern sites had exotics. In 2000, the average ratio of exotic to native species per site was 1 exotic to 24.0 natives in the north, and 1 to 4.8 in the south. The presence and abundance of exotic species was a poor predictor of native species diversity and native species losses since 1950. However, specific exotic species and specific weedy native species are linked to such losses. Because both native and exotic species can exhibit invasive traits and alter plant community structure, we should recognize that exotic and invasive are not synonyms.

INVASIVE PLANTS:

PHRAGMITES GENETICS AND IDENTIFICATION

Saturday, September 27 - afternoon

USING MORPHOLOGICAL CHARACTERISTICS TO DISTINGUISH INVASIVE INTRODUCED GENOTYPES OF *PHRAGMITES AUSTRALIS* FROM NATIVE NORTH AMERICAN GENOTYPES

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ABSTRACT: The causes underlying the population explosion of *Phragmites australis* in North American wetlands have eluded scientists for decades and habitat modifications and disturbance have been implicated frequently. Recent genetic evidence has confirmed the existence of introduced European genotypes in North America. Present-day populations of *P. australis* represent both native North American and introduced European haplotypes. Native genotypes appear non-invasive, while introduced genotypes are spreading rapidly. The cryptic invasion of European genotypes (apparently without hybridization with native genotypes) has resulted in disappearance of endemic genotypes in New England. Habitat loss and continued encroachment of invasive *P. australis* genotypes, plus conventional control treatments without respect of genotype may further reduce native populations to a point where the species (or certain genotypes) may become rare or endangered. We have established reliable morphological characters to distinguish native and introduced genotypes at all times of the year. While there is considerable character variation across North America, differences in stem coloration and texture and looseness of leaf sheaths can be used to clearly separate all native from introduced genotypes. The discovery of native and introduced genotypes will require new approaches for genotype-specific management of *P. australis*. Invasive, introduced genotypes should be controlled, while native genotypes should be preserved. The ability to distinguish different genotypes morphologically in the field will allow this genotype specific management. This workshop will provide hands on experience with material of different genotypes that will be brought to the workshop. **Participants are encouraged to bring their own samples (5 stems/site) to the workshop for identification.**

PHRAGMITES AUSTRALIS: A NATIVE INVASIVE SPECIES IN LAKE SUPERIOR WETLANDS?

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ABSTRACT: Over the past several decades populations of a competitively superior non-native strain of *Phragmites australis* (giant reed grass) have expanded rapidly in salt marshes of coastal North America, creating dramatic changes in community composition. Populations of *Phragmites* in coastal wetlands of the Great Lakes may similarly threaten the ecological integrity of these inland wetland communities. A combination of paleoecological and genetic analyses was used to determine when *Phragmites* became established in a Lake Superior coastal wetland and whether the source of *Phragmites* was non-native or native populations. Radiocarbon-dated stratigraphic changes in the abundance of pollen and macroscopic plant remains were used to infer the timing of vegetation changes in the wetland over the past 1000 years. There is no evidence that *Phragmites* grew at this site until the last several decades, suggesting that it is not native to this wetland and that its recent expansion may create significant changes in the wetland community. However, genetic data from chloroplast DNA sequences and microsatellite markers indicate that the *Phragmites* growing at this site is a variety that is native to North America and common throughout the Midwest. These results suggest that human-induced changes in the landscape in combination with long-term environmental changes over hundreds of years may play an important role in the expansion of native *Phragmites* populations at this and other similar sites.

INVASIVE PLANTS: POLICY AND POLITICS – FEDERAL, STATE, AND LOCAL

Saturday, September 27 – morning and afternoon

THE CITY OF ANN ARBOR'S INVASIVE SPECIES LIST

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ABSTRACT: In 1995, the City of Ann Arbor began taking initial steps to develop a City-wide Invasive Species List to prohibit developers from planting certain species in wetland mitigations. The development of the list was prompted by the City's interest in revising its Wetland Preservation Ordinance. The language in the ordinance that enables this list is as follows: "The use of native plants characteristic of local conditions is encouraged. Species should be selected based on the need for wildlife, restoration, landscaping, and recovery. The Building Department shall, in consultation with knowledgeable persons, maintain and update a list of botanical species that are considered invasive. Mitigation activities shall be performed without the use of invasive species." Although the initial use of the Invasive Species List was only in wetland mitigations, its application was expanded to include all building developments in 1996 when it was referenced in the Subdivision and Land Use Control Ordinance. In 1999, Ann Arbor's Invasive Species List was revised, with some species added and others removed. This current version of the list contains 122 species in four categories. Some species are banned in all instances; others are permitted in special circumstances. Species in one category are not only prohibited, they are also required to be removed from any wetland mitigation where they are found. A new revision of the list is underway, and will be available (at least in draft form) by September 2003. The presentation will address criteria for listing species, and the challenges and usefulness of such a list locally.

INVASIVE PLANTS: RECENT POLICY ADVANCES

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ABSTRACT: In early 1999, President Clinton issued Executive Order 13112, which established the National Invasive Species Control and eventual adoption of the nation's first invasive species management plan. Promulgation of the order and the efforts of the Council have resulted in improvements in coordination among agencies and increased funding for some critical programs, particularly early detection of new introductions and rapid response to them. Meanwhile, more than a dozen bills have been introduced in the 108th Congress that address some aspect of invasive species management. I will review the status of the bills pertaining to invasive plants and suggest key pressure points for those who wish to influence national policy.

COOPERATIVE EFFORTS BETWEEN THE HORTICULTURE INDUSTRY AND EXOTIC PEST PLANT COUNCIL IN FLORIDA

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ABSTRACT: The Florida Exotic Pest Plant Council (FLEPPC), Florida Nurserymen and Growers Association (FNGA), and Tampa Bay Wholesale Growers (TBWG) have met to address issues of invasive plant species in the horticultural trade since 1997. Discussions have primarily focused on the FLEPPC List of Category I and II Invasive Species, which currently includes 124 species. The horticulture industry was sensitive to the listing of commercially available species for several reasons. As a result of industry concerns, FLEPPC clarified the purpose of the List and included the regions in Florida in which species have been invasive. The nursery industry polled their membership and used trade publications to determine which of the species were economically important. Those species listed by FLEPPC that were not considered economically important by the industry were identified as species FNGA and TBWG could recommend that their membership cease to use, propagate, or sell. To date, 11 species on the Category I (most invasive) and 34 species on the Category II (increasingly invasive) lists are not recommended by these industry associations. More recommendations may follow the assessment of invasiveness of the remaining commercially available species using a University of Florida tool. Species that may be substituted for those no longer recommended are also being identified.

UNSOLVED PROBLEMS IN THE WAR ON WEEDS

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ABSTRACT: Since the signing of Executive Order (EO) 13112 in 1999, unprecedented cooperation has occurred among federal, State, and local agencies. EO13112 was written to combat the loss of \$27B annually in the United States due to invasive plants and their impacts on the land. In spite of new cooperation in the prevention and control of weeds, many problems remain. This paper will discuss four of them: 1. no target list is held in common by agencies, 2. Eleven States do not have Noxious Weed Law, 3. weeds do not respect political boundaries, and 4. highway corridors continue to be pathways crossing all boundaries. This paper will update you on what is being done with these four key problems the slow the war on weeds. Solutions include outreach, public awareness, research, and best management practices – examples from a national perspective.

MINNESOTA'S EXOTIC EXPERIENCE: A STATE CASE STUDY

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ABSTRACT: Minnesota is aggressively addressing invasive species. Several key steps have occurred since 1987. Two of the most important and unique steps occurred from 1989 to 1991 when the state legislature established a Minnesota Interagency Exotic Species Task Force and a statewide program to minimize the spread of harmful exotic species of wild animals and aquatic plants. In 1996, the state revised and expanded its laws regarding harmful exotic species and in 1998 it adopted a new set of administrative rules for them. The Minnesota Department of Natural Resources (MDNR) Exotic Species Program has three goals: prevent new introductions in the state; prevent their spread within the state; and reduce the harm caused by them. To address the first two goals, MDNR has used several strategies and actions including public awareness, watercraft inspections, and a variety of state regulations. It is illegal to transport aquatic plants on a public road or to launch a boat with them attached. It is illegal to place nonnative aquatic plants in public waters. The MDNR Program's funding is derived primarily from a \$5 surcharge on watercraft licenses. The program budget is approximately \$1.4 million per year. Additionally, special appropriations and grants have been sought for specific projects such as research on biological controls for invasive plants that invade natural areas and aquatic sites. The Minnesota Department of Agriculture (MDA) also has several responsibilities for invasive terrestrial plants and plant pests. The MDA, MDNR, and many other entities now form the Minnesota Invasive Species Advisory Council.

DEVELOPING A NEW WISCONSIN NOXIOUS WEED LAW

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ABSTRACT: Invasion of non-native plants into Wisconsin's waters, forests, grasslands, and agricultural fields is a serious ecological problem and financial burden on public and private lands. Wisconsin's existing weed law is out-of-date and ineffective. A Weed Law Technical Advisory Committee (TAC) was formed in late 1998 to address this issue. The makeup of the 20-member TAC is diverse, including representatives from the green industry, environmental/lake/woodland organizations, agribusiness, local government, state agencies, and the university. Through a strategic thinking process the TAC identified problems with existing laws, fears/concerns, desired future directions, criteria for classifying invasiveness of plants, purposes of a new law, and their goal to "protect the agricultural and natural resources of the state from aggressive/noxious weeds for the mutual benefit of citizens." TAC members were challenged to find middle ground in suggesting the details of a new weed law. The proposed law creates a 12-member Noxious Weed Council attached to WDNR that would develop scientific findings and recommend classifying invasive species into four categories: 1) state-prohibited noxious weeds – may not sell, distribute, plant, cultivate, or transport and must be eradicated; 2) state-restricted noxious weeds – may not sell, distribute, plant, cultivate, or transport and must be controlled; 3) voluntary management noxious weeds – control and containment encouraged; 4) watch plants – Council reviews plants to determine if they should be listed as state-noxious weeds. A municipality or county may list locally prohibited or contained noxious weeds if the plant(s) is on state categories 1-3 above. More details will be included in the presentation. The Legislative Reference Bureau is presently redrafting the proposed bill.

INVASIVE PLANTS: PREDICTING, ASSESSING INVASIVENESS, AND INVENTORY

Saturday, September 27 – morning and afternoon

MODELING THE SPREAD OF INVASIVE PLANTS ON A FREQUENTLY DISTURBED MILITARY TRAINING SITE, LITTLE FALLS, MN

Jill E. Babski¹ and Jorge E. Arriagada². St. Cloud State University, Department of Biological Sciences, 720 4th Ave S, St. Cloud, MN, USA 56301. ¹baji0201@stcloudstate.edu ²jeaarriagada@stcloudstate.edu

ABSTRACT: Human activities have increased the rate of spread and number of plants invasions. Currently hundreds of non-native plants are causing environmental or economic harm throughout the country. The most opportune time to control the spreading of plant populations is when they are small, so predicting the locations of the potential spread will result in early detection. Early control is the least costly and most effective method. Three invasive plant species [*Centaurea maculosa* (spotted knapweed), *Euphorbia esula* (leafy spurge), and *Tanacetum vulgare* (common tansy)] that are well established on Camp Ripley Military Training Site are spreading due to constant military activity. These plants have already caused major damage and change in North America's grassland ecosystems. A model that will predict the potential spread of these established invasive plant populations is here proposed. This model is based on factors that facilitate invasive plant spread such as disturbance, soil type, community composition, and distance to roads. The dispersal of invasive plants is caused inadvertently by military activity that disturbs fields and opens new areas for invasive establishment. Soil type dictates where plant species prefer to grow. The community composition, for example, associated species, might indicate the community preference of the invasive plants. Also, proximity to a road might suggest that vehicles are major dispersal agents. This model provides a tool that will allow early detection and early control of these invasive plants.

COMMUNITY INVOLVEMENT IN CONTROLLING INVASIVE COASTAL PLANTS

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ABSTRACT: The Door County Soil and Water Conservation Department has made a priority of involving citizens in efforts to control aquatic invasive species. The Door County SWCD supports a county-wide invasive species team, which consists of lay people as well as trained practitioners and educators in the area of invasive species. The Door County Invasive Species Team (DCIST) has undertaken the task of developing an invasive species inventory and action plan. Both the Door County SWCD and Wisconsin Wetlands Association have successfully developed networks of local groups and individuals so that the citizens are truly taking ownership of their local habitats. The Door County SWCD has over 40 local and regional partners and is using the additional partnerships developed through the WWA purple loosestrife survey to design and implement an early detection and rapid response plan for the county. The plan will address the monitoring and control for the top six non-native invasive plants that impact Door County habitats the greatest. This session will detail the methods that our collaborating organizations used in order to achieve a high level of citizen participation and the development of the DCIST early detection/rapid response plan. This will include detailed descriptions of our methods, successes, and failures in the following areas: Volunteer recruitment tactics, project marketing; Broad collaborations with local groups; Volunteer training and preparation; Volunteer appreciation; Survey design/data uses; Public input into county-wide invasive species action plan; Public information systems-interactive data reporting; and Mobilization of control efforts.

PRIORITIZING INVASIVE PLANTS FOR MANAGEMENT

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ABSTRACT: Recent progress using a combination of biological and chemical controls to manage *Lythrum salicaria* (purple loosestrife) has provided hope for expanding GLIFWC's invasive plant management program to include other invasive plant species. Unfortunately, there are several hundred non-native invasive plants within the ceded territories that vary in their impacts to natural ecosystems and feasibility of control. Because resources are limited, management efforts must be prioritized. This presentation summarizes our efforts to compile a database for non-native invasive plants and develop a consistent set of criteria and methods for ranking each species. We sought to prioritize those species that posed the greatest threats to local ecosystems and had the greatest likelihood for successful control. A database of relevant plant attributes was compiled from published sources, online databases, and a survey of resource professionals conducted in cooperation with the Invasive Plant Association of Wisconsin (IPAW). Each attribute was quantified based upon its influence on ecological impact and feasibility of control. A cumulative score was derived for each species and was used to assign each plant to one of four management categories. This database is a "work in progress" but should prove applicable throughout the Upper Great Lakes region. The database can be easily modified for use at different spatial scales or within specific habitats. Future additions to the database will help identify educational outreach needs and target audiences.

