

**SOME ASSEMBLY REQUIRED: PRESERVING NATURE IN A FRAGMENTED LANDSCAPE  
NATURAL AREAS ASSOCIATION 34<sup>TH</sup> ANNUAL CONFERENCE  
OCTOBER 9-12, 2007, CLEVELAND, OHIO**

**ABSTRACTS**

ALPHABETICAL BY PRIMARY AUTHOR'S LAST NAME. PRESENTING AUTHOR'S NAME IS UNDERLINED. SEE THE SESSION SCHEDULE FOR THE SEQUENCE OF ABSTRACT NUMBERS (IN PARENTHESES).

(139) RESPROUTING DEMOGRAPHICS OF TREE REGENERATION IN EASTERN OAK FORESTS: THE ROLE OF FIRE AND THE PERSISTENCE NICHE. Matthew A. Albrecht<sup>1</sup>, Ryan W. McEwan<sup>2</sup>, Todd F. Hutchinson<sup>3</sup>, Joanne Rebbeck<sup>3</sup>, and Brian C. McCarthy<sup>1</sup>. <sup>1</sup>Department of Environmental and Plant Biology, Ohio University. [matthew.albrecht@ohio.edu](mailto:matthew.albrecht@ohio.edu); [mccarthy@ohio.edu](mailto:mccarthy@ohio.edu). <sup>2</sup>Department of Forestry, University of Kentucky. [ryan.mcewan@uky.edu](mailto:ryan.mcewan@uky.edu). <sup>3</sup>U.S. Forest Service, Northern Research Station. [thutchinson@fs.fed.us](mailto:thutchinson@fs.fed.us); [jrebbeck@fs.fed.us](mailto:jrebbeck@fs.fed.us).

Fire is hypothesized to change the successional dynamics of eastern oak forest communities by altering the demographic structure of tree populations. Despite the widespread use of fire as a management tool, few comparative studies have explored the demographic vital rates of tree regeneration before and after applying fire. We report a six-year demographic study that was replicated in experimental stands (~25 ha) receiving either no fire (unburned), fire (burned), or a combination of fire and silvicultural thinning (burned+thinned). More than 99% of individuals (< 10 cm dbh) were topkilled following two prescribed fires (2001 and 2005), dramatically altering the structure of tree populations and the physiognomy of the forest community. Yet, advanced regeneration (< 10 cm dbh, > 15 cm tall) exhibited remarkable persistence following disturbance by sprouting at the root collar. The initial size of advance regeneration prior to disturbance was more important in explaining survival and sprouting probabilities than fire intensity or species identity. Demographic processes, however, were much more dynamic in the small seedling (< 15 cm tall) community, where survival and sprouting rates varied significantly among species and treatments over time. Taxa that maintained persistence by resprouting showed strong recruitment limitation (*Carya* spp., *Nyssa sylvatica*, and *Quercus* spp.), whereas species that were poor resprouters as small seedlings (*Acer rubrum*), or absent from the regeneration pool prior to disturbance (*Liriodendron tulipifera*), colonized the post-fire environment by seed. In addition to recruitment limitation, the potential for resprouting rates to vary among tree life-history stages should be considered when managing forest succession with disturbance.

KEY WORDS: FFS, restoration, fire, population dynamics, forest succession

(24) SEED DISPERSAL UNDER AMERICAN BEECH AND SUGAR MAPLE CANOPY ADULTS IN NORTHEASTERN OHIO BEECH-MAPLE FOREST. Sandra L. Albro and Paul B. Drewa. Department of Biology, Case Western Reserve University. [sandra@case.edu](mailto:sandra@case.edu); [paul.drewa@case.edu](mailto:paul.drewa@case.edu).

The influence of either conspecific or heterospecific adult trees on regenerative dynamics of plant populations has received much attention in forests dominated by American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*). Less considered is the extent to which such effects are potentially contingent on seed dispersal patterns that might be mediated by the fragmented nature of temperate forests. We quantitatively evaluated total and viable seed abundance of these co-dominant species under conspecific and heterospecific adult trees in relation to the edges of three forest fragments in northeastern Ohio. During August–November 2006 at each site, seeds were collected from four funnel traps beneath each of 10 beech and 10 maple adults, counted, and visually inspected for viability. Additionally, we measured the distance between each tree and the forest edge. Mean densities of all beech and maple seeds were up to

10 times greater under conspecific than heterospecific adults. Further, the proportion of these seeds that were viable was either equivalent between beech and maple adults or greater under conspecific adults. At one site, however, only 1 of 90 beech seeds was viable. At another site, densities of maple seeds increased 20-fold while viability increased 3-fold with distance from the forest edge. We caution that total and viable seed input should be accounted for prior to elucidating effects of adult trees on regenerative dynamics of woody plant populations. Management of temperate forest fragments should consider the influence of edges on regenerative dynamics of native plant species on a site-by-site basis.

KEY WORDS: seed dispersal, forest fragmentation, regenerative dynamics, beech-maple forest

(98) ARMCHAIR EDUCATION AND BIOLOGY-ARE WEBCAMS FOR YOU? Judy Alderson<sup>1</sup>, Joe Meehan<sup>2</sup> and Mary McBurney<sup>3</sup>. National Park Service, Alaska Regional Office. [Judy\\_alderson@nps.gov](mailto:Judy_alderson@nps.gov). <sup>2</sup>Alaska Department of Fish and Game. [Joe\\_meehan@fishgame.ak.state.us](mailto:Joe_meehan@fishgame.ak.state.us). <sup>3</sup>Lake Clark National Park and Preserve. [Mary\\_mcburney@nps.gov](mailto:Mary_mcburney@nps.gov).

For the last several years webcams have been in use at Walrus Islands and McNeil River State Game Sanctuaries and National Natural Landmarks in Alaska. These cameras provide live feed views of walrus haulouts and fishing brown bears to internet websites and to a viewing area at the Pratt Museum in Homer, Alaska. Part of a partnership effort including Alaska Department of Fish and Game, National Park Service, the National Geographic and the Pratt Museum, these cameras provide a unique opportunity for viewing and documenting wildlife activities. This session will discuss the partnering aspects of these projects, the implications for this type of interpretation/education for the resources and the public, the possibilities of generating scientific data through these types of projects, and the pros and cons based on experience so far.

KEY WORDS: webcams, wildlife viewing, walrus, brown bear, Alaska

(54) INTEGRATING FRESHWATER AND TERRESTRIAL PERSPECTIVES IN CONSERVATION PLANNING: A SCENARIO ANALYSIS. Amis, Mao Angua<sup>1</sup>, M. Rouget<sup>2</sup>, M. Lotter<sup>3</sup>, and J. Day<sup>1</sup>. <sup>1</sup>Freshwater Research Unit, University of Cape Town, South Africa. [mao@botzoo.uct.ac.za](mailto:mao@botzoo.uct.ac.za); [jday@botzoo.uct.ac.za](mailto:jday@botzoo.uct.ac.za). <sup>2</sup>South African National Biodiversity Institute. [rouget@sanbi.org](mailto:rouget@sanbi.org). <sup>3</sup>Mpumalanga Parks Board, South Africa. [mervyn@intekom.co.za](mailto:mervyn@intekom.co.za).

Systematic conservation planning seeks to prioritize ecosystems for conservation intervention in the face of limited resources. However, conservation planning procedures do not often take a holistic approach in identifying priority areas across ecosystems. In this study, we tested different scenarios for integrating the assessment of freshwater and terrestrial ecosystems in conservation planning. We also determined the degree of spatial overlap between freshwater and terrestrial priorities. Some of the parameters tested for each scenario include, their potential to achieve set biodiversity targets, total area required and the cost of the conservation portfolio. Jaccard's coefficient of dissimilarity was used to compare the different scenarios. It was found that assessing freshwater priorities alone using sub-catchments as planning unit was the most efficient in capturing both freshwater and terrestrial priorities. Overall we found a 20% overlap between freshwater and terrestrial priorities. It's thus recommended that conservation planning in multiple ecosystems should first aim at capturing areas where there is a spatial overlap between priority areas in the different ecosystems.

KEY WORDS: conservation planning, freshwater, terrestrial, biodiversity priorities

(101) REHABILITATION OF NATIVE PRAIRIE REMNANTS IN THE NORTHERN GREAT PLAINS UTILIZING FIRE AND HERBICIDE. Matt A. Bahm<sup>1</sup>, Thomas G. Barnes<sup>2</sup>, and Kent C.

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Smooth Brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) are introduced cool-season perennial grasses known to invade grasslands throughout North America. During the fall of 2005 and spring of 2006, we implemented a removal study at 6 native prairie sites in eastern South Dakota that have been invaded by smooth brome and Kentucky bluegrass. Treatments included five herbicide combinations and a fall burn to determine the potential of each for renovation of invaded native grasslands. The herbicide combinations were applied in the fall and spring to determine optimum timing for control. Across sites, control plots averaged 28% and 33% cover by smooth brome and Kentucky bluegrass, respectively. Smooth brome cover on herbicide treated plots ranged from 1 to 14% and Kentucky bluegrass cover ranged from 2 to 24%. Smooth brome cover was similar between fall burned and control plots (21% to 28%), but Kentucky bluegrass cover was significantly lower (12% to 33%). Native plant response was similar across fall treatments, but spring treatments had a more detrimental effect on both native grasses and forbs. Several herbicide combinations show potential for removal of smooth brome, while causing minimal harm to native species.

KEY WORDS: fire, herbicide, native plants, prairie, rehabilitation

(29) BEST MANAGEMENT PRACTICES TO MANAGE CANADA THISTLE IN NATIVE PRAIRIES. Roger Becker<sup>1</sup>, Milt Haar<sup>1</sup>, Luke Skinner<sup>2</sup>, Mark Gulick<sup>3</sup>, Judy Markl<sup>3</sup>, and Dennis Opdahl<sup>3</sup>. <sup>1</sup>Dept. of Agronomy and Plant Genetics, University of Minnesota. [becke003@umn.edu](mailto:becke003@umn.edu); [haarx003@umn.edu](mailto:haarx003@umn.edu). <sup>2</sup>Division of Ecological Services, Minnesota Department of Natural Resources. [luke.skinner@dnr.state.mn.us](mailto:luke.skinner@dnr.state.mn.us). <sup>3</sup>DNR Talcot Lake WMA, Minnesota Department of Natural Resources. [Mark.Gulick@state.mn.us](mailto:Mark.Gulick@state.mn.us); [Judy.Markl@state.mn.us](mailto:Judy.Markl@state.mn.us); [Dennis.Opdahl@state.mn.us](mailto:Dennis.Opdahl@state.mn.us).

A cooperative study involving the University of Minnesota and Talcot Lake Wildlife Management Area determined Best Management Practices for control of Canada thistle in native prairie. Studies were initiated in 2004 at the West Graham WMA and the USFS Timber Lake WPA. BMP practices include clipping to prevent seed production or deplete root carbohydrate reserves, herbicide application in the fall to optimize control, and spring or summer herbicide timings designed around the pre-July 15<sup>th</sup> nondisturbance goal for optimum waterfowl production. While this investigation is ongoing, it appears that most native forbs survived clopyralid applications, although flowering and seed production will be reduced or eliminated during the treatment season. Notable exceptions are native sunflowers, which will likely need to be re-introduced into the target site once established Canada thistle is controlled. Canada thistle seedling reestablishment is being investigated via functional group competition with native plants during establishment. Seed flight will be an issue with fall applications and is being addressed in ongoing studies to define seed production and movement.

KEY WORDS: Canada thistle, *Cirsium arvense*, control, native prairies

(114) RESTORATION AND RECOVERY OF A SEDGE-RUSH-FEN MEADOW DEGRADED BY NON-NATIVE *TYPHA ANGUSTIFOLIA* IN NW PENNSYLVANIA. James K. Bissell. Curator of Botany, Cleveland Museum of Natural History. [jbissell@cmnh.org](mailto:jbissell@cmnh.org).

Non-native narrow-leaf cattail (*Typha angustifolia*) is invading, degrading and completely replacing native plant species within fens and marshes throughout northeast Ohio and northwest Pennsylvania. In July 1988, Museum Botany Department staff discovered a previously unreported high-quality Alder-Interior Sedge Fen supporting more than one dozen Pennsylvania Endangered and Threatened plants on the north shore of Edinboro Lake in Erie County. At the time of

discovery, a 12-square-meter population of *Typha angustifolia* was present along the southern edge of a .3-acre open Sedge-Rush Fen Meadow. Between 1988 and 1998, *Typha angustifolia* spread across the open fen meadow and removed 12 rare herbaceous plants tracked by the Pennsylvania Heritage Program. By 1998, the Museum had mapped 18 state-listed plants in the fen, including two new to the flora of Pennsylvania, *Salix pedicellaris* and *Myriophyllum verticillatum*. In fall 2002, the *Typha angustifolia* was sprayed with the herbicide Accord. The decision to spray the non-native cattail was based in part on loss of vigor and new shoot death exhibited by two rare shrubs, *Lonicera oblongifolia* and *Salix pedicellaris*, within the northern edge of the expanding cattail meadow. The cattail litter was burned in June 2003 and permanent quadrants and photo stations were established. All but three of the 12 rare plants eliminated by the cattail encroachment have recovered from the seed bank. Three other rare plants not previously observed in the fen, *Eleocharis intermedia*, *Cyperus diandrus* and *Sagittaria cuneata*, also recovered from the seed bank after the cattail was removed.

KEY WORDS: non-native, *Typha angustifolia*, sedge-rush-fen meadow, rare plants, restoration, removal, recovery

(116) OCCURRENCE AND DISTRIBUTION OF AQUATIC VASCULAR PLANTS OF NORTHEAST PENNSYLVANIA'S GLACIAL LAKES AND PONDS AS RELATED TO WATER CHEMISTRY PARAMETERS. Timothy A. Block and Ann Fowler Rhoads. Botany Department, Morris Arboretum of the University of Pennsylvania. [block@pobox.upenn.edu](mailto:block@pobox.upenn.edu).

The glacial lakes and ponds of Northeast Pennsylvania contain more than 130 species of aquatic vascular plants. These lakes and ponds range from a nearly pristine, oligotrophic condition to eutrophic due, in part, to various anthropogenic influences. The purposes of this study were to determine if some species are significantly related to water quality parameters and if species suites are associated with the general trophic status of the lakes. Data were collected on the presence of aquatic macrophyte species from 115 lakes and ponds. Water chemistry data were collected from 45 lakes by the Pennsylvania Department of Environmental Protection. Binary logistic regression was used to look for statistically significant relationships between species and water chemistry parameters individually. The matrix of presence/absence data was transformed using Beal's smoothing to derive a matrix of probabilities of each species occurring in each lake. The resulting matrix of probabilities was used in cluster analysis to search for suites of species. The regression analysis shows that some, but not all, species are significantly related to either high or low levels of total alkalinity, phosphorous, nitrogen, or pH. The results of cluster analysis reveal the occurrence of two distinct suites of species. In one cluster are most of the species associated with more oligotrophic, low-nutrient situations while a second cluster contains most of the species associated with higher-nutrient more eutrophic lakes, including all of the non-native invasive plant species found. These results are consistent with those of similar studies conducted in Northern Europe and Northeastern U.S.

KEY WORDS: aquatic plants, Pennsylvania flora

(4) THE DIFFERENT ROLES OF NATIVE AND INTRODUCED PLANTS IN STRUCTURING AQUATIC AND FOREST COMMUNITIES. Bernd Blossey, Director, Ecology and Management of Invasive Plants Program, Cornell University, [bb22@cornell.edu](mailto:bb22@cornell.edu).

Plant invasions are suspected to alter community structure, food webs, and ecosystem function. However, quantitative evidence for unique risks to recipient communities associated with nonnative plant invasions is usually lacking. And even less is known about traits that may make certain species "strong" invaders that are able to transform entire communities. Recent evidence from forest communities appears to suggest that invasive plants are often the passengers, not the drivers of ecosystem change. Overabundant native deer and introduced earthworms appear to be the ecosystem engineers in forests responsible for allowing introduced plants to invade. In

contrast, in littoral aquatic communities, it appears that emergent plants, as the major producers of energy and biomass, drive aquatic communities. It is less clear that there is a fundamental difference between plants based on their origin (native or not). It appears that differences in plant chemistry, not necessarily origin, have large extended effects on aquatic ecosystem processes, food webs, and trophic structure. I will explore potential underlying principles of these fundamentally different results obtained from terrestrial and aquatic environments.

(51) EFFECTS OF FIRE AND FIRE SURROGATES ON LONGTERM SOIL QUALITY AND HEALTH AT THE CONTINENTAL SCALE: A META-ANALYTICAL APPROACH. Ralph E.J. Boerner<sup>1</sup>, Jianjun Huang<sup>1</sup>, and Stephen C. Hart<sup>2</sup>. <sup>1</sup>Department of Evolution, Ecology, and Organismal Biology, Ohio State University. [Boerner.1@osu.edu](mailto:Boerner.1@osu.edu); [huang.404@osu.edu](mailto:huang.404@osu.edu). <sup>2</sup>School of Forest Resources, Northern Arizona University. [Steve.hart@nau.edu](mailto:Steve.hart@nau.edu).

Numerous studies have evaluated the impact of various restoration treatments (e.g. mechanical thinning and prescribed fire) on soil nutrient status, C/N pools and nutrient cycling processes in forests. Results from these previous assessments appear highly idiosyncratic, due likely to large differences in experimental and methodological approaches among the studies. We evaluated the one year and three year impacts of the Fire and Fire Surrogate (FFS) Network treatments on network-wide soil conditions and nutrient cycling rates through meta-analyses (with pre-treatment conditions as covariates where available) and meta-analysis. Of the twelve response variables only two indicated significant, network-wide effects of the treatments: mineral soil exposure and soil pH. Both were both significantly greater in burn and mechanical+burn treatments than in the mechanical and control treatments. Meta-analysis indicated that the network-wide effect on soil pH was driven entirely by large increases due to fire in two western sites, whereas the increase in mineral soil exposure was network-wide. There were no significant, effects on bulk density, soil compaction, available P, Ca, Mg, K, or Ca:Al ratio, soil C, N, C:N ratio, *in situ* net N mineralization or nitrification. On a network-wide basis, the only soil C or N parameter that was significantly altered by burning was total inorganic N, which increased slightly. Taken together, these results suggest that ecosystem restoration treatments have a minor impact on soil properties and ecosystem processes.

KEY WORDS: fire, ecosystem restoration, soil health, carbon, nitrogen

(105) QUANTIFYING THE COSTS AND MONITORING THE RESULTS OF VARIOUS INVASIVE PLANT CONTROL METHODS. Tom Borgman<sup>1</sup> and Mary Klunk<sup>2</sup>. <sup>1</sup>Hamilton County Park District. [tborgman@greatparks.org](mailto:tborgman@greatparks.org). <sup>2</sup>Five Rivers MetroParks. [mklunk@metroparks.org](mailto:mklunk@metroparks.org).

Invasive plants such as Amur honeysuckle (*Lonicera maackii*) are having huge impacts on the biodiversity of natural areas. Land managers can no longer "let nature take its course." Hamilton County Park District and The Five Rivers MetroParks located in Southwest Ohio are employing similar techniques in the management of Amur honeysuckle on 30,000 plus acres of park land. Once the natural areas are cover mapped, invasive plant control plans are prioritized with emphasis first, on protecting high quality habitats with rare species and second the reduction of high seed producing honeysuckle plants. The costs of control methods were studied. Five River's and Hamilton County's cost tracking came up with the following conclusion: Contracted fall foliar treatment: \$250 per acre, In-house foliar treatment: \$150 per acre plus equipment investment, Contracted cut and chip: \$3200 per acre, In-house cut and chip \$1200 per acre, In-house cut and treat stumps: \$1200 per acre, In-house basal bark treatment: \$600 per acre. Preliminary results of plant community studies in treated areas are showing a positive trend in native plant diversity and abundance. The results from current control methods being utilized have shown that native plants are recovering in areas where honeysuckle has been removed; answering yes to the question "Is it worth the effort?"

KEY WORDS: cover mapping, honeysuckle, control techniques, costs, and results.

(118) PARTNERSHIP POSSIBILITIES AND PECULIARITIES: INVOLVING COLLEGE UNDERGRADUATES IN NATURAL AREAS RESEARCH, MANAGEMENT AND OUTREACH. Woodward S. Bousquet. Environmental Studies Department, Shenandoah University. [wbousque@su.edu](mailto:wbousque@su.edu).

University undergraduates constitute a largely untapped resource for natural areas research, conservation and public education projects. Barriers and misconceptions prevent more extensive and systematic utilization of college students by natural areas managers. A different set of constraints discourages faculty from taking advantage of the learning opportunities that natural areas can provide that extend beyond the half-day field trip. Experiences from extended projects will be presented in order to demonstrate how successful partnerships can be sustained between natural areas managers and institutions of higher education with relevant undergraduate programs.

KEY WORDS: research, partnership, university, undergraduate, conservation

(23) A POTENTIAL CONTRIBUTION OF NATURAL AREAS TOWARDS THE IMPROVEMENT OF A GROWTH AND YIELD MODEL. Don C. Bragg. Southern Research Station, USDA Forest Service. [dbragg@fs.fed.us](mailto:dbragg@fs.fed.us).

Natural areas have long provided many social and ecological benefits. However, with few exceptions, they have not fully realized their promise for other purposes. For instance, the increasing scarcity of large, old trees on the landscape accentuates the mensurational potential of natural areas. As an example, height models are rarely developed across all tree sizes because they are typically derived from the limited range found on commercial timberland, which makes their application in many older stands problematic. The Southern Variant of the Forest Vegetation Simulator (FVS) uses a pair of height dubbing functions that systematically underestimate the potential of loblolly pine (*Pinus taeda*). Furthermore, FVS assumes loblolly has a maximum height of 38 m, even though it has been reliably documented to 51 m in the Congaree Swamp National Park, and examples 40 m tall are commonly found across the range of the species. With simple yet accurate tools and techniques, it is possible to measure large specimens with minimal impact on the natural area, and use these data to supplement more conventional tree height models. To this end, I have sampled dozens of large loblolly pine from natural areas across southern Arkansas, northern Louisiana, and northeastern Texas. Using these measurements, I modified the FVS height dubbing models to explicitly include loblolly pines over 115 cm in diameter and >40 m tall. These extensions are applicable in both managed stands and areas where trees are allowed to grow towards their maximum biological potential.

KEY WORDS: Chapman-Richards function, forest mensuration, FVS, loblolly pine

(103) EFFECTS OF HERBICIDING PHRAGMITES AUSTRALIS ON MICROBIAL AND INVERTEBRATE COMMUNITIES. Emmalisa M. Brown, Ferenc A. de Szalay and Laura G. Leff. Department of Biological Sciences, Kent State University. [ebrown@kent.edu](mailto:ebrown@kent.edu); [fdeszala@kent.edu](mailto:fdeszala@kent.edu); [lleff@kent.edu](mailto:lleff@kent.edu).

Emergent plant litter is a major source of energy and carbon for wetland food webs. Microbes initially breakdown the detritus and invertebrates feed on these microbes and the detritus. The carbon and energy is then transferred to higher trophic level consumers. Invasive plants such as the common reed, *Phragmites australis*, have crowded out native plants and altered detrital pools, also altering the carbon and energy transfer within the wetland food web. *Phragmites* stands are often controlled by cutting the stems of the plant or by spraying herbicide on the leaves and stems of live plants, which initiates early senescence; we hypothesize that the method of control may effect detritus quality. In this study, cut (leaves cut from the stem of live plants)

and herbicided (leaves collected 6 days following spraying with a 2% glyphosate foliar spray) Phragmites leaves, and cut leaves from the native wetland species wool grass, *Scirpus cyperinus*, were placed in litter bags in flood pulsing wetlands. Samples were removed periodically during fall and winter 2006 and spring 2007. Leaf mass loss, fungal and bacterial biomass, and invertebrate community composition were measured. Leaf mass loss shows similar trends across the treatments with cut Phragmites litter having the greatest mass loss. Microbial numbers were highest on herbicided Phragmites. Aquatic invertebrate communities differed between treatments; with Oligochaeta and Mollusca initially being most numerous on the herbicided treatment and Chironomidae the most numerous on the cut and wool grass litter. The results suggest that different control methods of Phragmites can alter the litter quality and in turn alter the microbial biomass and invertebrate communities.

KEY WORDS: *Phragmites australis*, microbial biomass, invertebrates, herbicide

(100) GREEN RIBBON INITIATIVE. Rick Bryan<sup>1</sup>, James Toppin<sup>2</sup>, <sup>1</sup>Green Ribbon Initiative. [ramidon@utoledo.edu](mailto:ramidon@utoledo.edu). <sup>2</sup>Oak Openings Region Conservancy. [jtoppin@sbcglogal.net](mailto:jtoppin@sbcglogal.net).

The Green Ribbon Initiative, a program of the Oak Openings Region Conservancy, is a partnership of public and private organizations, landowners and individuals working to preserve enhance and restore critical natural areas in the Oak Openings Region of Northwest Ohio.

KEY WORDS: partnership, habitat preservation, oak openings region

(48) THE INFLUENCE OF SOIL ENVIRONMENT ON THE DIVERSITY OF ECTOMYCORRHIZAL FUNGI IN A MATURE BEECH-MAPLE FOREST. David J. Burke, Charlotte R. Chan, and Kurt A. Smemo. The Holden Arboretum, Kirtland, Ohio. [dburke@holdenarb.org](mailto:dburke@holdenarb.org); [cchan@holdenarb.org](mailto:cchan@holdenarb.org); [ksmemo@holdenarb.org](mailto:ksmemo@holdenarb.org).

Many important forest trees form mutually beneficial associations with ectomycorrhizal fungi (ECM) that colonize plant roots. ECM can enhance plant nutrient acquisition, and increase resistance to pathogens and drought. The distribution and diversity of ECM may be controlled by soil organic matter content, nutrient availability, soil temperature, and plant diversity. Human activities including forest fragmentation can alter forest soils and adversely affect ECM. Loss of ECM could result in altered patterns of forest productivity and carbon and nutrient cycling. To better understand the effects of soil environment on ECM, we examined their distribution in relation to soil environmental conditions in two mature beech-maple forests in Northeastern Ohio. A total of 240 soil cores were collected in June and September of 2006 to a depth of 5-cm. Soil was sorted from roots and reserved for analysis of soil pH, C, N and P. DNA was extracted from root tips recovered from soil samples and used to amplify the internal transcribed spacer region of the rRNA gene which has taxonomic significance. PCR product was used to generate terminal restriction fragment length polymorphism (TRFLP) profiles that were used to determine the presence of mycorrhizas in soil samples and their proportional abundance within the soil core. We detected at least 36 different mycorrhizal species types among the cores. The most abundant fungal species detected belonged to the genera *Russula* and *Tomentella* (25% and 22% of ectomycorrhizal species respectively). The effect of soil environmental conditions on the distribution of mycorrhizal species will be discussed.

KEY WORDS: diversity, ectomycorrhizal fungi, soil, TRFLP

(10) INVASIVE SPECIES AND FOREST HEALTH – BEYOND THE OBVIOUS: SIMILARITIES AND DIFFERENCES RELATED TO IMPACTS, MANAGEMENT AND PREVENTION. Faith T. Campbell. The Nature Conservancy. [fcampbell@tnc.org](mailto:fcampbell@tnc.org).

I will explore common threads and differences in impacts, management, and prevention of these more complex/difficult invasions as identified by the earlier speakers. The speakers have been asked to address following questions:

- 1) What is the current and potential future range, or significant geographic or ecological limits, of the target species?
- 2) What are the probable vectors of introduction and spread, including human behavior (e.g., human transport of bait or firewood)
- 3) Briefly describe direct and indirect impacts of the invader
- 4) Describe any practical steps that a site manager can take to prevent invasion of the site by these species - including early detection and management of introduction vectors or pathways. Can your agency's leaderships and visitors be motivated to take actions to control spread vectors of the target organisms?
- 5) Describe any practical steps that a site manager can take to prepare for this invasion or to manage it. Include restoration and adaptation.
- 6) Are you aware of any "lessons" from your experience with this invasive species that might be applied to other similar invaders?

KEY WORDS: invasive species, forest health, preventing invasions, managing pathways or vectors

(124) INVASIVE PLANT SURVEYS IN EMERALD ASH BORER-IMPACTED FOREST COMMUNITIES. [John Cardina](#)<sup>1</sup>, Catherine P. Herms<sup>1</sup>, Kathleen S. Knight<sup>2</sup>, Daniel A. Herms<sup>3</sup>, and Annemarie Smith<sup>3,4</sup>. <sup>1</sup>Department of Horticulture and Crop Science, The Ohio State University. [cardina.2@osu.edu](mailto:cardina.2@osu.edu); [herms.3@osu.edu](mailto:herms.3@osu.edu). <sup>2</sup>USDA Forest Service, Northern Research Station, [ksknight@fs.fed.us](mailto:ksknight@fs.fed.us). <sup>3</sup>Department of Entomology, The Ohio State University, [herms.2@osu.edu](mailto:herms.2@osu.edu), <sup>4</sup>Current address: Ohio Department of Natural Resources. [Annemarie.Smith@dnr.state.oh.us](mailto:Annemarie.Smith@dnr.state.oh.us).

