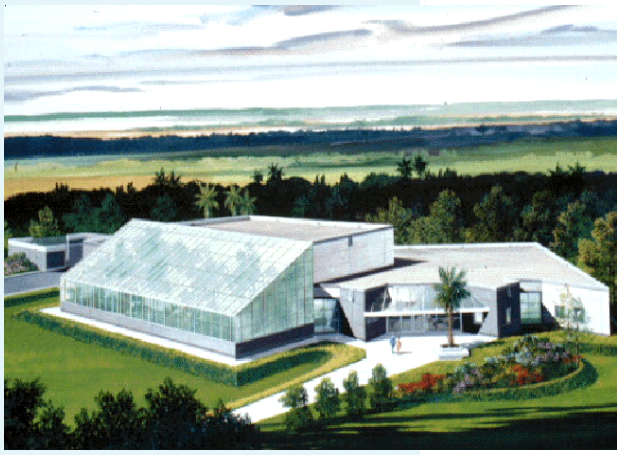
# IPRL Offshoots

*USDA-ARS Invasive Plant Research Laboratory*
*3205 College Ave., Fort Lauderdale, Fl 33314*

March 2004



The picture at left is an artists rendering of the new quarantine facility at the IPRL. The building is scheduled to open mid-year 2004. The building is specifically designed to perform research on insects and pathogens selected as potential biological control agents.

The IPRL is currently working on a number of invasive plant species all of which have biological control agents either already released to do their work or being evaluated for future release. This report provides some insight into the various programs at the IPRL.

*John Scoles - Editor*

## Upcoming Events

Plant Biologists of South Florida Meeting
April 3, 2004
Big Cypress National Preserve, Florida
http://pbsf.org

65th Annual Meeting of the Association of Southeastern Biologists
April 14-17, 2004
University of Memphis, Fogelman Executive Center
Memphis, Tennessee
http://www.people.memphis.edu/~biology/asb/

Florida Exotic Pest Plant Council 20th Annual Symposium and Southeast Exotic Pest Plant Council 6th Annual Symposium
April 28-30, 2004

*More upcoming events on last page*

## Programs at the IPRL

The Invasive Plant Research Laboratory (IPRL) is the only laboratory in the United States dedicated to research on invasive plants. Although the staff at the IPRL work mainly on plants invading southern Florida, their work has a global reach and impact.

Invasive plants harm natural and agricultural ecosystems by competing for resources and crowding out natural vegetation. Those exotic weeds restrict irrigation, increase water loss, clog flood control structures, displace native plants, slow water flow, speed silt production, increase debris production, and degrade wildlife habitat. Programs run by the IPRL are designed to permanently reduce the harmful impacts of invasive plants by developing and deploying biological control agents to attack the invading plants.

Biological control involves using the invasive plant's natural enemies to keep the plant in check. Traditional controls, such as cutting, grinding, mowing, and spraying are effective but play a role in water quality

**IPRL Quick Fact:**

The IPRL resides on land that belongs to the University of Florida but was once a naval air station.

degradation and provide only temporary relief from invasive plant problems. Successful biological control reduces harmful effects by slowing weed growth and decreasing reproductive output, thereby limiting weed biomass. Biological control also reduces the invasive plant's competitive advantage over native species. Biological control agents are persistent and spread naturally, thereby providing long-term control. They also impact infestations that are otherwise inaccessible to traditional control methods. Combining biological control with the traditional controls is known as integrated pest management.

*Old world climbing fern* (Lygodium microphyllum)

*Photo by John Scoles.*

The basic approach to developing a biological control program involves several steps:

1. Recognizing that an exotic species has (or might) become a problem
2. Conducting exploratory surveys for potential biological control agents in the plant's native range
3. Screening the most promising of these agents for environmental safety (host-specificity)
4. Establishing self-perpetuating populations of safe biological control agents
5. Developing management strategies to enhance the effectiveness of naturalized biological control agents

Scientists survey the home range of an invasive plant to uncover potential biological control agents. Once a potential biological control agent is identified, it is shipped to the United States and placed in quarantine for extensive study. Currently, the IPRL uses a quarantine facility in Gainesville, Florida, while awaiting the opening of its new quarantine facility in Fort Lauderdale.

