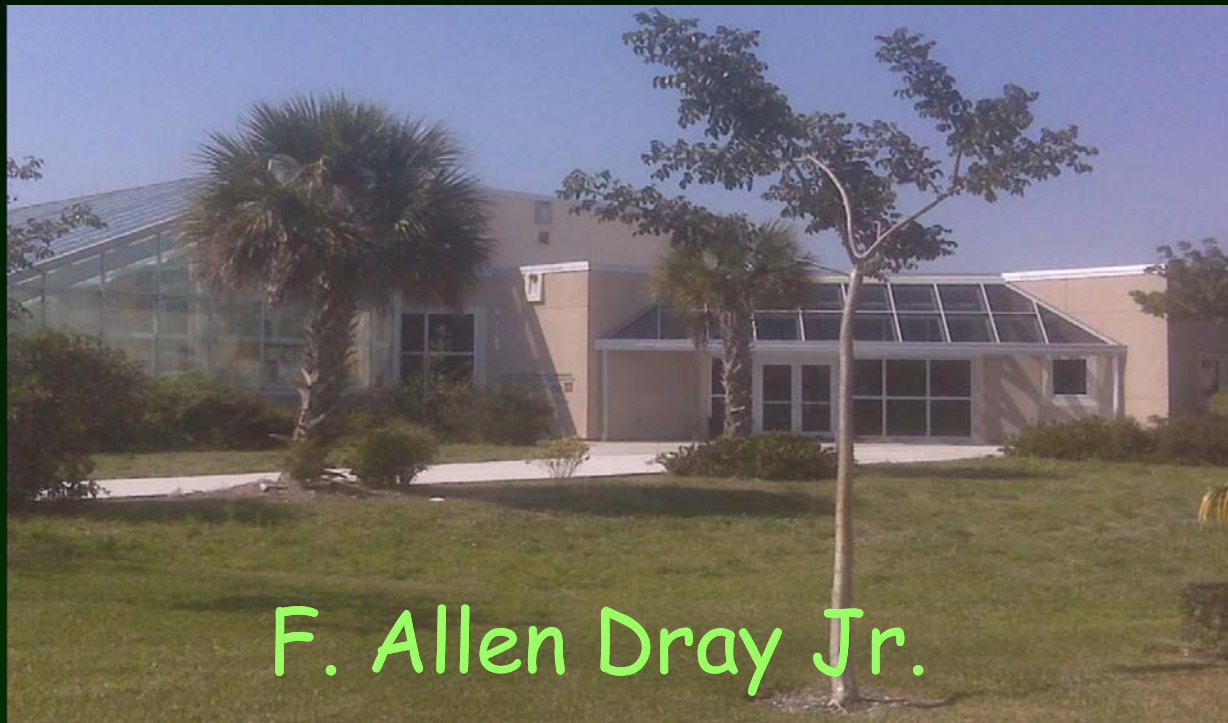


USDA Invasive Plant Research Lab

Combating Invasive Plants in the Everglades



F. Allen Dray Jr.

U.S. Department of Agriculture
Agricultural Research Service
Invasive Plant Research Laboratory

IPRL: Who are we?

- 1954 – unit established to study South Florida hydrology
- 1957 – expanded to add alligatorweed control efforts
- 1959 – USDA & USACE begin joint aquatic weed efforts
- 1986 – melaleuca in Everglades added to targets
- 1994 – began designing a quarantine facility to meet stakeholder needs for expanded biocontrol research
- 2005 – new quarantine facility complete, quadruples capacity
- 2011 – began construction on CERP mass rearing facility
- 2014 – began operational use of mass rearing facility

The Mission of the Invasive Plant Research Laboratory (IPRL) is to address the complex and multi-faceted problems of exotic plant invasions in natural and agricultural ecosystems...

The IPRL conducts research into the impacts of exotic plants as well as the safety and effectiveness of biological control and other methods used to manage invasive plants.

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Invasive Species: What are they?

An invasive species is an organism that is out of its natural environment and is causing harm to its new environment.

