

Melaleuca Eradication and Exotic Plants - Implement Biological Controls

Project Managers:
Corps – Shauna Allen
SFWMD – John Morgan, Jr.



COMPREHENSIVE
EVERGLADES
RESTORATION PLAN



Outline

- **Project Background**
- **Existing and Future without Conditions**
- **Alternative Plan Formulation**
- **Project Milestones**





Authorization

- **Section 601 of WRDA 2000**
- **“This project calls for the mass rearing, field release, establishment and field monitoring of approved biological control agents for Melaleuca and other exotic plants.”**
- **This project falls under the “Programmatic Authority”; total project cost less than \$25M**
- **Approval authority is ASA(CW)**



Project Purpose

To increase the effectiveness of biological control technologies to manage Melaleuca and other exotic plants.

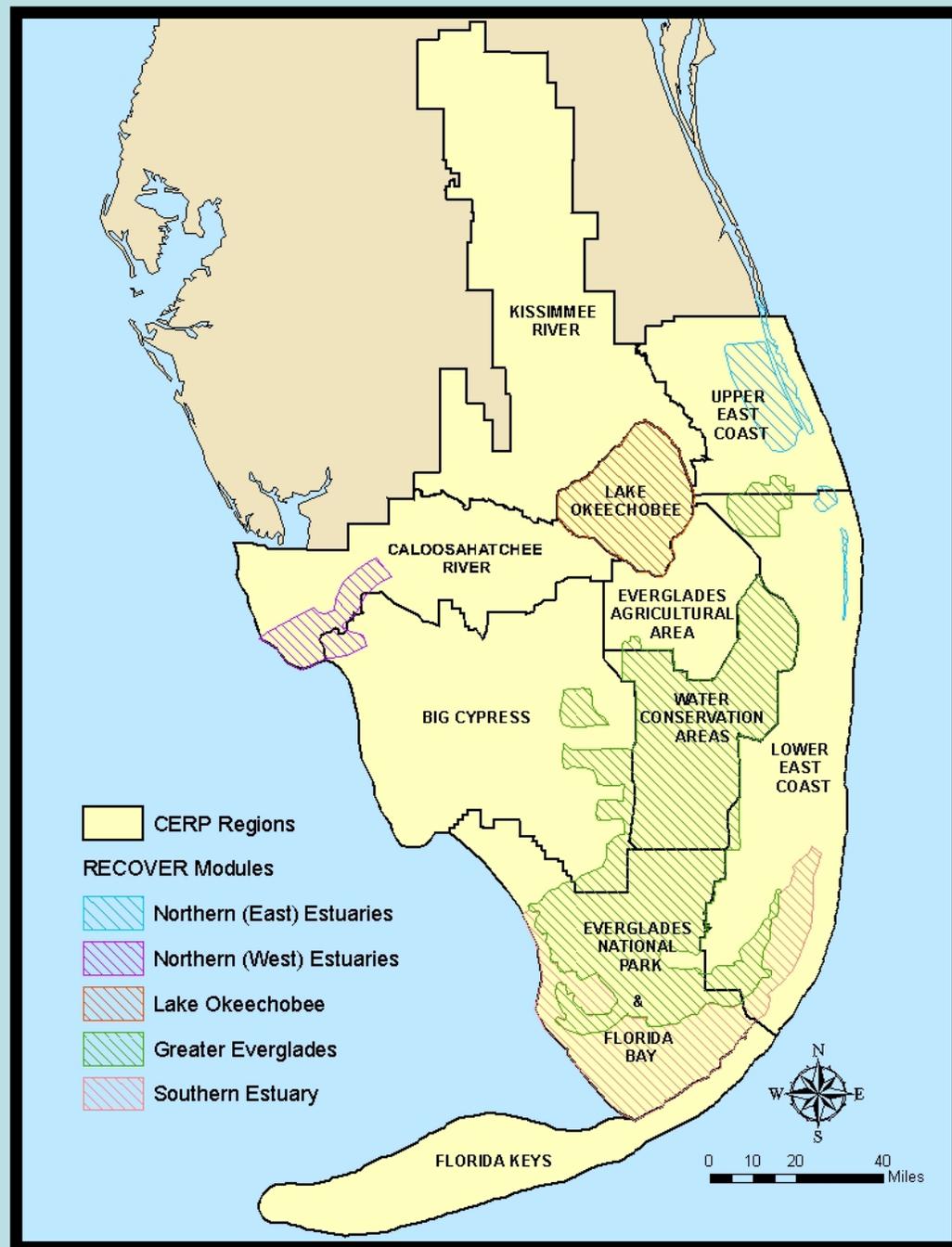


Project Team Members

- **US Army Corps of Engineers (USACE)**
 - Terry Artrip, Kevin Wittmann, Susan Conner, Jon Lane, Larry Taylor, Shauna Allen
- **South Florida Water Management District (SFWMD)**
 - John Morgan, Jr., LeRoy Rodgers
- **US Department of Agriculture (USDA)**
 - Paul Pratt, Allen Dray and Ted Center
- **US Fish & Wildlife Service (USFWS)**
 - Art Roybal
- **US Department of Interior (USDOL)**
 - Robert Doren



Study Area Map



Yellow Book Plan

Component	Status
Part A - construction of a new Melaleuca quarantine and research facility.	Complete A new facility was constructed by the without federal support.
Part B - renovation of an existing facility at the University of Florida in Gainesville.	Suspended Lack of sponsor support. This facility is phasing out weed biological control quarantine testing.
Part C - mass rearing, field release, establishment and field monitoring of approved biological control agents for Melaleuca and other invasive exotic species.	In Progress Subject of this PIR



Reaffirmation of YB

- **“Reaffirmation” PIR**
 - Included in the Yellow Book Plan
 - Needs/Objectives have not changed
 - No new purpose added
 - Other alternatives considered
- **Optimize design concepts from YB**



Project Features

- **Mass Rearing, Field Release, Establishment and Field Monitoring of approved biological control agents for:**
 - Melaleuca
 - Lygodium
 - Brazilian Pepper
 - Australian Pine
- **Design and Construction of Mass Rearing Annex at USDA's Davie, FL Quarantine Facility**



Benefits

- **Primary System Benefits**
 - Prevents expansion of invasive exotics into natural areas
 - Reduces coverage of invasive exotics
 - Reduces density of invasive exotics
- **Secondary System Benefits**
 - Promotes reestablishment of native plants
 - Restores native habitat for native birds and wildlife species
 - Reduces stressors on rare, threatened and endangered species



