

Note to Poster Presenters: Please hang your posters prior to the Poster Session in the space provided for your specific theme in the Guggenheim Pavilion. We recommend doing so during Thursday lunch or dinner.

Odum Conference Poster Abstracts

Poster Session, Thursday, April 30, 7:00 – 10:00pm

Guggenheim Pavilion

**indicates presenting author*

Theme A: Invasive species management activities that incorporate a dynamic aspect

Cassano, John; Alvey, Rob* – ¹Garden City High School; ²US EPA and Garden City Bird Sanctuary

Making sump-thing happen: Eradication research on Japanese knotweed

Nassau County Storm Water Storage Basin #232 in Garden City, Long Island, is a 9-acre "sump" established as a pilot site with the Nassau County Department of Public Works to demonstrate the "Dual Use" potential between local communities and the County. This permits use of many of Nassau County's 600 basins as passive parks, recreational fields and nature preserves while maintaining their original function to drain streets and roads. The site, renamed the Garden City Bird Sanctuary has been re-landscaped as a community nature preserve and bird sanctuary for educational and environmental stewardship programs. All maintenance is conducted through voluntary community services.

After an inventory identified extensive areas of alien exotic invasive plants, an Agreement of Understanding was signed with the Long Island Weed Management Task Force. Efforts to eliminate *Ailanthus*, Oriental bittersweet, and Norway maple continue. One innovative program for researching eradication of Japanese knotweed was initiated through the efforts of John Cassano, a student at Garden City High School. Under the direction of Rob Alvey, the student designed a Boy Scout Eagle project to map and test methods to control or eradicate Japanese knotweed. Four areas were staked out in the spring of 2008. Once the areas were cut, an area was designated the control area. A second parcel was repeatedly cut, a third blanketed, and a fourth parcel was treated with either Roundup or vinegar. The parcels were monitored during the year and the effectiveness of the treatments assessed. The success of the research program enabled John to successfully complete his Eagle project and also participate in the 2009 Long Island Science and Engineering Fair through his high school science program. The effectiveness of blanketing has led to the expansion of eradication efforts at other storm water basins on Long Island.

Kiviat, Erik* – Hudsonia Ltd

Dynamic, goal-directed, site-specific management of *Phragmites*

Habitat functions and other ecosystem services provided by *Phragmites australis* in North America vary in space and time. Animals and plants associated with *Phragmites*-dominated vegetation (reedbeds) may be diverse and include species of conservation concern depending on the local environment and the architecture of the vegetation. For example, extensive dense reedbeds in coastal marshes are used by breeding northern harriers; impounded standing water reedbeds interspersed with shallow pools support diverse breeding marsh and water birds; small dense reedbeds in freshwater tidal marshes attract ten species of roosting songbirds in large numbers; several rare vascular plants occur in reedbed edges or in sparse reedbeds; reedbeds are used by mammals, birds, snakes, fishes, butterflies, and odonates for foraging, food, escape cover, thermoregulation, flood refuge, and display perches. Taxon, life stage, geographic area, livestock grazing, and habitat structure affect the biota of reedbeds. Habitat structure includes patch size, edge vs.

interior, admixture of other plant species (e.g., shrubs, vines), interspersions with other communities, hydroperiod, soils, and salinity. Goal-directed and site-specific management of reedbeds should be an optimization process to improve habitat while providing nutrient removal, soil stabilization, carbon sequestration, and products. Management may include eradication, containment, partial removal of biomass, and planting other species to diversify the reedbeds, in order to achieve the locally desired goals. This dynamic approach may be applicable to other abundant, long-present invasive plants.

Kleppel, Gary S. *; LaBarge, Erin – University at Albany, SUNY

Ecosystem-based targeted grazing and the control of *Lythrum salicaria* in wet meadows: Establishing a dynamic relationship between ovine herbivores and the plant community

Control of *Lythrum salicaria* (purple loosestrife) by mechanical means and herbicides has been marginally effective at best, as this Eurasian import has become ubiquitous throughout the Northeast, much of the Midwest and the Northwest. Recent attempts at control with insects have been promising. We report here on a protocol to control the spread of *L. salicaria* and potentially restore native plant biodiversity in wet meadows using the ecosystem-based, targeted grazing – deployment of carefully selected ovine breeds into an invaded landscape in ways that mimic the biomass and temporal distributions of large, wild herbivores. The study was performed between June 16 and August 3, 2008, in a wet meadow, on an agricultural landscape in East Berne, NY, that is heavily invaded by *L. salicaria*. Romney sheep were moved, at 3-d intervals, through a system of four, 200 m² paddocks, bounded by movable electrical fencing. The ovine biomass was 3 times the biomass equivalent, i.e., 3 tons acre⁻¹, used in conventional livestock grazing operations. Comparisons were made to ungrazed controls. The grazed sites had lower median plant canopy and lower *L. salicaria* flower density than controls. Numbers of *L. salicaria* stems, however, increased. The increase in stems appears generally not to be due to vegetative spreading as median proportional cover by *L. salicaria* decreased by 221.3% in the grazed paddocks, as opposed to an increase of 1.7% in the controls. Recovery of native plant species was also observed.

Schwartzberg, Lora ^{1*}; Montgomery, Michael E ²; McDonald, Richard ³ – (1) Department of Biology, SUNY New Paltz; (2) US Forest Service, Northern Research Station; (3) Symbiont

A preliminary study of the biology of *Scymnus (Pullus) coniferarum* Crotch 1874 (Coleoptera: Coccinellidae), an adelgid predator native to the western United States and a potential biocontrol for *Adelges tsugae*

The conifer lady beetle, *Scymnus coniferarum*, is widely distributed in the western United States. More than 200 specimens were collected from adelgid infested hemlock in the Seattle, Washington, vicinity to establish a laboratory colony for evaluation and assess its potential for biocontrol of *Adelges tsugae*, hemlock woolly adelgid (HWA), widely distributed in the eastern U.S. The developmental and reproductive biology of *S. coniferarum* have been examined in the laboratory. Its host range remains to be evaluated. *Scymnus coniferarum* fed readily on HWA, laid eggs on HWA infested foliage, and its larva completed development on HWA, confirming that HWA is a suitable host for *S. coniferarum*. During a 24 hr test period *S. coniferarum* consumed a mean of 8.6 eggs, 2.8 nymphs, and 1.0 adult adelgids. From egg to adult took an average of 34 days at 20° C, photoperiod 14:10 (L: D) h, and 70-99% humidity. Fourteen percent of 102 eggs developed into adults. Based on this preliminary study of the biology of *S. coniferarum*, it appears to be a promising candidate for biological control of *A. tsugae*. Due to the wide range of the host, prey, and predator, global warming/climate change may have only a minor impact on this dynamic association.

