Abstracts for Scheduled Presenters

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A Status Report of *Lygodium* Distribution in the Lake Wales Ridge Ecosystem

In March 2004, the Lake Wales Ridge Ecosystem Working Group (LWREWG) Invasive Species Committee (ISC) conducted a helicopter survey of the Lake Wales Ridge with generous assistance from the South Florida Water Management District (SFWMD). SFWMD provided a contract helicopter and pilot for several days, and several Committee members participated, logging invasive species using a GPS unit. The survey was especially concerned with finding new locations of climbing fern (*Lygodium microphyllum* and *L. japonicum*). We also logged cogongrass, Brazilian pepper, tropical soda apple, and melaleuca. After two extremely active hurricane seasons in 2004 and 2005, the ISC felt that Lygodium had probably spread a great deal. We decided to conduct another survey if SFWMD would provide helicopter assistance. SFWMD was contacted by the ISC and agreed to do the survey in early February 2006.

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Species distribution modeling of invasive plants in the state of Florida, USA

FLEPPC maintains a Microsoft Access database for recording element occurrence records for invasive plants throughout the state that many participants of this conference have submitted records to. This database is managed by Florida State University's Robert K. Godfrey Herbarium and currently holds >5000 records. Records are from parks, reserves, highway right-of-ways, and even people's yards. Land managers and veteran observers submit the vast majority of the records and all records are screened by Kathy Burks (an invasive species expert at Florida Natural Areas Inventory) before being entered into the database. A few records are also vouchered in herbaria around the state (FLEPPC 2005).

As part of my Master's thesis for Florida State University, I have developed a georeferencing protocol for the FLEPPC element occurrence records. In September 2005, two graduate student technicians from Florida State University were hired to georeference the FLEPPC records in accordance with the protocol. During this talk, I will explain the georeferencing protocol and present the current progress of the georeferencing project. I will give special attention to the utility of the element occurrence records with reference to general trends in the precision of records. I will conclude my talk by discussing my progress with modeling the species distributions of six invasive exotic plant species: *Ardisia crenata*, *Ardisia elliptica*, *Dioscorea alata*, *Dioscorea bulbifera*, *Lygodium microphyllum*, and *Lygodium japonicum*.

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Invasive Plants - In the Library, In the Parks and in the Classroom.

A key component to any invasive plant management plan is education and information outreach. Until the general public understands the need for invasive plant management, they can, and often will, be a stumbling block in the road to progress. Unless we educate children about these issues, citizens will need to be informed again and again as they reach adulthood. Until legislators understand the need for invasive plant management, they will put tax dollars elsewhere. Therefore, education and information outreach are crucial. In a new program initiated by the late Vic Ramey in cooperation with Jeff Schardt of the Florida Department of Environmental Protection, Bureau of Invasive Plant Management, science teachers and public land biologists will be offered new learning materials about invasive plants including such items as PowerPoint lessons and study units, labs and hands-on learning activities, plant identification along with associated print materials, and much more. Two award-winning science teachers are part of the project to help author teaching materials, and a team of workers at CAIP had already been assembled prior to Vic Ramey's untimely demise. Our plan is to move forward as scheduled as a tribute to Vic's lifelong enthusiasm and creative approach to education.

All products of the Initiative are based on research found in the APIRS science library and online database, now with more than 65,000 science reports and books about aquatic plants and invasive plants. APIRS continues to collect new and retrospective literature on these topics, and to catalog them and enter them into the free, searchable online database. The database can easily be searched using any combination of terms including author, date, plant name, keyword, citation and more. Information about all of these projects may be found by visiting the CAIP-APIRS website at http://plants.ifas.ufl.edu.

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"I'm Sorry, You've Been Voted off the Island": Quantifying Ecological Effects and Managing Invasive Exotic Plants in the Virgin Islands

Invasive non-native plant species continue to cause world-wide economic and ecological damage. The State of Florida consistently spends over 20 million dollars each year to manage just a few of the worst problem species. Many of the same and additional problematic plant species are also spreading in and around the Caribbean. Most of the introductions in Florida have been for agricultural purposes, including horticultural production. Only a few of these have become serious problems, but the consequences of these few are focusing state, national, and international attention on invasive pest issues.

This presentation will present the results of a three-year invasive exotic plant research project within the Virgin Islands National Park aimed at quantifying ecological effects on native flora, as well as introduce the audience to National Park Service management/control projects in the US Virgin Islands with special emphasis on the Buck Island Reef National Monument.

Research conducted in the US Virgin Islands was funded through a grant from the US Department of Agriculture's Tropical and Subtropical Agricultural Research (T-STAR) Program through the University of Florida. The project was comprised of three components: 1) survey the invasive non-native plant species, including agricultural introductions, currently existing in the natural areas of the US Virgin Islands and major Cays; 2) document the ecological effects of invasive exotic plant species on native plant cover, richness and diversity; 3), restore a section of protected natural Virgin Islands habitat within the Virgin Islands National Park by removing invasive non-native plant species and replacing them with native plant species from local propagules.

Today, exotic plants infest nearly 2.6 million acres in the US National Park System. In response to the degradation of native natural ecosystems service-wide caused by invasive exotic plants, the US National Park Service has established sixteen tactical Exotic Plant Management Teams. Modeled after the approach used in wildland firefighting, the teams provide highly trained, mobile strike forces of plant management specialists to assist parks in the control of invasive exotic plants. The Caribbean park units were added to the existing Florida Partnership Team in 2002. Like in Florida, management/control projects are coordinated through a NPS representative and contracted companies provide the labor for control.

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Integrated Weed Management Plan for Brazilian Peppertree (*Schinus terebinthifolius*) in Florida: An Update

Permanent suppression of Brazilian peppertree in Florida will require the development and implementation of an ecologically based integrated weed management plan. The goal of this IWM plan will be to provide land managers with a predictable strategy for addressing the Brazilian peppertree problem at the landscape level. A basic tenant of the IWM approach is that the plant communities invaded by Brazilian peppertree are unique, dynamic and will require the application of various technologies (e.g., chemical, cultural, and mechanical controls, as necessary) to enhance the natural processes and mechanisms that direct vegetation change in a particular habitat. Natural regulating factors such as plant competition, flooding, and allelopathy can be manipulated to increase their impact on Brazilian peppertree control, and host specific biological control agents will be introduced to restrict seed production and reduce the vigor of new seedlings and regrowth from treated stumps. In order to implement a site-specific IWM plan for Brazilian peppertree, the critical ecological processes that direct plant community dynamics to the detriment of Brazilian peppertree in a particular ecosystem must be identified and manipulated. Those processes with the highest probability of causing change in the desired direction will be modified to

produce predictable results. Three different management scenarios for Brazilian peppertree in Florida are presented. In each site-specific scenario, the key elements of a successional weed management model- designed disturbance, controlled colonization, and controlled species performance-are applied by taking into account not only the extent of the infestation but also the type of habitat invaded.

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Evaluation of Artificial Diet Treatments for Rearing of *Anthonomus tenebrosus* (Coleoptera: Curculionidae), a Potential Biological Control Agent of Tropical Soda Apple, *Solanum viarum*.

Anthonomus tenebrosus Boheman is a potential biological control agent of tropical soda apple (*Solanum viarum* Dunal), an invasive exotic weed now found in the southeastern United States. Native to South America, *A. tenebrosus* feeds exclusively on the flowers and young leaves of this weedy plant. To investigate its potential as a biocontrol agent, A. tenebrosus was imported and a colony established in March 2002 at the Division of Plant Industry quarantine facility in Gainesville, Florida. The colony has been maintained and further supplemented with two additional shipments to increase both the colony size and genetic diversity. Should A. tenebrosus be approved for release against tropical soda apple, a successful artificial diet and rearing protocol will be needed to produce healthy biocontrol agents. Our goal is to develop an artificial food source that is nutritionally adequate to produce healthy insects that are comparable to those feeding on tropical soda apple plants.

A successful artificial diet will allow researchers to mass-produce insects for year round availability. Currently, our focus is on the adult weevil. In total, 120 weevils are exposed to selected diet treatments over a 3 day period and feeding observations recorded. Research areas thus far have included evaluation of existing diets for other *Anthonomus* species, the incorporation of freeze-dried host plant material to encourage host specificity of the weevil, diet presentation, diet color, and texturizing components. Diet testing is ongoing with additional investigations looking into anti-oxidation agents, solasodine, proline, and other ingredients thought to enhance feeding and/or oviposition.

