

# **Statewide Invasive Species Management Plan for Florida**

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## **Glossary of Acronyms**

<b>APHIS</b>	Animal and Plant Health Inspection Service (USDA)
<b>CFA</b>	Cooperative Forestry Assistance program
<b>AQUA</b>	Division of Aquaculture (FDACS)
<b>DAI</b>	Division of Animal Industry (FDACS)
<b>DOF</b>	Division of Forestry (FDACS)
<b>DPI</b>	Division of Plant Industry (FDACS)
<b>EADAU</b>	Emerging Animal Disease Assessment Unit (FDACS-DAI)
<b>EPA</b>	United States Environmental Protection Agency
<b>EPPC</b>	Florida Exotic Pest Plant Council
<b>FBI</b>	Federal Bureau of Investigation
<b>FAS</b>	Department of Fisheries and Aquatic Sciences (Univ. of Florida)
<b>FDACS</b>	Florida Department of Agriculture and Consumer Services
<b>FDEP</b>	Florida Department of Environmental Protection
<b>FDOT</b>	Florida Department of Transportation
<b>FWC</b>	Florida Fish and Wildlife Conservation Commission
<b>GFC</b>	Game and Freshwater Fish Commission, now the FWC
<b>IFAS</b>	Institute of Food and Agricultural Sciences (Univ. of Florida)
<b>IPPC</b>	International Plant Protection Convention
<b>ISWG</b>	Invasive Species Working Group
<b>NFWFMD</b>	Northwest Florida Water Management District
<b>SFWMD</b>	South Florida Water Management District
<b>SJRWMD</b>	St. Johns River Water Management District
<b>SRWMD</b>	Suwannee River Water Management District
<b>SWFWMD</b>	Southwest Florida Water Management District
<b>USDA</b>	United States Department of Agriculture
<b>WMD</b>	Water Management Districts

1 **Glossary of Terms**

2  
3 **Control and Management**– means eradicating, containing, suppressing spread, reducing  
4 population size, or reducing the effects of invasive species and preventing new invasions  
5 in Florida.

6  
7 **Introduction** – means the intentional or unintentional escape, release, dissemination, or  
8 placement of a species into a Florida ecosystem as a result of human activity.

9  
10 **Invasive species** – means a nonindigenous species that has the ability to establish self-  
11 sustaining, expanding, free-living populations, and may cause economic and/or  
12 environmental harm.

13  
14 **Native species** – means a species within its natural range or natural zone of dispersal, i.e.,  
15 within the range it could or would occupy without direct or indirect introduction and/or  
16 care by humans. It excludes species descended from domesticated ancestors.

17  
18 **Nonindigenous species (synonyms: exotic or non-native species)** - means, with respect  
19 to a particular ecosystem, any species, including its seeds, eggs, spores, or other  
20 biological material capable of propagating that species, which is not native to Florida.

21  
22 **Pathways** - natural and human connections that allow movement of species or their  
23 reproductive propagules from place to place.

24  
25 **Risk assessment** – a science based process to evaluate the economic and/or  
26 environmental risk(s) of nonindigenous species.

27  
28 **Stakeholders** – means any and all interested parties.

29  
30 **Introduction**

31 The movement of plants, animals, and microbes beyond their natural range is  
32 much like a game of biological roulette (U.S. Congress, 1993). Once in a new  
33 environment, an organism may simply die or it may become established and reproduce  
34 with little noticeable effects on its surroundings (Simberloff, 1997). But sometimes, a  
35 new species becomes invasive, and it spreads unimpeded and causes great environmental  
36 and/or economic harm.

37 Florida is particularly prone to nonindigenous species invasions (Simberloff,  
38 1997). Florida has a climate similar to that of the Neotropics with an absence of hard  
39 freezes and exhibits a disturbed and diverse patchwork of environmental and agricultural

1 habitats. The southern third of Florida is a peninsula and a habitat island, bounded on  
2 three sides by water and the fourth by frost, and it is typified, as are oceanic islands, by  
3 an impoverished native flora and fauna. Florida also has many lakes, streams, and rivers  
4 that can facilitate the easy spread of invasive species. These characteristics make Florida  
5 an epicenter for biological invasions (Simberloff, 1997), a process that dates back to early  
6 commerce between the City of St. Augustine and South America (Schmitz et al., 1993).  
7 During the past 400 years, Florida has been inundated with waves of mostly tropical and  
8 subtropical nonindigenous plants and animals. These waves of introductions accelerated  
9 during the twentieth century with the rise of the ornamental plant and pet industries and  
10 through unintentional contaminants of imported commodities. Today, the Port of Miami  
11 receives 85% of the live nonindigenous plant shipments that arrive each year in the  
12 United States (U.S. Congress, 1993).

13 Fortunately, few of the thousands of species that have been introduced into  
14 Florida have become invasive. For example, approximately 25,000 nonindigenous plant  
15 species have been introduced into the United States with 1,180 of these species becoming  
16 established in Florida and thriving outside of human cultivation (Wunderlin, 1997).  
17 Sixty-nine of these are considered by the Florida Exotic Pest Plant Council to be altering  
18 native plant communities by displacing native species, changing community structures or  
19 ecological functions, or hybridizing with native species; another fifty-six have increased  
20 in abundance or frequency but are not yet known to be harmful (Florida Exotic Pest Plant  
21 Council, 2001). But even a few invasive species can have a staggering economic impact  
22 in Florida. More than \$240 million has been spent in Florida by state, federal, and local  
23 agencies since 1980 to control invasive nonindigenous aquatic, wetland, and upland  
24 plants on publicly owned waterways and conservation lands (Bureau of Invasive Plant  
25 Management, 2001).

