Wildland Weeds

FALL 2006


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Wildland Weeds

FALL 2006, VOLUME 9, NUMBER 4

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The mission of the Florida Exotic Pest Plant Council is to support the management of invasive exotic plants in Florida's natural areas by providing a forum for the exchange of scientific, educational and technical information.

An exotic plant has been introduced to Florida, either purposefully or accidentally, from a natural range outside of Florida. A naturalized exotic plant is one that sustains itself outside of cultivation (it is still exotic; it has not "become" native). An invasive exotic plant not only has become naturalized, but it is expanding its range in Florida plant communities.

Wildland Weeds (ISSN 1524-9786) is published quarterly by the Florida Exotic Pest Plant Council (FLEPPC) and the Southeast Exotic Pest Plant Council (SE-EPPC) to provide a focus for the issues and for information on exotic pest plant biology, distribution and control.

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On the Cover:
What do these butterflies have in common? They all benefit from exotic plants in Florida. Clockwise from upper left: Ceraunus blue, Long-tailed skipper, Polydamas swallowtail, Cloudless sulphur (caterpillar). Polydamas swallowtail photo by Erika Simons. All others by Michael Meisenburg. See article on page 6.

editor's note

Recently I visited the lovely city of Portland, Oregon and spotted an "invasive plant removal/restoration planting" sign in one of their many city gardens along the Willamette River. Outside the city at one of the beautiful waterfalls along the Columbia Gorge, I came upon a young woman pulling weeds. She was Diana Spartis, an AmeriCorps member leading a group of students from the Alpha Conservation Corps. They were working at Latourell Falls, a scenic natural area, removing the invasive ground cover Herb Robert, a/k/a Stinky Bob *(Geranium robertianum)*, under a grant from the Oregon State Parks and Recreation Department.

Returning home to Gainesville, Florida, I attended a "Florida Quilts" show at the natural history museum and one of the quilts featured a lionfish. The panel describing the quilt, written by the artist, cautioned against releasing lionfish into the wild due to their non-native and invasive status. It went on to mention that studies were underway on their impacts to local fisheries. I was quite surprised, but on reflection (and while reviewing my overflowing email inbox in preparation for this issue), I realize that we are now riding a huge wave of awareness, activity and research on the invasive species dilemma. Just a few of the many widespread endeavors taking place in our field right now:


Diana Spartis

- National Tribal Invasive Species Conference in Nevada
- Japanese knotweed workshop at Cornell University, Ithaca, New York
- "Elongated mustard *(Brassica elongata)* is growing about 5 miles east of Salida, Colorado on the north of the Arkansas River. It jumped the river this spring and is continuing to spread along roads and into the surrounding areas. Chaffee County Weeds has been in contact with BLM and treated 18 acres along the roads and…"
- The Midwest Invasive Plant Network is offering a free distance-learning workshop on How to Start a Cooperative Weed Management Area in the Eastern United States
- Aimed at preventing the spread of aquatic invasive species by water gardeners and aquarium hobbyists, "Do Not Release" materials warn about potentially invasive aquatic plants and animals and caution against releasing them into our waters.

FLEPPC Education and Outreach Small Grants

Request for Proposals - FY 2007 • **Proposal Due Date:** March 1, 2007

Program Description and Eligibility

The Florida Exotic Pest Plant Council is soliciting grant proposals for non-native invasive plant education and outreach projects in the State of Florida. The intent of these grants is to provide funding to organizations or individuals who wish to educate the public about non-native invasive plants and their effects on the environment and economy of Florida. Proposals will be accepted from individuals, public or private nonprofit organizations, and academic institutions.

Evaluation Criteria

Award preference will be given to proposals that meet the following criteria:

- Involve a plant or plants listed on the FLEPPC 2005 List of Invasive Species (found on www.fleppc.org);
- Educational message will reach a large segment of the community;
- Include partnerships (please specify type and degree of involvement for partner entities);
- Demonstrate matching funds or in-kind contributions;
- Increase local community awareness of non-native plants through local charettes, volunteer events, web site development, and distribution of educational materials;
- Evaluate the project success through process or outcome evaluation;
- Heighten community awareness about non-native invasive plant identification, control, and prevention;
- First time applicants and new projects, although repeat applicants will still be considered.

Application instructions and further information may be found on the FLEPPC website (**www.fleppc.org**). Grants may not be used to fund capital expense items (sprayers, chain saws, machinery, herbicide) or to fund control or large-scale herbicide application activities. Requests for funding should not exceed $1,000.00 and all funds awarded are to be used within 1 year of receipt. If full funding is not available, partial funding may be awarded.

Applicant/organization must present a summary of results at the FLEPPC Annual meeting (poster or presentation) or provide a summary article for Wildland Weeds, the FLEPPC quarterly magazine.

The FLEPPC Education Committee will review all grants and award letters will be sent via electronic mail by May 1, 2007.

FOR FURTHER INFORMATION, contact Leesa Souto, Director of Public Education
Email: Lsouto@mail.ucf.edu • Phone: 321-722-2123 • Fax: 321-722-3585 (call first)

- The U.S. House of Representatives passed an appropriations bill that would double the budget of the National Science Foundation (NSF) over the next ten years. If passed, it would provide $11.8 million for initial implementation of the National Ecological Observatory Network (NEON). One of the primary "challenges" identified for NEON is research concerning invasive species.
- A news release on the Southern California Caulerpa Action Team (SCCAT) website regarding the successful eradication of *Caulerpa taxifolia* quotes NOAA's Deputy Assistant Secretary of Commerce for Oceans and Atmosphere: "The proliferation of *Caulerpa* would have irreversibly changed the ecosystem in California's near-shore coastal environment." Caulerpa was detected in the Agua Hedionda lagoon (near San Diego) and Huntington harbor (near Los Angeles). A number of governmental agencies and community-based environmental organizations cooperated and worked together to successfully eradicate the invasive marine weed.
- Front page *Washington Post* article on the link between increased carbon dioxide emissions and invasive vines: "*Pumped Up on Carbon Dioxide, Vines Strengthen Their Grip*"
- National Science Foundation hosts "*Biodiversity and Ecosystems Informatics Working Group*." Former ISAC officer and Deputy Chief of Research of the U.S. Forest Service and Co-chair of Ecosystems Center's Semester in Environmental Science (SES) program presents, "*Indicator Design and Data Assessment for Non-native Species*."
- U.S. Department of Agriculture's Forest Service will host a meeting for Federal economists interested in invasive species.
- A Conservation Grazing Workshop in Connecticut includes topics: Invasive Plants and Their Alternatives; Using Sheep for Invasive Plant Control; Conservation Grazing with Exmoor Ponies; and Goats as Grazing Animals for Invasive Plant Management.
- The Nebraska Invasive Plant Conference, "*Threats to Nebraska Rivers: Invasive Plant Conference*" promotes the control of invading plants to prevent further degradation of the state's riparian areas.
- Conference announced: *Invasive Plants in Pacific Northwest Ecosystems*.
- New provision to law provides for invasives control and native species establishment in federally funded highway construction projects.
- Recent Appalachian Mountain Club magazine article on invasives, "*Space Invaders: As invasive species choke out natives, scientists wage a costly and mounting battle*." New England examples are highlighted.

This issue of *Wildland Weeds* brings you news of the SE-EPPC Invasive Plant Mapping Project, Georgia EPPC's List of Non-Native Invasive Plants in Georgia, a report on foreign exploration for new biological control agents, and the results of a study on the socio-economic impacts of controlling melaleuca in south Florida. A lot of folks are working hard – please help out by joining an EPPC chapter today!

Silver Linings

by Michael Meisenburg, University of Florida / IFAS, Center for Aquatic and Invasive Plants. Photos by the author unless otherwise noted.

People like butterflies. Not everyone, but many do. They make butterflies the subject of photographs, paintings, and poems. They landscape with plants to attract these colorful creatures; plants as nectar sources and—for the devoted butterfly gardener—plants as caterpillar hosts. They buy books to help identify the many species and books to teach them which plants to plant. They may keep life lists or yard lists, with some taking cross-country vacations to add species to these lists. They certify their yards with the National Wildlife Federation as backyard habitats; habitats for many species, including butterflies. They may even…(pause added for dramatic effect) plant exotic plants for their butterflies because, like it or not, many butterflies do benefit from introduced plants.

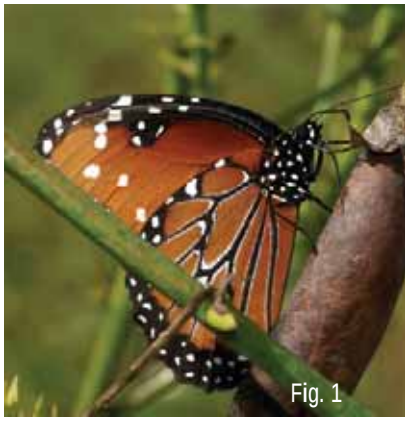
The extent to which any particular butterfly species benefits from introduced plants varies. Some plants, such as lantana (*Lantana camara*) and musky mint (*Hyptis mutabilis*), are excellent sources of nectar for many butterflies. Find these plants on a hot summer day and you will often see many butterflies hovering around them. Introduced plants such as these rival native species for their attractiveness to adult butterflies. However, while these plants benefit the insects by feeding adults, a butterfly's range depends more on larval host plants than adult nectar sources (Cech and Tudor 2005). For most butterfly species, adults live a few weeks or less, and non-migratory species usually remain fairly close to their larval host plants.

Some butterfly species have undergone population increases or range expansions in recent years because invasive exotic plants are being used as larval host plants. Some species even colonize the United States from other countries (Smith et al. 1994, Cech and Tudor 2005). The degree of invasiveness of the plants being utilized ranges from none to FLEPPC Category I designations.

*Small and easily overlooked, Ceraunus blue butterflies are common around Gainesville near patches of their larval host plants; usually the non-native trailing indigo (*Indigofera spicata*).*

Exotic opportunism

Butterflies benefit from introduced plants in many ways. An unusual example is this Queen imbibing alkaloids from showy rattlebox (*Crotalaria spectabilis*, Figure 1). Much like their close relatives Monarchs, Queens have coevolved to use alkaloid-producing plants to their advantage. Plants in the genus *Crotalaria* produce alkaloids as a defense against herbivory; the male (pictured) must collect these chemicals to synthesize pheromones and attract a mate.