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Bringing Invasive Exotic Species in South Florida Ecosystem Restoration and the Comprehensive Everglades Restoration Plan (CERP)

For too many years invasive exotic species have been the forgotten stepchild of environmental management and restoration for south Florida. In 1994 the South Florida Ecosystem Restoration Task Force (SFERTF) recognized the seriousness of the threat of invasive species to restoration by establishing the Noxious Exotic Weed Task Team to address these issues for the Task Force. In 2000 the Task Force established the Florida Invasive Species Task Team to address invasive animals. Since then the work of these two teams coordinating with other like-minded groups such as the State Invasive Species Working Group (ISWG), CERP and RECOVER have developed a plan and program to incorporate invasive exotic species (all taxa) into the CERP and RECOVER programs for south Florida Ecosystem Restoration and incorporated an invasive exotic plant “indicator” into the suite of System-wide indicators that the SFERTF will be using to help assess the success of the restoration program. Two CERP programs are completed; the construction of an invasive species biocontrol quarantine facility and Special Reconnaissance Report on invasive exotic species, and two are currently in the works for invasive species; the development of a Master Invasive Species Plan for South Florida Ecosystem Restoration and a Biocontrol development, rearing, distribution and monitoring program which already has $5.5 million funding approved. Leadership and development and funding of both programs are provided by the Corps of Engineers and South Florida Water Management District.

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Georgia Invasive Species Taskforce: Developing interagency cooperation to manage Cogongrass (*Imperata cylindrica*) on a state-wide scale

With only 25 known infestations, cogongrass, (*Imperata cylindrica*), is an emerging invasive species in Georgia. To facilitate cooperation in all areas of management, both of cogongrass and other invasive species, State and federal agencies, university personnel and EPPC members have combined to form the Georgia Invasive Species Task Force. The task force has adopted a three-fold approach to managing cogongrass in Georgia: 1.) management of known infestations, 2.) discovery of any existing but unknown infestations, and 3.) preparing for new infestations. Control efforts on known infestations are currently being administered by USDA Animal and Plant Health Inspection Service – Plant Protection and Quarantine (APHIS-PPQ) or Georgia Forestry Commission personnel. University of Georgia faculty and staff are maintaining a database of known infestations and, using ARC-GIS software, have created an online mapping program showing locations. Plans are underway to implement on the ground and remote sensing surveys to aid in discovering new infestations. Workshops, educational materials, and press releases are all being used to inform and educate the public on this new threat. To prepare for the inevitable increase in new infestations, the Georgia Invasive Species Task Force is developing protocols for handling new finds, initiating a land-owner assistance program, and training agency and university personnel on identification, management and control of cogongrass.

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Yes, Virginia, there are Alligators in Idaho

Weed management programs in the West and in Florida are well-established. This paper will discuss some of the Western/Florida commonalities and some of the differences – obvious and not so obvious. Largely through the leadership of the National Invasive Species Council, agencies are beginning to develop strategies to deal with invasive species beyond weeds. This paper will discuss parallel efforts that are in the being formalized to develop an all-taxa assessment for the Everglades and for the US Forest Service Northern Region, which includes Northern Idaho, Montana and the Dakotas.

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Turning Knowledge into Chocolate

Since the inception of FLEPPC in the 1980s, an impressive array of accomplishments has accumulated. This includes providing state-wide leadership in invasive plant issues by coordinating the development of interagency management plans, holding the annual symposium, and hosting the online invasive plant database. In addition, there is national recognition for Wildland Weeds, the Invasive Plants Lists, our liaisons with the nursery plant industry, and the model that we provide for other EPPCs. While these, and many other good activities, need to be maintained by FLEPPC, there are also plenty of new opportunities to be embraced. As the incoming Chair, it is my responsibility to ponder these matters for the future benefit of FLEPPC. But more significantly, in this presentation, you will witness how knowledge of such things translates into chocolate!

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National Park Service Exotic Plant Management Teams in the Southeastern United States: Update and News

Three of the 17 Exotic Plant Management Teams serving NPS units are based in the southeastern United States. This presentation will provide an overview of the operational successes and challenges facing these teams and the strategies that have been implemented to make them more efficient. The effectiveness of the Student Conservation Association's Native Plant Corp as a tool for exotic plant control in the Big South Fork National River and Recreation Area will be discussed. In addition, and update on the newly operational exotic plant control program serving NPS units along the southern Atlantic coastal areas in NC, SC & GA will be provided.

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Over Run: Coping with Invasive Exotic Animals in Florida.

For the past ten years the Florida Panther and Ten Thousand Islands National Wildlife Refuges have been organizing and hosting a regional conference called the "Exotic Species Workshop for Southwest Florida," to educate local biologists and land managers about the identification and control of invasive, exotic plant and animal species. Information from some of the exotic animal presentations from the Exotic Species Workshop will be reiterated here including, coyotes (Main), monk parakeets (Lindsey), reptiles and amphibians (Krysko and Enge, Campbell, Snow and Oberhofer), fish (Nico and Shafland), arachnids (Edwards), lobate lac scale (Pemberton), Mexican bromeliad weevil (Frank), mosquitoes (O'meara), fire ants (Porter) and the complexities of "heartwater" disease (Burridge and Simmons).

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Australian Weed Risk Assessment

Screening tools that effectively predict which non-native species are likely to become invasive are necessary because of the disproportionate ecological and economic costs associated with invaders. We are testing the effectiveness of the Australian Weed Risk Assessment (WRA) in identifying invasive plant species in Florida. We selected the WRA (slightly modified for Florida) because it is a relatively simple, consistent, and transparent screening tool that has been tested and implemented. Further, this system resulted in the best prediction of the full range of invasive plants in Hawaii and the Pacific. We have paired invaders and non-invaders in natural areas (30 pairs) and in agriculture (30 pairs) for this test. Species status in natural areas was determined using the IFAS Assessment of the Status of Plants in Florida's Natural areas; status in agricultural areas was determined using lists of the most common weeds in different commodity crops published by the Southern Weed Science Society. Where possible, the paired species are of the same growth form and from the same family. A diverse group of annuals and perennials in six growth forms from 52 families in 26 orders are included. All non-invaders have been in Florida for over 50 years. While the project is on-going and conclusions are premature, thus far over 90% of the invasive species are predicted to be invasive by the WRA. However, identification of non-invasive species has not yet been as successful (<50%). The proportions in each category will change as more species are included and when we have implemented a secondary screening approach developed for Hawaii and the Pacific Islands.

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GreenThumb Certified – Working with Nurseries to Stop Invasives

The Florida Keys is home to 26 Retail Nurseries and 38,700 Homeowners, most of which are still unfamiliar with all of the invasive exotic plant species for our region. Relinquishing the stick for the carrot, the Educational Committee of the Florida Keys Invasive Exotic Task Force (Task Force), elected to promote nurseries that voluntarily stopped selling Category 1 and 2 invasives. The "GreenThumb Certified" stamp of approval was born.

A collaborative partnership between The Nature Conservancy, Monroe County Extension Program, and the Florida Keys Scenic Highway Program, "GreenThumb Certified" provides recognition to plant nurseries in Monroe County that not only pledge to not sell invasive exotics, but also push "AlterNatives" (Native plants that fill the same form and function as the invasive), and provide their customers with Keys-friendly fertilizers, mulch, and irrigation options.

Using creative partnerships, the GreenThumb movement secured $13,000 in funding and countless promotional opportunities, including television spots, radio interviews and plugs by electric and water utilities. Alternative water grants from South Florida Water Management District provided seed money to host rainbarrel workshops at GreenThumb nurseries as well as other community events. Brochures outlining the program and promoting the website: www.KeysGreenThumb.net are provided to conservation land managers, utilities, municipalities and whoever else asks. As the Task Force identifies and demonstrates successful strategies like GreenThumb it is hoped that agencies, organizations and like-minded groups will learn from, borrow and improve upon, its successes and innovations. Cooperation is the key to winning the war on invasive exotic plants.

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Amphibian Risk Assessment and Glyphosate Herbicides: Key Considerations for Laboratory and Field Experiments

Recent papers in the scientific literature and articles in the public press have suggested that Roundup® branded herbicides, which contain glyphosate as an active ingredient, may pose a risk to amphibian populations. In this presentation, the properties of glyphosate, glyphosate formulations, and surfactants are considered along with the toxicity to and exposure of aquatic organisms to these substances. The conclusions from this review are that glyphosate and Roundup branded formulations used according to label directions will pose minimal risk to amphibian populations.