**Existing and
Future without Project
Conditions**

Melaleuca Eradication and Exotic Plants- Implement Biological Controls

Four of the Worst Weeds



Melaleuca



Lygodium

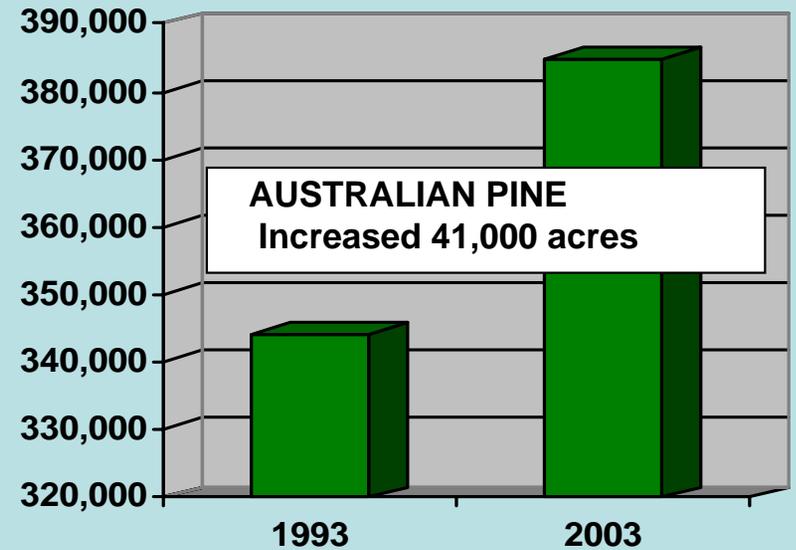
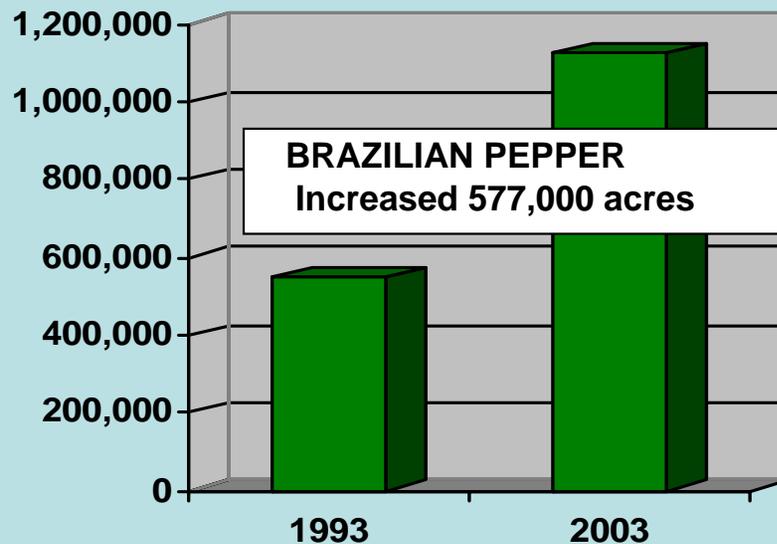
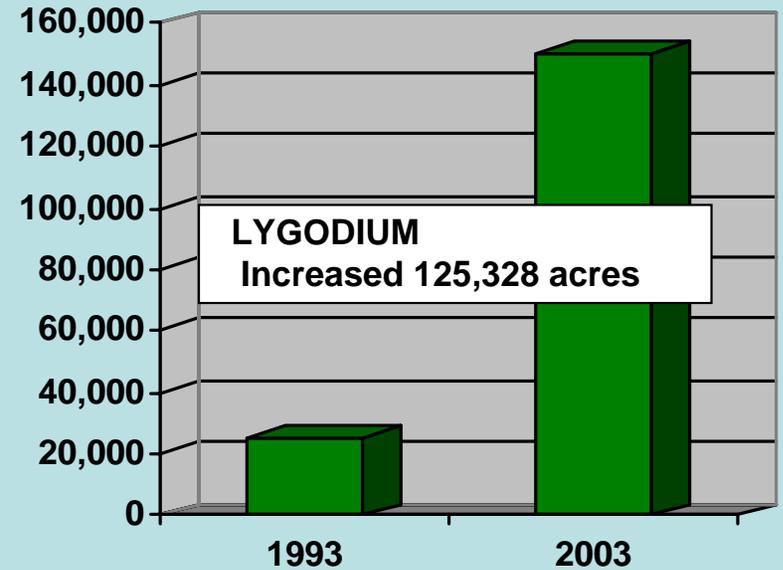
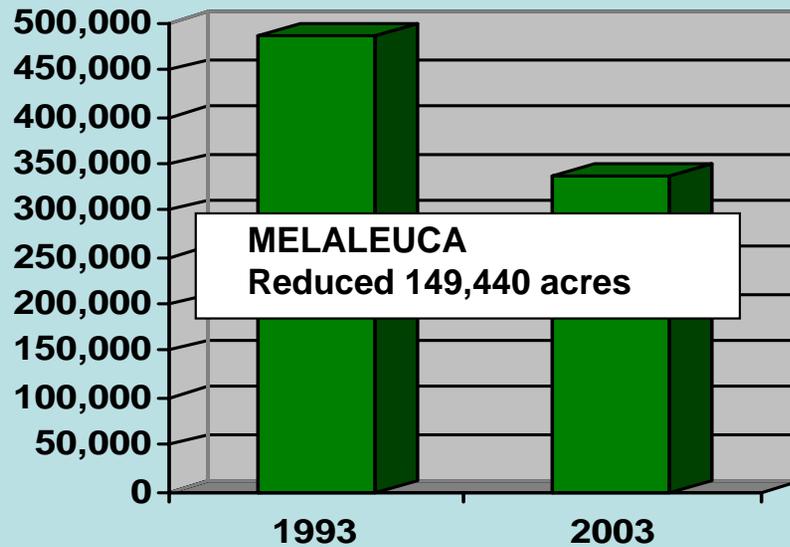