LINDA COOPER

Fig. 1

Flying north into new counties

Several native butterfly species previously confined to the more-southerly latitudes of Florida have spread north in recent years, and their expansion appears to follow changes in the state's flora.

Native to Florida, Long-tailed skippers use legumes for rearing their caterpillars. They readily use introduced plants in the genus *Desmodium*, such as *D. incanum* and *D. tortuosum* (commonly known as beggarticks or ticktreefoils). These two species are often found in disturbed areas around the state. Young larvae fold small pieces of leaves over to hide from predators (Figure 2), while older larvae (Figure 3) sometimes attach two leaves together with their silk for the same purpose. A common fall butterfly, Long-tailed skippers appear to be expanding their range to the north as their populations have grown throughout the state. The Long-tailed skipper is an agricultural pest, as the caterpillars seem to prefer cultivated beans (*Phaseolus* spp.) as host plants over any other legume.


Fig. 3


Fig. 2


Fig. 5

LINDA COOPER


Fig. 4

Plants in the genus *Senna* often are utilized by Florida's butterflies, in this case sulphurs (family Pieridae). One is the Cloudless sulphur, a familiar yellow butterfly that is especially abundant during late summer. Their caterpillars often are found on the introduced septicweed (*Senna occidentalis*, Figure 4). The caterpillars are primarily green, but may be bright yellow as well (see sidebar). The green larvae of Sleepy oranges also can be found on sennas, such as coffeeweed (*Senna obtusifolia*, Figure 5). Both of these sulphurs are common butterflies. Another, the Orange-barred sulphur, is expanding its range north based on, it seems, the planting of valamuerto or Christmas senna (*Senna pendula*) in central and northern Florida. Figure 6 shows a female depositing an egg on this FLEPPC Category I species near Kanapaha Prairie in western Alachua County (Gainesville).


Fig. 6

CECELIA LOCKWOOD

Is it global warming?

A recent article in *The Gainesville Sun* asserted that global warming is allowing certain butterfly species to expand their ranges northward due, presumably, to decreased winter mortality (Tuesday 10/11/05). However, for ten of the thirteen species used as examples, range expansions may in fact be aided by expanding populations of non-native plants being used as larval food-plants. Of the thirteen butterfly species listed in the article, four are using non-native plants that are now growing wild in Alachua County; four are using non-native plants common in home landscaping; and two are using native plants frequently found in disturbed habitats but uncommon in undisturbed natural areas. Many of the species referred to in the newspaper article are also used as examples in this magazine article. The bottom line: if introduced *Aristolochia* wasn't growing in Alachua County, there would be no Polydamas swallowtails, regardless of how warm it gets.

Another tropical species expanding to the north as far as Gainesville is the Polydamas swallowtail (Figure 7). In northern Florida, it is never far from dutchman's-pipe or *Aristolochia* vines, the obligatory host. One of these, the calico vine (*Aristolochia elegans*, formerly misapplied as *A. littoralis*), is a FLEPPC Category II species.


Fig. 7

ERIKA H. SIMONS

Crossing the state line

Knowing no political boundaries, butterflies often cross into Florida from the north. For the pierids (sulphurs and whites), this is due in no small part to the abundance of its more-temperate larval host plants: legumes and crucifers. In northern Florida, many of these plants are introduced ruderal and agricultural plants, such as sweet clover (*Melilotus albus*), white clover (*Trifolium repens*), alfalfa (*Medicago sativa*), black medic (*Medicago lupulina*), cabbage (*Brassica oleracea*), wild radish (*Raphanus raphanistrum*), and garden radish (*Raphanus sativus*).


Fig. 8

LINDA COOPER

Refugees from another country

The ultimate example of butterflies benefiting from introduced plants is when a species colonizes Florida from outside of the United States. For a species to succeed in this rare event, it must find its larval host plant to be adequately available. Thus, it is not surprising that they would use a plant species introduced from their native range. However, we do sometimes find non-native butterfly species that have colonized Florida utilizing native vegetation. A little tropical butterfly, the dingy purplewing, was observed doing so several years ago and is now established in southern Florida. Occasionally, Caribbean species establish ephemeral populations in southern Florida, only to die out after a few years. Butterflies are mobile creatures and, like their host plants, have populations that wax and wane as environmental conditions dictate.

A close relative of the Long-tailed skipper—the Dorantes longtail—uses many of the same legumes for larval host plants as the long-tailed, but seems to favor *Desmodium* over all others. After being found for the first time in southern Florida in 1969, the range of Dorantes skippers is expanding to the north and they can now be found throughout Florida. There is speculation that they are supplanting Long-tailed skippers in the state (Cech and Tudor 2005).


Fig. 9

HOLLY SALVATO


Fig. 10

LINDA COOPER

Three butterflies—Gray ministreak, Fulvous hairstreak, and Malachite—use FLEPPC-listed species and, while it is possible that they use other species, the only verified host plants are invasive.

Gray ministreaks use lead tree (*Leucaena leucocephala*, a Category II species) for their caterpillars, and lay their eggs on the unopened flower buds (Figure 8). One of—if not the—smallest butterflies in the U.S., gray ministreaks were first documented in Florida in 1973 (Cech and Tudor 2005). They are found throughout the Caribbean. At Fort De Soto Park (Pinellas County), Gray ministreaks may also be using woman's tongue (*Albizia lebbeck*, a Category I species) as a host plant (Lyn Atherton, personal communication).

During the same period, Fulvous hairstreaks (Figure 9) arrived in Florida from the Caribbean. Given that their sole (known) host plant is Brazilian pepper (*Schinus terebinthifolius*, a Category I species) (Minno et al. 2005), it is surprising that they have not become more widespread. Formerly abundant in certain regions of southern Florida (e.g. Homestead), they have become less common in the last year or two (Mark Salvato, personal communication).


Fig. 11

Certainly the most spectacular of our recent introductions is the Malachite (Figure 10), a green and black showstopper. It's only known larval host plant in Florida is the green shrimp plant or Browne's blechum (*Blechum pyramidatum*, a recent addition to the Category II listing) (Minno et al. 2005). This butterfly made periodic strays into southern Florida through the 1960's from Cuba, and by 1970 had become established (Smith et al. 1994, Cech and Tudor 2005). It ranges north to Sarasota and Vero Beach.

However…

These are some of the best examples of increasing butterfly diversity as a result of introduced plants in Florida. However, the examples are not a complete list, as many other cases exist. For instance, many species in our largest family of butterflies—the skippers (family Hesperiidae)—use grasses as host plants. Several skippers have successfully made the jump to non-native grasses, including torpedograss (*Panicum repens*), guineagrass (*Panicum maximum*), Johnsongrass (*Sorghum halapense*), and cogongrass (*Imperata cylindrica*), among others (Minno et al. 2005). Observations of skipper larvae on introduced grasses might lead to the conclusion that these plants are good for the species using it. However, assessing an exotic plant's benefit (or cost) to wildlife should be made by comparing it to the native plants that are displaced— a plant being utilized by an animal does not necessarily mean that the habitat has been enhanced. For example, observations of a Clouded skipper caterpillar on Johnsongrass (Figure 11) might lead some to assume that Johnsongrass is good for clouded skippers. But evaluating the plant's proposed benefit to butterflies should include the species it is displacing. If the Johnsongrass displaced Fakahatcheegrass (*Tripsacum dactyloides*), one of the butterfly's native host plants, then the *net* benefit of the Johnsongrass is canceled.

It also should be noted that new host plants may not always increase butterfly populations. Spicebush swallowtails use trees and shrubs in the laurel family, including the Category I invasive camphortree (*Cinnamomum camphora*). However, in several years of looking for their boldly colored larvae, only once have I found a spicebush swallowtail caterpillar on a camphortree, suggesting that host plants (or lack thereof) are not the limiting factor in Spicebush swallowtail populations.

Conclusion

The situation in Florida is not unique, as a similar situation exists in California where 14 of the 32 butterfly species found within the city of Davis (a low number by Florida standards) exist solely on introduced vegetation (Thacker 2004). A majority of the remaining species will also use non-native plants as caterpillar host plants. Like the Orange-barred sulphurs and Polydamas swallowtails in Florida, the Davis butterflies benefiting from the introduced flora are native species undergoing range expansions.

One may question whether having new butterflies in the state is a good thing, since they could be regarded as exotics. The situation is analogous to that of the cattle egret: the birds expanded their range after humans modified the environment and created conditions conducive to the egrets. But whether or not you call them exotics is a philosophical debate. Geopolitical boundaries don't matter to wildlife, and where the line is drawn only matters to us. Rather than calling the butterflies ìexotic,î a more appropriate description might be ìnaturalized.î And, of course, if these butterflies begin to displace our native species, then they might be considered ìinvasive.î

It is inescapable that invasive species displace native species and upset the complex food webs that make up natural communities. Understanding this big picture motivates many of us to keep up the battle against these invasives, a battle that increases in importance daily as the conversion of natural habitats to developments continues. However, hidden within this big picture is a silver lining of increasing butterfly diversity in Florida.

Contact Michael Meisenburg at ecomike@ufl.edu for further information.

Literature cited

Cech, R., and G. Tudor. 2005. Butterflies of the East Coast: an observer's guide. Princeton University Press, Princeton, New Jersey.

Smith, D. S., L. D. Miller, and J. Y. Miller. 1994. The butterflies of the West Indies and SouthFlorida. Oxford University Press, Oxford, England.

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Thacker, P. D. 2004. California butterflies: At home with aliens. Bioscience:54(3) 182-187.