DEVELOPING AN INVASIVE PLANT POLICY: CHICAGO BOTANIC GARDEN'S EXPERIENCE

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ABSTRACT: Invasive plants pose a significant and growing threat to our native species and ecosystems, as well as our national economy. Globalization and world trade have increased the rate at which plants move, both deliberately and not, to new areas of the world. Some of these introduced plants become invasive in their new habitats. Horticulture, in the broad sense, has been one of the primary pathways for invasive plant introduction. Estimates for the percentage of invasive plants that were introduced as ornamentals are generally between 50% and 85%. However, addressing the problem does not require removing all non-native plants from the landscape. A garden can significantly decrease the invasive risk posed by its collection by removing known invaders and carefully evaluating and assessing the risk of new introductions. This presentation will discuss traits common to many invasive plants, methods to minimize risk of deliberate plant introductions, and how the Chicago Botanic Garden has developed its policy on plant introduction and invasive plants.

ASSESSING THE INVASIVE PLANT SPECIES THREAT IN INDIANA

Ellen M. Jacquart. Indiana Chapter of The Nature Conservancy, 1505 N. Delaware St. #200, Indianapolis, IN, USA, 46202.

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ABSTRACT: Invasive plant species are a threat to most natural areas in Indiana. However, there is little consensus among natural resource professionals and nursery and landscaping professionals which species pose the greatest threat to natural areas. Because little information is available on the extent and impact of invasive plant species' populations in Indiana it is difficult to objectively rank invasive species and thus reach consensus. Consequently, species that are considered a grave threat by some resource professionals are still recommended by other resource professionals and sold by nurseries. A group of concerned agencies and organizations formed the Invasive Plant Species Assessment Working Group (IPSAWG) and developed an assessment tool to measure which intentionally introduced plant species pose the greatest threat to Indiana's natural areas. Based on the assessment results, specific recommendations are made for each invasive species. The members of IPSAWG then incorporate those recommendations into policies and regulations. Results so far will be shared.

WEEDS TO WATCH FOR: PLANTS THAT MAY HAVE THE POTENTIAL TO BECOME INVASIVE IN THE UPPER MIDWEST.

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ABSTRACT: Although it may seem that every aggressive Eurasian plant is already in the Upper Midwest, we are actually quite fortunate, in that many are not here – yet! Our inland and northern location gives us the advantage of time. Many of the plants we will be concerned about in the coming decades are currently invading the forests of New England, grasslands of the Great Plains, and waters or lands in the milder regions to our south. By observing their invaders we can benefit by seeing which plants tend to be aggressive in different environments. Various prediction methods can aid us in trying to determine what species are likely to invade in our own local areas. We can learn about control methods from those who have been dealing with these plants elsewhere, and we can attempt to prevent their establishment – if we know what to watch for. This presentation will introduce you to many of the plants most likely to become problematic in natural areas in the Upper Midwest in the near future. Some already are locally invasive, either on the edges of the Upper Midwest, or in local infestations. Information for this presentation has been gleaned from invasive plant lists, websites and feedback from land managers throughout the region. Information on each plant will include identification characteristics, habitats and geographical regions most likely invaded. Participants will be encouraged to share information on additional species that they have observed or anticipate being invasive in the region.

THE TRADE IN LIVE FRESHWATER ORGANISMS IN THE UPPER MIDWEST: WHAT SPECIES ARE INVOLVED, WHAT RISKS ARE POSED, AND HOW CAN THESE RISKS BE BEST MANAGED?

Reuben P. Keller (presenting) and David M. Lodge. Department of Biological Sciences, University of Notre Dame, Notre Dame, IN, 46556. USA. rkeller2@nd.edu, lodge.1@nd.edu

ABSTRACT: We quantified the risk posed by the trade in live freshwater organisms to the US upper Midwest. First, we purchased temperate zone invertebrates, amphibians, fish and plants from both national suppliers and local outlets, identifying all species to the lowest taxonomic level possible. Second, we assessed the probability that these species would become invasive if released. Approximate numbers of species purchased and identified were 100 plants, ten amphibians, eight fish and ten invertebrates. Because many more plants are being transported, we concentrated on the risks posed by plant introductions, defining aquatic plants as any requiring wetland conditions at some stage in their life cycle. As a first attempt to assess risk, we used the US Animal and Plant Health Inspection Service and Australian weed risk assessments (WRAs). Specifically, these WRAs were tested on species known to have invaded the US upper Midwest and species known to have been in trade for a long period without establishing. Neither WRA was able to satisfactorily distinguish these groups. A first generation risk assessment tool we created, specific to aquatic plants in the US Midwest, performs better. This suggests that such management tools may allow better prevention of unwanted introductions in the future. Such risk assessment tools will also address the need for rigorous, objective and repeatable analyses of the economic and environmental threats posed by organisms before they are allowed into trade.

NATIONAL AND REGIONAL EFFORTS TO INVENTORY, MAP AND ASSESS INVASIVE PLANTS - AN UPDATE

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ABSTRACT: The U.S. National Invasive Species Council's Management Plan calls for the establishment of an invasive species assessment and monitoring network. Some pieces of what could become a national and even international network of databases on invasive species have formed. For example, an assessment of invasive plant, animal and disease species on U.S. Fish & Wildlife Service's wildlife refuges has been conducted and other federal and state agencies are planning or considering similar system-wide assessments. There are also now several strong regional invasive plant inventory and mapping projects that aim to cover all public and private land within the regions they cover. Among those which are well beyond the planning stage and into implementation include the Invaders Database System which covers five Northwestern states, the Southwest Exotic Plant Mapping Project which covers Arizona, New Mexico and parts of adjoining states, and the Invasive Plant Atlas of New England which covers the six New England states. Creators of these projects have been careful to use at least a minimum set of common database fields so that it will be possible to share data among the entire network of databases.

DEVELOPMENT OF THE IPAW WORKING LIST OF THE INVASIVE PLANTS OF WISCONSIN

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ABSTRACT: The Invasive Plants Association of Wisconsin (IPAW) has developed and published working lists of 66 invasive plants and 114 potentially invasive plants for Wisconsin. Publication of lists of invasive plants can be controversial. Since there are no broad empirical studies of the ecological effects and spread of non-native plants that would allow objective categorization of plants as

invasive, it was felt that to have credibility the IPAW invasive plant list must be based on the observations of many people who have experience with non-native plants across the state. These lists were formed using the results of a survey of 60 amateur and professional naturalists who provided personal observations of non-indigenous plants in the native plant communities of Wisconsin. The survey produced 2,993 observations of the ecology and spread of non-indigenous plants in the state. This paper describes the form of the survey and the methodology used to compile the IPAW working lists of invasive and potentially invasive plants. Several key elements were incorporated in the process of formation and publication of the list to ensure that the working list would be accepted as an objective catalogue of plants that invade and impact native plant communities.

EFFICIENT AND EFFECTIVE MONITORING OF INVASIVE PLANT SPECIES

Daniel W. Salzer. The Nature Conservancy of Oregon, 821 SE 14th Avenue, Portland, OR 97229. dsalzer@tnc.org Presented by Mandy Tu.

ABSTRACT: There is a particular set of challenges associated with the design of monitoring programs for invasive plant species. This presentation covers a range of monitoring needs including early detection, determining whether a non-native plant is becoming invasive, determining the response to management efforts, and determining the impact of invasive species and their control methods on native species. The following approaches, and under what circumstances they are appropriate, will be covered: qualitative approaches (e.g., presence/absence, permanent photopoints, qualitative estimates of abundance), mapping approaches (e.g., remote-sensing approaches, GPS mapping surveys), quantitative approaches (e.g., using density, frequency, cover, or biomass sampling techniques) and the tracking of control efforts as a monitoring technique (e.g., person hours spent removing an invasive plant occurrence). A new invasive plant database used to track the status of invasive plant occurrences will be demonstrated. The TNC Invasive Weed Database has the capability to track weed occurrences, assessments and treatments, and can achieve full two-way synchronization with Palm or Pocket PC personal digital assistant (PDA) units connected to a GPS unit. This enables exporting of data from the MS Access database onto a PDA, the display of that data in the field, completing new assessment and treatment records (including documentation of any new occurrences), then immediately uploading the new data collected from the field (including GPS data) into the Access database. These data can be directly exported as ESRI shapefiles for use in standard GIS programs, such as ArcView and ArcPad, and in a variety of formatted monitoring reports.

INVASIVE PLANTS:

REED CANARY GRASS CONTROL

PANEL DISCUSSION: REED CANARY GRASS CONTROL

Moderated by Alice Thompson. Panel members: Arthur Kitchen, Craig Annen, and Dan Spuhler.

SELECTIVE CHEMICAL CONTROL OF *PHALARIS ARUNDINACEA* L. (REED CANARYGRASS): TOWARD AN INTEGRATED APPROACH.

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ABSTRACT: The invasive species *Phalaris arundinacea* L. (reed canarygrass) has been difficult to control with herbicides because most treatment programs are centered on non-selective herbicides that hinder successful native species reestablishment. We performed a feasibility study to assess the potential of a grass-specific herbicide (Vantage[®], sethoxydim) for controlling reed canarygrass and restoring plant species diversity to affected natural areas. Sethoxydim treatment reduced inflorescence density and aboveground biomass of reed canarygrass by ca. 90% and 50%, respectively. Carryover treatment effects on reed canarygrass were not detected when herbicide applications were discontinued, although the small size (16 m²) of experimental plots and ability of reed canarygrass to recolonize treated areas from its seed bank and rhizomes may have influenced this result. Sethoxydim treatment had a positive effect on herbaceous species recruitment. Total sedge and forb biomass increased by up to 99% in sethoxydim-treated plots, although reed canarygrass remained the dominant species. Our results demonstrate that selective chemical control of reed canarygrass can be achieved without harming efforts to reestablish native species, and that sethoxydim can be incorporated into integrated control programs for reed canarygrass. Herbicides are only one of many tools at our disposal. Instead of searching for a treatment "recipe", we should seek to understand community susceptibility and life history traits as they relate to invasion mechanisms and use this information to formulate adaptive, ecologically based control strategies on a site-specific basis. Natural systems are complex and adaptive, and management strategies need to consider this if they are to be successful.

IMPACTS TO ESTABLISHED *PHALARIS ARUNDINACEA* (REED CANARY GRASS) BY ALTERATION OF HYDROLOGY IN DEGRADED WETLANDS IN SOUTHERN WISCONSIN

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ABSTRACT: The author explores case histories of several degraded wetlands restored in the last 10 years through the Service's "Partner's for Fish and Wildlife" program. Effects of increasing hydrology on existing *Phalaris arundinacea* (Reed Canarygrass) populations will be examined along with a discussion of related causal factors that influence the persistence and invasive-ness of this species. The author's experience with these sites suggests that along with water depth, temporal factors such as period of inundation and seasonality play a critical role in the success or failure of hydrological manipulation as a primary control method for this species.

REED CANARY-GRASS (*PHALARIS ARUNDINACEA* L.): A REVIEW

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ABSTRACT: I will review Reed Canary-grass by providing background on its natural history in North America and beyond, agricultural history, the native/alien question, implications of infestation, control methods, recent research, and future research and management needs.

INVASIVE PLANTS: REED CANARY GRASS SPREAD

Saturday, September 27 – morning

PROCESSES OF FLORISTIC DEGRADATION IN URBAN AND SUBURBAN WETLANDS IN NORTHWESTERN INDIANA

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ABSTRACT: Processes of floristic degradation of urban and suburban wetlands were investigated in the Turkey Creek and Little Calumet River watersheds in Northwestern Indiana, USA. A total of 103 degraded wetland sites were classified into ponds, marshes, woodlands, and forests using Detrended Correspondence Analysis (DCA) ordination. Ponds ($83.5 \pm 3.8\%$ open water surface), with peripheral vegetation along the shorelines, are formerly wetlands, but deepened by artificial excavation; marshes were characterized by extensive grass cover ($89.8 \pm 3.7\%$), mostly *Typha angustifolia* (narrow-leaved cattail); woodlands retained extensive grass cover ($72.1 \pm 3.6\%$), but were subjected to encroachment of woody species ($46.5 \pm 5.2\%$), mostly *Salix* spp. (willows); and forests had significant canopy closures by trees ($84.0 \pm 4.1\%$), mostly *Populus deltoides* (cottonwood). The DCA also provided trajectories of floristic degradation as follows: (1) expansions of cattails in the impounded wetlands and *Phalaris arundinacea* (reed canary grass) in the drained wetlands; (2) invasions of *Phragmites australis* (common reed) on litter mounds of cattail stands; (3) invasions of *Lythrum salicaria* (purple loosestrife) in disturbed patches especially adjacent to major highways and local roads; (4) encroachment of woody species, such as willows and cottonwood, in the drained wetlands or the wetlands with significant litter accumulations; and (5) invasions of exotic woody species. The floristic degradations in our study appeared to be symptoms of altered hydrology, and restoration of natural hydrology prior to the removal of invasive plants appeared to be crucial for restoration of native vegetation.

FACTORS THAT INFLUENCE DOMINANCE BY REED CANARY GRASS (*PHALARIS ARUNDINACEA* L.) IN WET MEADOWS

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ABSTRACT: Understanding how urban runoff promotes dominance by reed canary grass (*Phalaris arundinacea*, Pa) requires study of patterns in the field as well as experimental evaluation of cause-effect relationships. In sampled wetlands, indicators of hydrologic disturbance and presence of Pa correlated with declines in species richness and floristic quality. To determine which of the disturbances that are associated with urban runoff (nutrient inflows, sedimentation, flooding) are most responsible for Pa invasions, we conducted an experiment in 150 mesocosms, each 1.1-m^2 . We planted a diverse assemblage of wet meadow species and grew them for two years before introducing plugs of Pa. Subsequently, we applied nutrients, sediments and flooding disturbances (each at 3 levels in all 27 combinations). Native species richness decreased with the application of sediments or flooding of 4 consecutive weeks or longer, and mortality of several species in these treatments increased the overall light transmission through the plant canopy, which in turn increased the final biomass of Pa. Pa also expanded in direct relation to the level of nutrients added. Our results support and extend the theory of fluctuating resource supply since increases in gross supply of resources increased the invasibility of the experimental assemblages. Multiple factors in combination were usually additive but sometimes synergistic in their effects on invasion. These results point to the need for managers to control or mitigate multiple disturbances - i.e., by halting nutrient inputs and minimizing disturbances that disrupt the integrity of the native plant canopy – in order to reduce the spread of Pa.