Emerald ash borer (EAB, *Agilus planipennis*) infestation is predicted to eliminate ash (*Fraxinus* spp.) trees from eastern North America, leaving canopies open to colonization by invasive plants. We initiated surveys in forests along the progressing EAB invasion front in Michigan and Ohio, to serve as baseline information for studying changes in the presence and abundance of invasive plant species in response to ash mortality and gap formation. All known invasive plant species were identified and counted in 180 forest plots varying in forest community structure and degree of ash dieback. Invasive plant density was low in most (70%) plots, ranging from 0 to 1% cover, while a small number of plots had over 20% cover of invasives. Most invasive plant species were woody shrubs, including *Lonicera* spp., *Rhamnus* spp., *Berberis thunbergii*, *Eleagnus umbellata*, *Euonymus alatus*, *Ligustrum vulgare*, and *Rosa multiflora*. The numbers of invasive species in a single 0.25-acre plot ranged from 0 to 6. Soil seedbank samples revealed a high level of variation in plant species composition, as expected, but a very low presence of propagules of any invasives. These findings suggest that invasive plants present in the forest at this time have not yet been significantly impacted by EAB-induced gap formation. However, we encountered significant infestations of woody invasives along access roads and trails leading to the sample sites. In addition, we observed small sapling of invasive species in the shade of the forest canopy that might respond quickly to EAB-induced canopy gaps.

KEY WORDS: invasive species, disturbance, succession, emerald ash borer

(99) LAKE ERIE ALLEGHENY PARTNERSHIP FOR BIODIVERSITY (LEAP): A COLLABORATIVE APPROACH TO CONSERVATION OF BIODIVERSITY. [Kay Carlson](#)<sup>1</sup>, Patty Stevens<sup>2</sup>, and Renee Boronka<sup>3</sup>. <sup>1</sup>The Nature Conservancy, Ohio Chapter, Lake Erie Watershed Program. [kcarlson@tnc.org](mailto:kcarlson@tnc.org). <sup>2</sup>Cleveland Metroparks, Division of Park Planning. [pjs@clevelandmetroparks.com](mailto:pjs@clevelandmetroparks.com). <sup>3</sup>Cleveland Museum of Natural History, Center for Conservation & Biodiversity. [rboronka@cmnh.org](mailto:rboronka@cmnh.org).

The Lake Erie Allegheny Partnership for Biodiversity (LEAP) was first convened by the Cleveland Museum of Natural History in March 2004. LEAP's mission is to support member organizations in identifying, protecting, restoring and sharing information about the diverse native habitats of the glaciated lands and waters south of Canada from Sandusky Bay to the Allegheny Mountains and to promote public awareness and understanding of those habitats. LEAP is a voluntary network of conservation-related agencies and organizations which share common goals and have come together to achieve their goals through coordinated collaboration and cooperation. To date, approximately 132 individuals (representing approximately 40 different organizations) from northeast Ohio and northwest Pennsylvania have become members. A website ([www.leapbio.org](http://www.leapbio.org)) is currently being developed.

LEAP is preparing a Regional Biodiversity Plan with a focus on preservation and restoration of biodiversity in the glaciated portion of the Lake Erie basin, including parts of western Pennsylvania and New York. In addition, LEAP is establishing a Regional Biodiversity Fund at the National Fish and Wildlife Foundation (NFWF) to provide funding toward biodiversity conservation and restoration projects. The Regional Biodiversity Plan will be used as a tool for guiding which projects get supported through the Fund. A \$46,000 grant from NFWF for the initial phase of Plan development was secured in August, 2005. Members of LEAP have contributed over \$77,000 in in-kind technical assistance toward this project to date.

KEY WORDS: partnerships, collaboration, Lake Erie, biodiversity, conservation, planning

(78) FIRE EFFECTS AND SOIL DISTURBANCE: INVESTIGATING HOW JAPANESE CLIMBING FERN (*LYGODIUM JAPONICUM*) RESPONDS IN LONGLEAF PINE SAVANNAS. [Becky J. Carmichael](mailto:bcarmi1@lsu.edu) and William J. Platt. Department of Biological Sciences, Louisiana State University. [bcarmi1@lsu.edu](mailto:bcarmi1@lsu.edu); [btplat@lsu.edu](mailto:btplat@lsu.edu).

Recurrent disturbances maintain the diverse flora, but also enhance invasion of longleaf pine savannas. Large-scale disturbances (e.g., hurricanes) produce non-uniform distribution of woody (tree stumps, branches) and fine (pine needles) fuels in pine savannas. Non-uniform fuels produce locally heterogeneous fire intensity, creating patchiness in the groundcover, which may in turn facilitate invasion by both native and exotic species after hurricanes and fire. Stumps, a result of large-scale disturbance, also are prone to small-scale animal disturbances, thus combining effects of different scales of disturbance. We experimentally studied how an exotic fern, *Lygodium japonicum*, was influenced by pine stumps produced by large-scale disturbances, small-scale disturbances by animals, and post-hurricane changes in fuels in a second-growth longleaf pine savanna. We hypothesized that invasion of *L. japonicum* would be facilitated by large scale disturbances that produced stumps and small-scale animal disturbance that decreased local fire intensity. We randomly selected 18 plots of *L. japonicum* at three sites prior to 2007 prescribed fires. Plants were selected adjacent to and >5m from stumps. One of three treatments (fine-fuel addition, fine-fuel removal, unaltered control) were randomly applied to circular 1m<sup>2</sup> plots around each plant, simulating the presence of tree crowns, local animal disturbance, and no disturbance. The fronds of each plant were counted and mapped before and six months after fire. Results supported our hypothesis that re-growth of *L. japonicum* was affected by local fine fuels and disturbances. The combination of stumps and animal disturbances that reduced fuels and opened sites should facilitate invasion by *L. japonicum*.

KEY WORDS: longleaf pine savanna, *Lygodium japonicum*, disturbance

(95) BIRD PREFERENCES OF RECLAIMED SURFACE-MINED GRASSLANDS UNDER DIFFERENT MANAGEMENT REGIMES AT THE WILDS. [Nicole D. Cavender](#)<sup>1</sup>, [Jason S. Larson](#)<sup>2</sup>, [Danny J. Ingold](#)<sup>2</sup>, and [Shana Byrd](#)<sup>1</sup>. <sup>1</sup>Department of Restoration Ecology, The Wilds,

Cumberland, OH. [ncavender@thewilds.org](mailto:ncavender@thewilds.org). <sup>2</sup>Department of Biology, Muskingum College, New Concord, OH. [ingold@muskingum.edu](mailto:ingold@muskingum.edu).

During the past decade, grassland birds have been the focus of several studies and numerous surveys on the reclaimed surface-mined grasslands at The Wilds, located in Southeastern Ohio. Data from seasonal census and recapture studies have indicated that these reclaimed grasslands are providing suitable nesting and foraging habitat for a variety of obligate grassland nesting species including Henslow's sparrows (*Ammodramus henslowii*), grasshopper sparrows (*A. savannarum*), savannah sparrows (*Passerculus sandwichensis*) and bobolinks (*Dolichonyx oryzivorus*). Since 2004, The Wilds has initiated another study focused on understanding how management regimes such as mowing, burning, native forb and grassland introductions, and woody shrub removal affect the long-term success of these birds. The study encompasses a total of 182 acres (74 hectares) with four management regimes. Within each of the management units, strip transect censuses have been conducted on a weekly basis from May to early July during the 2005 field season and from late March to late August during the 2006 and 2007 field seasons. New species that were observed in the management units during 2006 include Northern Harrier (*Circus cyaneus*), Golden Eagle (*Aquila chrysaetos*), and Sedge Wren (*Cistothorus platensis*). Areas dominated by autumn olive have so far shown to harbor few if any obligate grassland bird species. Early disturbance of areas, where autumn olive has been removed, show little change in species diversity and occurrence. The burn management area has initially shown the most significant effects on species occurrence and diversity. We will be presenting 2005-2007 baseline data from these units emphasizing the implications for habitat preference and management.

KEY WORDS: grassland birds, reclaimed surface-mines, autumn olive, The Wilds

(129) BUTTERFLY HABITAT RESTORATION ON RECLAIMED MINED LAND OF THE WILDS IN SOUTHEASTERN OHIO. Nicole D. Cavender and Shana S. Byrd. The Wilds, Cumberland, OH. [ncavender@thewilds.org](mailto:ncavender@thewilds.org).

Butterflies are critical components of many ecosystems and have suffered from habitat loss. The Wilds is no exception. Located on almost 10,000 acres of land, The Wilds has experienced ecological disturbance from agriculture and surface mining for coal followed by land reclamation. With the loss of much of the original forest and vegetation, native butterfly populations have been severely impacted.

Since 2003, The Wilds has been working on restoring large areas of land in order to enhance habitat for butterfly populations. Restoration and management techniques have included the large-scale replacement of non-native grassland areas with native perennials, the establishment of various nectar and host plants along wetlands, forests and meadows, the use of mechanical and chemical means for management and control of invasive plants, and the use of prescribed fire. In order to track long-term changes in butterfly populations, weekly transects have been run since 2004 (April – October) following the methodology used by The Ohio Lepidoptera Society, Long-term Monitoring Program (Pollard and Yates, 1993). In 2004, 625 individual butterflies were recorded on the transect. In 2005, 788 individuals were recorded (24% increase). In 2006, 1525 individuals were recorded. This was a 94% increase since 2005, and a 114% increase since 2004. Species richness increased from 26 to 37. These results are attributed to the successful establishment of nectar and host plant species in an environment that was previously lacking these needed resources. Additional data from 2007 will be presented as well as a discussion about restoration techniques and butterfly monitoring results.

KEY WORDS: habitat restoration, butterfly monitoring, mined land, The Wilds

(143) USING TISSUE CULTURE TO RECOVER THE ENDANGERED NORTHERN WILD MONKSHOOD (*ACONITUM NOVEBORACENSE*) IN OHIO. [Susan M. Charls](#) and Valerie C. Pence. Center for the Conservation and Research of Endangered Wildlife (CREW), Cincinnati Zoo and Botanical Garden. [susi.charls@cincinnati-zoo.org](mailto:susi.charls@cincinnati-zoo.org); [valerie.pence@cincinnati-zoo.org](mailto:valerie.pence@cincinnati-zoo.org).

The federally endangered Northern wild monkshood (*Aconitum noveboracense*) occurs in Ohio only at Gorge Metro Park near Akron and Crane Hollow State Nature Preserve. The Gorge population was virtually extirpated due to salt runoff from an adjacent highway. In an effort to save the population, the Center for Plant Conservation (CPC) and Holden Arboretum collaborated with the Endangered Plant Propagation Program (EPPP) at CREW to develop tissue culture propagation methods for this species. In 2003, the Crane Hollow population was used to develop protocols for in vitro collecting, tissue culture propagation and rooting, and acclimation of tissue cultured plants. Confident with these protocols, tissue was then received from the threatened Akron population in Spring, 2004. In vitro cultures were successfully established from all six plants sampled and several tissue cultured plants were returned to Metro Park collaborators as early as fall of 2004.

Currently, the diversion of salt runoff by the ODOT has enabled the natural population to begin recovery. A reserve satellite population to the threatened population has been established using tissue culture propagated plants from CREW. In August of 2006, Gorge Metro Park collaborators selected protected sites for outplanting best suited to the monkshood habitat. The plants were monitored through the fall of 2006 and showed promising survival. In 2007, more CREW-propagated monkshood will be planted and genetic analysis of the existing plants in the gorge will be done. Development of propagation procedures was funded in part by the Institute of Museum and Library Services.

KEY WORDS: monkshood, tissue culture, *Aconitum*, endangered, in vitro

(26) EFFECT OF DEER AND *LONICERA MAACKII* (AMUR HONEYSUCKLE) REMOVAL METHOD ON RESTORATION OF UNDERSTORY PLANT COMMUNITIES. [Kendra A. Cipollini](#)<sup>1</sup>, [Elizabeth M. Ames](#)<sup>2</sup> and [Don F. Cipollini](#)<sup>3</sup>. <sup>1</sup>Wilmington College, [kendra\\_cipollini@wilmington.edu](mailto:kendra_cipollini@wilmington.edu). <sup>2</sup>Wilmington College, [eames@wilmington.edu](mailto:eames@wilmington.edu). <sup>3</sup>Wright State University, Department of Biological Sciences, [don.cipollini@wright.edu](mailto:don.cipollini@wright.edu).

Invasive bush honeysuckle (*Lonicera maackii*) is removed from natural areas due to its negative impacts, yet deer may thwart restoration efforts. We investigated the success of native understory plants after removal of honeysuckle using two removal methods in the presence and absence of deer. The first removal method (cut/paint) consisted of cutting the stems and painting the stumps with the herbicide garlon. The second removal method (basal application) consisted of applying garlon to the base of the intact stem, leaving the dead stems in place. Light level in the cut/paint treatment was higher than in the basal application treatment which was higher than in the uncut treatment. In 2005, we transplanted seedlings of *Impatiens capensis*. Condition and height of *Impatiens* were higher in the cut/paint treatment. *Impatiens* were taller in the absence of deer. In 2006, the number of *Impatiens* seedlings was higher in the cut/paint treatment. There was a trend towards greater seedling number in the deer-absent treatment. Naturally-recruiting native species richness was higher in the cut/paint and basal application treatments than in the uncut treatment. Species richness was also affected by the interaction of removal method and fencing. When fenced, there were more species in cut/paint treatments than in basal application treatments. When unfenced, both the cut/paint and basal application treatments had similar species richness, indicating a protective effect of the standing woody stems against deer damage. There were more individuals of the invasive species *Alliaria petiolata* in the cut/paint treatment than in the uncut treatment.

KEY WORDS: forest, *Impatiens capensis*, invasive species, restoration ecology

(34) A STATEWIDE APPROACH TO INVASIVE SPECIES CONTROL IN VIRGINIA: MANAGING *PHRAGMITES AUSTRALIS* THROUGH PARTNERSHIPS AND MULTI-TIERED STRATEGIES. Paul Clarke, [Rick Myers](mailto:rick.myers@dcr.virginia.gov), and Kevin Heffernan. Virginia Department of Conservation and Recreation, Division of Natural Heritage. [paul.clarke@dcr.virginia.gov](mailto:paul.clarke@dcr.virginia.gov); [rick.myers@dcr.virginia.gov](mailto:rick.myers@dcr.virginia.gov).

Common reed, *Phragmites australis*, has been expanding into a variety of previously unoccupied wetland habitats throughout Virginia. This invasion by a non-native haplotype of *Phragmites* is a major concern due to the loss in plant and faunal diversity, and changes in ecosystem structure. These negative impacts from *Phragmites* are being realized across a diverse group of landowners and wetland managers across Virginia as well as the eastern United States. Consequently, efforts to control *Phragmites* and to promote the continued ecological function of those wetlands threatened by *Phragmites* have grown to include a suite of partners and multi-tiered strategies as diverse as the habitats impacted by *Phragmites*. With the frustration involved with spending limited conservation dollars to control *Phragmites* while not adequately understanding *Phragmites* rates of spread, or whether or not our control efforts were minimizing the statewide threat from *Phragmites*, we collectively adopted a strategy “from the sky down”. Land managers and private landowners affected by *Phragmites* have implemented broad and diverse management strategies including: “old-school” landscape-scale mapping with helicopters and GPS, state-of-the-art web-based technology to support private landowners, public forums for landowners and realtor associations, incorporation of private interest groups and local municipalities, a coordination group for effective communication and information sharing, creative funding sources, herbicide treatments utilizing imazapyr and glyphosate, and monitoring for herbicide efficacy and non-*Phragmites* response to treatments. Invasive species management involving the magnitude of *Phragmites*, whether addressed from a local natural area perspective, or from a statewide perspective, is best addressed with a strategy involving many tiers of action and many partners.

KEY WORDS: *Phragmites*, invasive, non-native, imazapyr

(140) NEGATIVE IMPACTS AND OPPORTUNITIES ASSOCIATED WITH THE INTRODUCTION OR REINTRODUCTION OF RARE SPECIES INTO NATURAL AREAS. Paul Clarke. Virginia Department of Conservation and Recreation, Division of Natural Heritage. [paul.clarke@dcr.virginia.gov](mailto:paul.clarke@dcr.virginia.gov).

The practice of introducing or reintroducing rare species into natural areas is a management tool that has often been employed for the purpose of conserving or preserving specific rare species. Such practices have resulted in many successes worthy of accolades, yet the practice is not without consequential effects that can jeopardize not only the success of specific introductions but perhaps more importantly, can jeopardize on-going and future conservation efforts. Negative impacts and secondary influences are being created through introductions and reintroductions that are implemented without adequately addressing the realized and potential consequences. Such negative impacts can include misleading the public’s perception and the consequent public’s reaction to endangered species and property rights interactions, confounding known biogeographic patterns, misallocating limited conservation funds, and obscuring vulnerable habitat requirements and long-term conservation priorities. The loss of native genetic diversity and the inadvertent introduction of pathogens are also deleterious impacts that have occurred with good intentioned introductions. While introduction and reintroduction techniques have, at times, been touted as valid and successful conservation measures, their use as successful conservation tools is often unproven with sparse or short-term data. Such “successful” introduction programs will remain of questionable value without longer-term and peer reviewed assessments. In order to maximize the benefits of our collective long-term conservation efforts, the negative consequences of rare species introductions must be addressed and managed

through focusing on ecosystem processes, transparent collaboration, long-term monitoring, peer-review and effective public education.

KEY WORDS: reintroduction, introduction, natural processes, endangered species, conservation

(59) FIVE HUNDRED THOUSAND ACRES OF DEAD WEEDS (GIVE OR TAKE)—FLORIDA'S UPLAND INVASIVE EXOTIC PLANT MANAGEMENT PROGRAM. [Ruark L. Cleary](#). Florida Department of Environmental Protection. [ruark.cleary@dep.state.fl.us](mailto:ruark.cleary@dep.state.fl.us).

Florida's approximately 35 million surface acres is divided into 67 counties. Over 10 million acres of Florida is set aside as public conservation lands, with some amount in almost every county. The current estimate of invasive exotic infestation on these lands is nearly 1.5 million acres. To address this serious and widely spread problem, the Upland Invasive Exotic Plant Management Program was developed and implemented in 1997 by the Bureau of Invasive Plant Management with the assistance of over 500 local, state, and federal public conservation land managers, non-government organization representatives, and private citizens. These cooperators, organized into eleven regional working groups, provide direction for the annual funding of upland weed control projects that address all Florida Exotic Pest Plant Council Category I and II species. The program incorporates the concept of place-based management, which allows for regionally diverse interests and concerns to implement flexible, innovative strategies, while maintaining statewide consistency and accountability. To date, the program has expended more than \$60 million of state funds, matched with over \$25 million in cooperator cost-share, to achieve initial control of over 400,000 acres of weeds (involving over 100 weed species) on 400 public conservation areas. These efforts were accomplished through cooperation with 5 federal, 11 state or regional, and 41 local government entities.

KEY WORDS: invasive plants, control, management, state program

(43) STUDYING LIGHTNING-CAUSED FIRES TO IMPROVE LANDSCAPE MANAGEMENT—A GREAT SMOKY MOUNTAINS NATIONAL PARK CASE STUDY. [Dana Cohen](#)<sup>1</sup>, [Bob Dellinger](#)<sup>2</sup>, [Rob Klein](#)<sup>2</sup>, [Beth Buchanan](#)<sup>3</sup> <sup>1</sup>USDA Forest Service, Kaibab National Forest. [dcohen@fs.fed.us](mailto:dcohen@fs.fed.us). <sup>2</sup>USDI National Park Service, Great Smoky Mountains National Park. [bob\\_dellinger@nps.gov](mailto:bob_dellinger@nps.gov), [rob\\_klein@nps.gov](mailto:rob_klein@nps.gov). <sup>3</sup>USDA Forest Service, Southern Region. [bbuchanan@fs.fed.us](mailto:bbuchanan@fs.fed.us)

For the last decade, Great Smoky Mountains National Park has implemented a wildland fire use (WFU) policy which authorizes park staff to manage lightning-caused fires without taking suppression actions, providing predefined conditions are met. These fires are monitored and the collected data has provided an invaluable platform for assessing lightning-caused fire behavior and effects on the modern southern Appalachian landscape.

WFU fires often occur outside the traditional prescribed fire season and persist for longer periods of time than management-ignited fires. These longer duration burns, the longest of which to-date lasted for 35 days, continue through fluctuations in fuel moistures and weather conditions which affect burn severity and intensity. This results in a greater mosaic and heterogeneity of fire effects than is seen in shorter-duration, intensively-managed prescribed fires. These lightning-caused fires have also illustrated the effects of fragmentation on landscape-scale fires, both from traditionally understood barriers (i.e. roads, trails, streams) as well as from invasive plants and animals.

As National Forest System lands begin to apply wildland fire use on a broader portion of the southeastern landscape, observations from WFU fires can aid land managers across the region in defining target conditions, refining management actions, and understanding ecosystem processes. This study highlights the characteristics of lightning-caused fires within the park and opportunities for integrating these observations into prescribed fire and other aspects of landscape management.

KEY WORDS: fire, lightning, wildland fire use, southern Appalachians, Great Smoky Mountains National Park, fire duration, fire suppression, long-term ignition event, fire regimes, prescribed fire, management-ignited fire

(94) DETERMINING LARK SPARROW BREEDING HABITAT REQUIREMENTS AND SUCCESS TO INFORM SAND BARREN RESTORATION. Melanie Coulter and Karen V. Root, PhD Biological Sciences Department, Bowling Green State University, [mdcoult@bgsu.edu](mailto:mdcoult@bgsu.edu); [kvroot@bgsu.edu](mailto:kvroot@bgsu.edu) .

In Northwest Ohio, Lark Sparrows rely on Midwest sand barrens, a globally rare early-successional plant community which is distributed in small patches across the Oak Openings region. Midwest sand barrens have been degraded by woody invasion following decades of fire suppression. At Oak Openings Metropark (OOM) and Kitty Todd Nature Preserve (KTNP), managers use prescribed fire, mowing, and a combination of these to restore and maintain Midwest sand barrens and support the local population of Lark Sparrows. Our research involves evaluating the effectiveness of this management by determining the breeding habitat requirements and nesting success of Lark Sparrows at OOM and KTNP. To determine habitat requirements, we measure the following components in occupied and abandoned Lark Sparrow territories: vertical structure of vegetation, percent cover of bunch grasses, shrubs, forbs and bare ground, vegetation height, size of barren, proximity to other breeding sites, proximity to human development, and soil type. Preliminary data suggest that Lark Sparrows prefer patches of sand barren larger than 1.9 ha with clump grasses, 50% bare ground, short vegetation, and no shrub cover. Since Lark Sparrows abandon degraded barrens, we can assume that breeding sites with high occupancy and nest success rates are high quality, functioning sand barrens. By comparing managed sand barrens to this standard, we relate habitat quality and function to the frequency and type of management on each site and suggest which types of management are most effective for restoring and maintaining functioning sand barrens.

KEY WORDS: woody invasion, habitat quality, Lark Sparrow, restoration, early-successional

(33) INTEGRATING INVASIVE SPECIES DATA: SOLUTIONS FOR DATA COLLECTION, MANAGEMENT, AND DISSEMINATION. Alycia W. Crall<sup>1</sup>, Jim Graham<sup>1</sup>, Catherine Jarnevich<sup>2</sup>, Greg Newman<sup>1</sup>, and Thomas J. Stohlgren<sup>2</sup>. <sup>1</sup>Natural Resource Ecology Laboratory, Colorado State University. [mawaters@nrel.colostate.edu](mailto:mawaters@nrel.colostate.edu); [jim@nrel.colostate.edu](mailto:jim@nrel.colostate.edu); [newmang@nrel.colostate.edu](mailto:newmang@nrel.colostate.edu). <sup>2</sup>United States Geological Survey, Fort Collins Science Center. [catherine.jarnevich@usgs.gov](mailto:catherine.jarnevich@usgs.gov); [tom\\_stohlgren@usgs.gov](mailto:tom_stohlgren@usgs.gov) .

Harmful, invasive non-native species continue to spread throughout the US and our inability to efficiently and effectively combat these invasions has resulted in enormous environmental and economic losses worldwide. However, the extent of existing non-native species data is not well known and there have been few efforts to improve collaboration and data synergy among groups. This problem is especially evident for invasive plant species data throughout the Midwest, where many groups collect data and work in isolation. The National Institute of Invasive Species Science (NIISS) is a consortium of governmental and non-governmental organizations formed to develop cooperative approaches to invasive species science. Since its creation, NIISS has been primarily involved in the creation of the Global Organism Detection and Monitoring System (GODM). GODM is a web-based data management system that has been developed to facilitate data-sharing on non-native species at a global scale. GODM and the underlying NIISS website ([www.niiss.org](http://www.niiss.org)) allow users to browse, upload, and download data on invasive species from a pooled data source. This presentation will focus on the current features of this system and additional resources available to merge disparate data across the region.

KEY WORDS: invasive species, data management, early detection, data synergy

(79) DISTRIBUTION OF WOODY RESEEDERS AND RESPROUTERS (*HYPERICUM* SPP.) ALONG FIRE FREQUENTED ECOCLINES OF THE NORTHERN FLORIDA GULF COAST. Raelene M. Crandall, and William J. Platt. Department of Biological Sciences, Louisiana State University. [rcrand1@lsu.edu](mailto:rcrand1@lsu.edu); [btplat@lsu.edu](mailto:btplat@lsu.edu).

Woody shrubs can be divided into resprouting and reseeding life histories based on responses to disturbances. Reseeders and resprouters are predicted to be restricted to habitats with long and short disturbance return intervals, respectively. Nonetheless, resprouters and reseeder shrubs co-occur along Gulf of Mexico coastal ecoclines that experience frequent lightning fires (> twice a decade). We hypothesize that resprouters should be associated with uplands where fires tend to burn frequently and evenly across the landscape. In contrast, reseeder shrubs should be associated with lowlands; fires spreading from uplands should burn increasingly patchy in progressively wetter areas. We used five belt transects of 50 1m<sup>2</sup> plots to examine habitat associations of *Hypericum microsepalum* (resprouter), *H. brachyphyllum* (facultative reseeder/resprouter), and *H. chapmanii* (obligate reseeder). Data indicate these species are separated along a gradient in topography and soil moisture. *Hypericum chapmanii* and *H. microsepalum* are separated spatially, with the former in low drainages and the latter in upland flatwoods. *Hypericum brachyphyllum* is intermediate in distribution and occasionally co-occurs with *H. chapmanii*. Reciprocal transplants to determine if these species can survive at different locations along ecoclines indicate no differences in survival between controls and transplants; reseeder and resprouter distributions are not constrained by habitat alone. Because recent fires were frequent in upland habitats, and less common in adjacent lowland habitats, we propose that fire frequency controls the distribution of reseeder and resprouters. Reseeders and resprouters may coexist along the same ecoclines if historically frequent disturbances increase in patchiness toward one end of the ecocline.

KEY WORDS: reseeder, resprouter, fire, ecoclines, habitat associations

(14) HOW RESEARCHERS AND THE NURSERY INDUSTRY CAN WORK TOGETHER TO PREVENT PLANT INVASIONS. Theresa M. Culley<sup>1</sup> and Keith Manbeck<sup>2</sup>. <sup>1</sup>Department of Biological Sciences, University of Cincinnati, OH. [theresa.culley@uc.edu](mailto:theresa.culley@uc.edu). <sup>2</sup>Decker's Nursery, Inc., Groveport, OH.

Invasive plant species often cause substantial economic and ecological impacts worldwide. Many invasive plants have been unintentionally introduced, such as in soil or seed, but some plants have been deliberately imported for horticultural and landscaping purposes before their invasive potential was realized. Prevention of these types of introductions requires that researchers and nurserymen work together to first identify problematic species and then arrive at a suitable and equitable solution. To be effective, the solution must address impacts on the ecosystem, the financial viability of the nursery industry, and consumers who drive the horticultural process. By combining hands-on expertise of nurserymen working directly with horticultural plants with the techniques and theory developed by scientists, we can work together to (1) examine the potential for invasiveness of some horticultural plants, (2) generate alternatives to invasive plants that are economically profitable for the nursery industry, and (3) educate the consumer. To demonstrate these ideas, we discuss several cases in which researchers and nurserymen have collaborated on invasive species. We also suggest ways in which the two groups can work together in the future to reduce introductions of invasive species through the horticultural pathway.

KEY WORDS: researchers, nursery industry, invasive plants

(127) GENETIC EFFECTS OF URBAN AND AGRICULTURAL HABITAT FRAGMENTATION IN THE COMMON YELLOW VIOLET, *VIOLA PUBESCENS*. [Theresa M. Culley](#)<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, University of Cincinnati. [theresa.culley@uc.edu](mailto:theresa.culley@uc.edu) .

Habitat fragmentation often has detrimental impacts on the genetic structure of plant populations but the effect of fragmentation in urban areas remains relatively unexplored. To investigate effects of urban habitat fragmentation, I examined six populations of the common yellow violet (*Viola pubescens*) located in deciduous forest fragments within urban parks in Cincinnati, Ohio. These were compared to four agricultural populations located in forest fragments surrounded by corn and soybean fields in central Ohio. The genetic variation and structure of all populations were examined with DNA-based microsatellite markers, consisting of 12 primer pairs. Regardless of location, levels of genetic variation were high in all populations, as measured by percent polymorphic loci ( $P = 90.3$  in urban populations;  $P = 91.7$  in agricultural populations) or number of alleles per locus ( $A = 3.08$  in urban populations;  $A = 3.60$  in agricultural populations). Populations were genetically differentiated from one another in both urban ( $\theta = 0.185$ ) and agricultural sites ( $\theta = 0.184$ ). These results are consistent with the mixed mating system of the species, which may buffer it against immediate loss of genetic variation in fragmented environments. Thus, habitat fragmentation caused by urbanization does not appear to detrimentally impact *V. pubescens* populations any more than in agricultural areas. Future studies should focus on additional plant species in urban areas as they may respond differently to habitat fragmentation.