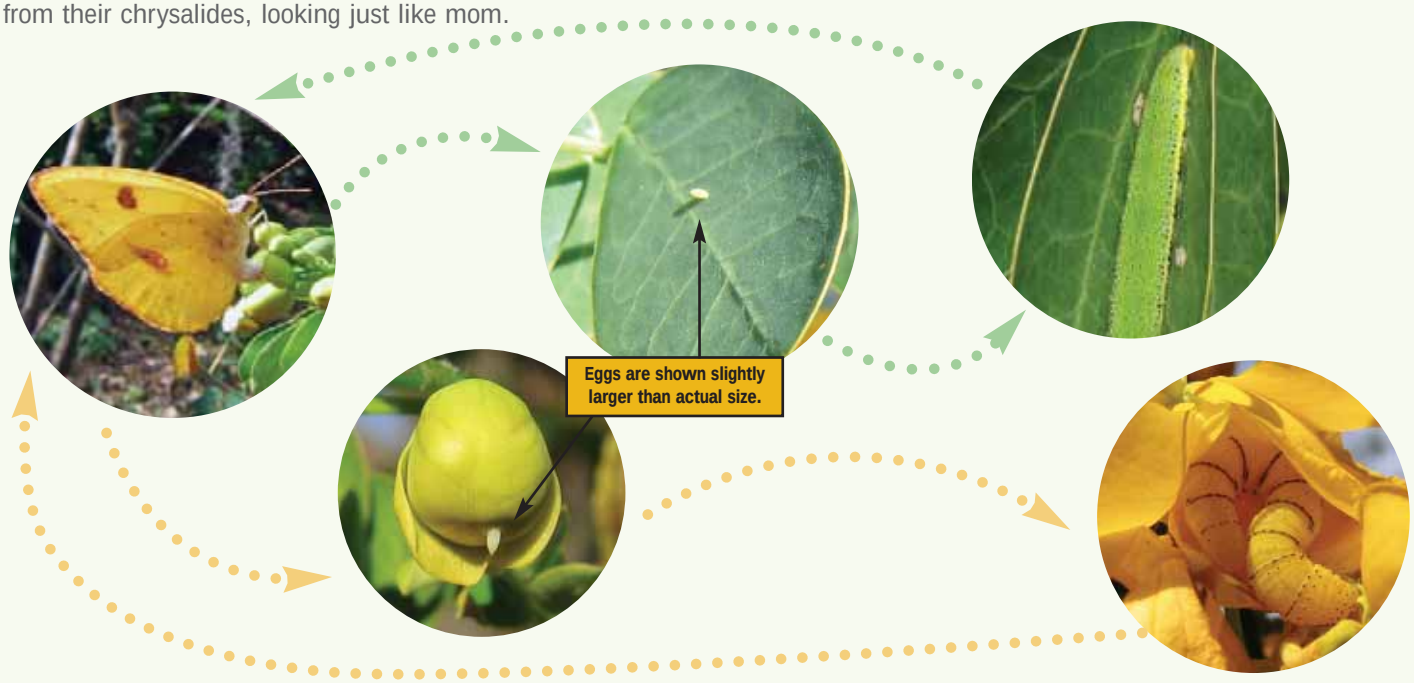
A special thanks to Marc Minno for his review of this article.

Exotic plants: a double-edged sword

Florida's state butterfly, the Zebra heliconian (formerly Zebra longwing), uses native passion vines as its larval host plant. These vines produce cyanogenic (toxic) compounds and, in a tightly coevolved relationship, the boldly colored caterpillars sequester these chemicals for their own protection. The introduced scarlet passionflower (*Passiflora coccinea*) produces the same chemicals, but in greater—and lethal—quantities than our native species. To gravid (pregnant) Zebra heliconians, scarlet passionflower tastes the same as native passion vines, but the elevated chemical levels doom the soon-to-hatch larvae. Plants such as these could function as population sinks, having deleterious effects on local Zebra heliconian populations and resulting in unintended biological control of the state's butterfly, if you will.

Sennas and sulfurs

It all begins with a female laying an egg, in this case a Cloudless sulphur and a valamuerto bush in my mother-in-law's backyard. Eggs can be laid on either unopened flowers or leaves and, if they survive the voracious and abundant ants, they hatch in a day or two. From there the caterpillars grow yellow or green, depending upon whether the caterpillars eat primarily green leaves or the yellow flowers. Larval colors aside, both morphs produce the same yellow adults when they emerge from their chrysalides, looking just like mom.



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Kathleen Craddock Burks

(09/30/1946 – 06/08/2006)

Kathy Burks, outstanding Florida botanist and dear friend to many in the conservation community, died at her home on June 8, 2006 after a brief battle with cancer. Kathy will be remembered for her joyful personality, her passion for botany, her personal integrity, her dedication to excellence, and her many contributions to botany and conservation in Florida.

Kathy received a Master of Science degree in Biological Science from Florida State University in 1992. Her master's project was a critical floristic study of Lake Miccosukee and environs in the Florida panhandle, where she developed an early expertise and interest in aquatic species, and endangered species such as the federally listed Miccosukee gooseberry (*Ribes echinellum*).

Kathy's first major project after graduating from FSU was a four-year study of plant diversity in wet savannas in the Apalachicola National Forest, which involved botanical inventory and monitoring of groundcover diversity in response to prescribed fire. She was hired by the Florida Department of Environmental Protection in 1993 where she worked in the Bureau of Invasive Plant Management for ten years and became known as one of the state's foremost experts on invasive plant species. During this time, Kathy gave dozens of presentations, conducted workshops, and contributed to numerous papers and reports, including *Florida Wetland Plants: an Identification Manual* (1998, John Tobe senior author) and *Identification and Biology of Non-Native Plants in Florida's Natural Areas* (1998, Ken Langeland senior author). Kathy also provided expert plant identification services for biologists and public land managers throughout the state.

Kathy joined the Florida Natural Areas Inventory in January 2004 as the program's invasive plants biologist where she was responsible for mapping the distribution and abundance of invasive exotic plants in Florida, and developing a statewide invasive plants geodatabase to manage the information and make it readily accessible. At FNAI she continued her role as a leader in the field of invasive plants, working with federal, state, and local governments and private organizations to advance critical issues related to the prevention and control of invasive exotic plant species.

During Kathy's career she served as Chair of the Invasive Species List Committee for the Florida Exotic Pest Plant Council, as Chair of the Science Committee for the Florida Wildflower Advisory Council, as a member of the Florida Endangered Plants Advisory Council, and she had recently accepted the responsibility of serving as Plants Editor for the Florida Committee on Rare and Endangered Plants and Animals (FCREPA). Whether invasive plants, rare plants, or roadside wildflowers, Kathy was involved with helping bring good science to decisions regarding all of these important conservation issues.

Beginning in her days at graduate school, Kathy was always a devoted advocate for the R. K. Godfrey Herbarium at Florida State University, bringing positive attention and critically needed financial resources to this important educational and research resource. Based on this longtime relationship with the Herbarium, her family requests that anyone wishing to honor Kathy make a contribution in her name to the Florida State University Foundation, specifically earmarked for Friends of the Godfrey Herbarium, P.O. Box 3062739, Tallahassee, FL 32306-2739.

We will miss Kathy's expertise and effectiveness, her congenial approach to getting the job done. But we will mostly miss her warm spirit, the passion and dedication she brought to botany and protecting Florida's important natural areas, and the friendships those who knew her were so fortunate to experience. Kathy leaves an enduring legacy in her good works and friendships that will continue to inspire for many years to come.

Gary Knight
Director, Florida Natural Areas Inventory

Georgia Exotic Pest Plant Council

List of Non-native Invasive Plants in Georgia

CHRIS EVANS, UGA

Category 1 ALERT Cogongrass *(Imperata cylindrica)*

The purpose of the Georgia EPPC Invasive Plant List is to identify and categorize plants that pose threats to natural areas in Georgia. *Natural areas* are those that are managed to conserve or restore native plant communities. This list does not include species that are problematic only in agricultural or pastoral systems. The list does not have regulatory authority; it is intended to aid in land management decisions and increase public awareness of invasive species.

INVASIVE PLANT DEFINITION

An *invasive exotic species* is defined as any species capable of propagating that is not native to that ecosystem, and whose introduction causes, or is likely to cause, environmental harm. Political boundaries are not used when determining the nativity of a species. Instead, a species is defined as exotic when it is not native to a particular ecosystem, making it possible to have a species that is native to parts of Georgia, but considered an invasive exotic in others.

LIST DESCRIPTION

The Georgia EPPC Invasive Plant List is separated into 4 categories, and one subcategory (see category definitions on following pages). Species were ranked by EPPC members with input from other professionals and land managers. Detailed distribution information does not exist for many of these species, making it difficult to use demonstrable distribution data as a criterion for ranking a species. Efforts are underway to collect this distribution data and it will be incorporated into future revisions of the List.

Category 1 – A serious exotic plant problem in Georgia natural areas, extensively invading native plant communities and displacing native species.

Scientific Name	Common Name
Ailanthus altissima (P. Mill.) Swingle	tree of heaven
Albizia julibrissin Durazz.	mimosa
Alternanthera philoxeroides (Mart.) Griseb.	alligatorweed
Eichhornia crassipes (Mart.) Solms	common water hyacinth
Elaeagnus umbellata Thunb.	autumn olive
Hedera helix L.	English ivy
Hydrilla verticillata (L. f.) Royle	hydrilla
Lespedeza bicolor Turcz.	shrubby lespedeza
Lespedeza cuneata (Dum.-Cours.) G. Don	Chinese lespedeza
Ligustrum sinense Lour.	Chinese privet
Lonicera japonica Thunb.	Japanese honeysuckle
Lygodium japonicum (Thunb. ex Murr.) Sw.	Japanese climbing fern
Melia azedarach L.	Chinaberrytree
Microstegium vimineum (Trin.) A. Camus	Nepalese browntop
Murdannia keisak (Hassk.) Hand.-Maz.	marsh dewflower
Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud.	princesstree
Pueraria montana (Lour.) Merr.	kudzu
Rosa multiflora Thunb. ex Murr.	multiflora rose
Triadica sebifera (L.) Small	tallow tree
Wisteria sinensis (Sims) DC.	Chinese wisteria

JIM MILLER, USFS

Category 1 Chinese privet (*Ligustrum sinense*)

Category 1 Alert - Not yet a serious exotic plant problem in Georgia natural areas, but has significant potential to become a serious problem.

Scientific Name	Common Name
Achyranthes japonica (Miq.) Nakai	Japanese chaff flower
Alliaria petiolata (Bieb.) Cavara & Grande	garlic mustard
Arthraxon hispidus (Thunb.) Makino	small carpgrass
Celastrus orbiculatus Thunb.	Oriental bittersweet
Imperata cylindrica (L.) Beauv.	cogongrass
Paederia foetida L.	skunk vine
Polygonum cuspidatum Sieb. & Zucc.	Japanese knotweed
Salvinia molesta D. S. Mitchell	giant salvinia

CHRIS EVANS, UGA

Category 2 Bigleaf periwinkle (*Vinca major*)

Category 2 – A moderate exotic plant problem in Georgia natural areas, invading native plant communities and displacing native species, but to a lesser degree than Category 1 species.