MAPPING WETLANDS DOMINATED BY REED CANARY GRASS USING LANDSAT THEMATIC MAPPER IMAGERY – A TOOL FOR WETLAND CONDITION MONITORING

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ABSTRACT: Monitoring and control of invasive species is a key component of effective land management. While managers often have site-level information, gathering information at the landscape level is especially difficult, yet critical to monitoring and documenting the extent and tracking the spread of invasions. Methods to use remote sensing technology to map invasions can provide cost-effective monitoring at the landscape scale. *Phalaris arundinacea* (reed canary grass) domination of wetlands was chosen because it is widely recognized as the most problematic invasive plant in Wisconsin wetlands and its widespread nature and disjunct phenology make spectral classification feasible. We used Landsat Thematic Mapper imagery (30m resolution) to identify wetlands heavily dominated by reed canary grass. We have classified wetland vegetation in a $185\text{ km} \times 185\text{ km}$ Landsat theme into three broad classes relative to reed canary grass: heavily dominated ($<80\%$ cover, co-dominant ($50\text{-}80\%$ cover) and absent to subdominant ($<50\%$ cover). The result is a digital raster coverage with a $\frac{1}{2}$ acre minimum mapping unit. This information will prove valuable to a wide variety of land managers and decision-makers. We report on the protocol for the classification, accuracy assessment, and the acreage of each vegetation class by watershed and by wetland type. We also report on results of a preliminary GIS analysis of land use and ecological factors related to reed canary grass invasion.

INVASIVE PLANTS: VOLUNTEER EFFORTS

Saturday, September 27 - afternoon

USING VOLUNTEERS TO COLLECT DATA ABOUT IOWA'S INVASIVE SPECIES

Christopher W. Evans. Iowa State University Department of Natural Resource Ecology and Management, 253 Bessey Hall, Ames, IA 50011-1021. evanscw@iastate.edu

ABSTRACT: Using volunteers to collect data about invasive species has proven an effective method of surveying an extensive amount of area as well as increasing public awareness about invasive species. Volunteer collected data can be scientifically relevant and is best used as an ongoing index. The North Central Woodland Invasive Species Survey uses volunteers to collect data about the distribution and abundance of four woodland invasive species on both private and public lands in Wisconsin, Indiana, and Iowa. A two-year pilot study was conducted in Iowa throughout the 2002 and 2003 seasons. The presentation will focus on the methods used to solicit and train volunteers, interpretation of the data, and recommendations for using volunteers.

ACHIEVING MANAGEMENT GOALS THROUGH INTERNS

Kathleen Harris, Park Naturalist, Peninsula State Park, PO Box 218, Fish Creek, WI, 54212. kathleen.harris@dnr.state.wi.us

ABSTRACT: Identify and discuss strategies to implement an invasive plant management internship program. Peninsula State Park, a 3,700-acre multiple-use area, provides the context of a how-to model. Invasive plant management interns began working at Peninsula in 2000. Successes and pitfalls, adaptive management strategies, using interns as educators, and suggestions for recruitment will be addressed. The group will also be invited to brainstorm funding sources in an atmosphere of tightening budgets.

USING VOLUNTEERS FOR INVASIVE SPECIES LAND MANAGEMENT

Scott Johnson. Wyalusing State Park, 13081 State Park Lane, Bagley, WI, USA, 53801. scott.johnson@dnr.state.wi.us

ABSTRACT: Use volunteers to help eradicate invasive species from your landscape. Learn how to inspire and organize youth and adult volunteers to take back the native forests and flowers of Wisconsin. Pick up techniques on how to organize large volunteer groups, what type of safety equipment is needed for invasive species removal, and results of a newly formed effort at Wyalusing State Park. This session will focus on honeysuckle and garlic mustard. Find out how your group can take back the forest from honeysuckle by using tug-a-suckle.

INVASIVE PLANTS

PANEL DISCUSSION: TIPS AND TECHNIQUES FOR RECRUITING AND MOTIVATING VOLUNTEERS

Moderated by Kathleen Harris, Chris Evans, Scott Johnson, and Mary Lerman

GETTING AND KEEPING THE HELP YOU NEED

Kathleen Harris¹, Scott Johnson², and Mary Lerman. ¹Wisconsin Department of Natural Resources, Peninsula State Park, PO Box 218, Fish Creek, WI, 54212. kathleen.harris@dnr.state.wi.us ²Wisconsin Department of Natural Resources, Wyalusing State Park, 13081 State Park Lane, Bagley, WI, USA, 53801. scott.johnson@dnr.state.wi.us

ABSTRACT: Listen and participate in a lively panel discussion related to recruiting and retaining volunteers. What individuals and groups will volunteer to help manage invasive species? How can you keep volunteers motivated and coming back for more? What kind of "basic training" do these volunteers need? What tools help them accomplish their job? What are the hidden costs of working with volunteers? Are there situations where volunteers are not the best choice? Learn from the experience of panel members, and be ready with questions and comments of your own.

FIRE FORUM

See Thursday's list above for abstracts

EFFECTIVE COMMUNICATIONS: BALANCING CONSERVATION WITH HUMAN EXPECTATIONS

Saturday, September 27 – afternoon

PEOPLE, PLANTS AND TABLE MOUNTAIN: THE SOCIAL IMPACTS OF MANAGING INVASIVE ALIEN PLANTS IN THE CAPE PENINSULA NATIONAL PARK, SOUTH AFRICA

Andrew E. M. Brown. Cape Peninsula National Park, P O Box 37 Constantia, 7848, Cape Town, South Africa. andrewb@parks-sa.co.za

ABSTRACT: The Table Mountain Chain on the Cape Peninsula is recognised globally for its extraordinarily rich and unique plant diversity. Situated within metropolitan Cape Town, this natural diversity is mirrored by the diversity of people that live along its edges. Since its establishment in 1998 the Cape Peninsula National Park (CPNP) has run an invasive plant control programme, aimed at restoring biodiversity and providing employment and economic development opportunities for local disadvantaged communities. This paper outlines some of the social impacts of the CPNP programme, the strategies and approaches used, the benefits that have been derived, the challenges faced, and how these have been addressed. About 620 disadvantaged people and their families have derived an income as a result of the programme, 90 small businesses have been developed and more than R40million (US\$ 4.8 million) as been injected into the local economy. Through deriving tangible benefits many poor people from surrounding communities have changed their perception of the value of the national park and natural areas. The clearing programme is supported by active volunteers, many of whom as a result of their involvement have become the most vocal supporters of the park. Conflicts have arisen over the removal of certain invasive plants, particularly where there is the need to balance the control of invaders with the maintenance of landscapes with invasive trees that are used for recreation, or are of cultural or historical value to people.

WETLANDS RESERVE PROGRAM: MANAGEMENT AND THE RELATIONSHIP BETWEEN LANDOWNER SATISFACTION, ECOLOGICAL AND SOCIOECONOMIC FACTORS

Ken Forshay¹, Hem Nalini Morzaria-Luna², Brack Hale³, Katie Predick¹. ¹Department of Zoology. University of Wisconsin-Madison, Madison, WI, 53706. kforshay@wisc.edu ²Department of Botany. UW-Madison, Madison, WI 53706. ³Gaylord Nelson Institute for Environmental Studies. UW-Madison, Madison, WI 53706.

ABSTRACT: We examined the experience of wetlands restorations under the Wetland Reserve Program (WRP) in a four county area in south-central and southeastern Wisconsin using the framework of adaptive management. We evaluated restoration sites from an ecological and a social perspective using ecological monitoring data recorded by NRCS (number of wetland communities and acreage per community) and a mail survey of WRP participants (landowner on satisfaction, involvement, planning and use of restoration sites). We found that the main type of wetland created is fresh meadow. Neither easement nor restoration cost relate to the number of wetland communities obtained after restoration nor to landowner satisfaction. Eighty-nine percent of restored sites have *Phalaris arundinacea* (Reed canary grass) and landowner satisfaction correlates with the presence of this species. We found landowners participate for a variety of reasons (recreation, economic) and thus have different expectations. Although landowner satisfaction with the program was high (mean 3.6±0.17, where 1=dissatisfied to 5=very satisfied), there were some concerns with specific restoration practices, the current tax scheme, deer stands and communication with WRP personnel. Landowner overall satisfaction was correlated with economic benefit and hunting activities. We conclude that some aspects of the WRP are adaptive: consideration of management goals as flexible, and inclusion of landowners in the restoration process. There is opportunity for improvement in WRP at the federal, state and local level; the program would benefit from using an adaptive management approach to wetland restoration.

UNIVERSITY WILD: A VIDEO TOUR OF THE CAMPUS NATURAL AREAS AT THE UNIVERSITY OF WISCONSIN-MADISON

Tom Sinclair, Gaylord Nelson Institute for Environmental Studies, University of Wisconsin-Madison, 5 Science Hall, 550 North Park Street, Madison, WI 53706. tsincla@wisc.edu

ABSTRACT: The University of Wisconsin-Madison is uncommonly blessed: Fully 325 acres of woodlands, wetlands, fields, and scenic lakeshore lie within the boundaries of this busy urban campus. These undeveloped lands, known as the Campus Natural Areas (CNA), constitute more than a third of the university's 932 acres in the heart of Madison. Open to a multitude of uses, from bird watching to picnicking, the CNAs are a priceless asset not only to the university but also to the surrounding community. However, their existence and continued welfare often have been taken for granted, and their educational, ecological, and historical values, overlooked. The university's Gaylord Nelson Institute for Environmental Studies has produced a new 18-minute video, "University Wild," to help raise awareness of the Campus Natural Areas both on and off campus. The video takes viewers on a memorable tour of these areas, touching on their diversity, uses, problems, and stewardship. In this session, producer Tom Sinclair will briefly introduce "University Wild," screen it in its entirety, then answer questions.

THE HONEY CREEK PROJECT: BALANCING ACT

M. Kathleen Sullivan and Gregory M. Quartucci, SmithGroup JJR, 625 Williamson Street, Madison, WI. 53703.

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ABSTRACT: SmithGroup JJR (SG JJR) worked collaboratively with the Iowa Department of Natural resources, the U.S. Army Corps of Engineers (USACE) and the Chariton Valley Resource Conservation and Development to refine a master plan for the Honey Creek Resort State Park. The 850-acre Honey Creek "destination recreation attraction" State Park is located in south-central Iowa on

Rathbun Lake, a regional flood control and water conservation reservoir operated by the USACE. The master plan focuses ecologically sensitive design, while enhancing and integrating the high quality natural features of the site into design. SG JJR engaged many different stakeholders to integrate divergent interests into a sustainable vision for the park. The master plan includes recommendations for best management practices for stormwater and wastewater treatment, development of a stewardship plan for restored and preserved areas, and use of integrated pest management practices. Other key issues addressed included protection and enhancement of cultural resources, endangered species habitat protection, prairie restoration and enhancement, and use of natural management practices such as controlled burning. The master plan also promotes the opportunity of creating an interpretive program to support the learning/teaching of Iowa's natural and cultural history. The use of SG JJR's highly interactive and flexible design approach, in combination with an appreciation of this peninsula's resources, has allowed for the protective and effective accommodation of numerous site-related opportunities and constraints and ultimately the creation of a win-win design that is applauded by decidedly divergent interests.

ETHICS FOR A SMALL PLANET WORKSHOP

Saturday, September 27 – morning

ETHICS FOR A SMALL PLANET: COMMUNICATING THE ETHICAL AND THEOLOGICAL REASONS FOR PROTECTING BIODIVERSITY: A presentation for environmental advocates who are interested in better communicating about the ethical foundations for protecting biodiversity.

Jane Elder, Executive Director, Biodiversity Project, 214 N. Henry St. Madison, WI 53703. www.biodiversityproject.org.
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ABSTRACT: Ethics, religion and spirituality are getting a lot of press these days - knowing how to talk about the relationship between these complex topics and the environment is becoming an important component of successful communications. The Biodiversity Project's latest publication *Ethics for a Small Planet* offers guidance on entering into the growing public conversation about the connection between deeply held beliefs and environmental protection. Jane Elder, Executive Director of the Madison, WI based Biodiversity Project (and perhaps two other guest speakers - TBD) will lead a discussion on the material covered in the handbook.

The Biodiversity Project's mission is to advocate for biodiversity by designing and implementing innovative communication strategies that build and motivate a broad constituency to protect biodiversity. Since our inception, the Project has served as a catalyst for new strategies, a nexus for collaboration and information sharing, and a resource for getting the word out on biodiversity. In very practical ways, the Project has helped the environmental movement craft and implement communications and education strategies on key issues that promote biodiversity conservation.

FEN AND MEADOW: MANAGEMENT AND RESTORATION POSSIBILITIES

Saturday, September 27 – morning

HYDROLOGIC ALTERATION, VEGETATION CHANGE AND RESTORATION POSSIBILITIES AT CHEROKEE FEN, MADISON, WI, USA

Quentin Carpenter and Suzanne Kercher. University of Wisconsin-Madison, 550 North Park St., Madison, WI 53706.

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ABSTRACT: With the retreat of glacial ice from the Madison, WI area approximately fourteen millennia ago, wetlands began forming in shallow areas of the Madison Lakes. The largest of these is now known as Cherokee Marsh and once covered over 1000 ha. Following European settlement this wetland complex was used primarily for harvesting wild hay and thus remained largely unaltered until about 35 years ago, when several ditches were dredged by public and private parties. Air photos document the rapid degradation of Cherokee Marsh in the vicinity of these ditches, with shrubs, trees and invasives colonizing areas of physical and presumed hydrologic disturbance. Recent on-site studies document the close link between the lowering of water tables and decreases in the diversity and quality of the vegetation in the area of the Cherokee Fen State Natural Area, one of the largest calcareous fens in Wisconsin (> 50 ha.). Three ditches (total length > 1 km) lower both the average growing season water table and the maximum depth to water table during dry spells. Areas between ditches suffer worse hydrologic alterations than areas with only one edge ditched, and plant diversity and quality (FQA) reflect this pattern. Plans are underway to refill all three ditches and clear the area of trees and shrubs. These previous studies provide both baseline information and suggest methods of assessing "success" for this restoration effort.