Brazilian Pepper



Australian Pine

Existing Conditions

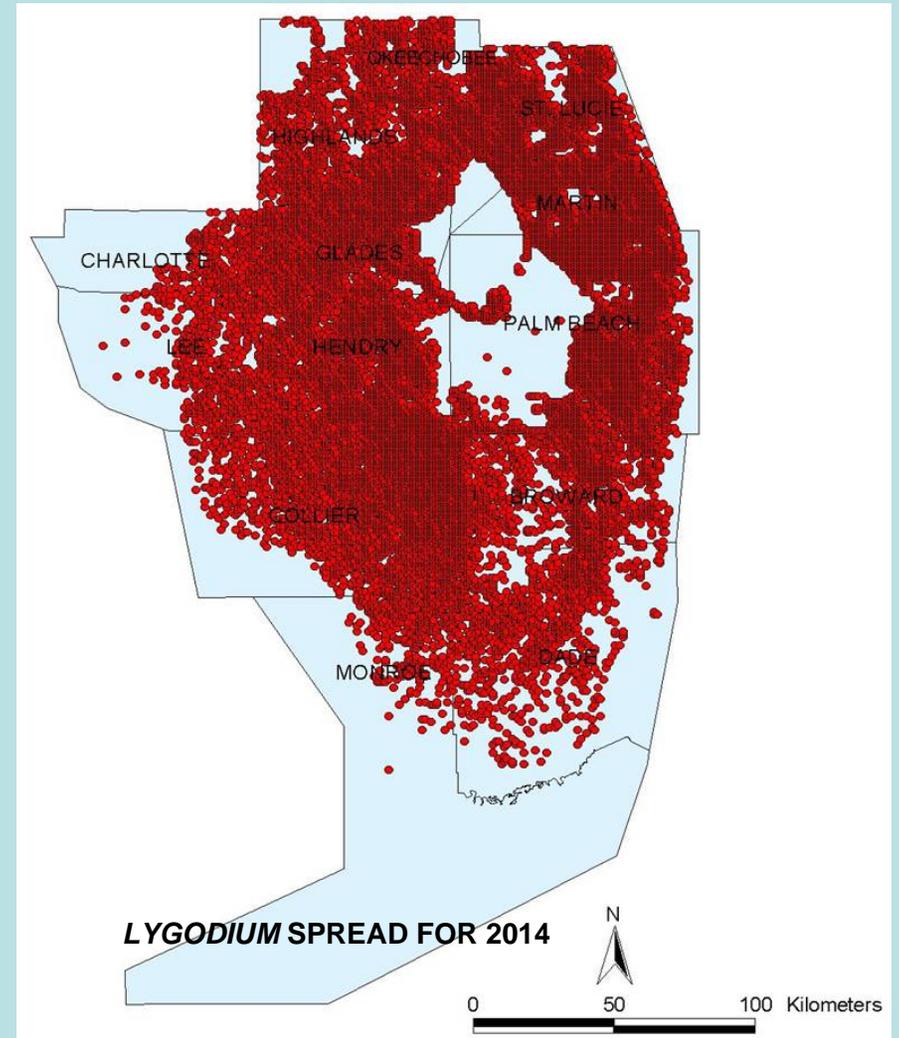
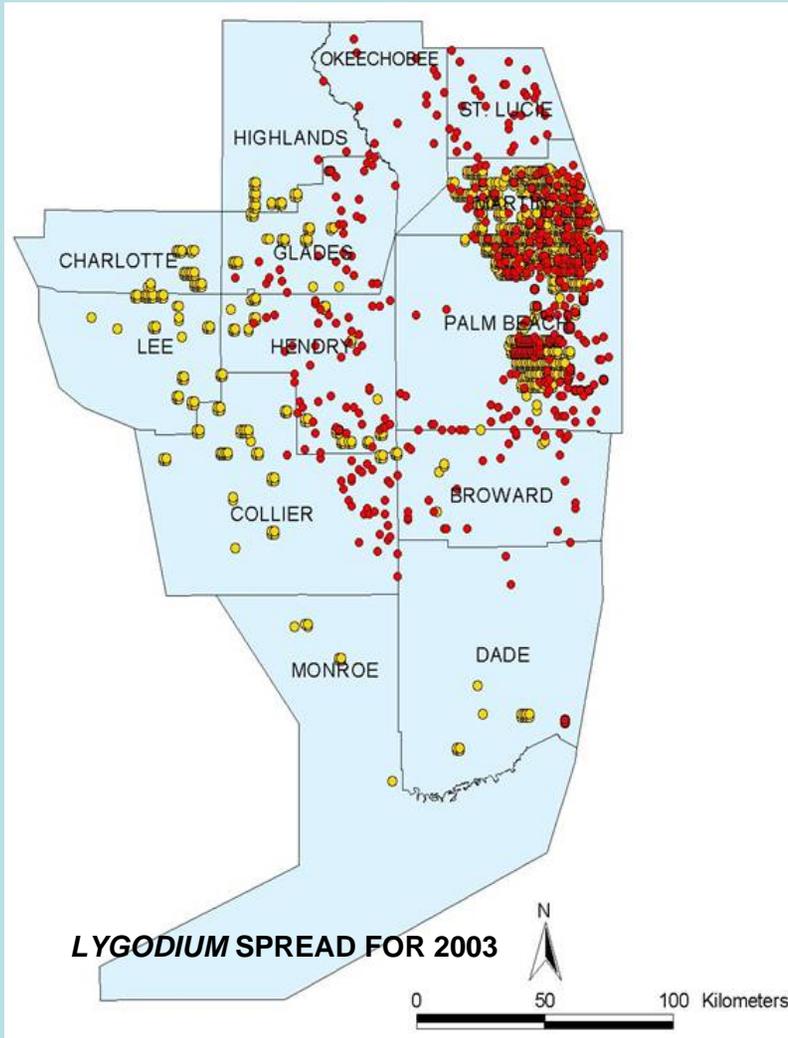


Future Without Project Conditions

Geographic Range Expansion (in acres) with predictions of future spread.

	1993	1995	1997	2003	2025	2050
Melaleuca	488,000	464,000	391,000	329,000	50,000	50,000
Lygodium	28,152	29,970	34,034	120,780	~900,000	~2,700,000
Brazilian Pepper	547,000	899,000	961,000	1,124,000	2,261,750	3,493,000
Australian Pine	344,000	357,000	370,000	385,000	474,000	572,214