Scientific Name	Common Name
Ardisia crenata Sims	coral ardisia
Cinnamomum camphora (L.) J. Presl	camphortree
Cynodon dactylon (L.) Pers	Bermudagrass
Dioscorea oppositifolia L.	Chinese yam
Egeria densa Planch.	Brazilian waterweed
Elaeagnus pungens Thunb.	thorny olive
Leucanthemum vulgare Lam.	oxeye daisy
Ligustrum japonicum Thunb.	Japanese privet
Lonicera maackii (Rupr.) Herder	Amur honeysuckle
Miscanthus sinensis Anderss.	Chinese silvergrass
Myriophyllum aquaticum (Vell.) Verdc.	parrot feather watermilfoil
Nandina domestica Thunb.	sacred bamboo
Nasturtium officinale Ait. f.	watercress
Paspalum notatum Flueggé	bahiagrass
Phyllostachys aurea Carr. ex A.& C. Rivière	golden bamboo
Sesbania herbacea (P. Mill.) McVaugh	bigpod sesbania
Sesbania punicea (Cav.) Benth.	rattlebox
Spiraea japonica L. f.	Japanese spirea
Tamarix gallica L.	French tamarisk
Vinca major L.	bigleaf periwinkle
Vinca minor L.	common periwinkle

Category 3 – A minor exotic plant problem in Georgia natural areas, or not yet known to be a problem in Georgia, but known to be a problem in adjacent states.

Scientific Name	Common Name
Alternanthera sessilis (L.) R. Br. ex DC.	sessile joyweed
Ampelopsis brevipedunculata (Maxim.) Trautv.	Amur peppervine, porcelainberry
Anthoxanthum odoratum L.	sweet vernalgrass
Arundo donax L.	giant reed
Berberis thunbergii DC.	Japanese barberry
Broussonetia papyrifera (L.) L'Hér. ex Vent.	paper mulberry
Carduus nutans L.	musk thistle
Centaurea cyanus L.	garden cornflower
Clematis terniflora DC	sweet autumn virginsbower
Colocasia esculenta (L.) Schott	coco yam
Coronilla varia L.	purple crownvetch
Daucus carota L	Queen Anne's lace
Dioscorea alata L.	water yam
Dioscorea bulbifera L.	air yam
Eragrostis curvula (Schrad.) Nees	weeping lovegrass
Euonymus fortunei (Turcz.) Hand.-Maz.	winter creeper
Hemerocallis fulva (L.) L.	orange daylily
Hibiscus syriacus L.	rose of Sharon
Lantana camara L.	lantana
Lespedeza thunbergii (DC.) Nakai	Thunberg's lespedeza
Ligustrum lucidum Ait. f.	glossy privet
Limnophila sessiliflora (Vahl) Blume	Asian marshweed
Liriope muscari (Dcne.) Bailey	monkeygrass
Lolium arundinaceum (Schreb.) S.J. Darbyshire	tall fescue
Lonicera fragrantissima Lindl. & Paxton	sweet breath of spring
Mahonia bealei (Fortune) Carr.	leatherleaf mahonia
Marsilea minuta L.	dwarf waterclover
Melilotus alba Medikus	white sweetclover
Melinis repens (Willd.) Zizka	rose Natal grass
Mentha x piperita L. (pro sp.)	peppermint
Morus alba L.	white mulberry
Mosla dianthera (Buch.-Ham. ex Roxb.) Maxim.	miniature beefsteakplant
Myriophyllum spicatum L.	Eurasian watermilfoil
Panicum repens L.	torpedo grass
Paspalum urvillei Steud.	Vasey's grass
Phragmites australis (Cav.) Trin. ex Steud.	common reed
Poa annua L.	annual bluegrass
Polygonum persicaria L.	spotted ladysthumb
Poncirus trifoliata (L.) Raf.	trifoliate orange
Potamogeton crispus L.	curly pondweed
Pyrus calleryana Dcne.	Callery pear
Rottboellia cochinchinensis (Lour.) W.D. Clayton	itchgrass
Rubus discolor Weihe & Nees	Himalayan blackberry
Sesbania vesicaria (Jacq.) Ell.	bagpod
Solanum viarum Dunal	tropical soda apple
Sorghum halepense (L.) Pers.	Johnsongrass
Stachys floridana Shuttlw. ex Benth.	Florida hedgenettle
Vernicia fordii (Hemsl.) Airy-Shaw	tungoil tree

Category 4 - A naturalized exotic plant (self-sustaining outside of cultivation) in Georgia but generally not a problem in Georgia natural areas, or a potentially invasive plant but additional information is needed to determine its true status.

Scientific Name	Common Name
Akebia quinata (Houtt.) Dcne.	chocolate vine
Allium vineale L.	wild garlic
Alysicarpus vaginalis (L.) DC.	white moneywort
Artemisia vulgaris L.	common wormwood
Bidens bipinnata L.	Spanish needles
Bidens pilosa L	hairy beggarticks
Bromus arvensis L.	field brome
Bromus secalinus L.	rye brome
Bromus tectorum L.	cheatgrass
Cirsium vulgare (Savi) Ten.	bull thistle
Commelina benghalensis L.	Tropical spiderwort
Cytisus scoparius (L.) Link	scotchbroom
Euonymus alata (Thunb.) Sieb.	winged burning bush
Fatoua villosa (Thunb.) Nakai	hairy crabweed
Firmiana simplex (L.) W. Wight	Chinese parasoltree
Gomphrena serrata L.	arrasa con todo
Ilex cornuta Lindl. & Paxton	Chinese holly
Ilex crenata Thunb.	Japanese holly
Ipomoea coccinea L.	redstar
Ipomoea cordatotriloba cordatotriloba Dennst.	tievine
Ipomoea purpurea (L.) Roth	tall morningglory
Jacquemontia tamnifolia (L.) Griseb.	smallflower morningglory
Kummerowia stipulacea (Maxim.) Makino	Korean clover
Kummerowia striata (Thunb.) Schindl.	Japanese clover
Liriope spicatum Lour.	creeping liriope
Najas minor All.	brittle waternymph
Orobanche minor Smith	small broomrape
Paspalum quadrifarium Lam.	tussock paspalum
Polygonum caespitosum Blume	oriental ladysthumb
Polygonum sachalinense F. Schmidt ex Maxim.	giant knotweed
Pyracantha coccinea M. Roemer	scarlet firethorn
Quercus acutissima Carruthers	sawtooth oak
Rosa laevigata Michx.	Cherokee rose
Rubus phoenicolasius Maxim.	wine raspberry
Setaria faberi Herrm.	Japanese bristlegrass
Setaria pumila (Poir.) Roemer & J.A. Schultes	yellow bristlegrass
Setaria viridis viridis (L.) Beauv.	green bristlegrass
Sonchus asper (L.) Hill	spiny sowthistle
Sonchus oleraceus L.	common sowthistle
Torilis arvensis (Huds.) Link	spreading hedgeparsley
Verbascum thapsus L.	common mullein
Verbena bonariensis L.	purpletop vervain
Verbena brasiliensis Vell.	Brazilian vervain
Verbena tenuisecta Briq.	moss vervain
Wisteria floribunda (Willd.) DC.	Japanese wisteria

NANCY LOEWENSTEIN, AUBURN UNIVERSITY

Category 3 Leatherleaf mahonia (*Mahonia bealei*)

The purpose of the Georgia EPPC is to focus attention on:

1. the adverse effects exotic pest plants have on the diversity of Georgia's native plants and animals;
2. the use of exotic pest plant management to prevent habitat loss;
3. the socioeconomic impacts of these plants;
4. changes in the seriousness of the different exotic pest plants over time;
5. the need to exchange information which helps land owners and managers set priorities for exotic pest plant management.

VIC RAMEY, UNIVERSITY OF FLORIDA

Category 4 Tievine (*Ipomoea cordatotriloba*)

9th Annual Southeast EPPC Conference

co-hosted by the
Georgia Exotic Pest Plant Council

March 20-22, 2007
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Foreign Exploration for Biological Control Agents of Three Invasive Plant Species from Asia

by Sharon M.L. Ewe[1], William A. Overholt[2], Laurence G. Kirton[3], Ee-May Lai[3], Ismail Ahmad[3] and Shankar Ulaganathan[4]

Introduction

In June 2005, a joint Florida International University (FIU) and University of Florida (UF) expedition to Malaysia was conducted to explore for potential insect biological control agents of three FLEPPC Category 1 plants: air potato (*Dioscorea bulbifera* Linn.), shoebutton ardisia (*Ardisia elliptica* Thunberg) and coral ardisia or coral berry (*A. crenata* Roxburgh.) (Fig. 1 A-C). This expedition, funded by the Florida Department of Environmental Protection, was led by Sharon Ewe (FIU) in collaboration with researchers from the Forest Research Institute Malaysia (FRIM).

Air potato growing behind the primary author's house in Osceola County, Florida.

All three Florida pest plant species are native to Southeast Asia, which has a high diversity of both the Dioscoreaceae and Myrsinaceae (Burkill 1935). Two field expeditions were undertaken during the trip. Fifteen natural areas, parks and forest reserves, as well as several dozen village compounds, home gardens, and "dusun" (small fruit orchards) were examined. Ewe and her partners traveled approximately 600 km in the urban and rural areas of Peninsular Malaysia (Fig. 2).

Air potato

The presence of air potato was first recorded in Florida in 1905 (Morton 1976) but the introduction of this species to North America can most likely be attributed to slave ships from Africa (Coursey 1967). It is believed to have originated in Asia but is found all over the tropics in Asia and Africa (Martin 1974). This plant has been cultivated in home gardens as a food source for such an extensive period that wide diversity is observed in species morphology throughout the Old World (Coursey 1967, Martin 1974). It remains an important food crop in sub-Saharan Africa (http://www.cgiar.org/impact/research/yam.html) where the tubers can be easily stored for up to 6 months as an emergency food source. It is less important in Southeast Asia where economic development has reduced the need for long-term food storage. Despite being noted in the floras of Central and South America, the air potato is not an important food source in the New World (Martin 1974).