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Survey of Control on Old World Climbing Fern (*Lygodium microphyllum*) in Southern Florida

We conducted surveys of natural area managers in South Florida concerning management of Old World climbing fern (OWCF), *Lygodium microphyllum* (Cav.) R. Br. Managers reported that OWCF poses the greatest threat to natural areas in south Florida, especially in isolated areas where herbicide treatment is limited to aerial application. Foliar sprays, or cut and spray, are the most common methods of herbicide application. Glyphosate was reported as the most commonly used herbicide. Managers reported that the limiting factors in controlling OWCF are time limits/other duties, lack of personnel, and limited funding. Respondents also reported that biocontrol agents may represent the best long-term hope for control of the fern. However, the general consensus of the respondents was that an integrated approach is needed to control OWCF on a landscape-wide level. This integrated control approach would include biocontrol agents, effective ground and aerial herbicide treatment, dedicated field crews, regular monitoring and agencies and private landowners, and the development of alternative treatments including combination of management techniques such as herbicide application, prescribed fire, and mechanical treatments.

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Monitoring the Effects of Repeated Aerial Herbicide Application on *Lygodium microphyllum* and Native Vegetation at A.R.M. Loxahatchee N.W.R.

Old World climbing fern (*Lygodium microphyllum*) is considered one of the worst non-native invasive plants of seasonal hydric habitat in southern Florida. In 2005, this invasive fern covered 49,690 ha in south Florida based on Systematic Reconnaissance Flights (SRF) preformed by the South Florida Water Management District (Amy Ferriter, South Florida Water Management District, Pers. Comm.). Based on models, it is estimated that *L. microphyllum* will overtake the five most invasive plants (*Melaleuca quinquenervia*, *Schinus terebinthifolius*, *Casuarina equisetifolia*, *Colubrina asiatica*, and *Ardisia elliptica*) combined in area coverage in south Florida by 2014 if left unmanaged (Volin et al., 2004). Infestations of Old World climbing fern often occur in natural areas that are remote and inaccessible to vehicles and personnel due to inundated and mucky soils, making treatment difficult.

As *L. microphyllum* grows, it smothers native vegetation both horizontally and vertically, exhibits indeterminate growth patterns, and forms complete canopy cover that alters habitat for native plants and animals. In addition, this fern changes the fire ecology of a given area, resulting in excessive and possibly non-recoverable damage to normally fire tolerant tree species.

The heaviest infestations occur in Martin and Palm Beach Counties, the general location of the first documented record for this species in Florida. In 1995, *L. microphyllum* covered ca. 7,284 ha of the Loxahatchee National Wildlife Refuge (LNWR) in Palm Beach County, but increased to ca. 19,433 ha in 2003 based on Systematic Reconnaissance Flights (SRF) performed by the South Florida Water Management District. The current estimate of *L. microphyllum* based on SRF in the refuge is ca. 25,200 ha (Woodmansee et al., 2005).

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Cogongrass (*Imperata cylindrical* L. Beauv) and torpedgrass (*Panicum repens* L.) response to growth regulator herbicides

Cogongrass and torpedograss have been shown to withstand conditions of foliar removal through dense rhizome systems. Rhizomes of cogongrass utilize apical dominance to maintain a high rhizome:shoot ratio, whereby only apical shoots arise after disturbance. By overcoming apical dominance the stimulation of axillary bud growth is initiated forcing the plant to divert more resources to these new shoots. These new shoots can then be treated with herbicide to further weaken the rhizome system and provide better control of cogongrass. On the other hand, apical dominance is very weak in torpedograss. However, studies have shown that torpedograss reacts very well to the growth regulator herbicide applications. A study was initiated to utilize the growth regulator herbicide diflufenzopyr to chemically break apical dominance in cogongrass and increase shoot production in torpedograss and potentially enhance control of these grasses with glyphosate and imazapyr. Cogongrass and torpedograss plants were grown under greenhouse conditions in 3L pots. After 8 weeks, plants were treated at four application timings of diflufenzopyr at 0.2 lbs-ai/A (no diflufenzopyr, 3 days prior to imazapyr or glyphosate, tank-mixed with glyphosate or imazapyr, or 3 days after imazapyr or glyphosate). Three different rates were applied for imazapyr (0.125, 0.25, and 0.5 lbs-ai/A) or glyphosate (0.38, 0.75, and 1.5 lbs-ai/A). Four weeks after treatment, shoots were removed and the plants allowed to regrow for an additional 4 weeks. At this time, visual ratings of regrowth and above and below ground biomass were taken. All imazapyr treatments with cogongrass, regardless of diflufenzopyr, provided >80% control, with <0.01 gm shoot biomass.

There was greater cogongrass control at the lower rates of imazapyr in combination with diflufenzopyr applied 3 days prior and as a tank mix. Similar results were observed in glyphosate, but at a much lower level of control. Diflufenzopyr applied as a tank mix with glyphosate provided 48 and 38% greater control at 0.38 and 0.75 lbs-ai/A, respectively, compared to glyphosate alone. However, glyphosate alone at 0.38 and 0.75 lbs-ai/A caused significantly greater shoot regrowth, even compared to diflufenzopyr alone. Glyphosate has been reported to cause growth regulator type effects and this warrants further research with cogongrass. Studies with torpedograss are currently being conducted and results will be presented at the annual meeting.

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Engineering Invasives in the Everglades – What is the CORPS Doing about Invasive Species in Everglades Restoration?

It has been well documented that invasive species in the greater everglades area are causing damage to the ecosystem. Even the Corps of Engineers documented this in the 1999 Central and Southern Florida Project Comprehensive Review Study. However, no invasive species projects were initially funded under the Comprehensive Everglades Restoration Project (CERP). Since then, the Corps has begun to re-evaluate the Restudy and CERP and have begun to move forward on addressing invasive species issues. This presentation will present a historical perspective on the Corps and invasive species, discuss the current status of the Everglades Invasive Species Master Plan project and the CERP Biocontrol project as well as to speculate at potential Corps involvement in invasive species issues in the future.

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Looking at sites of treated *Lygodium* --is it dead yet?

This is the question most land managers would love to answer "Yes!" The Bureau of Invasive Plant Management (BIPM) has been funding projects to treat and control invasive plants since 1998. FNAI's Lygodium Specialist has been given the task of visiting public lands that have received funding from BIPM where either species of Lygodium was treated. Using qualitative descriptives, live and dead populations are characterized and treatment methods and chemicals are tracked. It is hoped that the more effective treatment methods will surface from the information gathered during the site surveys, which involve over 100 treatment areas statewide. One year into this review, some preliminary findings are beginning to surface. To noone's surprise, cutting the climbing rachis and using a foliar spray of glyphosate on the remaining rooted plant mass has proved to be effective in most situations, and use of Escort has hsown itself to have some problems in terns of non-target damage, particularly on palms. The Japanese climbing fern (*Lygodium japonicum*) seems to be more persistent, but is a less dramatic climber than Old World Climbing Fern (*L. microphyllum*). Other preliminary findings will be discussed as well. There is a growing concern that both species have breached the Central Florida overlap zone in opposite directions, so effective treatment is likely to become even more critical.

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Management of Invasive Species in Hawaii since the 1993 OTA Report: Progress and Prospects.

Harmful Non-indigenous Species in the United States," produced by the Office of Technology Assessment (OTA) of the U.S. Congress in 1993, was a landmark document. Whereas analysis by the academic international SCOPE program, led in the U.S. by Dr. Harold Mooney of Stanford University, had produced ample consciousness-raising information on the ecological problems caused by introduced species at the national and international levels in the 1980s, there had been no comprehensive source of management information (i.e., prevention, eradication, control), at least not in the U.S. The OTA report changed that, and devoted its Chapter 8 to "Two case studies: Non-indigenous species in Hawaii and Florida," the states identified as being particularly hard hit by the problem and having substantial experience in addressing the problem. A comparison of how effectively the two states, differing in many ways and separated by 5,000 miles but with strong climatic similarities, have dealt with the problem since 1993 should be useful. My keynote talk will attempt to present a balanced view of Hawaii's successes and failures and what the future may have in store for us.