MOWING AND HERBICIDE AS AIDS IN FEN RESTORATION

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ABSTRACT: Fens are a globally rare community dominated by herbaceous species and strongly influenced by the flow of calcareous groundwater. From historical aerial photographs of fens in Northeast Indiana we know that woody vegetation has increased and the area of open fen has declined since the 1950's. Prescribed burning has been able to maintain some open fen, but not to restore areas dominated by woody vegetation. Logistical limitations and concerns about direct mortality to insects and reptiles limit timing and frequency of burns. During two months in January through March, 2003 we mowed 23.4 hectares (57.7 acres) of shrubs in Northeast Indiana fens. During the summer of 2003 we will be spraying woody plant re-sprouts in part of this area. In other fens, shrubs were hand cut, and in some areas the stumps treated with herbicide during the winter. The intent is to develop restoration techniques that will be practical and cost effective on a large scale. Using photographs and cost data the costs and benefits of hand cutting, mowing, stump treating, and spraying re-sprouts will be compared.

PROPAGATION AND RESTORATION OF FEN ORCHIDS

Scott Weber, Bluestem Farm, S5920 Lehman Road, Baraboo, WI 53913. bluestem_farm@juno.com

INTERNATIONAL ISSUES

Saturday, September 27 – afternoon

CONTROLLING INVASIVE ALIEN PLANTS IN THE CAPE PENINSULA NATIONAL PARK, SOUTH AFRICA, STRATEGIES, TOOLS, CHALLENGES AND LESSONS

Andrew E. M. Brown. Cape Peninsula National Park, P O Box 37 Constantia, 7848, Cape Town, South Africa. andrewb@parks-sa.co.za

ABSTRACT: The Cape Peninsula mountain chain is an area of extraordinarily rich and unique plant diversity, situated within the metropolitan city of Cape Town. This natural asset is under threat from invasive alien plants that displace native biodiversity, increase fire risk, alter fire regimes, accelerate erosion, and disrupt hydrological processes. Since 1998 the Cape Peninsula National Park (CPNP), managing 23500 of the 31000 ha of natural area on the Cape Peninsula, has run an invasive plant clearing programme that has cleared 84% of the CPNP, reducing the density of invasive plants by approximately 45%. More than R40million (US\$4.8 million) has been spent and 620 people employed. This paper outlines some of the strategies and approaches used during the programme both inside and outside the CPNP, and the challenges faced and the lessons learnt along the way. These include the control techniques employed, the management tools and systems developed, and awareness and communication initiatives to gain popular support for the control programme and to encourage neighbouring landowners to manage their land responsibly. The control of invasive plants is also used as an important incentive to get private landowners to contract the management of their land into the CPNP as part of the park's land consolidation strategy. Some of the challenges faced include balancing cost effective invader control with maximizing the restoration of biodiversity, using fire as an important vegetation management tool in an urban context, and managing sponsors, partners, and other stakeholders with diverse interests and objectives.

SUSTAINABLE FOREST MANAGEMENT AND BIODIVERSITY CONSERVATION IN THE RAINFOREST OF MISIONES PROVINCE, ARGENTINA

Diego Quesada-Allué¹, Paula I. Campanello¹, Genoveva Gatti¹, Amy T. Austin² and Guillermo H. Goldstein¹. ¹Laboratorio de Ecología Funcional, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Pabellón 2-Ciudad Universitaria (1428), Argentina. kiu3@bg.fcen.uba.ar ²IFEVA y Facultad de Agronomía, Universidad de Buenos Aires/CONICET, Argentina.

ABSTRACT: The Atlantic Rainforest is a threatened ecosystem with a high level of biological diversity, running through south of Brasil, southeast Paraguay and northeast Argentina. Actually most of the original forest has disappeared in terms of changes in land use. In Paraguay and Brasil only around 7% of the original cover remains, while Argentina's forest (40%) is the biggest continuous extant area. In Misiones Province, Argentina, large areas of this type of ecosystem are being utilized for timber extraction. As a result of this activity, incoming solar radiation is increased enhancing the growth of herbaceous plants and vines. These plants tend to outcompete the tree species with high economic value. Our research is oriented to evaluate the forest response to selective timber extraction when postharvest restoration practices (e.g., liana cutting and native invasive species -mainly bamboo- clearing) are applied. The methods and techniques we use include hemispherical photography, gas exchange and chlorophyll fluorescence measurements, stable isotopes and available nutrients in soil analysis. We attempt to understand the light and nutrient requirements of several important species of this ecosystem with high commercial values. The overall applied objective of our study is to improve our understanding of the structure and function of the Argentinean subtropical rain forest and to evaluate and/or propose alternative management practices that help maintain species diversity and enhance forest productivity.

IMPLEMENTATION OF SOUTH AFRICA'S RIVER HEALTH PROGRAMME IN THE UNIQUE RIVER SYSTEMS OF THE CAPE FLORAL KINGDOM.

Wietsche Roets, Western Cape Nature Conservation Board (WCNCB), Scientific Services: River Conservation Unit, P/Bag X6546, GEORGE, South Africa, 6530. wroets@pawc.wcape.gov.za

ABSTRACT: All life forms of the biosphere on this planet rely on water for their survival, of which most would disappear when denied access to the less than 1% available freshwater. With the generally poor state of river systems globally the most precious water resources ARE under severe threat. The same is true for one of the world's six Floral Kingdoms, namely the Cape Floral Kingdom (CFK), which is situated almost entirely in the Western Cape Province of South Africa. This plant kingdom is the product of the predominantly winter rainfall and specific geology and soils with which it is associated. These environmental conditions give rise to unique river systems draining these catchments. Most of these rivers are associated with ancient Table Mountain Sandstone geological formations and are characterized by a quick response to rainfall, high gradient and water speed, low pH and low conductivity. Not surprisingly this biome is home to high numbers of endemic plants and animals. South Africa is a dry country by world standards and its well-developed agriculture and cities are heavily dependent on rivers for water supplies. Over-abstraction, in-stream dams and pollution have left many rivers in a moderate to poor ecological condition. The national Department of Water Affairs and Forestry (DWAF) and provincial conservation agency (WCNCB) have responded to this threat by developing the national River Health Programme which monitors the ecological health of the nations rivers. This talk focuses on the successful implementation of the RHP in the Western Cape Province and discusses how this province is now a national leader due to collaboration and partnerships amongst land-owners, water resource managers and users.

INVERTEBRATE DIVERSITY: IMPORTANCE OF THE RARE AND NOT SO RARE

Saturday, September 27 – morning

REINTRODUCTION AND CONSERVATION OF A STATE-ENDANGERED BUTTERFLY: *CALEPHELIS MUTICUM* (SWAMP METALMARK)

Susan S. Borkin, Curator of Invertebrate Zoology, Milwaukee Public Museum, 800 West Wells Street, Milwaukee WI 53233
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TERRESTRIAL INVERTEBRATES ASSOCIATED WITH *PHRAGMITES AUSTRALIS* (GIANT REED GRASS) AND *TYPHA LATIFOLIA* (BROAD LEAF CATTAIL) IN THREE WETLANDS ALONG GREEN BAY, LAKE MICHIGAN

Jeanette M. Jaskula and Michael Draney, University of Wisconsin-Green Bay, Green Bay, WI 54311

ABSTRACT: Recent low water levels in Lake Michigan have allowed *Phragmites australis* (giant reed grass), an invasive plant species, to aggressively colonize coastal wetlands, out-compete native flora, and form dense, monotypic stands. The effects of this change on the terrestrial invertebrates in Great Lakes coastal marshes remains essentially unknown. Three coastal wetlands were sampled on the southern shore of Green Bay, Lake Michigan. Each wetland contains extensive stands of *Phragmites* and *Typha latifolia* (broad leaf cattail) and was evaluated to determine if the community structure of terrestrial invertebrates differs in *Phragmites* stands compared to extant *Typha* marshes. Replicate pan traps, randomly located within each stand were used to capture invertebrates in June and September 2002. 12,049 invertebrates, mainly insects, were collected representing 145 families within 24 orders. *Typha* had greater abundance and family-level richness of invertebrates compared to *Phragmites*. True flies (Order Diptera) were the most abundant order, accounting for 60% of all individuals and 30% of all families. Abundance and family richness of Dipterans were significantly higher in *Typha* than in *Phragmites*. House flies (Muscidae) and small dung flies (Sphaeroceridae), whose larvae feed on dung, were significantly more abundant in *Typha* in June. In addition to insects, the spider, *Clubiona pallidula* (Clubionidae), an exotic spider from Eurasia, represents a new Wisconsin state record and was only trapped in *Phragmites*. This study is the first of its kind to demonstrate the negative impacts of *Phragmites* on the abundance and diversity of invertebrates, especially Dipterans, in Great Lakes coastal wetlands.

PARASITES OF SNAILS AS INDICATORS OF ESTUARINE BIRD COMMUNITIES

Kevin D. Lafferty and Ryan R. Hechinger. Marine Science Institute, University of California, Santa Barbara, CA 93106.

ABSTRACT: We examined the role of bird definitive host communities in structuring parasite communities in first intermediate hosts. We analyzed this relationship for the diverse community of digenean trematodes that use various species of coastal wetland birds as definitive hosts and *Cerithidea californica* (California Horn Snail) as their first intermediate host. We used time-lapse videography to measure habitat use of birds at six sites within Carpinteria Salt Marsh (Santa Barbara Co., California, USA). For the same sites, we also characterized the larval trematode community structure in snails. We relate between-site variation in bird abundance and diversity to variation in larval trematode community abundance and diversity in the first intermediate host snails. Results show positive correlations between bird abundance/diversity at a site and larval trematode prevalence/diversity in snails at that site. These results indicate that trematode communities in snails may be useful as a tool for assessing the bird diversity that a wetland supports.

LAND ETHICS INTERPRETED: A SENSE OF PLACE FOR HUMANS, A NECESSITY FOR SOME SPECIES?

Saturday, September 27 – morning and afternoon

COLLECTING MEMORIES AS A TOOL FOR DEVELOPING A SENSE OF PLACE

Susan C. Gilchrist. Wisconsin Department of Natural Resources, 1350 Femrite Dr., Monona, WI, USA, 53716.

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ABSTRACT: As part of an ecosystem management project, my task was to interview people with long-term connections to Wisconsin's Northwest Sands or pine barrens. I interviewed about 54 people with a variety of connections to the place. I asked them what the area was like when they first came there, how it had changed, how they felt about those changes, what activities they had done there, what people they thought had had an impact on the land there, and what messages they wanted to deliver to the committee developing a land management plan for the area. I found myself developing connections to the people and through them, the place. I found that most people were glad for the opportunity to tell their stories, to have input, and I like to theorize that my interest empowered them and may have even increased their attachment to the place. Initially, the steering committee may not have valued the oral history's application to their mission in creating a management plan, but in the end, I think the affective presentation of other people's words had an impact on the scientifically trained and economically oriented planners, giving them a closer understanding of what people value about the land. In this session, I will tell the story of my project in the sand country, sharing some anecdotes from interviewees, and suggest that collecting oral memories could be used as a tool for other projects.

PRESERVING NATURAL SOUNDS IN NATIONAL PARKS

Richard D. Horonjeff, Jason C. Ross, and Nicholas P. Miller. Harris Miller Miller & Hanson Inc, 15 New England Executive Park, Burlington, MA, USA, 01803. rhonjeff@hmmh.com

ABSTRACT: Over the past decade, the natural sounds in Parks and other remote areas have become an important resource preservation issue. As the population increases and open space declines, opportunities for experiencing the sounds of nature are diminishing. Unbroken solitude, experiencing only indigenous sounds, and savoring moments when virtually all sound ceases are special opportunities offered in many parks. As park visitation increases, so has the frequency of audible human activity. Currently, motorized vehicles are the primary sources of non-indigenous sounds. Automobiles, buses, motorcycles, aircraft, boats, snowmobiles, and personal watercraft are examples of such sources. The more pristine the natural environment, the more difficult it is to preserve. Measurements show that in the absence of wind, vegetation and moving water, sound levels often drop to near or below the human threshold of hearing. Under these circumstances, no sound energy is available to mask the non-indigenous sounds. During particularly quiet times, research indicates that roadway traffic is audible well over a mile away, air tour aircraft as much as ten miles away, and commercial high altitude jet traffic at even greater distances. The audible durations of these sources range from one to five minutes or more. Thus, only a few intrusions per hour can largely compromise the resource. This paper briefly reviews the past twelve years of research and public policy. It also describes the human audition process and presents graphic illustrations of the nature of the problem. Finally, some unanswered questions regarding operational definitions for this resource are posed.

DEVELOPING A LAND ETHIC IN STUDENTS BY RESTORING PRAIRIES, WOODLANDS AND WETLANDS ON WISCONSIN SCHOOLYARDS

Todd F. Miller¹, and Libby McCann². ¹University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison, WI, USA 53711. tfmille1@wisc.edu ²University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison, WI, USA 53711.

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ABSTRACT: The University of Wisconsin-Madison Arboretum, one of the birthplaces of ecological restoration, has a threefold mission to conserve and restore Arboretum lands, advance the science of restoration ecology, and foster the land ethic. In order to reach more K-12 students and provide more in-depth instruction than could be done in a single tour of the Arboretum, staff began holding summer institutes for teachers in 1989. Since then, teams of teachers from more than 150 schools in Wisconsin have used remnant and restored communities at the Arboretum and local natural areas to learn restoration techniques and methods to incorporate ecological restoration into the curriculum. Ecological restoration projects at schools provide students with hands-on learning about local ecosystems and the experience of taking action on behalf of the environment. Students also learn how to conduct research, manage their restorations, and grow to appreciate nature. The program provides ongoing support to participating schools and has partnered with other organizations to provide local support to schools distant from the Arboretum. The staff is currently considering ways to adapt the program to other states and biomes.

PRESERVING THE HISTORY OF THE LAND: THE INTERFACE OF CULTURAL AND NATURAL HISTORY IN NATURAL LANDS MANAGEMENT

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ABSTRACT: Understanding the land use history of a parcel of land is a key element in developing a plan for its management or restoration as a natural area. The use of historic documents such as General Land Office survey records, aerial photos, county histories, and land ownership maps can tell much about the lands history. This history is often also written on the land itself in the form of fencerows, open growth form trees in a dense forest, building foundations, stumps, and abandoned waterways. Taken together, and carefully interpreted, these resources can reveal the rich history of the human interaction with the landscape. Often the restoration and management of a natural area involves the undoing of the changes brought on by human interactions in effort to return it to a pre-settlement condition. But how far should we go in erasing the evidence of humans on the landscape? While restoring an agricultural field to prairie vegetation is appropriate, should all of the fencerow and dead furrows be removed? Can the information about cultural

features on the natural landscape be successfully recorded in words and pictures, or should they be preserved on the land? How might the erasure of cultural information on the landscape effect the ability of future land managers to understand the history of the land? And what is the role of natural areas management in preserving the evidence of past cultures such as the Native Americans? This session will attempt to pose many questions, and perhaps answer a few.