In Florida, air potato forms a thick blanketing vine that can shade out both canopy and understory vegetation (Langeland 2003). At present, management of this species is limited to repeated physical and chemical methods, with no long-term alternatives. In describing this species, Martin (1974) observed that underground tubers were sometimes attacked by beetles and nematodes but appeared to be more resistant than tubers of other species. Ongoing work in Ghana by Overholt and African colleagues has revealed several species of insect defoliators, but none yet that are sufficiently host-specific to be considered as candidates for biological control agents.

In Northern Peninsular Malaysia, air potato is known in rural villages as "ubi takut babi" (potato afraid of pigs) because of its aerial tubers. Many older villagers recalled growing air potato in the 1950s, when the plant was widely cultivated primarily for its underground tubers. However, due to easy access to fast-food chains and marketplaces selling the common potato (*Solanum tuberosum* L.), air potato is no longer cultivated. We encountered several *Dioscorea* spp. vines on the expedition, primarily either in secondary forest or at the edges of home gardens. In addition to the air potato, we encountered *D. orbiculata*, *D. glabra* and *D. hispida*. Almost all individuals, including the air potato, had signs of leaf damage. It appeared, however, that herbivory was sporadic

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(1b) Shoebutton ardisia in the understory of remote south-western brackish mangrove areas in Everglades National Park; (1c) Fruiting coral berry growing in the shady understory in Tallahassee.

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or seasonal as some sections of vines had been completely consumed while younger or older leaves remained intact. In some areas, several feet of *Dioscorea* sp. vines were completely defoliated, possibly by the larval form of a sawfly that was not seen during this expedition but was observed during a previous trip in December 2004 (Fig. 3A; see http://www.fiu.edu/~ewes/www/Malaysia-trip.htm for a more complete description). In the home garden of the undergraduate volunteer (S. Ulamanathan), two air potato vines were found that showed signs of foliar insect damage but no insects. Two bulbils on a vine had healed wounds from borer damage; visual inspection revealed that the insects were no longer present. One Lymantrid (Lepidoptera) and two *Tagiades* (Lepidoptera: Hesperiidae) caterpillars were collected from the air potato plants during this trip. The Lymantrid remains unidentified as it emerged a wingless female. The *Tagiades* larvae did not develop into adults, but were probably *T. japetus* (Stoll) or *T. gana* (Moore) or both species, as there appeared to be two larval forms.

Ardisia

Shoebutton ardisia (*Ardisia elliptica*) was introduced into Florida as an ornamental in 1900 (Gordon and Thomas 1997). Having escaped cultivation, this primarily bird-dispersed species can now be found in most South Florida counties (Wunderlin and Hansen 2004) where it often displaces native understory species by forming dense monospecific stands (Koop 2003). Coral berry (*Ardisia crenata*) was introduced into Florida about the same time as the shoebutton ardisia. This species is now recorded in 14 northern Florida counties as well as in Texas (Singhurst et al. 1997). Like shoebutton ardisia, this species is shade-tolerant and can form monospecific carpets that displace native communities (Langeland and Craddock-Burks 1998). These plants represent a significant threat to the remaining closed-canopy natural areas in Florida as they can shade out and outcompete native understory species, altering forest structure and function (Gordon 1998). They also have the capacity to displace native species such as *Ardisia escallanoides* (marlberry) and the endangered *Argythamnia blodgettii* (Blodgett's silverbush).

Although there is no record of human use of either species in Florida, fruits of shoebutton ardisia are eaten by locals in Peninsular Malaysia and described as tasting similar to java plum (*Eugenia jambolana*) (Burkill 1935). Burkill (1935) also reports that seeds of coral berry are eaten by the Malays while the indigenous people of the Peninsula and the Javanese use the leaves as a salad. Leaf and root juices of coral berry are also used to treat fevers, coughs, diarrhea, ear-ache, and other ailments.

An elongate bagworm leaf herbivore on shoebutton ardisia.

In Peninsular Malaysia, shoebutton ardisia was found as a cultivated ornamental. Although this plant was cultivated in coastal areas and as a roadside plant, shoebutton ardisia appeared to be a difficult species to maintain because of the prevalence of herbivores. Eight species of herbivores were observed on five populations of shoebutton ardisia in June 2005. The most frequently encountered herbivore was the pagoda bagworm, *Pagodiella hekmeyeri* Heylaerts (Lepidoptera: Psychidae). This caterpillar was present in large numbers and caused significant damage by excising round holes (diameter range ≈ 3 – 20 mm) from the leaves (Fig. 3B). An elongate species of bagworm also was found on shoebutton ardisia. (Fig. 3C). Although larvae of the latter species were larger (approximately 4-5 cm long), density of this herbivore on shoebutton ardisia was lower, resulting in less damage. Additionally, we also found a cocoon on the underside of a leaf and some small red-brown chrysomelid beetles that scraped the undersides of leaves (Fig. 3D). The insect that emerged from the cocoon was later identified as a moth, *Birthama congrua* Walker (Lepidoptera: Limacodidae), while the beetles were determined to be *Rhyparida* sp. (Chrysomelidae: Eumolpinae) and *Manobia* sp. (Chrysomelidae: Alticinae). We visually estimated that damage to shoebutton ardisia ranged from approximately 10-80% of leaves damaged and/or consumed by herbivores. Greater damage was observed on smaller trees (often ≥ 50% leaf area consumed), possibly leading to the death of a planted individual along a trail in a forest recreation park.

Figure 2 (A) Outline of expedition trips (dotted line) within Peninsular Malaysia. The first trip explored home gardens and forested areas of midwestern Peninsular Malaysia while the second trip focused on rural home gardens and plantations in northwestern Peninsular Malaysia. **(B)** Geographical location of Malaysia relative to other countries in South East Asia.

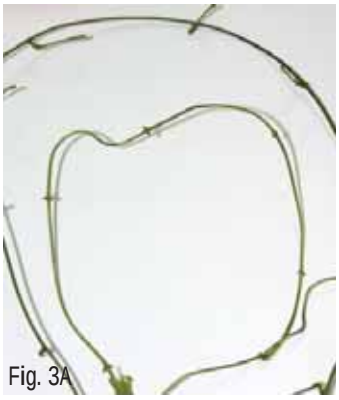
Fig. 3A


Fig. 3B


Fig. 3D


Fig. 3E

*(A) Sections of air potato stem that had been defoliated by unknown herbivores (possibly sawfly larvae). The damage appeared to be several months old. (B) Pagoda bagworm (*Pagodiella hekmeyeri*) to the right of a damage hole formed by removal of a circular disc of leaf lamina. The bagworm scrapes the chlorophyll off the leaf before incising cleanly around the area consumed. The excised leaf disc is then added to the bagworm's protective case. (D) Signs of Chrysomelid damage on the underside of a shoebutton ardisia leaf. The beetle scrapes out small patches on the underside of the leaf, resulting in a spot-like damage pattern. (E) Mealybugs observed on shoebutton ardisia during an earlier trip (Dec 2004).*

Although all plants were fruiting copiously, no fruit feeders were observed and most of the damage to foliage was restricted to the lower half of the canopies. Some of the damage to shoebutton ardisia also appeared to be seasonal. For example, fresh leaf miner damage was observed only on some plants even though there were exit holes of leaf miners on all plants. In December 2004, Ewe found some shoebutton ardisia growing in FRIM infested with a mealybug (Fig. 3E), probably *Rastrococcus spinosus* (Robinson) (Homoptera: Pseudococcidae), but none of these insects were found on the same plants in June 2005. The general appearance of the mealybug colony at the time suggests they may have been in decline due to natural control by predators and parasitoids.

Coral ardisia was less popular as an ornamental in Malaysia and usually found in the understory of primary forests. We found two populations of coral berry but only one species of herbivore, *Collix stellata* Warren (Lepidoptera: Geometridae), on this plant. This moth species has been recorded feeding on *Trigonostemon* sp. (Euphorbiaceae), *Ardisia* sp. (Myrsinaceae) and *Allophylus* sp. (Sapindaceae) in Peninsular Malaysia (Holloway 1997, in which the moth is referred to by its junior synonym, *C. griseipalpis* Wileman).

Conclusion

During our relatively short survey, we discovered a high diversity of herbivores on shoebutton ardisia in Peninsular Malaysia (8 herbivore species), and a lesser diversity on air potato (3 herbivore species). At least two bagworm species were found co-existing on shoebutton ardisia in June 2005 and, although present only part of the year, they caused significant damage to the trees. However, the same bagworms are considered pests of some commercial crops in Malaysia (Khoo et al. 1991), and thus are not likely to be sufficiently specialized to use in biological control. Some of the insects observed were possible specialists, such as the chrysomelid beetles found on shoebutton ardisia and the sawfly on air potato.

Despite their proximity to the equator (1-4ºN), the Peninsular Malaysian herbivores displayed a high degree of temporal variation in abundance, perhaps in response to wet and dry periods or as a result of natural fluctuations in population size mediated by natural enemies. Different suites of herbivores seemed to dominate the plants during the two different visits. More detailed and longer term studies will be required prior to introducing candidate biological control agents. The complete DEP report is available at: http://www.fiu.edu/~ewes/www/Malaysia-trip.htm.

Acknowledgements

We thank the Florida Department of Environmental Protection for research funding to Ewe and Overholt. We also thank Dr. M.S. Mohamedsaid for identifying the beetle specimens; Dr. J. Holloway, Natural History Museum, London, for confirming the identities of the adult moths; Dr. D. Lee (FIU), and S. Cheng and M. Azmi (FRIM), for research support.

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Socio-Economic Impacts of Controlling Melaleuca in South Florida

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Melaleuca quinquenervia, commonly referred to as melaleuca, was introduced to Florida in the late 1800s and has flourished in the state since its introduction. In the late 1980s and early 1990s efforts to eradicate/control melaleuca began in earnest. Public agencies in Florida have spent an estimated $25 million on control efforts from 1989 to 1999 and have succeeded in reducing the area it covers by about 100,000 acres (Pratt and Ferriter 2001). However, private landholders have been less aggressive in its removal, and this has allowed melaleuca to spread in many areas and resulted in no net loss of the acreage covered. The Areawide Management Evaluation of Melaleuca (TAME Melaleuca) project was created in 2001 specifically to address the problems and unique situations associated with melaleuca control, and to further promote effective control measures. The work presented here is part of the TAME project's efforts to assess the current status of melaleuca management in the state.