KEY WORDS: cleistogamy, genetic variation, microsatellite, *Viola pubescens*

(53) USE OF A MULTIMETRIC ECOLOGICAL MODEL TO BALANCE NATURAL AREA PROTECTION AND PUBLIC USE. [Robert L. Curtis](#). Natural Resource Management Department, Metro Parks, Serving Summit County, OH. [rcurtis@summitmetroparks.org](mailto:rcurtis@summitmetroparks.org).

Because a majority of natural areas are protected by public funds, there is a need to balance adequate protection and appropriate public use. Recognizing this need, we created a process whereby park improvements could be guided by sound ecological data. Toward this end a multimetric ecological model was developed to thoroughly, rapidly and objectively assess habitat quality within natural areas. The model is intended to rank habitat units of like developmental state using the following metrics: 1) floristic quality; 2) successional state; 3) rare species; 4) hydrologic function; and 5) patch attributes. This broad suite of metrics relies heavily on field inventories, local and regionally developed species-area relationships (SARs), GIS data and analysis, and previously developed indices, such as the Floristic Quality Assessment Index (FQAI) and Ohio Rapid Assessment Method (ORAM) for wetlands.

Using several years of data (including 186-380 units totaling 2500-4000 acres and ranging from urban to pristine habitats across the county), we were able to calibrate the model, as well as each metric, to fit local curve distributions and define break points allowing the designation of protective statuses. We assign an "excellent" designation to those habitats scoring above mean plus 1.5 standard deviations, which we restrict from any type of development or unauthorized access. Conversely, we assign a "poor" designation to those scoring below mean less 1.5 standard deviations, which we deem suitable for development of active recreational areas. Average habitats fall between these break points and are allowed low-impact improvements such as trails and observation decks.

KEY WORDS: ecological model, park planning, natural area assessment, public use

(1) OHIO'S NATURAL HERITAGE. Guy L. Denny, Fredericktown, OH. [guydenny@ecr.net](mailto:guydenny@ecr.net).

At the time of earliest settlement, the natural landscape of Ohio was a "living tapestry" of ecologically rich and diverse floristic communities; each a product of past major geological and

climatological events that greatly influenced the soils and topography of the state. These factors, in turn, played a major role in present-day plant and animal distributions as well as development patterns.

Although most of Ohio's original natural landscape has been greatly fragmented and altered by agricultural, industrial, and residential development, an impressive and diverse system of natural communities remains. To fully appreciate the state's rich natural heritage of today, we need to understand the role past events had in shaping the 5 major physiographic regions occurring in Ohio, and examine the special ecological niches, the flora, and the fauna characteristic of each of these regions.

(106) COMPARISON OF THE PHOTOSYNTHETIC CAPACITY OF THREE INVASIVE SHRUBS WITH NATIVE WOODY SPECIES IN MEADOW, EDGE, AND MATURE FOREST ECOSYSTEMS OF SOUTHWEST MICHIGAN. David L. Dornbos Jr.<sup>1</sup>, Laura Holtrop<sup>2</sup>, Michele Ritsema<sup>2</sup>, and Erica VanderGaast<sup>2</sup>. <sup>1</sup>Biology Department, Calvin College. [dld9@calvin.edu](mailto:dld9@calvin.edu). <sup>2</sup>Graduates of Calvin College.

Common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Rhamnus frangula*), and autumn olive (*Elaeagnus umbellata*) compete aggressively for light within a plant canopy, altering its composition and diminishing native biodiversity. At two locations in southwestern Michigan, we compared the photosynthetic capacity and light use efficiency of these invasive shrubs with several native species during 2005 and 2006. We used a CO<sub>2</sub> exchange meter to measure quantum flux, net photosynthesis, and transpiration rate in meadow, edge, and mature forest canopies. All three invasive shrubs exhibited higher CO<sub>2</sub> uptake rates than most native species in high light environments (photosynthetically active radiation [PAR] > 900 μmol/m<sup>2</sup>/s), consistent with their propensity for rapid growth. Only buttonbush (2005) and redbud (2006) acquired CO<sub>2</sub> as fast as the buckthorn species on the Calvin College campus, while black cherry produced CO<sub>2</sub> uptake rates similar to autumn olive at the Pierce Cedar Creek Institute sites. Mature forest environments with leaf area indices of 2.4-3.2 reduced photosynthesis rates up to 10-fold by preventing most solar radiation from reaching the shrub layer. Both buckthorn species maintained photosynthesis rates of 0.9 to 1.1 μmol CO<sub>2</sub>/m<sup>2</sup>/s under forest canopies, a rate equal to or greater than the native species evaluated. Autumn olive produced superior rates of 4.1 μmol/m<sup>2</sup>/s CO<sub>2</sub> uptake in comparison with 1.2-2.1 μmol/m<sup>2</sup>/s by several native tree species. Buckthorn and autumn olive exhibit advantages in light use efficiency across a broad range of light intensities, confirming their invasive ability and providing insight about practices necessary to manage these shrubs in restoration projects.

KEY WORDS: buckthorn, autumn olive, native species, photosynthesis, light use efficiency

(41) FIRE REGIMES AND RESPONSES OF WOODY GROUND COVER VEGETATION IN BARRENS OF SOUTHERN OHIO. Paul B. Drewa and Sheryl M. Petersen. Department of Biology, Case Western Reserve University. [paul.drewa@case.edu](mailto:paul.drewa@case.edu); [sheryl.petersen@case.edu](mailto:sheryl.petersen@case.edu).

The natural fire regime that once characterized oak barrens throughout the Bluegrass Region of the Interior Low Plateau in southern Ohio is not well understood. Nonetheless, current burn prescriptions are based largely on past activity of Native Americans who regularly used fire in these barrens and adjacent oak-dominated forest during the dormant season (fall, early spring) for hunting and agricultural purposes. Since 2003, we have been evaluating the efficacy of such prescriptions in deterring encroachment of resprouting, woody groundcover vegetation in oak barrens, which represent some of the most species rich ecosystems in North America. Thus far, our research demonstrates that anthropogenic dormant season fires increase resprout densities of root crown-bearing woody vegetation. Following March biennial fires in barren habitats, stem densities of these plants increased almost 1½ times compared to levels at the onset of the study. Additionally, stem densities after dormant season fires were 75% greater than stem densities in

fire-excluded areas. These results suggest that the current use of prescribed fire during the dormant season is not effective in deterring the proliferation of encroaching woody vegetation. Elucidating resprouting responses of woody vegetation following the experimental manipulation of fire regime attributes represents a critical next step in (1) improving our understanding of fire regimes and (2) refining the use of prescribed fire as a conservation and restoration tool in oak barrens. A more recent suggestion that oak barrens may have been characterized by lightning-initiated, growing season fires should provide impetus for such an approach.

KEY WORDS: barrens, dormant season fire, fire regimes, resprouting, woody groundcover vegetation

(131) ROLE OF COARSE WOODY DEBRIS IN DETERMINING TERRESTRIAL INVERTEBRATE COMMUNITIES IN A HEADWATER FLOODPLAIN. Maureen K. Drinkard and Ferenc A. de Szalay. Department of Biological Sciences, Kent State University. [mdrinkar@kent.edu](mailto:mdrinkar@kent.edu); [ferenc@kent.edu](mailto:ferenc@kent.edu).

Coarse woody debris (CWD) from fallen trees is an important structural component of riparian floodplains. In large river systems, CWD is an important terrestrial invertebrate habitat because it enhances food resources for detritivores, and it provides a refuge from predators and desiccation stresses during draw downs. However, this has been less studied in intermittently-flooded headwater systems. Our study examined effects of CWD in a headwater wetland along Mud Brook, Ohio. In Spring 2006, we simulated tree-fall events by placing 1 m X 15 cm logs (length X diameter) in the floodplain. By September 2006, organic matter content, soil moisture, and soil temperature were not different in CWD addition areas and adjacent unmanipulated areas without CWD. Invertebrate richness collected with pit-fall traps was also not different, but total number of invertebrates was higher in CWD addition areas. Some taxa (Collembola: Entomobryidae, Sminthuridae; Coleoptera: Ptilidae) that feed on CWD were also more abundant in the CWD addition areas. Abiotic factors and invertebrates below natural logs in the floodplain were also sampled in September 2006. Contrary to what we found in our CWD addition areas, soil organic content below natural logs areas was higher than adjacent areas without logs. Our results show that CWD affects both habitat conditions and invertebrate communities in headwater wetlands. Although certain effects may develop slowly over time (e.g. changes in abiotic conditions under fallen logs) invertebrate community responses occur more rapidly.

KEY WORDS: riparian, headwater, wetland, coarse woody debris, invertebrate

(80) FIRE HISTORY OF RED PINE-DOMINATED FORESTS OF SENEY NATIONAL WILDLIFE REFUGE, UPPER MICHIGAN. Igor Drobyshv<sup>1</sup>, Charles Goebel<sup>1</sup>, David Hix<sup>2</sup>, Greg Corace, III<sup>3</sup> and Marie Semko-Duncan<sup>1</sup>. <sup>1</sup>School of Environment and Natural Resources, The Ohio State University. [drobyshv.1@osu.edu](mailto:drobyshv.1@osu.edu); [goebel.11@osu.edu](mailto:goebel.11@osu.edu); [semko-duncan.1@osu.edu](mailto:semko-duncan.1@osu.edu). <sup>2</sup>School of Environment and Natural Resources, The Ohio State University. [hix.6@osu.edu](mailto:hix.6@osu.edu). <sup>3</sup>Seney National Wildlife Refuge, US Fish and Wildlife Service. [Greg\\_Corace@fws.gov](mailto:Greg_Corace@fws.gov).

Red pine (*Pinus resinosa*) has been a historically important species in the Lake States, with 38% of the forests dominated by this species in the eastern portion of Michigan's Upper Peninsula. While periodic fires apparently played an important role in providing regeneration opportunities for this species, fire suppression policies have decreased the presence of naturally regenerated red pine across the region. To better understand the natural dynamics of red pine-dominated ecosystems we studied past fire regime within a portion of Seney National Wildlife Refuge (SNWR) which has experienced relatively little direct human intervention, including fire suppression policies. We reconstructed fire events on 35 sites distributed across SNWR by dating fires scars on wedges sampled from both living and dead trees. Site fire chronologies covered a period of 200 to 300 years. Preliminary results indicate that large (> 5,000 - 10,000 ha) surface

fires occurred with a return interval of 40-60 years. The human impact on fire regime in the first half of the 20<sup>th</sup> century resulted in high incidence of smaller (< 100 ha) fires, and a decrease in fire frequency in the second half of the 20<sup>th</sup> century. We find little evidence of differences in fire regimes between two major landform types (glacial outwash channels vs. island-type sand ridges). It appears that observed differences are primarily the result of land-use history, rather than topographic attributes. By quantifying the role of fire activity in controlling fuel loadings we show that periodic low intensity fires reduced excessive fuel loading in a range of pine-dominated stands. Consequently, we suggest that prescribed fire should be a part of conservation programs and sustainable forest practices for red pine-dominated forest ecosystems within the region. However, restoration of sites significantly altered relative to their historic condition may require other silvicultural treatments.

KEY WORDS: natural disturbances, land use history, fire hazard, climate, forest management

(132) COMPOSITION, STRUCTURE, AND HISTORY OF AN OLD-GROWTH BEECH-MAPLE FOREST OF THE LOWER GREAT LAKES REGION, USA. [Igor Drobyshev](#)<sup>1</sup>, [Natalie Pinheiro](#)<sup>1</sup>, [Marie Semko-Duncan](#)<sup>1</sup>, [Kathryn Holmes](#)<sup>1</sup>, [David M. Hix](#)<sup>2</sup>, and [Charles Goebel](#)<sup>1</sup>. <sup>1</sup>School of Environment and Natural Resources, The Ohio State University. [drobyshev.1@osu.edu](mailto:drobyshev.1@osu.edu); [pinheiro.2@osu.edu](mailto:pinheiro.2@osu.edu); [semko-duncan.1@osu.edu](mailto:semko-duncan.1@osu.edu); [holmes.203@osu.edu](mailto:holmes.203@osu.edu); [goebel.11@osu.edu](mailto:goebel.11@osu.edu). <sup>2</sup>School of Environment and Natural Resources, The Ohio State University. [hix.6@osu.edu](mailto:hix.6@osu.edu).

Our understanding of the successional dynamics of beech-maple forests in the Lower Great Lakes region is limited due to scarcity of stands which have escaped human-related influences (e.g., logging and grazing). We quantify the composition, structure, and dynamics of a relatively undisturbed old-growth remnant (Crall Woods, Ashland County, Ohio) by mapping and obtaining tree-ring chronologies from all trees >10 m dbh on two 2500 m<sup>2</sup> plots. *Acer saccharum*, *Fagus grandifolia*, *Liriodendron tulipifera*, and *Tilia americana* dominate the overstory, while the sub-canopy is also dominated by *A. saccharum* and *F. grandifolia*. The age ranges of the canopy and sub-canopy individuals are 200-250 years and 50-150 years, respectively. Single-tree chronologies show multiple growth release periods, the most common dating back to approximately 1860-70 and 1930-35. Canopy gaps and gap-associated tree regeneration are characteristic features of the stand, and appear to be reflected in the spatial distribution of woody species. Specifically, spatial structure of the sub-canopy trees exhibits a regular pattern at the scale of 6 meters and less, and an aggregated pattern at larger scales. For trees with intermediate canopy positions a similar threshold is observed at 8 meters, and for dominant and co-dominant trees, at 14 meters. In the future we will develop a more detailed reconstruction of the age structure, disturbance events and associated regeneration pulses, and reconstruct historical disturbance rates for this forest. This information will be compared with published rates and to help direct forest ecosystem restoration projects for beech-maple forests in the Lower Great Lakes region.

KEY WORDS: forest succession, natural disturbances, spatial dynamics, hardwoods, dendrochronology

(37) ASSESSMENT OF PRIMARY HEADWATER STREAM HABITATS IN THE GRAND RIVER AND CHAGRIN RIVER (OHIO) BASINS. [Chad Edgar](#) and [Matt Scharver](#). Lake County Soil and Water Conservation District. [cedgar@lakecountyohio.gov](mailto:cedgar@lakecountyohio.gov); [mscharver@lakecountyohio.gov](mailto:mscharver@lakecountyohio.gov).

The Lake County Soil and Water Conservation District has conducted over 1000 assessments on primary headwater streams in northeast Ohio. The Headwater Habitat Evaluation Index (HHEI) was used with procedures developed by the Ohio Environmental Protection Agency and described in detail in the "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams". (OEPA, 2002) Primary headwater stream habitats are defined by having less than 1

square mile (2.59 square kilometers) of drainage area and pools <40cm. HHEI assessments include physical, chemical and biological measurements of freshwater streams to rank habitats into one of 5 designations. The data collected during research is captured by a geographic information system (GIS), which is used to deliver information to conservation agencies, landowners, and government jurisdictions. Important information like flooding potential, riparian corridors, and chemistry can be displayed on maps with reference to the amount of development, wetlands, and proximity to structures. HHEI data collected is being used to support many programs such as: TMDL development, 401/404 water quality permits, acquisition of conservation easements, and provide information to local planning commissions and zoning boards. The inventory has revealed the distribution of several obligate salamander and macroinvertebrate species which could be used to monitor long term trends in water quality impairment. This study has also shown that the Grand River and Chagrin River basins have more rare coldwater streams than what had been predicted statewide. Conservation of natural areas that contain these unique habitats is essential to maintaining the function and value of downstream water quality.

KEY WORDS: assessment, headwater, salamander, macroinvertebrate, GIS

(74) THE WILD LINK PROGRAM: PRESERVING AND ENHANCING ECOLOGICAL CORRIDORS ON PRIVATE LANDS. Eric Ellis. Wild Link Program, Conservation Resource Alliance, Traverse City, MI. [craeric@chartermi.net](mailto:craeric@chartermi.net).

The Conservation Resource Alliance's (CRA) Wild Link program helps private landowners protect and restore critical ecological corridors in rapidly developing areas of northern Michigan. Through this program, CRA assists private landowners by preparing habitat management plans which address their goals for their property as well as enhance regional wildlife habitat connections. If a private landowner needs help implementing his/her plan CRA staff will coordinate the project and may pursue partial funding for it. Management plans can include, but are not limited to: stream/wetland restoration, improvements for wildlife viewing, invasive species control, enhanced hunting opportunities, timber production, and prescribed burn implementation. There are no fees for writing plans. There are no contracts involved. No public access is required. CRA collaborates with and seeks cooperation from numerous local, state and national organizations to provide funding for the program. Wild Link fills an important niche in the local conservation community and plays a complimentary role to the work of many regional groups by working with private landowners on a voluntary basis to link property under permanent legal protection (e.g., conservation easements, TNC lands, state forests). By helping individuals invest in their land to achieve positive results we aim to maintain healthy habitat connections in the region. Wild Link's primary goals are to meet landowner needs, improve wildlife habitat, keep large ecosystems connected, and keep species from becoming threatened or endangered.

KEY WORDS: corridors, wildlife, private landowners

(104) IMPACTS OF INVASIVE REED CANARY GRASS (*PHALARIS ARUNDINACEA* L.) ON PLANTS, ARTHROPODS AND SMALL MAMMALS. Jamie Ellis, Greg Spyreas, Brian Wilm, Allen Plocher, Dave Ketzner, Jeff Matthews and Ed Heske. Illinois Natural History Survey. [jamese@inhs.uiuc.edu](mailto:jamese@inhs.uiuc.edu).

Multi-trophic effects of exotic, invasive plant species are not well understood and little studied. We suspect that as an invasive plant gains dominance and plant diversity decreases, other organisms in the ecosystem will be negatively affected. Reed canary grass (*Phalaris arundinacea* L., hereafter RCG) is an invasive and pervasive plant in Illinois emergent wetlands. To test for effects of invasion by RCG, we compared richness, abundance and ecological quality (FQI for plants) indices of plants, mammals, arthropods and small mammal communities in old-field plots and experimental plots with or without RCG. Additionally, vegetation and arthropod data from 81 wetlands across Illinois collected as part of the Critical Trends Assessment Program (CTAP) were

analyzed. As expected, RCG had negative effects on plant species richness and FQI in study plots. Results from CTAP wetland data also showed this trend. Nearly every arthropod order was less abundant and species rich in RCG dominated plots. At CTAP wetlands Homopteran (leafhoppers) richness and abundance decreased with increasing cover of RCG. White-footed mice (*Peromyscus leucopus*) were more abundant in plots with diverse, native vegetation (low RCG cover) but voles (*Microtus ochrogaster* and *M. pennsylvanicus*) were more abundant in plots dominated by RCG. Our study suggests that as RCG increases in dominance and wetland plant diversity declines, the diversity and abundance of other organisms generally declines or is at least compositionally altered.

KEY WORDS: reed canary grass, multi-trophic, invasive species

(8) EFFECTS OF ASH DIEBACK DUE TO INTRODUCED EMERALD ASH BORER ON LITTER-DWELLING ARTHROPODS IN CENTRAL HARDWOOD FORESTS. [Kamal JK Gandhi](#)<sup>1</sup>, [Annemarie Smith](#)<sup>2</sup>, and [Daniel A Herms](#)<sup>1</sup>. <sup>1</sup>Department of Entomology, The Ohio State University. [gandhi.42@osu.edu](mailto:gandhi.42@osu.edu); [herms.2@osu.edu](mailto:herms.2@osu.edu). <sup>2</sup>Ohio Division of Forestry and USDA Forest Service. [annemarie.smith@dnr.state.oh.us](mailto:annemarie.smith@dnr.state.oh.us)

We studied the responses of litter-dwelling arthropods (Coleoptera: Carabidae; Arachnida: Araneae) to the severity of gap formation caused by ash tree mortality due to the introduced emerald ash borer (EAB) in hardwood forests of southeastern Michigan. Twenty eight replicate stands were established for combinations of three ash cover types (black, green or white ash), and two sizes of forest canopy gaps (small or large). In each stand, two pitfall traps were each placed in three permanent vegetation plots (18m radius) along a transect, for a total of 168 traps for the study. Sampling was conducted from May to September 2006, and traps were emptied every 15 days. All adult ground carabid beetles have been identified to species-level. The taxonomic work on spiders is in progress. Preliminary results indicate that trap catches and species richness of carabid beetles were higher in the small gap stands that also had the most unique species. There were negative relationships between carabid catches and percentage canopy gap formations and ash tree mortality. Riparian carabid species were caught primarily in black ash, where they were further aggregated in the small gap stands. Cluster analysis revealed that the black ash-small gap stands had the most distinct species composition that was significantly different from that of the large gap stands within the same cover type. Overall, results indicate that in short-term, extensive canopy gap formations due to ash dieback by EAB are adversely affecting carabid species activity, diversity, and composition in southeastern Michigan.

KEY WORDS: biodiversity, Carabidae, emerald ash borer, exotic insects, Michigan

(73) ASSEMBLING NATURAL AREAS IN URBANIZED WATERSHEDS. [Lynn Garrity](#), Cuyahoga (Ohio) Soil & Water Conservation District. [lgarrity@cuyahogawcd.org](mailto:lgarrity@cuyahogawcd.org)

Natural areas in urban watersheds continue to be lost from redevelopment and development patterns causing increased fragmentation and degraded ecological systems. Without natural areas in urban areas, the desire to leave the city continues to increase and cause continued pressure on rural land conversion. Due to the abundance of small parcels, proximity to high human population densities, and high property values, the challenges and approaches of urban land conservation are distinct. The Euclid Creek and West Creek Watersheds in Cuyahoga County have begun to identify and conduct land conservation strategies to protect remaining natural areas and restore degraded areas back to viable natural areas. This presentation will present these approaches being used around the United States and in Cuyahoga County by local watershed groups that have proven successful in assembling these natural areas in urban areas and the examination of the need for an urban land conservancy as a strategy for the future.

KEY WORDS: urban, watershed, land conservation, habitat

(145) FOREST ECOSYSTEM RESTORATION EFFECTS DECOMPOSITION AND NUTRIENT RECYCLING IN APPALACHIAN MIXED-OAK FORESTS. [Carla Gaij](#) and Ralph E.J. Boerner. Department of Evolution, Ecology, and Organismal Biology, The Ohio State University. [Gaij.1@osu.edu](mailto:Gaij.1@osu.edu), [boerner.1@osu.edu](mailto:boerner.1@osu.edu).

In 2004 we began a three year litter decomposition experiment at the Ohio Hills Fire and Fire Surrogate site in order to produce predictive models of the effects of the restoration on nutrient turnover. We considered soil/climate characteristics, the quality of the decomposing litter as factors, the influence of dormant season fire at historical frequencies, and landscape position. Decomposition rates and N and P dynamics were determined by using leaf litterbags incubated *in situ* packed with site-specific litter mixes and standard litter types. We compared mass, N, and P loss among treatments between leaf fall in autumn 2004 and early spring 2005, and found that mass loss was unaffected by treatment; but, N release was greater in burned than unburned plots (with or without thinning) and P release was greater in burn-only and thin-only plots than in the control. We compared the first four months of decomposition of litter from burned plots harvested in 2004 (4<sup>th</sup> post-fire year) and 2005 (1<sup>st</sup> year after second fire). Loss of mass, N, and P were significantly greater from the 1<sup>st</sup> post-fire year than the 4<sup>th</sup> post-fire year litter. Estimates of annual decay rates (k) suggest that spatial variability in decomposition within a treatment was considerably greater in burned or burned+thinned plots than in control or thinned plots. Once the final harvest is completed in July 2007 we will utilize structural equation modeling approaches to develop predictive models for C, N, and P turnover in relation to landscape position, litter source, and restoration treatments.

KEY WORDS: ecosystem restoration, fire, decomposition, Appalachian oak forest

(82) ECOSYSTEM MANAGEMENT IN THE ALBANY PINE BUSH PRESERVE: A CASE STUDY OF A HIGHLY FRAGMENTED GLOBALLY RARE NATURE PRESERVE. [Neil A. Gifford](#)<sup>1</sup> and Jason T. Bried<sup>2</sup>. <sup>1</sup>Albany Pine Bush Preserve Commission. [ngifford@tnc.org](mailto:ngifford@tnc.org). <sup>2</sup>The Nature Conservancy – Eastern New York Chapter. [jbried@tnc.org](mailto:jbried@tnc.org).

In upstate New York less than 10 percent of the original 25,000 acres of inland Pine Barrens still exist. What remains is degraded and fragmented as a result of habitat conversion through fire suppression and economic development. 3,070 acres of inland pitch pine scrub oak barrens have been protected in the Albany Pine Bush Preserve (APB), which is considered one of the best remaining worldwide examples of this fire-dependent ecosystem, and supports more than 40 at-risk wildlife species. Since 1991 the Albany Pine Bush Preserve Commission, a unique public-private partnership, has been restoring altered fire regimes to create and manage a viable Preserve in the highly fragmented suburbs of New York State's Capital City. More than 1,000 acres have received prescribed fire treatments, 100 acres of non-native invasive black locust (*Robinia pseudoacacia*) have been removed, and endangered species habitat restoration has occurred on more than 200 acres. Monitoring illustrates that these efforts are meeting management objectives and not only advancing state and federal Karner blue butterfly (*Lycaeides melissa samuelis*) recovery efforts, but also benefiting insects, birds, and herpetofauna listed in the New York State Wildlife Action Plan as Species of Greatest Conservation Need. This presentation will provide a summary of the Commission's ecological viability assessment and biological management, as well as a discussion of the biological and social challenges of restoring altered fire regimes and managing a rare ecosystem in a fragmented urban landscape.

KEY WORDS: fragmentation, prescribed fire, at-risk wildlife, Karner blue butterfly, pitch pine scrub oak barrens.

(44) EFFECTS OF SINGLE, GROWING-SEASON MECHANICAL AND PRESCRIBED FIRE TREATMENTS IN RESTORING INLAND PITCH PINE SCRUB OAK BARRENS. [Neil Gifford](#)<sup>1</sup>, [Craig Kostrzewski](#)<sup>1</sup>, [Jason Bried](#)<sup>1</sup>, [G. Thomas Dooley](#)<sup>2</sup>. <sup>1</sup> Albany Pine Bush Preserve Commission ([ngifford@tnc.org](mailto:ngifford@tnc.org)), <sup>2</sup> The Nature Conservancy – Tennessee Chapter

Pitch pine scrub oak barrens (PPSOB) are one of the rarest and most volatile ecosystems in the Northeastern United States. The 3,010-acre Albany Pine Bush Preserve contains one of the best remaining examples of an inland PPSOB and supports more than 40 rare species, including the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*). Between 1991 and 2002, 700 acres of fire-suppressed PPSOB were managed with dormant season prescribed fire by the Albany Pine Bush Preserve Commission. Dormant season fire had limited success in restoring PPSOB and was counter productive in areas invaded with hardwoods. High flame lengths and rates of spread also presented significant challenges in this highly fragmented urban landscape. Growing-season mechanical and prescribed fire treatments were initiated in 2003 on eight acres of PPSOB which were mechanically treated in June. Prescribed fire was applied to four of the eight acres in July 2003, producing relatively slow but intense fire behavior. Post-treatment monitoring revealed greater treatment efficacy in the mowed and burned area, with significant reductions in litter and duff and considerable mineral soil exposure. To date, 239 acres have received the combined growing season restoration treatment. These fires appear to consistently produce manageable fire behavior while generating a mosaic of fire effects and meeting restoration goals. Growing and dormant season fire is envisioned to maintain “restored” barrens, while degraded and invaded areas require mechanical, chemical and planting treatments to reach management objectives.

KEY WORDS: pitch pine scrub oak barrens, prescribed fire, growing season fire, mechanical fuel load reduction, wildland urban interface, Karner blue butterfly

(55) FUNCTIONAL DELINEATION AND RESTORATION PRIORITY MODEL FOR RIPARIAN AREAS OF THE CUYAHOVA VALLEY NATIONAL PARK. [P. Charles Goebel](#) and [Kathryn L. Holmes](#). School of Environment and Natural Resources, The Ohio State University. [goebel.11@osu.edu](mailto:goebel.11@osu.edu); [holmes.203@osu.edu](mailto:holmes.203@osu.edu).

Riparian areas are critical ecotones between aquatic and terrestrial ecosystems that provide many ecosystem services from regulating the movement of nutrients and energy to providing diverse habitats for both plants and animals. Due to their critical position on the landscape and ecological importance, riparian areas need to be protected and restored in most watersheds. This is particularly true for the interfaces between urban and rural landscapes such as those encountered in the Cuyahoga Valley National Park, located between the Cleveland and Akron metropolitan areas of northeastern Ohio. These riparian areas are characterized by broad, open floodplains along the Cuyahoga River and steep forested ravines along its tributaries. In 2006, the condition of the Park’s riparian areas was assessed and a Riparian Restoration Priority Index (RRPI) model was developed. Using remote sensing and a geographical information system (GIS), a functional ecotone approach was used to delineate riparian areas and assess their ecological function in terms of canopy cover, sediment delivery, hydrology, plant diversity, and potential quality of wildlife habitat. The RRPI model incorporates ecological, social, and management components, including riparian function, geomorphic channel variability, potential public education visibility, and Park management objectives (e.g. controlling invasive species). Using the model, 53% of the Park land was delineated as riparian. The RRPI identified riparian areas in need of restoration and ranked locations from low to high priority. This approach can be easily adapted and applied to other natural areas with extensive riparian areas and sufficient digital data.

