Invasive Exotic Plants and Animals in South Florida: Variations on Similar Themes

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South Florida Water Mgmt District
Florida’s Non-native Flora & Fauna

- 1200 plant species (~170 invasive, 4270 total plant species)
- 1150 Insect species
- 196 Bird species
- 47 Reptile species
- 32 Fish species
- 30 Mammal species
- 6 FW Invert. species
- 4 Amphibian species
- ?? Marine species
A graph titled "INVASION CURVE" illustrates the timeline and costs of managing invasive species, from introduction to eradication or containment. Key points include:

**Prevention**
- Pre-Import Regulations (e.g., Lacey Act)
- Education & Outreach
- Interception
- Most cost effective

**EDRR**
- Attempt to eradicate or contain
- Moderate cost, low impact, short term

**Control**
- Manage species at lowest feasible levels
- Long-term impact & highest cost financially and ecologically
Water Hyacinth 
(*Eichhornia crassipes*)

South American native
Early 1880s intro to N. America
St. Johns River impassable by 1889
1889 Rivers and Harbors Act
Severe problems world-wide

Water lettuce, *Pistia stratiotes*

Papyrus and hyacinth, Nile River

Chopping hyacinths, Lake Chapalla, Mexico
Melaleuca:
Our First Upland Plant From Hell

Melaleuca quinquenervia

- Australian native
- Arrived early 1900s
- Imported for:
  - timber
  - landscaping
  - possibly to dry out wetland
Melaleuca Management

Historical Background

- 1975 - Two Melaleuca workshops (FL FWCC)
- 1980 - Melaleuca symposium (FL Div. Forestry)
- 1982 - Exotic woody plant conference (Fairchild)
- 1984 - Exotic Woody Plant workshop (ENP)
- 1984 - Exotic Pest Plant Council formed
- 1986 - ENP Initiates Control Program
- 1988 - EPPC Exotic Pest Plant Symposium
- 1990 - Melaleuca Task Force
Melaleuca Task Force
January 1990

• Jointly convened by
  ▪ Florida Exotic Pest Plant Council
  ▪ South Florida Water Management District

• >30 participants:
  ▪ Federal, state, & local government representatives, scientists, NGOs, private industry

• Objective:
  ▪ Develop a comprehensive strategy for managing melaleuca throughout its range in Florida
Melaleuca Management Plan: Approach

- Summarize current ecological knowledge
  - identify research gaps

- Summarize existing control technologies
  - what is working, for whom, and where

- Identify control technology research needs
  - developing biological controls, improving chemical and mechanical controls

- Develop plan to integrate and coordinate efforts regionally
Melaleuca Management Plan

Defining the Problem

Extent of infestations:
- South of Hwy 60
- Mainly concentrated near areas of early plantings

How much is out there?
- Various techniques tried
  - satellite images
  - false color infrared
  - aerial reconnaissance
- Estimates varied
  - 495,300 - 2.5 million acres
Melaleuca Management Plan

Defining the Problem

Invading native habitats
- Sawgrass prairies
- Cypress heads
- Pinelands
Melaleuca Management Plan

Defining the Problem

Melaleuca is a fire-adapted species:

- Leaf oils fuel hot crown fires
- Leaf litter fuels fires
- Fires release seed
- Native species do not recover as quickly
Melaleuca Management Plan
Defining the Problem

Existing control options

• Millions of seeds per tree
• Many herbicides tried
• Effectiveness varied
• Treatments result in dense, even-aged seedling stand
• Treated trees often resprout
• Mechanical removal very expensive & unsuited for most natural areas
Melaleuca Management Plan
Implementing the Plan

How quickly do infestations grow?

- Aerial photos of 1 mi$^2$ areas (1:3600 scale)
- 8 areas in Dade & Broward Counties
- 25 yrs to go from 5% (30 acres) to 95% (600 acres) cover

% Infestation = 97.91/(1 + 77.52 x 0.74$^{Year}$)

$R^2 = 0.94$

Source: Laroche & Ferriter 1992
J. Aquatic Plant Manage. 30: 62-65
Melaleuca Management Plan

Implementing the Plan

Ecological studies:

• Reproductive ecology
  ▪ large (21 m) trees hold up to 51 million seeds
  ▪ 15% of seeds have embryo
  ▪ seeds can germinate under water

• Florida vs. Australia
  ▪ more seeds germinate
  ▪ seedlings more abundant
  ▪ greater tree density
  ▪ greater stand biomass

