

## ABSTRACTS: POSTERS

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### EFFECTS OF SOIL BIOTA AND RHIZOSPHERE EXTRACT FROM NON-NATIVE *Lonicera maackii* ON THE NATIVE *Impatiens capensis*

Invasive plant species, such as *Lonicera maackii*, are threats to the ecosystems of their invaded ranges. While many plants species are identified as being invasive, little is known about the mechanisms that allow for their success. An area of specific interest is how a non-native invasive species can interact with a native plant species. Allelopathy is a proposed mechanism by which an invasive plant might directly, or indirectly, suppress a competitor by phytochemical products. Though *L. maackii* has been described as having allelopathic potential, it remains unclear as to the impact that it has on below ground processes. These processes may include nutrient uptake, mycorrhizal infection, soil microbial activities and response to pathogens. In order to explore the potential below ground effects of *L. maackii* on a native species, *Impatiens capensis*, we tested the effects of a rhizosphere extract under two soil conditions and measured mycorrhizal infection, through time, with microscopy. The natural fluorescence of the mycorrhizae allowed us to observe changes in the infection of the roots resulting from treatment with *L. maackii* rhizosphere extract. Our results found that soil sterilization, and soil sterilization with exposure to *L. maackii*, affect mycorrhizal infection in *I. capensis* roots. In addition, we found positive effects of soil sterilization on above ground growth measures. Evaluation of our growth measures and mycorrhizal infection revealed different positive correlations between various growth measures in different treatments, but no significant correlations to mycorrhizal infection. The results of this experiment offer supporting evidence of the allelopathic potential of *L. maackii*, as well as the significant role of the microbial community present in field soils for plant-plant interactions and early growth performance.

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### ASSESSING THE IMPACTS OF COGONGRASS (*Imperata cylindrica* (L.) Beauv) ON ROOT-FEEDING BARK BEETLE POPULATIONS ASSOCIATED WITH SOUTHERN PINE DECLINE

The non-native, invasive grass, cogongrass (*Imperata cylindrica* (L.) Beauv) is an increasing threat to the diversity of native plant species of the southeastern U.S. Another issue facing landowners of southeastern forests is Southern Pine Decline (SPD). The factors associated with SPD include a complex of abiotic and biotic stressors that cause economically significant premature mortality in pine forests. A suite of root-feeding bark beetles associated with SPD could potentially have higher populations in areas containing cogongrass due to additional stresses. Twenty plots were established in a loblolly pine plantation located in southeastern Mississippi (10 with cogongrass/10 without cogongrass). Data show that *Hylastes salebrosus* is the most abundant species and has consistently higher populations in cogongrass plots. *Hylastes porculus*, *Dentroctonus terebrans*, and *Hylobius pales* show similar trends, but populations are not significantly different between treatments. Ten year annual growth was found to be significantly less in plots containing cogongrass compared to growth of trees in plots not containing cogongrass. Pine fine root weight was found to be significantly less in plots containing *I. cylindrica* as well. This may indicate that cogongrass is having a negative effect on loblolly pine root growth leading to reduced radial growth and increased stress.

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## **DOES HERBICIDE TRANSLOCATION CORRELATE WITH SEASONAL CARBOHYDRATE BALANCE IN AN EVERGREEN SHRUB *Ardisia crenata*?**