26 In Florida, there has been no comprehensive statewide measurement of the direct  
27 and indirect economic costs associated with the majority of harmful invasive species.  
28 However, there are indications that invasive species have a significant economic impact.  
29 A recent report prepared by Florida scientists and agricultural officials estimates that the  
30 annual impact of invasive nonindigenous plants, animal pests, and diseases are costing  
31 sales losses of \$179 million in agricultural production (Pest Exclusion Advisory

1 Committee, 2001). According to information compiled by the Florida Governor’s Office  
2 for the U.S. General Accounting Office Survey of States Regarding Expenditures for  
3 Invasive Species Activities for fiscal year 1999-2000, a total of \$90.8 million were spent  
4 by nine Florida state agencies. The Florida Department of Agriculture and Consumer  
5 Services spent the most (\$45.9 million) for prevention, monitoring, eradication, control  
6 and restoration efforts. In south Florida alone, state and federal agricultural agencies  
7 conducted a multi-year \$300-million effort to stop reintroduced citrus canker from  
8 spreading to central Florida by cutting thousands of citrus trees on private property  
9 (Schmitz and Simberloff, 2001). These costs associated with harmful invasive species  
10 are expected to grow with increasing world trade and the introduction of new invasive  
11 species (Schmitz and Simberloff, 1997).

### **Florida is at high risk for new invasions**

14 Florida is at high risk for the introduction of new invasive nonindigenous species  
15 because of the state’s strategic southeastern-most location. Florida, as with other states  
16 with ports and complex transportation systems, is expected to act as one of the nation’s  
17 sentinels against these invasive species (Pest Exclusion Advisory Committee, 2001).  
18 Yet, federal and state systems in place to intercept, eradicate, or contain these invaders  
19 have not kept pace with the influx of non-native agricultural pests (including diseases)  
20 along with environmental invaders arriving each year in Florida. The frequency at which  
21 nonindigenous organisms entered Florida via the plant and animal material brought in by  
22 tourists, smugglers, and cargo grew exponentially during the 1990s (Pest Exclusion  
23 Advisory Committee, 2001). The number of tourists entering Florida in the last ten years  
24 grew 20 percent, approaching nearly 50 million people yearly. Perishable cargo nearly  
25 tripled to more than 6 million tons. Mail deliveries and smuggling operations that avoid  
26 official inspections also grew exponentially. However, the resources needed to regulate  
27 these activities are nearly unchanged (Pest Exclusion Advisory Committee, 2001).

28 As a consequence, two Mediterranean fruit fly infestations in Florida cost federal  
29 and state taxpayers nearly \$50 million to eradicate (Pest Exclusion Advisory Committee,  
30 2001). The tick-borne Heartwater disease, an outbreak of which could kill 50-90 percent  
31 of Florida’s cattle, other ruminant livestock, and the state’s native deer population, is as

1 close as the Caribbean islands (Pest Exclusion Advisory Committee, 2001). Equine  
2 piroplasmiasis, a parasitic disease also transmitted by ticks, along with Heartwater and  
3 other lesser-known animal and plant maladies, have already cost the taxpayers more than  
4 \$400 million to address (Pest Exclusion Advisory Committee, 2001).

5 Nine state agencies have responsibilities for invasive nonindigenous species  
6 including their prevention, detection, control, and monitoring as well as restoration of  
7 invaded habitats and agricultural areas (Table 1). Three state agencies (FDEP, FDACS,  
8 and FWC) have regulatory authority over invasive nonindigenous species. Historically,  
9 policies held by some of these agencies occasionally conflicted. Presently, there are no  
10 comprehensive mechanisms to coordinate prevention and management activities among  
11 the responsible agencies.

12 **Table 1. State agencies with jurisdictional responsibilities for invasive species in Florida. Operations**  
13 **indicate: I-importation regulatory program, P-prevention, D-detection, C-control, M-monitoring,**  
14 **and R-restoration efforts.**

Agency	Operations	Research/ Development	Outreach Efforts	Information Management
FDEP <sup>1</sup>	I,P,D,C,M,R	Yes	Yes	Yes
FWC <sup>2</sup>	I,P,D,C,M,R	Yes	Yes	Yes
FDACS <sup>3</sup>	I,P,D,C,M,R	Yes	Yes	Yes
FDOT <sup>4</sup>	D,C,M,R	Yes	Yes	No
NFWWMD <sup>5</sup>	D,C,M	Yes	Yes	Yes
SWFWMD <sup>6</sup>	D,C,M,R	Yes	Yes	Yes
SFWMD <sup>7</sup>	D,C,M,R	Yes	Yes	Yes
SJRWMD <sup>8</sup>	P,D,C,M,R	Yes	Yes	Yes
SRWMD <sup>9</sup>	D,C,M	Yes	Yes	Yes

16  
17 <sup>1</sup> Florida Department of Environmental Protection

18 <sup>2</sup> Florida Fish and Wildlife Conservation Commission

19 <sup>3</sup> Florida Department of Agriculture and Consumer Services

20 <sup>4</sup> Florida Department of Transportation

21 <sup>5</sup> Northwest Florida Water Management District

22 <sup>6</sup> Southwest Florida Water Management District

23 <sup>7</sup> South Florida Water Management District

24 <sup>8</sup> St. Johns River Water Management District

25 <sup>9</sup> Suwannee River Water Management District

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**Not all nonindigenous species are invasive or harmful in Florida**

It should be noted that not all nonindigenous species are harmful to agriculture and the environment, and they are essential to many Florida industries. Many nonindigenous species provide economic, recreational, and social benefits. Florida’s citizens, as well as agriculture and other industries, benefit from nonindigenous species that are produced and appreciated as pets, food, raw materials for soft and hard goods, and hunting and fishing resources, or used to mitigate environmental damage. Very few of Florida’s agronomic crops (vegetables, horticulture, fruit, livestock, tropical fish, and others) valued in excess of \$55 billion per year are native species.