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Weeds Won't Wait!

**WEEDS
WON'T
WAIT !**

The Strategic
Plan for
Managing
Florida's Invasive
Exotic Plants
Part Four:
Executive
Summary of the
Strategic Plan

This comprehensive multi-agency scientific assessment determined fixing Everglades hydrology without addressing invasive species would ultimately fail restoration objectives

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Doren et al 2002 South Florida Ecosystem Restoration Task Force.

Everglades Invaders: Why are they important?



Brazilian peppertree in Everglades wetland:
alters hydrology, biogeochemistry, community structure,
plant recruitment, and resource competition

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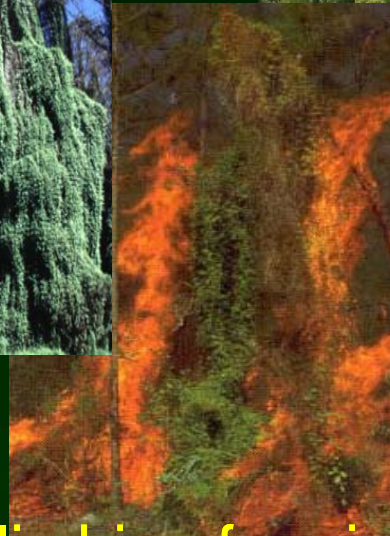
Everglades Invaders: Why are they important?

Australian pine in coastal zones:
alters geomorphology, biogeochemistry, community
structure, plant recruitment, resource competition,
and interferes with T/E species

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Everglades Invaders: Why are they important?



Old World climbing fern in tree islands and pinelands:
alters community structure, plant recruitment, resource
competition, fire regimes, geomorphology, and
hydrology

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Everglades Invaders: Why are they important?

Melaleuca in Everglades graminoid wetland:
alters geomorphology, community structure, plant
recruitment, and resource competition



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Solving this conservation challenge?

No one technology can effectively & efficiently control invasive plants in all habitats and under all circumstances

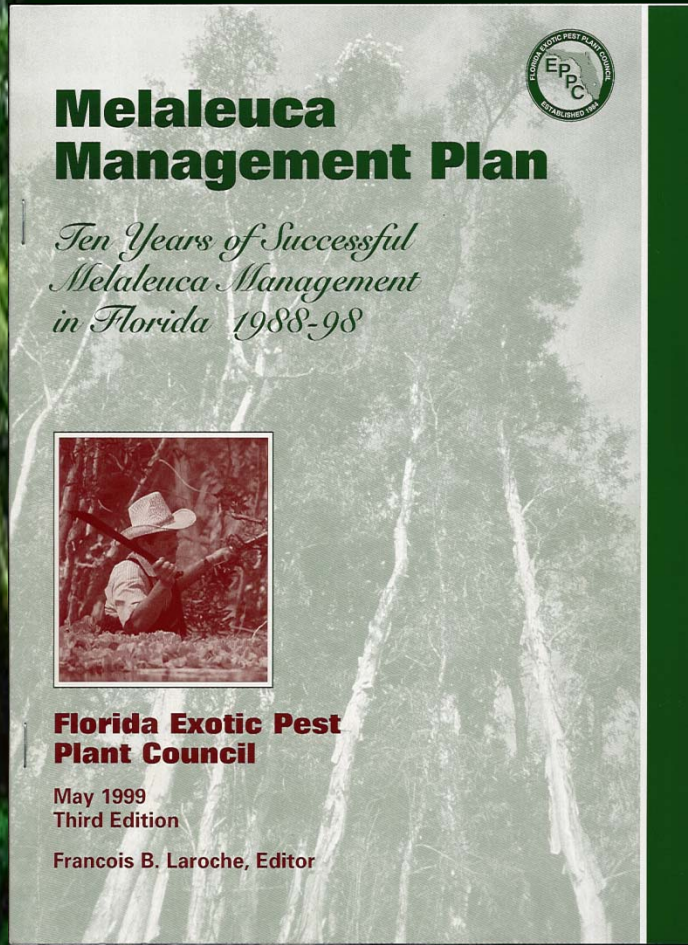
Solution?