While developing biological controls, teams of scientists and technicians investigate a variety of biological and ecological factors including:

- Plant and insect demographics (where they are found and how they spread)

- Plant and insect reproductive biology (how they reproduce)
- Plant tissue biochemistry (their chemical makeup)
- Insect eco-physiology and nutritional ecology (their effect on the environment)
- Intraspecific and interspecific plant competition (how they compete with their own species and with other species)
- Plant and insect ecological genetics using DNA fingerprinting

Scientists at the IPRL test potential biological control agents to ensure that they feed only on the targeted plant (host specific) and do not harm native and agriculturally important plants.

IPRL programs have thus far developed 15 biological control agents for use against the following 6 invasive, non-native plants.

- **Alligatorweed** - permanent control of alligatorweed now occurs in most areas of the southeastern United States from the introduction of three South American insects.
- **Melaleuca** – two biological control agents are at work with another one on the way. See the February report for details.
- **Giant Salvinia** – the salvinia weevil is at work in 13 countries on 3 continents.
- **Waterhyacinth** - populations are being maintained at historically low levels throughout the southern United States by three biological control agents from South America.
- **Hydrilla** - three Asian and Australian insects are impacting hydrilla.
- **Waterlettuce** - control of waterlettuce has been achieved at multiple sites through damage caused by a South American weevil.

**IPRL Quick Fact:**

The IPRL has researched, tested, and released 15 insect biological control agents.

*Waterhyacinth*

*Photo by Scott Wiggers.*

The IPRL is examining the possible use of biological controls for other weeds such as Brazilian pepper, skunk vine and old world climbing fern, and for lobate lac scale, an invasive insect discovered in southern Florida in 1999.

The IPRL works in cooperation with a variety of organizations

**IPRL Quick Fact:**

The IPRL has successfully introduced biological control agents for six invasive, non-native plants.

to accomplish its mission including: the South Florida and Southwest Florida Water Management Districts, Florida Department of Environmental Protection, University of Florida, and the U.S. Army Corps of Engineers, Broward and Miami-Dade County Departments of Environmental Resource Management, Florida Department of Agriculture and Consumer Services, and US Department of Interior. Ecological, agricultural, and economic benefits continue to mount from past biological control successes, and future successes will strongly contribute to efforts towards restoring southern Florida ecosystems.

***Giant salvinia***

***Photo by Scott Wiggers.***

**Update on the status of the melaleuca bud-gall fly**

On March 16, Dr. Ted Center, research entomologist and research leader for the IPRL received word that the melaleuca bud-gall fly (*Fergusonina turneri*) and its obligate nematode *Fergusobia quinquenerivae* have been recommended for release as a biological control agent for *Melaleuca quinquenervia*. The recommendation came from the Technical Advisory Group (TAG). TAG is a multi-national, multi-disciplinary, multi-agency, committee whose primary purpose is to provide guidance to researchers and recommendations to regulating agencies for or against the release of non-indigenous biological control agents, based on considerations of potential non-target impacts and conflicts of interest.

The bud-gall fly is the third biological control agent for melaleuca. Affectionately called “the Ferg,” the bud-gall fly has been in quarantine in Gainesville, Florida, for the past 4 years undergoing rigorous testing to ensure that it feeds only on melaleuca and that its release into the wild would not harm the environment.

The fly lays its eggs in melaleuca buds. Along with its eggs, the fly also deposits mutualistic nematodes. The nematodes initiate growth of tumor-like swellings (galls) that form from the bud tissue. The nematodes feed on the gall tissue and reproduce asexually. The fly egg hatches after the gall is formed, and the fly larvae also feed on the nutrient-rich gall tissue. A second generation of

sexually reproducing nematodes develop and the fully grown fly larvae form pupae. Immature nematodes then invade the body cavity of only female pupae. The pupae emerge from the gall as adult flies. The nematodes migrate to the ovaries, and flies carry them to new buds to begin the cycle anew (see illustration below.) The more energy the plant diverts to gall creation, the less it has to produce flowers, seeds, and new shoots thereby exerting a high degree of biological control over the plant. Galled buds cannot develop into a flowers or shoots.