Lygodium Expansion

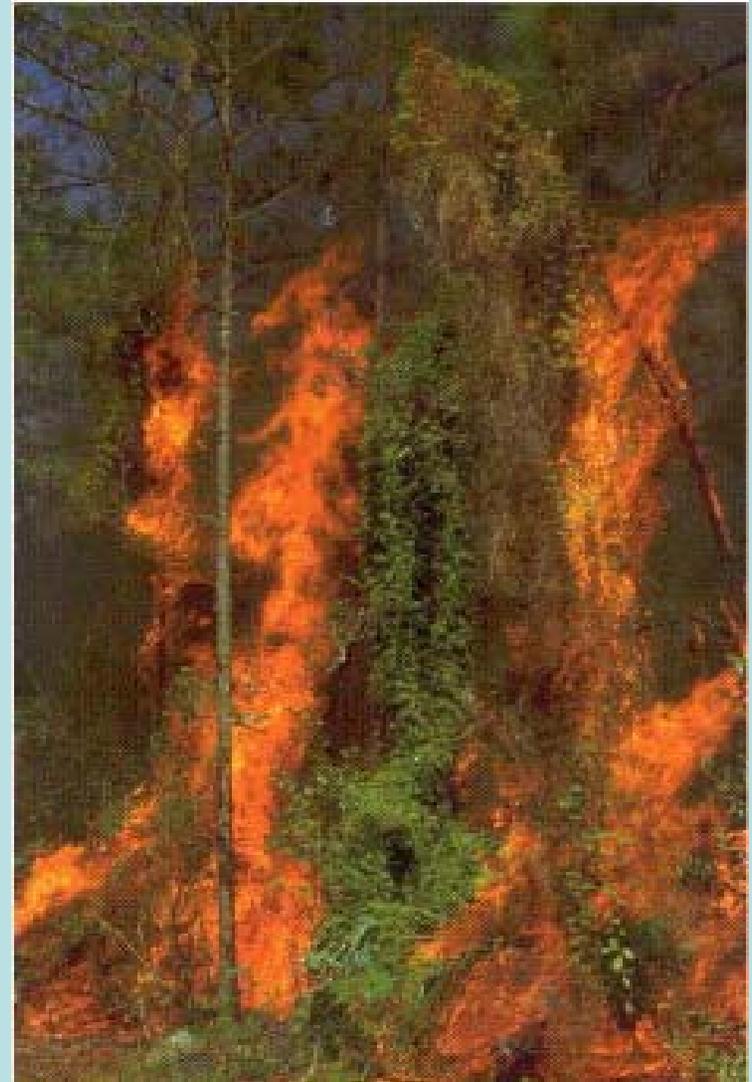


- Yellow dots actual cover data from SRF
- Red dots model prediction cover data

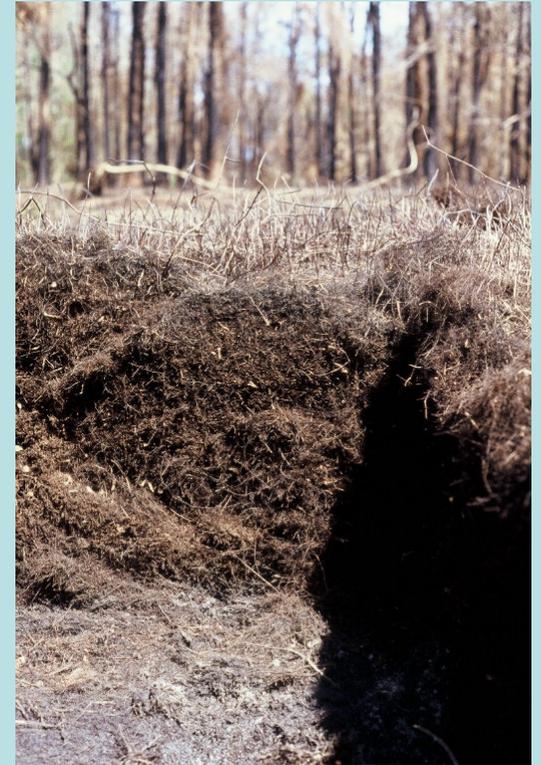
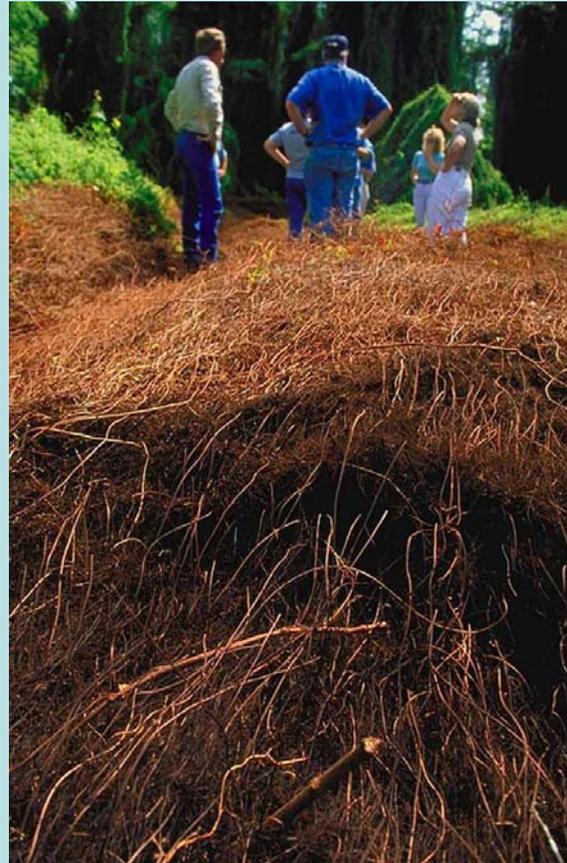
Lygodium Impacts



- **Altered Structure**
- **Collapses Trees**
- **Altered Disturbance Regime**



Lygodium Impacts



- **Alters structure**
- **Prevents recruitment**
- **Impedes water flow**
- **Resource Competition**



Biological Control Development Process

- **Discovery and identification**
 - Locate target plant natural enemies in native range
- **Approval for importation and study**
 - Review by USDA Technical Advisory Group
 - Permitting in compliance with NEPA (ESA)
- **Quarantine studies**
 - Testing in a secure lab for host specificity
- **Initial field release**
 - Targeted release areas, rely on natural dispersal
- **Monitoring**
 - Biocontrol agents are tracked by state and federal scientists.
 - Releases and results are annually recorded

Biological Control Agents

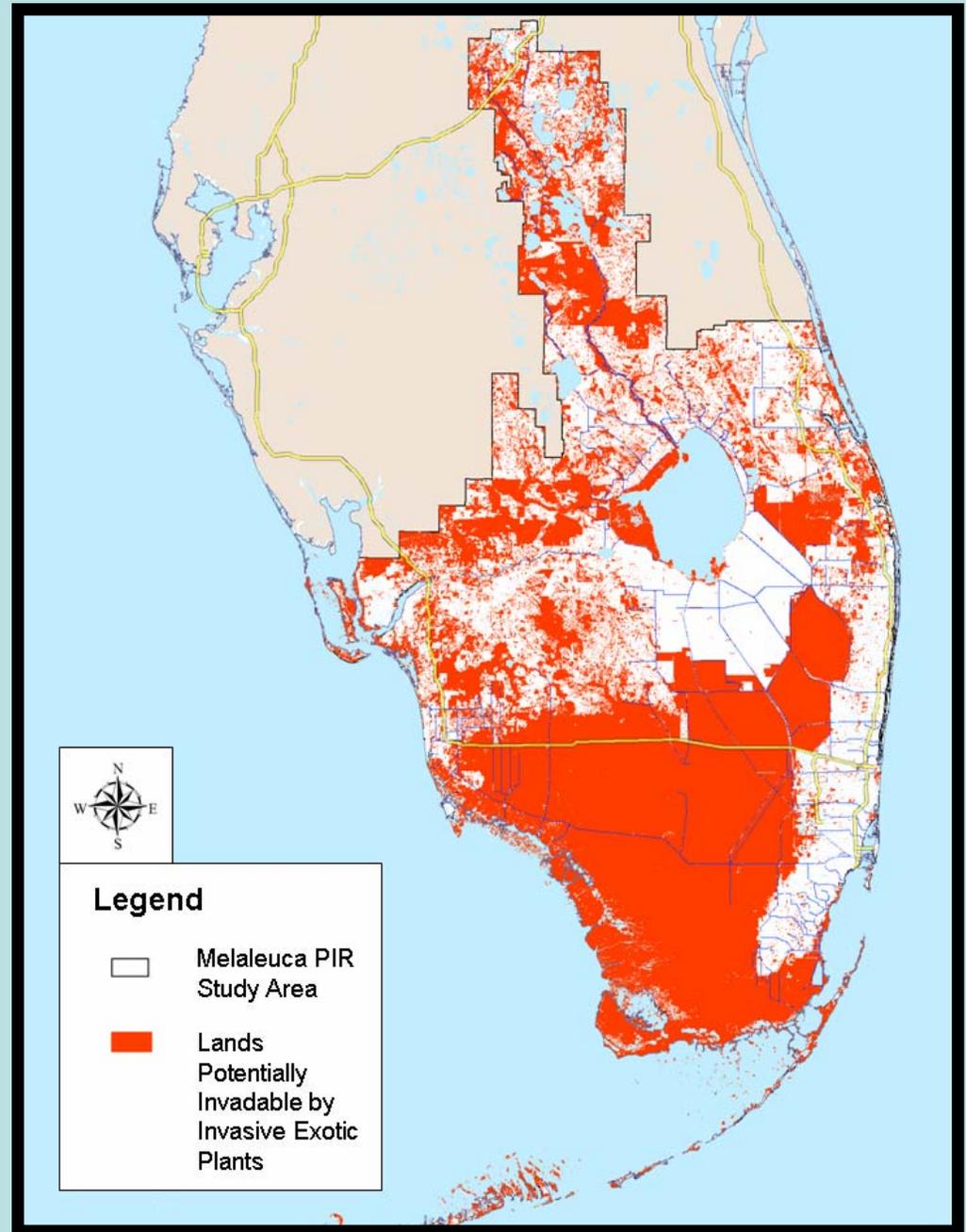
Approval Status

- **Melaleuca**
 - 4 approved
 - 2 approval process
- **Lygodium**
 - 3 approved
 - 1 approval process
- **Brazilian Pepper**
 - 3 approval process
- **Australian Pine**
 - 1 approval process
- **Air Potato**
 - 1 approval process