Integrated Pest Management

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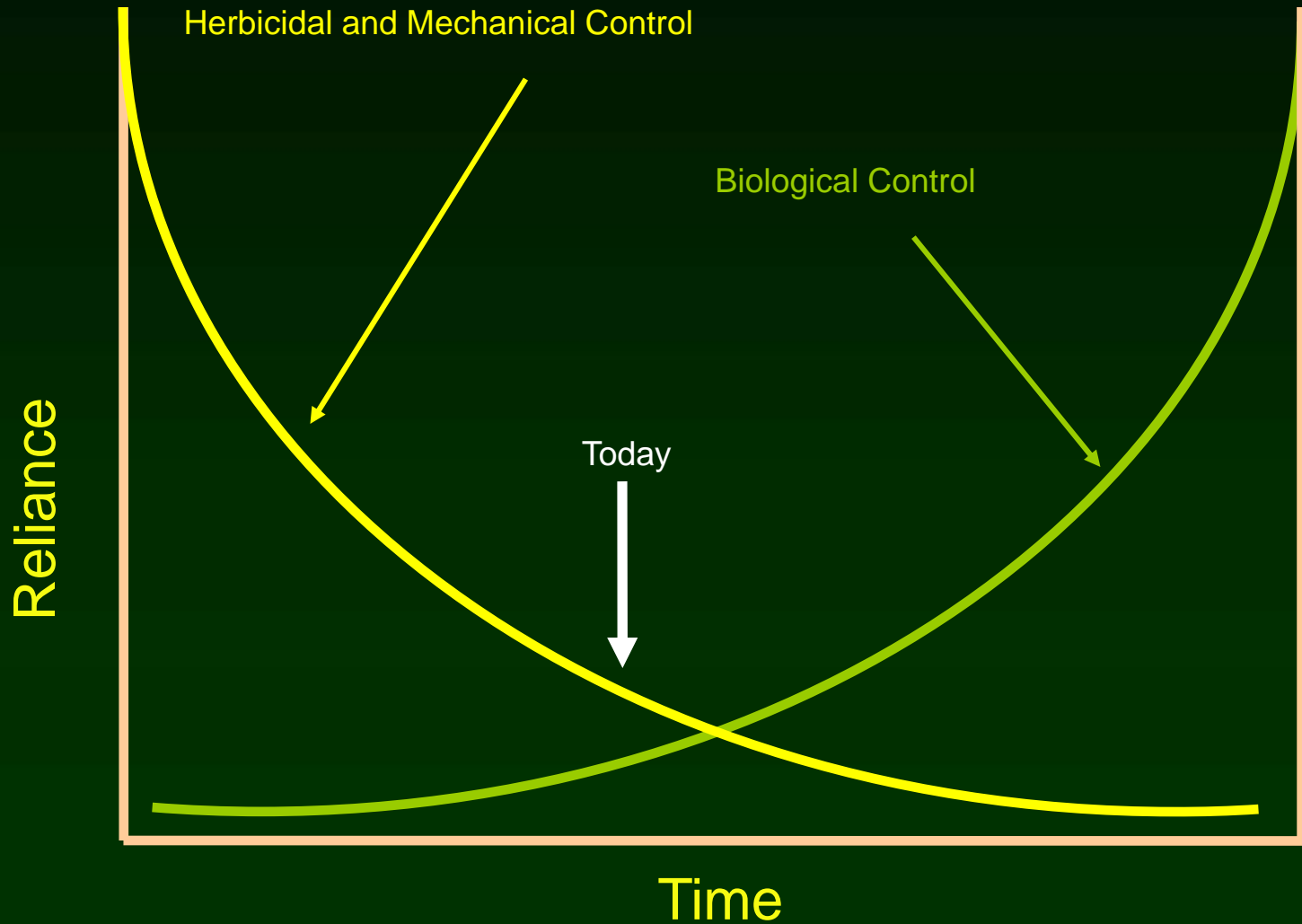
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Melaleuca Management Plan



- May 1990 - 1st ed.
- April 1994 - 2nd ed.
 - ☐ revised to include most recent information
- May 1999 - 3rd ed.
 - ☐ revised to update information
 - ☐ recommendations changed to reflect progress

Conceptual Model



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Weed Biological Control

Biological control (biocontrol) is the science of re-associating natural enemies with their hosts in regions where neither the host nor the enemy naturally occurs.