KEY WORDS: riparian, GIS, restoration, ecological modeling, Cuyahoga Valley National Park

(113) HIERARCHICAL CONTROLS ON RIPARIAN GROUND-FLORA COMPOSITION AND STRUCTURE IN BEECH-MAPLE FOREST ECOSYSTEMS OF THE LOWER GREAT LAKES. P. Charles Goebel, Kathryn L. Holmes, Marie E. Semko-Duncan and David M. Hix. School of Environment and Natural Resources, The Ohio State University. [goebel.11@osu.edu](mailto:goebel.11@osu.edu); [holmes.203@osu.edu](mailto:holmes.203@osu.edu); [semko-duncan.1@osu.edu](mailto:semko-duncan.1@osu.edu); [hix.6@osu.edu](mailto:hix.6@osu.edu).

The functional importance of riparian areas in forested landscapes is irrefutable. As a result, many resource agencies are actively implementing stream and watershed restoration programs that focus on restoring native riparian plant communities. While some information on riparian forests is available to resource managers that can help in designing restoration strategies, little is known about the factors that influence composition and structure of riparian ground-flora communities. To address this need, we examined the influence of stream size, valley landform, and soil characteristics on the composition, structure and diversity of ground flora communities along headwater streams in the Cuyahoga Valley National Park of northeastern Ohio. Species richness and productivity (e.g., total aboveground plant biomass) was highest on the floodplain-terrace landforms associated with higher-order streams, while the hillslopes associated with the stream valley walls along these higher-order streams were both the least diverse and productive. Few terraces were observed along the lower-order streams; however, the hillslopes associated with these streams were almost as diverse and productive as the terraces associated with the higher-order streams. Canonical correspondence analyses (CCA) suggest that plant community structure is related strongly to hierarchical landscape controls. Graminoids and disturbance-indicating perennial forbs dominate the more disturbed areas characterized by coarser-textured soils, while pteridophytes, other perennial forbs, and woody seedlings dominate the finer-textured soils associated with hillslopes, regardless of stream size. These results suggest that ground-flora communities along streams in the study area are strongly influenced by a suite of hierarchical factors including stream size, valley landform, and soil characteristics.

KEY WORDS: riparian, headwater streams, diversity, ground-flora, Cuyahoga Valley National Park

(12) INVASIVE PLANT – POLLINATOR INTERACTIONS. Karen Goodell. Department of Evolution, Ecology, and Organismal Biology, The Ohio State University. [goodell.18@osu.edu](mailto:goodell.18@osu.edu).

Interactions between invasive plants and pollinators are of increasing interest because they can influence the dynamics of both invasive plants and their pollinators. Pollinators can promote seed production in some invasive plants, which could promote spread of the invader. Conversely, lack of suitable pollinators could limit the establishment and spread of some non-native plants. Invasions of non-native plants also may affect bee populations directly by contributing floral resources, or indirectly, by reducing the abundance or diversity of floral resources. Non-native plants could boost populations of pollinators that facilitate seed set of the non-native plant and promote its invasion. Impacts on bee abundance or behavior may indirectly affect reproduction of native plants that share pollinators with the non-native species through competition or facilitation of flower visitors. Invasive plants could trigger negative feedback on reproduction of native plants if reductions in native plant densities or diversity also cause declines in pollinator populations that service native plants.

I present results on the pollination biology and pollinator interactions of the invasive shrub *Lonicera maackii*. I discuss the impacts of *Lythrum salicaria* invasions on pollinator communities. In a study of 14 calcareous fens in NJ, USA, I found that invaded sites had higher densities of flower-visiting insects and lower bee species diversity than uninvaded sites. Bee community composition also differed between sites. Uninvaded sites supported higher densities of small, native bees. Invaded sites had higher densities of large bees. Despite these differences, initial studies showed no difference in pollen limitation of a dominant native shrub.

KEY WORDS: invasive plant, pollination, mutualists, Apiformes, indirect effects

(19) ASSESSING VIABILITY AND IDENTIFYING CRITICAL ENVIRONMENTAL VARIABLES AND GENETIC STRUCTURE OF A RARE FRESHWATER TURTLE. [Hillary M. Harms](#), and Karen V. Root. Department of Biological Sciences, Bowling Green State University. [hmorgan@bgsu.edu](mailto:hmorgan@bgsu.edu); [kvroot@bgsu.edu](mailto:kvroot@bgsu.edu).

The spotted turtle, *Clemmys guttata*, is a freshwater turtle currently protected throughout most of its range. The population declines and protected status of this species warrant urgent conservation action. Three tools especially useful for investigating population declines in instances where data may be limited and/or difficult to obtain are GIS, population modeling, and molecular population genetics. We use these tools, combined with field surveys and radio-telemetry in three managed sites in Northwest Ohio, to address the overarching questions of (1) what do spotted turtles need; (2) are populations viable; and (3) how should we manage them. We are further exploring the ecology of spotted turtles, increasing the understanding of turtle habitat requirements, conducting a risk assessment, and determining genetic structure of spotted turtles throughout Ohio. We found that spotted turtles show high site fidelity and turtle activity appears to be correlated with hydroperiod. Each study site appears to be heterogeneous enough to meet the turtle's life-history needs. While the three sites are similar in habitat, successful, frequent reproduction is detectable at only one of the three sites. Our sensitivity analysis of the population model shows that population growth rate is most affected by adult survival and age of first breeding; indicating that research should focus on these variables. The results from the genetic analysis will address the effects of fragmentation and aid in focusing management efforts. This research highlights the power of using multiple techniques; providing timely vital data that will help in the conservation of the turtle species chosen.

KEY WORDS: spotted turtle, habitat, spatial, viability, modeling

(64) THE EAB ERADICATION PROTOCOL: ENVIRONMENTAL IMPACTS AND NATIVE PLANT COMMUNITY RESPONSES. [Constance E. Hausman](#)<sup>1</sup>, [Oscar J. Rocha](#)<sup>1</sup> and [John F. Jaeger](#)<sup>2</sup>  
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In a world of global commerce, there is an increased likelihood that species are transported from country to country. The importation of species through foreign trade, accidental or not, might have detrimental consequences. The United States is currently experiencing the beginning stages of a prolific invasion. The Emerald Ash Borer (EAB), *Agrilus planipennis*, a beetle native to Asia, is attacking all ash tree species. Once infested, tree mortality is one hundred percent within 3-5 years. Eradication measures include cutting all ash trees within a half-mile radius of an infested tree. Consequently, habitat conditions become altered dramatically with abrupt changes to the environment caused by the removal of so many trees. Changes to the environment include an increase in the number and size of gap formations. In addition, the effect of heavy vehicles used to remove trees leads to an increase in soil compaction. These factors influence composition of the existing plant community however of greater concern is whether this level of disturbance further facilitates a secondary spread of invasive plant species.

This project investigates the environmental impacts due to the EAB eradication program and describes the initial stages of plant colonization to determine the degree of invasibility between the cut and uncut areas. Results indicate that the plant community in cut areas is beginning to show an increase level of sensitivity to invasive plant species. The changes to the environment imposed by the eradication protocol observed thus far appear to create ideal opportunities for the spread of invasive plant species

KEY WORDS: emerald ash borer, invasive species, disturbance ecology, plant community

(59) BUILDING A BRIDGE WITH F-TROOP. [Bill Helfferich](#). South Florida Water Management District, West Palm Beach. [whelffer@sfwmd.gov](mailto:whelffer@sfwmd.gov).

**The Mission:** Fully assemble and install a 60' long fiberglass freespan "kit" bridge across Tick Island Slough along the Florida National Scenic Trail. **The Challenge:** Complete construction over a single 3-day weekend, using an all volunteer 20-person work force (F-Troop) ranging from 10-80 years old, and use cable rigging systems in lieu of power equipment to fly the bridge into place. F-Troop is a euphemistic semi-organized assemblage of Florida Trail Assn. members from across the state that gather in various locations to undertake construction and repair projects along the Florida Trail, one of only eight federally designated scenic trails in the United States. The bridge "kit" consists of several thousand pieces which must be assembled into a precise arc. A U.S. Forest Service rigger installed cables, blocks, and winches in trees on both sides of the span to enable the two 60' spans to be hung and pulled across the opening. **The Result:** Completion of a beautiful new bridge and a group of tired, dirty, and happy volunteers who were totally amazed at what they had accomplished in three short days.

KEY WORDS: volunteers, bridge, Florida Trail Association, rigging

(125) IMPACTS OF EMERALD ASH BORER-INDUCED GAP FORMATION ON FOREST COMMUNITIES. [Daniel A. Herms](#)<sup>1</sup>, [John Cardina](#)<sup>2</sup>, [Catherine P. Herms](#)<sup>2</sup>, [Kamal Gandhi](#)<sup>1</sup>, [Kathleen S. Knight](#)<sup>3</sup>, [Robert P. Long](#)<sup>3</sup>, [Deborah G. McCullough](#)<sup>4</sup>, and [Annemarie Smith](#)<sup>1, 5</sup>.  
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Emerald ash borer (EAB, *Agrilus planipennis*) is an invasive wood-boring beetle that has killed millions of ash (*Fraxinus* spp.) trees since its accidental introduction from Asia. We have initiated a series of long-term studies to investigate effects of ash mortality and associated gap formation on forest community structure, composition, and succession. We have established 99 plots within the Huron River watershed in southeast Michigan across a gradient of EAB impact ranging from zero to 100% ash mortality. Objectives include quantifying (1) patterns and rates of ash mortality in relation to tree community composition, (2) successional trajectories in relation to gap size and tree community composition, (3) ash seed bank and seedling regeneration, (4) response of native understory vegetation, (5) spread and establishment of invasive plants, (5) responses of invasive earthworms, and their role in facilitating exotic plant establishment in gaps, and (6) responses of native arthropod fauna including ground beetle (Carabidae) and spider assemblages. Once infested, ash decline and mortality progressed rapidly in all stands regardless of basal area, density, species composition, or other stand variables. Ash was the most common woody seedling, which could facilitate ash regeneration and provide a continued host for EAB. The ash seedbank was limited, suggesting long-term perpetuation of ash is precarious. Preliminary data suggests that EAB-induced gap formation will facilitate the spread of invasive plants. Ground beetle species richness was reduced in stands impacted by EAB, at least initially. These studies suggest that EAB will have substantial, long-term effects on forest communities.

KEY WORDS: invasive species, disturbance, succession, emerald ash borer

(36) ENVIRONMENTAL INFLUENCES ON THE COMPOSITION AND STRUCTURE OF MACROINVERTEBRATE ASSEMBLAGES IN HEADWATER STREAMS OF NORTHEAST

OHIO. [Kathryn L. Holmes](mailto:holmes.203@osu.edu)<sup>1</sup>, P. Charles Goebel<sup>1</sup>, Lance R. Williams<sup>1</sup>, and Marie Schrecengost<sup>2</sup>.  
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Riparian areas and aquatic ecosystems are connected and influence each other through a variety of processes including organic matter inputs and flooding. Studies that examine how multiple taxa are structured by their habitat and interact with each other are lacking for many types of stream systems, especially primary headwaters. As headwater stream restoration increases, increased scientific data is needed to guide sustainable restoration. During the summer of 2004, we conducted a study to examine how environmental factors influence macroinvertebrate assemblages in headwater streams of northeast Ohio across watershed positions. Upstream and downstream 100 m reaches of four perennial headwater streams (1<sup>st</sup> - 3<sup>rd</sup> order) in Cuyahoga Valley National Park were sampled for riparian forest habitat, in-stream habitat, macroinvertebrates, fishes, and salamanders. Macroinvertebrate functional feeding guild proportions differed between watershed positions with upstream reaches having higher mean percent shredder and predator species while downstream reaches had higher mean percent collector species. Canonical correspondence analysis indicates 87% of the variation in macroinvertebrate feeding guilds can be explained by riparian and in-stream habitat, and predators. Partial canonical correspondence analysis reveals in-stream habitat explains 37.2 % of the explained variation in macroinvertebrate feeding guilds, while riparian habitat explains 27.9%, and predators explain 23.3 %. Canonical correspondence analysis indicates 76% of the variation in macroinvertebrate families can be explained by the interaction between in-stream habitat and predators explains 25.5 % of the explained variation in macroinvertebrate families.

KEY WORDS: macroinvertebrates, aquatic, riparian, headwaters

(57) SENSITIVITY-VALUE ANALYSIS: A SPATIALLY LINKED MULTI-CRITERIA DECISION SUPPORT TOOL FOR PROTECTED AREA PLANNING AND ZONATION APPLIED IN SOUTH AFRICAN NATIONAL PARKS. [Stephen Holness](mailto:sholness@nmmu.ac.za). Park Planning and Development, South African National Parks. [sholness@nmmu.ac.za](mailto:sholness@nmmu.ac.za).

This paper presents an overview of the spatially linked multi-criteria decision support tool known as sensitivity-value analysis which has been developed within South African National Parks. The tool integrates best available biodiversity and landscape knowledge into the spatial planning process to inform appropriate use zonation, appropriate infrastructure and commercial development, spatially specific management activities and SANParks' response to external pressures.

The analysis integrates the principles of systematic conservation planning with traditional site analysis. The suitability of an area for a particular type of development is seen to be a combination of its value (i.e. contribution to the national conservation estate) and its sensitivity (i.e. the vulnerability to a variety of disturbances). The paper outlines how we have attempted to combine biodiversity value, biodiversity sensitivity, aesthetics and heritage attributes at a landscape scale into an analysis useful for park management. The process is designed to ensure that decisions are taken on a consensus basis within a defensible, transparent and biodiversity driven framework.

This paper outlines "sensitivity-analysis" and how it was applied both within national parks and adjacent areas as a decision support tool in a workshop environment. The paper analyses the successes and failures of this approach, both in terms of making well informed decisions in complicated environments, as well as in developing a culture of collaborative decision making between science and management.

KEY WORDS: multi-criteria decision making, zoning, protected environments, conservation planning

(27) SEEDBANK COMPARISON OF PAIRED MATURE AND IMMATURE MIXED-MESOPHYTIC FORESTS IN WEST VIRGINIA. Cynthia D. Huebner. Northern Research Station, USDA Forest Service. [chuebner@fs.fed.us](mailto:chuebner@fs.fed.us).

Forest seedbanks can serve as a history of past colonization events and a predictor of future competing vegetation for regenerating forests. Three paired mature (80+ year old) and immature (15-year old clear cuts) stands sharing the same topography were sampled intensively for their seedbanks. Each of the six stands contained 10 nested plots. Ten 6-cm deep x 10-cm wide and 20 15-cm deep x 3-cm wide soil samples were taken from each plot. The seedbanks of the immature stands were significantly more rich, diverse, and less even than those of the mature stands. Species not found in the mature stand seedbanks but were found in those of the immature stands, included *Agrostis perennans*, *Carex communis*, *Carex swanii*, *Danthonia compressa*, *Glyceria* sp., and *Panicum clandestinum*. These are weedier species that respond well to disturbances. *Galium triflorum*, *Laportea canadensis*, *Leersia virginica*, *Solidago caesia*, *Stellaria pubera*, and *Tiarella cordifolia* are more common to mature forest understories, but were also only found in the immature stand seedbanks, but much less abundantly. Three of the latter (*G. triflorum*, *L. canadensis*, and *T. cordifolia*) were only found in the deeper samples. Deeper samples were not significantly more or less diverse than the shallower samples, but they were significantly less rich and more even. These results suggest that regeneration by seed may increase for some species common to mature forests in response to canopy removal. The patchy species distribution in immature stands may provide safe sites away from the more competitive weedy species.

KEY WORDS: soil seedbank, disturbance, diversity, species composition

(130) NATURAL SELECTION FOR RESISTANCE OF *IMPATIENS CAPENSIS* TO THE COMPETITIVE EFFECTS OF THE INVASIVE PLANT *ALLIARIA PETIOLATA*. Sophie L. Hurley and Kendra A. Cipollini. Wilmington College. [shurley@wilmington.edu](mailto:shurley@wilmington.edu); [kendra\\_cipollini@wilmington.edu](mailto:kendra_cipollini@wilmington.edu).

*Alliaria petiolata*, or garlic mustard, is an invasive species having negative impacts on forested natural areas in North America. Garlic mustard has been shown to reduce growth and genetic diversity in *Impatiens capensis*, jewelweed or touch-me-not. It is possible that surviving native plants are adapting to the presence of garlic mustard and becoming better competitors against it. In a greenhouse setting, we investigated the selection for garlic mustard-resistant phenotypes of *Impatiens capensis*. *Impatiens* individuals from areas without garlic mustard (naïve populations) and from areas with garlic mustard (experienced populations) were collected from the field. Experienced and naïve *Impatiens capensis* were then grown in the presence and absence of garlic mustard. We measured height, leaf number, flower number, and dry biomass of *Impatiens capensis*. We analyzed the data using 2-way Analysis of Variance (ANOVA) with the two factors of garlic mustard presence and experience level of the population. Garlic mustard negatively impacted *Impatiens capensis* across both levels of experience. We found that there was variation in the response to garlic mustard between plants from experienced and naïve populations. This evidence suggests selection for increased competitiveness against garlic mustard in *Impatiens capensis*. Possible long-term coexistence between the two species may be possible due to this selection.

KEY WORDS: competition, evolution, jewelweed, garlic mustard, touch-me-not

(109) MANAGING THE REGENERATION LAYER IN MIXED-OAK FORESTS THROUGH FIRE AND FIRE SURROGATE TREATMENTS: RESULTS AFTER 8-YEARS. [Todd F. Hutchinson](mailto:thutchinson@fs.fed.us)<sup>1</sup>, [Matthew A. Albrecht](mailto:albrecht@fs.fed.us)<sup>2</sup>, [Brian C. McCarthy](mailto:mccarthy@ohio.edu)<sup>2</sup>, [Joanne Rebbeck](mailto:jrebbeck@fs.fed.us)<sup>1</sup>, and [Robert P. Long](mailto:rplong@fs.fed.us)<sup>1</sup>. <sup>1</sup>U.S. Forest Service, Northern Research Station. [thutchinson@fs.fed.us](mailto:thutchinson@fs.fed.us); [jrebbeck@fs.fed.us](mailto:jrebbeck@fs.fed.us); [rplong@fs.fed.us](mailto:rplong@fs.fed.us). <sup>2</sup>Ohio University, Department of Environmental and Plant Biology. [ma323500@ohio.edu](mailto:ma323500@ohio.edu); [mccarthy@ohio.edu](mailto:mccarthy@ohio.edu).

Mesophytic tree species are abundant in the understory and midstory of many oak-dominated forests, thus threatening oak's long-term sustainability. Prescribed fire, and to a lesser degree mechanical thinning, are now being applied by managers in an attempt to sustain oak forest. However, there have been few long-term studies of these treatments on hardwood regeneration. The Fire and Fire Surrogates Study was established in 2000 at three sites in southern Ohio. All sites had an oak-dominated canopy but other species dominated the midstory and understory. Treatments were an untreated control, burn, thin, and thin+burn. The midstory thinning was conducted after the 2000 growing season and prescribed fires in early-spring 2001. In the first 5-years, *Acer rubrum* maintained dominance in the regeneration layer by resprouting; *Nyssa sylvatica* and *Sassafras albidum* also persisted via sprouting. Treatments stimulated germination of *Liriodendron tulipifera*, which then advanced into the sapling layer on thinned units. Without large acorn crops, oak (*Quercus*) seedling densities either remained static (red oaks) or declined (white oaks) on all treatments and controls. In 2005, we applied a second series of prescribed fires. The management objective of these fires was to reduce the abundance and size of competitors relative to that of oaks. Also, substantial acorn crops occurred in fall 2005 (white oaks) and to a lesser degree in fall 2006 (red oaks). We are re-sampling all sites in summer 2007 to determine the longer-term implications of fire and fire surrogate treatments on the structure and composition of tree regeneration.

KEY WORDS: ecosystem restoration, fire, regeneration, Appalachian oak forests

(83) THE VASCULAR FLORA OF VINTON FURNACE EXPERIMENTAL FOREST: HOW MUCH HAS IT CHANGED IN 50 YEARS? [Todd F. Hutchinson](mailto:thutchinson@fs.fed.us)<sup>1</sup>, [Richard L. Gardner](mailto:gardner@dnr.state.oh.us)<sup>2</sup>, and [Marilyn Ort](mailto:marilynortt@charter.net)<sup>3</sup>. <sup>1</sup>U.S. Forest Service, Northern Research Station. [thutchinson@fs.fed.us](mailto:thutchinson@fs.fed.us). <sup>2</sup>Ohio Department of Natural Resources, Division of Natural Areas and Preserves. [Rick.Garner@dnr.state.oh.us](mailto:rick.garner@dnr.state.oh.us). <sup>3</sup>Ohio Department of Natural Resources, Division of Natural Areas and Preserves, retired. [marilynortt@charter.net](mailto:marilynortt@charter.net).

The 1200 acre Vinton Furnace Experimental Forest (VFEF) is located in the unglaciated Allegheny Plateau region of southern Ohio. Silvicultural research has been conducted at the forest since 1952. In the mid-1800s, the entire area was clearcut to fuel the charcoal iron industry. As forests were regenerating, wildfires occurred frequently (ca. 1875-1935). The dissected landscape is dominated by upland oak forests; other communities include mixed mesophytic forests (primarily in ravines), and both open and forested floodplains. In a published flora, Gustav Hall (1958) recorded the habitat and relative abundance of 536 species in 95 families, of which 91% were native. Since Hall's survey, silvicultural studies (harvesting and more recently prescribed burning) coupled with the expansion of forest roads have created a variety of disturbed habitats in an otherwise maturing forest landscape. In 2001, we began a new systematic collection and inventory of the flora. We have documented 615 species in 98 families, of which 88% are native and 12 are state-listed as rare. By comparing our survey with Hall's, several trends emerge: 1) a decrease in the abundance of some open woodland/edge species (e.g., *Tephrosia virginiana*, *Clitoria mariana*, *Ceanothus americanus*), 2) a decrease in the abundance of native pines (*Pinus echinata*, *P. rigida*) and some ericaceous species (e.g., *Kalmia latifolia*, *Gaylussacia baccata*, *Epigaea repens*), and 3) several new invasive species are becoming relatively abundant, most notably *Microstegium vimineum*, which has spread rapidly along roads and streams.

KEY WORDS: Vinton Furnace Experimental Forest, flora inventory, change over time

(110) LANDSCAPE HETEROGENEITY AND THE INFLUENCE OF PRESCRIBED FIRE AND THINNING ON HARDWOOD REGENERATION IN SOUTHERN OHIO. [Louis R. Iverson](mailto:liverson@fs.fed.us), Todd F. Hutchinson, Anantha Prasad, and Matthew Peters. U.S. Forest Service, Northern Research Station. [liverson@fs.fed.us](mailto:liverson@fs.fed.us); [thutchinson@fs.fed.us](mailto:thutchinson@fs.fed.us); [aprasad@fs.fed.us](mailto:aprasad@fs.fed.us); [scalandfire\\_mpeters@yahoo.com](mailto:scalandfire_mpeters@yahoo.com).

Regeneration of oak (*Quercus*) is constrained by closed-canopy conditions and the increasing abundances of shade-tolerant species (e.g., *Acer* spp.). In hilly terrain, the abundance and size of oak regeneration typically decreases from dry sites with low overstory density to moist sites with greater canopy cover. The Fire and Fire Surrogates Study (FFS) is quantifying the effects of restoration treatments on oak forest ecosystems. As a component of the FFS study, our objective here was to quantify and map the distribution of hardwood regeneration across the landscape on two untreated control units and two units that were thinned in 2000 and burned in 2001 and 2005. For each of the four 20 ha treatment units, a 50 m grid was established. Potential soil moisture was modeled and mapped by applying the Integrated Moisture Index (IMI). We sampled tree regeneration by size classes on all gridpoints in 2000 (before treatments) and in 2001, 2004, and 2006. Canopy cover was estimated at each gridpoint in 2000, 2001, and 2006 with hemispherical photography. The integrated moisture index was related to several variables: grid points modeled as dry had more light penetration and more abundant oak regeneration. Large oak seedlings (50-140 cm height) increased in abundance on the thin+burn treatments, and analyses showed that reduced canopy cover was the key variable. Several other species (*Acer rubrum*, *Liriodendron tulipifera*, *Sassafras albidum*) also exhibited marked variations in regeneration success, depending on the severity of the fire treatments and the moisture regime across the landscape.

KEY WORDS: landscape heterogeneity, fire, forest restoration, regeneration

(28) SEED BANK PLANTS MAY REQUIRE MYCORRHIZAS TO GERMINATE AFTER SEVERE DAMAGE BY HURRICANES. [Demetra Kandalepas](mailto:dkanda1@lsu.edu) and William J. Platt. Department of Biological Sciences, Louisiana State University. [dkanda1@lsu.edu](mailto:dkanda1@lsu.edu); [btplat@lsu.edu](mailto:btplat@lsu.edu).

Wetlands in southeast Louisiana frequently experience salinity and flood stress. We hypothesize that mycorrhizal fungi may play a role in allowing some species to re-establish after long periods of saltwater pulses and flooding caused by storms. We surveyed marsh plant roots from the Manchac land bridge, between Lakes Pontchartrain and Maurepas in southeast Louisiana, to assess the extent of Arbuscular-Mycorrhizal infection in this wetland, pre- and post-hurricanes Katrina and Rita. A transect was established along an elevational gradient and roots were collected for 14 common species before Hurricane Katrina as well as in the fall following the 2005 hurricanes. We performed subsequent surveys in summer and fall 2006. Eight plant species collected prior to the hurricanes were not present immediately after. Nine of the 14 original species had re-established by summer 2006. Roots were stained and examined for mycorrhizal infection. Infection decreased in 100% of the species that were able to re-colonize after the hurricane. Infection in three of these species, however, either stayed the same or increased dramatically by May 2006. These preliminary results suggest that (1) most marsh plants have moderate to low mycorrhizal associations under low to moderate stress, (2) under severe stress, mycorrhizal associations may become too expensive to maintain or when nutrients are added to the system, mycorrhizae may become redundant to plants, (3) some marsh species, for example those that re-establish from seed, may require mycorrhizas to germinate after severe disturbance causes mortality or extensive damage. These hypotheses will be tested with future research.

KEY WORDS: hurricanes, mycorrhizae, seed bank, marsh, Louisiana

(13) *CEUTORHYNCHUS* SPP. AS POTENTIAL BIOLOGICAL CONTROL AGENTS OF GARLIC MUSTARD IN THE UNITED STATES. [Elizabeth J. Katovich](mailto:Elizabeth.J.Katovich@umn.edu)<sup>1</sup>, Esther Gerber<sup>2</sup>, Hariet L. Hinz<sup>2</sup>, Luke C. Skinner<sup>3</sup>, Bernd Blossey<sup>4</sup>, David W. Ragsdale<sup>5</sup>, and Roger L. Becker<sup>1</sup>. <sup>1</sup>Department of Agronomy and Plant Genetics, University of Minnesota. [katov002@umn.edu](mailto:katov002@umn.edu); [becke003@umn.edu](mailto:becke003@umn.edu). <sup>2</sup> CABI Bioscience, Switzerland. [e.gerber@cabi.org](mailto:e.gerber@cabi.org); [h.hinz@cabi.org](mailto:h.hinz@cabi.org). <sup>3</sup>Minnesota Department of Natural Resources. [luke.skinner@dnr.state.mn.us](mailto:luke.skinner@dnr.state.mn.us). <sup>4</sup>Cornell University, [bb22@cornell.edu](mailto:bb22@cornell.edu). <sup>5</sup>Department of Entomology, University of Minnesota. [ragsd001@umn.edu](mailto:ragsd001@umn.edu).

Garlic mustard (*Alliaria petiolata*) is a herbaceous biennial plant that has invaded hardwood forests throughout the northeastern and northcentral United States. Collaborative efforts between CABI Bioscience, Cornell University, the University of Minnesota, and the Minnesota Department of Natural Resources has identified four species of weevils, *Ceutorhynchus scrobicollis*, *Ceutorhynchus alliariae*, *Ceutorhynchus roberti*, and *Ceutorhynchus constrictus* as potential candidates for garlic mustard biological control in the United States. Host range testing of potential biocontrol insects on non-target plant species is required prior to request Federal (USDA-APHIS) approval for field release in the United States. Current testing by CABI Bioscience in Delemont, Switzerland and under quarantine at the University of Minnesota shows *Ceutorhynchus scrobicollis* will likely be the first introduction if approved for release. The Technical Advisory Group request will be submitted in 2007 with anticipated field release in 2008.

KEY WORDS: garlic mustard, *Alliaria petiolata*, biological control

(16) COOPERATIVE WEED MANAGEMENT AREAS: EXPANDING THE SUCCESSFUL WESTERN CONCEPT TO THE EASTERN STATES. [S. Kelly Kearns](mailto:S.Kelly.Kearns@wisconsin.gov). Endangered Resources Program, Wisconsin Department of Natural Resources. [Kelly.kearns@wisconsin.gov](mailto:Kelly.kearns@wisconsin.gov).