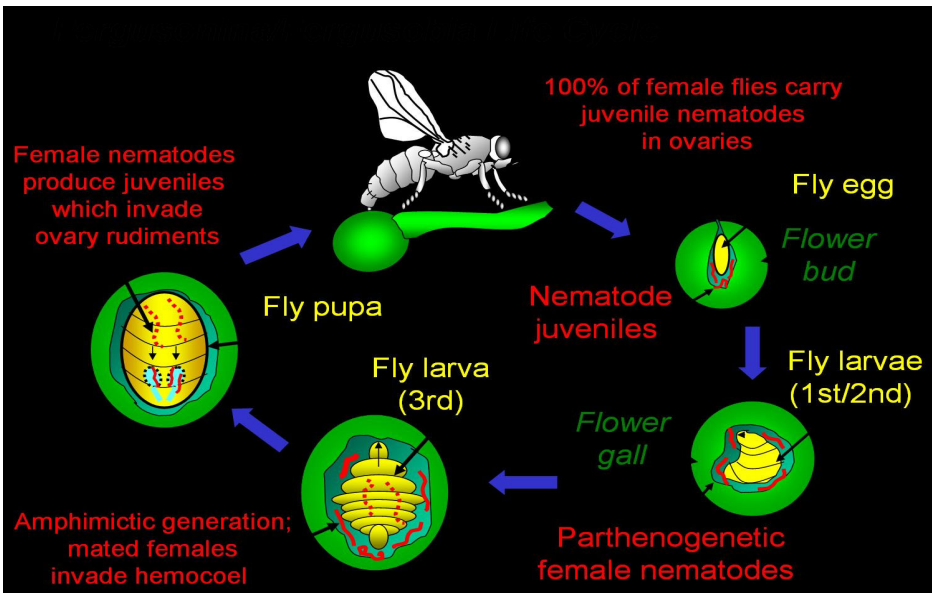
The Animal and Plant Health Inspection Service (APHIS) must still approve the request to release the insect. APHIS is a unit of the U.S. Department of Agriculture.

**IPRL Quick Fact:**

The IPRL is the largest laboratory in the U.S. working on invasive plants.

***Melaleuca Bud-gall fly. Photo by Susan Wineriter.***

***Gall produced by the melaleuca bud-gall fly. Photo by Susan Wineriter.***




*Life cycle of the melaleuca bud-gall fly and its obligate nematode. Illustration courtesy of Dr. Robin Giblin-Davis, University of Florida.*

**IPRL Quick Fact:**

The IPRL was instrumental in maintaining waterhyacinth populations at historically low levels throughout the southern U.S.

## TAME Melaleuca project holds its first two demonstrations

One of the primary purposes of the The Area-wide Management and Evaluation (TAME) Melaleuca project is to transfer knowledge to public and private land managers about how to use integrated pest management to deal with the melaleuca problem. On February 19th and March 10th, teams of contractors converged on demonstration sites at the Everglades buffer strip by Holiday Park, near Fort Lauderdale, and Prairie Pines, in North Fort Myers, respectively, to begin treating huge stands of melaleuca. To mark breaking ground at the demonstration sites, Cressida Silvers, project coordinator for TAME Melaleuca, arranged for a number of local interested individuals to view the treatments as they happened. A film crew from the University of Florida, Institute of Food and Agricultural Science (IFAS), was also on hand at both events to record the work being done.

*Girdled melaleuca tree. The herbicide wasmixed with a blue dye to make it visible.*

*Photo by Natalie Scoles.*

The Everglades buffer strip demonstration site is about 60 acres of dense melaleuca and other invasive plants, such as Australian pine and Brazilian pepper, located along Route 27 in Broward County. The Prairie Pines site is 64 acres of pine flatwoods owned and managed by the Lee County Parks and Recreation Department. Both demonstration sites consist of various treatment plots marked off with flags and spray paint. Each plot was treated using a different control method, mechanical, chemical, or biological. Demonstrating these various control methods alone and in combination shows the importance of using an integrated approach to control melaleuca.

Mechanical control can be performed with large machinery or by hand with machetes and chainsaws. Machines cut, stack, and grind the trees. One machine, affectionately known as the “brontosaurus”, uses a chipper on a long boom to grind standing trees all the way down to the ground, leaving huge piles of mulch in its wake. Another machine, called a feller-buncher, grabs trees, saws them off at the base and applies herbicide to the remaining stump, then stacks the trees for later disposal. A third machine, a Barko chipper, pushes the trees over and grinds them up as it goes. The Barko chipper is often used to cut roads and fire lines when fighting wild fires. Each machine has its advantages and all of them work best on large expanses of trees.