Balciunas and Center (1991) conducted a benefit-cost analysis of melaleuca control as part of their study on the prospects and dilemmas that could arise if biological control was used in the fight against this invasive tree. Under the assumption that melaleuca was allowed to spread unchecked, they determined that by the year 2010 economic damages could amount to $1.76 billion. In contrast to this and other prior research that has been largely prospective, we sought to characterize the current state of melaleuca management in South Florida and to determine the benefits and costs of controlling melaleuca for the year 2003. The main objective of this analysis was to assign monetary values to the benefits gained in areas invaded by melaleuca that have been successfully treated, and the costs associated with that treatment.

To document the current status of melaleuca and associated management practices, surveys were developed and mailed to professional land managers and residents in the 10 southernmost counties of Florida during the summer of 2004. The surveys for the professional managers were sent to individuals whose management areas were classified as park/preserve or agricultural. Information gathered included general descriptive information pertaining to the management unit and specific information on melaleuca control treatments. The response rates for park/preserve and agricultural managers were 32% and 22%, respectively.

As shown in Tables 1-1 and 1-2, the responses from park/preserve managers revealed that 619,317 acres of melaleuca inhabited their management areas, while they treated a total of 84,740 acres during 2003. Park managers indicated the largest area of infestation occurred on park/preserve lands and lakefronts (553,763 and 39,509 acres respectively). Managers also indicated that stump treatment was used most frequently on park/preserve land (46,562 acres.) Because control strategies may not be completely effective, a 90% rate of effective removal was applied to the treatment areas reported by park/preserve managers to yield the estimated area of melaleuca killed as 76,265 acres. Based upon the survey results, the total costs associated with these control methods were reported as $10.9 million. The park/preserve managers felt that melaleuca impaired the ecological function and recreational use of the land they managed by an average of 23%.

Agricultural managers indicated that a total of 12,271 acres of melaleuca occupied their land and that they treated an estimated 10,868 acres. Managers indicated that the largest areas of infestation occurred on lands classified as pasture/range land (10,441 acres). The most frequently used method of treatment was mechanical removal (7,279). When the previously mentioned effective rate of treatment is applied, it is estimated that 9,781 acres of melaleuca were killed in 2003. Survey results indicated that agricultural managers spent an estimated cost of $1,180,000 during 2003. It should be noted that the raw data from agricultural managers represented a sample of the population and were subsequently expanded to reflect that population. The population was 11,500 and the sample size was 2,000. The population size was divided by the sample size and yielded an expansion factor of 5.75. This calculation assumed that the sample data gathered was representative of the population. Finally, the agricultural managers

Table 1-1. Infested Area of Melaleuca Categorized by Land Use, 2003.

Land Use Classification	Park Managers (Ac.)	Ag. Managers (Ac.)	Total (Ac.)
Park	553,763	0	553,763
Lakefront	39,509	0	39,509
Mitigation	13,897	6	13,903
Range	690	10,441	11,131
Other	8,633	748	9,381
Right of Way	2,718	69	2,787
Fruit	63	558	621
Crop	43	374	417
Forest	0	46	46
Nursery	1	29	30
Total	**619,317**	**12,271**	**631,588**

Table 1-2. Various Control Methods Used to Treat Melaleuca in South Florida, 2003.

Method	Park Managers (Ac.)	Ag. Managers (Ac.)	Total (Ac.)
Felling + Herbicide (stump treat.)	46,562	2,277	48,839
Foliar/Soil Herbicides	15,802	1,064	16,866
Mechanical	4,592	7,279	11,871
Hack and Squirt	11,454	230	11,684
Biological Control	6,310	18	6,328
Biological + Other	4,242	0	4,242
Other Control	20	0	20
Total*	**84,740**	**10,868**	**95,608**

**Total area excludes biological plus other control methods to avoid double counting.*

reported that the agricultural productivity, market value, and ecological function of their land had been reduced by an average of 24 percent, 11 percent, and 22 percent, respectively.

The benefits that applied to the areas of land reported by park/preserve managers were ecosystem benefits, recreational values, and the benefits gained from avoidance of increased fire damages, and were $13,142,718, $703,313, and $178,213, respectively for a total of $14,024,244. The benefits of restored ecological function, agricultural productivity, agricultural market value, and avoidance of fire damages applied to melaleuca treatment areas as reported by agricultural managers were in the amounts of $236,866, $2,146,228, $6,675,569, and $178,213, respectively, and yielded a total of $9.24 million. Since there were two categories of managers being considered, the overall avoidance of fire damages $356,426 was divided between the two categories to yield $178,213 for each managerial category. Total benefits were estimated to be $23,261,120 (Table 1-3).

The costs were derived from the residential and professional survey data along with the TAME Melaleuca program costs, which include the costs associated with this research, and as shown in Table 1-4, were estimated to be $13.2 million.

Based upon the results of the surveys it was quite apparent that the vast majority of melaleuca control was still taking place on public land in South Florida. This phenomenon is most likely because a legal mandate requires public agencies to remove invasive plants from their management areas. It may be necessary for the legislature to make the current laws addressing the general public more stringent so as to induce a greater number of private land managers and homeowners to implement melaleuca controls on their properties. While making tighter laws is a step in the right direction, it will also be necessary for the lawmakers to assign specific penalties for those in violation of the law and require a uniform enforcement of the laws and penalties. This would require increased presence by the enforcement agencies and would certainly require a greater amount of time and effort from those agencies. A requirement similar to those of some municipalities that call for new construction sites to have melaleuca trees removed from the property before a certificate of occupancy can be issued may be a useful tool in inducing melaleuca removal.

The English/Spanish language residential survey was directed at gathering information related to the awareness and perceptions of melaleuca by the residents. Specifically, the content of the survey was designed to gather an introductory assessment of residential experience with and knowledge of melaleuca, an assessment of attitudes towards melaleuca and treatment methods, as well as cost data, willingness-to-pay information, and demographic data. Residents (as opposed to park/preserve and agricultural managers) had the lowest survey response rate at 20 percent and the majority of residents surveyed (96%) indicated that they did not have melaleuca on their property. It was estimated that the residents of South Florida spent approximately $246,750 on melaleuca control/removal in 2003.

A majority of residents who responded to the survey questions aimed at determining their awareness of melaleuca indicated that they knew that melaleuca was not native to Florida and that they knew non-native plants could be harmful (71% and 89%, respectively). However, when the residents were later asked to indicate if melaleuca affected their

Table 1-3. Total Benefits of Melaleuca Control in 2003.

Benefit	Value ($)
Agricultural productivity	2,146,228
Agricultural land market value	6,675,569
Ecological function	13,379,584
Recreational value	703,313
Avoidance of fire damages	356,426
Total	**23,261,120**

Table 1-4. Cost Data for Melaleuca Control in 2003.

Group	Costs ($)
Park managers	10,866,113
Agricultural managers	1,180,000
Residents	246,750
TAME Melaleuca	915,000
Total	**13,207,863**

enjoyment of the outdoors, 77% of those who responded to the question indicated that it did not. When residents were asked to indicate if they felt that melaleuca negatively affected their property value, 95% of those responding to the question indicated that they felt it did not. There seemed to be a gap between what people know about melaleuca and how that knowledge affected their desire to take the actions necessary to control it. According to the survey data, the main sources that provided information on melaleuca for residents were newspapers and local/national news (59% and 47% of residents who responded to the question, respectively). Policy makers, environmental action groups, and public agencies should target these outlets to help educate the public about melaleuca and why they should control it.

It is important to keep in mind that this analysis did not consider benefits that may have accrued to private homeowners in South Florida and would only serve to increase the benefit figure. Given the resulting benefit-cost ratio of 1.76, it can be said that current policies requiring melaleuca control provided a benefit to society for the year 2003. It is interesting to note that due to the compound effect of having multiple values tied to their land (i.e.-the values gained from the ecological functions, the actual production of agricultural commodities, as well as the market value of the land) this analysis indicated that agricultural lands have a higher benefit-cost ratio than park/preserve lands for treating melaleuca (7.83 vs. 1.29). Even without considering the benefits accruing to agricultural land market values, the ratio is still greater for agricultural lands than park/preserve lands (2.17 vs. 1.29). Therefore, it is recommended that policymakers and public agencies continue to at least maintain the current levels of funding and control efforts for melaleuca reduction. Not only should they continue to maintain the current levels of funding, but they should also consider increasing funds to help specifically target agricultural managers to persuade them to control melaleuca on their property. This would help solve the problem of having melaleuca spread on private lands while it is being controlled on public lands, and would also help avoid cross contamination from the infested areas to the areas under control. In view of the positive benefit-cost ratio determined in this study, it is recommended that policies requiring the removal of melaleuca remain in effect until the benefits no longer outweigh the costs.

For further information, contact the authors at: kfinn@ufl.edu or awhodges@ufl.edu

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Gainesville's Great Air Potato Round Up

by Gary Paul, Nature Operations Division, City of Gainesville, Florida

Gainesville's Annual Great Air Potato Round Up was a spectacular success for the seventh year this past January with almost 1,000 participants removing nearly 16,000 pounds of air potato tubers from local natural areas. This brings the event's seven-year total to more than 111 tons of tubers.

The Round Up has become a popular and effective educational tool to focus the public's attention on invasive exotic plants and their management. A goal of the campaign is to help people understand how home landscaping decisions can affect the plant communities in our natural areas. Nearly all of Gainesville's 21 nature parks border residential areas and connect to other neighborhoods by the many creeks that flow through the city. These adjoining properties and creeks can serve as dispersal corridors for the highly invasive air potato plants and their tubers.