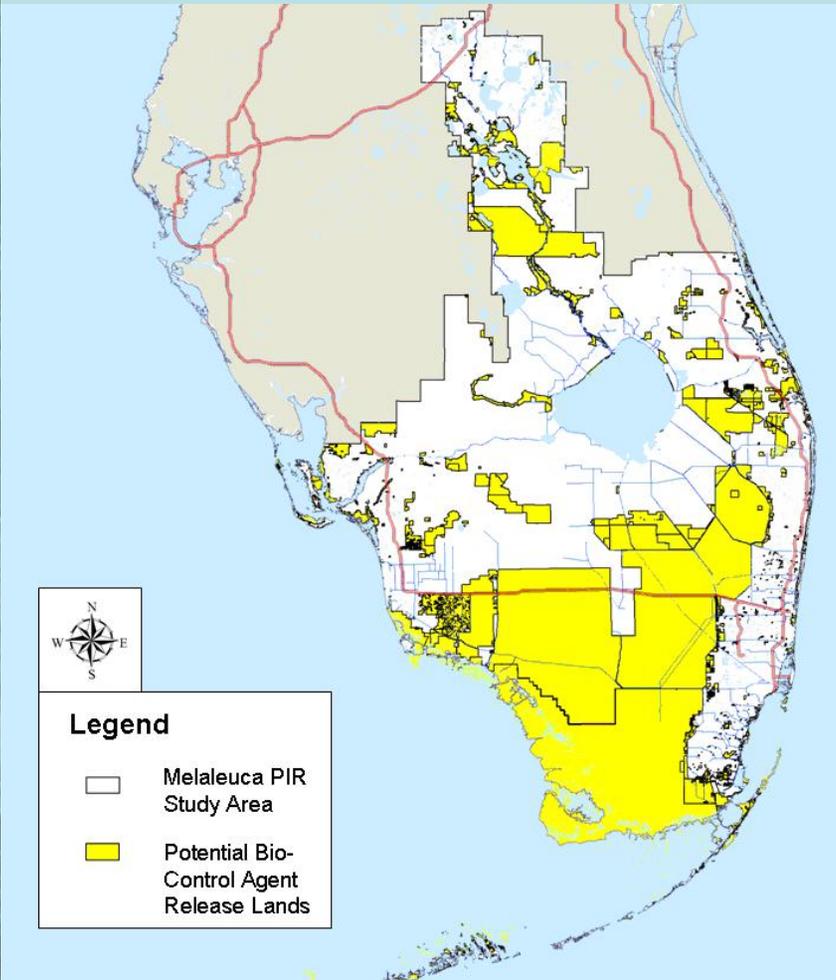




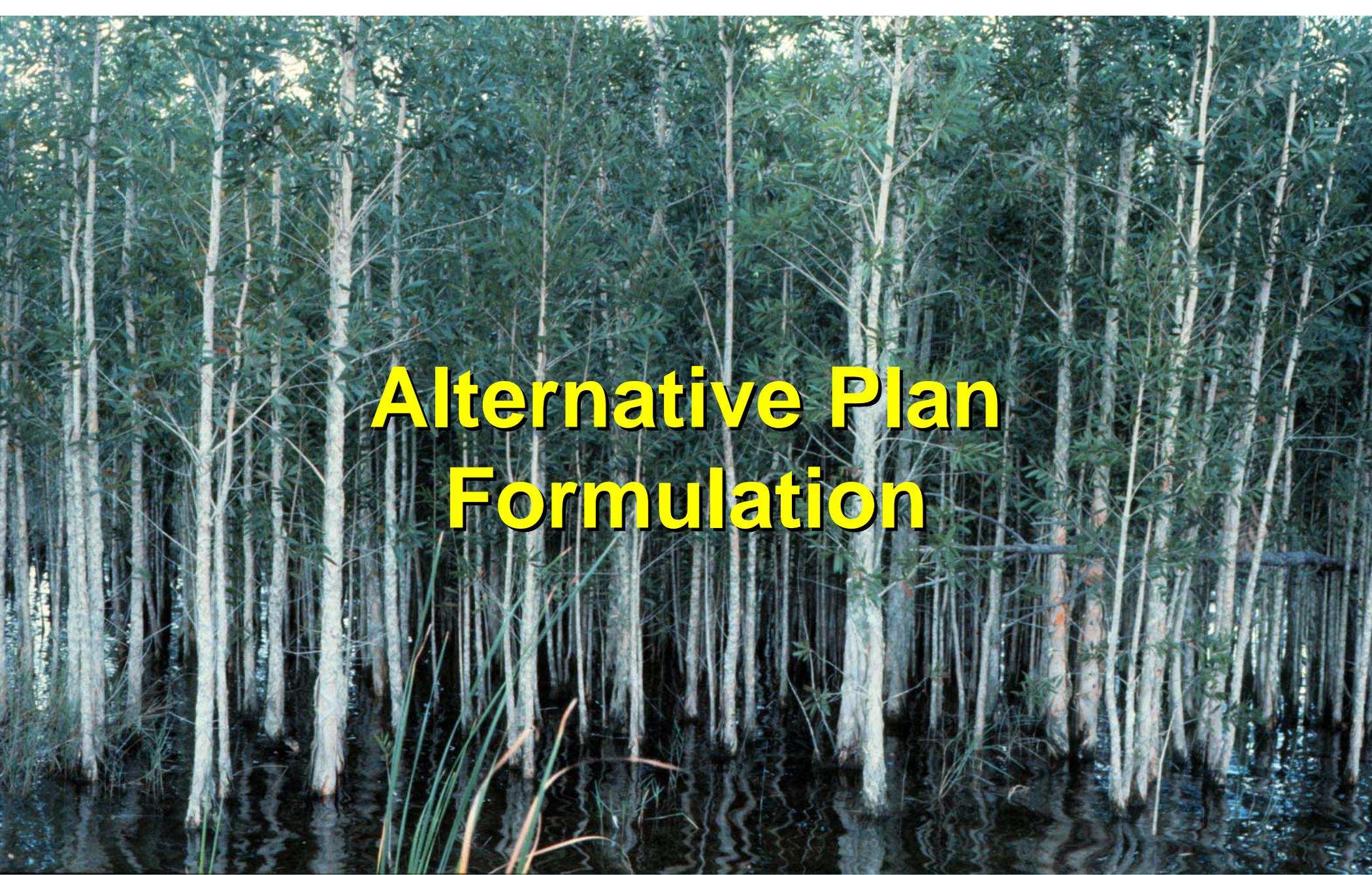
Lands Subject To Invasion



Potential Release Areas



- All target plants are classified Fed/State pest plant lists
- Release only into publicly owned lands
- Will not release onto privately owned lands
 - Private land owners can protect their plants through the use of pesticides