Over the last few decades the western states have developed a very successful approach to allowing private and public land managers to work across jurisdictional boundaries to manage invasive plants. These organizations have also created a political constituency that has resulted in regular funding becoming available for invasive plant management in many of the states. Until recently, Cooperative Weed Management Areas (CWMA's) were almost unknown in the eastern states. There are major differences between eastern and western states in habitat types, land ownership, agricultural practices and economics that have made weed management a more entrenched part of the economy in the west. Eastern states need to approach invasive plant coordination somewhat differently, adapting the lessons learned from western experiences to the eastern landscape and the multitude of invasive plants we must deal with. This talk will compare and contrast CWMA efforts across the country, providing some guidance on how to make it work in the east. Some examples of eastern CWMA's and their successful projects should inspire participants to organize weed management efforts in their local area.

KEY WORDS: CWMA, eastern states, Cooperative Weed Management Areas

(22) ELEVEN-YEAR STUDY OF BLANDING'S TURTLE IN CREATED WETLAND AND UPLAND HABITATS. [Erik Kiviat](mailto:Erik.Kiviat@bard.edu), Tanessa Hartwig, and Gretchen Stevens. Hudsonia Ltd. [kiviat@bard.edu](mailto:kiviat@bard.edu); [hartwig@bard.edu](mailto:hartwig@bard.edu); [stevens@bard.edu](mailto:stevens@bard.edu).

We created wetland and nesting habitats for Blanding's turtle to mitigate loss to development in Dutchess County, New York. Organic soil sods with intact herbaceous and woody vegetation were translocated from the destroyed wetland to the created wetlands to accelerate development of deep-flooding, shrubby, organic-soil pools. A 1300 m fence with one-way turtle "gates" was installed on two sides of the site to reduce turtle movements onto roads. We have collected 11 years of data on turtle activities, hydrology, soils, and vegetation. Adult Blanding's turtles immediately and consistently used created wetlands in nesting season and summer, and nested on created upland habitats. Created wetlands provided basking and foraging habitat in the spring

and early summer, and rehydrating areas for nesting females. There has been relatively little use of created wetlands in early spring and late summer and hardly any in winter. Adult use of created and nearby "natural" wetlands has been closely related to water levels. The turtles selected microhabitats with greater cover of buttonbush, submergent vegetation, or neuston (floating duckweeds, liverworts, and detritus). Nesting females selected soils with more gravel in wetter spring seasons and more sand in drier seasons, but hatchling productivity and length/weight ratio did not differ among years. Created nesting habitats gradually became overgrown with herbaceous weeds causing nesting females to circumambulate the fence. Females selectively nested in small, experimentally-tilled plots in preference to mowed or hand-weeded plots. Blanding's turtles need a complex of interconnected habitats which can be created only at considerable expense.

KEY WORDS: Blanding's turtle, created wetland, soils, vegetation

(71) CONTROLLED BOW HUNTING VS. PROFESSIONAL SHARP-SHOOTING AS DEER MANAGEMENT TOOLS IN AN URBAN SETTING. John Klein, Hamilton County Park District. Cincinnati, Ohio. [jklein@greatparks.org](mailto:jklein@greatparks.org).

Can archery replace sharp-shooting as an effective deer management tool? Experiences of managing a controlled bow hunt program for two seasons and a professional sharp-shooting program for five seasons in the Hamilton County Park District will be shared. After safely removing 2,343 deer, what have we learned? When and where each method has been the most effective will be discussed as well as inventive ways to improve efficiency, program costs and challenges that influence success.

KEY WORDS: Hamilton County Parks, bowhunting, costs

(93) HOW FAST WILL THE TREES DIE? A TRANSITION MATRIX MODEL OF ASH (*FRAXINUS* SPP.) DECLINE IN FOREST STANDS INFESTED BY EMERALD ASH BORER (*AGRILUS PLANIPENNIS*). Kathleen S. Knight<sup>1</sup>, Robert P. Long<sup>1</sup>, Annemarie Smith<sup>2</sup>, Kamal Gandhi<sup>3</sup>, and Daniel A. Herms<sup>4</sup>. <sup>1</sup>USDA Forest Service Northern Research Station. [Laca0023@umn.edu](mailto:Laca0023@umn.edu); [rlong@fs.fed.us](mailto:rlong@fs.fed.us). <sup>2</sup>Ohio Department of Natural Resources. [Annemarie.smith@dnr.state.oh.us](mailto:Annemarie.smith@dnr.state.oh.us). <sup>3</sup>Department of Entomology, The Ohio State University. [gandhi.42@osu.edu](mailto:gandhi.42@osu.edu). <sup>4</sup>Department of Entomology, The Ohio State University. [herms.2@osu.edu](mailto:herms.2@osu.edu).

Emerald ash borer (EAB, *Agilus planipennis*) is a serious threat to all North American ash (*Fraxinus*) species and has already killed more than 20 million ash trees in Michigan, Ohio, and Indiana. We recorded ash tree health and other forest stand characteristics in 124 monitoring plots in 38 EAB-infested forest stands in Michigan and Ohio from 2004 to 2007. Ash was a dominant component of these stands, with green ash, white ash, and black ash represented at different sites. >2000 ash trees were monitored at infested sites. These data were used to create a transition matrix model of ash decline, where each transition probability was a function of stand characteristics such as ash density, ash species, stand size, and average ash health. A subset of the data from stands in Michigan, not used to create the model, was used to test the accuracy of the model in predicting ash decline. The model showed the potential for rapid decline of ash trees in infested stands with mortality increasing by 20-40% per year. Some of the stands in Michigan, which have been infested for at least 4 years, have reached 100% mortality while some of the Ohio stands, which have probably not been infested for more than three years, currently have <20% mortality. The transition matrix model can be used to predict the trajectory of ash decline in infested stands, which may be useful for planning management and restoration activities.

KEY WORDS: emerald ash borer, *Agilus planipennis*, ash decline, model

(15) REDUCING SEED OUTPUT AND SEED VIABILITY OF CULTIVARS: HOW MUCH IS ENOUGH TO CREATE A PLANT THAT WILL NOT BE INVASIVE? [Tiffany Knight](#)<sup>1</sup>, Jean Burns<sup>1</sup>, Kayri Havens<sup>2</sup>, Pati Vitt<sup>2</sup>, Ed Guerrant<sup>3</sup>. <sup>1</sup>Department of Biology, Washington University, St. Louis, MO. <sup>2</sup>Chicago Botanic Garden, Glencoe, IL. <sup>3</sup>Berry Botanic Garden, Portland, OR.

The majority of ornamental landscape plants used in U.S. are not native to North America and some of these plants have escaped from cultivation; a small fraction of those that escape have become natural area invaders. Once a species is identified as invasive, it is crucial to prevent the sale and spread of that species. However, this may be objectionable to nurseries and to the public if the species is desirable in landscaping and highly profitable economically. Recently, horticulturalists have recognized that cultivars of a single species can differ dramatically in their total seed output and/or in their seed viability. The critical conservation question is: are these less fecund cultivars still an invasion threat or are they safe to use in landscaping? We evaluate how much seed output/seed viability would need to be reduced in order to significantly reduce the population growth rate of an invasive species. We have found 14 invasive plant species in which a demographic model has been constructed to project population growth rate. We simulate how decreasing seed output and seed viability might affect population growth rate. Overall, decreasing seed output has dramatic effects on the population growth rate of short-lived species, but much less of an effect on the population growth rate of long-lived shrubs and trees. Creating cultivars with significantly lower seed output or seed viability may successfully prevent the invasiveness of short-lived herbs. However, for most perennials, complete sterility will be necessary to ensure that the species will not become invasive.

KEY WORDS: landscape plants, invasive, seed viability, seed output, cultivar

(119) CONSERVATION EDUCATION AND NATURE PRESERVES: A MENTOR MARSH EXAMPLE. Barb Kooser. Cleveland Museum of Natural History. [bkooser@cmnh.org](mailto:bkooser@cmnh.org).

Outdoor education is invaluable for helping students connect to natural areas, but also presents a challenge to the educator. In designing an education program on a natural area, one must first understand the curriculum standards and goals and the need of the students and teacher, and then examine how features of the natural area can be studied to meet those needs. In most cases interesting programs can be devised that meld these two pieces. Simple equipment can be used and students can collect meaningful data for the preserve manager. Our experience dictates that field experiences should be more than a simple walk in the woods, and ought to include the identifying a research question, collecting and analyzing data. This last step is critical in providing a meaningful experience to students. The educational programs at the Mentor Marsh Nature Center will be used as examples.

KEY WORDS: conservation, education, Mentor Marsh

(18) MOVEMENT AND ECOLOGY OF THE EASTERN MASSASAUGA RATTLESNAKE (*SISTRURUS CATENATUS CATENATUS*). [Matthew J. Kowalski](#)<sup>1</sup>, Benjamin C. Jellen<sup>2</sup>, Ryan E. Miller<sup>1</sup>. <sup>1</sup>Western Pennsylvania Conservancy. [mkowalski@paconserve.org](mailto:mkowalski@paconserve.org); [remiller@paconserve.org](mailto:remiller@paconserve.org). <sup>2</sup>Department of Biology, Saint Louis University. [benjellen@illinoisalumni.org](mailto:benjellen@illinoisalumni.org).

In order to create effective conservation and management plans for a species, a thorough understanding of its ecology is necessary. In March 2005, the Western Pennsylvania Conservancy began a two-year radio telemetry project to determine the spatial, thermal and reproductive ecologies of the Eastern Massasauga in Pennsylvania. Work was funded by the Wild Resources Conservation Fund and the State Wildlife Grants program of the USFWS. 42

Massasaugas were tracked for at least one field season in 2005 and 2006. A total of 257 Massasaugas were encountered 2524 times over the two-year study.

The study provided valuable information about Massasauga ecology in Pennsylvania including morphology, age and size of reproductive individuals, mating systems, litter size and female investment in reproduction, and inter-birth interval. We determined the activity and hibernation periods of the species, as well as determining when they mate and give birth. Because radio-transmitters were temperature sensitive, we know what their body temperatures were during the active season and winter months. We also found out common causes for their mortality. We compared the home ranges and movement patterns of Massasaugas from different populations, sexes and reproductive states. We also tracked newborn individuals to determine what they do and how they grow during their first two months of life. Seasonal movements were identified and a plethora of information was gathered about the specific habitat of these elusive snakes. Pennsylvania can now create a Massasauga conservation plan that considers the life history and habitat needs of the species on a local scale.

KEY WORDS: massasauga, spatial, thermal, reproduction, habitat

(35) PROTECTING FRESHWATER MUSSELS IN NORTHEASTERN OHIO BY THE CREATION OF NATURAL AREAS. Robert A. Krebs<sup>1</sup>, James K. Bissell<sup>2</sup>, and David J. Kriska<sup>2</sup>, <sup>1</sup>Department of Biological, Geological and Environmental Sciences, Cleveland State University. [r.krebs@csuohio.edu](mailto:r.krebs@csuohio.edu). <sup>2</sup>Cleveland Museum of Natural History.

Freshwater mussels, family Unionidae, have greatly declined in numbers within Ohio, as they have throughout most of the United States. Loss of habitat from agriculture and urbanization, and the presence of invasive freshwater species like Dreissenid mussels represent the greatest present threats to extant populations. In Northeast Ohio alone, four species are listed as endangered, four as threatened, and eight as species of concern based on declining abundance. Here we describe the known distributions of these species, and map their positions with respect to preserved natural areas, which include state and federal preserves as well as numerous private holdings and conservation easements. Of particular note are member of the Grand River Partnership, composed of the Cleveland Museum of Natural History, The Nature Conservancy, Ohio Division of Wildlife, Ohio Division of Natural Areas and Preserves, Grand River Partners, Inc, Ashtabula Soil and Water, Lake Soil and Water, Lake Metroparks, the Geauga Park District and the Boy Scouts of America, who combine to protected significant riparian corridors adjacent to mussel bed along the Grand River, home to 27 unionid species. This habitat is home to the snuffbox, the black sandshell and five other rare species. However, as many of these natural areas have been only recently established or expanded, their impact on the fauna is difficult to assess. Much of the habitat for mussels remains unprotected, making improvements at a watershed level critical. Furthermore, any impacts to headwaters can jeopardize downstream populations regardless of the protections put in place locally.

KEY WORDS: conservation, mussels, endangered species, Unionidae, watershed

(141) GENETIC VARIATION AND DIFFERENTIATION AMONG POPULATIONS OF GREEN ASH TREES (*FRAXINUS PENNSYLVANICA*) FROM NINE METROPARKS FROM TOLEDO, OHIO. Michelle Lang<sup>1</sup>, Constance E. Hausman<sup>1</sup>, John F. Jaeger<sup>2</sup>, and Oscar J. Rocha<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, Kent State University. [meeshlang@gmail.com](mailto:meeshlang@gmail.com) ; [chausman@kent.edu](mailto:chausman@kent.edu) ; [ojrocha@kent.edu](mailto:ojrocha@kent.edu). <sup>2</sup>Toledo Area Metroparks, Toledo Ohio. [john.jaeger@metroparkstoledo.com](mailto:john.jaeger@metroparkstoledo.com).

*Ex situ* conservation strategies, in the form of seed banks, green houses, or botanical gardens, can be used to successfully preserve the genetic diversity of populations in danger. Understanding the genetic structure of such populations is vital to maximizing the amount of

genetic diversity obtained and preserved for such strategies. In this study, we attempt a preliminary description of the genetic structure of seven populations of Green Ash (*Fraxinus pennsylvanica*) located in the Toledo Metroparks area. The importance of this study lies in the recent introduction of the invasive emerald ash borer beetle (EAB), a severe threat to the native Ash tree populations.

Fifteen trees were collected from each Metropark and analyzed using five microsatellite marker loci. Genetic diversity was quantified by calculating the number of alleles per locus ( $A$ ), the effective number of alleles per locus ( $A_E$ ), observed heterozygosity ( $H_O$ ), and Nei's expected heterozygosity ( $H_E$ ) (Nei 1973), for each locus and averaged over all loci.

Our data revealed that the effective number of alleles varies between populations and observed heterozygosity was lower than expected according to Hardy-Weinberg equilibrium. Results also show a strong correlation between geographic distance and genetic distance. The results from this study will help to implement a sampling procedure for the establishment of a seed bank collection for the adequate preservation of the genetic diversity of ash trees from the area. The quality of this sampling will be important to the future of Green Ash in Ohio.

KEY WORDS: emerald ash borer, *ex situ* conservation, *Fraxinus pennsylvanica*, genetic variation

(102) MANAGING DEER FOR BIODIVERSITY: A STUDY ON THE IMPACTS OF OVERABUNDANT DEER ON SMALL MAMMAL AND INVERTEBRATE COMMUNITIES. Sara A. Laux and Michael Walton. Department of Biological, Geological and Environmental Sciences, Cleveland State University. [s.a.laux@csuohio.edu](mailto:s.a.laux@csuohio.edu); [b.walton@csuohio.edu](mailto:b.walton@csuohio.edu).

Wildlife managers are currently faced with the challenge of managing overabundant deer herds to minimize conflict between deer and natural resources. Unfortunately, the impact of deer overabundance on entire forest ecosystems is unknown. One important but poorly understood deer-induced change to forest ecosystems is the initiation of a cascade of effects on small mammal and invertebrate abundance and diversity. Evaluating these interactions is important because these communities represent a large component of biodiversity within forest ecosystems, whose activities drive essential ecological processes such as decomposition and nutrient cycling. To assess the impacts of deer on forest microhabitat and the small mammal and invertebrate communities inhabiting the forest floor, seven field sites were chosen in areas of varying deer density within the Cleveland Metroparks and Cuyahoga Valley National Park. A suite of habitat variables were measured and small mammal and invertebrate populations were assessed using several trapping methods. Preliminary results revealed that deer are having a negative impact on forest floor microhabitat. High density or high impact sites exhibited decreased leaf litter depth (GLM;  $p = 0.01$ ), drier soils (GLM;  $p = 0.04$ ), and fewer seedlings (GLM;  $p \leq 0.001$ ) and saplings (GLM;  $p = 0.03$ ) compared to areas of lower deer impact. Small mammal diversity and abundance was significantly lower at high impact relative to low impact sites. Following a similar trend, the mesofaunal invertebrate community exhibited higher abundance in low impact sites compared to areas of high impact. However, non-native invasive species were more abundant in areas of high deer impact.

KEY WORDS: deer, small mammals, invertebrates, overabundance, microhabitat

(20) THE WEST VIRGINIA WHITE BUTTERFLY (*PIERIS VIRGINIENSIS*) IN NORTHEAST OHIO. Cathi A. Lehn<sup>1</sup>, Andrew S. Fennell<sup>1</sup>, and Judy Semroc<sup>2</sup>. <sup>1</sup>Biodiversity Alliance. [clehn@cbgarden.org](mailto:clehn@cbgarden.org); [asf@clevelandmetroparks.com](mailto:asf@clevelandmetroparks.com). <sup>2</sup>Cleveland Museum of Natural History. [rainefox@sbcglobal.net](mailto:rainefox@sbcglobal.net).

The West Virginia White butterfly (*Pieris virginiensis*) is a small white Pierid butterfly distributed in wooded habitats across the northeastern United States. The host plants for this butterfly include a variety of species in the Mustard family, especially toothwort (*Cardamine* spp.). This univoltine butterfly's short flight season occurs in April and May. Although the butterfly is not listed as threatened or endangered it has many threats against it, including forest fragmentation, invasive plants, parasites, pesticide use, and deer. Garlic mustard (*Alliaria petiolata*) has been identified as a major threat to the butterfly.

The Lake Erie Allegheny Partnership, a consortium of thirty conservation organizations located in northeastern Ohio, has identified this butterfly as a species of concern. Specific locality information for the West Virginia White has been only marginally documented through the monitoring program of the Ohio Lepidopterists Society where very few occurrences of the butterfly are entered into the database. The 2007 flight season was used to gather locality information for the butterfly utilizing a survey form distributed to naturalists throughout the region. The results from the 2007 flight season will be discussed and compared to previous records for the butterfly. Also included in the survey is locality information for toothwort and garlic mustard. A regional strategy for the 2008 flight season for the butterfly will be presented.

KEY WORDS: butterfly, garlic mustard, partnerships, citizen science

(115) WEST CREEK RESTORATION: PIECING TOGETHER AN URBAN NATURAL AREA.  
Mark Link, Northeast Ohio Regional Sewer District, Cleveland, Ohio. [linkm@neorsd.org](mailto:linkm@neorsd.org)

The West Creek Watershed is an urbanized watershed encompassing 14 square miles in Cuyahoga County. West Creek drains portions of the communities of Parma, Seven Hills, Brooklyn Heights, and Independence before flowing into the Cuyahoga River at River Mile 11.3. The land use throughout the watershed is primarily residential (55%), but a large portion remains forested (23%). The downstream portions of West Creek have been heavily impacted by industrial and commercial development, and encroachment from transportation infrastructure. The ecological backbone of the West Creek Watershed is the 350-acre West Creek Reservation, the Cleveland Metroparks' newest reservation. Since 1997 the grassroots based West Creek Preservation Committee (WCPC) has worked diligently to preserve the land that makes up the Reservation, and other ecological features in the watershed, in an effort to develop a 500-acre natural park. In 2004 the Northeast Ohio Regional Sewer District (NEORS) teamed up with WCPC to develop a plan for restoring degraded sections of West Creek. One mile of urban stream is the focus of this restoration with the idea that these restored areas will be the catalyst for connecting the Reservation to additional trails and riparian buffers, connecting the pieces that form a unique urban natural area. The purpose of presenting this case study at the Natural Areas Association Conference is to demonstrate how natural stream channel design techniques are being implemented in Northeast Ohio and to begin a dialogue on how we might improve our efforts in establishing connected natural areas in our urban environment.

KEY WORDS: urban stream restoration, urban watershed, Cleveland Metroparks, stream channel design, Northeast Ohio Regional Sewer District (NEORS)

(100) COLLABORATION BETWEEN THE CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION (CTUIR) AND WASHINGTON STATE UNIVERSITY (WSU) FOR NATIVE PLANT AND ECOLOGICAL RESTORATION RESEARCH. [Steven O. Link](mailto:Steven.O.Link@wsu.edu)<sup>1</sup>, [Rico Cruz](mailto:RicoCruz@ctuir.com)<sup>2</sup>, [Sally Simmons](mailto:Sally.Simmons@ctuir.com)<sup>1</sup>, and [Barbara Harper](mailto:Barbara.Harper@ctuir.com)<sup>2</sup>. <sup>1</sup>School of Biological Sciences, Washington State University Tri-Cities, [slink@wsu.edu](mailto:slink@wsu.edu); [ssimmons@tricity.wsu.edu](mailto:ssimmons@tricity.wsu.edu). <sup>2</sup>Department of Science and Engineering, CTUIR, [RicoCruz@ctuir.com](mailto:RicoCruz@ctuir.com); [bharper@ctuir.com](mailto:bharper@ctuir.com).

Washington State University and the Confederated Tribes of the Umatilla Indian Reservation are teaming to create a new capacity to address some of society's most difficult natural resource

problems in natural areas. These problems include maintaining native plant diversity and combating invasive species. We present recent successes in the development of our Cooperative/Institute for Native Plant Propagation and Research for Ecological Restoration, Native Plant Research, Awareness, Propagation, Uses, and Preservation. We are building greenhouses to propagate native species for restoration and research. Our Cooperative will include members of society with an interest in native plant research including land management agencies, Native American groups, commercial greenhouses, nurseries, and ecological restoration contractors among others. We discuss our experiences forming the Cooperative, our local experience collecting native plant seed, and growing them in greenhouses. We discuss efforts to control invasive species by planting competitive native species.

KEY WORDS: partnership, native flora, ecological restoration, invasive species, propagation

(49) PLETHODONTID SALAMANDERS IN FOREST-FLOOR FOOD WEBS: DO SALAMANDER FECES SUBSIDIZE BOTTOM-UP PATHWAYS? [Owen Lockhart](#) and B. Michael Walton. Department of Biological, Geological, and Environmental Sciences, Cleveland State University. [owen.lockhart@gmail.com](mailto:owen.lockhart@gmail.com).

Plethodontid salamanders are generalist predators hypothesized to be important regulators of ground arthropod communities in the temperate forests of North America. However, recent studies indicate that plethodontids can have complex effects in forest-floor food webs, including direct and indirect effects that vary spatially, seasonally, and with abiotic factors. In addition, plethodontids may also affect food webs via "bottom-up" pathways, e.g., subsidizing fungi-to-microbivore pathways with salamander feces. We conducted a laboratory microcosm experiment to test for bottom-up effects of the red-backed salamander, *Plethodon cinereus*, on invertebrate community structure and decomposition rates over time. Changes in invertebrate density and leaf-litter decomposition rates were compared among treatments that included no salamander/no feces controls, salamander feces alone (bottom-up effects), and salamanders (top-down and bottom-up effects). Our results suggest that bottom-up effects are partly responsible for salamander effects on invertebrate community structure. The usefulness of microcosm experiments as a tool to unravel the complexities of the terrestrial detrital food web will also be discussed.

KEY WORDS: food web, community ecology, arthropod, salamander, *Plethodon cinereus*

(107) WHITE OAK DECLINE AND MORTALITY IN SOUTHERN OHIO. [Robert P. Long](#)<sup>1</sup>, [Yilmaz Balci](#)<sup>2</sup>, [William MacDonald](#)<sup>2</sup>, and [Daniel Balsler](#)<sup>3</sup>. <sup>1</sup>USDA Forest Service, Northern Research Station. [rlong@fs.fed.us](mailto:rlong@fs.fed.us). <sup>2</sup>Division of Plant and Soil Sciences, West Virginia University. [yilmaz.balci@wvu.edu](mailto:yilmaz.balci@wvu.edu); [macd@wvu.edu](mailto:macd@wvu.edu). <sup>3</sup>Division of Forestry, Ohio Department of Natural Resources. [dan.balsler@dnr.state.oh.us](mailto:dan.balsler@dnr.state.oh.us).

Extensive white oak (WO = *Quercus alba* L.) decline and mortality has been observed since 2002 in oak forests across southern Ohio, and was especially severe at the 3800 ha. Scioto Trail State Forest in southern Ross County where this study was conducted. A series of stressors including drought (1998 and 1999) and insect defoliators (forest tent caterpillar, *Malacosoma disstria*; common oak moth, *Phoberia atomaris*; half-wing geometer, *Phigalia titea*) adversely affected tree health through 2004. WO crown dieback and mortality initially developed as single trees or small groups of trees at lower slope and bottomland sites. In a pilot study, *Phytophthora cinnamomi* was recovered from soils sampled near two sites with declining trees in 2004 and 2005. In 2006, plots (n=103) associated with declining (n= 59) or non-declining (n=44) WO were established to sample soils and roots and evaluate these for the presence of *Phytophthora spp.* *Phytophthora spp.*, usually *P. cinnamomi*, were found in 69% (41 trees) of soils from declining trees and 57% (25 trees) of soils from non-declining trees. Excess moisture in 2003 and 2004 may have favored development of *Phytophthora spp.* or other root pathogens. WO mortality was assessed in seven

severely affected bottomland stands using 3-7 800 m<sup>2</sup> plots at each site (total n=34). Standing dead WO basal area ranged from 9 to 18 m<sup>2</sup> ha<sup>-1</sup>, or 57% to 84% of total WO basal area. Sapling regeneration (stems <10 cm dbh) is dominated by maples (*Acer saccharum*, *A. rubrum*) that are poised to fill canopy gaps.

KEY WORDS: white oak decline, Ohio, stressors, *Phytophthora*

(97) THE WEST CREEK STEWARDSHIP CENTER: A PARTNERSHIP TO ENHANCE AND PROTECT THE HEALTH OF OUR URBAN WATERSHEDS. Linda Mack<sup>1</sup>, Patricia Stevens<sup>2</sup>.  
<sup>1</sup>Northeast Ohio Regional Sewer District. [mackl@neorsd.org](mailto:mackl@neorsd.org) <sup>2</sup>Cleveland Metroparks.  
[pjs@clevelandmetroparks.com](http://pjs@clevelandmetroparks.com).

A dynamic and unique partnership has been formed around the belief that healthy natural systems benefit the social, economic, and environmental fabric of our urban communities. How this occurred is an example of urban evolution. Our urban culture has stressed area natural resources to the brink of dysfunction. Our urban park systems recognize that they are being compromised by conditions beyond their park boundaries. These urban stresses have deleterious effects on streams throughout area watersheds; we acknowledge the ecological disruptions, but it's the infrastructure deterioration, increased flood events and impact on in property values that has communities interested in watershed improvements.

Building on our region's appreciation of the recreational and aesthetic benefits of natural areas (parks, greenways and trails) and the emerging realization of the economic benefits (stormwater management, flood protection, and the relationship to property values), a partnership (Cleveland Metroparks, Northeast Ohio Regional Sewer District and the West Creek Preservation Committee) is developing a Watershed Stewardship Center that will focus on how to best manage healthy natural systems and integrate them back into our urban neighborhoods. The vision of this partnership is to create a regional center of excellence for the ecological improvement of urban watershed at the Cleveland Metropark's West Creek Reservation.

KEY WORDS: natural systems, partnership, urban, watershed

(13) SLOWING RELICT SAND DUNE SUCCESSION TO CONSERVE NATIVE PLANTS AND INSECTS USING TWO VEGETATION MANAGEMENT TECHNIQUES IN NORTHEASTERN OHIO. Patricia MacKeigan. Cleveland State University and Cleveland Museum of Natural History.  
[tmackeig@cmnh.org](mailto:tmackeig@cmnh.org) .

The North Kingsville Sand Barrens is an oak savanna habitat with scattered sand barren areas throughout. Actions are underway to restore and maintain the sand barren habitat with the goal of promoting native species diversity for the preservation of the flora and fauna that thrive in this environment. Current management practices were examined to determine if they slow natural ecosystem succession to maintain this endangered habitat. Control of two weedy plant species occurring at NKSB, quackgrass and dewberry, is hypothesized to promote a more diverse habitat with more rare and /or desirable plant species. Disking and herbicide application were used in replicate plots approximately 2000 m<sup>2</sup>, while control plots remained unmanipulated. Plant species composition and density were recorded for both target nuisance species and desirable taxa. Species richness, Shannon's diversity and Jaccard's Coefficient of Similarity were calculated for all three treatments. Plant species richness and diversity results were compared using repeated measures ANOVA. Disked plots showed higher plant diversity than control plots with herbicide treated plots having the lowest diversity. Herbicide was found to be more effective overall at reducing mean percent aerial coverage of both target species while disking was found to better promote plant diversity and rare plant species.

KEY WORDS: oak savanna, sand barren, rare species management, ecosystem restoration

(50) DECADAL SCALE IMPACTS OF C4 GRASS REINTRODUCTIONS ON SOIL CARBON AND NITROGEN CYCLING IN SUCCESSIONAL ECOSYSTEMS. Wendy M. Mahaney<sup>1</sup>, Kurt A. Smemo<sup>2</sup>, and Katherine L. Gross<sup>1</sup>. <sup>1</sup>Department of Plant Biology, Michigan State University, [mahaneyw@kbs.msu.edu](mailto:mahaneyw@kbs.msu.edu); [kgross@kbs.msu.edu](mailto:kgross@kbs.msu.edu). <sup>2</sup>Case Western Reserve University and The Holden Arboretum, [ksmemo@holdenarb.org](mailto:ksmemo@holdenarb.org).