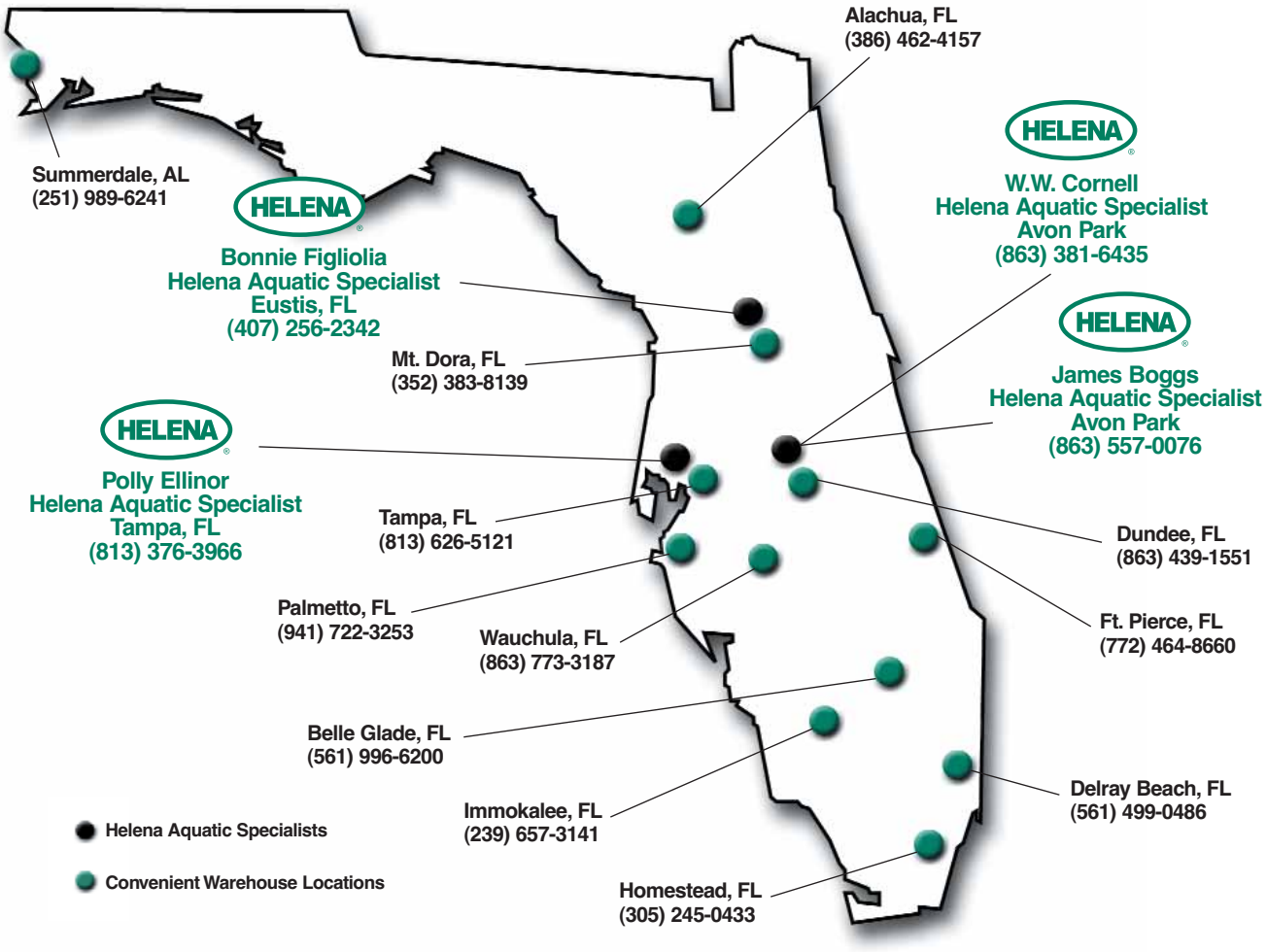
The City of Gainesville's initial public education campaign on invasive plants in natural areas consisted of "nativescape" workshops, a corresponding brochure, and guided nature walks. However, the program had only limited success. Our message was getting through, but we often had low attendance, and many of the participants already were aware of the problems created by non-native invasive plants. We were failing to attract a large portion of our target audience – residents with little or no knowledge of the issue.

We decided to try a large, full-scale education event – a volunteer exotic plant removal day and celebration, to attract this target audience. The event was modeled after popular litter cleanups, with participants collecting tubers instead of trash. To make it fun for everyone, we planned to have prizes, competitions and, of course, free T-shirts for participants. We sought sponsors to donate cash, goods and services, sending out letters to businesses and organizations, and following up with phone calls. We used a multi-media approach to attract volunteers, including radio public service announcements, posters in business windows, the government access television channel, our non-profit support group's newsletter, our website and the newsletters of other environmental organizations who support the event. Local scouting groups, the University of Florida and Santa Fe Community College also were heavily recruited for volunteers. The Florida Exotic Pest Plant Council (FLEPPC) and the Payne's Prairie Chapter of the Florida Native Plant Society (FNPS) enthusiastically supported us, as do more than a score of other national and local entities. Once we came up with a catchy name, "The Great Air Potato Round Up" was born in 2000.

Air potato (*Dioscorea bulbifera*) was chosen as the focus species for three reasons: First, the distinctive appearance and prevalence of air potato in Gainesville makes this an easy-to-recognize plant to target. Large populations are established along most of Gainesville's creeks, and it is a menace to both publicly held natural areas and private landowners. We target areas in nature parks or properties with direct creek connections to nature parks. Second, picking up tubers that resemble baking potatoes involves little training for volunteers; a one-day event precludes time to train volunteers in plant identification and removal. Lastly, air potato tuber removal allows for better scheduling opportunities. Spring and autumn in Gainesville are booked with festivals, plant sales, and football games and summer is just too hot to attract many people outdoors. That leaves winter, when the plant goes dormant and collapsing vines deposit tubers on the ground – perfect for easy harvest and disposal!

Volunteers preregister and are assigned to sites. They meet their leader at the site on the morning of the event. Site leaders are a key to the campaign's success. In addition to volunteer supervision, the education they provide is the most critical task of all. We recruit site leaders from people knowledgeable in ecology, Florida's natural communities, and/or invasive non-native plant ecology. Using pressed plant samples, line drawings, photos, maps, and fact sheets, site leaders give short presentations prior to tuber collection by the volunteers. To encourage participation and increase motivation, recognition is given to the individual and to the group with the

continued on page 29…



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Invasive Plant Control, Inc. manages invasive species throughout the United States. Clients range from the National Park Service to non profit land managers. IPC strives to build a strong relationship with each and every client. Invasive Plant Control, Inc.'s work with the Pittsburgh Parks Conservancy is an excellent example of the benefits of a strong partnership. The following interview with Mary Beth Steisslinger, Ecological Restoration Coordinator for the PPC, highlights some of this organization's achievements.

Who is the Pittsburgh Parks Conservancy?

The Pittsburgh Parks Conservancy's mission is to work in partnership with the City of Pittsburgh to restore, renew, revitalize and preserve the four great parks of Pittsburgh - Frick, Highland, Riverview and Schenley. Since 1998, the PPC has been a Private Non-Profit Partner with the City of Pittsburgh. The PPC works closely with the Department of Public Works (DPW), Parks Division, on planning, restoration and maintenance efforts to continually improving Pittsburgh's four historic parks. Pittsburgh has 1700+ acres in the center of the City in Frick, Highland, Riverview and Schenley Parks. The parks are over 100 years old, and revitalization efforts include the stewardship of historic structures, landscapes and plantings.

What is the Pittsburgh Parks Conservancy's involvement with invasives?

The Pittsburgh Parks Conservancy has received many grants to work on natural area restoration with a goal being the reestablishment of biodiversity in these urban settings. Often times, the invasive plant threats hinder the true recovery of a functioning native plant community. The PPC contracted with Invasive Plant Control, Inc. to help with the initial intensive treatments for 1, 2 and 3 year periods, depending on the severity of invasive plant infestation. Once the severe populations have been suppressed the PPC takes over maintenance of invasive eradication with the help of the DPW Parks and Urban EcoStewards.

Who are the key players IPC, Inc. and the PPC partner within Pittsburgh?

Besides the City of Pittsburgh, our main partners include members of the Pittsburgh Urban Ecological Collaborative (UEC) made up of over a dozen environmental organizations including the Nine Mile Run Watershed Association, PA Cleanways, Friends of the Riverfront and Partners in Parks... Additionally, we work with many community groups, schools and individuals in a program collaboratively run thru the UEC called Urban EcoStewards. Once a natural area in the parks or greenspace of the City has undergone some focused restoration activities, Urban EcoStewards are assigned to the areas to keep invasive plants out and steward native plantings.

What relationship does the PPC have with IPC?

Invasive Plant Control, Inc. and the Pittsburgh Parks Conservancy have collaborated on activities that include a county-wide symposium on invasive plants, development of one of the first cooperative weed management areas (CWMA) in the NE, to trainings, consulting and advising for PPC staff, field partners and municipal land managers in the Pittsburgh area.






What are some of the current invasive plants being controlled by IPC, Inc. and the PPC?

Invasive Plant Control, Inc. and the Pittsburgh Parks Conservancy are currently working on an 80 acre restoration of the historic landscape and natural areas in the Panther Hollow Watershed in Schenley Park. Invasive plant challenges include garlic mustard threatening old stands of trillium, May apple and Solomon's seal; Norway maple which has rapidly eliminated many species found in the original sugar maple-basswood community and Japanese knotweed which has spread along all the stream banks and wetland areas, choking out moist meadow species such as Joe-pye, ironweed, Sylphium cup-plant and seed-box.

What are some invasive plant management projects on the horizon?

Invasive Plant Control, Inc. and the Pittsburgh Parks Conservancy are currently working with city, county, state and federal partners through the newly formed CWMA, Three Rivers Invasive Species Coalition (TRISC). One of the driving forces behind this coalition is to respond early to eliminate mile-a-minute vine in the western half of the state where it has only recently established a foothold.

For additional information about the Pittsburgh Parks Conservancy visit their website at www.pittsburghparks.org.

You can also find this interview online at www.invasiveplantcontrol.com

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most, the largest, and the most unusual tubers collected. Awards are presented at a central celebration following the event, which also offers educational displays, free food, and live music, and culminates with drawings for many great prizes donated by local and national businesses. Past prizes have included valuable items such as a new mountain bike and a kayak!

Public response to The Great Air Potato Round Up has been phenomenal, exceeding all expectations. After seven years, the event is well known in Gainesville and anticipated by residents. Very little recruiting is necessary as people now contact us to ask if they can participate. Still, we speak about the Round Up to civic groups whenever the opportunity presents itself. Our challenge now is to think of ways to expand the educational message to encompass additional problem plants. A preliminary idea is to collaborate with our local chapter of the Florida Native Plant Society to educate nursery owners about the hazards of offering exotic pest plants for sale to the public and alternatives to these plants. Our hope is to someday rid our city's natural areas of all invasive plant infestations with the help and cooperation of informed citizens.