The goal is to produce enough stress to the host that it no longer causes problems in its non-native range.

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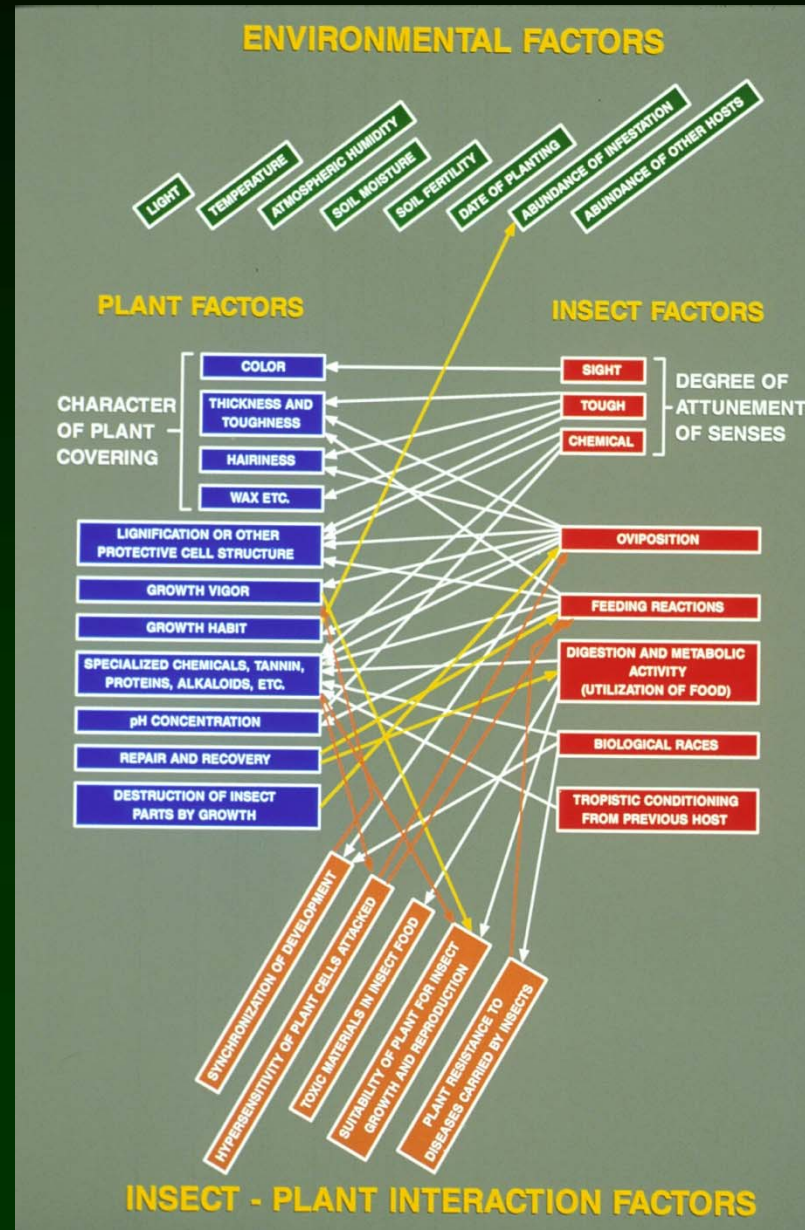
How does biocontrol work?