Theme B: Basic research on dynamic aspects of invasions

Adams, David*; Roblee, Kenneth; Stone, Ward – NYS DEC Office of Invasive Species Coordination

NYS waterbird mortality as a result of Type E botulism and nonnative invasive species

Periodic waterbird mortality, due to type E botulism (*Clostridium botulinum*) intoxication, has been documented on the Great Lakes since the 1960s. The most recent series of events are unique in that they appear to be linked to population increases of two nonnative invasive species, the quagga mussel (*Dreissena bugensis*) and the round goby (*Neogobius melanostomus*).

The first documented mortality in New York State occurred in the eastern basin of Lake Erie November 2000. To monitor impacts on waterbirds, thirteen 500-meter shoreline transects were established and monitored weekly. Surveys were repeated during fall 2001 through 2008. By extrapolation we estimate that up to 5415, 2862, 17301, 3008, 5943, 2297, 4375, 8915 and 2005 waterbirds may have died.

In an effort to detect increases in the geographic extent of these annual mortality events, forty-seven 500-meter transects were placed at five mile intervals along the Lake Ontario shoreline during 2002. These transects were monitored weekly during the peak of Common Loon (*Gavia immer*) migration 2002-2008. By extrapolation we estimate that up to 1046, 1529, 1693, 1193, 4933, 3650 and 1628 waterbirds may have perished.

The waterbird species with the greatest mortality differed for the 2000-02 mortality events. Redbreasted Merganser (*Mergus serrator*) had a predicted mortality of 2479 in 2000, Common Loon 1149 during 2001, and Long-tailed Duck (*Clangula hyemalis*) 13219 in 2002. Common Loon experienced the greatest mortality during the 2003-8 events, ranging from 1656 to 10040.

Allen, Jenica M ^{*1}; Ibáñez, Inés ², Wilson, Adam M ¹; Treanor, Sarah A ¹; Silander, John A ¹ – (1) University of Connecticut; (2) University of Michigan

Identifying hot spots of plant species invasions and assessing foci of further spread

Invasive species are a global ecological and economic issue, making inference on where to target early control and eradication efforts critical. We aimed to forecast hotspots of invasion in terms of invasive species richness and high abundance of particular species by combining climate, land-use/land-cover (LULC), and habitat information in spatially-explicit hierarchical Bayesian models. Species occurrence and abundance data were derived from the Invasive Plant Atlas of New England (IPANE), demonstrating the potential for fruitful collaborations between researchers, citizen scientists, and resource managers. Species-specific analyses included prominent plant invaders in New England: *Berberis thunbergii* (Japanese barberry), *Celastrus orbiculatus* (Oriental bittersweet), *Elaeagnus umbellata* (autumn olive), *Euonymus alata* (burning bush), and *Rosa multiflora* (multiflora rose). Projections were made using two future climate models (CCSM3 and UKMO-HadCM3) in addition to current climate.

Both the richness and abundance models indicate that climate variables were most influential in determining the incidence or cover of invasives, followed by site and LULC variables. Invasive species richness was higher in warmer areas with lower annual and highly seasonally variable precipitation. Edge habitats increased and evergreen forest and cropland LULC decreased invasive richness. The abundance analysis showed differences in the direction and magnitude of the effect of each predictive variable among the five species, demonstrating the need for both synthetic and species-specific approaches to prediction and management. Model predictions suggest that all species, except *E.umbellata*, may

be more abundant relative to current climate under moderate predictions (CCSM3), but that their incidence may be reduced under extreme climate predictions (HadCM3).

Allstadt, Andrew*^{*}; O'Malley, L; Kozma, B; Korniss, G; Racz, Z; Caraco, T; Newman, J – University at Albany, SUNY

Velocity and roughening of an invasive front

After establishment, many exotic species expand into the surrounding environment through local propagation, spreading as a discernable invasive front. We model this spatial advance as an individual-based, stochastic process in two dimensions, where an invasive and a resident species compete preemptively for resources. Initially, the species are separated by a linear front; the invader's subsequent advance is governed by local dispersal and mortality events in both species. At early times, correlations in the position of leading invasive individuals develop over short distances. As the front continues to advance, the length of these correlations grows until they extend over the entire front. Velocity of the front and variance about the average front position grow with correlation length, and reach their asymptotic values as the correlation length spans the front. Consequently both asymptotic velocity and front variance exhibit specific scaling relationships with the front length, regardless of the detailed propagation and mortality processes. These relationships also suggest this ecological model belongs to the Kardar-Parisi-Zhang (KPZ) universality class; a set of spatial-growth models sharing common scaling properties. Other KPZ systems include the advance of wildfires, spatial epidemic spread, and the Eden model of tumor growth. Given that ecological invasion with local dispersal belongs to this universality class, we can specify the probability distribution of the most advanced invader, the "front runner." We shall test hypotheses related to the length of an invasive front with a field experiment, using grass and clover as a model system.

Averill, Kristine M*¹; DiTommaso, Antonio¹; Mohler, Charles L¹; Milbrath, Lindsey R² – (1) Cornell University; (2) USDA-ARS Robert W. Holley Center for Agriculture and Health

Generating biological data on the invasive swallow-worts (*Vincetoxicum* spp.) to better inform their management using biocontrol

Pale and black swallow-wort (*Vincetoxicum rossicum* and *V. nigrum*, respectively) are nonnative, perennial, herbaceous vines in the Apocynaceae. The species are becoming increasingly problematic in the northeastern United States and southeastern Canada and management of the species has been challenging. A classical biological control program was initiated in 2004 by the USDA-ARS. Success of this biological control effort depends on the availability of plant demographic data, which can be modeled to determine which swallow-wort life stage(s) are likely to be most susceptible to control efforts. Since little is known about the establishment phase of swallow-wort's life cycle, we conducted a field experiment in central New York State to determine establishment and survival during the first two years after sowing.

We sowed pale swallow-wort seeds in two old-fields subjected to four disturbance regimens. We hypothesized that establishment and survival would be greater in treatments with greater disturbance. At the better-drained site, overall swallow-wort establishment was 15(1)% and did not differ between treatments. At the poorly-drained site, establishment varied by treatment; mowed and control plots had greater swallow-wort establishment (10(2)%) than herbicide+tillage and herbicide plots (1.6(0.5)%). Of emerging seedlings, survival was high at both sites (70–84%). At both sites, swallow-wort total (above- and below-ground) biomass was greater in herbicide + tillage and herbicide plots than in mowed and control plots. These results indicate that pale swallow-wort establishment and survival is successful across a range of disturbance regimens and that growth is greater in more disturbed regimens. Biocontrol implications will be discussed.