Alternative Plan Formulation

Melaleuca Eradication and Exotic Plants- Implement Biological Controls



Planning Constraints

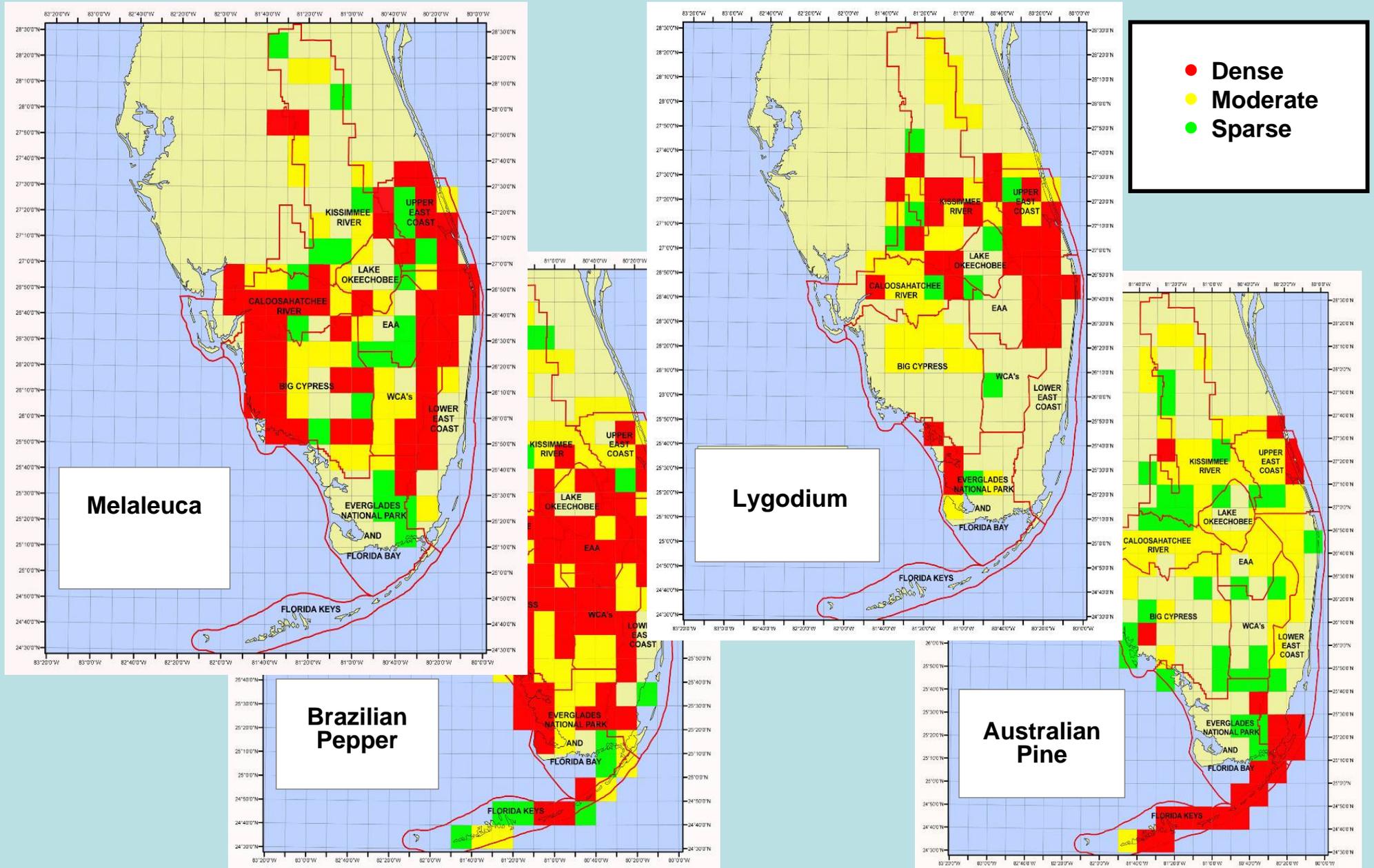
- **Biocontrol agents need to be identified and developed over time.**
- **Biocontrol agents are species-specific.**
- **Limits on the number of insects that can be produced at one time.**
- **The effects of all agents are not known.**
- **An ecosystem-level approach must be used to manage exotics species.**



Preliminary Alternative Development

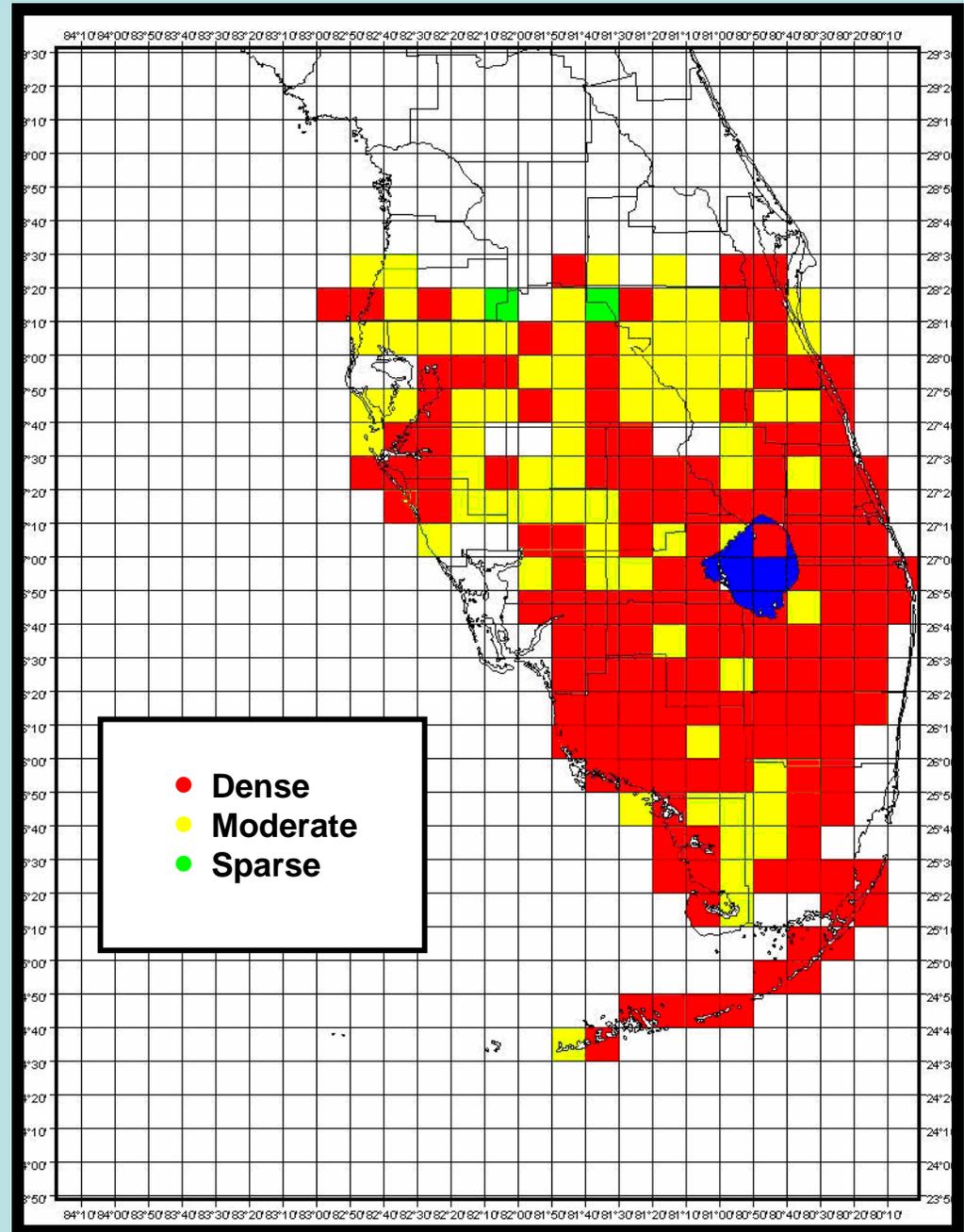
- **Systematic Reconnaissance Flights (SRF) for plant distribution**
- **Preliminary Alternatives**
 - Inoculative Approach
 - Inundative Approach
 - High Density Releases
- **Screening Criteria**
 - Density reduction
 - Seedling mortality
 - Reproductive capacity