- Foreign surveys (find the critters)
- Quarantine studies (make sure they're safe)
- Release & establishment (get them into the field)
- Long-term monitoring (determine effectiveness)
- Redistribution (move them around if necessary)
- Technology transfer (help others use the critters)

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THE MULTI-GENE NATURE OF HOST USE BY A SPECIALIZED INSECT



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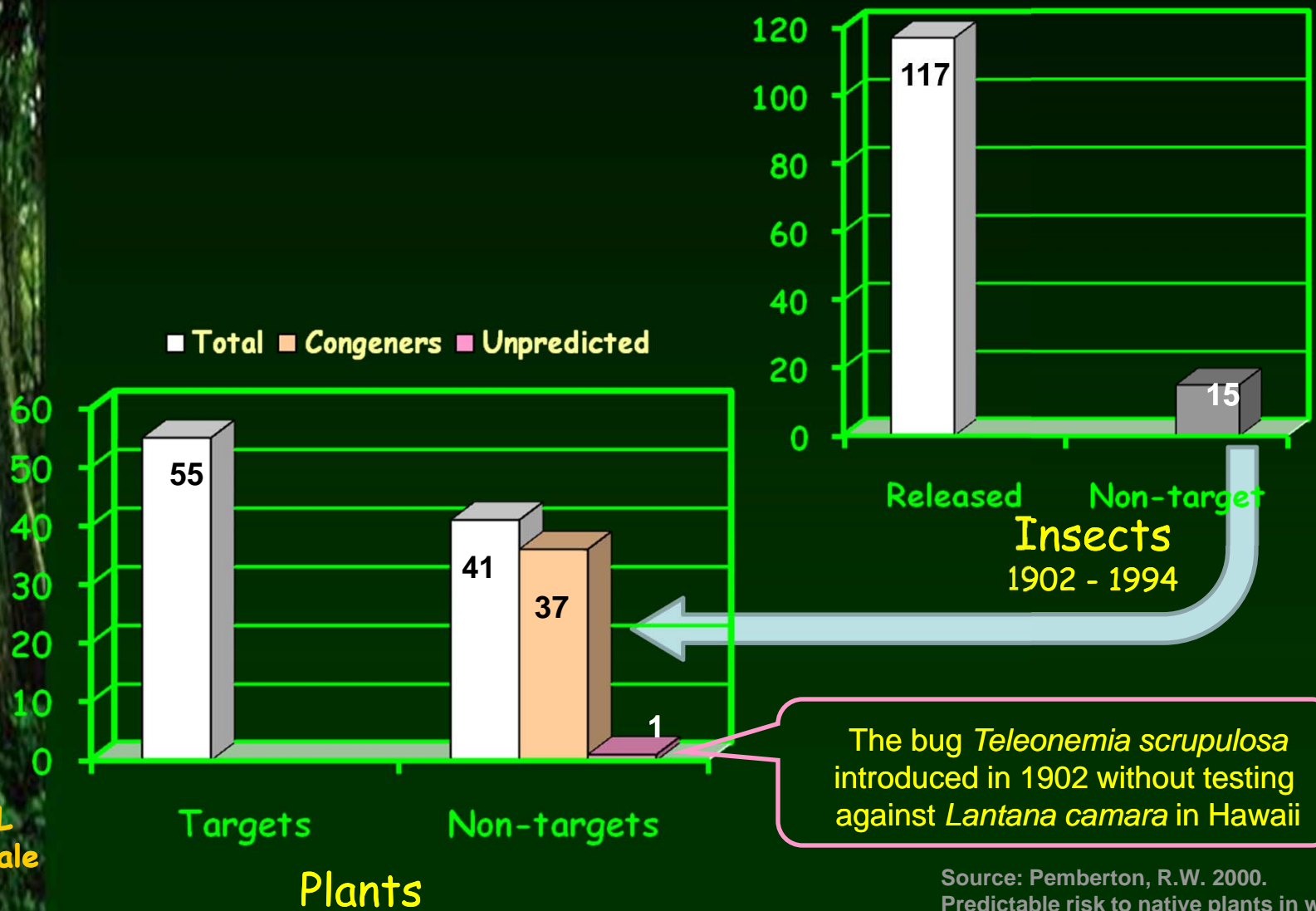
Host Testing Protocols

- The Centrifugal Method (Phylogenetic)
 - Species group: *Melaleuca leucadendra* complex
 - Other Congeners: *Melaleuca* spp.
 - Subfamilial relatives: Leptospermoideae
 - Other Confamilials: Myrtaceae
 - Order: Myrtales
- Habitat Associates
- Economically or Ecological Important Species

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Safety of biological control



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Source: Pemberton, R.W. 2000.
Predictable risk to native plants in weed
biocontrol. *Oecologia* 125: 489-494.