Chang, Cynthia*; Smith, Melinda – Yale University

Different levels of diversity have varying impacts on invasion resistance and productivity of tallgrass prairie

Native community diversity has historically been thought to play a central role in invasion resistance by increasing interspecific trait variation. Trait variation also occurs at the intraspecific level, where phenotypic and/or genotypic diversity could confer invasion resistance via the same mechanisms. Genotypic variation within a dominant species may account for overall phenotypic trait variation within a given community, and thus may play a central role in determining invasion resistance. We conducted our study in 66 1-m² plots located in intact tallgrass prairie. For each plot, we measured the genotypic and corresponding phenotypic variation of dominant C₄ grass individuals (*Andropogon gerardii*) and plant community diversity. Establishment and persistence of added invasive grass seeds (*A. bladhii*) was monitored. Finally, we measured resource (nitrogen, water and light) availability. Multiple regression analyses found early-season soil moisture content and end of season individual biomass of the dominant species to be significantly related to invasion success (both early and late season). Genotype variation of *A. gerardii* was also significantly related to late season persistence of the invasive grass. This suggests that both resource availability and genotypic variation within a dominant species are important drivers in invasion resistance. Furthermore, genotypic and phenotypic variation are positively correlated which suggests that phenotypic trait variation in a dominant species could be one key mechanism driving invasion resistance. Finally, community diversity was not found to be significantly related to invasion, suggesting that it is population level diversity of the dominant species that plays an important role in tallgrass prairie under invasion.

Cohen, Jillian S*¹; Maerz, John C²; Blossey, Bernd¹ – (1) Cornell University; (2) University of Georgia

It's not where you're from, it's who you are that counts: Plant traits determine impacts on larval amphibians

Plant detritus is the primary energy source in freshwater benthic food webs. Theory suggests that plant invasions can affect consumers by changing the quality of the detrital pool, but empirical evidence for this is lacking. Tadpoles, a dominant wetland consumer, may be particularly responsive to shifts in litter quality, as they feed largely on detrital biofilms. I conducted two experiments to evaluate the impacts of invasive plant litter on tadpoles. For each experiment, I hypothesized that litter quality, including C:N, C:P, N:P, and phenolic content, would determine tadpole productivity. First, I conducted a field experiment involving four native and five invasive plant species at five wetland complexes in central New York. I installed field cages in sites dominated by a single species of each plant and added three tadpole species according to their natural phenology. I monitored cages regularly, collecting and weighing all metamorphosed individuals as they became available. Importantly, my data shows that tadpole performance did not differ in habitats dominated by native and invasive plants. Rather, my findings suggest that plant traits, irrespective of plant origin, determine amphibian performance. For my second experiment, I raised tadpoles in mesocosms containing litter from 15 populations of a single invasive species that varied widely in litter quality. Similar to my first experiment, litter traits explained much of the observed variation in tadpole productivity. These experiments show that litter quality strongly influences tadpole performance and suggest that functional traits, irrespective of species origin or identity, can have important consequences for ecosystem function.

Collins, Rachel J*; Bankert, Christina A; Gibson, Zach M; Patel, Devki G; Smith, Adrienne M – Roanoke College

Facilitation or apparent facilitation? Patterns of invasive plant and exotic earthworm abundances in Southwestern Virginia

Non-native species pose serious threats to native communities and are a top cause for species endangerment worldwide. Two important approaches to understanding these threats include assessing (1) the causes of invasion, and

(2) the effect of invasions. We used both approaches in studying the effects of two invasive plant species (Asian stilt grass (*Microstegium vimineum*) and garlic mustard (*Alliaria petiolata*) and exotic earthworm communities in forest in Southwestern Virginia. We surveyed plant and earthworm communities in eight forests in 2007 and 2008. These sites ranged from small suburban fragments (<10 ha) to large nature reserves (5,100 ha). After two years of sampling, earthworm communities in our study sites appear to be comprised solely of exotic species. We found positive correlations between exotic earthworm richness and the abundances of exotic plant species and vines (multiple regression; $r^2 = 0.97$; $P < 0.5$; $n = 7$). Further, exotic plant species richness was greater within areas of dense *M. vimineum* and *A. petiolata* populations compared to areas without invasive plant species (two sample t-test; $t = 2.69$; $P < 0.05$; $df = 19$). Lastly, we found a negative correlation between native plant species richness and invasive plant species abundance (linear regression; $r^2 = 18.3$, $P < 0.05$, $N = 24$). Taken together, our results suggest that invasive plants and exotic earthworms may facilitate each other similar to the Invasion Meltdown mechanism and our sites seem to exhibit Biotic Resistance where high native species richness inhibits invasions.

Farrer, Emily C*; Goldberg, Deborah E – University of Michigan

Mechanisms and reversibility of effects of hybrid cattail on native wetlands

Most invasive plants negatively affect the native communities they invade. However, invasives can affect natives via different mechanisms, and distinguishing among them is essential for understanding the dynamics of invasions and for directing management strategies. Two common mechanisms of invasive plant effect are direct competition and alteration of the environment. We tested this in a Great Lakes marsh invaded by *Typha x glauca* (hybrid cattail), which produces monodominant stands with considerable litter accumulation. We teased apart the effects of live *T. x glauca* vs. its litter on the environment and plant community with a live/litter transplant experiment. We also tested whether these effects were reversible by a live/litter removal experiment in the *Typha* stand. Over four years, both transplanted litter and live *T. x glauca* increased soil inorganic nitrogen, but only litter decreased light. Litter had a much stronger effect on the plant community, decreasing native diversity and abundance and changing community composition to a more terrestrial species assemblage. Removal of litter and live *T. x glauca* had no effect on soil nutrients, but litter removal greatly increased light. Litter removal resulted in a greater increase in native diversity and abundance than removal of live *T. x glauca*; however it did not restore native marsh species, but rather recruited more terrestrial grasses and forbs. These results suggest that *T. x glauca* affects native plants by altering the environment by litter accumulation; however, removal of aboveground litter will not restore wetland communities because altered soil conditions favor colonization by terrestrial plants.

Giencke, Lisa M*; Dovčiak, Martin; Mitchell, Myron J – SUNY College of Environmental Science and Forestry

Spatial dynamics and effects of beech bark disease on an Adirondack forest

American beech (*Fagus grandifolia*), a major forest tree species in the Northeastern U.S., has been increasingly infected throughout its range by beech bark disease (BBD), which is caused by a non-native insect scale (*Cryptococcus fagisuga*) and fungal pathogens (non-native *Neonectria coccinea* var. *faginata* or native *N. galligena*). Although BBD can considerably affect forest ecosystem structure and function, our understanding of disease spatial dynamics in infected stands and its effects on tree recruitment is rudimentary. We studied spatial patterns of insect scale, canker and tree recruitment using historical stem maps from a ~2 ha plot in a mature northern hardwood forest in the central Adirondacks. Species, diameter at breast height (DBH) and spatial location of all trees (with DBH > 5 cm) in the plot were recorded in 1985 and 2000. Percentage of each beech stem infected by scale and canker was recorded in 2000. We analyzed spatial patterns of infected beech trees and tree recruitment using Ripley's K-function. Almost 80% of small beech trees (DBH < 10 cm) were not infected by canker but about half were already attacked by scale in a spatially patchy fashion. The majority of larger beech trees were attacked by scale and canker; attack severity appeared

correlated to distance from a heavily infested stand section. Despite increased mortality, beech abundance increased from 1985 to 2000; dead beech trees were positively associated with live beech recruits (but negatively with uncantered recruits). Thus, BBD can lead to continuous presence of low quality beech stands.