For more information, contact the author at: paulga@ci.gainesville.fl.us

THANK YOU

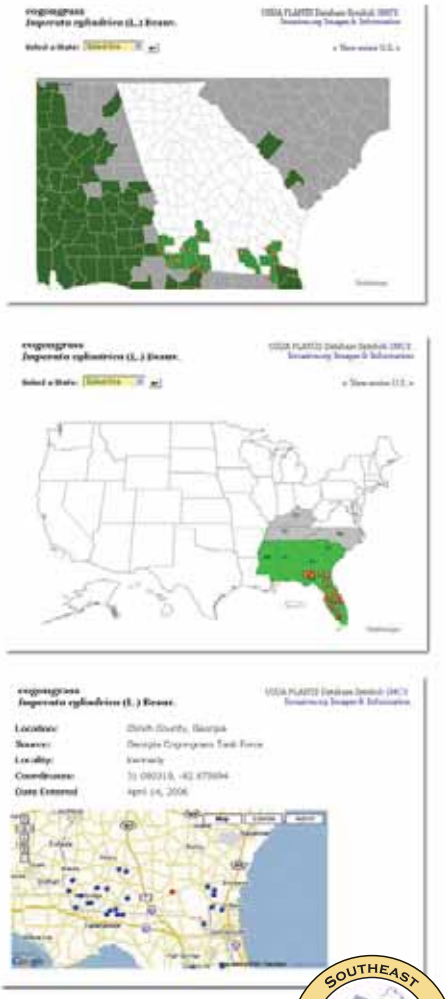
to the following sponsors for supporting this issue of *WILDLAND WEEDS*:

The Southeast EPPC
INVASIVE PLANT MAPPING PROJECT

by Chris Evans and Chuck Bargeron
The University of Georgia, Bugwood Network

Invasive species are a serious problem in the Southeast, and addressing them is an integral part of any land management or restoration plan in our region. Ask most managers and researchers and they could tell you where they have seen invasive species and which ones occur in their area. Occurrence/distribution data also is available from research projects, inventories and surveys that have been conducted by graduate students, university researchers, and conservationists. However, this data is not organized for easy access in a central location for the Southeast.

In response, the Southeast EPPC is introducing its invasive plant mapping project. The project provides a single location to compile existing data about the distribution of invasive plants across the Southeast and to collect new data using volunteers. This project will improve our understanding of the range of the major invasive species, and aid in a rapid response to early detections of new species. As the data becomes more complete, it can be used by state EPPC chapters to review and adjust their state lists of invasive species.



Private landowners, managers, researchers and other interested individuals (whether EPPC members or not) can easily contribute to this database via an online report form developed by the University of Georgia's Bugwood Network. The form allows space to report descriptive information about the infestation, such as the size of the infested area and canopy cover, and location information.

A question that often arises when using volunteer-collected data is "how can we be sure the species is accurately identified?" This mapping project hopes to verify the validity of volunteer-collected data by allowing users to upload photographs with their data forms. These photos will be reviewed by invasive species experts throughout the Southeast for identification accuracy. Additionally, the collection and submission of voucher specimens to a local herbarium is strongly encouraged. Only reports that include a reviewed photo or a voucher specimen will be labeled as "verified."

The project uses the North American Weed Management Association (NAWMA) mapping standards, which means that existing data can be easily incorporated into the database and shared with other projects. Many invasive species management projects store their data in a format that complies with these standards to facilitate data compilation and sharing (including any project using The Nature Conservancy Weed Information Management System (WIMS) program).

Even though the Southeast EPPC mapping project is just getting underway, a broad background of data already has been compiled. County-level distribution data from the NRCS PLANTS database (http://plants.usda.gov/) has been included for over 400 invasive species. While this data is not yet complete, it does provide a start. Most importantly, it allows users to see where data needs to be collected. Additionally, for the federally listed noxious weeds, county-level data from the Cooperative Agricultural Pest Survey Program, administered by USDA Animal and Plant Health Inspection Service (APHIS), also have been included. Plans are underway to add several more large data sets to the project database.

Viewing the data online is easy and intuitive. Distribution data is graphically displayed as point-data or on county-level maps. The project uses a Flash-based mapping server for county-level maps that is fast loading and easy to use. Google Maps web services are incorporated to allow users to overlay the point data with road maps, satellite images, and topographic maps.

To learn more about the project, view current maps, or enter data, visit the Southeast EPPC's website at www.se-eppc.org or contact Chris Evans at cevans@uga.edu

Internodes

Mark your calendar

- North American Weed Management Association (NAWMA) Annual Conference, September 18-21, 2006, Calgary, Alberta, Canada. http://www.nawma.org/
- 33rd Annual Natural Areas Conference, September 20-23, 2006, Northern Arizona University, Flagstaff, AZ. Theme: Stewards of the Old and New West. Focus: Natural areas preservation in differing contexts. www.naturalarea.org
- National Association of Exotic Pest Plant Councils (NAEPPC) Membership Meeting, September 20, 2006, Flagstaff, AZ as part of the 33 Annual Natural Areas Conference.
- California Invasive Plant Council (Cal-IPC) Conference, Research & Management: Bridging the Gap, October 5-7, 2006, Sonoma County, CA. www.cal-IPC.org
- 30th Annual Florida Aquatic Plant Management Society Meeting, October 30 - November 2, 2006; St. Petersburg, FL. www.fapms.org
- Public Land Acquisition & Management Partnership Conference, November 1-2, 2006, Jacksonville, FL. www.ces.fau.edu/plam2006
- 11th Annual Invasive Species Workshop, Florida Panther/Ten Thousand Islands Refuges & The Rookery Bay National Estuarine Research Reserve, December 1, 2006. Takako_hashimoto@fws.gov or (239) 353- 8442 x 222
- Eighth Annual National Invasive Weeds Awareness Week (NIWAW 8), organized by the Invasive Weeds Awareness Coalition (IWAC), February 25 – March 2, 2007, Washington, DC. www.nawma.org/niwaw/niwaw_index.htm
- SE-EPPC Annual Symposium, co-hosted by the Georgia Exotic Pest Plant Council, March 20-22, 2007, Athens, GA. Chris Evans at cevans@uga.edu or www.gaeppc.org
- Florida Native Plant Society, April 19-22, 2007, Gainesville, FL. www.fnps.org
- 22nd Annual FLEPPC Symposium, April 30–May 3, 2007, Cocoa Beach, FL. www.fleppc.org
- 2007 Aquatic Weed Control Short Course, University of Florida-IFAS, Aquatic, Upland and Invasive Weed Control; Aquatic Plant Identification, May 14-18, 2007, http://conference.ifas.ufl.edu/

Publications

- The popular brochure, Herbicide Advice for Homeowners by Dr. Kenneth Langeland, has been updated and posted online at the University of Florida-IFAS Extension Publication website under the title, Herbicides to Kill Invasive Trees in Home Landscapes: http://edis.ifas.ufl.edu/AG259
- *NatureServe Explorer*'s Assessment of Non-native U.S Plants is now available on their website: http://www.natureserve.org/explorer/. 452 non-native plants of the U.S. are searchable by name, location, invasive impact rank (I-Rank), or by a combination of these criteria. Assessments are the result of applying a systematic protocol (Morse et al. 2004) to determine the degree of impact an individual non-native species has on the native plants, animals, and ecosystems of the U.S.
- A new publication on the use of fire as a tool for controlling invasive plants can be downloaded at: http://www.cal-ipc.org/ip/management/UseofFire.pdf The 57-page document also can be ordered for a slight charge from Cal-IPC at http://www.cal-ipc.org.
- Systematic Reconnaissance Flight (SRF) exotic plant distribution data can now be downloaded for South Florida from the TAME Melaleuca website at: http://tame.ifas.ufl.edu/ The SRFer Mapserver was developed for the TAME Melaleuca project to provide an interactive platform to display and download SRF Data for Melaleuca and other invasive species.
  - Browse historical South Florida Water Management District SRF data for Florida (1993-2005)
  - Browse, display and print SRF point data in Google Maps
  - Download .gif files for use in applications such as MS Word and Powerpoint
  - Download shapefiles for use in GIS applications
  - Global distribution data for Melaleuca coming soon!

  Project contact is Amy Ferriter, Boise State University, Department of Geosciences, amyferriter@boisestate.edu
- The National Exotic Pest Plant Council website at www.naeppc.org includes a map outlining individual state chapters, the SE-EPPC, the Midwest Invasive Plant Network, the Mid-Atlantic EPPC, and the Invasive Plant Atlas of New England. *We are coming together, folks!*
- Go to http://www.fs.fed.us/invasivespecies/prevention/huntersanglers.shtml for an interesting note about *The Invasive Species Threat to Hunting and Fishing in America, a Partnership Bringing Hunters and Anglers Into the Battle Against Terrestrial and Aquatic Invasive Species*.
- The USDA Forest Service, Forest Health Technology Enterprise Team http://www.fs.fed.us/foresthealth/technology/bcpubs.shtml has a list of publications on biological control, including *Invasive Plants of Asian Origin Established in the United States and Their Associated Natural Enemies Volume 1, 2nd Edition*, and *Invasive Plants Established in the United States that are Found in Asia and Their Associated Natural Enemies Volume 2, 2nd Edition.*
- The Plant Conservation Alliance's Alien Plant Working Group has approximately 60 fact sheets in PDF format on their list, *Least Wanted: Alien Plant Invaders of Natural Areas:* http://www.nps.gov/plants/alien/fact.htm The fact sheets include management options.

Grants

- The Florida Exotic Pest Plant Council solicits grant proposals for non-native invasive plant education and outreach projects in the State of Florida. The purpose is to provide funding to organizations or individuals who wish to educate the public about non-native invasive plants and their effects on the environment and economy of Florida. Please see RFP on page 4.
- *Pulling Together Initiative* (PTI) grant proposals are solicited from non-profit organizations and government agencies interested in managing invasive plant species. The Initiative provides support on a competitive basis for the formation of local Weed Management Area (WMA) partnerships. These partnerships engage federal resource agencies, state and local governments, private landowners, and other interested parties in developing long-term weed management projects within the scope of an integrated pest management strategy. Preproposals for next year will be due at the end of October 2006. To learn more, visit http://www.nfwf.org/programs/pti.cfm