ECOLOGICAL EXTENSION PROJECTS: A PRACTICAL WAY TO DEVELOP A LOCAL LAND ETHIC

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ABSTRACT: Most biodiversity in the world survives on private property and will be protected only if private landowners have an ecological awareness and knowledge that motivates them to manage their land for biodiversity. One method of encouraging landowners to "ecoconsciously" manage their land is to hire local ecologists to work one-on-one in the field with them. In essence, this concept is an expansion of a rural education program that in the United States is known as "extension education." In this case, the purpose is to provide ecological information to rural citizens, especially rural landowners. Projects such as this could be formed either privately or publicly. In this presentation we will discuss the initial two years of an ecological extension education project in southwest Wisconsin called the "Blue Mounds Project", which was established in 1996, the effective and ineffective actions undertaken during the first two-years of this project, and the feasibility of starting similar "ecological extension projects" in other parts of the US and world. Presentation leader Brian Pruka was the founder and initial director of the Blue Mounds Project. This project still exists today.

WILDLIFE NEED HABITAT OFF LIMITS TO HUMANS!

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ABSTRACT: In 6 million years of human evolution, there has never been an area off limits to humans -- an area which we deliberately choose not to enter so that the species that live there can flourish unmolested by humans. Yet, our observations and intuition about wildlife suggest that most want and need such seclusion in order to survive. Recent research confirms this: even recreation traditionally considered harmless is actually detrimental to wildlife. Restoring true wilderness will require rethinking and redesigning all land uses and wildlife management regimes, as well as changing how we relate to wildlife.

NATURAL AREAS RESTORATION: WEEDS AND SEEDS, PLANTS AND PROGRAMS

Saturday, September 27 – afternoon

ECOLOGICAL RECLAMATION OF A SAND MINE AT GRAND MERE STATE PARK IN SOUTHWEST MICHIGAN

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ABSTRACT: Mining was completed in 2002 at the 40-acre Peters sand mine adjacent to Grand Mere State Park and an ecological reclamation of the mine is ongoing. Grand Mere State Park, a National Natural Landmark, contains over one mile of Lake Michigan shoreline with sand dunes supporting oak forests and wetlands supporting hardwood-conifer swamp, lakeplain prairie, and interdunal wetland (wetpanne). While mining began at this site in the 1960s, subsequent lawsuits and passage of Michigan's sand dune protection laws resulted in an agreement that permitted Manley Brothers (later TechniSand) to operate the mine under specific conditions that included working with the Michigan Department of Natural Resources (MDNR) on reclamation and eventually turning the property over to the State to become part of Grand Mere State Park. Most reclamation in Michigan's sand dunes has been restricted to planting a monoculture of *Ammophila breviligulata* (beach grass) and scattered trees such as *Robinia pseudoacacia* (black locust) not native to local ecosystems. The MDNR Parks and Recreation Bureau has worked closely with TechniSand, the Michigan Natural Features Inventory, the Michigan Department of Environmental Quality, the USEPA, the USDA Natural Resources Conservation Service, the Michigan Civilian Conservation Corps, local native plant nurseries, plant installation businesses, and local volunteers to design and implement an ecological reclamation of the Peters sand mine, using a diverse mix of over 100 native plant species propagated from local seed sources. Preliminary monitoring indicates successful propagation and establishment of the majority of species to date, and invasive species control has begun.

NOT JUST A PRETTY FACE-REDUX: UTILIZING NATIVE PLANTS FOR EROSION CONTROL ON SHADED SLOPES

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ABSTRACT: One year ago at the NAA Conference in Asheville, NC, we presented information on the development of a list of native species we expected to perform well for erosion control on shaded slopes. This year we will share our experiences and present information on our observations from three Milwaukee County Park natural areas that have experienced severe disturbance and were planted in the spring of 2003 with native local ecotype and genotype woodland plant species.

WETLAND RESTORATION UNDER THE WETLANDS RESERVE PROGRAM (WRP) IN WISCONSIN

Emily C. Steel¹, Greg Kidd², and Evelyn A. Howell³. ¹Gaylord Nelson Institute for Environmental Studies, University of Wisconsin-Madison, Madison, Wisconsin 53706. ecsteel@wisc.edu ²United States Department of Agriculture, Natural Resources Conservation Service, 6515 Watts Road, Suite 200, Madison, WI 53719. greg.kidd@wi.usda.gov ³Department of Landscape Architecture, University of Wisconsin-Madison, Madison, Wisconsin 53706. eahowell@wisc.edu

ABSTRACT: The Wetlands Reserve Program (WRP) is a federal program authorized under the Farm Bill for restoring wetlands on private lands. In states such as Wisconsin where it is estimated that up to 50% of historical wetland area has been lost due to drainage or destruction, the WRP represents an opportunity to restore substantial wetland acreage to the landscape. The WRP began in earnest in 1994 in Wisconsin and in the first 9 years of the program approximately 360 easements have been awarded, representing 34,974 acres enrolled. The WRP has been well received by the public both nationally and in Wisconsin, and it is expected that this program will continue to play a role in wetland restoration over the next several years. This research investigates the extent to which the WRP has restored wetlands in Wisconsin and evaluates the ecological effects of the Wisconsin WRP on wetland acreage, native wetland vegetation, and wetland community types in Wisconsin. As of the end of 2002 the Wisconsin WRP has restored or protected a total of 22,432 acres, and monitoring data from approximately 200 WRP wetland restorations in Wisconsin is synthesized. Information is presented on statewide geographic distribution of restoration sites, size of restoration, wetland community types, dominant vegetative species by community, presence of invasive species, and adjacent upland area restored. The ability of WRP projects to achieve natural wetland composition and structure is assessed.

MANAGEMENT STRATEGIES FOR PROTECTING NATURAL AREAS WITHIN DEVELOPING URBAN ENVIRONMENTS: ECOLOGICAL ASSESMENT AND MANAGEMENT RECOMMENDATIONS FOR BAIRD CREEK GREENWAY

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ABSTRACT: An ecological study of the Baird Creek Greenway in Green Bay, Wisconsin was conducted for the Baird Creek Parkway Preservation Foundation in 2002. The purpose of the study was to assess and describe the ecological condition/health of the Greenway and its natural communities and, based on this information, to develop a management plan for the Greenway. The greenway is a three mile long wooded stream valley (approximately 500 acres) on the east side of Green Bay owned by the City of Green Bay and Brown County. It contains many high-quality natural areas (e.g. wetlands and woodlands) and is used intensively for recreational activities (e.g. biking and hiking). The study involved collection of vegetation data and stream morphology and habitat data within the greenway. In addition, the entire greenway was assessed qualitatively to document the greenway's current ecological condition as well as the current and potential impacts and threats to its ecological health. Management and restoration recommendations were provided for each of the 17 identified plant communities/land cover types. These recommendations included protecting vulnerable parcels, properly managing storm water run off, maintaining necessary wetland hydrology, regulating recreational use, controlling non-native woody and herbaceous species, thinning aggressive native woody species, conducting prescribed burns, reintroducing native herbaceous species, promoting regeneration of native trees, and protecting ecologically sensitive areas. Goals of these restoration measures include protecting Baird Creek and its tributaries, stabilizing soil to reduce erosion, protecting water quality,

protecting native communities, and increasing biological and structural diversity within these communities and the Greenway as a whole.

PRIVATE LANDS MANAGEMENT

Saturday, September 27 – afternoon

PANEL DISCUSSION: FORWARD TO NATURE: PRIVATE LANDOWNERS MANAGING LAND FOR NATURAL DIVERSITY

Facilitated by Darcy Kind, Bureau of Endangered Resources, Wisconsin Department of Natural Resources, PO Box 7921, Madison WI 53707 USA Darcy.Kind@dnr.state.wi.us Panelists: Penelope and Gary Shackelford, 10728 North Bay Shore Lane, Milton WI 53563 shackelfordp@charter.net; John P. Van Altena, Jr. 11726 North Vogel Road, Milton WI 53563 jvanaltena@hotmail.com ; Ron Martin, Midwest Prairies LLC, N1020 Vinnie Ha Ha Road, Fort Atkinson WI 53538 midwest@compufort.com ; Jesse Bennett and Jaye Maxfield, Driftless Land Stewardship LLC, 13058 Rock School Road, Glen Haven WI 53810 dls@chorus.net www.driftlesslandstewardship.com

ABSTRACT: Private landowners interested in the plant and animal communities that inhabit their property approach land management from differing perspectives and with a wide range of resources and knowledge. The Van Altenas and Shackelfords represent different points of entry along the challenging path of restoring natural communities on private lands. One property was a retired family farm. The other, which included corn fields, orchards, pastures, and a marsh managed for duck hunting, was purchased by “city folk” from St. Louis to enjoy for birding and photography. These properties in south central Wisconsin total over 500 adjacent acres. Habitats include oak forest, shallow marsh, sedge meadow, shrub-carr, oak savanna, mesic prairie, wet prairie, and ash swamp. The owners will discuss how their own synergistic interactions (sharing seed, plants, knowledge, equipment, and labor) and their many sources of expert advice and information (DNR, private consultants, and non-governmental organizations) enabled them to carry forward. They will share their excitement in discovering threatened species on their property as well as the frustrations and victories (small and large) in their battle against invasive species. The land managers will discuss their role in working with private landowners and their approach to control of invasive species, integrating their expertise and labor with the efforts of landowners in both decision-making and hands-on work.

RARE PLANT CONSERVATION

Saturday, September 27 – morning

THE INFLUENCE OF POPULATION SIZE AND DENSITY ON POLLINATOR SERVICE IN *AGALINIS SKINNERIANA* (OROBANCHACEAE)

Hannelore Artiomow. University of Wisconsin – Milwaukee, Department of Biological Sciences, Lapham Hall 181, 3209 N. Maryland Ave., Milwaukee, WI 53211. lartiomow@krlt.org

ABSTRACT: The remaining Midwest prairie and savannah plant species are often restricted to small populations in fragmented habitats. Small plant populations are thought to be at risk for reproductive declines because floral resources may not be sufficient to attract and maintain pollinator communities. This study examined whether population size and density influenced levels of pollinator service and seed set in *Agalinis skinneriana* (Orobanchaceae), a rare, hemiparasitic, annual prairie plant. Three paired, large and small, populations in southwest Wisconsin were selected for study in 2000 and 2001. Population density increased significantly with population size ($P=0.001$). Small native bees, including members of Colletidae (yellow-faced bees), Andrenidae, Halictidae (sweat bees), and Apidae (small carpenter bees), were the most prevalent pollinators of *A. skinneriana*, followed by syrphid flies. Pollinator visitation rates were negatively correlated with population size ($P=0.025$). During 2000, dense pollinator observation plots within large populations received the lowest mean rates of visitation (0.6 visits/flower/hr). Variation in visitation rates may reflect local small bee abundance. Percent seed set was not influenced by population size or by pollinator visitation rates. *Agalinis skinneriana* is self-fertile, which may insure moderate seed set throughout its blooming period.

PRIVATE LANDOWNERS- GUARDIANS OF BIODIVERSITY: ENDANGERED RESOURCES LANDOWNER CONTACT PROGRAM

Darcy D. Kind. Endangered Resources Program, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI, USA, 53707. Darcy.Kind@dnr.state.wi.us

ABSTRACT: Private landowners and land managers throughout Wisconsin are protecting the biological diversity of the state, by acting as stewards to threatened and endangered species found in their own backyards. These landowners are involved with the Landowner Contact Program, a voluntary rare species protection program coordinated by the Wisconsin Department of Natural Resources' Bureau of Endangered Resources. With over 85% of the land in Wisconsin in private ownership, private landowners can play a vital role in protecting the state's rare resources. Through outreach and education efforts the Landowner Contact Program works to create awareness and appreciation for rare species and the habitat that supports them. The program offers information on the laws that protect rare species, management of the rare species, potential threats to the habitat, and assistance with population monitoring. Since its initiation in 1991, the program has been highly successful in influencing landowners to voluntarily protect and permanently protect rare species.

PLANTS OF CONCERN: VOLUNTEERS MONITOR RARE SPECIES IN A REGIONAL PROGRAM (NORTHEAST ILLINOIS)

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ABSTRACT: Plants of Concern (POC), launched in 2000, is a regional, long-term monitoring program for state-listed and other rare plant species in Northeast Illinois. It is a partnership of public and private conservation agencies, landowners and volunteers, guided by an advisory group of land managers, scientists and volunteers. A key component is training volunteers to collect data as a way of leveraging scarce landowner resources. A critical objective of POC is to census and assess the status of populations, using standardized protocols to ensure consistency of data. Demographic monitoring is conducted on selected plant species: *Cirsium hillii* (Prairie Thistle), *Cypripedium candidum* (White Lady Slipper), *Tomanthera auriculata* (Eared False Foxglove) and *Viola conspersa* (Dog Violet). Another major goal is to relate population trends with management practices, to provide feedback to managers following an adaptive management process. During the 2001 and 2002 seasons, 117 volunteers monitored 191 occurrences of 81 species, working with 43 landowners at 91 sites. Data indicate that a majority of populations of rare species suffer high invasive species presence and other stresses. However we also observed evidence of recruitment within many populations. For those populations monitored with finer scale demographics, we are also determining those characters best suited for documenting life history strategies, reproductive success and persistence. The presentation focuses on program concept, data analysis results and long-term goals. POC is coordinated by the author through the Chicago Botanic Garden in partnership with Audubon-Chicago Region and is partly funded as a project of Chicago Wilderness, a regional conservation coalition.

CONSERVATION EFFORTS FOR THE ILLINOIS –THREATENED *AGALINIS AURICULATA* (OROBANCHACEAE): HOW MUCH DO WE KNOW?