Jiang, Hao; Zimmerer, Edward; Liu, Dongjiao; He, Kate* – Murray State University

Using molecular markers to study the patterns of genotypic diversity of an invasive plant, alligator weed (*Alternanthera philoxeroides*) in southeastern US

Alligator weed (*Alternanthera philoxeroides*) is a successful invader native to South America. It has invaded all continents except Africa and Europe. In spite of its serious invasiveness all over the globe, alligator weed has been rarely studied in terms of its invasion mechanisms. It is even more surprising that knowledge on the relationships between its genetic variation and invasiveness is still very limited. This project attempts to uncover the mechanisms of alligator weed invasion using molecular markers to examine the patterns of genotypic variation of this successful invader. The analysis of genetic variation was carried out using Inter-Simple Sequence Repeat markers (ISSRs) on plant samples collected from three states in the southeastern US. The molecular evidence indicates that there is genetic variation in alligator weed populations. The results of this study suggest that genetic variation is closely related to the history of species introduction. Moreover, high genetic variation found in alligator weed populations contributes to its invasion success.

Jones, Chad C* – Connecticut College

Habitat distribution models poorly predict future occurrences of two invasive species

Habitat distribution models are increasingly used to predict the potential distribution of invasive species. If successful, these models can help managers target limited resources for monitoring and controlling invasive species to areas where the species are most likely to occur. The accuracy of these models is usually determined based on the current species distribution. However, because invasive species are not at equilibrium with the environment, models that accurately predict current distributions of invasive species may not be effective at predicting future distributions. I used data on the 1982 distributions of two invasive species, *Celastrus orbiculatus* and *Rosa multiflora*, in a natural area in southeastern Connecticut to create habitat distribution models using logistic regression. I then assessed how well these models predicted the distributions of the two species in 1982, 1992 and 2002. Overall model accuracy for *Celastrus* was high in 1982 and 1992 but declined in 2002. In addition, the ability of models to accurately predict new occurrences declined dramatically from 98% in 1982 to 76% in 1992 and only 27% in 2002. Models for *Rosa* followed a similar trend although predictive accuracy only dropped from 92% in 1982 to 61% in 2002. Both species have begun to invade types of habitats not invaded in 1982. These results suggest that measures of model accuracy from the time that model is developed are not good determinants of the ability of models to predict future occurrences. Thus habitat distribution models for invasive species must be used with great care.

Knight, Kathleen S*; Long, Robert P; Rebbeck, Joanne; Herms, Daniel A; Cardina, John; Herms, Catherine P; Klooster, Wendy; Gandhi, Kamal JK; Smith, Annemarie; Costilow, Kyle; Long, Lawrence; Smith, Stephanie K; Cappaert, David L – US Forest Service, Northern Research Station

Effects of emerald ash borer (*Agrilus planipennis*) on forest ecosystems in North America

Emerald ash borer (EAB) (*Agrilus planipennis*), a recently introduced beetle, has killed millions of ash (*Fraxinus spp.*) trees in North America. In over 250 monitoring plots in forests in Ohio and Michigan, representing a gradient of EAB infestation duration, we are monitoring the decline and mortality of thousands of ash trees, the responses of both native and invasive plant species, changes in species composition and forest structure, and effects on other organisms and ecosystem processes. The plots are located in forest stands of different ages and in different habitats to include all

five ash tree species native to the region (*F. Americana*, *F. pennsylvanica*, *F. nigra*, *F. profunda*, and *F. quadrangulata*). Mortality of mature ash trees in a forest stand may reach 98% within six years of infestation by EAB, and is not affected by habitat or by the density, basal area, or species composition of ash trees. Invasive plant species are present, but not dominant, in most plots, with individual species distributions related to habitat, geography, and land use history. These plants may increase in abundance due to canopy gaps that result from ash mortality. EAB may dynamically interact with other species in these forest ecosystems. Woodpecker feeding behavior changes as woodpeckers take advantage of the abundant food source that EAB represents. Native parasitoid wasp species have been observed parasitizing EAB. We will continue to monitor these changing forest ecosystems as the effects of EAB reverberate through them.

Liu, Dongjiao*; Jiang, Hao; Zhang, Robin ; He, Kate – Murray State University

Predicting the spatial distribution of an invasive plant, *Lonicera japonica*, based on species occurrence data from two watersheds in Western KY and TN

The invasion of alien plants has serious ecological and economic consequences. Geographic factors including human disturbances and habitat characteristics such as land cover, terrain, water and soils play an important role in plant invasion. However, the spatial distribution of most invasive plants is poorly documented, the path of dissemination is sketchy and the mechanism of spatial dispersal is mostly unclear. This project examines and compares the spatial distribution of a successful invasive plant, Japanese honeysuckle (*Lonicera japonica*), in two watersheds of similar size but ecologically distinct in Western Kentucky (Ledbetter Creek) and Western Tennessee (Panther Creek). The occurrence data of Japanese honeysuckle and nine environmental variables were collected and measured from a total of 283 random plots at the two watersheds. A spatial logistic regression model was developed to identify the factors that contribute most to the spread of this invasive plant. Our results show that the spatial distribution of this invasive plant appears to be different at the two watersheds. The Ledbetter Creek watershed with heavier anthropogenic disturbances has a greater distribution of Japanese honeysuckle than the forested Panther Creek Watershed. The spatial regression model indicates that the distance from the main road, soil moisture, light intensity, and plant species richness of each plot were significantly correlated with the spatial distribution of invasive species at the Ledbetter Creek Watershed. However, elevation was the only significant factor in relation to the spatial distribution of Japanese honeysuckle at the Panther Creek Watershed. Furthermore, our results suggest that the invasion risk is strongly linked to anthropogenic disturbances.

Molofsky, Jane*; Collins, A Robin – University of Vermont

Evolution of range margins in invasive species

The study of invasive species at their current range margin and beyond can provide information on the likely distributional limits of the invasive species and its response to changing climate. In this study, we planted individuals of the invasive grass *Phalaris arundinacea* taken from its native range in Europe and its introduced range in the United States into common gardens along a climatic gradient to determine whether individuals are locally adapted to the current climate regime and whether they have the potential to evolve with changing climate. Native genotypes collected from the center (Czech Republic) and their range margin (France) and introduced genotypes collected from the center (Vermont) and the current range margin (North Carolina) were grown in identical common gardens in Vermont, North Carolina, Georgia and Florida. Survivorship declined sharply along this climatic gradient with no individuals surviving in Florida; there were no significant differences in survivorship between native and invasive genotypes. For tiller number and biomass, there were few significant differences among populations in their mean performance within a single garden; furthermore, there was no evidence for local adaptation of individuals to a particular climatic region. In North Carolina, both the French and North Carolina genotypes exhibited higher heritability for tiller number and biomass than the Czech Republic and Vermont genotypes. Thus, genotypes from climatically similar regions had higher

evolutionary potential than those that came from climatically dissimilar regions. However, at the climatic extremes of Vermont and Georgia, we found that invasive North Carolina genotypes had significantly higher heritability than the native French genotypes.