Invasion of exotic plants in natural areas has become a growing concern for land managers. One of the most common methods of control has been the use of herbicides. In the state of Florida, mesic hardwood hammocks are invaded by *A. crenata*, a perennial exotic plant with high capacity to resprout. It has often been controlled by mowing and foliar-application of the herbicide triclopyr (3,5,6-trichloro-2- pyridinyloxyacetic acid), however its efficacy is reported to be variable. We conducted two experiments (field and greenhouse) to test whether herbicide efficacy may be improved by selecting the optimal time of application that considers species-specific attributes including plant form, life history, and physiological characteristics. In the field experiment at Gainesville, Florida, we evaluated the efficacy of triclopyr herbicide in relation to the seasonal applications (October, January, April, and July) and the effects of mowing in relation to root carbohydrate dynamics. The second experiment in a greenhouse aimed to quantify the movement of <sup>14</sup>C-labeled herbicide within the plant in relation to light availability and carbohydrate dynamics. In the field, adult plants showed lower herbicide efficacy in January and was not influenced by prior mowing. Efficacy on seedling abundance changed over the seasons with a significant effect of mowing, which removed seed sources. The greenhouse experiment showed that large amounts of herbicide remained on the leaf surface, but a high proportion of what entered the plant was translocated to the roots. Triclopyr is an effective herbicide to kill adult *A. crenata* provided adequate time occurs to facilitate herbicide uptake prior to a rainfall event, and removal of seed bearing shoots by mowing or other means are important for preventing rapid recovery of the population.

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## **IMPACTS OF COGONGRASS IN SOUTH ALABAMA: MAPPING THE EXTENT AND UNDERSTANDING PERCEIVED THREATS**

Cogongrass (*Imperata cylindrica*) is an invasive species that was introduced to the United States in the 1900s via seed in packing material in shipping containers from South Asia. It spreads by both underground rhizomes and windblown seed. Currently, it is distributed in southeastern U.S., particularly in the states of Alabama, Florida, Mississippi, Georgia, South Carolina, Texas, and Louisiana. Many natural resources are affected by the spread of this invasive species in Alabama. In this research project, remote sensing is utilized as well as a landowner survey instrument to map current cogongrass locations in South Alabama and assess the documented and perceived impact this invasive species has had upon the management of the land. Both a manual and automated process was evaluated for mapping the extent on open agricultural lands and right-of-ways. The manual mapping was chosen as the more accurate method currently for mapping cogongrass with an accuracy of approximately 90.5%. Approximately 10,500 acres were mapped in Mobile and Baldwin Counties and it is estimated that it would cost more than \$630,000 dollars to control this much area of cogongrass. Resource managers surveyed for the study believe that there is a strong economic impact primarily in the timber industry and on livestock production. This study involves testing various methods to locate and map this invasive species. Another aspect of this study involved interviewing resource managers in Alabama and surrounding Southeastern states to gain an understanding of their perceptions of

cogongrass as an economic threat. Results of the mapping gave the areas of cogongrass infestation in the pasture and crop lands as well as right-of-ways of Mobile and Baldwin Counties. The outcomes of the survey and interviews provided an estimated cost of controlling cogongrass per acre.

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**LIFE HISTORY ADAPTATIONS AND DAMAGE OF *Calophya* spp.  
(HEMIPTERA: CALOPHYIDAE) TO BRAZILIAN PEPPERTREE**

Gall forming insects are highly specialized herbivores that often complete development on a single host plant. Because of their specificity and damage to the host, gall formers have been used in several weed biological control programs. As an initial step towards understanding the suitability of leaf galling psyllids as potential biological control agents of Brazilian peppertree, we determined the densities in the native range, and the life history adaptations under quarantine conditions of *Calophya latiforceps* and *C. terebinthifolii*. In the city of Salvador, Bahia State, densities of *C. latiforceps* galls reached as high as 1250 per Brazilian peppertree leaf, and caused severe discoloration. The process of host colonization by *Calophya* spp. begins when the female inserts an egg at the border of the leaflet or along the veins. Eggs hatch 8-9 days after oviposition and the first instar or “crawler” explores the adaxial surface of the leaflet to find a place to settle. A yellow halo is noticeable around nymphs two or three days after they settle. Gall growth increases over time reaching a peak in the 4th and 5th instars. Development from egg to adult takes 44 to 50 days. Observations of the insect colonies maintained at the quarantine of the University of Florida in Fort Pierce, suggest that the *Calophya* spp. galls not only reduced the photosynthetic capacity of Brazilian peppertree, but also resulted in shedding of young leaflets.