Simberloff et al. (1997) reported that the ecological effects of Florida’s nonindigenous species found in the natural environment vary enormously. Of all the taxa introduced into the state, nonindigenous plants are currently having the greatest environmental impact (Simberloff et al., 1997). For other introduced taxa, the documented effects are few. For example, in other parts of the United States, nonindigenous fishes have often played a key role in the endangerment or extinction of native fish species. In Florida, Shafland (1996) reported that fishes introduced into Florida have had few, if any, negative effects on native fish fauna and an important sport fishery has been established using the nonindigenous butterfly peacock bass. And recent data from eight quantitative fish surveys conducted in South Florida (Trexler, 2000) provide little evidence of ecological effects of introduced fish species in the central or northern Everglades wet-prairie communities. On the other hand, because south Florida lacks native specialized fish species, the kind that are most susceptible for endangerment or extinction, Trexler et al. (2000) warn this ability for native fish species to cope with more than 50 introductions of nonindigenous fish species and the profound environmental alterations that characterize this region is no guarantee they will not be affected by further introductions of nonindigenous fish species.

Another example is the nonindigenous feral pig. Feral pigs, through their rooting, have a more destructive impact on natural habitats than any other nonindigenous Florida mammal (Layne, 1997). However, they, along with the armadillo, now comprise an important part of the diet of the endangered Florida panther. Maehr et al. (1990) report

1 that feral pigs and armadillos make up from 63.3% of the biomass consumed to as little  
2 as 33% in more southern areas, but deer are the most significant food because of their  
3 cosmopolitan distribution. Dalrymple and Bass (1996) rate feral pig and armadillo  
4 consumption even lower: 29% biomass combined versus 36% for deer. Maehr suspects  
5 that deer populations are sufficient to support existing Florida panthers without the  
6 addition of nonindigenous feral pigs (Maehr, personal communication, 2001). And, there  
7 are those who have even suggested that the feral pig is an impediment to panther range  
8 expansion because it harbors pseudorabies, a disease that once proved fatal to a panther  
9 in the heart of its range in southern Hendry County (Glass et al., 1994).

10 Clear agricultural and environmental benefits of nonindigenous species are those  
11 that are used for biological control of invasive species. Frank and McCoy (1993) report  
12 the release of 151 insect species in Florida since 1890 for use against insects and weeds.  
13 About 28% of these agents became established. Thirty-four were released against insect  
14 pests of agriculture and horticulture, the other eight against aquatic weeds (Frank and  
15 McCoy, 1993). Some have been very successful in controlling unwanted invaders. For  
16 example, Alligatorweed, once a severe problem in Florida, is now suppressed by a  
17 nonindigenous flea beetle (Center et al., 1997).

18 A major challenge for government agencies in Florida will be to accurately assess  
19 all the costs and benefits associated with each nonindigenous species, and to find ways to  
20 minimize the costs while maintaining the benefits.

## **How a statewide invasive species management plan can help**

23 The need for coordinated multi-agency planning and programs for preventing and  
24 controlling invasive nonindigenous species has been raised by several studies, such as the  
25 Office of Technology Assessment’s report “Harmful Nonindigenous Species in the  
26 United States” (U.S. Congress, 1993), the Florida Department of Environmental  
27 Protection’s report “An Assessment of Nonindigenous Species on Florida’s Public  
28 Lands” (Schmitz and Brown, 1994), the National Invasive Species Council’s “National  
29 Invasive Species Management Plan” (National Invasive Species Council, 2001),” the  
30 Florida Pest Exclusion Advisory Committee Report (Pest Exclusion Advisory  
31 Committee, 2001), and the South Florida Ecosystem Restoration Task Force and

1 Working Group’s report “An Assessment of Invasive Plants in Florida” (Doren and  
2 Ferriter, 2001). Any effective statewide strategy for preventing and managing invasive  
3 species must first consider that these invading species are not limited to legislative and  
4 professional boundaries, geography, or even individual programs. A growing number of  
5 scientists, resource managers, and agricultural officials recognize that a statewide  
6 invasive species management plan could provide a framework for coordinating state  
7 agency prevention and management efforts in Florida while facilitating cooperation with  
8 local and federal agencies. The successful implementation of this plan necessitates the  
9 involvement of individuals, organizations, and businesses involved with direct though  
10 sometimes conflicting interests in nonindigenous species.

11 Efforts to prevent new invasions and manage most invasions in Florida have  
12 proven to be inadequate despite some individual program successes. The exclusion and  
13 management of invasive nonindigenous species in Florida is a complex, multi-  
14 disciplinary problem that threatens Florida’s agricultural resources and public  
15 conservation lands. A new paradigm must be developed in government that will  
16 encompass the multi-jurisdictional aspects of biological invasions in Florida and reach  
17 out to obtain the cooperation of all stakeholders including private industry, private  
18 landowners, non-governmental organizations, and the public to lessen this threat.