Mooney, Emily H* ; Morrissey, Danielle – Massachusetts College of Liberal Arts

Population variation in herbivory-related traits in Japanese knotweed, *Fallopia japonica*

Japanese knotweed, *Fallopia japonica*, is a non-native, invasive species throughout Europe and the United States. Our research focused on understanding how herbivory-related traits vary among populations of *F. japonica*. Plants were propagated from rhizomes obtained from three distinct populations. We used *Spodoptera exigua* larvae in a bioassay to assess variation among these population sources. Larvae were allowed to feed on plants for 72 hours, after which we measured the leaf area consumed by larvae and the weight gain by larvae. In addition, we assessed plants response to herbivory by measuring chlorophyll fluorescence. While weight gain by the larvae did not vary among population sources, there was evidence that response to herbivory varied among population sources. Specifically, chlorophyll fluorescence increased following herbivory, but the extent of increase varied among population sources. We are currently analyzing leaf area data, so that we can test for differences in conversion efficiency among larvae feeding on plants from different populations sources.

O'Donnell, Kelly L* ; Pigliucci, Massimo – Stony Brook University

Selection dynamics of native and invasive annual *Polygonum* species

The ability to evolve rapidly is often implicated in discussions of what makes invasive plant species invasive. However, we are often lacking knowledge of which traits are under selection during an invasion. Plant invasions represent natural experiments that allow us to both explore the dynamics of natural selection in the wild and examine the evolution of an invader on contemporary time scales. We conducted a study of 10 natural populations of two invasive species (*Persicaria lapathifolia* and *P. cespitosa*) and one native species (*P. pensylvanica*) to quantify the amount of natural selection acting on these species to compare the selection dynamics to which each is exposed. We also conducted a germination trial to compare the potential for invasion determined by germination rate. A Lande-Arnold style multiple regression selection analysis was performed on five morphological traits (height, stem diameter, leaf number, leaf shape, and leaf area) using flower number as our fitness proxy. Most selection was indirect and caused by correlations with other traits under selection. However, there was significant direct selection for increased leaf number in both natives and invasives and thicker stems in just the invasives. The germination test showed that not only do the invasive plants have a significantly higher germination rate (>60% compared to 3%), but they also germinate significantly faster; both findings have large implications for the ability of these two invasives to spread. Another field season would need to be conducted to examine how each species is responding to their set of selection pressures.

Pinder, Rebecca A^{1*}; Groffman, Peter M²; Robinson, George R¹ – (1) University at Albany, SUNY; (2) Cary Institute of Ecosystem Studies

Streamside interactions between salamanders, earthworms and soil nitrogen cycle processes

In North American forests, exotic earthworms are expanding their ranges into forests that were previously earthworm free. Earthworms can disrupt native forests by altering understory plant composition, consuming large amounts of leaf litter, mixing soil layers, and altering nutrient dynamics. The main objective of this study was to determine if quantity and diversity of earthworms and salamanders along stream banks are associated with differences in nitrogen cycling in these soils, focusing, in particular, on assessing the rates of nitrification, mineralization and denitrification along the stream bank. Soil samples were collected from stream banks in the Adirondack, Catskill and Helderberg regions of New

York State where salamander and earthworm abundances, level of co-occurrence, and diversity were measured. Nitrification, mineralization and denitrification rates were compared across 16 streams. Potential denitrification rates were determined using a denitrification enzyme assay, while potential nitrification and mineralization rates were determined using laboratory incubations. There was a positive, though not significant, relationship between denitrification potential and the number of earthworms encountered. There was no significant relationship between nitrification and mineralization rates and abundances of earthworms or salamanders. As some earthworm species are thought to exert more of an effect on nitrogen cycle processes than others, further analysis will be done on a species by species basis (1237 earthworms were collected for identification and 1138 salamanders were identified to species in situ). Future work will focus on designing controlled experiments to further examine how earthworms and salamander interactions affect nitrogen cycling along the stream edge.

Rauschert, Emily*; Mortensen, David – The Pennsylvania State University

Quantifying the role of roads and road maintenance in the spread of an invasive plant, *Microstegium vimineum*

Preventing the spread of invasive species into new areas is seen as a critical for management, as eradication is often difficult, if not impossible, once populations are well established. The importance of human activity for the spread of invasive plants has long been recognized, but quantification of the impact of the vectors involved is lacking. We present a conceptual framework and ongoing experiments to understand the rapid spread of the invasive exotic *Microstegium vimineum* (Japanese stiltgrass). Detailed small-scale experiments provide the data to model the natural spread of *Microstegium*, which is several orders of magnitude slower than actual large-scale observations. Spread in roadside habitats, although variable, was found to be greater than in forested or wetland habitats. Forested roads, along which *Microstegium* grows abundantly, are often unpaved and are subject to frequent maintenance activities such as road grading. Experiments using seed proxies document the potential of road grading to rapidly spread seeds throughout road networks. We also investigate the role of road structures such as culverts in facilitating invasion into the forest interior. These results highlight the need to limit human-mediated spread when managing invasive species.

Rollinson, E*; Ness, JH – Skidmore College

Exotic plant species experience less herbivory than natives in a phylogenetically controlled survey

Enemy release is one mechanism by which exotic species may spread and become invasive. The enemy release hypothesis proposes that introduced plant species leave co-evolved natural enemies behind in their native ranges and, as a result, experience reduced herbivory and pathogen loads in their introduced range. This reduction in natural enemies may facilitate invasions of exotic plants if they experience lower levels of herbivory than native plant species. We compared herbivory on native and exotic plant species that naturally co-occur in riparian and forest habitats in Saratoga County, NY. We monitored a total of 43 plant species (26 native and 17 exotic; average 9 ± 4 individuals per species) in 30 families. Differences in herbivory between exotic and native species may be confounded by phylogenetic relationships among species in either of these categories; using taxonomically paired exotic and native species controls for these common ancestry effects. Therefore, we both directly compared native and exotic species, and compared them within taxonomically controlled groups. Exotic species had significantly lower levels of herbivory than did native species; this result remained when only taxonomically-controlled groups of species were compared. Our results suggest that observations of reduced herbivory in exotic species is truly a result of their introduced status, rather than an artifact of any common ancestry among exotic species. This enemy release may be an important mechanism of biological invasions.