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ABSTRACT: Conservation of rare plants is a difficult task especially when dealing with parasitic plants. Ecological interactions between parasitic plants and their hosts are of extreme importance, but are often overlooked. In addition, basic background and life history data must be available so that successful management and reintroduction techniques can be implemented. In a multiple-year study of five populations, we have gathered information on the reproductive biology, seed germination, host preference, and genetic diversity of the Illinois-threatened *Agalinis auriculata* (Michaux) Blake (eared false-foxglove, Orobanchaceae), an annual hemiparasitic plant. Overall, *A. auriculata* is mostly an autogamous species with a short window for out crossing. The species has very low seed germination and seedling survivorship. Haustoria developed when *A. auriculata* was associated with members of Asteraceae. Finally, preliminary results show low levels of diversity (few alleles per locus, low levels of polymorphism and heterozygosity) in *A. auriculata*, compared to

more widespread *Agalinis* species. Information from this study will be valuable to land managers and will assist them with the proper reintroduction of *A. auriculata* to suitable sites.

A TALE OF THISTLES: ONE PARK'S CONSERVATION OF A THREATENED PLANT

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ABSTRACT: Join park naturalist, Carolyn Rock, on a 20-year journey of conservation of the Federally threatened Pitcher's thistle at Whitefish Dunes State Park. Follow the park staff's efforts to preserve habitat, educate park visitors and neighbors along with count plant numbers.

NATURAL AREAS AND RARE SPECIES OF THE MILWAUKEE COUNTY PARK SYSTEM: THERE'S MORE TO THIS SENSE OF PLACE THAN BEER AND BIKES

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ABSTRACT: Milwaukee County, Wisconsin, well known for its beer and motorcycles, is the most developed area in the state and the Milwaukee County Park System manages nearly 15,000 acres of this urban area, including two State Natural Areas and numerous other local natural areas. From Beech- Sugar Maple dominated forest to Big Bluestem dominated prairie, Milwaukee County has a wide range of natural communities within its borders. Also, within this urbanized area there are approximately 120 state listed Endangered, Threatened, or Special Concern species. I will briefly describe some of the higher quality sites, threats to these sites and rare species, and current and proposed restoration and management.

STATE PROGRAMS: ORIGINS, STATUS, AND A MODEL FOR DEVELOPING STATE NATURAL AREAS

Saturday, September 27 -- morning

WISCONSIN'S STATE NATURAL AREAS PROGRAM: ORIGINS AND EARLY DEVELOPMENT

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ABSTRACT: In 1951, Wisconsin became the first state with a natural areas program created by legislative mandate. The program's origins may be traced back more than a century earlier, however, to the pre-Civil War efforts of naturalists such as Increase Lapham and groups like the Wisconsin State Horticultural Society. Around the turn of the 20th century, the movement to preserve native landscapes made significant progress under the leadership of local organizations and private landowners. In Ripon, two women's groups banded together in 1901 to save a remnant stand of sugar maple and basswood known as South Woods. Meanwhile, private landowners intentionally preserved native landscapes on their own property. An oak forest at "Wychwood," a private estate on Geneva Lake, became one of Wisconsin's first designated natural areas. Momentum increased over the 1920s and 1930s, due to the efforts of botanists such as Norman Fassett and John T. Curtis of the University of Wisconsin and Albert M. Fuller of the Milwaukee Public Museum. Citizens' groups, including the Friends of Our Native Landscape, also campaigned to save natural areas. Working closely with Fassett and Fuller, Aldo Leopold made a proposal to the Wisconsin Conservation Commission in 1945 to create a Committee on Natural Areas. The Committee targeted sites for acquisition, including Parfrey's Glen, purchased in 1947. Legislative endorsement of the program followed in 1951, with the creation of the State Board for the Preservation of Scientific Areas. Today, Wisconsin's natural areas program comprises more than 400 sites offering unique scientific and educational opportunities.

WISCONSIN'S STATE NATURAL AREAS PROGRAM: A MODEL?

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ABSTRACT: In 1951, the Wisconsin legislature created a state Scientific Areas Program (later the name was changed to State Natural Areas), the first of its kind in the nation. Over the years, the program has been charged with added responsibilities to include 1. Protect high quality natural communities, rare species habitat, and significant geological and archaeological features, 2. Legally protect sufficient examples of each biotic community and natural feature over a range of environmental gradients to ensure preservation of the state's biological diversity, 3. Maintain "benchmark" or reference areas – functioning natural system – for comparison with human-manipulated systems, 4. Provide opportunities for scientific research on natural systems where natural processes are allowed to proceed essentially unimpeded, 5. Provide opportunities for both formal and informal environmental education to students and the public to gain understanding and appreciation of biotic communities and their component species, 6. Provide ongoing stewardship for natural areas using the principles of ecosystem management, and 7. Encourage partners to undertake projects that meet the goals of the program. The implications of these wide-ranging charges will be explored including limitations for successfully attaining the program's goals.

STATUS OF STATE NATURAL AREA PROGRAMS.

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ABSTRACT: Under the auspices of the NAA Program Assistance Committee, Thom, Amy Linsenhardt, and Karen Kramer conducted a survey of best contacts for each state's natural area or nature preserve program to determine the current status of state-level programs in the USA, and to compare 2001 state natural area activity to levels found by The Nature Conservancy in a study published in 1977. This paper discusses seven criteria used to determine whether a state has a "comprehensive" natural area program, such as having a state-level authority to lead the program and recognition of natural area units as part of a statewide system with some form of designation, dedication, or registration. It also compares state program growth by number of acres and number of units added to systems over the last 25 years. By survey criteria, only 23 states have comprehensive natural area programs, fewer than there were 25 years earlier (although the criteria were somewhat different in the 1977 study). State programs were grouped into five categories for analysis. In some respects comprehensive natural area programs appear to be losing ground, but individual state programs have grown and some states without comprehensive programs are conserving significant natural area resources. The survey will be most useful if it is frequently updated. The list of best contacts for each state should facilitate such an update, but some group or agency needs to step forward to accomplish this. The authors of the survey believe that biodiversity conservation would benefit if more states adopted comprehensive natural area programs.

VERTEBRATE ISSUES: EFFECTS OF HUMAN ACTIONS ON VERTEBRATE CONSERVATION

Saturday, September 27 – morning

BREEDING BY SNOWY PLOVERS FOLLOWING PROTECTION FROM HUMAN DISTURBANCE

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ABSTRACT: To experimentally assess how human disturbance alters shorebird breeding success, we monitored snowy plover breeding activity at Coal Oil Point Reserve in Santa Barbara before and after management actions. The site had formerly supported breeding before it was opened to public recreation in 1970. In the subsequent three decades, no conservation efforts were made and only three nests had been observed (none were successful prior to protection). In 2001/2002, we erected a rope barrier to direct foot traffic from the core plover roost area down to the wet sand. Volunteers helped gain compliance, provided education, discouraged off-leash dogs and scared away crows. Prior to management 2% of beach users could identify a snowy plover. After educational signs, this increased to 17% and again to 89% after full implementation of the volunteer program. The number of unleashed dogs in the area declined as did disturbance to plovers within the fence. Snowy plovers increased in abundance relative to historical levels. Plovers initiated 9 nests and fledged 14 out of 16 hatched chicks. Subsequent experiments using artificial nests indicated that egg survivorship was significantly lower outside the fenced area than inside the fenced area due to trampling by beach users. Predation by crows was also an important source of egg mortality on artificial nests. This is the first evidence that a reduction in disturbance can lead to the recovery of a formerly abandoned snowy plover breeding site.

USING ANALYSIS AND MODELING OF MAMMALIAN CARNIVORE MOVEMENT TO ASSESS LANDSCAPE CONNECTIVITY IN THE SOUTHERN CALIFORNIA ECOREGION

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ABSTRACT: Many regions have been severely impacted by urban and agricultural development, and this process will often continue into the foreseeable future. The effects of such landscape change include a loss of habitat for species, and a reduction in landscape connectivity. A case in point is the southern California ecoregion, where assessments of the functional connectivity of the present landscape and possible future landscapes in this region are lacking. Since connectivity is an interaction between landscapes and animal movement, models of movement on heterogeneous landscapes may be useful tools for making assessments. We present new models and methods for analyzing radiotelemetry data, and present individual-based movement models (IBMMs) that we have constructed to simulate animal movement on geographic information system models of real landscapes. We are applying the statistical methods to the analysis of *Puma concolor* (mountain lion, puma) and *Felis rufus* (bobcat) radio and global positioning system (GPS) telemetry data collected in southern California. The results of this analysis are used in conjunction with the IBMMs to assess landscape connectivity on present and potential future landscapes in the southern California ecoregion. These assessments will allow conservation organizations and resource agencies to take proactive steps to preserve habitat connectivity in this fragmented system.

HABITAT SELECTION OF GRASSLAND BIRDS IN NORTHWEST ILLINOIS: EFFECTS OF PLANT SPECIES DIVERSITY, VEGETATION STRUCTURE, AND LANDSCAPE VARIABLES

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ABSTRACT: We censused birds and plants at 30 sites in Carroll and Jo Davies counties, Illinois to test the idea that vegetation structure is more important than plant species diversity for grassland bird habitat selection. We also examined the influence of landscape variables on grassland bird occurrence at the 30 sites. The sites included remnant prairies, prairie restorations, warm season plantings, cool season grasslands, and oldfields. Landscape variables were more important than either vegetation structure or plant diversity variables for predicting bird occurrence. Vegetation structure and plant species diversity did not have easily distinguishable effects on bird occurrence in multivariate analyses. Results suggest that while warm season plantings and restorations approximate some features of native prairies important for grassland birds most restorations and plantings in this area are far too small and/or far from other grasslands to support grassland bird species most in need of conservation efforts.

POSTER ABSTRACTS

MAPPING AND MODELING THE CURRENT AND POTENTIAL DISTRIBUTIONS OF INVASIVE PLANTS FROM CHINA

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ABSTRACT: Scientists at the EROS Data Center and colleagues in the Biological Resources and Geography disciplines of the US Geological Survey are collaborating to develop predictions of the potential distribution of selected invasive plants from China using remote sensing, GIS, and a variety of modeling techniques. *Sapium sebiferum* L. (Chinese tallow), the first of several plants we are investigating, is a major threat to key native plant communities in the Southeast and is one of the most significant exotic invasive plants of Chinese origin in the U.S. While some of the invasive characteristics of *S. sebiferum* have been well documented, a major uncertainty remains regarding its potential to colonize inland habitats and cause further economic and ecological damage. As a first step in generating predictive models of potential *S. sebiferum* distribution, we are developing a current distribution map of the species in the U.S. We have assembled information from a wide variety of sources and scales, including: the USDA/Plants database, county weed surveys, floral inventories, other scientific studies, and remote sensing. Information from these sources have been integrated and synthesized to develop the map by using a combination of sampling and modeling. We have developed a database of presence/absence point information, which we will use as reference data for developing predictive models in the future.

LANDSCAPE-SCALE INVASIVE BRUSH REMOVAL AT GREEN RIVER STATE WILDLIFE AREA

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ABSTRACT: During the past 60 years, Green River State Wildlife Area (GRSWA) has experienced significant woody encroachment of mesophytic, successional, and invasive exotic species to the detriment of the high quality prairie and wetland habitats. Landscape-scale restoration of these habitats was initiated in 2001 through a 500 acre timber sale. To date, nearly 200 acres containing over 5000 tons of chipwood and 83,000 board feet of lumber have been harvested utilizing logging equipment such as feller-bunchers, skidders, and whole-tree Mobark chippers. Income produced from the timber harvest has been used for habitat restoration of cleared areas. Cut stumps are treated with a 20% solution of Garlon 4 in basal oil. A 2% foliar application of Garlon 3a is used on resprouting woody vegetation early in the growing season, while a 2-5% foliar application of Krenite S with a non-ionic surfactant is used on resprouting black locust in a late summer application. Cleared and treated habitats are then planted to a mix of native prairie and wetland species collected on site.

AN EVALUATION OF HERBIVOROUS INSECT PERFORMANCE ON NATIVE (US) AND INTRODUCED (EUROPEAN) *SOLIDAGO GIGANTEA*

Robert Clare¹ and Gretchen Meyer². ¹University of Wisconsin- Milwaukee, P.O. Box 413, Milwaukee, WI 53201 USA, tampopo@execpc.com and ²University of Wisconsin Field Station, 3095 Blue Goose Road, Saukville, WI 53080 USA, gmeyer@uwm.edu.

ABSTRACT: *Solidago gigantea* is a native North American plant, which was introduced into European gardens about 250 years ago. The first escapes were reported around 1850, and this species, as well as *S. altissima*, and *S. canadensis* have become highly invasive in the intervening years. Many native species of *Solidago* are aggressive inter-specific competitors, but are nonetheless not invasive in their native habitat. In Europe these same species of goldenrod have become invasive, with average stem densities of 78 stems/m² compared to 35 stems/m² here. It has been hypothesized that one reason for this invasiveness may be the release from herbivore pressure of the native insect fauna. Thus, plants in their introduced range are able to preferentially allocate more resources to growth and reproduction without regard to the maintenance of physical and chemical defenses. In this study insects from three major orders of phytophagous insects were utilized to test the hypothesis that plants from their introduced range have reduced allocation to defense. These insects represent two exophytes, a xylem sap feeder (Homoptera: Cercopidae), a leaf chewer (Coleoptera: Chrysomelidae); and a third insect, an endophytic gall maker (Lepidoptera: Tortricidae). They were evaluated for their performance on multiple populations of native (US), and introduced (EU) *Solidago gigantea*. It is likely that conservation efforts aimed at the preservation of native habitats through the control of invasives can be improved with a more thorough understanding of why plants become invasive.

NPS NATIONAL NATURAL LANDMARKS IN THE UPPER MIDWEST REGION

Janet Eckhoff, National Natural Landmarks Coordinator, National Parks Service, Midwest Region. Wilson's Creek National Battlefield, 6424 W. Farm Road 182, Republic, MO 65738 Janet_Eckhoff@nps.gov

COASTAL WETLANDS WEB PAGES TO ASSIST CONSERVATION PLANNING FOR WISCONSIN.