## 19 20 **Statewide Invasive Species Management Plan for Florida**

21 The scope of this plan will encompass all harmful invasive species in Florida with  
22 the exception of those organisms that only cause human disease. The purpose of the plan  
23 is to provide a blueprint for state agency action to prevent the introduction of harmful  
24 invasive species, provide for their control, and minimize their economic, environmental,  
25 and other impacts. Many of the general action items in the plan were recommended by  
26 the reports listed above and can be completed or at least initiated with current available  
27 resources. The plan also recognizes that without significant and sustained resources for  
28 existing and new programs, the plan cannot be fully implemented in Florida. In addition,  
29 resources are needed for developing a multi-jurisdictional information-sharing network  
30 that will provide prevention, management, and public education about biological

1 invasions in Florida to scientists, resource managers, policy-makers, students, and the  
2 public.

### 3 **The Invasive Species Working Group**

4 The Florida Department of Environmental Protection undertook the responsibility  
5 of organizing and facilitating a July 10, 2001 meeting, at the request of the Governor (to  
6 be included with the final print copy in Appendix 1), to determine the most effective way  
7 of developing a comprehensive statewide plan that unifies and coordinates the  
8 responsibilities of government agencies to prevent and manage harmful biological  
9 invasions in Florida. The representatives from the state and federal agencies that  
10 attended the July 10 meeting recognized the need for a working group representing state  
11 agencies with responsibilities for invasive nonindigenous species to carry out the  
12 Governor’s request of developing a statewide invasive species management plan. In  
13 subsequent meetings, the Invasive Species Working Group (ISWG) was formed.

14 The ISWG is comprised of representatives from the following state agencies, state  
15 agency divisions, and university: Florida Department of Environmental Protection;  
16 Florida Department of Agriculture and Consumer Service’s Divisions of Plant Industry,  
17 Animal Industry, Forestry, and Aquaculture; Florida Fish and Wildlife Conservation  
18 Commission; Florida Department of Transportation; Northwest Florida Water  
19 Management District; Southwest Florida Water Management District; South Florida  
20 Water Management District; St. Johns River Water Management District; Suwannee  
21 River Water Management District; and the University of Florida’s Institute of Food and  
22 Agricultural Science.

23  
24

### 25 **Statewide Coordination and Intergovernmental Cooperation**

26 Coordination and cooperation among agencies are essential elements to the  
27 success of any invasive species prevention or management program. Because these  
28 elements are essential, a lack thereof creates many opportunities for the consensus on  
29 which such coordination and cooperation must be based to either break down at almost  
30 any stage in the process, or not even develop in the first place. Generally, coordination  
31 and cooperation fail over “turf” issues, environmental concerns about control activities,

1 differing philosophies about an invading organism, funding issues, or limited information  
2 about the economic, agricultural, or environmental impacts of an invader. Developing a  
3 fair, balanced, and objective statewide invasive species plan in the face of frequently  
4 competing interests will be challenging, but this is the key to successful prevention and  
5 management operations in Florida.

### **General Action Items**

- 6  
7 1. The Invasive Species Working Group (ISWG) will develop a Memorandum of  
8 Understanding (MOU) for presentation to state agencies involved in invasive  
9 species prevention, eradication, research, and control by January 2003. The  
10 purpose of the MOU is (a) to help integrate and coordinate Florida-wide agency  
11 invasive species prevention, eradication, research, and control actions and help  
12 integrate them with national and international invasive species management  
13 efforts; and (b) to develop and outline procedures that will help resolve  
14 jurisdictional and other intrastate agency issues regarding invasive species  
15 programs.
- 16 2. By July 2003, each state agency that is a party to the MOU and a member of the  
17 ISWG will conduct an evaluation of its current statutes and rules relevant to  
18 invasive nonindigenous species. The purpose of this evaluation is to concur on  
19 potential legislation revisions to cover potential gaps or reduce duplication.
- 20 3. Starting in July 2003, the ISWG will review and evaluate the status of invasive  
21 species reporting. ISWG will work to develop a standardized reporting format,  
22 including a summary of fiscal year expenditures and agencies' suggested  
23 legislative budget requests for prevention, eradication, research, and control of  
24 invasive species.
- 25 4. Each member of the ISWG will work with its own agency information technology  
26 staff to provide links among existing invasive species websites and databases by  
27 July 2003. ISWG will review and make recommendations regarding an inter-  
28 agency information support network and database for invasive species by July  
29 2004.
- 30 5. The final draft of the Statewide Invasive Species Management Plan will be sent to  
31 those federal agencies that have jurisdictional authority for preventing, regulating,



1 **General Action Item**

- 2 1. ISWG will evaluate current surveillance programs and make recommendations to  
3 improve prevention and detection efforts by January 2004.

4 **Rapid Response**

5 Rapidly responding to new invasions is crucial because some introduced invasive  
6 species can be eradicated if the invasion is recognized early enough and the eradication  
7 campaign is sufficiently well-designed, comprehensive, and adequately funded.

8 **General Action Item**

- 9 1. Beginning in January 2004, the ISWG will recommend rapid response procedures  
10 appropriate for new discoveries of invasive nonindigenous species. Coordination  
11 with federal and local agencies and non-governmental organizations will be  
12 implemented where appropriate.