While research on plant species' influence on ecosystem properties and processes has focused on exotic species introductions, little is known about how reintroductions of extirpated species may impact degraded systems. This study examines how the reintroduction of C4 grasses into former prairie-savanna systems influences soil carbon (C) and nitrogen (N) cycling relative to unmanaged successional communities dominated by exotic C3 grasses at two sites in southwestern Michigan, USA. The C4 and C3 species examined in this study differ significantly in many traits that are expected to influence soil C and N cycling. C4 species had significantly greater root and shoot biomass, and more recalcitrant tissue compared to the dominant C3 species. Soils under C4 species had significantly lower inorganic N levels, and lower *in situ* net N mineralization rates than soils under C3 species. Plant shoot decomposition rates were significantly slower for C4 species compared to C3 species. We also found limited evidence for increasing soil C pools under C4 species after 12 years. Overall, our results show that species that possess different plant traits relevant to soil C and N cycling can indeed alter soil processes on a decadal timescale. Given the increasing extent of human impacts on plant communities, expanding our understanding of how plant species changes are likely to impact ecosystem properties is imperative to evaluating which species shifts have the most potential to alter ecosystem function.

KEY WORDS: prairie restoration, old-fields, warm season grasses, C4 species, *Andropogon gerardii*, *Bromus inermis*

(7) EVOLUTION IN A FOREST PEST CONTROL PROGRAM: THE EMERALD ASH BORER. Victor C. Mastro, USDA, APHIS, PPQ. [vic.mastro@aphis.usda.gov](mailto:vic.mastro@aphis.usda.gov)

The emerald ash borer, *Agrilus planipennis* (Coleoptera:Buprestidae), was found infesting ash trees (*Fraxinus*) in and around Detroit, Michigan in 2002. Since then it has been discovered in Indiana, Ohio, Maryland, Illinois, Pennsylvania, and in Ontario, Canada. Its rapid spread can be directly related to its artificial movement in nursery stock and in wood and wood products including logs, firewood, green lumber, wood chips, etc. It is also a good flyer and has a strong propensity to disperse. All species of native ash that exist within the currently infested area, including white, green, blue, black and pumpkin ash are susceptible to attack. Adult females lay their eggs in ash bark crevices where the newly hatching larvae mine down into the cambium of the tree. There, they complete their larval development forming serpentine feeding galleries. Once the number of larvae feeding on the cambium is great enough so that most of the tree's vascular system is compromised, tree mortality occurs. This usually happens three to four years after the initial attack. When the emerald ash borer (EAB) was discovered, there was little knowledge about its biology, behavior, host range, or pest potential in North America. Since then, an aggressive research program, designed to support an evolving operational program, has made great progress in a number of areas. These areas of work include the development of survey and control techniques (chemical, mechanical, biological, and silvicultural). Other studies are focusing on the insect's mating behavior, host finding behavior, and host tree susceptibility/resistance to EAB attack. As findings from these and other studies become available, the program is adopting and modifying operations to increase efficiency and, more effectively, meet program goals. The program initially moved from visual inspection of trees for survey to the systematic and targeted establishment of detection tree (ash trees girdled and sometimes fitted with sticky bands). Now, with the development of new technology, it is moving toward an attractant baited trap. Control measures are also evolving and will continue to improve.

Changes in tactics and overall strategy occurs in almost every pest control program but, in the emerald ash borer program, we have been forced to develop knowledge and technology at an almost record speed and the program will evolve at a similar speed.

KEY WORDS: emerald ash borer, ash, *Agrilus planipennis*, pest control

(11) DEVELOP AN EARLY DETECTION PROGRAM FOR INVASIVE PLANTS IN YOUR AREA: LINKING LOCAL EFFORTS TO THE U.S. NATIONAL EARLY DETECTION AND RAPID RESPONSE SYSTEM FOR INVASIVE PLANTS. Debbie Maurer. Lake County Forest Preserve District, Illinois. [dmaurer@co.lake.il.us](mailto:dmaurer@co.lake.il.us).

Early detection and rapid response (EDRR) is a strategy to help prevent the establishment and spread of new exotic invasive plants (and other organisms) into uninvaded areas. This approach has been implemented at multiple geographic scales within the U.S, from local parks to the multi-state regions. The US Geological Survey and others are working to develop and implement a coordinated National Early Detection and Rapid Response System that links EDRR efforts by the federal government to local grassroots efforts. The National EDRR System identifies the roles of national, regional, state, and local partners that can help facilitate effective EDRR programs nationwide. Learn about the elements necessary for the implementation of a successful EDRR program in your area through ongoing efforts in the Midwest and other regions. A key element of early detection and rapid response programs at any scale is strong partnerships.

KEY WORDS: early detection, rapid response, invasive plants, partnerships

(9) WILD PIGS: AMERICA'S MOST SUCCESSFUL LARGE INVASIVE SPECIES? John J. Mayer. Savannah River National Laboratory. [john.mayer@srs.gov](mailto:john.mayer@srs.gov).

Recently, wild pig populations in the United States have increased significantly in both distribution and numbers. This increase is largely man-made because of the interest by the sport-hunting public in this animal as a big game resource. These illegal introductions have resulted in the establishment of this destructive invasive species in numerous areas that heretofore had no wild pigs. The key to the wild pig's success as a large invasive species is that it is both a habitat generalist and an opportunistic omnivore, and can reproduce at explosive rates. The primary impacts that these animals have on natural areas include rooting damage, tree damage, competition with native game species, depredation of native flora, and predation of native fauna. Other less frequent impacts are also realized. The only effective control techniques currently available include lethal removal and fencing. The uses of immunocontraception and toxins have potential for future application. A substantial percent of the animals in an area must be removed annually to keep a population stable to decreasing in size. Successful management strategies in "pig free" areas center on early detection and rapid response to new releases of these animals. Once established in an area, the management of a wild pig population requires directed ongoing control efforts. Future projections for this invasive species in the United States include a continuation of both range expansion and population size increase.

KEY WORDS: feral hog, *Sus scrofa*, wild pig

(42) FIRE HISTORY AND FOREST REGENERATION IN CENTRAL APPALACHIAN MIXED OAK FORESTS. Brian C. McCarthy, Department of Environmental and Plant Biology, Ohio University. [mccarthy@ohio.edu](mailto:mccarthy@ohio.edu).

Fire is believed to be an historical part of the central Appalachian oak forest ecosystem. Prior to European colonization, Native Americans regularly set fires and natural fires occasionally started by lightning strike. Fire regimes were drastically altered following Anglo settlement, and all but

removed from the ecosystem in the late 1920s. Prescribed fire is being increasingly used as a management tool in mixed oak forests of the central Appalachians, along with other silvicultural practices, to promote certain structural and compositional conditions. However, there remain quite a few unknowns. The frequency, intensity, and timing of historical fires remain somewhat sketchy. We have conducted several studies in the region that examine the historical fire regime; however, a dearth of data on pre-settlement fire continues to hamper a full understanding of the pre-settlement fire regime. We have also studied fuel dynamics, hardwood regeneration, and seed production under experimental conditions of prescribed fire and thinning. The dynamics of fuel in this region is largely driven by climate and decomposition rather than fuel accumulation, thus fire management to control fuel loads is moot. Prescribed fire and thinning do not have strong impacts on forest composition after five years; however, they are effective at altering forest structure. The incongruence between the forest overstory and understory suggests that historical disturbance regimes were different than we seem to be able to recreate today. Long-term studies will hopefully shed light on some of these processes and additional studies are needed to better understand the ecology and management of these forests.

KEY WORDS: disturbance, fire, forest, oak

(136) A NEW BIOLOGICAL CONTROL PROGRAM FOR COMMON TANSY (*TANACETUM VULGARE*) IN CANADA AND THE UNITED STATES. Alec McClay<sup>1</sup>, [Monika Chandler](mailto:Monika.Chandler@state.mn.us)<sup>2</sup>, André Gassmann<sup>3</sup>, Gitta Grosskopf<sup>3</sup>, Urs Schaffner<sup>3</sup>, John Gaskin<sup>4</sup>. <sup>1</sup>McClay Ecoscience [biocontrol@mcclay-ecoscience.com](mailto:biocontrol@mcclay-ecoscience.com), <sup>2</sup>Minnesota Dept of Agriculture [Monika.Chandler@state.mn.us](mailto:Monika.Chandler@state.mn.us), <sup>3</sup>CABI Switzerland Centre [u.schaffner@cabi.org](mailto:u.schaffner@cabi.org), [a.gassmann@cabi.org](mailto:a.gassmann@cabi.org); [g.grosskopf@cabi.org](mailto:g.grosskopf@cabi.org), <sup>4</sup>USDA-ARS Northern Plains Agricultural Research Laboratory [JGaskin@sidney.ars.usda.gov](mailto:JGaskin@sidney.ars.usda.gov)

Common tansy (*Tanacetum vulgare* L., Asteraceae) is an invasive perennial herb native to Europe and Asia. It was introduced into North America as a culinary and medicinal herb, but escaped from cultivation over 200 years ago. A biological control program for common tansy is being funded and coordinated by a Canadian-US consortium led by the Alberta Invasive Plants Council (AIPC) and the Minnesota Department of Agriculture. McClay Ecoscience is coordinating the project in Canada on behalf of the AIPC. CABI Switzerland Centre is identifying and testing potential agents for efficacy and host specificity. Phylogenetic studies in support of test plant list development are being carried out at the USDA-ARS Northern Plains Agricultural Research Laboratory. Field and literature surveys were carried out in Europe in the mid 1990s and updated with a more recent literature survey covering Russia. Based on this research, 11 potential biological control agents were identified.

KEY WORDS: common tansy, *Tanacetum vulgare*, biological control

(126) RESTORATION BY MECHANICAL RECONSTRUCTION OF THE TREE STRATUM: DOES IT MATTER WHICH TREES ARE CUT? [Jessica R. Miesel](mailto:miesel.1@osu.edu)<sup>1</sup>, Ralph E.J. Boerner<sup>1</sup>, and Carl N. Skinner<sup>2</sup>. <sup>1</sup>Department of Evolution, Ecology, and Organismal Biology, The Ohio State University. [miesel.1@osu.edu](mailto:miesel.1@osu.edu); [boerner.1@osu.edu](mailto:boerner.1@osu.edu). <sup>2</sup>Pacific Southwest Research Station, U.S. Forest Service. [cskinner@fs.fed.us](mailto:cskinner@fs.fed.us).

The montane ecosystems of the Cascade Range of northern California and southern Oregon have been subjected to repeated manipulation and active fire suppression for over a century. This has resulted in changes in community structure that contribute to increased wildfire hazard and severity. Ecosystem restoration via reduction of stand density for wildfire hazard mitigation has received substantial attention in recent years; however, many ecological questions remain unanswered. This study compares belowground impacts of a canopy and subcanopy thinning treatment that reestablishes ponderosa pine (*Pinus ponderosa* P. & C. Lawson) dominance (hereafter Pine-preference) with a treatment that accelerates growth of large trees regardless of

species (hereafter Size-preference). We evaluated forest floor and soil chemical and microbial parameters in six experimental thinning treatment units of 40 ha each in the Klamath National Forest of northern California. Both treatments were thinned to achieve similar tree spacing and stand density. Total soil C, soil N, and phenol oxidase (fungal) activity were significantly greater in the Size-preference treatment, whereas soil C:N ratio, total inorganic N in the soil solution, and soil pH were all significantly greater in the Pine-preference treatment. Acid phosphatase activity, an index of overall microbial activity, and chitinase activity did not vary significantly between treatments. These data indicate that these two thinning strategies produce differences in the soil environment that have the potential to affect the growth rates of the trees that remain as well as growth and survivorship of newly-established seedlings. This study contributes to an ecological understanding of the belowground effects of wildfire mitigation and forest restoration strategies in mixed-conifer forests of northern California.

KEY WORDS: restoration, mechanical reconstruction, soil, California, Oregon.

(122) AVIAN COMMUNITY RESPONSES TO PRESCRIBED FIRE AND TREE HARVEST FOR ECOLOGICAL RESTORATION. Donald B. Miles. Department of Biological Sciences, Ohio University.

Historical management practices in U. S. forests emphasized fire suppression. The reduced frequency of fires has resulted in excessive accumulation of fuel, high tree densities and potentially altered tree species composition. Resource managers now employ a variety of treatments to diminish fuel loads to avoid severe and catastrophic fires. Alternative treatments include prescribed burns and thinning, both of which are assumed to mimic natural ecosystem function. Despite the presumed benefit of such treatment to forest ecosystem health, including wildlife populations, little data are available about avian responses to alternative silviculture treatments. I present the results of a study using a BACI design to ascertain the temporal response of avian community composition to fire and fire surrogate treatments. The null hypothesis was no treatment specific differences in community diversity. The effects of disturbance on avian community composition in each of four treatment types was estimated using point count census methods. Treatment plots were control, burn, thin, and burn + thin and treatments were replicated in three different sites. Avian censuses were conducted a year before the treatments to obtain baseline data, and four years post-treatment. The results represent acute and relatively long-term responses to forest disturbance. I used ordination methods to show the temporal change in community composition among treatments. Species composition was significantly different among treatments, with highest diversity occurring in thin and burn plots. However, there was considerable heterogeneity in the data. After five years the treatment plots did not converge on the community metrics characteristic of pre-disturbance. We document how species composition and niche organization shifts in response to the thin and burn treatments.

KEY WORDS: avian community structure, prescribed fire, ecosystem restoration

(137) EFFECTIVENESS OF EZ-JECT LANCE FOR CONTROL OF BUSH HONEYSUCKLE AND OTHER WOODY SPECIES IN ILLINOIS WOODLAND COMMUNITIES. Stephen Miller and Philip Ochs. Southern Illinois University, Department of Biology, [ssmiller@siu.edu](mailto:ssmiller@siu.edu); [phil\\_ochs67@hotmail.com](mailto:phil_ochs67@hotmail.com).

The purpose of our research was to test the effectiveness of the EZ-Ject herbicide lance injector at controlling bush honeysuckle (*Lonicera maackii*), sugar maple (*Acer saccharum*), and willow (*Salix nigra*). These species are considered to be invasive to natural communities in southeast Illinois.

Plot data was taken for the three invasive forest species; two plots sampled for bush honeysuckle, two for sugar maple, and one for willows. The plots were located on Illinois

Department of Natural Resources properties in southeast Illinois within a thirty-mile sample area. Each plot was constructed in the same manner; a suitable site with a relatively even distribution of the target species was located. Either 100 or 200 individual plants were marked and treated with the EZ-Ject herbicide lance according to label directions. Control areas were directly adjacent to the treated portions and were all within an area of relatively even distribution of the target species. We used marking systems which allowed us to track plant injury both on the plot as a whole and as individual size classes. The plots were checked multiple times from June through July. Death and injury progression was measured on a simple scale of 0-5.

Our results showed the progression of injury and death over the research period. Our results indicate that the herbicide lance can be significantly effective at controlling bush honeysuckle and willows, while sugar maples seem to be more resilient. This straightforward experiment provides some insight into the viability of this control method.

KEY WORDS:

(5) WHICH CAME FIRST – THE WORM OR THE WEED? [Victoria Nuzzo](#)<sup>1</sup>, [John Maerz](#)<sup>2</sup>, and [Bernd Blossey](#)<sup>3</sup>. <sup>1</sup>Natural Area Consultants, Richford, NY. [vnuzzo@earthlink.net](mailto:vnuzzo@earthlink.net). <sup>2</sup> Warnell School of Forestry and Natural Resources, The University of Georgia. [jmaerz@warnell.uga.edu](mailto:jmaerz@warnell.uga.edu). <sup>3</sup>Department of Natural Resources, Cornell University. [bb22@cornell.edu](mailto:bb22@cornell.edu).

Plant invasions are frequently cited as a leading cause of plant community change. To assess impact of plant invasions on forest understory vegetation, we monitored native vegetation, leaf litter volume and earthworm biomass in 15 forests in the presence/absence of three nonnative plants (*Microstegium vimineum*, *Alliaria petiolata*, *Berberis thunbergii*). PCA revealed that nonnative plant cover was positively associated with nonnative earthworm biomass, and with graminoid cover. Earthworm biomass was negatively associated with litter volume, and with cover of native herbaceous and woody plants. These worm-associated responses were detected at all sites despite differences in worm species and abundance, native plant community composition, invasive plant species identity, and geographic region. These patterns suggest that earthworm invasion, rather than nonnative plant invasion, is the driving force behind changes in forest plant communities, including native plant species decline and nonnative species invasion.

KEY WORDS: nonnative plant, nonnative earthworm, species decline, species invasion

(96) PRESERVING NATURE USING THE HUMAN DIMENSION AS SOCIAL CAPITAL. [Dana M. Oleskiewicz](#). The Ohio State University Extension Center at Wooster. [oleskiewicz.1@osu.edu](mailto:oleskiewicz.1@osu.edu).

Protecting natural resources requires a change in land use activities, which often requires a change in how management decisions are made and also who is involved in the decision-making. Communities are seeking to increase their capacity to effectively use stakeholder participation in resource management decisions. The goal is to increase the social capital of a community so that nature in a fragmented landscape can be protected using collaborative partnerships.

Ohio State University (OSU) Extension has been very successful at linking people with the knowledge, skills and materials they need to manage natural resources in their community. Our program is based on the assumption that every community has the capacity to address even complex management issues. Rather than focusing on what is missing, our educational programs seek to discover what is working and identify methods to enhance and expand planning efforts.

Local stakeholders and effective partnerships are viewed as critical for achieving environmental goals. This presentation will focus on aspects of community capacity building and will outline how to structure for resource management so that collaborative decision-making and a high level of stakeholder participation is utilized.

The presentation will also address the implications of viewing natural resource management issues as social issues and not merely as technical problems to be fixed by convincing landowners to adopt certain best management practices. Participants will have an opportunity to learn the benefits and challenges of taking a social change approach to natural resource management.

KEY WORDS: community-based resource management, collaborative partnerships, capacity building, social capital

(68) WHITE-TAILED DEER MANAGEMENT: AN ADMINISTRATIVE POINT OF VIEW. [Lawrence Peck](#), Columbus and Franklin County Metro Parks, Columbus Ohio. [peck@metroparks.net](mailto:peck@metroparks.net).

The Columbus and Franklin County Metro Parks owns and manages over 23,000 acres of natural area parks in the central Ohio region. The Metro Parks serve over 6 million visitors annually, operates and maintains 17 park areas, approximately 35 miles of multi-use bike trails employs a staff of 250 employees and manages a total budget of 23 million dollars. Metro Parks began implementing its white-tailed deer management strategy in 1991, which has consisted of relocation, culling with sharpshooters, experimental birth control, and various forms of public hunting. To date, this program has involved nearly 7,000 deer. Approximately 33,000 man hours of effort have been expended at an estimated "cost" of \$789,000. As an annual management program the discussion will focus on deer management from a top-level administrative point of view and the impact of the deer management program on the Metro Parks workforce, budget and operations. Discussion will also focus on the value-driven aspect of the program vs. the scientific perspectives and also the involvement of the community media.

KEY WORDS: metro parks, culling, birth-control, public hunting, costs

(25) STRUCTURE AND DYNAMICS OF OAK-DOMINATED FORESTS IN THE BLUEGRASS REGION OF SOUTHERN OHIO. [Sheryl M. Petersen](#) and Paul B. Drewa. Department of Biology, Case Western Reserve University. [sheryl.petersen@case.edu](mailto:sheryl.petersen@case.edu); [paul.drewa@case.edu](mailto:paul.drewa@case.edu).

In oak-dominated forests throughout the eastern US, encroachment of shade tolerant hardwoods is impeding oak regeneration. The extent to which such dynamics are occurring in oak-dominated forests in the Bluegrass Region of southern Ohio is uncertain because they have not been characterized extensively. We quantitatively examined the structure and dynamics of woody plant populations in three, second-growth forest fragments, each with unique soil characteristics and underlying bedrock. At each site, we evaluated (1) densities of woody groundcover species in 30, circular (19.6-m<sup>2</sup>) plots, and (2) diameter at breast height (dbh) of woody stems  $\geq 2$  cm dbh in 16, square (0.0625-ha) plots. Nonmetric multidimensional scaling revealed three assemblages of woody groundcover species that corresponded to our three sites. However, all sites shared a preponderance of shade tolerant hardwoods, especially maples (*Acer rubrum*, *Acer saccharum*), and low abundances of oaks. Size structures of shade tolerant species were unevenly distributed and exhibited continuous recruitment; stem densities in the lowest size-class (2-5 cm dbh) ranged from 60-330 stems/ha. By contrast, size structures of oaks (e.g., *Quercus alba*, *Quercus rubra*) were evenly distributed and had almost no stems <15 cm dbh, suggesting negligible recruitment. While the variation in species composition among sites is likely influenced by edaphic characteristics, we postulate that the prevalence of shade tolerant vegetation and lack of oak recruitment are a result of decades of fire suppression. Restoration and subsequent management of these forests will not be successful unless fires that mimic the natural fire regime are re-introduced.

KEY WORDS: fire suppression, forest dynamics, oak-dominated forest, size distributions, southern Ohio

(93) MANAGING PARK HABITATS FOR VIABLE SONGBIRD POPULATIONS. [Lisa J. Petit<sup>1</sup>](#), Daniel R. Petit<sup>2</sup>, and Michael Johnson<sup>3</sup>. <sup>1</sup>National Park Service, Cuyahoga Valley National Park. [Lisa\\_Petit@nps.gov](mailto:Lisa_Petit@nps.gov). <sup>2</sup>Cleveland Metroparks. [drp@clevelandmetroparks.com](mailto:drp@clevelandmetroparks.com). <sup>3</sup>Metro Parks, Serving Summit County. [mjohnson@summitmetroparks.org](mailto:mjohnson@summitmetroparks.org).

With support from the NPS Park Flight Migratory Bird Program international partnership, we developed models of habitat quality for songbird populations in mature forest and early successional habitats across the 33,000 acres of Cuyahoga Valley National Park in northeastern Ohio. Birds were surveyed using point counts at 335 randomly selected points in forest and in 124 grassland and old field sites. Presence/absence of bird species was related to vegetation features and landscape measures using logistic regression to create species-specific models of habitat quality. Statistically significant models were created for a number of common species and species of regional or national conservation priority. Models based on specific vegetation and landscape features generally had 70-85% accuracy in predicting the presence/absence of a given bird species. These models have wide-ranging application as decision support for park managers in assessing current and desired future conditions for terrestrial habitats and bird populations.

KEY WORDS: habitat quality, songbirds, assessment, decision support

(39) NATIVE OHIO BROOK TROUT AND THE DEVELOPMENT OF A REGIONAL HABITAT SUITABILITY INDEX. [Paul J. Pira<sup>1</sup>](#), Andrew Burt<sup>2</sup>, Paul Anderson<sup>3</sup>. <sup>1</sup>Geauga Park District [ppira@geaugaparkdistrict.org](mailto:ppira@geaugaparkdistrict.org). <sup>2</sup>Ohio Department of Natural Resources, Division of Wildlife. <sup>3</sup>Ohio Environmental Protection Agency, Division of Surface Water

The headwaters of the Chagrin River, Geauga County, are perhaps one of the most ecologically important lotic systems within Northeast Ohio because of the occurrence of "State Threatened" brook trout (*Salvelinus fontinalis*). This highly disjunct population is the only location; within the entire State, where these unique fish were found to be naturally occurring. Cooperative efforts amongst the Ohio Division Wildlife, Ohio EPA., Geauga Park District, conservation organizations, and local academic institutions have protected these fish and reintroduced them into 14 suitable streams. In the summer and fall of 2005 a collaborative effort to develop a regional Habitat Suitability Index (HSI) which characterized and delineated suitable brook trout habitat was undertaken. Both physical and chemical variables were measured for 16 streams where sustainable brook trout populations were considered "successful", "failed", or "variable". Results indicate that multiple physical and water quality factors determined the success of the introductions. The most important physical factors for "successful" brook trout streams were mean redd substrate size, available spawning area, and percent cobble. The most important chemical variables were water temperature, dissolved oxygen, percent saturation of dissolved oxygen, calcium, and hardness. These factors alone may be able to predict the potential success or failure of any future brook trout introduction sites in Northeast Ohio.

KEY WORDS: habitat fragmentation, stream assessment, cold-water habitat, brook trout.

(2) WILL GLOBAL CLIMATE CHANGE BREAK THE RESTORATION CAMEL'S BACK? THOUGHTS FROM THE HURRICANE-RAVAGED THIRD COAST. William J. Platt, Department of Biological Sciences, Louisiana State University, [btplat@lsu.edu](mailto:btplat@lsu.edu).

Restoration goals often involve reassembly of ecological systems historically present on a site. Trajectories of change towards historical states are produced based on reintroduction of components present historically and reinstatement of ecological processes that operated historically. Global climate change and associated effects are producing conditions never experienced by historical ecological systems. Establishing restoration targets based on historical

conditions is unlikely to result in accomplishment of goals. New scientific concepts for restoration of natural areas are needed that focus on goals other than the recreation of ecological systems present historically.

Restoration alternatives could be based on changes expected in intact, non-degraded ecological systems as a result of global climate change. Restoration-induced shifts in degraded ecological systems might be possible that produce convergence with changing, non-degraded ecological systems. Such trajectories of change might maintain some semblance of historical conditions and conserve biodiversity.

This quasi-historical approach may not be possible in areas where global climate change currently is producing rapid changes in ecological systems. Human actions along the Gulf of Mexico coastline, and especially in the Mississippi Delta, coupled with sea level rise and augmented disturbances such as hurricanes, have produced loss of ecological systems over an area larger than Delaware and extensive degradation on a supra-regional scale. Restoration on an equally large-scale is needed that involves assembly of ecological systems that cope with rapid and sudden environmental change. Concepts that guide restoration in such habitats are likely to be based on assembly of functional ecosystems, irrespective of history, biodiversity, and exotic species.

KEY WORDS: historical and functional restoration goals, global climate change, disturbances, directions of change

(32) SEARCH AND DESTROY: INITIATION OF A MANAGEMENT PLAN FOR *AILANTHUS ALTISSIMA* AT THE EDGE OF APPLALACHIA PRESERVE. Sarah K. Polgar and [Kim J. Brown](mailto:Kim.J.Brown@ohio.edu). Department of Environmental and Plant Biology, Ohio University. [sp210505@ohio.edu](mailto:sp210505@ohio.edu); [kim.brown@ohio.edu](mailto:kim.brown@ohio.edu).

The Edge of Appalachia (EOA) Nature Conservancy preserve in Adams County, Ohio hosts many rare and sensitive species, which are potentially threatened by invasive organisms including *Ailanthus altissima* (AIAL). This preserve consists of fragmented parcels interspersed with private property and roads. Edge environments and dispersal corridors have facilitated the spread of AIAL. Our objectives were to map populations of AIAL, to characterize abiotic factors correlated with these, and to draft a management plan for the control of AIAL at EOA. This plan will be used by the Nature Conservancy to prioritize management areas based upon the threat level of AIAL spreading into sensitive plant communities. In 2006, 12 10x50m AIAL plots and 12 control plots were sampled. The control plots allowed us to test for differences in abiotic factors between invaded and non-invaded sites. In the AIAL plots, AIAL trees, saplings, and seedlings were enumerated. Locations of all plots were mapped and data were synthesized in a GIS database. Minor differences were found between AIAL and control plots for soil moisture (35.8% and 29.6%), soil pH (6.5 and 6.2), and soil texture. Stand structure was similar between AIAL and control plots: vegetation area index (3.8 vs. 3.2), percent canopy openness (9% vs. 10%) and the percentage of understory cover (40.3% vs. 42.2%). These results strongly suggest that AIAL has the potential to invade most areas of EOA. Results will be presented with the site history of each area and the proximity to roads and land features. Information from soils maps, geology maps and aerial photographs will also be analyzed for possible effects on AIAL populations. This project will lead to a better understanding of AIAL and will facilitate solutions to protect rare species and community types at the EOA preserve.

KEY WORDS: Ailanthus, invasive, management, GIS, inventory

PATTERNS OF PLANT RICHNESS IN FRAGMENTS OF GLOBALLY IMPERILED PINE ROCKLAND FOREST: EFFECTS OF RECENT FIRE FREQUENCY AND FRAGMENT SIZE. [Jennifer Possley](#)<sup>1</sup>, [Steven W. Woodmansee](#)<sup>2</sup>, [Joyce Maschinski](#)<sup>1</sup>. <sup>1</sup>Center for Tropical Plant

Conservation, Fairchild Tropical Botanic Garden, [jpossley@fairchildgarden.org](mailto:jpossley@fairchildgarden.org). <sup>2</sup>The Institute for Regional Conservation.

Maintaining native plant diversity through fire management is challenging in the wildland-urban interface. In subtropical South Florida, fragments of fire dependent, globally imperiled pine rockland forest are scattered throughout urban areas. To determine the effects of recent fire frequency, major soil type and fragment size on species composition, we measured understory vascular plant presence and cover in 162 plots distributed among 16 pine rockland fragments in 1995 and 2003. Fragments received either 0, 1 or >1 burn(s) between sampling periods. Native plant richness was very high overall. Major soil type, which is associated with latitude and elevation, strongly influenced the assemblage of species present at a given site. Native species cover was significantly different across different burn categories; Stepwise Discriminant Analysis correctly classified 72% and 82% of plots in the Biscayne region and Redland region respectively depending upon recent fire frequency. Fragment size was positively associated with species richness, but small fragments had great variance in the total number of native species they supported with some having nearly as many species as the largest fragment. Examining trends over time for rare native and invasive non-native species exposed the spread of the invasive grass *Rhynchelytrum repens* (Willd.) C.E. Hubb. and showed no major decreases in rare species. In general, this study provided encouraging results for managers of small urban forest fragments, showing that they can maintain high levels of native plant diversity, even when fire occurs infrequently or does not occur for a decade.