Fla: 25,000 trees/ha

Oz: 800 trees/ha
Melaleuca Management Plan
Implementing the Plan

Strategy

Eliminate existing stands
- mechanical removal
- treat with herbicides

Halt expansion
- Seed/sapling mortality
  - hand-pull saplings
  - treat with herbicides
  - damage by biocontrol insects
- Reduce seed production
  - damage by biocontrol insects
Melaleuca Management Plan
Implementing the Plan

Biocontrol studies:

- >400 herbivores on Melaleuca in Australia
- Several candidate insects identified
- Quarantine testing
- Built new quarantine lab
Melaleuca Management Plan

Implementing the Plan

• Aerial surveys (SFWMD)
  - flight lines every 2.5 mi
  - coordinates (GPS) & density recorded for every occurrence

• Conducted every 2 yrs
  - 488,000 acres in 1993
  - 453,000 acres in 1995
  - 391,000 acres in 1997
  - 104,000 acres in 2010

How much is out there?
Melaleuca Management Plan
Implementing the Plan

Herbicide studies:

• Ground application
  - Hack/squirt & Cut/stump
  - completely girdle tree
  - treat stumps shortly after cut

Aerial application
  - Novel microfoil boom with small (0.02) nozzle
  - overlap spray paths by 50%
  - treat twice
Old World Climbing Fern
*(Lygodium microphyllum)*

Millions of dust-like spores spread on winds

Melaleuca: Became serious problem in ~75 yrs

Lygodium: Became serious problem in ~ 20 years

“Normal” fires kill native trees due to ladder fuel

Covers and kills Everglades tree islands

Old root matter build-up

Fertile fronds
Treatments
Spare Natives

One month after treatment

Treatments around sawgrass
Winter treatments over buttonbush
(*Cephalanthus occidentalis*)
Okeechobee gourd 
(*Cucurbita okeechobeensis*)
Federal and State-listed endangered species
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Lionfish in the Atlantic Basin

- Native to Indo-Pacific
- Now present from Carolinas to Venezuela
- Aquarium trade release
- Prolific spawning and survival of young
- Ambush predator
- Native ambush predators don’t expect mouthful of venomous spines
- Lionfish Roundups – Yum!
- Native name: “Butterfly Cod”

*Pterois volitans*
Island apple snail and endangered Everglade Snail Kite

- Much larger non-native apple snails overwhelming Florida apple snail
- Young kites can’t open exotic snails energy deficit = death
- Exotic snail lays many more eggs

Eggs of 5 apple species now in Florida

Florida apple snail eggs - Only native sp.
Pythons

Perfect predators

Everglades public lands cover the same area as 2 Rhode Islands

Snake what snake?
Perfect aquatic predators, too

Who wins?

Happy in aquatic settings
How Did Pythons Get Into the Everglades?

- Est. U.S. pet snake population is 900,000
- Illegal for sale in Florida since July 1, 2010
- 20% of U.S. snake dealers carry pythons
- Burmese Python most popular large snake
- Sell for as little as $20
- Grow to 6-8 feet in one year
- Messy, unwanted and liability when grown
Burmese Python Facts

- Southeast Asia home similar to ‘Glades
- Generalist in terms of diet, habitat & behavior
- Lays large clutch of eggs (up to 100)
- Long lived (> 25 years)
- Average adult snake in glades 10’-15’
- Can grow to > 20’ and weigh over 200 lbs
- Sightings and captures on the increase
Python Captures (2000 to 2011)
South Florida Range of Burmese Pythons

Captures 1996 - 2003

All Captures to date
United States Geological Survey
Climatological Prediction of Potential U.S. Range of Burmese Python

Suitability classification
- yes
- maybe
- no

Present Day

Year 2100 – Effects of Climate Change

Native Range
What a python eats in 5-7 years to reach 13 feet in length
Food items found inside pythons:

- gray squirrel
- opossum
- cotton rat
- black rat
- house wren
- pied-billed grebe
- and...

White ibis

Black-tipped wing feathers in stomach of python
What Next?

- Survey, destroy & collect for study (SFMWD one armed employee)
- Public harvest in FFWCC areas
- Trapping
- Sniffing
- Winter surveys in cooperation with FFWCC & ENP
- Transport carcasses to ENP wildlife biologist
- Support existing study of snake biology in Everglades
- Identify and manage known refuge areas
- Outreach to area veterinarians, snake owners and the pet industry
Giants Collected in Everglades

- Burmese python
- Ball python
- Reticulated python
- Common boa constrictor
Reticulated Python in ENP
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