Consequences of riparian invasion for in-stream food webs and litter processing

Small streams are often powered by energy and other resources delivered by senescing leaves falling from riparian vegetation. We tested the hypothesis that invasions of riparian zones by Japanese knotweed (*Fallopia japonica*) alter the development of in-stream food webs. We used 0.1m² buckets to collect dehiscing leaves along a transect that included invaded and non-invaded riparian habitat abutting Kayaderosseras Creek, NY. We weighed the leaves that fell weekly from 21 Sept to 25 Nov, 2008. Owing to among-species differences in leaf-fall phenology (median loss prior to Oct 14 for *Populus*, *Acer*, *Rhamnus*, *Tilia* and *Ulmus* spp, Oct 28 for *Quercus* spp and Nov 4 for *Fallopia*), leaves in knotweed-invaded microsites entered streams later in the autumn. We created leaf-packs that mimicked the changing composition of in-stream litter derived from these two habitats, systematically adding leaf material to leaf packs and collecting a sub-sample of the leaf-packs five times over a 40 day interval. We demonstrated that litter from invaded microsites was processed more slowly over a given time interval and also found differences in macro-invertebrate community composition, with higher diversity and lower Plecoptera representation in the invaded leaf-packs. We attribute these differences to the combined effects of differences in leaf quality, leaf age, and progressively falling water temperatures when late autumn leaves, such as knotweed, enter the stream.

Wildova, Radka*¹²³; Goldberg, Deborah¹ – (1) University of Michigan; (2) Institute of Botany, Academy of Sciences of the Czech Republic; (3) Ecological Research Institute

Exotic and native cattails and their hybrid in North America: Implications for understanding cattail invasions

We examined the ecology of invasions of northern Michigan wetlands by the European cattail, *Typha angustifolia*, and its hybrid, *T. x glauca*, with native *T. latifolia*. Little is known about wetland characteristics affecting invasibility, the mechanisms by which *T. angustifolia* or *T. x glauca* invades, or whether either displaces *T. latifolia*. Surveys revealed *T. angustifolia* was more abundant in unshaded, densely-vegetated wetlands on sandy soils, while *T. latifolia* was better represented at sites with exposed organic soils, standing water, and tree shading. The hybrid was restricted to unshaded sites with fine textured soils. However, all three parent taxa did have some habitat overlap. Two experiments revealed responses to environmental conditions consistent with these patterns. In a common garden experiment, low soil organic matter (SOM) decreased the growth of *T. latifolia* and the hybrid, but not that of *T. angustifolia*. In contrast, low light decreased the growth of *T. angustifolia* and the hybrid, but not of *T. latifolia*. The hybrid had higher growth than both parents only when both SOM and light were high. However, in a four year field experiment in which all three taxa were transplanted to a marsh with sandy soil, low SOM and high light, both survival and productivity of the hybrid were consistently higher than both parents despite these oligotrophic conditions. Our results suggest differing growth responses to soil texture, organic matter, and light can enable invasion by both the non-native and hybrid taxa into wetland habitats that would be unoccupied by the native species, and that degree of eutrophication is not the key variable triggering invasion.

Theme C: Invasive species monitoring and database initiatives

del Puerto, Marcelo*; Van Vranken, Sandra*; Crocoll, Scott – Division of Fish, Wildlife, and Marine Resources, NYS Department of Environmental Conservation (NYSDEC)

Invasive species hunting in NYSDEC Wildlife Management Areas

Wildlife Management Areas (WMAs) are state owned lands which are set aside for the production and appreciation of fish and wildlife. The abundance of invasive species in WMAs can diminish the wildlife and recreational values of these lands. The first step towards developing an invasive species control and management strategy is to carefully assess the presence, abundance, distribution and location of invasive species. In the summer of 2008 two undergraduate interns searched for and mapped the locations of several terrestrial and aquatic invasive species at 17 WMAs located throughout Albany, Clinton, Essex, Saratoga, Schoharie and Washington counties of New York State. The interns were trained to identify over 30 common invasives and their similar look-alikes and to input this information onto hand-held GPS units. Location, habitat type, plant identification and other pertinent data were recorded for each occurrence.

Unable to survey every square foot, interns concentrated efforts on common invasion and dispersal corridors within the WMAs. These data sets were then used to create maps in ArcGIS, which show the location of every invasive species occurrence recorded. Future goals are to continue monitoring these WMAs for changes in distribution and expand monitoring efforts to more WMAs across the state. With this information decisions can be made as to where eradication efforts are needed most.

Losey, John*; Allee, Leslie; Smyth, Rebecca – Cornell University

Lost Ladybug Project

Over the past twenty years several native ladybeetle species including *Coccinella novemnotata* (the nine-spotted ladybeetle) that were once very common in the Northeast have become extremely rare. During this same time several species of exotic ladybeetles especially *Coccinella septempunctata* and *Harmonia axyridis* have greatly increased both their numbers and range. In many areas exotic ladybeetle species are now dominant. This shift has happened so quickly that concerns have been raised regarding the ability of exotic species to regulate herbivore populations in managed and natural systems as effectively as our familiar native species always have. Here we present data on the decline of native ladybeetles in the Northeast and outline our ladybeetle citizen science program which is being developed to educate nonspecialists on the importance of biodiversity and conservation and to recruit them to join us in our ladybeetle survey (<http://www.lostladybug.org>).

Meissner, Heike¹; Fritz, Jennifer²; Floyd, Leah*²; Emerine, Sherrie*² – (1) USDA, APHIS Plant Protection and Quarantine; (2) NC State University Center for Integrated Pest Management

Exotic Pest Information Collection and Analysis (EPICA): Safeguarding through biosurveillance and early warning

The mission of the United States Department of Agriculture's (USDA) Plant Protection and Quarantine (PPQ) is to safeguard U.S. agriculture and natural resources from the risks associated with the entry, establishment, or spread of exotic pests. For a proactive and effective safeguarding approach, PPQ needs early warning regarding potential pest threats. To address this need, Exotic Pest Information Collection and Analysis (EPICA) conducts biosurveillance by continuously monitoring, collecting, analyzing, distributing, and archiving relevant open-source information for PPQ programs. EPICA news articles are archived in the Global Pest and Disease Database (GPDD), which contains information on over 2,000 pests of U.S. quarantine concern.

O'Brien, RT*, Plemons, M* – NYS Office of Parks, Recreation, and Historic Preservation

Invasive species monitoring and database initiatives within the NY State Office of Parks, Recreation, and Historic Preservation (OPRHP)

The New York State OPRHP Environmental Management Bureau has been active in invasive species initiatives for the past decade, including most recently the Invasive Species Council. As awareness of the serious negative impacts of invasive species grew and the agency focused on invasives management in the field, data collection, early detection, and monitoring began. At Minnewaska State Park Preserve, a database was developed in 2007 as a part of an overall Invasive Species Management Plan for the preserve. This plan serves as a template for other parks and provides a statewide framework and database, paramount to a successful agency-wide program.

OPRHP has a dedicated focus on early detection and monitoring for two invasive insects, the Asian longhorned beetle (ALB) and the emerald ash borer beetle (EAB). Both species are at risk of becoming established in NY State and are capable of imposing significant environmental and economic costs. We are involved in a multi-agency collaborative effort with NYSDEC, the NYS Department of Agriculture and Markets, and the USDA in monitoring for the early detection of these insects. Trapping and monitoring for EAB began in 2008 and is expanding in 2009. Statewide ALB surveys and ongoing monitoring are being implemented focusing on critical early detection. OPRHP is educating park staff and visitors on invasive insect identification and the need to stop their movement via firewood. Our monitoring efforts include engaging the public in early detection and monitoring.