Plant Density Estimates



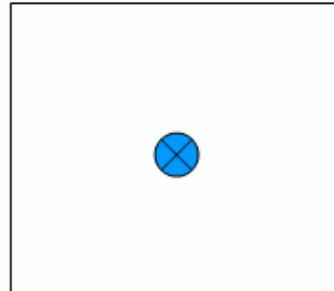


Generalized Density Estimates

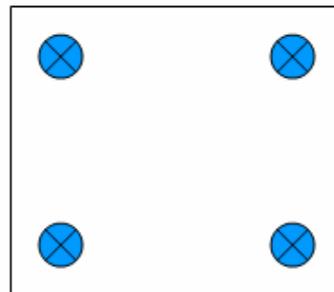


Release Strategies

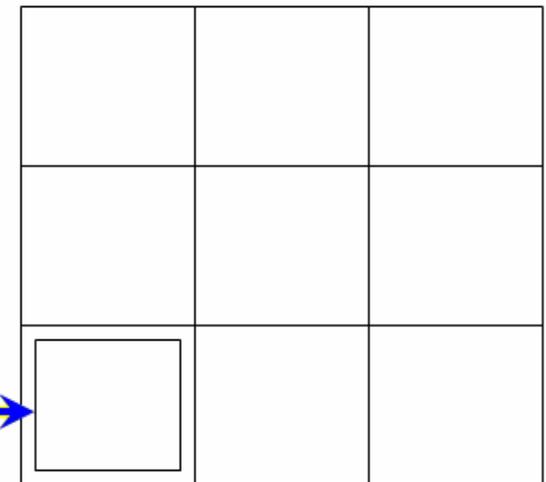
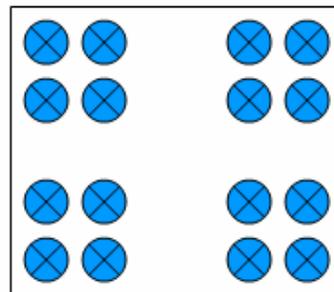
Inoculative Approach - A small number of biological control agents are released at a single site of each cell that is infested with the target weed



Inundative Approach - Multiple releases of a few individual insects in each cell that is infested with the target weed



High Density Approach - Multiple releases of many insects in each cell that is infested with the target weed

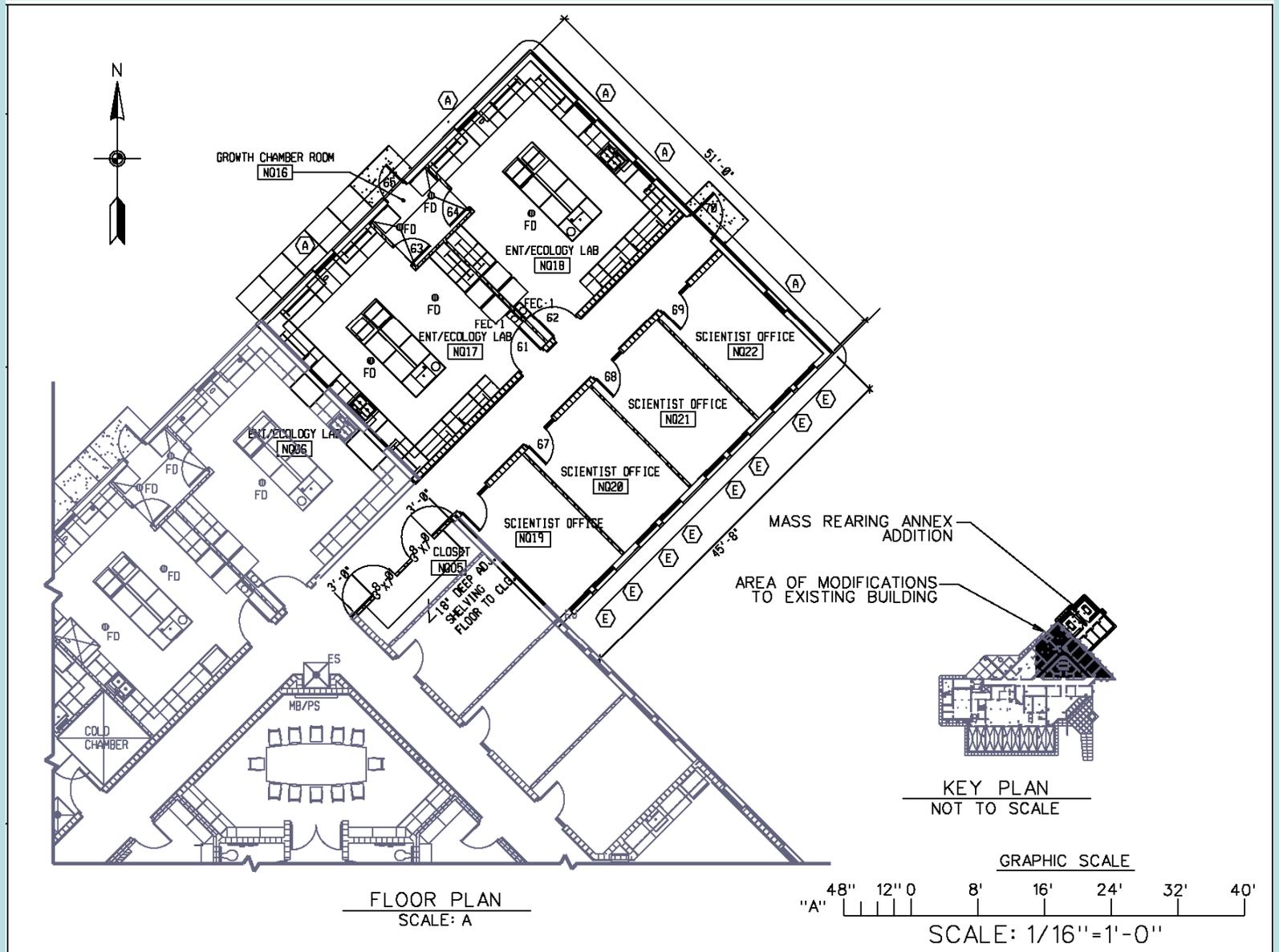


Grid cells in Project Area
(showing 9 of the many cells)

Release Strategy Comparison

Release Type	Number of Insects/ Location	Number of Locations w/in Cell	Amount of Effort	Time to Maximum Weed Impact
Inoculative	Few	One	Little	Long
Inundative	Few	Many	Moderate	Moderate
High Density	Many	Many	High	Little

Mass Rearing Annex





Alternative Plan Screening

- **Eliminate alternatives that target only sparsely infected cells**
 - 6, 7, 14, 21
- **Eliminate alternatives that do not have the mass rearing annex**
 - 2, 4, 8, 10, 12, 15, 17, 19
- **Eliminate alternatives that do not realize benefits in less than 25 years**
 - 13, 20
- **Ranked remaining plans according to times to achieve benefits**
 - In order: 9, 16, 3, 5, 11, 18
 - 11 and 18 were considered marginal and were eliminated from further consideration.