13 **Control and Management**

14 When invasive species are permanently established or populations are too  
15 widespread for eradication and containment efforts, the only effective actions lessening  
16 their impacts are through control and management measures. Control and management  
17 efforts may include: population suppression through biological and chemical controls or  
18 other management activities, attempting to limit population dispersal, and maintaining an  
19 invasive species population at its lowest possible population density through aggressive  
20 control activities. Because the majority of biological invasions in Florida span  
21 jurisdictional boundary lines, control activities in Florida are often carried out by  
22 cooperating with federal and local government agencies. Sharing technical information,  
23 coordinating management priorities, and agency capacities across all affected agencies  
24 are crucial in developing cost-effective statewide control and management efforts.

25 **General Action Items**

- 26 1. The ISWG will identify known invasive specie problems in Florida and  
27 recommend management actions to federal, state, and local governments, private  
28 landowners and others by July 2003.

- 1        2. State agencies will identify information, staff, research, and budget needs to  
2        improve invasive species management in Florida by July 2003. The ISWG will  
3        provide review and make recommendations to the agencies.
- 4        3. State agencies will develop or revise invasive species management plans to  
5        achieve cost-effective management efforts of invasive species by January 2004.
- 6        4. The ISWG will review agency invasive species procedures and make  
7        recommendations, where appropriate, to coordinate species management plans  
8        across agencies by July 2004.
- 9        5. The ISWG will evaluate potential incentive programs or assistance for private  
10       landowners and make recommendations to the Florida Legislature to establish  
11       incentive programs or assistance to private landowners for the control of invasive  
12       nonindigenous species on private lands by January 2004.
- 13      6. The ISWG will facilitate the dissemination of existing BMP (best management  
14      practices) for minimizing the human spread of invasive species.

### **Public Education about Biological Invasions**

15        Educating visitors, commercial importers, residents, and agricultural producers  
16        about the impacts of invasive nonindigenous species and the importance of keeping  
17        new invasive species out of Florida is a key component of a successful statewide  
18        invasive species prevention and management program.

### **General Action Items**

- 21      1. The ISWG will provide recommendations to agencies to implement a coordinated  
22      public awareness campaign about the impact of invasive nonindigenous species  
23      on Florida's agriculture and environment and disseminate information on statutes  
24      and rules pertaining to these species by January 2003. Existing interagency  
25      educational councils will be consulted for recommendations and coordination.
- 26      2. State agencies will make current publications available to interested parties by:  
27      (a) using existing resources on the web to provide information to the public on  
28      invasive species issues (see Statewide Coordination and Intergovernmental  
29      Cooperation Section), and (b) creating a web-based list of invasive species  
30      publications currently available from agencies.

31

## Existing State Programs and Findings

### Florida Department of Environmental Protection (FDEP)

#### Bureau of Invasive Plant Management

Florida has approximately 1.5 million acres of publicly accessible freshwater lakes and rivers. These public waterways provide wildlife habitat and more than \$1.5 billion in annual revenues to Florida from freshwater fishing and wildlife observation. In 1971, the Florida Legislature designated the Department of Environmental Protection (FDEP) as the lead agency for coordinating and funding aquatic plant management activities of government agencies and commercial companies on public waterbodies. This centralized approach has proven effective in that it established a statewide aquatic plant management and resource protection plan, ensured statewide priority distribution of available funds, reduced administration, coordinated management operations, avoided duplication, and ensured consistency in policy, goals, and control methods. For example, when there was no statewide aquatic plant management plan, funding was inconsistent and invasive nonindigenous plant populations were out of control as recently as the early 1970s. Since this centralized approach has been implemented, water hyacinth has been reduced statewide from 120,000 acres in the late 1950s and early 1960s to less than 1,000 acres in 2000 (Figure 1).

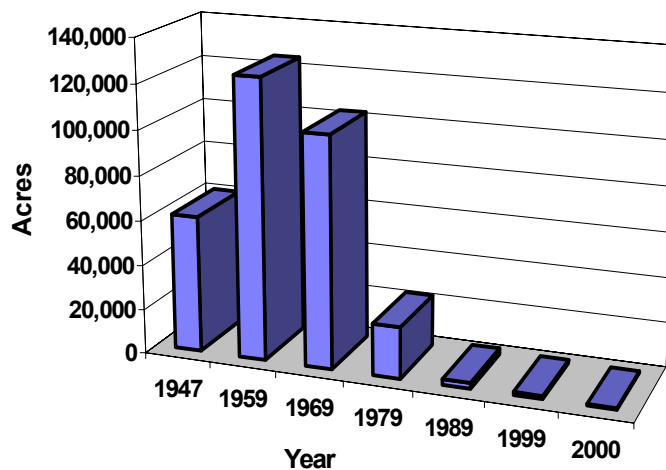


Figure 1. Acres of water hyacinth in Florida's public waterways from 1947 to 2000.

1           Each year, staff from the Department of Environmental Protection survey 459  
2 public waterbodies to determine the extent of invasive nonindigenous aquatic plant  
3 populations in Florida. This information is used to alert managers for rapid control  
4 measures to contain and eradicate new populations, to help develop management  
5 priorities to distribute state funds, and to evaluate aquatic plant management programs for  
6 their overall effectiveness. In 2000, nonindigenous plant infestations were found in 408  
7 (89%) of Florida’s 459 public waterbodies. Eleven highly invasive nonindigenous  
8 species have been identified growing in Florida’s waterways. Many of these  
9 infestations, especially canopy producers like water hyacinth and hydrilla, interfere with  
10 recreational use, cause severe oxygen depletion, stunt fish populations, cause fish kills,  
11 restrict water flow, increase flooding, restrict navigation, accelerate sedimentation, and  
12 reduce biodiversity in lakes and rivers.