Treanor, Sarah A*; Silander Jr, John A; Mehrhoff, Leslie J – University of Connecticut

Invasive Plant Atlas of New England

The establishment and spread of invasive alien species (IAS) has been well-documented as a global threat to biodiversity and ecosystems services. The Invasive Plant Atlas of New England (IPANE), created in 2001, began in an effort to support the study of IAS in the six New England states. Building on the success of volunteer atlas projects of other taxa, the web-based network utilizes trained volunteers in conjunction with experts to collect presence/absence and abundance data as well as detailed local habitat information across New England. These data provide the elements necessary to develop predictive models of the potential distribution and spread of IAS, IAS hotspots, potential responses to climate change, and the influence of historical land use patterns across the region. These projects, using volunteer-collected data points, help to highlight areas in need of targeted survey and management. Early detection of new occurrences by IPANE collaborators has led to the immediate response and management of some populations regionally new or new to a state. The IPANE database allows for the dissemination of this information back to the volunteers and the public additionally providing individual species information, images, management links, removal events, as well as distributional data and maps. This comprehensive web-based tool provides an information hub for the public and volunteers facilitating the collection, analysis and communication of information related to IAS in New England. IPANE and its volunteers have contributed significantly to the invasion literature at large, advancing our understanding of invasive alien species in the region.

Wootton, Louise^{1*}; Burkitt, Jim² – (1) Georgian Court University; (2) Brookdale Community College

Assessing patterns in spread rate and direction of *Carex kobomugi* relative to known populations of endangered dune species in order to prioritize management actions for this species in New Jersey

The invasive Asiatic sand sedge, *Carex kobomugi*, is spreading rapidly in New Jersey's coastal dunes, where it is having a strong, negative effect on the abundance and diversity of native flora. Currently there is no active management plan for the species, nor is one planned. Starting in 2002, we have been working to create a species inventory using GPS mapping

and GIS-based data processing. Comparison of polygons denoting population sizes at each sampling interval will be used to look for patterns in the rates and direction of spread of this species. For example, are certain populations in New Jersey spreading faster than others? If so, can those patterns be related to physical characteristics of sand dune habitats such as prevailing winds or longshore ocean currents? We also plan to combine our data with existing databases of the locations of threatened and endangered species. This information will, in turn, be used to help direct future management efforts to areas where they will have maximum benefit. For example, areas predicted to be at high risk of future invasion should be subjected to intensive monitoring to allow for early detection. Similarly, new populations should be targeted for rapid response (manual removal, herbicide application, etc.). In addition, removal of populations presenting particularly strong threats to threatened and endangered species should be prioritized. Finally, the population inventory that we generate for *C. kobomugi* will provide a benchmark against which future expansion of the species, or the effectiveness of future management efforts, can be measured.

Theme D: Collaborative undertakings between invasive species ecologists and managers

Breisch, A; Haggerty, K; Holzworth C; Hughes, T*; Janis, M; Jaycox, J; O'Brien, R; Plemons, M; Rogers, M; Schnurr, L – NYS Office of Parks, Recreation and Historic Preservation

Closing the door on uninvited visitors - A collaborative approach to defending our New York State Parks from invasive species

The NYS Office of Parks, Recreation and Historic Preservation (OPRHP) recognizes the importance of partnership and outreach in managing invasive species. As part of our agency's Natural Resource Stewardship and Environmental Interpretation Initiative, we have enhanced our collaborative approach to researching, monitoring and managing invasive species throughout our parks and historic sites. By implementing natural resource projects that more greatly involve academia, non-profit organizations, other resource agencies and our staff and patrons, we are more effective in promoting awareness and providing education about the threats invasive species pose to our park ecosystems.

Over the past year, biologists and ecologists working within the Environmental Management Bureau have teamed up with several partners, including local colleges and universities, NY PRISM members, general public volunteers, NYS park facility managers and agencies such as NYS Agriculture and Markets, USDA, NYSDEC and The Nature Conservancy to monitor and eradicate invasive species. Projects range in scope from interpretive programs and workshops to large-scale plant removals. Our poster highlights several of the successful projects conducted over the past year; provides information about the types of invasive species that currently threaten our State Parks; and emphasizes the value of a collaborative approach to addressing natural resource issues.

Corbin, Jeffrey D^{1*}; Flint, Steven² – (1) Union College; (2) The Nature Conservancy, Adirondack Chapter

Control of *Alliaria petiolata* in Adirondack Park – A test of early eradication

Early detection and eradication of newly established non-native species populations are often touted as being the most effective and cost-efficient strategies to preventing establishment of invasive species. Relatively few studies, however, have documented the process of control from the time of detection through complete eradication. Understanding the factors influencing success, including the length of time needed to achieve eradication, will help habitat managers make informed decisions as they allocate resources. In 2006, Nature Conservancy staff was alerted that a population of *A. petiolata* had established in the southwest part of New York's Adirondack Park. Control (via hand-removal) began in late Summer 2006, and was repeated in Spring 2007 and 2008.

We established 81 permanent transects (20 m long) in Spring 2007 in order to monitor the effectiveness of the control program. The number of flowering/fruited individuals along each transect were counted before and after each season's hand-pulling. In 2007, 38% of the transects had at least one *A. petiolata* individual; the mean number of individuals was 13, and the densest transect had over 400 individuals. In 2008, the population was significantly smaller. *A. petiolata* was found in only 20% of the transects, and the mean number of individuals was 2. The densest transect had only 45 individuals. This control program is effectively reducing the population size, but we cannot yet project when eradication will be achieved. Future surveys will help determine the number of years required to exhaust the seedbank and for the population to be considered eradicated.

Jordan, Marilyn J^{1*}; Moore, Gerry²; Weldy, Troy W³ – (1)The Nature Conservancy, Long Island Chapter; (2) Brooklyn Botanic Garden; (3) The Nature Conservancy, Eastern New York Chapter

New York State plant ranking system for evaluating non-native plant species for invasiveness

The Nature Conservancy and the Brooklyn Botanic Garden (BBG) have developed an invasive plant ranking system to assess the invasive nature of non-native plant species in New York State, and to predict the potential invasiveness of new arrivals. A two stage process is used. First, a species' invasiveness is ranked at the state level based on scores received for answers to 20 questions in four broad categories: 1. Ecological impact, 2. Biological characteristics and dispersal ability, 3. Ecological amplitude and distribution, 4. Difficulty of control. Second, a species is ranked for one or more of the eight regions in NYS based on a combination of the NYS score, distribution, and likelihood of establishment or spread given the region's habitats and climate. This ranking system is designed to be repeatable, based on the best available science, clearly explained and fully documented. BBG populates the ranking forms, which are then reviewed, edited and approved by a committee of stakeholders including botanists, ecologists, industry representatives, and land managers. Between March 2008 and March 11, 2009, 99 species have been assessed and approved by the review committee. Another 80 species will be reviewed by early 2010. Results of these assessments are being used to revise a list of plants prohibited from sale in Nassau and Suffolk Counties (Long Island). New York State's Office of Invasive Species Coordination is currently developing recommendations for a statewide invasive plant species list, which will be considered by the NYS legislature in 2010.