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The residual effect of Imazapyr herbicide on selected revegetation species following cogongrass control

Field studies were conducted to evaluate the impact of imazapyr on the growth and establishment of several native species. To determine this impact, 8 rates of imazapyr (0.0, 0.016, 0.032, 0.063, 0.125, 0.25, 0.5, and 1.0 lbs-ai/A) were applied under field conditions to bare soil in Citra, FL. Immediately after application, the herbicide was lightly incorporated and 13 desirable plant species transplanted into each plot. The experiment was initiated in June 2004 and repeated one month later. One year after planting, heights were recorded and regression analysis was used to determine the rate of imazapyr that would cause a 35% decrease in height. Transplant survival and growth was reduced in the first experiment compared to the second due to higher annual weed pressure, resulting in a higher sensitivity to imazapyr for several species in the presence of competing weeds. An additional study was conducted to determine the degradation rate of imazapyr in soil. Areas representing 3 distinct soil types were sprayed with varying rates of imazapyr and sampled immediately prior to application, immediately after application, and at 1, 3, 6, and 12 months after treatment (MAT). Imazapyr concentration was determined using a corn-root bioassay, and regression analysis was used to develop a predicted degradation curve over time for each soil type. This bioassay data was combined with plant species injury and mortality data to create a timetable to best predict optimal planting dates per species. Six species were predicted to be planted immediately after imazapyr application with a 40% survival rate. Eucalyptus species can be planted 5 days after treatment (DAT) in clay and 8 DAT in overburden to exhibit no more than 30% injury. Mimosa and bluejack oak also show slightly longer time periods in overburden soils as compared to clay soils. Silkgrass and broomsedge have the longest delay in planting (approximately 38 DAT in clay and 35 DAT in overburden), and wiregrass showed at least 30% injury at all rates of imazapr.

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Combining herbicide application regimens with revegetation using maidencane cuttings to control torpedograss infestations in wetlands at The Nature Conservancy's Disney Wilderness Preserve over three growing seasons.

Torpedograss infestations are known to be difficult to control with any level of long-term success. From 2003 through 2005 we utilized a regimen of multiple applications of hand-sprayed aquatic herbicides to control dominant and monospecific populations of torpedograss in shallow wetlands. As torpedograss infestations became suppressed, we sprigged near-horizontal cuttings of maidencane into these wetlands at close spacing in torpedograss-free areas. Overall, herbicide treatments at these wetlands have been reduced in frequency and total area over time. Sprigged maidencane is well-established in some areas formerly dominated by torpedograss. Torpedograss is largely excluded from areas sprigged with maidencane, while herbicide application frequency and extent have been drastically reduced. Torpedograss recolonizes and dominates unsprigged areas without regular herbicide application.

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Ecology of *Colubrina asiatica* (L.) Brogng. (Rhamnaceae) and Consequences for Management

Colubrina asiatica ("latherleaf") is an aggressive colonizer of remote beach and back-dune habitats on islands and coastal ecosystems. Despite an abundance of anecdotal speculation and qualitative assessments regarding the reproductive potential and competitive ability of this species, there is little empirical evidence on which to base sound management decisions. The objective of this presentation is to present a summary of the first of a two-year project investigating basic ecological and reproductive aspects of *Colubrina,* and to discuss topics in the literature which are not supported by our work thus far. Finally, we recommend a research agenda to address current knowledge gaps in basic ecological research and management programs.

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Super Beetle Fighting the Plant from Hell: Tropical Soda Apple

Tropical soda apple (TSA), *Solanum viarum* (Solanaceae), is an invasive perennial weed in southeastern USA. Native to South America, it was first detected in south Florida in 1988, and it has already invaded more than one million acres of grasslands, improved pastures and conservation areas in eleven states. A biological control project against TSA was initiated in 1997. After 3 years of intensive host-specificity testing, the South-american beetle *Gratiana boliviana* (Chrysomelidae) was approved and a field release permit was issued by USDA-APHIS-PPQ in May 2003, and its release in Florida began in summer 2003. Up to now, approximately 45,000 beetles have been released in 20 counties in Florida, 2 counties in Georgia, and 2 counties in Alabama. Establishment, dispersal, and initial impacts of the beetles have been monitored since summer 2003 at several selected sites. Open-field specificity tests in South America with two other potential biocontrol candidates (the chrysomelid beetles: *Metriona elatior* and *Gratiana graminea)* corroborate the high specificity and significant defoliation effects of these beetles on TSA plants.

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The F1 Sterile Insect Technique (F1SIT): A Novel Approach to Host Range Testing of the Tortricid *Episimus utilis*, A Natural Enemy of Brazilian peppertree.

In 1994, several natural enemies of Brazilian peppertree were imported into a quarantine facility in Florida as candidates for classical biological control. One of these candidates was a South American leaf-rolling moth *Episimus utilis* Zimmerman (Lepidoptera: Tortricidae), which had been previously released in Hawaii in the 1950s. Traditional no-choice and multiple choice tests produced ambiguous results. Because laboratory testing often can overestimate host range, leading to the rejection of acceptable candidates, the F1 Sterile Insect Technique (F1SIT) was investigated as a new approach for risk assessment of candidate biological control agents. Using the F1SIT approach, the leafrollers could then be safely released temporarily for field host range testing. Male and female virgin *E. utilis* adults were treated with increasing doses of gamma radiation (cs-137) and either inbred (treated female x treated male) or outcrossed (treated female x nontreated male, nontreated female x treated male) to un-treated *E. utilis* adults. Five pairs of adults were placed in triangular waxed paper oviposition cages and allowed to mate and oviposit for two intervals of 5 days. Sterility was expressed as the number of eggs that failed to hatch. The percent egg hatch from irradiated *E. utilis* adults was significantly affected by the dose of radiation and the gender irradiated. As the dose of radiation increased, the percentage of eggs that hatched declined. The relationship between radiation dose and percentage egg hatch is based on preliminary data and additional data will be collected to further define this relationship.

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Update on the Activities of the Florida Invasive Species Working Group

At the request of Governor Jeb Bush, the Florida Department of Environmental Protection coordinated a meeting of state and federal agencies to develop a statewide invasive species management plan for Florida. The Governor approved the resulting plan “Statewide Invasive Species Strategic Plan for Florida" during 2003. The purpose of the meeting and goal of the plan is to provide a better-coordinated, more effective statewide approach to invasive species management in Florida.

The Invasive Species Working Group (ISWG), comprising nine state agency representatives and one university faculty member has been established to implement the action items contained in the strategic plan. Member agencies include

the Florida Department of Environmental Protection (DEP), the Fish And Wildlife Conservation Commission (FWC), the Department of Agriculture and Consumer Services (FDACS), the Department of Transportation (DOT), the five water management districts and the University of Florida.

During 2005 the ISWG met on four occasions. A brief summary of significant action taken during the past year will be discussed including:

- Recommendation that DEP be made an official member of the Florida Department of Agriculture and Consumer Services Noxious Weed and Invasive Plant Review Committee.
- Recommended that DEP and FWC clarify jurisdiction/responsibility for the management of invasive marine plant species.
- Recommended that FWC review existing feral hog management practices/policies for public conservation lands and develop a consistent statewide feral hog policy and develop a policy or mission statement that recognizes feral hogs as a non-native species that are disruptive to the environment and that they should be managed at their lowest population level, where feasible, on public conservation lands.
- Completion of an initial effort to uniformly document invasive species management costs which indicated a total expenditure during FY03-04 of more than $97 million.
- Sub-working group established to make information on funding and incentive programs for private landowners more available and to recommend how invasive species problems on private lands could be better addressed.

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Future Directions for Hydrilla Management in Florida

Hydrilla (*Hydrilla verticillata* L.f. Royle), now in its sixth decade in Florida, has been extremely efficient in its ability for both intra and inter-lake spread in the abundant clear and relatively shallow water bodies of Florida. In December 2005 professional resource and aquatic plant managers representing federal, state, and county agencies, private industry representatives, and personnel from non-profit resource organizations gathered in Orlando, Florida for a two-day meeting to discuss issues related to hydrilla and hydrilla management. This meeting was a follow-up to a December 2004 meeting of county, state, and federal resource managers that resulted in the completion of a white paper entitled “Hydrilla Management in Florida: A Summary and Discussion of Issues Identified by Professionals with Future Management Recommendations”. Both the white paper and the 2005 meeting reflected the growing awareness of fluridone resistance and the increasing complexity of managing hydrilla in large flood control project waters that serve multiple uses. The document and discussions revolved around five key issues related to hydrilla management: the status of integrating management techniques, the potential use and removal of grass carp for selective plant management, the current use of fluridone and future of new herbicide development, the impact of water regulation schedules and deviation requests on large-scale hydrilla management efforts, and the impacts of hydrilla and hydrilla management on fish and wildlife. This talk will focus on areas where the group came to a consensus and other areas of hydrilla management that remain contentious between the stakeholder groups

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Could Africa be a Source of Hydrilla Natural Enemies?