13           Since 1974, Florida’s overall aquatic plant management objectives have revolved  
14 around implementing the concept of “maintenance control,” which was pioneered by the  
15 U.S. Army Corps of Engineers upon the completion of a massive water hyacinth control  
16 project in Florida during 1973. Maintenance control is defined as “a method for the  
17 control of nonindigenous plants in which control techniques are utilized in a coordinated  
18 manner on a continuous basis in order to maintain the plant population at the lowest  
19 feasible level.” Previous to 1974, species like water hyacinth were allowed to reach  
20 problem levels before control measures were implemented. That strategy resulted in the  
21 death of large amounts of vegetation, which led to detrital loading. The only way to  
22 prevent such environmental disturbances and lower the amount of herbicides used  
23 associated with control operations was to prevent the targeted plant population from  
24 reaching a large size. For example, water hyacinth covered 2,300 acres of the Suwannee  
25 River in the early 1970s. Thousands of tons of sediments were produced by the natural  
26 shedding of root and shoot material and from controlled plants. Hundreds of acres  
27 required control using thousands of pounds of herbicide. Crisis management was  
28 replaced by maintenance control efforts in the late 1970s. Since achieving maintenance  
29 control in 1985, the amount of control necessary has been substantially reduced thus  
30 lowering environmental and economic impacts. Native plants have returned to the  
31 shores and marshes of the Suwannee River, restoring fish and wildlife habitat (Figure 2).

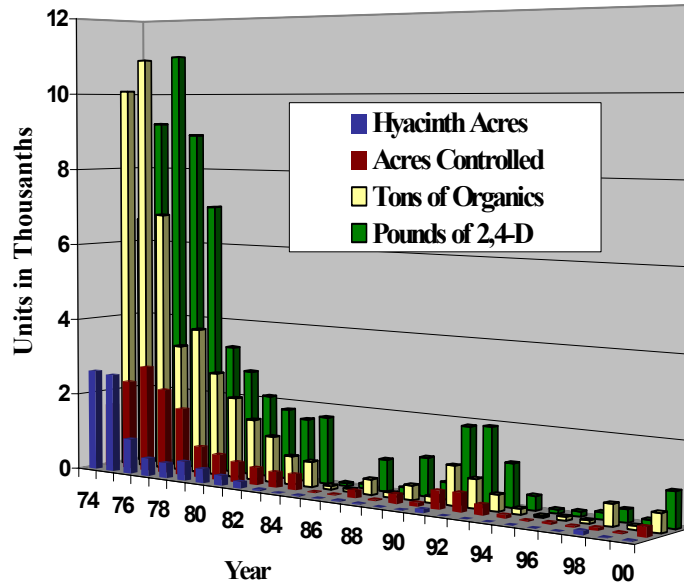


Figure 2. Suwannee River water hyacinth population size, acres controlled, tons of organic material deposited within the river, and pounds of herbicides applied from 1974 to 2000.

Aquatic plant management in Florida is a multidisciplinary effort in that chemistry, hydrology, biology, meteorology, and the multi-jurisdictional aspects all need to be considered before treatment operations begin. Individual aquatic plant management programs for all of Florida’s public waterbodies are developed and/or revised each year. State biologists and government contractors prepare requests that are reviewed by local, state, and federal agency personnel that have jurisdictional authorities over affected waterbodies. These reviewers then meet annually to establish individual operational management plans and budgets. Past history has taught us that in order to successfully remove unwanted vegetation, managers must apply the appropriate control methods with the goal of preserving, restoring, or enhancing natural processes, and they must be flexible in assessing and revising management needs.

In 1996, the state formed a Task Force on Invasive Upland Plants that was comprised of federal, state, and local land management officials, along with private interest groups. A report was generated recommending four primary goals: raise awareness about the harm invasive nonindigenous plant species cause on public lands, develop and fund a program to remove these species, make the management of these species part of overall land management efforts in Florida, and develop strong partnerships among all agencies, universities, and private landowners for a coordinated

1 approach for the management of these species. Legislation was passed in 1997 that  
2 authorized the state to expand its aquatic plant management program to include upland  
3 invasive nonindigenous plant species and bring these populations under maintenance  
4 control.

5         Perhaps the greatest difference between the statewide aquatic plant management  
6 program and the newer upland plant management program is the number of official  
7 jurisdictions involved within each program. In Florida, there are few on-site managers  
8 assigned to a specific waterbody because they are mostly interconnected waterways that  
9 are largely sovereign or owned by the state. Only a few state, federal, and local agencies  
10 have programs with jurisdictional responsibilities for managing invasive aquatic plants.  
11 Florida’s aquatic plant control program funds the removal of invasive plants with six  
12 state agencies, four federal agencies, eleven counties, and one city. In contrast, there are  
13 diverse, distinct government agency land management responsibilities for public  
14 conservation lands and most have on-site managers to carry out these tasks. In addition,  
15 Florida’s public conservation lands are increasing in their size and diversity because of an  
16 aggressive land buying effort during the past ten years to save critical wildlife habitat  
17 from development.