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**NATIVE PLANT COMMUNITY RESPONSE TO DIFFERENT METHODS OF  
REMOVAL OF EXOTIC INVASIVES**

Exotic plant invasions disrupt native ecosystems and reduce the richness, abundance, and health of native plant communities. Curtailing exotic plant invasions and removing them from invaded sites can be difficult and costly, yet may be critical for conservation and restoration efforts. Our study sites were established in 2008 on two forested areas on the campus of University of North Carolina, Asheville. Sampling was conducted in the understory, shrub layer and overstory before the plots were treated for exotic invasive removal either mechanically (by digging and pulling), chemically (foliar application of herbicide), or a combination of mechanical and chemical treatments. Sampling and treatments were repeated annually. All three treatments reduced exotic cover, and community responses to treatment are being investigated. Understory data from 2008-2010 was compiled and analyzed with PC-ORD using non-metric multidimensional scaling (NMMS), which revealed that the understory plant communities on the two study sites are distinct from each other. Further analysis will employ NMMS to determine if the shrub and canopy layers are also unique between the two sites. Next, the native and exotic plants of each site will be analyzed separately to determine if any clusters of species are responding similarly to particular treatments, or if any exotic invasive species are drivers of the plant community response. Identifying exotic species that have the most impact on the overall plant communities and targeting them for removal will help maximize scarce resources and get the most out of restoration projects.

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### **CHINESE TALLOWTREE SEED BANK ECOLOGY, SEEDLING DYNAMICS AND NOVEL HERBICIDES FOR CONTROL**

Chinese tallowtree (*Triadica sebifera*) is an aggressive non-native tree capable of invading a wide variety of habitat types. Explosive increases in local populations are occurring across the Gulf Coast, extending as far north as central Alabama. Tallowtree displaces native species, is potentially toxic to livestock and some wildlife, impacts nutrient cycling, and is having an increasing impact on production forestry. It is difficult to control due to its vigorous re-sprouting and release and/or recruitment of seedlings from an extensive seed bank. Our objectives are to evaluate integrated strategies for Chinese tallowtree control. We are comparing two new herbicides, imazamox (Clearcast) and aminocyclopyrachlor (Streamline) with the commercial standard triclopyr (Garlon 4 or 3A) and an untreated control. We are also evaluating application techniques, the role of tallowtree size in relation to treatment efficacy and the degree of non-target injury to desirable plant species. We are also evaluating advance reproduction in tallowtree stands and will also test methods to control seedling recruitment following initial control efforts, in relation to seedling emergence patterns. These data will assist developing optimal management strategies that address Chinese tallowtree control, from seedlings to mature trees.

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### **A LiDAR EVALUATION OF 3-DIMENSIONAL PATTERNS OF THE INVASIVE OLD WORLD CLIMBING FERN**

Old World climbing fern (*Lygodium microphyllum*) is an invasive plant listed by the Florida Exotic Pest Plant Council (FLEPPC) as a Category I invader with significant ecological and economic impacts that threaten native plant diversity. This plant relies on native vegetation for structural support to ascend into the forest canopy and forms dense vegetation mats that cover tree crowns. It proceeds to alter the 3-dimensional structure of the canopy and subsequently affects the light regime which negatively impacts native plant composition. Airborne LiDAR (Light Detection And Ranging) technology is a form of remote sensing that measures the elevation of surfaces over a site. This study aimed to determine the efficacy of using LiDAR to examine the biophysical changes induced by an invasive plant on its ecological surroundings, such as shading by the invader and changes in canopy openness and biomass, and to quantify the extent to which they alter community structure. The novel implementation of LiDAR analysis would help to reduce the amount of field surveys that land managers are required to undertake and provide a more detailed picture of how canopy structure is altered by invasive climbing vegetation.