KEY WORDS: pine rockland, species richness, forest fragments, fire, wildland-urban interface

(108) TREE SEEDLING AND SAPLING SURVIVORSHIP AFTER TWO DORMANT SPRING BURNS IN SOUTHERN OHIO MIXED OAK FORESTS FROM 2000 to 2006. [Joanne Rebbeck](#), Robert P. Long, and Daniel A. Yaussy. U.S. Forest Service, Northern Research Station. [jrebbeck@fs.fed.us](mailto:jrebbeck@fs.fed.us); [rlong@fs.fed.us](mailto:rlong@fs.fed.us); [dyaussy@fs.fed.us](mailto:dyaussy@fs.fed.us).

We are investigating the effectiveness of prescribed fires in combination with thinning as a management tool to improve oak regeneration in Ohio's mixed-oak forests. Three study areas were established in 2000 as part of the National Fire and Fire Surrogates Study. Each site was divided into: control (C), burn only (B), thin only (T), or thin + burn (TB) treatment units. Stands were thinned from below in late 2000-2001 and burned during the spring dormant seasons of 2001 and 2005. Annually, we have monitored tagged seedlings (oak and hickory) and saplings (maple, blackgum, and hickory). After the first burn, seedling survival (including resprouted stems) was lowest in TB (66%), followed by 78% in T, 84% in B, and 93% in unthinned control (C) units. Sapling survival was lowest in TB (84%), but survival in other treatments varied (94-100%). After the second burn (2005), seedling and sapling survival was lower in all treatments compared to the first burn. This was related to higher maximum temperatures (499°C) recorded during the 2005 prescribed fires, compared with 2001 (389°C). In the TB units, 59% of seedlings survived, 69% in the B and T units, and 72% in the C units. Sapling survival averaged 73% in TB, 83% in B, 87% in T and ~100% in C units. We are currently evaluating treatment effects on survival in 2006 to determine if differences exist between thin-barked mesic species such as maples and thick-barked species such as oak, hickory and blackgum.

KEY WORDS: prescribed fire, oak regeneration and sustainability

(138) EFFICACY OF HERBICIDAL CONTROL METHODS ON COMMON TEASEL (*DIPSACUS FOLLONUM* L.). Thomas Reeve<sup>1</sup>, Hugh Brown<sup>1</sup>, and [John Taylor](#)<sup>2</sup>. <sup>1</sup>Department of Natural Resources and Environmental Management, Ball State University. [reevetom@hotmail.com](mailto:reevetom@hotmail.com); [hbrown@bsu.edu](mailto:hbrown@bsu.edu). <sup>2</sup>Field Station and Environmental Education Center, Ball State University. [jetaylor@bsu.edu](mailto:jetaylor@bsu.edu).

Common teasel (*Dipsacus fullonum* L.) is an aggressive invasive species throughout much of North America, invading roadsides, ditches, rights of way, and natural areas. This study examined three herbicides used to control common teasel: 1) BK 800, a 2,4-D based broad-leaf herbicide mixed in diesel fuel; 2) Glyphomax® a non-selective glyphosate-based product mixed in water with a non-ionic surfactant (Nu-Film®-IR) added at 5.3 mL/L; and 3) Transline®, a clopyralid based broad-leaf herbicide used for non-crop areas with the same non-ionic surfactant. Herbicides were applied in three concentrations taken directly from label specifications: low end, high end, and the midpoint between low and high ends. Plant rosette counts taken two weeks after application were compared to counts taken before to create a “survival ratio”. The majority of applications resulted in total kill of all common teasel rosettes. Ratios were compared between all treatment groups and the control. All herbicide treatments resulted in significantly ( $p < 0.001$ ) more kills than the control. The different concentrations of each treatment were compared against each other to determine the optimum concentration for common teasel control. The 2.0 mL/L concentration of Transline®, the 13 mL/L concentration of Glyphomax® and the 55 mL/L of BK 800 are the most effective treatments. There was no significant difference between efficacies of the three above herbicides. This study provides the first known quantitative survey of herbicidal control of common teasel, and it should serve as a starting point for future studies on controlling this invasive plant.

KEY WORDS: teasel, invasive plant, herbicide

(56) LARGE-SCALE CONSERVATION PLANNING USING SPATIALLY-EXPLICIT MULTISPECIES MODELS IN FLORIDA. Karen V. Root. Department of Biological Sciences, Bowling Green State University. [kvroot@bgsu.edu](mailto:kvroot@bgsu.edu).

Large-scale conservation in a human-dominated landscape requires an approach that incorporates the spatial and demographic requirements of the resident species. Individual risk assessments were developed for 60 rare and imperiled wildlife species in Florida that combined habitat suitability maps with spatially-explicit population models for each species. This technique identified the demographic variables with the greatest impact on survival and highlighted which patches of suitable habitat were most important for persistence. These individual risk assessments were then combined in a variety of ways (e.g., by taxa, by ecosystem) to estimate the multispecies conservation value (MCV) for each patch on the landscape. Based on these analyses, a number of clear trends have emerged. There were substantial differences in the locations that were identified as having the highest MCV depending on the species or ecosystems that were included. For example, the number and location of patches of habitat that were most suitable for birds differed from those most suitable for mammals or amphibians and reptiles. This suggests that caution is warranted when planning is based on the needs of just a few species or specific taxa. Also, more attention should be focused on understanding the spatial constraints for vulnerable species; there is little data for most species on the critical parameters such as dispersal and carrying capacity required for spatially-explicit conservation. This approach is flexible and can readily accommodate a variety of data and scales. Therefore, this project can serve as a guide to large-scale, multi-species planning efforts elsewhere.

KEY WORDS: conservation planning, risk assessment, spatially-explicit, modeling, Florida

(75) AN ASSESSMENT OF THE CONSERVATION STATUS OF OHIO'S OAK OPENINGS REGION USING REMOTELY SENSED DATA. Timothy A. Schetter<sup>1</sup>, John F. Jaeger<sup>1</sup>, Scott R. Abella<sup>2</sup>, and Karen V. Root<sup>3</sup>. <sup>1</sup>Metroparks of the Toledo Area. [tim.schetter@metroparkstoledo.com](mailto:tim.schetter@metroparkstoledo.com); [john.jaeger@metroparkstoledo.com](mailto:john.jaeger@metroparkstoledo.com). <sup>2</sup>Public Lands Institute

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The approximately 48,000-ha Oak Openings Region of northwestern Ohio was historically dominated by oak savannas and woodlands with interspersed wet prairies. The region's ecosystems were systematically altered through fire suppression, draining and filling of wetlands, and urbanization leading to fragmentation and degradation of habitat for the region's 160+ state-listed plant and animal species. Currently, five globally rare plant communities occur within the region. Although pre-settlement distribution of these communities has been gleaned from historic records, the current distribution and conservation status of plant communities within the region has not been thoroughly inventoried. Through analysis of satellite images (LANDSAT TM), orthophotos, and field data, we mapped the current distribution of plant communities within the Oak Openings Region. We qualitatively assessed their current conservation status by considering species richness, distribution of invasive species, and current management practices. Currently, approximately 10,000 ha of land within the region have been converted for urban use while 21,000 ha have been converted into croplands. Of the approximately 16,000-ha of natural or seminatural lands remaining in the region, 4,500 hectares have been acquired by various conservation organizations to serve as parks or preserves. Less than 600 hectares have received restoration treatments to date. Results of this assessment will be used to guide future acquisition efforts by public agencies and help land managers prioritize areas for restoration. Additionally, data will be shared with community planners in an attempt to direct future urbanization away from the most ecologically sensitive areas.

KEY WORDS: conservation, gap analysis, land planning, oak savanna, remote sensing

(38) DIATOM COMMUNITY DISTRIBUTION ALONG AN ENVIRONMENTAL GRADIENT. [Kyle C. Scotese](#) and Julie A. Wolin. Biological, Geological, and Environmental Sciences Department, Cleveland State University. [k.scotese@csuohio.edu](mailto:k.scotese@csuohio.edu); [j.wolin@csuohio.edu](mailto:j.wolin@csuohio.edu).

Nutrient enrichment in the form of anthropogenic phosphorous and nitrogen inputs have occurred in lakes in this ecoregion. In the absence of historical water chemistry data, the extent to which this disturbance has impacted lakes in the Erie/Ontario drift and lake plains ecoregion remains to be determined. The objective of this study is to develop a diatom calibration set through analysis of surface sediments and water chemistry from 30 lakes over a proposed phosphorous and nitrogen gradient in the glaciated regions of northeast Ohio and northwest Pennsylvania with an additional lake in New York. All but three of these lakes were naturally formed, and some lakes occur in protected natural areas. Diatoms can be used as indicators of environmental variables. Parameters known to affect diatom distribution include pH, total nitrogen, total phosphorous, and trace metal levels. The relationship between recent diatom species and environmental variables will be established using canonical correspondence analysis and weighted averaging regression. The calibration set will be used to develop transfer functions. Transfer functions allow the extrapolation of historical water chemistry from analysis of diatom species in deeper sediments. With respect to lake management, efforts to restore a lake to baseline or natural conditions may be enhanced through use of this data set. Information from this study will be added to a multi-regional database of existing transfer functions. No current calibration set exists for this geographic region.

KEY WORDS: diatoms, calibration set, lake management, transfer function, gradient

(144) ASSESSING THE IMPACT OF FLOODING ON SOIL SEED BANKS ALONG HEADWATER STREAMS IN THE CUYAHOGA VALLEY NATIONAL PARK, OHIO. [Marie E. Semko-Duncan](#), P. Charles Goebel, and Kathryn L. Holmes. School of Environment and Natural Resources, The Ohio State University. [semko-duncan.1@osu.edu](mailto:semko-duncan.1@osu.edu); [goebel.11@osu.edu](mailto:goebel.11@osu.edu); [holmes.203@osu.edu](mailto:holmes.203@osu.edu).

Severe flooding in 2003 and 2006 along the Cuyahoga River and many of its tributaries located in the Cuyahoga Valley National Park (CVNP) resulted in severe scouring of the lake clay sediments at many locations. In many instances, sediments up to a half meter deep were deposited downstream, significantly altering the environment along many of the small tributaries in the CVNP. As the headwaters of many of these tributary streams originate outside of the CVNP in an urban landscape, there was concern about the ecological consequences of flooding on riparian plant communities. To quantify the long-term effects of the floods and how the reorganization of sediments along the stream valley influences the composition and structure of riparian plant communities, we established eight permanent sites along headwater streams in the CVNP. Standing vegetation and seed bank composition were sampled across fluvial landforms representing a gradient of flooding frequency and disturbance. Seed bank soils were subjected to two flooding regimes under greenhouse conditions and analyzed using the seedling emergence method. Results two years following the flood indicate there was little resemblance in species composition or abundance between the seed bank and standing vegetation. The standing vegetation, consisting of over 100 species, was dominated by perennial forbs. Seed bank samples were comprised of 25 species, 80% of which were graminoids. *Juncus* spp., absent from the summer vegetation survey, were overwhelmingly abundant in the seed bank, comprising 69% of total germinants. Non-native species accounted for only 2% of the total seed bank.

KEY WORDS: assessment, seed bank, flooding, headwater stream

(128) THE URBAN HEAT ISLAND AND VEGETATION PHENOLOGY. [Daniel P. Shustack](#) and Amanda D. Rodewald School of Environment and Natural Resources, The Ohio State University. [shustack.1@osu.edu](mailto:shustack.1@osu.edu); [rodewald.1@osu.edu](mailto:rodewald.1@osu.edu) .

Urban areas often experience elevated temperatures in comparison to their rural surroundings. The term “urban heat island” has been used to describe this phenomenon. Forest patches surrounded by an urban matrix may or may not be buffered from the urban climate; this may result in different phenological patterns between urban and rural forests. We selected 11 sites that ranged from a highly urban landscape matrix to a rural/agricultural matrix. At 1 km around each site, we quantified the amount of urbanization and scaled each site based on an “urban index.” We record daily maximum and minimum temperatures at each site between 1 January 2006 and 30 June 2006. We monitored vegetation phenology of 7-10 individual plants of *Aesculus glabra* (Ohio buckeye), *Acer negundo* (box elder) and *Lonicera maackii* (honeysuckle) at each site. We determined the date of bud break, the date completion of leaf expansion, and measured shoot length at one time point in mid-April. Average monthly maximum temperatures were not related to urbanization; average monthly minimum temperatures were positively ( $p < 0.05$ ) related to urbanization. Temperatures accumulated faster in more urban sites although this pattern was non-significant ( $p > 0.05$  for all months). Bud break was earlier in urban areas for honeysuckle, buckeye, and box elder, although this pattern was only significant for honeysuckle ( $p < 0.05$ ). Shoot length in mid-April was best predicted by temperature accumulations. These results demonstrate that the urban heat island can mediate biological processes such as vegetation phenology in remnant forest patches in urban areas.

KEYWORDS: urban heat island, vegetation phenology, bud break, leaf expansion, Columbus, Ohio, urban matrix, urban-rural gradient

(76) ASSESSMENT OF LANDSCAPE EFFECTS ON WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IMPACTS IN CUYAHOGA VALLEY NATIONAL PARK, OHIO. [Kevin L. Skerl](#). National Park Service, Cuyahoga Valley National Park. [kevin\\_skerl@nps.gov](mailto:kevin_skerl@nps.gov).

White-tailed deer (*Odocoileus virginianus*) populations in Cuyahoga Valley National Park have been increasing annually by 10%/year since 1990 and exceed densities of 100 deer/mi<sup>2</sup> in some areas. Long-term ecological monitoring reveals a variety of impacts attributable to deer, but deer distribution data (fecal pellet surveys and spotlight density estimates) do not correlate well with impact patterns. We tested the hypothesis that landscape composition and characteristics were influencing observed impact patterns. Deer habitat types were classified for thirty-six 176 ha plots around existing forest vegetation monitoring sites. A variety of landscape composition metrics were calculated using ArcView GIS 3.3 and FRAGSTATS software. The effects of landscape metrics on vegetation impact variables were examined using correlation and multiple step-wise regression models. Initial results indicate that total shrub area and forest edge within plots were inversely correlated to percent of groundcover browsed and together explained over 50% of the variability in this impact. The availability of forage in shrub and edge habitats in the landscape may therefore release interior forest vegetation from browse pressure, confounding attempts at explaining impact patterns by deer numbers alone. Additional results will be reported.

KEY WORDS: white-tailed deer, landscape, vegetation, geographic information systems, national park

(45) USING CLIMATE TO DEDUCE CHARACTERISTICS OF NATURAL FIRES IN SOUTH FLORIDA: IMPLICATIONS FOR MANAGEMENT. Matthew G. Slocum<sup>1</sup>, William J. Platt<sup>1</sup> and Brian Beckage<sup>2</sup>. <sup>1</sup>Department of Biological Sciences, Louisiana State University [mateo457@yahoo.com](mailto:mateo457@yahoo.com). <sup>2</sup>Department of Botany, University of Vermont

Prescribed fires that mimic characteristics of lightning fires are likely to be most effective for restoration and management of fire-frequented habitats. Determining these characteristics can be problematic, however, if natural archives of fires (e.g., tree rings with fire scars) do not exist or if conditions have changed since historical records were generated (e.g., global climate change). Characteristics of lightning fires can be deduced, however, by examining how they are affected by climate. At two sites in south Florida (Everglades National Park and the Avon Park Air Force Range), the largest lightning fires occurred intra-annually during the dry/wet season transition and inter-annually during droughts caused by La Niña. These fires accounted for ~80% of the total area burned by lightning fires over the periods of record. In contrast, anthropogenic fires, which accounted for more total area burned, generally exhibited different intra- and inter-annual timing. This timing difference resulted in anthropogenic fires occurring under different climate and fuel conditions, and they were therefore unlikely to have had characteristics (e.g., intensity, patchiness) similar to those produced by lightning fires. This is especially relevant for southern Florida, given that lightning fires are more likely than anthropogenic fires to interact with flooding to produce a patchwork of effects. Given available evidence regarding timing of lightning fire, and the evolution of pyrogenic species under climate-induced fire regimes, restoration should involve prescribed fires that attempt to mimic natural intra- and inter-annual timing. Models based on climate need to be created to guide application of prescribed fires.

KEY WORDS: south Florida, drought, El Niño southern oscillation, natural and anthropogenic fire, seasonal and inter-annual timing

(52) SPATIAL AND TEMPORAL DYNAMICS OF *LYTHRUM SALICARIA* INVASION IN A PEAT-FORMING SEDGE FEN. Kurt A. Smemo<sup>1,2</sup>, Wendy M. Mahaney<sup>3</sup>, and Joseph B. Yavitt<sup>4</sup>. <sup>1</sup>The Holden Arboretum [ksmemo@holdenarb.org](mailto:ksmemo@holdenarb.org). <sup>2</sup>Department of Biology, Case Western Reserve University. <sup>3</sup>Department of Plant Biology, Michigan State University. [mahaneyw@kbs.msu.edu](mailto:mahaneyw@kbs.msu.edu). <sup>4</sup>Department of Natural Resources, Cornell University. [jby1@cornell.edu](mailto:jby1@cornell.edu).

Spread of the exotic species *Lythrum salicaria* L. (purple loosestrife) across wetlands in North America is assumed to have negative effects on native species. However, few studies have quantified the spatial and temporal trends of *Lythrum* invasion, and changes in patterns of net

primary productivity (NPP) remain unclear. We examined aboveground NPP along a *Lythrum* invasion gradient in a *Carex lacustris* Willd. (lake sedge) dominated fen, approximately 10 years after *Lythrum* was first observed in the wetland. *Lythrum* was visually striking in the wetland but its stem density was highly variable. We established three transects extending from sites with almost no *Lythrum* present to the most heavily *Lythrum*-dominated sites and compared soil nutrients and *Carex*, *Lythrum*, and total NPP (aboveground biomass) over three years. We found no significant differences in mean *Carex* NPP across years or sites, but did find significant differences in mean *Lythrum* NPP between years and sites. However, *Lythrum* NPP was not increasing over time. Mean total NPP significantly varied by year in response to annual *Lythrum* biomass trends. There were no significant differences in most soil nutrients among sites or years. *Carex* represented over 80% of the total biomass across both sites and years, while *Lythrum* never comprised more than 10% of the total biomass. This suggests that *Lythrum* invasion had little to no effect on native species' biomass, species richness, or soil nutrients after 10 years. Instead, *Lythrum* may be invading areas not utilized by native vegetation.

KEY WORDS: *Carex*, fen, invasion, *Lythrum salicaria*, purple loosestrife

(62) IMPACT OF EMERALD ASH BORER ON FORESTS WITHIN THE HURON RIVER WATERSHED OF SOUTHEAST MICHIGAN. [Annemarie Smith](#)<sup>1</sup>, Daniel A. Herms<sup>2</sup>, and Robert P. Long<sup>3</sup>. <sup>1</sup>Ohio Department of Natural Resources, Division of Forestry. [annemarie.smith@dnr.state.oh.us](mailto:annemarie.smith@dnr.state.oh.us). <sup>2</sup>Department of Entomology, The Ohio State University. [herms.2@osu.edu](mailto:herms.2@osu.edu). <sup>3</sup>USDA Forest Service. [rlong@fs.fed.us](mailto:rlong@fs.fed.us).

Emerald ash borer (*Agrilus planipennis* Fairmaire)(EAB), a buprestid beetle native to Asia, has killed millions of ash trees (*Fraxinus* spp.) over thousands of square miles in southeast Michigan, northwest Ohio and neighboring Ontario. This invasive pest has the potential to decimate ash across North America with major impacts on forest ecosystems.

The objectives of this study were to determine (1) if community structure affects forest susceptibility to EAB invasion, and (2) the effects of EAB-induced ash mortality on forest community composition. Transects were established in 31 forested stands in southeast Michigan that varied in ash density, topography, hydrology, stand structure and community composition. Three replicated 0.25 acre plots were established in each transect for quantification of overstory and understory woody vegetation. The impact of EAB was quantified by assessing crown dieback of each ash tree and counting the characteristic D-shaped emergence holes of the beetles and woodpecker attacks at a standard location on the trunk of each ash tree.

We found no relationship between EAB-induced dieback or mortality of ash and density, basal area, relative dominance, or relative density of ash. Severity of ash dieback was negatively correlated with distance of the stand from the putative epicenter of the invasion. Black ash (*F. nigra*) dieback was greater than that of white (*F. americana*) or green ash (*F. pennsylvanica*). As EAB eliminates ash from infested stands, abundance of saplings and seedlings suggests that *Acer* (maple), *Tilia* (basswood) and *Prunus* (cherry) are most likely to replace ash in the canopy.

KEY WORDS: emerald ash borer, community, composition, mortality

(121) FRESHWATER MUSSEL SPECIES DISTRIBUTION AND DENSITIES IN THE FRENCH CREEK WATERSHED. [Tamara A. Smith](#)<sup>1</sup> and Darran Crabtree<sup>2</sup>. <sup>1</sup>Pennsylvania Natural Heritage Program. [tsmith@paconserve.org](mailto:tsmith@paconserve.org). <sup>2</sup>The Nature Conservancy, French Creek Project, Meadville, PA.

The freshwater mussel communities of the French Creek watershed are nationally recognized for their importance to biodiversity. Our research attempts to gather more information on the distribution and densities of these species throughout the watershed. This study utilized timed

searches to characterize mussel species richness and to calculate catch per unit effort (CPUE) values. Quantitative surveys were then utilized to calculate estimates on densities and abundances. Relationships between these data were used to estimate densities on a river-wide scale. Starting in NY, the main stem of French Creek was divided into 28 stretches equal length and one site was randomly chosen within each stretch, favoring optimal habitat for rare species and high species diversity. Tributary sites were chosen in a similar manner. Snorkelers collected as many unionid individuals as possible with a target search rate of 0.5m<sup>2</sup>/minute. Thirty-two main-stem sites and 12 tributary sites were surveyed with timed searches. Mean species richness was 9.8 (8.0, 11.6) and mean CPUE was 39.6 (24.7, 54.6). Quantitative sampling was performed at ten sites using a double sampling design, systematically placed with multiple random starts and 0.25m<sup>2</sup> quadrats. Density estimates ranged from 0.0/m<sup>2</sup> to 27.98/m<sup>2</sup>. Abundance estimates range from 0 to 69,848 live mussels per site. For the main-stem, we calculated regression models to estimate densities and abundances at qualitatively sample sites based on the CPUE at quantitatively sampled sites. Extrapolation yields approximately 12 million animals in the 39.6 km of significant riffle/run habitat in the main stem of French Creek.

KEY WORDS: French Creek, freshwater mussels, Unionidae, Pennsylvania.

(142) EFFECTIVENESS OF TRANSPLANTING VS. SEEDING OF *LUPINUS PERENNIS* IN AN OAK SAVANNA REGENERATION SITE. Mark K. St. Mary and Helen J. Michaels. Department of Biological Sciences, Bowling Green State University. [skmark@bgnnet.bgsu.edu](mailto:skmark@bgnnet.bgsu.edu); [hmichae@bgnnet.bgsu.edu](mailto:hmichae@bgnnet.bgsu.edu).

*Lupinus perennis*, an indicator species for savanna and barrens habitat, is the sole larval food source for the federally endangered Karner blue butterfly and an important food source for several other butterfly species. Although butterfly recovery programs include restoration of existing lupine populations and establishment of new ones, the determination of the optimum conditions and method of lupine restoration has received little attention. This study compared the survival, growth and reproduction of *L. perennis* 13 months after planting as seed and greenhouse transplants from four population sources across naturally occurring gradients of light, soil moisture, pH, phosphorous, and soil surface materials along field transects in a savanna restoration. Estimates of labor required in the production, planting and aftercare of both greenhouse plants and seeds were also compared. Both population source and substrate type significantly influenced seedling emergence, while survival decreased with high light levels, herbivory, and disturbance. As expected, transplants had significantly greater survival than seedlings, but were also affected by initial size, population source, herbivory and disturbance. Seedling size was influenced by population source, light, and soil pH, while transplant size varied only with population and light. Only 1% of seedlings flowered, compared to 25% of transplants, but only population source had a significant effect on seed production. Although approximately 9.5 times more labor was required for transplants, their greater success in survival, growth, and reproduction may warrant their use for butterfly restoration programs.

KEY WORDS: plant restoration, seeding, transplants, butterfly restoration

(61) VALUE OF LANDSCAPE INITIATIVES, INCLUDING BIOSPHERE RESERVES, FOR SOCIAL-ECOLOGICAL SYSTEMS IN A FRAGMENTED LANDSCAPE. Ruida Stanvliet. Western Cape Nature Conservation Board, Stellenbosch, South Africa. [stanr@webmail.co.za](mailto:stanr@webmail.co.za).

In our modern world, natural ecosystems have become much fragmented and entwined with social systems. Human populations and settlements are usually present within or close to valuable conservation areas. In order to achieve efficient management of natural ecosystems, it has become non-negotiable to address the links to social systems and the benefits to human populations.

Landscape initiatives have become an important conservation tool in South Africa. They include biosphere reserves, conservation corridors and biodiversity initiatives. The strength of these initiatives lies mainly in building lasting partnerships between relevant role-players. Each one has its own particular focus area; some could focus more on conservation aspects while others could have a stronger focus on developmental and social issues. All of them however seek to achieve sustainable development in the wider sense. This paper looks at a number of landscape initiatives in South Africa and discusses their similarities and differences. It emphasizes the role of the biosphere reserve concept in fragmented landscapes, and in bringing together conservation and social issues through the framework of Man and the Biosphere (MAB). This link between environment and people is of the utmost importance in urban areas. The paper makes a case for the applicability and value of the biosphere reserve framework in the very fragmented urban context towards achieving resilience in social-ecological systems.

KEY WORDS: landscape initiative, biosphere reserve, conservation, resilience, partnerships

(100) ASSESSING THE ROLE OF NEW YORK STATE PARKS IN PRESERVING BIODIVERSITY. [Amanda J. Stein](#)<sup>1</sup>, [George R. Robinson](#)<sup>2</sup>, [Thomas B. Lyons](#)<sup>1</sup>. <sup>1</sup>Environmental Management Bureau, New York State Office of Parks, Recreation, and Historic Preservation. [amanda.stein@oprhp.state.ny.us](mailto:amanda.stein@oprhp.state.ny.us); [thomas.lyons@oprhp.state.ny.us](mailto:thomas.lyons@oprhp.state.ny.us). <sup>2</sup> Department of Biological Sciences, University at Albany. [grobins@albany.edu](mailto:grobins@albany.edu).

New York State Office of Parks, Recreation and Historic Preservation (OPRHP) manages over 200 sites with a cumulative area of approximately 134,000 ha, or <1% of the area of NY State. A recent comprehensive survey of 135 of the parks by scientists from the NY Natural Heritage Program (NYNHP) determined the occurrence of 1,000 rare “elements” (site-specific records of species and communities of conservation interest). Using these survey data, we examined the OPRHP system and its role in biological conservation from a landscape perspective. Although most individual parks are relatively small (mean = 1323 ha), they are well-distributed across the state, so as a group they hold the potential to sample a sizable number of different habitats, simply by virtue of their geographic coverage. Although larger parks tend to hold higher numbers of rare elements, the many small parks make unique contributions to the system’s overall biodiversity. Most rare elements are found in few (1-3) parks, most occupy small areas (<10 ha), and many of those with ranges carrying beyond park boundaries extend into private lands. Preliminary viability estimates indicate that about half of all recorded populations and communities face size constraints or other challenges. Further study will reveal how rare elements in state parks compare to the rest of the NYNHP records in their dispersion, diversity, and estimated viability.

KEY WORDS: rare, NY State Parks, redundancy, conservation network, biodiversity

(6) INDIRECT EFFECTS OF BEECH BARK DISEASE: POTENTIAL IMPACTS ON INSECT AND SMALL MAMMAL COMMUNITIES. [Andrew J. Storer](#)<sup>1</sup>, [Brian L. Beachy](#)<sup>1,2</sup> and [Justin N. Rosemier](#)<sup>1,3</sup>. <sup>1</sup>Ecosystem Science Center, School of Forest Resources and Environmental Science, Michigan Technological University. [storer@mtu.edu](mailto:storer@mtu.edu). <sup>2</sup>Current affiliation: Michigan Natural Features Inventory. [beachyb@michigan.gov](mailto:beachyb@michigan.gov). <sup>3</sup>Current affiliation: Kentucky Wesleyan College. [jrosemier@kwc.edu](mailto:jrosemier@kwc.edu).

North American forest ecosystems are continually being affected by the introduction and spread of invasive organisms that cause mortality and disease to important tree species. The indirect ecological impacts of this tree mortality on forest ecosystems are not well documented. Beech bark disease (BBD), an invasive disease complex consisting of a scale insect and several species of Ascomycete fungi, has caused dramatic declines of American beech (*Fagus grandifolia*). Potential indirect effects of beech bark disease were investigated in Upper Michigan using blacklight traps for moths, flight intercept traps for bark and wood infesting insects, and

small mammal traps. Black light trapping showed that several moth species (Lepidoptera) that utilize beech and/or maple as a larval host were significantly less abundant in forests with BBD, likely as a result of decreased host material due to BBD induced tree mortality. Flight intercept trap catches showed that bark beetles (Coleoptera: Scolytidae) were significantly more abundant at sites without BBD than at sites with BBD. Short term effects on small mammal populations have not been significant, though indications of potential impacts on southern red-backed voles were evident. Small mammal granivore communities preferred European beech to sugar maple seeds, and therefore the impacts of BBD on wildlife that directly or indirectly utilize beechnuts will likely depend on the availability and acceptability of alternate food sources. Where alternate food sources are not available, beechnut loss as a result of beech bark disease may result in long term declines in populations of certain small mammal species.