Alligatorweed (*Alternanthera philoxeroides*)

South America



Alligatorweed flea beetle
(*Agasicles hygrophila*)

USACE herbicidal control:
Pre-1965 - > \$1,000,000/yr
Today - ~\$20,000/yr



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Waterhyacinth (*Eichhornia crassipes*)

South America

Previously released

Waterhyacinth moth
(*Niphograptia albiguttalis*)

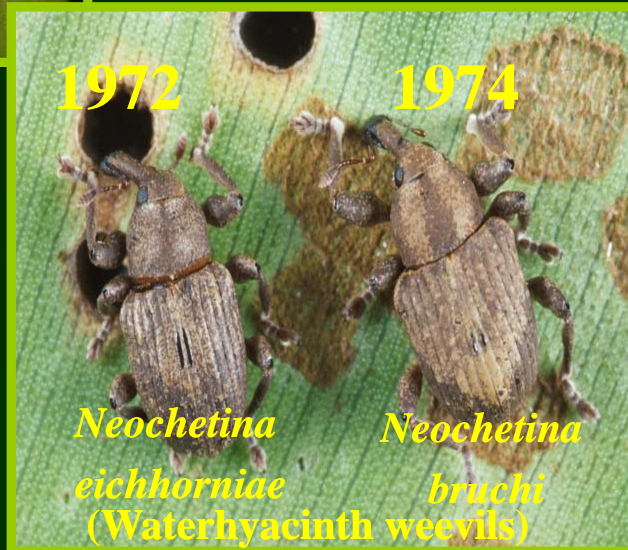


1972

Neochetina
eichhorniae
(Waterhyacinth weevils)

1974

Neochetina
bruchii



2010

Waterhyacinth mirid
(*Megamelus scutellaris*)



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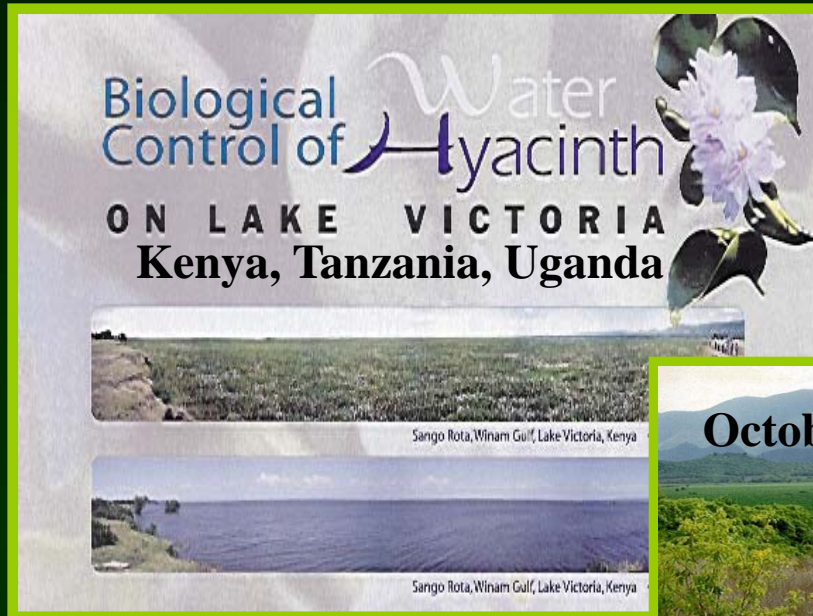
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Waterhyacinth (*Eichhornia crassipes*)

South America

With biocontrol insects, waterhyacinth in the U.S. grows smaller and spreads slower than previously.