For more than 30 years, there have been efforts to identify good natural enemies of *Hydrilla verticillata*, one of the most serious aquatic invaders in Florida. The native range of hydrilla is vast and includes parts of Asia, Australia, Europe and

possibly Africa. The search for natural enemies of hydrilla began in 1971 with surveys in India and Pakistan. Later, surveys were expanded to include Malaysia, China, Korea, Japan, Thailand, Vietnam and Australia. Several natural enemies were discovered during these explorations, and four were released in Florida, but only the ephydrid fly, *Hydrellia pakistanae*, established. Additionally, a pyralid moth, *Paraponyx diminutalis*, established in Florida, although it was never released Neither of these insects provides sufficient control of hydrilla. In East Africa, hydrilla occurs but is not considered to be a weed, which prompted exploration for natural enemies in the 1970s and 1980s. At least two species of chironomid midges, *Polypedilum* spp. were found, which caused severe damage to hydrilla. Unfortunately, efforts to rear these midges failed, and they were never released in Florida. Thus, a second look for natural enemies, with particular emphasis on *Polypedilum* spp., may be profitable. With this in mind, Overholt and Cuda visited Kenya, Burundi and Uganda in 2005. Hydrilla was found on the Burundi shore of Lake Tanganyika and in Lake Kyoga in Uganda. More recently, Ugandan collaborators have identified hydrilla in Lake Bisina. In Burundi, several insects were reared from hydrilla, including a *Bagous* sp. weevil and a *Polypedilum* sp. Funding permitting, Africa exploration will continue to find new natural enemies, and to develop laboratory rearing methods for *Polypedilum* spp.

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DEP's Invasive Plant Research: A Historical Perspective and Review of the Program

Scientific research is, and has been, the foundation of Florida's invasive plant management programs. From 1970 through 2006, the bureau spent $13,417,505 on 144 research projects to determine best control and prevention management practices for invasive non-native plant species found on the state's public conservation lands and waterways. Of these funds spent, 51% were spent on hydrilla (*Hydrilla verticillata*) research. More than $7.4 million was spent on biological control research through the years targeting species as hydrilla, water hyacinth (*Eichhornia crassipes*), Brazilian pepper (*Schinus terebinthifolius*), Old World climbing fern (*Lygodium microphyllum*), and melaleuca (*Melaleuca quinquenervia*). In fiscal year 2005-06, DEP funded almost $1.4 million on 35 research and 3 outreach projects with a total of 12 research projects (six each) targeting hydrilla and Old World climbing fern. Information about DEP's Research Review Process and the research and outreach recommendations from the Invasive Plant Summit 2000 along with present outreach efforts will also be presented.

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Hymenachne amplexicaulis Control at Myakka River State Park

Hymenachne amplexicaulis is an exotic, invasive weed that has spread to most countries of the neo-tropics. The pathway and timing of the introduction of this species into Florida is uncertain. However, the first herbarium record was from a ponded pasture in Palm Beach County in 1957. This suggests that the grass could have been intentionally introduced as a forage. Current herbarium records indicate that *H. amplexicaulis* is present in wetlands and rivers in 16 counties in Florida. It is expected that total eradication of *H. amplexicaulis* is impossible, but maintenance control methods should be established to prevent further spread of this invasive, exotic species. Two experiments were established on November 3, 2005 at the Myakka River State Park. These sites are approximately 5 km apart; sites were designated as 'North' and 'South'. Glyphosate (4.2 kg ae/ha), imazapyr (1.12 and 1.68 kg ai/ha) and glyphosate + imazapyr (4.2 + 1.12 kg/ha) was applied to *H. amplexicaulis* plants; an untreated check was included. The experiment was established as a split-plot design to test differences in single versus repeat applications onto the same plot, with the main plot designated as the herbicide treatment, and the sub-plot being either single or sequential herbicide applications. A factorial arrangement of spring versus fall application will also be investigated. Herbicides were applied with a 2-person back pack sprayer calibrated to deliver 468 liters per hectare at 262 kPa. Control was visually estimated 1 and 3 months after treatment and by harvesting whole plants and planting individual nodes to monitor regrowth.

H. amplexicaulis control was different among sites one month following a fall application, but the trend was similar. Glyphosate provided the least control with 79 and 86% control at the North and South sites, respectively. Imazapyr at 1.1 and

1.7 kg/ha provided similar control among application rates and at both sites. The tank-mix of glyphosate and imazapyr provided equal control to that of imazapyr at the North site, while this treatment provided the highest control at the South site. The difference between the two sites may be due, in part, to the difference in the amount of standing water at each site (North=40 cm; South=20 cm).

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Status of TAME Project

The biological control program for the invasive tree *Melaleuca quinquenervia* began in the mid 1980s with exploratory surveys for potential agents in the tree's native territory in Australia. The first biological control agent, a weevil, was released in south Florida in 1997 followed in 2002 by the second agent, a psyllid. Both insect agents are well established with reproducing populations throughout melaleuca infested regions of the state. Feeding damage by these agents reduces growth and reproduction of melaleuca. With the success of the biological control program, a mechanism was needed to increase awareness of the insects, of the damage they cause and of how that damage can fit into existing melaleuca management programs. In 2001, the US Department of Agriculture Agricultural Research Service (USDA ARS) funded a five year demonstration and research project entitled The Areawide Management and Evaluation of Melaleuca, or TAME Melaleuca. The project is a partnership between USDA-ARS, the South Florida Water Management District and the University of Florida's Institute of Food and Agriculture Services, with several other organizations and individuals contributing as well. The principal goal is to demonstrate integrated melaleuca management based on the use of biological control but also including chemical and mechanical tactics. TAME Melaleuca has nine demonstration sites at which workshops and field tours are offered. In addition to demonstration and outreach activities, TAME Melaleuca also sponsors continued research on various aspects of melaleuca biology, invasion and management. Activities and accomplishments of the TAME Melaleuca project as it approaches its final year will be reviewed.

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Disposable Pets, Unwanted Giants: Pythons in Everglades National Park

Reports of exotic snakes in Everglades National Park include regular and increasing sightings of Burmese pythons (*Python molurus bivittatus*). Pythons in the wild today are a result of unwanted, intentionally, and perhaps accidentally, released exotic pets. The Burmese python, a native to Southeast Asia, can reach a length greater than twenty feet. This python is a long lived (15 – 25 years) behavioral, habitat, and dietary generalist, capable of producing large clutches of eggs (8 – 107). Pythons in Everglades National Park have been observed along the main park road, in Long Pine Key, at Shark Valley, along Tamiami Trail, and in the remote mangrove backcountry. They have also been observed repeatedly on the eastern boundary of ENP, especially in the C-111 Project Basin and along other canal levees managed by the South Florida Water Management District (SFWMD). The non-native python's diet in the Everglades includes raccoon, rabbit, muskrat, squirrel, opossum, cotton rat, black rat, cat (kitten), bobcat, house wren, pied-billed grebe, coot, white ibis, limpkin, and American alligator. Sources of mortality include motor vehicles, mowing equipment, fire, and alligators. As *Python molurus* is known to eat birds, and also known to frequent wading bird colonies in their native range, the proximity of python sightings to the Paurotis Pond and Tamiami West wood stork rookeries is troubling**.** Between 1995 and 2005, 212 Burmese pythons were captured and removed or found dead on the road. In the years 2003, 2004, and 2005; 23, 70, and 95 pythons have been removed from the park and adjacent lands, respectively. During fall (Oct/Nov) of 2005 while clearing land in the C-111 Project Basin (the Frog Pond) at least 22 pythons were killed by farm machinery and at least 7 more pythons were encountered by the SFWMD while mowing retention area levees. Undocumented reports for this same time period suggest an additional 17 – 20 pythons may have been hit and killed by farm machinery. There were also numerous reports of pythons escaping the approaching tractors. In recent years (2003 – 2005) individuals of all size classes have been seen with increasing regularity in and around Everglades National Park and on lands managed by SFWMD along the park's eastern boundary. The measured total length for snakes recovered ranged from 2 feet to over 15 feet, including hatchling sized animals recovered in the summer of 2004 and 2005. Burmese pythons present a potentially significant threat to the successful ecological restoration of the greater Everglades. Pythons are now established and breeding in South Florida. *Python molurus bivittatus* has the clear potential to occupy the entire footprint of the Comprehensive Everglades Restoration Project, adversely impacting valued resources across the landscape. Burmese pythons are widely bred in Florida and still imported from Southeast Asia as pets.