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## THE DEVELOPMENT OF ArcGIS METHODOLOGY ENABLING A DIRECT COMPARISON OF *Melaleuca quinquenervia* SPATIAL DATA FROM SYSTEM RECONNAISSANCE FLIGHTS AND DIGITAL AERIAL SKETCH MAPPING WITHIN THE EVERGLADES COOPERATIVE INVASIVE SPECIES MANAGEMENT AREA

*Melaleuca quinquenervia* is an exotic invasive plant species that poses one of the most serious threats to the native biodiversity of South Florida, especially within the Everglades (Serbesoff-King 2003, Dray Jr. et al 2006, Langeland and Burks 1998, Laroche and Ferriter 1992). Once melaleuca infestation occurs, it degrades the integrity of the native flora and fauna's habitat and rapidly colonizes the area, overtaking up to 95 percent of a one square-mile area within 25 years (Serbesoff-King 2003). Furthermore, the total economic detriment to South Florida was estimated at \$2 billion by 2010, notably including tourism, recreation, and control effort costs (Balciunas and Center 1991, Serbesoff-King 2003). Hence, it is imperative to facilitate a meaningful comparison between historic and recent melaleuca spatial data in South Florida, specifically within the Everglades Cooperative Invasive Species Management Area (ECISMA). However, accomplishing this had been virtually impossible between the historic System Reconnaissance Flight (SRF) data and more recent Digital Aerial Sketch Mapping (DASM) data; they featured incompatible data collection methodologies and different data types (point, polygon). I collaborated with scientists from the Land Resource Bureau (LeRoy Rogers) and National Park Service (Tony Pernas, Jed Redwine); they provided historic SRF point data (1995), DASM polygon data (2012), and the ECISMA boundary extent (2013). Consequently, my objective was to simulate the SRF data collection methodology using ArcGIS to generate "SRF samples" of the DASM data lying within the ECISMA boundary. The outcome was a point-based dataset directly comparable to the SRF point data, enabling a trend analysis to be performed, thereby yielding accurate, potentially meaningful data concerning an extremely deleterious invasive.

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## THE FLORIDA INVASIVE SPECIES PARTNERSHIP – WORKING TOGETHER TO ACHIEVE SUCCESS

The Florida Invasive Species Partnership (FISP) is a collaboration of federal, state and local agencies together with non-government organizations, formed to link efforts in invasive species prevention and management across agency and property boundaries in Florida. Our mission is to foster partnerships as an additional tool in these efforts by increasing communication, coordination and the use of shared resources. FISP builds community awareness, leverages limited resources through cooperation, and may reduce land management costs. The ultimate goal is to conserve wildlife habitat, working agricultural and forest lands, natural communities and biodiversity in Florida.

In the spirit of partnership, FISP will share what has been achieved since the 2011 SE-EPPC meeting, what we have learned, and open a dialogue with EPPC members from other states to gain additional ideas for the future.

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### **LATE SEASON SELECTIVE CONTROL OF WINTER CREEPER (*Euonymus fortunei*)**

Winter creeper is a nonnative invasive plant that was introduced from Asia in 1907 as an ornamental plant. It is commonly planted as an ornamental, and because of ornamental planting and bird-dispersed seeds it has become prominent as a ground cover in disturbed forest areas and poorly managed landscapes. Winter creeper is very competitive, in part, because it retains its leaves year round in some environments. Can application of foliar herbicides achieve selective control of winter creeper, after other desirable species have dropped their leaves? This study was initiated in December, 2011 at the University of Kentucky Arboretum to answer the question asked above. Coralberry (*Symphoricarpus orbiculatus*) was the primary desirable species of concern. Herbicide treatments were applied with a single tipped CO2 sprayer until the leaf surface of the entire plot (0.9 m x 0.9 m) was wet. Most treatments were applied on December 17, 2011. Visual data were collected on plots for percent wintercreeper foliar cover (0-100%) at 96 (3/22/2012), 112 (4/7/2012), and 267 (9/9/2012) days after treatment (DAT). The treatments included the following products (active ingredients): Reward (diquat), Finale (glufosinate), and Roundup Pro (glyphosate) plus a non-ionic surfactant at 0.5% v/v. Coralberry was not killed by any of the treatments but there was some damage to the new foliage visible 112 DAT in the glyphosate plots. The best control of wintercreeper 112 DAT was with the glufosinate treatments (7 to 18% foliar cover) and the glyphosate treatments had poor control (35 to 53% foliar cover). However, by 267 DAT the best glufosinate treatments had 12 to 25% foliar cover while the best glyphosate treatments had 5 to 10% foliar cover.