Technology transfer to other nations has helped reduce waterhyacinth Infestations in their waterways, as well.



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Broad-leaved paperbark (*Melaleuca quinquenervia*)

Previously released

1997



Melaleuca weevil
(*Oxyops vitiosa*)



2002



Melaleuca psyllid
(*Boreioglycaspus melaleucae*)

2005



Melaleuca gall fly
(*Fergusonina turneri*)

2008



Melaleuca stem-gall fly
(*Lophodiplosis trifida*)

Currently in quarantine



Melaleuca flower weevil
(*Haplonyx multicolor*)

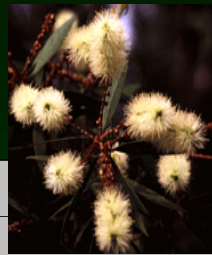
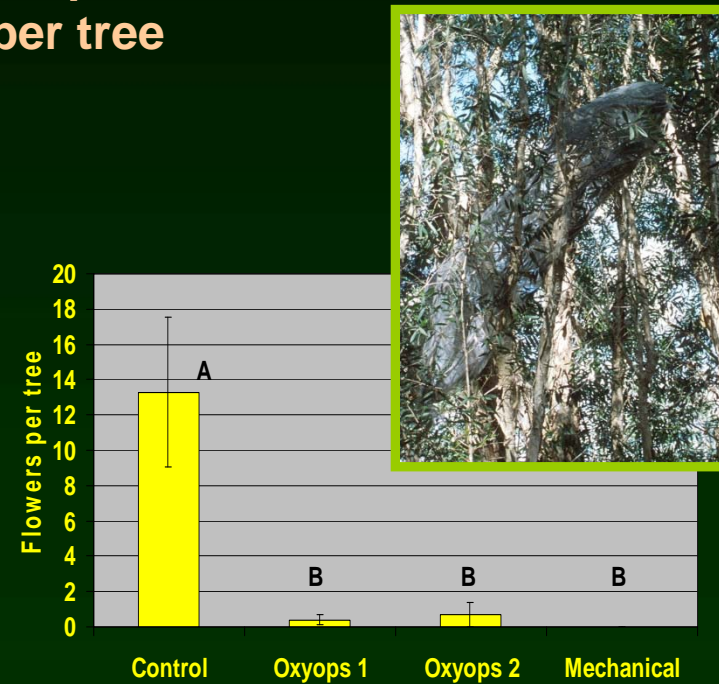
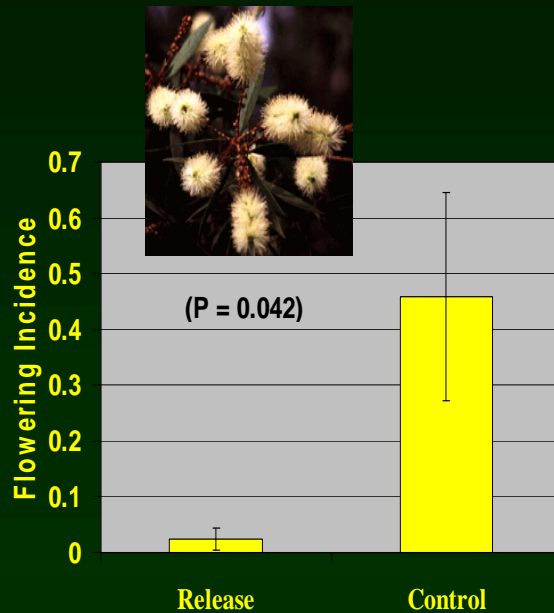
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Broad-leaved paperbark (*Melaleuca quinquenervia*)

Australia

With biocontrol insects, *Melaleuca* flowers less often and produces fewer flowers per tree



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Old World climbing fern (*Lygodium microphyllum*)

Asia



Currently in quarantine

Previously released

Brown Lygodium moth
(*Neomusotima conspurcatalis*)