Proposed management and control actions must include strategies for preventing their intentional release. In July of 2005 an Invasive Snake/Reptile Management and Response Workshop was convened. Workshop participants recommended strategic actions in three broad areas; (1) python control, (2) rapid response to invasive amphibians and reptiles in South Florida, and (3) public outreach and education. Action plans are being drafted, pilot projects advanced, and funding pursued.

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Region 4 FWS Invasive Species Strike Team: Team Operations and FY05 Accomplishments

In 2004, the National Wildlife Refuge System, in response to the escalating problem of invasive species, established five regional Invasive Species Strike Teams throughout the United States, including one team geared specifically to dealing with invasive species management in Florida. The Region 4 Invasive Species Strike Team (R4 ISST), stationed at the J.N. 'Ding' Darling NWR in southwest Florida, will focus on management of invasive exotic plants and to a lesser degree, exotic animals.

The primary duties of the R4 ISST will include: 1) administering contracts for invasive exotic plant mapping and control on Florida refuges; 2) early detection and rapid response to new plant invasions by direct interdiction of the 2-member 'strike team'; 3) providing technical assistance and recommendations to refuge managers, i.e., identification, IPM development, monitoring and treatment protocols; and 4) representing the Service on regional task forces and committees involved with invasive species management in Florida. The goal of the 'strike team' will be to attempt to coordinate and standardize invasive species management activities on National Wildlife Refuges throughout Florida, and provide technical assistance to remaining NWRs in the Southeast.

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Brazilian Pepper Biological Control: Updates from Foreign Exploration Activities

Brazilian pepper is one of the worst environmental weeds in south Florida. This species occupies a diverse number of habitats decreasing the biodiversity in the infested areas. Although chemical controls are known and used to control this invasive species, biological control presents an attractive alternative when practiced safely. The native range of Brazilian pepper in South America extends north from Misiones Argentina into Paraguay and along the coast of Brazil to north of Rio to Aracaju, Bahia province. This extensive range of the weed, from 8 to 38 degrees south latitude, is being surveyed extensively by the our USDA/ARS Invasive Plant lab and colleagues at the USDA/ARS South American biological control lab.

By conducting monthly surveys many new herbivores are being recovered throughout the native range of the species. These include the weevils *Omolabus piceus* and *Apocnemidophorus pipitzi*, thrips, psyllids, and an eriophyid mite. Progress will be presented describing the potential of these as potential biological control agents.

Abstracts for Poster Presentations

Maria Alejandra Barahona

Impact of the Stem-Mining Weevil *Mecinus janthinus* on Dalmation Toadflax Population in Idaho

Abstract not provided

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Access to invasive and exotic species information and images through Invasive.org

The University of Georgia's Bugwood Network (www.bugwood.org) developed Invasive.org as a tool for collecting, providing and maintaining information and images related to invasive and exotic species for North America. This includes plants, insects, pathogens, nematodes, mollusks and vertebrates, as well as many biological control agents. Identification, ecology and management information is easily accessible for many of these species. Invasive.org currently provides information and/or images for over 600 different species. The project has been funded in part by the USDA Forest Service and USDA APHIS PPQ. The overall goal of the project is to cross agency and organizational barriers to provide the most useful information to the largest audience. In order to accomplish this goal cooperation is required at a regional, national and even international level.

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A Pilot Study of Herbicide-Fire Treatment to Control *Lygodium microphyllum* on Tree Islands

Controlling infestations of the invasive fern *Lygodium microphyllumon* tree islands within Arthur R. Marshall Loxahatchee National Wildlife Refuge (refuge) is a critical responsibility for natural resource managers. This project proposes a small-scale pilot study using islands (n= 10) heavily infested with *L. microphyllum* that will initially be aerially treated with metsulfuron methyl (Escort XP) at 2oz/ac. Approximately 6months post-treatment, five of these islands will be treated with fire after significant vegetation browning occurs and when ambient water levels are relatively high. Fire would be used as a one-time treatment per individual tree island, as frequent fire intervals would likely cause irreparable damage to island integrity. Cover of exotic and native vegetation, canopy cover and tree survival will be monitored at the beginning of each year for at least 3 years. Follow-up [ground] treatments using herbicide will be conducted as necessary on islands without fire treatment, and possibly on islands with fire treatment. Therefore, the cost and efficacy of using prescribed fire for controlling *L. microphyllum* infestation on tree islands can be weighed against more "traditional" treatment methods. Project outcome pending, using fire could provide for a less expensive control method, a longer re-treatment interval, and are allocation of resources to heavily infested areas, which is a significant benefit for a large managed area such as the refuge. Optimistically, removing the thick rachis mat of *L. microphyllum* with fire will remove excess biomass and decrease shading in hopes of expediting recovery time of the native plant community.

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The Lygodium Sawfly, *Neostromboceros albicomus*, a New Potential Biocontrol Agent for Old World Climbing Fern, *Lygodium microphyllum*

Old World climbing fern, *Lygodium microphyllum* (Cav.) R. Br., has rapidly become one of the most invasive weeds in South Florida. The speed of the invasion, 70,000 acres in three years, demand that management options be developed as

quickly as possible. One option is biological control through the use of insects. Since 2000, researchers at the Florida Biological Control Laboratory, Gainesville, have been studying potential biocontrol agents of *L. microphyllum.* One agent, *Austromusotima camptozonale*, after approval from the USDA-APHIS, has been released in south Florida. *Austromusotima* is the first agent in a complex of agents that will eventually be released against *L. microphyllum*. The Lygodium sawfly, *Neostromboceros albicomus*, is currently been evaluated in quarantine as a potential biological control agent. Information on the biology and host specificity of the sawfly will be presented.

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Fergusonina turneri (Diptera: Fergusoninidae) and its nematode symbiont, *Fergusobia quinquenerviae* (Tylenchida: Neotylenchidae): potential biological control agents of *Melaleuca quinquenervia* in south Florida

Since introduction into South Florida in the late 1800's, the Australian melaleuca tree, *Melaleuca quinquenervia* ("melaleuca"), has invaded more than 200,000 ha (*ca*. 7.8 ha/d over the past century) of wetlands comprising the Florida Everglades. Two biological control agents, the melaleuca weevil *Oxyops vitiosa* and the melaleuca psyllid *Boreioglycapsis melaleucae*, were initially released in 1997 and 2001, respectively, and have since established throughout south Florida. Recently, the melaleuca bud-gall fly *Fergusonina turneri* along with its obligate symbiotic nematode *Fergusobia quinquenerviae* also cleared quarantine-based host specificity testing and have been approved for field release in south Florida. This is the first mutualism approved as a biological control agent pair in the U.S. The bud-gall fly deposits its eggs and nematodes in the interior of young melaleuca buds via an elongated ovipositor. The nematode then appears to cause a proliferation of cell growth to occur within the bud. The resulting gall inhibits the normal growth of stem and leaf tissues from the bud and provides the necessary food source for developing nematodes and fly larvae. Nematodes reinvade the ovaries of fly pupae, and adult flies with nematodes emerge from the gall. Preliminary releases of the bud-gall fly + nematode were made in 2005 and a second set of releases is planned for the winter of 2006/2007.

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Amphibian Risk Assessment and Glyphosate Herbicides: Key Considerations for Laboratory and Field Studies

In recent years, a number of published studies have examined the potential for adverse effects of glyphosate herbicide formulations on amphibian growth, development, behaviour and survival. These studies have included laboratory, simulated field, and field exposure studies to a variety of amphibian species. Due to the lack of established test guidelines for amphibian studies, the study protocols vary considerably among researchers, which can make comparison of results among multiple studies difficult. Herbicide formulations and exposure concentrations studied vary significantly, and some exposure concentrations are much higher than the levels that have been shown to be present in the environment following lawful herbicide application. Moreover, processes of dissipation from the water column, biodegradation, and bioavailability are often not addressed in the study design. Therefore, the results from studies in which test animals are continuously exposed in artificial systems at unrealistically high concentrations must be evaluated with caution. This presentation examines several recently published studies that have evaluated the potential for effects of glyphosate herbicide formulations to amphibians. This analysis compares the exposure regimes used in these studies with environmentally realistic exposure scenarios, in order to put the results of these studies into the proper context for evaluating ecological risk.

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The Australian native *Melaleuca quinquenervia* (Cav.) S. T. Blake is an invasive tree in South Florida that threatens biodiversity in the greater Everglades region. *Melaleuca quinquenervia* was first introduced to Florida in 1886 for agroforestry or horticultural reasons and has since spread aggressively, out competing native flora and forming dense monocultures. As part of a classical biological control program to establish top-down pressure on *M. quinquenervia* by reuniting the invasive plant with its natural enemies, the psyllid *Boreioglycaspis melaleucae* Moore was released in 2002 and established in the field. It remains unclear how *B. melaleucae* development, fecundity, and oviposition respond under a range of temperatures and humidities such as those found in southern Florida. The purpose of this study was to determine the influence of temperature,

humidity and host plant terpenoid profile (chemotype) on *B. melaleucae* stage-specific development times and survival, oviposition rate, and fecundity.