18         Another contrasting factor is the number of plant species that are managed within  
19 each program. In the aquatic environment, there are 11 invasive aquatic plant species  
20 where state funds are spent to remove them. In the upland environment, state funds  
21 target more than 125 invasive plant species making it more difficult and time consuming  
22 to achieve management success. Many control methods are species-specific, and  
23 improper species identification or a lack of a suitable control method can lead to failure.

24         Because of these differences, the upland plant management program had to  
25 establish a mechanism to encompass this diversity of land ownership into a coherent  
26 strategy to map invasive plant population densities, prioritize funding needs, develop  
27 long-term management goals, and educate the public about why these species should be  
28 removed. To identify the extent of the problem and to form partnerships at the local  
29 level, eleven Regional Invasive Plant Working Groups were established covering the  
30 entire state (Figure 3). Each working group has representatives from federal, state,

1 county, city, and non-governmental organizations, and private landowners. These  
2 working groups have the responsibility to map the distribution of invasive upland  
3 **Figure 3. Map showing the locations of FDEP’s eleven Regional Invasive Plant Working Groups.**

4



5

6 nonindigenous plant species within their regions, set regional control priorities, develop  
7 long-term management plans, and develop comprehensive public education programs  
8 about the harm species cause to public conservation lands.

9 The state relies on these working groups to appropriately direct funding toward  
10 their region’s highest priorities. Because Florida’s invasive plant populations vary in  
11 their distribution throughout Florida, with the southern portion of the state containing the  
12 largest population densities, each working group has flexibility to develop their own  
13 project ranking criteria for their region. Program liaisons have been designated for each  
14 working group to facilitate project proposal review and coordination with state program  
15 staff. Establishment of these regional working groups provides a foundation for  
16 maintaining partnerships to integrate, coordinate, and fund efforts to remove invasive  
17 nonindigenous plant species from public lands, and on a voluntary basis, on private lands  
18 that may impact public lands. In order for invasive nonindigenous species removal  
19 projects to be eligible for state funds, there are several minimum requirements. Federal,  
20 state, and local government lands receiving state funds for invasive plant removal must  
21 be designated as public conservation land. In an effort to target the greatest number of  
22 the largest invasive plant populations for initial removal, the program requires that land  
23 management agencies continue maintenance control in perpetuity after the bulk of the

1 plants are initially controlled from a project site. This insures that available state funding  
2 will not be tied to maintenance control costs on a limited number of public conservation  
3 lands. In addition, projects will be looked on more favorably for funding if cooperative  
4 cost share or matching funds are available; control technologies have been established for  
5 the targeted invasive plant species; the project will benefit specific threatened or  
6 endangered species; and the site has a high restoration potential. In 2000, the species  
7 with the most acres controlled were the Australian melaleuca tree and Brazilian pepper  
8 shrub under the FDEP upland plant management program (Table 2).

9 **Table 2. Invasive plant acres controlled<sup>1</sup> for the top ten most invasive upland plant species found in**  
10 **Florida’s conservation lands in 2000 along with their percent of total acres controlled for all upland**  
11 **plant species.**

<b>Plant</b>	<b>Acres Controlled</b>	<b>% Total Acres</b>
<b>Melaleuca<sup>2</sup></b>	<b>5827.68</b>	<b>34.28%</b>
<b>Brazilian pepper</b>	<b>3807.77</b>	<b>22.40%</b>
<b>Lygodium spp</b>	<b>2167.73</b>	<b>12.75%</b>
<b>Australian pine</b>	<b>1730.46</b>	<b>10.18%</b>
<b>Chinese tallow</b>	<b>1260.45</b>	<b>7.41%</b>
<b>Ardesia</b>	<b>824.59</b>	<b>4.85%</b>
<b>Wisteria</b>	<b>514.96</b>	<b>3.03%</b>
<b>Chinaberry</b>	<b>488.04</b>	<b>2.87%</b>
<b>Cogon grass</b>	<b>399.94</b>	<b>2.35%</b>
<b>Air potato</b>	<b>338.67</b>	<b>1.99%</b>

13 <sup>1</sup>by estimated acres controlled and % of total project acres for all species

14 <sup>2</sup>does not include melaleuca acres controlled by SFWMD

15  
16  
17 Because over 410,000 of approximately 2 million acres of National Park Service  
18 lands in Florida are infested with invasive nonindigenous plant species, and act as seed  
19 sources for state public conservation lands, the state upland plant removal program began  
20 offering funding assistance to federal land managers. In 2000, the State of Florida  
21 developed a partnership with U.S. National Park Service in providing \$292,000 in  
22 matching funds for 12 invasive plant control projects. These matching funds provided  
23 cost-effective invasive plant control and benefited the park’s services efforts to protect  
24 and reestablish native plant communities on federal lands. This state-federal matching  
25 fund program is expected to continue for the next several years.

26 FDEP’s prevention efforts revolve around permitting aquatic plant retail outlets

1 and banning 26 nonindigenous plant species for most retail use and possession without a  
2 FDEP issued permit. However, present regulations for deterring the possession of  
3 prohibited plant species are lax and cumbersome to use. There are two prohibited state  
4 plant lists (FDEP’s prohibited aquatic plant species and the Florida Department of  
5 Agriculture and Consumer Service’s (FDACS) noxious weed list) with different criteria  
6 and listing processes. These two separate weed lists have failed to provide for quick and  
7 effective listings of harmful species.