Mukherjee, Jayanti Ray*¹; Jones, Thomas A²; Adler, Peter B¹; Monaco Thomas A² – (1)Utah State University; (2)USDA-ARS Forage and Range Research Laboratory

Seedling traits of native perennials vs. invasive annuals: A case study in the Intermountain West

In restoration plantings, seedling competition from invasive annuals is an important factor hindering native-species establishment. *Bromus tectorum* is an invasive winter-annual grass on the rangelands of North America's Intermountain West. This grass capitalizes on abundant spring soil resources while temperatures are still cold, and its long penetrating roots deplete soil resources and hinder establishment of slower-growing native perennial bunchgrasses such as *Pseudoroegneria spicata* and *Elymus wawawaiensis*. A close examination of functional traits at the seedling stage can help answer questions such as: what makes invasive species different from desirable native species, and which functional traits can make desirable species better competitors with invasive annuals? In this study, we compared seed mass, seedling growth rates, and functional traits of *B. tectorum*, nine *P. spicata* populations, and 'Secar' *E. wawawaiensis* under cold (5/10°C) and favorable (15/20°C) temperature regimes. *Bromus tectorum* germinated and initiated coleoptiles faster than the perennials under both temperature regimes. Of the three grasses, *B. tectorum* had the highest root: shoot length ratio and a relatively high specific root length; *P. spicata* exhibited the highest values for seed mass, absolute growth rate, shoot and root biomass, and shoot length; and *E. wawawaiensis* had the highest specific leaf area and relatively high high-temperature relative growth rate. Our results show that *B. tectorum* has a

strikingly greater root: shoot length ratio than native species at the seedling stage. This suggests that selecting plant materials for this trait could be desirable for establishing native species on rangelands.

Rebeck, Joanne*; Hutchinson, Todd; Iverson, Louis; Yaussy, Daniel; Bowden, Michael; Kloss, Aaron – US Forest Service, Northern Research Station

Aerial mapping of female *Ailanthus altissima* trees in Ohio mixed oak forests

Ailanthus altissima (tree-of-heaven) is a highly invasive tree that is present in many forested landscapes in the eastern US. Managers often observe an expansion in *Ailanthus* populations following forest disturbances such as harvesting and prescribed burning. A single female *Ailanthus* tree can produce 350,000 seeds, which are commonly wind-disseminated distances exceeding 100 to 200 meters. A cooperative research project was initiated to study the distribution and abundance of *Ailanthus* within the highly dissected landscape of Tar Hollow State Forest in southeastern Ohio. We employed geo-referenced digital aerial sketch mapping technology in a low-flying helicopter to identify female trees (seed-producers) and patches (non-seeders) of *Ailanthus* in winter 2008, when persistent seeds are highly visible. The method appears to be an effective way to survey for seed-producing *Ailanthus* across a landscape. During a two hour flight, 99 seed-bearing females and 42 patches, ranging in size from 0.18 to 13.4 ha were identified within a 3885 ha (9600 acre) area. Seventy percent of the aerially-identified females were ground-truthed using hand-held GPS units; 4.3% were either misidentified or not located. Starting in summer 2009, sampling of individual trees as well as a systematic grid will quantify *Ailanthus* abundance and demography in relation to management practices and landscape/stand attributes, to better understand and model the key factors related to the presence, abundance, and spread of *Ailanthus*. The direct effects of prescribed fire and herbicide treatments on *Ailanthus* demography and spread will also be studied.

Stephenson, Laura^{1*}; Schwager, Kathy² – (1) Peconic Estuary Program, NYSDEC; (2) The Nature Conservancy, Long Island Chapter

350 volunteers successfully remove aquatic weed from Peconic River, Long Island

Ludwigia peploides, more commonly known as water primrose, is a South American species that was first detected in the Peconic River in 2003. This aquatic non-native, invasive plant which grows primarily on the water surface, spreads rapidly in warm weather months and can often take over entire slow-flowing waterbodies. *Ludwigia* poses a major threat to the Peconic River as it acts as unsuitable fish habitat, outcompetes native plants, reduces biodiversity, blocks sunlight to oxygen producing submerged plants, and severely impedes recreational uses of the river.

The Peconic Estuary Program and its partners have embarked on a multi-year monitoring and volunteer driven eradication effort in an attempt to rid the species from the Peconic River and prevent spreading to other Long Island waters. Since the initiation of the eradication effort in the Spring of 2006, over 350 volunteers have spent over 1500 hours hand-pulling over 126 cubic yards of *Ludwigia*. Frequent monitoring suggests past and current efforts have been successful in controlling the invasive plant and project partners are hopeful that only small scale maintenance pulling will be required in the future.

Toro, Jessica M* – The Nature Conservancy

Weed It Now, a large-scale invasive control project in a Northeastern forest

A large-scale project focused on reducing invasive species in a Northern forest was launched in 2002 by The Nature Conservancy. The goal of this project, named Weed It Now, is to reduce the density of invasive species to less than 5% on 9,000 acres within a large, contiguous forest covering three states. Since less than 5% of the land is owned by The Nature Conservancy, developing partnerships with private individuals, and state and federal agencies is necessary to accomplish the goals of this project. At the beginning of Year 5 of the project, over 75 properties have been enrolled totaling approximately 8500 acres. Evaluating the success of the project will involve considering the participation of a diversity of landowners as well as measuring the reduction in coverage of invasive species and the increase in the size of the uninvaded forest core.

Zimmerman, Chris* – The Nature Conservancy, Eastern New York Chapter

Is resistance futile? Assessing the success of potential invasive species prevention and control strategies in the Catskills

Invasive species prevention and control are resource intensive activities. Determining the probability of long-term success of invasive plant prevention and control strategies requires information on invasive plant distribution, vectors, and response to management. To abate the invasive plant threat to forest ecosystems in the Catskills, a set of draft prevention and control strategies are in development. To develop strategies, survey data of ten terrestrial invasive plants on 356 transects along roads and trails across 104,000 hectares (258,000 acres) was used. The frequency and density of invasive species in the Catskills varied, as did their distribution patterns across the landscape. The invasive plants surveyed were fairly widespread along the road system, with 74% of the road transects containing at least one invasive; however, only 3 of the 50 trail transects (< 1%) were occupied by one of the focal invasive species. Road side management was identified as a potential vector for many of the invasive plants surveyed. A list of priority species was generated and two primary strategies drafted 1) detect and eradicate invasive plants approaching the region, and 2) maintain areas that are currently free of invasives. Prevention and early detection strategies are in development for five terrestrial invasive plants approaching the region. Two invasive species prevention zones totaling ~ 40,500 hectares (100,000 acres) have been drafted. Current efforts aim to assess the feasibility of invasive plant prevention and control in the Catskill Park.