KEY WORDS: beech bark disease, moths, bark beetles, small mammals, indirect effects

(17) FRAGMENTATION IN TIME AND IN SPACE: MICROCLIMATE AND DECLINE OF RELICT PAPER BIRCH IN THE NIOBRARA VALLEY, NEBRASKA. Esther D. Stroh. U.S. Geological Survey, Columbia Environmental Research Center, MO. [esther\\_stroh@usgs.gov](mailto:esther_stroh@usgs.gov).

The Niobrara River Valley supports scattered stands of paper birch (*Betula papyrifera*) on steep north-facing slopes along the river and in north-facing spring-fed canyons. These stands occur approximately 400 km southwest of the present day paper birch range and have probably been in the Niobrara Valley since the end of the Wisconsin glaciation. Recent (10 - 20 years) dieback of canopy-sized Niobrara birch has caused concern for the populations' continued persistence. In this ongoing study, we have continuously monitored microclimate in twelve Niobrara paper birch stands since June 2005; we have also assessed birch health and environmental conditions in these and other Niobrara sites. Local microclimates in the birch sites differ from the surrounding climate as measured by a nearby weather station located in the Niobrara Valley but not inside a birch stand. The first full year of data show higher spring and winter daily maximum temperature in birch stands along the lower (eastern) portion of the Niobrara birch range compared to stands along the upper (western) portion of the range. Late winter and early spring thaws followed by May freezes have been associated with dieback of paper birch in other U.S. and Canadian locations; in the Niobrara Valley, lower river birch stands have a higher proportion of dead trees than do upper river sites. Increased frequency of spring thaws and May freezes in the Niobrara Valley from 1978-2006 compared to 1949-1977 may partially explain Niobrara birch dieback and higher proportion of dead trees in lower river sites.

KEY WORDS: relict populations, microclimate, paper birch, climate change

DEVELOPING PARTNERSHIPS FOR COLLABORATIVE FIRE MANAGEMENT IN THE ONSLOW BIGHT LANDSCAPE, NORTH CAROLINA. Chris Szell<sup>1</sup>, Margit Bucher<sup>1</sup>, Jennifer Costanza<sup>1</sup>, Cecil Frost<sup>2</sup>, Alexa McKerrow<sup>3</sup>, Milo Pyne<sup>4</sup> <sup>1</sup>The Nature Conservancy, [cszell@tnc.org](mailto:cszell@tnc.org); <sup>2</sup>University of North Carolina-Chapel Hill; <sup>3</sup>Southeast Gap Analysis Project; <sup>4</sup>NatureServe

The Onslow Bight landscape covers 1.4 million hectares (3.7 million acres) on the coastal plain of North Carolina. It contains land managed by local, state, and federal agencies, including the US Forest Service, the US Department of Defense, the North Carolina Wildlife Resources Commission, and the Nature Conservancy. The landscape is comprised of a number of fire dependent ecosystems, including longleaf pine savannas, pocosins, marshes, riverine wetlands and associated ecotones. Like much of the coastal plain, the Onslow Bight landscape faces rapid changes in forest land ownership and land use patterns. Couple this with changing air quality standards, the lack of funding, and negative perceptions of fire by the public, land managers are increasingly challenged to get enough fire on-the-ground to maintain ecosystem health. By bringing fire use practitioners from various agencies and organizations together, we hope to increase the effectiveness of burning for improving ecological conditions at a landscape scale.

Since 2005, partners from 13 agencies in the Onslow Bight have been working together within the framework of a Fire Learning Network to develop collaborative strategies for a common vision of landscape-scale fire management. Currently, a memorandum of understanding for sharing resources for burning among agencies is under development and priority areas for burning within the landscape have been identified. GIS data showing fuel types will be developed, and fire behavior models will be used to demonstrate the effectiveness of fuel reduction. The long-term result will be more effective management and restoration of fire-adapted ecosystems in the Onslow Bight.

KEY WORDS: fire management, partnerships, fire learning network, Onslow Bight

(69) MODELING LICENSE-BUYING BEHAVIOR & EVALUATING STRATEGIES TO INCREASE DEER HUNTER PARTICIPATION. [Mike Tonkovich](#) and Dave Scott. Ohio Department of Natural Resources, Division of Wildlife. [Mike.Tonkovich@dnr.state.oh.us](mailto:Mike.Tonkovich@dnr.state.oh.us); [Dave.Scott@dnr.state.oh.us](mailto:Dave.Scott@dnr.state.oh.us)

In spite of increased opportunities and abundant deer herds, many hunters today appear unwilling to individually harvest additional antlerless deer. Moreover, the number of deer harvested per successful hunter increased only < 10% from 2000 to 2006. Strategies to increase individual hunter harvest (bag limit, longer seasons, reduced permit costs) will likely have limited management value. Instead, managers must promote increased hunter participation and ultimately higher hunter success rates. We developed models to predict the participation in deer hunting by past license buyers. We applied several promotional treatments to evaluate their effectiveness for increasing participation. Major predictive variables in models included patterns and timing of license or deer permit buying during the previous 4 years. In 2004, a promotional brochure emphasizing deer hunting opportunities was sent to past license buyers with predicted low and moderate probabilities of continued participation. A small incentive was included in a subset of the brochures sent. In 2005, 3 postcards were developed to promote archery, upland game, and deer firearms seasons. Targeted groups included those with low and moderate probabilities of continued participation as well as avid hunters. In 2006, we offered a large prize as an incentive for low or moderate probability hunters to purchase a license. Results include an evaluation of model performance compared to license-buying behavior of the control groups, effect size for promotional treatments, license sales among groups based on timing of mailings, and an economic analysis of the cost of treatments versus expected revenues.

KEY WORDS: Ohio, hunting, white-tailed deer, retention, modeling

(58) CONSERVATION PLANNING IN A RAPIDLY SUBURBANIZING COUNTY IN SOUTHEASTERN PENNSYLVANIA, USA. [Christopher Tracey](#). Pennsylvania Natural Heritage Program. [ctracey@paconserve.org](mailto:ctracey@paconserve.org)

Lancaster County, a well known agricultural region in southeastern Pennsylvania, is undergoing increasing pressure from rapid suburbanization. Despite rapid growth, this region is home to great biodiversity, including serpentine barrens, deep river gorges and other habitats that are home to state and globally rare species. As part of a county-led Green Infrastructure plan, the Pennsylvania Natural Heritage Program is currently updating records of rare and endangered species and natural communities from an initial natural areas inventory completed 18 years ago. Management plans have been developed for each ecologically significant site, including a threat analysis and detailed conservation recommendations. This natural inventory data is being compiled in the NatureServe Vista conservation decision support system along with land use, policy data and explicit conservation goals to evaluate several potential biodiversity conservation scenarios. Recommendations, such as zoning code enhancements and alternative land use plans, to better protect biodiversity have been developed. With this project, county decision-

makers can better understand the implications of land use, development and policy decisions on the natural areas within the county.

KEY WORDS: conservation planning, green infrastructure, NatureServe Vista

(70) THE REAL-WORLD PICTURE OF DEER FERTILITY CONTROL. John W. Turner, Jr., Department of Physiology & Pharmacology University of Toledo College of Medicine. [John.Turner@utoledo.edu](mailto:John.Turner@utoledo.edu).

The topic of fertility control for white-tailed deer has raised interest and questions for many people. Since 1989, when our first contraception studies began with captive deer, considerable knowledge has been gained regarding usefulness and application of this technology. The effectiveness of contraception in deer has been in the scientific literature since 1992. Its viability for field application in unhuntable populations (parks, preserves, suburban areas) has been demonstrated in 8 U.S. states and 2 Canadian provinces. Nonetheless, its pursuit as a management tool has been limited due in part to misinformation and the controversial nature of deer management. This presentation is focused on the current facts of deer fertility control regarding its capabilities and limitations in order to enable more informed viewpoints about this subject. The major topics include: 1) practical considerations in selection of target deer populations, 2) preferred means of access to deer for contraception, 3) issues of preparation, storage and delivery of the vaccine, 4) testing toward extending duration of vaccine effectiveness, 5) collateral effects of treatment on behavior and physiology, and 6) cost of vaccine, administering treatment and monitoring.

KEY WORDS: fertility control, vaccine, white-tailed deer, database

(134) CHARACTERIZATION AND COMPARISON OF WILDLIFE AND VEGETATION BETWEEN WETLAND AND AGRICULTURALLY ENCLOSED WATER DEPRESSIONS AT CYPRESS CREEK NATIONAL WILDLIFE REFUGE. Jodi M. Vandermyde<sup>1</sup> and Molly S. Hacker<sup>2</sup>. <sup>1</sup>Southern Illinois University-Carbondale, Department of Zoology [moo\\_too\\_you@hotmail.com](mailto:moo_too_you@hotmail.com). <sup>2</sup>Southern Illinois University-Carbondale Department of Plant Biology [mollyhacker@hotmail.com](mailto:mollyhacker@hotmail.com).

Cypress Creek National Wildlife Refuge (CCNWR), a wetland of national importance, is located within the Cache River watershed in Southern Illinois. CCNWR is a unique environment due to the convergence of at least four distinct physiographic regions, creating a diverse habitat which is maintained for migratory birds, resident wildlife, and endangered and threatened species.

The objective of the study was to determine whether a relationship exists between the biodiversity at two pairs of water depressions and the respective environments by comparing the vegetation and wildlife in the core and buffer zones. One pair of water depressions were enclosed by agriculture and the other pair were enclosed by a managed wetland. The core and buffer zones were examined by hoop-netting, funnel trapping, dip netting, and seining were used to assess the wildlife at each site, while vegetation was surveyed by a "walk around" and ranked via DAFOR method. Water quality samples, depth, and light visibility measurements were also collected from each location. By characterizing and comparing the flora and fauna of the agricultural and wetland water depressions, the results may contribute to understanding the importance of buffer zones in managed ecological systems. The results from the research can provide insight which may be useful for future managerial decisions regarding habitat alteration on the refuge.

KEY WORDS:

(3) CASCADING CONSEQUENCES OF INTRODUCED AND INVASIVE SPECIES ON IMPERILED INVERTEBRATES. David Wagner, University of Connecticut. [david.wagner@uconn.edu](mailto:david.wagner@uconn.edu).

Impacts of invasive species on rare and endangered (imperiled) insects will be reviewed in a two-part presentation. The first part of the talk will focus on the collective set of threats facing federal (United States Fish and Wildlife Service list of endangered and threatened insects) and state-listed (Connecticut's endangered, threatened and species of special concern). The importance of non-native invasive species will be measured against other identified threats to imperiled insects. The above approach, focused on federal- and state-listed taxa, does not take into account that even widespread and common species can become rare and face extinction as a result of biological introductions. The second half of the talk will consider six classes of threats to native insects: those stemming from biological introductions of plants, plant pathogens, inadvertently introduced insects, biological control agents, animal pathogens, and detritivores. Poignant examples from each category, emphasizing examples that relate to imperiled insects, will be presented.

Major summary points will be as follows: invasives pose the second greatest threat to USFWS-listed insects, second only to development and habitat loss. Invasives are the principal threat facing federally protected species listed from Hawaii. In Connecticut, for both state-listed terrestrial and imperiled butterflies, non-native invasives are of tertiary importance, following afforestation/succession and deer, and perhaps even global warming in importance. Once exotics are established, expect the unexpected (Malcolm effects): consequences of biological introductions often are complex, indirect, and unpredictable, with problems trickling in and trickling out to other trophic levels. Disharmonic biotas and simple communities are especially threatened by non-native invasives. Exotics pose their greatest threat to biodiversity in those instances where their presence catalyzes changes in basic ecosystem properties—two egregious examples include the impact of the Balsam Woolly Adelgid to the sky island biotas of the southern Appalachians and the changes brought on by introduced earthworms to forest understory communities. The effects of the Emerald Ash Borer may also prove catastrophic—if its spread continues unchecked, the beetle could drive more than 20 ash-specialist herbivores to extinction and irreversibly unravel the plant communities where ash is a co-dominant.

(85) CHANGES IN THE FLORA OF THE OAK OPENINGS REGION OF OHIO OVER THE PAST 100 YEARS. [Timothy L. Walters](mailto:twalters@manniksmithgroup.com). The Mannik & Smith Group, Inc. [twalters@manniksmithgroup.com](mailto:twalters@manniksmithgroup.com).

The Oak Openings Region stretches diagonally from Monroe, Michigan to Liberty Center, Ohio. In 1999, this region was designated one of The Nature Conservancy's 200 Last Great Places. This 130 square-mile region is characterized by post-glacial beach ridges and swales created as glacial Lake Warren retreated 12,000 years ago at the end of the Wisconsinian glaciation. These ancient beaches evolved into the oak-dominated sand ridges interspersed with sedge-grass dominated palustrine wetlands. This combination of savannas, wet and dry prairies and forests is home to the highest concentration of rare species than anywhere else in Ohio. In 1928, Edwin Moseley documented 715 vascular plant species in the first flora for this region. Since then, many botanists have scoured this unusual region. For the past decade, an updated flora of this region has been compiled by examining vouchered specimens from many of the regional herbaria and numerous field collections. 1,266 vascular plant species have been documented in the Oak Openings Region. Of these, 161 are listed on Ohio's rare plant list. This is 32% of the 503 rare plants of Ohio. Approximately 78% are native to the state of Ohio (as compared to 89% in 1928). Also, the number of non-native species has increased by four fold (81 species in 1928 and 275 species at present). With the ever present development pressures facing this region from the western expansion of the City of Toledo, this survey allows an updated detailed look at the flora of one of Ohio's rarest regions.

KEY WORDS: vascular plant, Oak Openings, northwestern Ohio, endangered

(31) JAPANESE BARBERRY (*Berberis thunbergii* DC) CONTROL IN SOUTHERN NEW ENGLAND. Jeffrey S. Ward<sup>1</sup>, and Thomas E. Worthley<sup>2</sup>. <sup>1</sup>Department of Forestry and Horticulture, The Connecticut Agricultural Experiment Station. [jeffrey.ward@po.state.ct.us](mailto:jeffrey.ward@po.state.ct.us). <sup>2</sup>Cooperative Extension, University of Connecticut. [Thomas.Worthley@uconn.edu](mailto:Thomas.Worthley@uconn.edu)

Dense Japanese barberry thickets that have developed throughout the Northeast are associated with a paucity of both tree regeneration and herbaceous plants, and more recently, with increased deer tick populations. Root wrenching and grubbing are the only current control options in areas where herbicides are prohibited by deeds or regulations (e.g., adjacent to drinking water supplies). To assess the potential of a backpack propane torch (100,000 BTU) as alternative organic control measure, we established three study areas in Connecticut in 2006. At each study area, 125 barberry clumps were selected and assigned one of five treatments: control (no treatment), pre-leafout and no follow-up, pre-leafout and follow-up treatment in July, post-leafout without follow-up, and post-leafout with follow-up in July. Mortality following a single treatment ranged 96% to 13% for the clumps < 80 cm and > 160 cm tall, respectively. Higher and more consistent mortality was noted for clumps that had been treated twice: 80% for clumps < 100 cm and 60% for clumps > 100 cm. Average post-treatment clump size was < 35 cm. Treatment is effective as only 11% of clumps rated dead after first year had sprouts by June 2007. Treatment times averaged 1 hour/hectare/percent cover, i.e. 25 hours/ha for a stand with 25% barberry cover. Backpack propane torches provide natural resource managers a cost-effective, organic alternative to control barberry in parks, nature preserves, or forests where herbicides are prohibited. Preliminary findings from a subsequent study comparing effectiveness and cost of propane torching versus herbicides will be presented.

KEY WORDS: *Berberis*, invasive species control, survival

(72) DEER MANAGEMENT IN URBAN NATURAL AREAS. John Watts, Columbus and Franklin County Metro Parks, Columbus, Ohio. [watts@metroparks.net](mailto:watts@metroparks.net).

The management of white-tailed deer has become an issue that nearly all resource and natural area managers have had to incorporate into their management strategies. The Columbus and Franklin County Metro Parks developed an aggressive white-tailed deer management strategy in 1991 to manage the Districts deer herd as well as protection of its natural area parklands. Deer densities as high as 450 deer per square mile were being experienced at the onset of this program. Management strategy options have included relocation, experimental birth control, culling with sharpshooters, general public hunting and controlled hunts. Currently, annual surveys indicate that deer densities have been reduced and are being maintained in a range of 20-40 deer per square mile. Discussion will focus on the biological impacts, biological recovery and a brief description of each technique. The Columbus and Franklin County Metro Parks owns and manages over 23,000 acres of natural area parks in the central Ohio region.

KEY WORDS: Metro Parks, deer management, urban deer management, white-tailed deer impacts

(47) THE BELOW-GROUND EFFECTS OF INVASIVE PLANTS. Michael N. Weintraub<sup>1</sup> and Kimberly A. Peters<sup>2</sup>. <sup>1</sup>University of Toledo Department of Environmental Sciences. [mnweintraub@gmail.com](mailto:mnweintraub@gmail.com). <sup>2</sup>Bowling Green State University Department of Biology [kapeters@bgsu.edu](mailto:kapeters@bgsu.edu).

Invasive exotic plants are threats to ecosystems throughout the world because they crowd out native plants and the organisms that depend on them. Recent research suggests that some exotic plants are successful invaders because of their impacts on soil processes such as nutrient cycling, but the mechanisms driving these effects are poorly understood. My objective was to survey the effects of six major invasive plant species in Ohio on soil nitrogen (N) and phosphorus

(P) availability; microbial biomass; and the microbial enzymes that control soil carbon, nitrogen, and phosphorus cycling. The hypothesis I was testing is that invasive plants alter soil microbial growth, and carbon and nutrient cycling, creating more favorable conditions for themselves, and less favorable conditions for native plants. Our data generally support this hypothesis. Only two of the six invasive species studied had no significant impact on soil enzyme activity or the concentration of nutrients. Furthermore, the pattern in our cross-species analysis illustrates a trend of invasives altering low-nutrient environments to high-nutrient environments. Although this is not the case for each invasive studied, the cross-species analysis points to an overall belowground difference between invasive and native soil nutrient availability, likely caused by presence of the invasive.

KEY WORDS: invasive plants, soil, biogeochemistry, nitrogen, phosphorus

(120) OUTDOOR CLASSROOMS: HOW K-12 EDUCATORS CAN USE NATURAL AREAS

Wendy Weirich, Department of Outdoor Education, Cleveland Metroparks.

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Many teachers find that natural areas are great tools for conveying not only science topics, but history, language, and art. Even if educators cannot find transportation to high quality natural areas in the region, there are ways to use the school yard to help students appreciate the nearby natural world. As author of the bestselling book, *Last Child in the Woods*, Richard Louv points out that there is a growing body of research indicating that the direct exposure to nature is essential for healthy childhood development. Children who obtain primary experiences in the natural world have a greater chance of growing up to be adults who care about natural areas. This presentation will address how to fight "nature-deficit" disorder in an educational setting.

KEY WORDS: land laboratory, nearby nature, re-wilding

(30) CHEMICAL CONTROL OF JAPANESE SPIRAEA (*SPIRAEA JAPONICA*) IN BIG SOUTH FORK N.R.R.A. William Wellman<sup>1</sup>, Thomas G. Barnes<sup>1</sup>, and Bryan Wender<sup>2</sup>. <sup>1</sup>Department of Forestry, University of Kentucky. [wwellman@uky.edu](mailto:wwellman@uky.edu). <sup>2</sup>Virginia Department of Conservation and Recreation.

Japanese spiraea is an exotic invasive woody shrub in Big South Fork National River and Recreation Area of Tennessee and Kentucky that occurs in the alluvial floodplain and other areas where several rare plants occur. The objective of this study was to determine the efficacy of three herbicides and three application methods to control Japanese spiraea. The three herbicides (glyphosate, triclopyr, and aminopyralid) and three treatment methods (foliar, cut stump, and basal) were applied in summer 2006 and winter 2007 in a randomized block design experiment at three locations. Foliar sprays were applied in July 2006 of 1.90 L/acre glyphosate, .47 L/acre triclopyr, and .21 L/acre aminopyralid. Cut-stump treatments of glyphosate and triclopyr at 25% were applied in July 2006. Basal bark treatments of the three herbicides were applied in February 2007 at 25%, mixed with 2% Penra Bark®. Vegetation samples were taken post-treatment at the end of the growing season in October 2006 and 2007, as well as in May 2007. Summer treatments reduced the Japanese spiraea cover to less than 6%. The glyphosate and triclopyr foliar applications reduced the Japanese spiraea cover to less than 1%. Cut stump application of triclopyr also reduced the Japanese spiraea cover to less than 1%. Results from the winter treatments and second growing season foliar and cut stump treatments will be discussed. These results indicate herbicides can be an effective method of controlling Japanese spiraea.

KEY WORDS: Japanese spiraea, exotic invasive, herbicide, control

(84) ETHNOBIOLOGY OF NATIVE AMERICAN FISH DRIVES AND ITS BEARING ON FISHERIES RESTORATION: AN EXAMPLE FROM PENNSYLVANIA'S ALLEGHENY RIVER. Charles E. Williams. Western Pennsylvania Conservancy. [cwilliams@paconserve.org](mailto:cwilliams@paconserve.org).

The Upper Allegheny River of northwestern Pennsylvania and southwestern New York was an important fisheries resource for the Alleghany Seneca and Delaware Native American tribes. The Seneca harvested fish by spearing them from canoes or in shallow water or by large coordinated fish drives. Fish drives often involved whole villages and were done in river eddies during summer low flows. A V-shaped stone weir with a wooden stockade was constructed downstream of the chosen eddy. A brush seine that spanned the width of the river was moved toward the weir, driving the fish into the stockade where they were speared or clubbed. Drives were highly efficient and harvested large quantities of fish, which were mostly dried or smoked for later use. Early Euro-American observers noted that many species of fish were taken with drives including warm-water species common in today's river: bass, perch, pike and suckers. However species unknown in today's Upper Allegheny and rare in Pennsylvania were also taken, notably buffalofish (*Ictiobus* spp.) some of which were "so large that one man could not handle them". In this paper I discuss the scientific and human dimensions value of using early observational data in understanding and reconstructing past fisheries, and in river restoration, with emphasis on the Upper Allegheny River.

KEY WORDS: Allegheny River, ethnobiology, fish, Native Americans, restoration

(112) A PRELIMINARY ECOLOGICAL AND FLORISTIC ASSESSMENT OF SHALE BARRENS IN THE OUACHITA MOUNTAINS OF ARKANSAS, USA. Theo Witsell. Arkansas Natural Heritage Commission. [theo@arkansasheritage.org](mailto:theo@arkansasheritage.org).

Shale glades or barrens in the Ouachita Mountains of western Arkansas and eastern Oklahoma have received relatively little attention by botanists and ecologists. These herbaceous or shrub-dominated communities occur as erosional features on several geologic formations, most notably the Womble, Mazarn, and Stanley Shale Formations. Geomorphologically they can be divided into three classes: 1) those occurring on steep slopes along streams, 2) those occurring in flat to gently sloping valleys, and 3) those occurring on upper slopes and ridges. Recent inventory work in these communities in western Arkansas has documented more than 30 plant taxa of state conservation concern, including 15 taxa of global conservation concern (those with global conservation status ranks of G1-G3). One species, *Physaria filiformis* (Rollins) O'Kane & Al-Shehbaz is federally listed Threatened and another, *Sabatia arkansana* Pringle & Witsell, was described new to science in 2005. These communities support a relict flora from warmer, drier climatic periods in the past and contain significant numbers of disjunct and endemic taxa. Globally rare and endemic taxa include *Amorpha ouachitensis*, *Amsonia hubrichtii*, *Carex latebracteata*, *Crataegus triflora*, *Draba aprica*, *Eleocharis wolfii*, *Eriocaulon kornickianum*, *Helianthus occidentalis* ssp. *plantagineus*, *Liatris compacta*, *Physaria filiformis*, *Sabatia arkansana*, *Silene regia*, *Streptanthus maculatus* ssp. *obtusifolius*, *Streptanthus squamiformis*, and *Valerianella nuttallii*. A summary of the flora and plant communities associated with these barrens will be presented and discussed.

KEY WORDS: shale barrens, glades, Ouachita Mountains, rare plants, endemism

(40) A SEASONAL ANALYTICAL APPROACH TO THE STUDY OF MACROINVERTEBRATE COMMUNITIES OF FOUR STREAMS IN NORTHEASTERN OHIO. Alison L. Yasick and Julie A. Wolin. Department of Biological, Geological, and Environmental Sciences, Cleveland State University. [a.yasick@csuohio.edu](mailto:a.yasick@csuohio.edu).

Empirical data collected from macroinvertebrate communities, between watersheds experiencing known differential anthropogenic effects are uncovering a hidden dynamic in stream pollution,

suggesting seasonality fluctuations. The purpose of this study is to address seasonal stream dynamics and to develop seasonal macroinvertebrate analysis techniques to better establish macroinvertebrate diversity. Over a period of two years, four adjacent watersheds, with well-understood human influence, in the Lake Erie drainage were analyzed for macroinvertebrate community diversity and taxonomic richness. To evaluate habitat conditions we used kick net sampling techniques and multivariate analysis of water nutrients and other in-stream abiotic factors. Complete spatial analysis of the collecting sites was acquired through ArcGIS and remotely sensed thematic imaging of the watersheds. Preliminary analyses indicated the statistically significant influence of pH levels, dissolved oxygen levels, and ortho-phosphate levels on the distribution of macroinvertebrate communities. As anticipated, these differences are seasonally dynamic. Seasonal fluctuations can be used as a guide to better equip land managers and planners with predictive models to quantify changes in biological characteristics within a stream, and to develop indices for taxonomic diversity and composition that occur with the implementation of remediation efforts.

KEY WORDS: ArcView, macroinvertebrate, multivariate analysis, remote sensing, seasonal analysis

(77) DELAYED MORTALITY OF EASTERN HARDWOODS AFTER PRESCRIBED FIRE. Daniel A. Yaussy<sup>1</sup>, and Thomas A. Waldrop<sup>2</sup>. <sup>1</sup>Northern Research Station, U.S. Forest Service. [dyaussy@fs.fed.us](mailto:dyaussy@fs.fed.us). <sup>2</sup>Southern Research Station, U.S. Forest Service. [twaldrop@fs.fed.us](mailto:twaldrop@fs.fed.us).

Two sites of the National Fire and Fire Surrogate study are located in hardwood dominated forests: the Southern Appalachians and the Ohio Hills. Increased first-year post-treatment mortality of overstory trees (DBH>4 cm) was expected in the units receiving prescribed fire. What was not expected was that these units displayed increased mortality in trees of all size classes for up to 4 years post-treatment. Survival analysis indicates the likelihood of mortality was related to prior tree health, species, size, bark thickness, and first order fire effects. The Ohio Hills site had significant defoliation in two of the years of this study; however, degree of defoliation did not contribute to mortality in this time period. Prior to treatment, both sites were unmanaged and competition for resources was stressing the trees. The additional stress due to cambial damage caused by the heat of the fires possibly put the trees at greater risk for opportunistic secondary agents of mortality, such as fungal attacks or insect infestations. This study indicates that monitoring the first-year post-treatment effects of a prescribed burn or wildfire may not afford an accurate assessment of the effects on the overstory. The study also suggests that managers should consider tree health when making fire prescriptions for hardwood stands.

KEY WORDS: hardwoods, prescribed fire, mortality, survival analysis

(111) PALEOLIMNOLOGICAL RECORDS OF HUMAN IMPACT ON BASS LAKE, OHIO. Christina Znidarsic<sup>1</sup>, Michelle Canatsey<sup>2</sup>, and Julie Wolin<sup>1</sup>. <sup>1</sup>Biological, Geological, and Environmental Sciences Department, Cleveland State University. [cznidarsic@yahoo.com](mailto:cznidarsic@yahoo.com). <sup>2</sup>Department of Geological and Environmental Sciences, Youngstown State University.

Bass Lake, Geauga County, Ohio was recently acquired by the Geauga Park District. In assessing the lake and its surrounding land-use pressures, we conducted a paleolimnological investigation of recent sediments. We extracted a core in June 2005 and sub-sectioned it into 1 cm intervals. Loss-on-ignition (LOI) analysis was conducted on all samples to determine organic carbon content. Based on carbon content fluctuations, selected intervals were analyzed in the core for fossil diatom assemblages. Correspondence analysis was conducted to determine major changes in diatom assemblages, and changes in diatom-inferred total phosphorous concentrations were calculated from existing nutrient optima data sets. Written historical records were collected to determine possible human impacts and compared with LOI carbon analysis, diatom analysis, and remote sensing analysis of 20<sup>th</sup> century land-use changes. Evidence of

early damming and dredging with recent eutrophication from development is seen in the carbon and diatom record. Diatom assemblages shift from low-pH, low-TP species such as *Eunotia incisa* to higher-pH, higher-TP species like *Stephanodiscus minutulus*. Remote sensing results show a transition from heavy agricultural use in the watershed during the 1950's to reforestation and increased development in the past decade. 1 cm sub-samples of another core have been dried and are currently being prepared for extraction of Pb<sup>210</sup> dates to further evaluate anthropogenic changes in Bass Lake. Future work includes extracting the entire sediment record to investigate Holocene climate variation in Bass Lake and the surrounding Lake Erie watershed, and refining the remote sensing information to return quantitative land use data.

KEY WORDS: diatoms, paleolimnology, remote sensing, land use, anthropogenic impact