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ABSTRACT: The State of Wisconsin is bordered by Lake Superior to the northwest and Lake Michigan to the east. The shorelines of these lakes are a complex arrangement of ecosystems that include a variety of freshwater wetland types. Coastal wetlands provide rich habitat for plants and animals and contribute greatly to the larger ecological processes of the Great Lakes Ecosystem. However, industry, development, and recreation are all impacting coastal wetlands and their important ecosystem functions. The Endangered Resources Program of the Wisconsin Department of Natural Resources, and through the financial support of the Wisconsin Coastal Management Program, has completed a number of inventory and data assessment projects aimed at increasing our understanding of freshwater coastal ecosystems and, in particular, coastal wetlands. One goal of these efforts is to provide information to natural resource professionals, managers and the general public. A new set of web pages

(<http://www.dnr.state.wi.us/org/land/er/publications/cw/>) that highlight 57 coastal wetland sites along Lake Michigan and Lake Superior will be presented. These "Primary Sites" were chosen because of their ecological significance using information from the Wisconsin Natural Heritage Inventory Database and several other sources over a three-year period. A short description is provided for each site along with a set of photographs and a list of rare species and communities documented there. The web site also contains background and reference information for Wisconsin's coastal wetlands and additional links to other coastal wetland information. Users can navigate to the Coastal Wetlands Web pages from the Endangered Resources Program Web pages, as well as the Wisconsin Coastal Management Program Web pages.

ASSESSMENT OF THE HERBACEOUS COMMUNITY AND PRESENCE OF *ALLIARIA PETIOLATA* AT COLLINS WOODS

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ABSTRACT: Baseline community structure information is needed for the management and conservation of sites at risk to invasive species. This study analyzed the abundance and distribution of *Alliaria petiolata* (garlic mustard) and the general plant species composition at Collins Woods (5.36 ha woodlot in East-Central Illinois) to provide baseline information for future site assessment. The entire site was exhaustively searched for *A. petiolata* presence; the number of first year and second year plants observed was recorded in a GIS database to enable future evaluation of its spread. Two methods characterized the herbaceous community diversity, evenness, and species importance. The first applied a 10 x 10 m grid across the entire site creating 455 (1 m²) plots in which species presence and cover were determined. The second used two randomly located 20 x 50 m modified Whittaker plots containing nested sub-plots that were sampled for plant density, cover, and number of species. The Shannon-Weiner index of diversity was 3.19 for the 455 (1 m²) plots and 2.42 and 1.40 for the two 20 x 50 m plots. A total of 92 species were identified at Collins Woods (10% non-native); *Parthenocissus quinquefolia*, *Sanicula gregaria*, *Toxicodendron radicans*, and *Geum canadense* had the highest importance values. The species-area relationship within each of the Whittaker plots was used to estimate species diversity and richness. The information from this study will be essential for evaluating the spread and impact of *A. petiolata* and other invasive species on the herbaceous community structure.

IDENTIFYING SIGNIFICANT ECOLOGICAL SITES: HARNESSING THE LOCAL KNOWLEDGE OF BIODIVERSITY

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ABSTRACT: The Bureau of Endangered Resources (BER) is charged with the inventory and analysis of biotic and ecological resources across Wisconsin. However, given the size of the state, the ecological complexity of the landscape, and the resources needed to compile meaningful inventory results, it is a task that depends on information gathered from a variety of sources. In order to create new approaches to comprehensive inventory, BER conducted a pilot "Experts Workshop" for the Fox River Headwaters Ecosystem Significant Ecological Areas (FRHE) in east central Wisconsin by inviting 60 individuals with first-hand knowledge of the local resources. The goals of the workshop were to increase the common understanding of the ecological resources of the area and to recommend ecologically significant sites. Coarse filter/GIS analysis of vegetation and natural community patterns and targeted field analysis of the study area complimented the workshop. The workshop was successful in gathering significant local knowledge on 192 potential hot-spots of biodiversity in a short period of time within the study area, providing opportunities to personally discuss ecological issues and share information, identifying future conservation planning opportunities, and forging new public/private partnerships. Conservation priorities were then assessed by attendees and formed the basis for BER's Ecological Assessment Report for Conservation Planning of the FRHE.

MORPHOLOGY AND PLANT COMMUNITIES OF *ALLIARIA PETIOLATA* IN NATIVE AND INVADDED HABITATS

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ABSTRACT: Exotic, invasive plants often exhibit different morphological traits in their new habitats, having been freed of herbivorous natural enemies from the plants' ancestral home. Habitats invaded by these exotic plants also may contain different plant communities than did ancestral habitats. We compared selected morphological traits of the invasive plant *Alliaria petiolata* (garlic mustard) at a location in Germany and Illinois, including number and length of main and side shoots, length of inflorescences, diameter of root crowns, and biomass. In addition, we identified and characterized the plant communities in Switzerland, Germany and Illinois. Overall, Illinois plants were taller and had longer main shoots and inflorescences, whereas German plants had side shoots and a greater total length of all shoots. Biomass and root crown diameter did not differ between sites. Cluster analysis yielded three distinct clusters, separated by length of shoots and inflorescences, and presence of side shoots. Plant communities differed among sites. The site in Switzerland had 6.17 annuals per 0.25 sq. m. plot, versus only 0.34 in Germany and 0.02 in Illinois. Perennials also were greater in Switzerland (30.2 per plot) and Germany (27.8 per plot) than Illinois (11.3 per plot). The differences in plant morphology and community composition may have implications for the success of planned biological control importations.

INVASION OF NORWAY MAPLE INTO MACKINAC ISLAND STATE PARK

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ABSTRACT: *Acer platanoides* (Norway maple) is commonly used in horticultural applications in urban areas. It's hardiness and ability to cast a very deep shade make for a very desirable ornamental. Unfortunately, these characteristics can also cause negative impacts on native species when the species works its way into the forest. For this reason, Norway maple poses a serious threat to ecosystem health in natural areas, especially those in close proximity to urban environments. In an effort to better understand how Norway maple interacts with the native forest, we are undertaking a study to investigate the Norway maple population on Mackinac Island, MI. The

island setting allows us to observe the population in relative isolation of influence from any surrounding seed sources, allowing us to focus on discrete introductions on the island due to plantings. We mapped, aged, and measured each of the Norway maples on the island in order to produce a GIS coverage of the island containing all of the occurrences of the species. Historic maps and photos suggest that past land-use practices are significant determinants of establishment and spread of Norway maple. This information will also be used for future studies to determine a number of other factors regarding the spread of Norway maple, including nascent foci, rates and patterns of spread, understory influences, and effects on stand dynamics. Understanding how these factors influence different aspects of the invasion will allow for more efficient and effective control measures where natural areas are threatened by invasion of Norway maple.

EFFECTS OF HUMAN ACTIVITY ON BIRD DISTRIBUTION IN AN ILLINOIS NATURE PRESERVE

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ABSTRACT: Agriculture, industrialization, and urbanization have fragmented Illinois forests. Remnant forest fragments are developed along their edges and are subject to human recreational pursuits. Thus, native and migrant bird species diversity in Illinois has declined, and effective management of remaining forest preserves is a priority. We report results of a study examining effects of human activity on bird distribution in the Carpenter Park Nature Preserve outside Springfield. Study plots were established in the preserve along a gradient of human use and were visited for 20-minute periods during sampling sessions from June 2001 through April 2003. Red-belly and downy woodpeckers, tufted titmouse, blue jay, Northern cardinal, indigo bunting and American robins were common; several are edge species. Neotropical migrants such as cerulean warbler (previously confirmed to have bred in the park) were no longer observed. Wood thrush and Kentucky warbler were present, but successful nesting has not been confirmed. Brown creeper, a species highly sensitive to forest fragmentation and previously confirmed to have bred there, is now heard only during winter. Human activity within our plots varied with plot position in the expected fashion, but there was no significant relationship between human activity and either bird species number or number of individuals observed. The preponderance of edge species observed, and the lack of a relationship between human use and bird distribution, suggest that this nature preserve is impacted by human activity in such a way that truly interior forest habitat is not perceived by bird species in the region.

USING CATTLE TO RESTORE OAK SAVANNA/WOODLAND IN SOUTHERN WISCONSIN

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ABSTRACT: Oak savanna, characterized by scattered oaks with an understory of prairie species is the most endangered native ecosystem in North America. The absence of grazing or burning, along with the introduction of the plow are key factors explaining the disappearance of this ecosystem. An objective of this study was to determine the effectiveness of rotational grazing on reducing the shrub layer in degraded oak savannas. This study took place at 3 sites in southern Wisconsin. For 2 summers, 5-7 animal units of Scottish Highland cattle (1AU=1000 pounds) were on each 1-acre treatment between 1 and 3 days and then placed in a pasture area for one day between replicates. At the end of the 25-day cycle, the next cycle began. Between 2 and 4 grazing cycles occurred, depending on moisture and regrowth. Shrub leaves were of good quality with 15% crude protein, 27% acid detergent fiber and 35% neutral detergent fiber. Animal weight gain and condition was similar between the controls and the project animals. Cattle observations revealed that they spent the majority of their time (>65%) in the wooded area of the plots. Trampling and rubbing of trees and shrubs was common and they used their horns to knock down small trees and to open up dense shrub groves. *Xanthoxylum americana* (prickly ash) and *Rubus* spp. (berries) were the favorite shrubs to browse. Cattle were effective at opening up the understory but continued grazing and a chainsaw will be needed to maintain the openness.

CONNECTING EDUCATION WITH APPLIED CONSERVATION PRACTICES: AN INTERN PROGRAM

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ABSTRACT: The Chicago Botanic Garden (CBG) has formed a partnership with the Bureau of Land Management (BLM). The Institute for Plant Conservation, CBG is committed to education and research initiatives with a specific focus on the conservation of threatened and endangered species and their natural habitats. The BLM has a limited number of staff (one botanist per 4.8 million acres) to manage the conservation activities of vast natural land areas that are under their care. An internship program was created as a result of the partnership that had formed between the CBG and BLM. In 2002, CBG staff expertise was utilized to select and train seventeen recent graduates chosen from a pool of applicants within the USA and Canada. The interns were sent to BLM state and field offices within Utah, California, Nevada, Colorado, Wyoming, Montana and Arizona. Questionnaires sent to both the mentors and interns revealed that the first year of the program was a success. The interns gained valuable experience working for a government agency. The mentors had projects completed that would never have been completed otherwise. Overall, this program has benefited the conservation of threatened and endangered species and their habitats at a time when it is becoming increasingly important.

PRIORITIZING INVASIVE SPECIES

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ABSTRACT: Among the thousands of non-native species that have been intentionally or unintentionally introduced to the U.S. from other places, relatively few are ecologically troublesome. With limited resources available for managing natural areas and other native species habitats, setting priorities is imperative. To best guide conservation action, it is essential to know which non-native species pose the greatest threats to natural habitats. To date, despite many policies and programs focused on non-native species, there is no broad agreement on which non-native plants are considered the most invasive in the United States. What is missing is a scientifically based assessment identifying the most invasive species. In 2002, in cooperation with The Nature Conservancy and the U.S. National Park Service, NatureServe completed a widely reviewed and tested scientific protocol for objectively assessing the invasiveness of non-native plants. NatureServe is now applying this method on a national level to evaluate the invasiveness of approximately 3,300 species of non-native flowering plants, ferns, and conifers known to grow outside of cultivation in the United States. Our goals are to produce a scientifically credible list of the nation's most invasive plants, produce a list of apparently non-invasive non-native plants, identify

species in need of further research, distribute the information through our website (www.natureserve.org), and provide other products and further analysis. The information developed from this process should greatly benefit the work of land managers in the conservation, government, and corporate sectors, as well as gardeners, landscapers, the nursery industry, private landowners, and conservation organizations.

THIRTY YEARS OF COMMUNITY CHANGE IN AN ILLINOIS OLD GROWTH FOREST

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ABSTRACT: Forest ecosystem degradation and loss is a serious problem throughout the Midwestern United States. Invasive species, altered drainage patterns and fire suppression are threatening the few remnants of original forest that remain. The aim of this study is to determine the effects of these anthropogenic changes on the composition of vegetation in Alerton Park, Illinois. Building on vegetation surveys from 1972-3 (Bell et. al.), and using two of the original transects, we resurveyed the forest understory in upland and low-land forest. All trees > 4cm DBH have been recorded and identification of the herbaceous species in the community is in progress. Flooding frequency and mean daily stream flow at this site have increased significantly since 1972, which may account for the decline in tree density in the bottomland forest (from 619 to 447 stems ha⁻¹ in 2002). Only one oak tree has recruited in the upland forest since 1972-3 and 10 species of tree formerly present are now absent. This decline in species diversity may be correlated with the invasion of *Alliaria petiolata* (garlic mustard) in the early nineteen eighties. A preliminary study in 2002 found *Alliaria petiolata* in 796 of 800 paired meter squared quadrats in the upland forest reaching densities up to 25 plants/m². The understory will be resurveyed over the next two years to determine the impacts canopy changes, invasive species, and increased flooding on the herbaceous community.

BREEDING BIRD COMMUNITY RESPONSES TO A SMALL SHRUBLAND-TO-RAIRIE RESTORATION

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ABSTRACT. Fifteen-minute point counts were used to sample bird communities within a 37-ha site at the 1,030-ha Revis Hill Prairie Nature Preserve, in Mason County, central Illinois. In 1994-95, habitats consisted mostly of shrublands (dominated by *Maclura pomifera*, *Crataegus* spp., *Cornus* spp., and *Gleditsia triacanthos*) surrounded mostly by second-growth woodland. By 2001-02, when counts were repeated, 15 ha of shrubland had been restored to tallgrass prairie (dominated by *Andropogon gerardi*, *Sorghastrum nutans*, and *Solidago canadensis*). For all years, 43 bird species were recorded and categorized as grassland (5), shrubland (12), or woodland (26) species. The Brown-headed Cowbird (*Molothrus ater*) was the most numerous species. An Index of Similarity comparing bird communities among all years ranged from 0.70 to 0.80, indicating a consistent similarity among pre- and post-restoration bird communities, both of which were dominated by woodland and shrubland species. Few species, other than the American Goldfinch (*Carduelis tristis*) and Common Yellowthroat (*Geothlypis trichas*), actually seemed to use the prairie restoration. Because true grassland birds tend to require large blocks of habitat, this small prairie restoration provides inadequate grassland breeding habitat. Resource managers should consider such effects during the planning phases of small restoration projects, especially if their goals are to serve more than botanical interests.