Alternative Plans Matrix

Alternative Plans	Inoculative Release	Inundative Release	High Density Release	Dense Cells	Moderate Cells	All Cells	With Mass Rearing Annex	Without Mass Rearing Annex
1								X
2	X					X		X
3	X					X	X	
4	X			X				X
5	X			X			X	
8		X				X		X
9		X				X	X	
10		X		X				X
11		X		X			X	
12		X			X			X
13		X			X		X	
15			X			X		X
16			X			X	X	
17			X	X				X
18			X	X			X	
19			X		X			X
20			X		X		X	

Initial Screening

Alternative Plans	Inoculative Release	Inundative Release	High Density Release	Dense Cells	Moderate Cells	All Cells	With Mass Rearing Annex	Without Mass Rearing Annex
1								X
2	X					X		X
3	X					X	X	
4	X			X				X
5	X			X			X	
8		X				X		X
9		X				X	X	
10		X		X				X
11		X		X			X	
12		X			X			X
13		X			X		X	
15			X			X		X
16			X			X	X	
17			X	X				X
18			X	X			X	
19			X		X			X
20			X		X		X	

Final Screening

Preliminary Alternatives	Screening Criteria		
	Density Reduction (Years)	Seeding Mortality (Years)	Reproductive Capacity (Years)
1. Do nothing (no releases, future without project)	> 50	> 50	> 50
3. Inoculate all infested cells (red, yellow and green) with approved biocontrol agents and construct a screen house	19	16	14
5. Inoculate only cells with dense weed infestations (red) with approved biocontrol agents and construct a screen house	24	21	19
9. Inundate all weed infested cells (red, yellow and green) with approved biocontrol agents and construct a screen house	13	11	10
11. Inundate only cells with dense infestations of the weed (red) with approved biocontrol agents and construct a screen house	24	22	20
16. Make high density releases of approved biocontrol agents at multiple points in all infested cells (red, yellow and green) and construct a screen house	14	12	11
18. Make high density releases of approved biocontrol agents at multiple points in densely infested cells (red) and construct a screen house	25	22	21

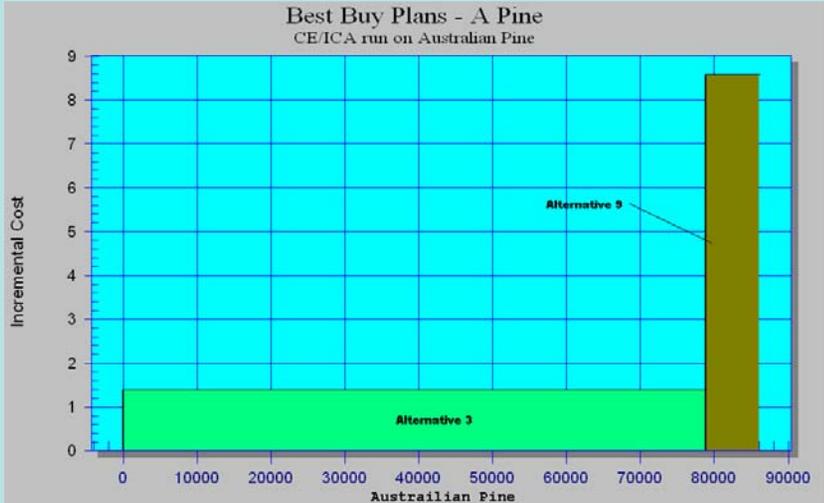
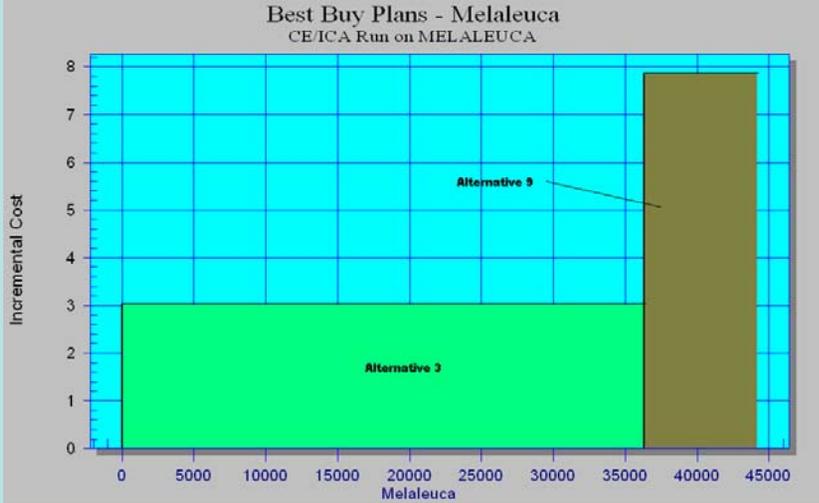
Final Array of Alternatives

*Alt 3 is identified as the TSP for Melaleuca and Australian Pine

**Alt 9 is identified as the TSP for Lygodium and Brazilian Pepper

	*Alt 3	Alt 5	**Alt 9	Alt 16
release strategy	inoculate	inoculate	inundate	high density
cells	all	dense	all	all
Melaleuca	351,120	351,120	351,120	351,120
Lygodium	2,158,398	2,027,620	2,315,332	2,289,176
Brazilian Pepper	2,646,599	2,509,444	2,811,185	2,783,754
Australian Pine	435,766	418,952	455,942	452,580
time to full benefits	19 years	24 years	13 years	14 years

CE/ICA Results





Why Alts 3 and 9?

- **Achieves project objectives**
- **Ecosystem level approach**
- **Protects uninvaded lands**
- **Targeted level of effort**
- **Increases effectiveness of existing control efforts**
- **More efficient use of biological agent production capability**
- **Benefits are independent of other CERP Projects**



Why Mass Rearing Annex?

- **Achieves project objectives**
- **Facilitates production of large numbers of biological agents**
- **Increases benefits in a shorter period**
- **Cost effective measure**

Why now?

Melaleuca is reported to spread at a rate of 7,043 acres/yr



- Originally released at 13 locations (~ 10 CERP cells)
 - Established at 9 sites (~ 8 cells)
 - Spread rate of 0.5 mi/yr
-
- Melaleuca infests 108 of the 11.5 x 11.5 mi grids within CERP boundaries
 - At 0.5 mi/yr, Oxyops would take 180 yrs to spread naturally from Fort Lauderdale to Naples
 - By inoculating 90% of cells, max dispersal distance would be 23 mi – only 46 yr needed



Costs

- **Total Estimated Cost**

- Implementation and Monitoring:

- \$ 12,844,000 (*TSP, May 2007 price level*)

- Rearing Facility Construction:

- \$ 787,000 (*TSP, May 2007 price level*)

- **YB Estimated Cost**

- Construction & O&M

- \$ 10,800,000 (*October 1999 price from YB*)

Cost Comparison

	Alternative 3	Alternative 5	Alternative 9	Alternative 16
Annual Cost	\$110,000	\$110,000	\$172,000	\$292,000
Melaleuca	36,335	29,775	44,207	42,895
Lygodium	474,066	444,928	517,641	509,726
Brazilian Pepper	623,192	528,623	680,434	670,245
Australian Pine	78,871	73,580	86,089	84,820

Major Milestones

FSM	Oct 2006
AFB Meeting	Aug 2007
AFB Guidance Memorandum	Aug 2007
Selected Alternative Plan (SAP)	Aug 2007
Draft PIR Published in Federal Register	Jan 2008
Final PIR Published in Federal Register	Nov 2008
Initiate Project Cooperation Agreement (PCA)	Mar 2009