There was no effect of chemotype or humidity on nymph development, but there was a strong effect of temperature. Nymph development progressed more rapidly at higher temperatures up to a point at 27.5°C, above which development rates declined. Insects are ectothermic and their development is strongly dependent on temperature, so it is not surprising that temperature was the most influential parameter. Humidity levels could perhaps be regulated by a microenvironment that nymphs create by shrouding themselves in layers of white filaments which they secrete from their abdomens. *B. melaleucae* could perhaps avoid terpenoids by circumventing oil glands while inserting their stylets into the leaf surface, as evidenced by other psyllid species. Preliminary data shows that *B. melaleucae* adults live 35 and 15 days on average at 20 and 30°C, respectively, and that individuals kept at 10°C either die within 10 days or live up to 50-100 days. Also, females deposit an average of 21, 168, and 85 eggs at 10, 20, and 30°C, respectively, over a lifetime. Chemotype of the test plant does not seem to be a factor in either longevity or fecundity. These data will be used to construct a life history table and to develop a temperature-based population dynamics model to predict population growth rates in the field.

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Results of Germination Trials for *Colubrina asiatica (L.) Brogng.* (Rhamnaceae)

Seed is a critical stage of the plant life cycle and significant regulator of plant population dynamics. Paradoxically, seed ecology, biogeography, dormancy, and germination traits of invasive species are rarely studied and poorly understood. We analyze and discuss patterns of germination of *Colubrina asiatica* (Rhamnaceae) from eight populations in south Florida. This coastal species inhabits beach and back-dune habitats on islands and coastal areas. This study includes experiments conducted in the field in Biscayne and Everglades National Parks and also under controlled greenhouse conditions. Results suggest that germination success is extremely low, and that burial of seeds is not favorable for germination. Additionally, although *Colubrina* plants produce copious amount of seed year-round, there may be significant seasonal variation in seed crop viability and survivorship. The primary objective of this study is to achieve a better comprehension of how *Colubrina* seed ecology influences population growth and how germination is regulated under natural conditions so that management of this species may be enhanced.

Michael G. Cripps

No Evidence for an 'Evolution of Increased Competitive Ability' for *Lepidium drapa*

Abstract not provided

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Potential Biological Control of West Indian Marsh Grass (*Hymenachne amplexicaulis*) in Florida

Invasions of exotic grasses constitute a major threat to aquatic ecosystems. West Indian Marsh Grass, Hymenachne amplexicaulis (Rudge) Nees, is currently invading the watersheds of central and south Florida. Hymenachne amplexicaulis is native to South America and the West Indies and has spread to most countries of the neo-tropics. Hymenachne amplexicaulis invades river banks, marshes and other areas subject to seasonal flooding. Reproduction involves stolons and seeds that can be transported great distances downstream. Therefore, seasonal flooding associated with summer rainfall in Florida facilitates spread of this grass. Control measures of H. amplexicaulis rely on the use of registered herbicides. However, herbicides offer only a short term control of H. amplexicaulis, as there is substantial regrowth from stolons and seeds after herbicide treatment. Therefore, more research is needed to find more effective measures to control this invasive grass in Florida.

Biological control has been a successful tactic to control invasive aquatic weeds worldwide. In Florida, an adventive insect was recently found causing severe damage to H. amplexicaulis. This insect was identified as Ischnodemus variegatus (Hemiptera: Blissidae) and it is consider native to South America. Little information is known about the host range of I. variegatus in Florida. Therefore, the objective of this study was to evaluate the host range of this herbivore under laboratory

and field conditions. Host range tests included taxonomically related species, grasses grown as food crops, turf grasses used in Florida, and grasses with ecological similarities to the target plant. So far, 60 plants species were tested under no-choice conditions for nymphal development and five plants for adult oviposition. Results showed higher survival of I. variegatus from nymph to adult on Hymenachne amplexicaulis compared to other tested plants. Development to the adult stage also occurred in Panicum hemitomon, Panicum anceps, Paspalum urvellei and Thalia geniculata. Under non-choice conditions, females laid eggs on P. hemitomon and H. amplexicaulis. Open field tests demonstrated that I. variegatus females can lay eggs on several non-target grasses (e.g. P. hemitomon, P. anceps). Since I. variegatus is present in most wetlands where Hymenachne occurs, this allowed the study of interactions of presumed "specific" herbivores with other plant species. Results from open field tests demonstrated that under local outbreak conditions (14 bugs/plant), I. variegatus females can lay eggs in non-target plants. The poor survival of nymphs under no-choice conditions and the low numbers of insects found in the open field test suggest that I. variegatus performs better on H. amplexicaulis but could use alternative hosts temporally for oviposition and shelter.

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Detection and implications for management of *Lygodium microphyllum* on tree islands in water conservation areas

Among Florida's non-indigenous invasive flora, *Lygodium microphyllum*, Old World climbing fern, is one of the most threatening species to the greater Everglades ecosystem. A combination of life-history traits and a lack of natural enemies enable *L. microphyllum* to invade both disturbed and undisturbed areas. The spread of *L. microphyllum* to tree islands in Water Conservation Area 3 (WCA-3) is a great concern of the South Florida Water Management District (SFWMD). Because of their close proximity to source populations, tree islands in WCA-3 may have been susceptible to invasion by *L. microphyllum*. Therefore, the Everglades Division of SFWMD initiated a collaborative effort with researchers at Florida Atlantic University to inventory tree islands in WCA-3A for the presence of *L. microphyllum*. Randomly selected islands are surveyed for *L. microphyllum* using a transect sampling approach. Transects are oriented in an east to west direction and traverse each island from slough to slough. Each transect is separated by a distance of 20 m. Of the islands surveyed thus far, 9% contain at least one *L. microphyllum* infestation (5 out of 55 islands). All *L. microphyllum* infestations are similar in size, structure, and location within each island. Vegetation assemblages and hydrology are similar on most islands, which indicates that *L. microphyllum* invasion in this region may be at an early stage. However, this may suggest that most islands in the area are susceptible to invasion. To address the likely spread of invasive species in the central Everglades, Everglades Division of SFWMD, in collaboration with the Districts Vegetation Management Division, is developing a strategic control program to manage invasive species infestations on tree islands within the WCA's. Its primary objective is to develop a cost-effective approach to rapidly locate and treat small populations in remote, closed-canopied communities where standard remote surveying methods are inadequate. An operational model that incorporates planning, budgeting, and a GIS-based management tracking system is being discussed and developed.

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The IFAS Assessment of the Status of Non-Native Plants in Florida's Natural Areas

Since May 2005, 164 new species have been assessed using the IFAS Assessment of the Status of Non-native Plants in Florida's Natural Areas. Since the first results of the IFAS Assessment were published in 2001, all FLEPPC-listed species and many species recommended in IFAS Extension publications have been assessed, bringing the total number assessed to over 320 species. Changes and additions have been made to the IFAS Assessment website at http://plants.ifas.ufl.edu/assessment.html, including new instructions for quoting the IFAS Assessment when writing about or recommending non-native species. The IFAS Assessment was originally intended to provide consistent recommendations for IFAS Extension faculty about the use of non-native plants, but is available on the web for anyone to use and quote. A quantitative summary of the current conclusions and results will be presented. For some species, current results are incomplete. This is because: some species mostly occur in disturbed sites (not included in the assessment); we only have records of new colonization and/or new populations of some species; or we are not familiar with all populations of species growing in natural areas. We would like to request new information, especially for incomplete assessments. We will be present at the conference with questionnaires for anyone willing to help us with any of the incomplete species assessments

that we list. We greatly appreciate everyone who has taken the time to complete our questionnaires and to provide information about the occurrence of non-native species in Florida.