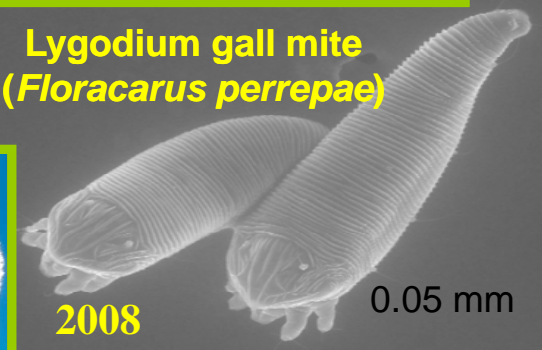
2008



Lygodium gall mite
(*Floracarus perrepae*)

2008

0.05 mm



Lygodium sawfly

(*Neostrombocerus albicomus*)

2004

Lygodium moth

(*Austromusotima camptozonale*)



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Asia & Africa

Air potato (*Dioscorea bulbifera*)

Recently released

2011

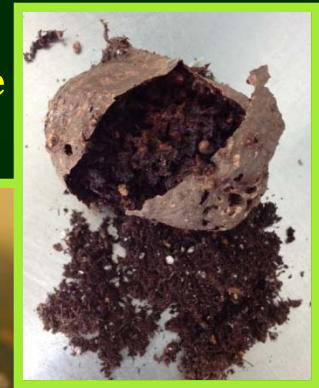


Air potato beetle
(*Lilioceris cheni*)



Currently in quarantine

Bulbil-feeding beetle
(*Lilioceris egena*)



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Brazilian pepper or Florida holly (*Schinus terebinthifolius*)

South America



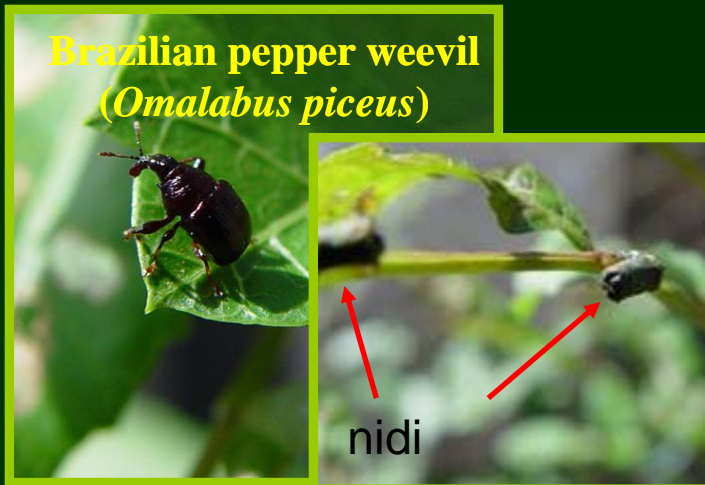
Currently in quarantine

Brazilian pepper thrips
(*Pseudophilothrips ichini*)



Recently in quarantine

Brazilian pepper weevil
(*Omalabus piceus*)



Brazilian pepper gall wasp
(*Allophragas* sp.)



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Herbicides: costly to develop, costly to use, not a panacea

Glyphosate problem



\$10.9 BILLION TO SETTLE ROUNDUP LAWSUITS
Non-Hodgkin's Lymphoma Potentially Linked To
Roundup.

Consumer market withdrawal planned

In July 2021, Monsanto owner Bayer AG said it would remove glyphosate-based herbicides from the U.S. consumer market by 2023 due to tens of thousands of lawsuits brought by people alleging they developed non-Hodgkin lymphoma from exposure to the company's glyphosate herbicides, such as Roundup.

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What next?

Weeds waiting in the wings:

- Lather leaf
- Lead tree
- Seaside mahoe
- Green arrowhead vine
- Caesarwed
- Black mangrove
- Cogongreass
- Water fern
- Earleaf acacia
- Over 166 spp in Florida, several dozen of which are Everglades invaders

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Questions???

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