Another mechanical control method, called hack and squirt,

requires girdling the trees then spraying the wounds with herbicide. The trees are girdled, usually with a machete, by cutting away a ring of bark to expose the tree's cambium layer. The exposed cambium provides a path for herbicide to travel down to the roots and also up into the branches.

The TAME Melaleuca team designated nine acres at each site to demonstrate various methods of treating the stumps that remain after cutting down trees. Melaleuca is a very hearty plant and if left untreated, the stumps quickly regenerate. The nine acres consists of nine stump treatment plots. Some plots received different chemical treatments. One plot contains biological controls. One plot is untreated (except for insecticide to keep the biological control agents away) and serves as the experimental control plot.

*A "brontosaurus" grinds melaleuca trees from the top down to ground level.*

*Photo by Paul Pratt.*


*A feller-buncher cuts and stacks melaleuca trees.*
*Photo by Paul Pratt.*

At the Everglades buffer strip, twenty-seven acres along Route 27 received aerial chemical treatments by helicopter. Three nine-acre aerial plots each received a different herbicide or mix of herbicides. At Prairie Pines, the same three aerial chemical treatments were applied on 24 acres.

The stress that melaleuca trees experience from mechanical and chemical control treatments causes them to drop their seeds. One mature melaleuca tree can hold an estimated 100 million seeds. Seedlings that sprout as a result (called recruitment) increase the plant infestation even after the original tree dies.

**IPRL Quick Fact:**

The IPRL has successfuly controlled waterlettuce and hydrilla in localized areas.

## Web Sites You May Want to Visit

To learn more about invasive plants and what various organizations are doing about them visit the following sites on the internet.

Agricultural Research Service
www.ars.usda.gov/

Center for Exotic and Invasive Plants
plants.ifas.ufl.edu

Federal Noxious Weed Program
www.aphis.usda.gov/ppq/weeds

Florida Department of Agriculture, Department of Plant Industry
www.doacs.state.fl.us/~pi/index.html

Florida Department of Environmental Protection, Bureau of Invasive Plant Management
www.dep.state.fl.us/lands/invaspec/

Florida Exotic Pest Plant Council
www.fleppc.org

Invasive Plant Research Laboratory
www.weedbiocontrol.org/

The National Agricultural Library's Invasive Species website
www.invasivespecies.gov

National Noxious Weed Program
http://dogwood.itc.nrcs.usda.gov/weeds

South Florida Water Management District
www.sfwmd.gov

Southwest Florida Water Management District
www.swfwmd.state.fl.us/

Student Conservation Association
www.thesca.org

TAME Melaleuca Project
http://tame.ifas.ufl.edu

The Nature Conservancy
http://nature.org/

**Picture of the Month**
*Aerial view of Prairie Pines demonstration site looking north. Photo by Scott Wiggers.*

Biological control now comes into play. The biological control method uses the tree's natural enemies to keep the trees in check. Two biological control agents, both of them insects, are currently at work on melaleuca, and they are particularly fond of young seedlings. Feeding damage from these two insects is helping to reduce seedling recruitment. A third biological control agent is due for release in the near future.

The Everglades buffer strip and Prairie Pines demonstration sites are just two of several sites around southern Florida where the TAME Melaleuca project is showcasing melaleuca treatment options. In April, the TAME Melaleuca project will hold two more groundbreaking demonstrations, one at its Corkscrew Swamp Sanctuary site in Collier County and the other in Palm Beach County. In addition to the small groundbreaking events held at these sites, the TAME Melaleuca team plans to hold regular, large-scale demonstration events at each site over the next few years. For more information on the TAME Melaleuca project, visit its web site at http://tame.ifas.ufl.edu.

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*More upcoming events*

Clarion Suites and Convention Center
Pensacola Beach, Florida
Deadline for papers/posters
January 30, 2004
http://www.fleppc.org/

Aquatic Weed Control Short Course 2004
May 3-7, 2004
Ft. Lauderdale, Florida
http://conference.ifas.ufl.edu/aw/

2nd Latin-American Short Course on Biological Control Weeds
June 7-10, 2004
Barcelo Hotel
Montelimar, Nicaragua

44th Annual Meeting of the Aquatic Plant Management Society
July 11-14, 2004
Tampa, Florida
www.apms.org

89th Annual Meeting of the Ecological Society of America
August 1-6, 2004
Portland, Oregon
www.esa.org/portland/

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Previous reports are available online at:
http://tame.ifas.ufl.edu/html/publications.htm

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