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### **PROSPECTS FOR BIOLOGICAL CONTROL OF COGONGRASS**

Cogongrass, *Imperata cylindrica* (L.) Beauv, is an aggressive, rapidly colonizing invasive weed of pine plantations, livestock pastures, roadsides, railways, reclamation areas, and natural communities in the southeastern U.S. Once established, this federal noxious weed quickly displaces native or planted vegetation, often forming dense monocultures that reduce the productivity and biodiversity in the invaded area and creating a fire hazard. Conventional methods of managing cogongrass are expensive, labor intensive and not sustainable due to the regenerative capacity of cogongrass. We examine prospects for identifying host specific natural enemies of cogongrass in its native Old World range.

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### **THE EFFECTS OF HYDROLOGY ON NODULATION AND NITROGEN ALLOCATION IN THE INVASIVE PLANT, CATCLAW MIMOSA (*Mimosa pigra*)**

*Mimosa pigra*, a native of South America, is among the most serious invaders of wetlands, grazing ranges, and cultivated areas around the world, including Australia, Indonesia, and southeastern Asia. *Mimosa pigra* has been identified as a Category I Invasive in South Florida (FLEPPC 2009), where it can be found throughout the urbanized coastal area and in natural areas such as the Loxahatchee River Natural Area. In both its native and non-native range *M. pigra* forms a symbiotic relationship with nitrogen-fixing microorganisms in the genus *Burkholderia*. Fixation of atmospheric nitrogen by *Burkholderia* residing in root nodules can potentially give *M. pigra* better access to this essential

plant nutrient than wetland species that do not form root nodules. The ability to fix nitrogen when dissolved nitrates are not available may give *M. pigra* a competitive advantage in seasonally inundated wetlands. Understanding how water regimes affect nodulation in *M. pigra* has important implications for effective management of this invasive plant in natural wetlands and water treatment areas. In this study we examined the effects of different water levels on nodulation and nitrogen allocation. A total of 25 seedlings were grown from *M. pigra* seeds collected at an invaded site in the Loxahatchee River Natural Area in Palm Beach County. When average plant height reached 8-10 cm, stem height of all plants was measured and 5 plants were harvested to determine above-ground and below-ground biomass. Remaining plants were inoculated with 50g of homogenized soil collected from the root zone of a nodulating field plant, and randomly assigned to drained or inundated treatment groups. At 6 weeks and 12 weeks post-treatment, 5 randomly selected plants were harvested from each treatment group. The number, size, and location of root nodules was determined by light microscopy. Results showed significantly greater nodule formation in plants grown in drained conditions. Results from analyses of the relative content of chlorophyll, protein, DNA and RNA in leaf tissue collected from each plant at the time of harvest will also be presented.

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### **MYCORRHIZAL SYMBIOSIS AND *Lygodium microphyllum* INVASION IN SOUTH FLORIDA**

*Lygodium microphyllum* (Old World climbing fern) is one of the most problematic weeds in south Florida, invading numerous habitats from mangroves to pine flatwoods natural ecosystems. Much of the research efforts on *L. microphyllum* has been focused on reproductive potential, spore release, growth under different environmental conditions, belowground rhizome dormancy and survival strategies that describes its invasiveness. However, the role of an important mutualistic association with arbuscular mycorrhizal fungi (AMF) in the competitive ability and successful invasion of *L. microphyllum* by enhancing nutrient uptake has not been previously considered. Analysis of field root and soil samples from the ferns introduced and native range as well as a seven-week growth chamber experiment were done to determine the level of mycorrhizal colonization in the roots of *L. microphyllum* and the dependency on mycorrhizal fungi for growth and phosphorus (P) uptake. The field root samples showed that *L. microphyllum* was heavily colonized by AMF in relatively drier conditions, which are commonly found on some Florida sites compared to more common wetter sites where the fern is found in its native Australia. The results from the growth chamber experiment showed that the mycorrhizal treatment plants had significantly higher relative growth rate and biomass compared to the non-mycorrhizal plants. Similarly, *L. microphyllum* was highly dependent on the mycorrhizal fungi for growth and P uptake. Our results suggest that AMF play a significant role in vegetative reproduction and likely enhance the invasiveness of *L. microphyllum* in south Florida natural areas.