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Investigating the determinants of local scale distribution of *Ruellia tweediana* (syn. *R. brittoniana*) in natural areas

There are approximately 17,000 native plant species in the United States but 25,000 non-native plant species in cultivation in Florida alone and of these more than 900 have escaped and become established in surrounding natural areas. *Ruellia tweediana* is a non-native plant introduced prior to 1940 that has naturalized in disturbed uplands and wetlands of 9 states, the Virgin Islands, and Puerto Rico. A popular horticultural plant, *R. tweediana* is available in many nurseries across Florida, being very attractive to the homeowner because of its ability to grow in many environmental conditions, from a water plant to growing in well-drained, almost xeric conditions. Observations in natural areas suggest that the field distribution of *R. tweediana* is limited to a narrow band along the banks of water ways. The goal of my research is to determine what may be influencing this narrow ecological range. There will be three experimental components: a seed burial study; a seedling transplant experiment, and a controlled greenhouse study with seedlings and/or mature plants to support the two field studies. These studies will investigate 1) whether the observed field distribution of *R. tweediana* can be explained by limitations due to environmental conditions (e.g. soil moisture) and/or by biotic interactions (e.g. competition with native plants), and 2) at which life-stages (seeds, seedlings, and mature plants) these limitations are most influential.

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The Potential for Spread of *Lygodium microphyllum* Spores by Herbicide Applicators

Old World climbing fern (*Lygodium microphyllum*) has become on of the worst invasive plants in Florida within ca. 40 years after first being documented in the State. The fern spreads across the landscape from wind blown spores, but these spores may also be moved by herbicide applicators and their equipment. Herbicide applicators often work in multiple natural areas and could potentially spread the spores of the fern to un-infested sites when moving to new work areas. Clothing and equipment of herbicide applicators were swabbed with 1-inch square cotton swabs following work in areas infested with *L. microphyllum* to determine if workers and their equipment were contaminated with spores. We detected *L. microphyllum* spores from all samples taken during treatment of *L. microphyllum* indicating that the spores of this fern easily contaminate clothing and equipment. When moving to new treatment areas, we suggest that applicators thoroughly clean equipment with high pressure water or air sprayers to remove spores. Clothing worn by applicators should also be washed prior to working in a new area.

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Monitoring the Effects of Repeated Aerial Herbicide Application on *Lygodium* and Native Species in the A.R.M. Loxahatchee National Wildlife Refuge

Abstract not provided

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Herbicide me, Seymour…Palm Beach County's Invasive Non-native Vegetation Removal Incentive Program

In February, 2003, the Palm Beach County Board of County Commissioners passed a new ordinance that targets nine invasive non-native plant species on properties that border conservation areas in the County. The ordinance requires the removal (the stick) of these plant species on all properties within this buffer, however, coupled with the ordinance, is a generous incentive/financial assistance program (the carrot) to help property owners with the removal of these plants. The poster details how this ordinance came into being, and the details of each of the incentive programs.

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Exotic Plant Species on Cumberland Island, GA

A survey of exotic plant species on Cumberland Island (Georgia, USA) was conducted during 2003-2004. Sixty-six exotic plant species were identified. Twenty-three of these are recognized as invasive or potentially invasive by either the GAEPPC or FLEPPC and eleven are found in natural areas of Cumberland Island National Seashore. Areas containing these species, obtained in the form of Geographic Information System layers, ranged from 1 m^2 to 2,273,708 m^2. Rankings of impact determined by the Alien Plant Ranking System ranged from 4 to 60, but did not agree well with rankings by the GAEPPC or FLEPPC.

Jessica L. McKenney

Increased Growth Vigor of the Mustard *Lepidium drapa* (L.) Provides Support for Invasiveness Hypothesis.

Abstract not provided

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Invasion of *Melaleuca quinquenervia* Alters a Southern Florida Forest Soil

A central question in the study of invasive species today is: What is the effect of exotic plant invasion on soil nutrient pools and microbial communities? *Melaleuca quinquenervia,* an Australian tree, is able to out-compete and replace native species thereby potentially altering soils in ecologically important areas such as the Florida Everglades. In February 2005, fourteen plots were established in two areas: an invaded area dominated by mature melaleuca trees with an under-story carpet of even-aged saplings and a non-invaded area dominated by mature cypress trees (*Taxodium ascendens*). Four soil samples were taken in each plot and separated at two depths: 0-5 cm and 5-15 cm. Analyses preformed will investigate the effect of melaleuca invasion on soil microbial population size, diversity, and function. Preliminary results reveal microbial biomass values were consistently higher in the non-invaded soils as compared to soils dominated by melaleuca. Microbial biomass carbon was 17% lower in the invaded soils for the 0-5cm soil depth and 25% lower for the 5-15cm depth. Microbial biomass nitrogen (MBN) and phosphorus (MBP) values followed a similar pattern. MBN was 29% lower in the invaded soils for the 0-5cm soil depth and 48% lower for the 5-15cm depth. MBP was 38% lower in the invaded soils for the 0-5cm soil depth and 53% lower for the 5-15cm depth. These results and additional microbial population analyses will be used to test three central hypotheses: lower substrate quality in melaleuca litter will 1) lower microbial biomass in invaded soils; 2) lower mineralization capacities in invaded soils; and 3) there will be a shift in the microbial species composition and an overall reduction in the microbial biodiversity in the invaded soils.

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First-year Results of a Two-year Study Evaluating Herbicide Effectiveness on Air Potato (*Dioscorea bulbifera*)

Air potato (*Dioscorea bulbifera*) is a nuisance species throughout the State of Florida, and as such is listed as a Category I invasive species by FLEPPC and as a Noxious Weed by the Florida Department of Agriculture and Consumer Services. To evaluate various herbicides in their ability to control air potato, thirteen treatments were sprayed at three sites. Percent leaf cover was estimated at the time of spraying and at 30-day intervals after spraying, until vines senesced at the end of the growing season. The most effective treatment at the first two sites in the shortest period was Accord XRT/Escort (1.1% and 0.3 g/gal, respectively), and the best treatment at the third site was Accord XRT (1.1%). Accord XRT alone was not evaluated at the first two sites, and the addition of Escort to the Accord XRT at the third site seemed to have no benefit. Results from Garlon 3A, alone or in combination with Overdrive, were nearly as good, but appeared to result in more off-target damage. To assess what affect Escort may have had on bulbil sprouting, a fourth site was sprayed with Accord XRT both with and without Escort. Bulbils were later gathered, but have not yet begun sprouting.

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Competitive Effects of the Invasive Grass *Rhynchelytrum repens* (Willd.) C.E. Hubb. on Pine Rockland Vegetation

The widely invasive grass *Rhynchelytrum repens* (Willd.) C.E. Hubb. invades globally-imperiled pine rockland forests of South Florida. To examine whether its spread into and persistence in undisturbed areas pose a threat to native species, we investigated whether the presence of *R. repens* was associated with a decline in the diversity and abundance of native pine rockland understory plants. We showed *R. repens* density class was strongly associated with a reduction in native species diversity, with high density (20% cover) plots having five fewer species than low density (0.2%) ones. When we separated species by functional groups, we found that graminoids were affected much more than other native species, with *R. repens* cover explaining 23% of the variation in graminoid diversity. *Rhynchelytrum repens* is indeed causing harm to pine rockland diversity, and we recommend that land managers take action to (1) treat infestations before they reach 30% cover, and (2) remove infestations of any density adjacent to natural areas.

Kenneth P. Puliafico

Impact of North American Insect Herbivores on the Invasive Plant, *Lepidium draba*

Abstract not provided

Marianna Szucs

Landscape Genetics and Climatic Associations of Flea Beetle Lineages, and Implications for Biocontrol of Tansy Ragwort

Abstract not provided

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Host Range of Lophodiplosis trifida (Diptera: Cecidomyiidae), a Potential Biocontrol Agent of Melaleuca quinquenervia (Myrtaceae: Myrtoideae: Leptospermoideae), Under Quarantine Conditions

Lophodiplosis trifida Gagné, was imported to the Florida Department of Agriculture, Division of Plant Industry quarantine facility, from Brisbane, Australia in early October, 2003. L. trifida was easily colonized on potted plants of its target species, Melaleuca quinquenervia S.T. Blake, in a quarantine greenhouse. Host range tests (no-choice oviposition and development tests) were initiated mid-October and will be completed by mid-year 2006. As of February 2006, 53 of the 63 non-target species (14 Leptospermoideae, 25 Myrtoideae, and 14 non-myrtaceous species) have been tested. L. trifida has oviposited on many species, but has completed development only on Melaleuca quinquenervia and possibly on a very close relative, M. viridiflora (tests underway). Some galling occurred on the closely related genus, Callistemon, but no adults emerged. If the remaining test results corroborate these results, a petition to release L. trifida will be submitted to the USDA APHIS Techinical Advisory Group in 2006.

Rachel Winston

The Efficacy of Biological Control Against Yellow Starthistle in the Hell's Canyon Ecosystem

Abstract not provided