ESTABLISHMENT AND PERSISTENCE OF PRAIRIE SPECIES AT VARYING SEEDING DENSITIES

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ABSTRACT: The loss of prairie throughout the Midwest has created an interest in prairie restoration. Despite efforts, critics say that we have yet to create an authentic, diverse prairie. Restorations tend to have lower structural diversity and lack conservative species. Previous studies have examined the effects of seed mixes and planting methods on diversity. No studies, however, address the issue of seeding density. We are examining the effect of seeding density on the establishment and persistence of prairie species. Three study sites were planted on the Leopold Memorial Reserve in Baraboo, WI – one in November 2001 and two in November 2002. All study sites have similar topography and soil type. The 2001 site consists of 45 species and the 2002 sites consist of 48 species. Each study site was divided into three replicates comprised of four treatments. Treatment areas were planted at 100, 200, 400 or 800 seeds/m². In 2003 all sites will be sampled. Rooted frequency and percent cover measurements will be taken in twenty 1m² plots within each treatment area. 35 of the 45 species planted in 2001 were present in 2002.

THE CENTER FOR EXOTIC SPECIES AT MICHIGAN TECHNOLOGICAL UNIVERSITY

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ABSTRACT: Exotic, invasive species continue to be introduced into North America and previously introduced species continually invade native communities. There is a need to understand the impacts caused by these organisms both for management purposes and for policy decisions relating to exotic species. The Center for Exotic Species in the School of Forest Resources and Environmental Science at Michigan Technological University has been established to address research and management questions in the broad field of exotic species. Insects, pathogens and weeds are all included in the scope of the Center. Characterizing their impacts will allow the prioritization of management practices targeting exotic species. The mission of the Center for Exotic Species is to develop research in these areas and provide results to governmental and non-governmental organizations, and to the general public. In addition, the Center is envisioned to provide educational tools for use in middle school and high school classrooms, and in the continuing education of resource managers. This will increase awareness and management of exotic and invasive species. The Center has active research, educational and management projects working with *Centaurea maculosa* (spotted knapweed), *Lythrum salicaria* (purple loosestrife), *Agrilus planipennis* (emerald ash borer), and the disease complex formed by *Cryptococcus fagisuga* and *Nectria* spp. (beech bark disease).

FIRST GRADERS ASSESS THE IMPACTS OF GARLIC MUSTARD ON NATIVE PLANTS

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ABSTRACT: *Alliaria petiolata* (garlic mustard) is frequently observed to outcompete native species, yet rarely are quantitative assessments done to determine its' impacts. Quantitative assessments can be simple, quick, and done by students at all grade levels. A first grade class conducted this study as part of an overnight field trip to Lake Kegonsa State Park. In 3 separate small groups the students first learned about invasive plants and how they can become aggressive and cause problems. For each group of students a ball was thrown to locate the plots in 2 areas, one with and one without garlic mustard. A ½ meter square quadrat frame was used to delineate the study plots. For each quarter of the frame one student was responsible for counting the larger plants and the total number of species and for estimating the total number of seedlings. They also searched the plot for invertebrates. The authors acted as data recorders. Their results were consistent in all 3 groups. Plots without garlic mustard had an average of 32.3 larger plants and 265.6 seedlings of 9 native plants. In the garlic mustard plants, there was an average of 52 flowering and 401.6 seedlings of garlic mustard, with an average of 4.6 plants of 2.3 other species, some of which were non-native. Invertebrate numbers were fairly consistent throughout the six plots. As a follow-up to the study, when pulling garlic mustard from the park, the students made another discovery - garlic mustard smoked over a campfire tastes like hotdogs!

THE USE OF CORN GLUTEN TO PREVENT GARLIC MUSTARD GERMINATION

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ABSTRACT: The spread of *Alliaria petiolata* (garlic mustard), has resulted in a decline in forest vegetation. Control methods currently utilized for garlic mustard do not prevent seed germination. The use of corn gluten, a natural pre-emergent herbicide, may be useful as a supplement to reduce the number of germinating seeds. I tested the effectiveness of corn gluten on an established population of garlic mustard at the University of Wisconsin Arboretum, Madison. I used two different application rates and two times of application. The number of rosettes was initially counted. After application of the corn gluten, I counted the number of new seedlings and also noted the affect, if any, on established rosettes. The experimental quadrants that received an application of corn gluten before the germination period seemed to remain in a stable state with few new seedlings emerging. The other quadrants that received a later application just past the germination period, and the control quadrant, had a significant number of garlic mustard seedlings

MANAGEMENT OF WHITE-TAILED DEER HERBIVORY AT UWM FIELD STATION

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ABSTRACT: Wildlife managers have recently begun to focus on lowering populations of *Odocoileus virginianus* (white-tailed deer), which are reaching densities in many regions that are considered overabundant. Deer are regarded as a keystone herbivore: as high densities of deer over browse preferred plant species, the biotic community as a whole is impacted and changed. This is thought to be the case at the University of Wisconsin – Milwaukee Field Station, which contains many unique habitats and associated plant species, some of which are on the southern edge of their range. It is our goal to assess deer densities and damage at the UWM Field Station using the following methods: 1) Establish an efficient, repeatable means to estimate deer density in and around the Field Station. 2) Understand if deer density at the Field Station is above carrying capacity by conducting exclosure studies of plant species that appear to be over browsed by deer. Results from two different types of deer pellet surveys will be compared to deer density estimates taken from helicopter flyovers of the station. Exclosure studies are currently being conducted to assess browse damage caused by deer. The focus of exclosure studies will be on two plant species: *Chamaedaphne calyculata* (leatherleaf) in the Sapa Bog, and *Trillium grandiflorum* (large-flowered trillium) in the Cedarburg Beech Woods. It is our goal to combine the results from these studies to design an appropriate management scheme for white-tailed deer, in order to preserve these and other plant species at the UWM Field Station.

BIOLOGICAL CONTROL OF PURPLE LOOSESTRIPE IN ILLINOIS

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ABSTRACT: *Lythrum salicaria* (purple loosestrife) is an exotic weed that severely threatens the natural composition of wetlands in Northern Illinois. The most promising method to restore the natural state of these wetlands is using biological control to reduce weed populations to levels low enough to allow native vegetation to flourish. Beginning in 1994 the State of Illinois began a purple loosestrife biological control program. With the Illinois Natural History Survey taking the lead in 1995, purple loosestrife in Illinois would no longer be on the loose. The Illinois program includes partnership with land managers, administrators, and scientists from a wide variety of organizations; mass rearing of *Galerucella* beetles for statewide releases; developing and supporting on-site rearing and educational materials for middle and high school students and homeowners. With over 2.5 million beetles released at over 250 sites and over 300 educators trained, purple loosestrife is on the "run" in Illinois.

DETERMINING THE FEASIBILITY OF PRESCRIBED BURNING TO AFFECT THE BUD BANK OF REED CANARY GRASS (*PHALARIS ARUNDINACEA* L.) POPULATIONS

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ABSTRACT: Prescribed burning has been advocated to control *Phalaris arundinacea* L. (reed canary grass), a problematic wetland species. To be effective, prescribed burning needs to prevent recruitment from the rhizome bud bank of the population. We conducted an observational and experimental study to measure the bud population and to assess the potential of fire to cause bud mortality. Soil cores collected from May to October from Waubesa Wetlands State Natural Area in Dane County, Wisconsin demonstrated that bud density correlates to rhizome abundance and that a dense stand can produce from 3000 to more than 6500 buds/m² of soil surface. Most buds were located within the first 5 cm below the surface, but buds ranged as deep as 15 cm. Soil cores were given two moisture treatments (moist or dry) and the surface was heated with a propane torch to simulate wildfire while the below-ground temperature was

monitored with thermocouples. Burning had no significant effects on bud mortality and was similar in both wet and dry treatments. Thermocouples indicated a great deal of variability between core temperature profiles; however, few of the cores experienced significant heat penetration greater than 3 cm below the surface. It is extremely unlikely that prescribed burning in the field can directly impact the bud bank even though it kills the aboveground material.

EVALUATION OF PRESCRIBED FIRE AND FOREST HARVEST AS WOODLAND RESTORATION TOOLS IN THE LOWER MISSOURI OZARKS

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ABSTRACT: Historical accounts of Missouri Ozark presettlement woodlands describe an open landscape consisting of scattered trees, little understory, and a well-developed herbaceous ground flora. Dendrochronological data indicate that these woodlands were associated with a regular aboriginal fire regime. Woodland communities have been significantly altered by wide-spread land clearing and grazing in the early 1900's and by fire suppression in more recent times. The most dramatic consequence of these changes in land use has been a transformation of both vegetation structure and composition. A 2,000 acre forest complex at Peck Ranch Conservation Area, lower Ozark section, Missouri, was chosen as the site for a pine-oak woodland restoration project using prescribed fire and forest harvest as the primary restoration tools. The goals for the first four years of this project were to increase both the total cover and number of herbaceous species, decrease invasion of woody plants and overstory basal area, and decrease leaf litter. Twenty-four 0.08 hectare circular plots were established in September of 2000 and *apriori* data on composition and structure of overstory, understory, and ground flora were collected. Treatments of fire and/or forest harvest were applied during 2001 and early 2002. Data were collected from plots in August of 2002. The first year of post-treatment data indicate that both prescribed fire and forest harvest significantly reduced woody plants, overstory basal area, and leaf litter. These data indicate that prescribed fire and forest harvest can be used successfully as tools in the initial phases of the woodland restoration process.

OFF-ROAD VEHICLES AS DISPERSAL AGENTS FOR EXOTIC SPECIES IN A FORESTED LANDSCAPE

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ABSTRACT: Off-road vehicle (ORV) travel is increasing in popularity in many parks, forests, and natural areas, but it may be incompatible with some conservation objectives. I combine field surveys for 8 species of exotic plants along 2 ORV trails in the Chequamegon National Forest (Wisconsin), mud collection from the undercarriage of ORVs using those trails, and a modeling approach to determine if ORVs disperse exotic plants. Field surveys indicate the presence of 5 of 8 species surveyed for, and at least one exotic plant along 88% of the sixty 100 m trail segments surveyed. I attempted to collect mud from 14 vehicles. Eight were clean; samples were collected from the remaining 6. Seeds germinated from soils collected from 3 ORVs. I construct a dispersal model predicts the amount of time required before an exotic plant species from one trail system colonizes another trail system, based on the number of ORVs visiting multiple trails per year, the probability seeds are transported from one trail to another, the probability those seeds are exotic, the probability that the seed germinates and the plant becomes established, and the number of seeds moved. The probability of colonization increases with increasing traffic, and could occur in less than 20 years. Eliminating ORVs from natural areas is the most effective strategy for stopping the introduction of exotics. Voluntarily cleaning vehicles prior to riding a new trail is effective in proportion to the number of individuals who clean. Spot-treating exotics along ORV trails is both ineffective and inefficient.

PROGRESS REPORT FOR THE PRAIRIE INVERTEBRATE BIODIVERSITY INVENTORY: WORK IN WISCONSIN

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ABSTRACT: The Prairie Invertebrate Biodiversity Inventory is a multi-state, multi-partner project begun in 1994 under the leadership of the Wisconsin Department of Natural Resources with primary funding provided by the USFWS Partnerships for Wildlife Program. The project has provided funds for co-operators in eight midwestern states. Research focuses on identifying the invertebrate fauna utilizing native grasslands, especially those dependent on prairie remnants and landscapes. To date, Wisconsin DNR researchers have made more than 400 collecting trips to over 170 sites within the state. Approximately 20,000 insect specimens have been collected and cataloged representing roughly 1,200 species, with nearly as many specimens remaining to be cataloged. Our research has centered on Coleoptera (464 species) and Hemiptera (416 species). We present information on leafhopper (Cicadellidae) species that show strong remnant-dependence, and focus on three species of particular interest: *Aflexia rubranura* (DeLong), a species dependent on prairie dropseed (*Sporobolus heterolepis*); *Polyamia dilata* DeLong, a rare species thought to live on cool season panicums in dry prairies, and *Attenuipyga vanduzeei* (Osborn & Ball), a particularly rare species for which the bulk of known specimens have been collected through this study.

NONRANDOM PATTERNS OF PLANT DISTRIBUTION IN ILLINOIS FORESTS WITH RESPECT TO SITE CONSERVATION VALUE AND TREE BASAL AREA

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ABSTRACT: Species assemblages of smaller islands are often predictable (nested) subsets of those of nearby larger islands, which, in turn, are nested subsets of even larger islands. Such non-random patterns are usually associated with species-specific dispersal abilities or extinction rates. This study examined patterns of species presence, not along gradients of habitat area, but along those of ecological community variables. The ground layer floras of 106 Illinois forests (55 upland and 51 floodplain) were analyzed to determine if they were nested with respect to three site parameters; floristic quality (as measured by Mean Coefficient of Conservatism), basal area per hectare, and mean DBH. We found that understory species were negatively nested with respect to basal area and mean DBH of trees, therefore as DBH and basal area increase certain species become predictably absent. Understory plants were nested with respect to measured floristic quality (though not significantly in floodplain forests), therefore certain species present on sites of high floristic quality are predictably absent from those of lower quality. Species of

higher floristic quality (e.g. *Arisaema triphyllum*, *Lindera benzoin*, *Smilacina racemosa*) were more likely to contribute to the nested pattern with respect to overall site floristic quality. Overall, these data suggest that floristic quality estimates predictably measure floristic quality in forest ground layers. Additionally, they suggest that successional stage or structure of the overstory affect understory floras in species-specific ways. These patterns are, among other things, likely linked to shade tolerance or disturbance tolerance of understory plants.

INVASION AND DISPLACEMENT OF NATIVE VEGETATION BY *RHAMNUS CATHARTICA*: TOWARD A MECHANISTIC UNDERSTANDING

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ABSTRACT: *Rhamnus cathartica* (common buckthorn) has aggressively invaded many Eastern Deciduous forests of the US, 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 applying Tilman's R* model to the invasion of buckthorn to test whether buckthorn reduces light to a level at which only it can regenerate. To accomplish this, we are planting and following seeds of eight woody species in paired plots, one of which we have removed buckthorn and the other plot buckthorn is present (n=12). In a second experiment, we are testing whether buckthorn prevents native vegetation from establishing via above- or below-ground effects. To test for below-ground competition from buckthorn, we are planting and following seeds of native woody species in buckthorn thickets in which the buckthorn is tied back to reduce above-ground competition from buckthorn. We will compare seedling germination 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. We are currently setting-up this study and expect to have preliminary results by August 2004.