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**THE FIRST COAST INVASIVE WORKING GROUP—FIGHTING BORDER  
WARS**

The First Coast Invasive Working Group (FCIWG) is a Cooperative Invasive Species Management Area (CISMA) that encompasses Baker, Clay, Duval, Nassau and St. Johns counties in northeast Florida. In recent years, FCIWG has experienced biological invasions from the north and south. Salt cedar (*Tamarix canariensis*) and beach vitex (*Vitex rotundifolia*) have been creeping down from Georgia. Brazilian pepper (*Schinus terebinthifolius*) and Old World climbing fern (*Lygodium microphyllum*) have been advancing from the south. Members of the FCIWG were actually responsible for discovering the northernmost populations of Old World climbing fern. There are two populations in the FCIWG area, one in western Duval County and one in northern St. Johns County. The FCIWG has led efforts to control and prevent the spread of these two populations. This talk will highlight those efforts and discuss other valuable services that the FCIWG provides to the northeast Florida area.

**INVASIVE PLANTS ARE NO MATCH FOR VOLUNTEERS! THE FWC  
VOLUNTEER PROGRAM'S INVASIVE AND EXOTIC PLANT CONTROL  
VOLUNTEER PROJECT**

The Florida Fish and Wildlife Conservation Commission (FWC) Volunteer Program promotes citizen science and stewardship opportunities to residents and visitors throughout Florida. Since 2007, more than 18,000 volunteers of all ages, backgrounds, ethnicities and skills from rural, suburban and urban areas have participated in FWC volunteer projects. And, with the demographics of Florida ever-changing, the FWC Volunteer Program provides a means to reach populations that may not normally have access to conservation-based citizen science and stewardship opportunities. The FWC Volunteer Program works to ensure that projects are well-suited for volunteer participation, the volunteer experience is a success, conservation gains are achieved, and volunteers become stewards for Florida's natural resources. Restoration of fish and wildlife habitat is critical to conserving species diversity and populations of species native to Florida. And stewardship volunteers play a critical part of addressing FWC conservation challenges, as FWC works to maintain a successful balance between people, priority species and habitats. A vibrant volunteer program is a crucial strategy to ensure that the public is involved in meeting FWC's public trust responsibilities. FWC volunteers engage in pest plant removal as well as projects that restore land to create additional wildlife habitat.

From July 2011 – June 2012 the FWC Volunteer Stewardship program accomplished the following:

Invasive and exotic plant control

- 14 invasive plant removal workdays on state and other conservation lands
- Located non-treated invasive species for quality control of contractor sprays covering over 30 acres on private, FWC and other public lands
- Maintained upland exotic vegetation (~60 acres) at the Babcock/ Webb WMA
- Chemically treated at least 185 Melaluca trees in the Jetport area of Big Cypress WMA.

Restore Native Habitat through Plantings



- Planted approximately 6,000 native plants on state and other conservation lands
- Planted 2,500 wiregrass plants covering approximately 17 acres within the Chassahowitzka WMA and the Chinsegut/Big Pine WEAs.
- Participated in a longleaf pine survival count, covering approximately 300 acres at the Chassahowitzka WMA
- Planted 280 native oak species on approximately 22 acres at the Half Moon WMA to restore native habitat for the Florida Scrub-Jay.

#### Prescribed Burn Assistance

- A 1,284 acre prescribed burn at the Everglades WMA
- Five prescribed burns (~1500 acres) at the Babcock/Webb WMA.
- A 540 acre and a 558 acre prescribed burn at the Holey Land WMA
- A 25, 35 and 40 acre prescribed burn at the Guana River WMA