## 8 **Findings**

- 9 • Civil instead of criminal penalties for violation of FDEP’s rules governing the  
10 possession of prohibited aquatic plant species need to be implemented. These  
11 changes were initiated in the 2001 legislative session but a penalty schedule is  
12 still needed. FDEP should be able to levy a substantial fine for possession of  
13 prohibited plants. Additional changes to existing statutes and rules are needed to  
14 make it easier to confiscate prohibited plants held in violation of the rules and that  
15 authority needs to be delegated to the field staff level. These changes need to be  
16 implemented by July 2003.
- 17 • Legislation is needed to make it easier to place invasive plants that invade non-  
18 agricultural areas on a statewide prohibited plant list. Presently, FDEP must  
19 obtain FDACS and Florida Fish and Wildlife Conservation Commission (FWC)  
20 approval for placing a plant species on FDEP’s list. Presently, the authority of  
21 regulating invasive plants is divided between FDACS and FDEP with no clear  
22 enforcement authority assigned to either agency.
- 23 • A cooperative agreement is needed between FDACS and FDEP to allow each  
24 agency to enforce each other’s rules and statutes when it relates to prevention of  
25 harmful invasive plant species. FWC could also be added to this agreement.
- 26 • A prohibited plant species-working group should be established using staff from  
27 involved agencies that would meet to discuss new introductions or threats, and  
28 develop action plans for new infestations. Bureau staff is insufficient to  
29 adequately conduct inspections and research new potential invasive plant species.  
30 A designated research center and appropriate budget contributed to/shared by

- 1 appropriate agencies to evaluate nonindigenous plant species potential  
2 invasiveness in Florida is needed.
- 3 • FDEP needs to develop better reporting, tracking, and rapid response of new plant  
4 invasions. All FDEP contracts with aquatic and upland plant removal contractors  
5 should be modified to allow for a rapid eradication program to be implemented  
6 and contractor services to be quickly utilized.

7

### 8 **Florida Department of Agriculture and Consumer Service (FDACS)**

9

#### **Division of Plant Industry**

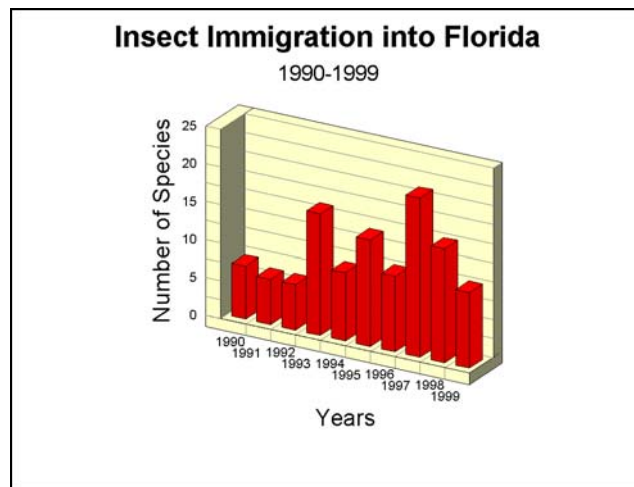
10

The Division of Plant Industry has the state responsibility for detecting,  
11 intercepting, identifying, and controlling organisms, which directly or indirectly threaten  
12 Florida’s agricultural, horticultural, and native plant resources. There are specific statutes  
13 and rules that provide for the regulation of plant pests, arthropods, noxious weeds,  
14 genetically engineered plants or plant pest organisms, and biological control agents.

15

Historically, agriculture has been viewed as the primary beneficiary of the plant  
16 regulatory system. However, the economic benefits of protecting plant resources accrue  
17 broadly. Nationally, according to a General Accounting Office 1997 report, introduced  
18 invasive plant pests result in an estimated \$41 billion annually in production and in  
19 prevention and control expenses. On average, the State of Florida experiences the  
20 establishment of 12 new plant pest species each year. A ten-year high of 39 plant pests

21



22

23

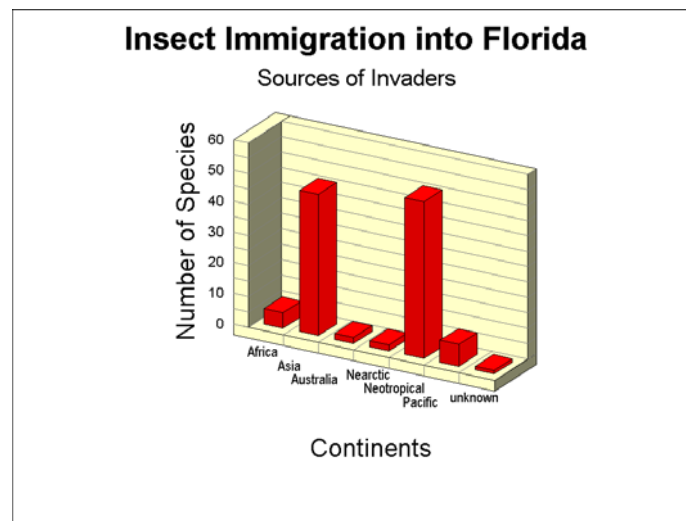
**Figure 4. Graph showing insect species immigration into Florida from 1990 to 1999.**

1

2 was established in FY 1996-97 (Figure 4).

3 A recent FDACS report, “The Exotic Invasion of Florida (2000),” states that  
4 nearly every month a new nonindigenous arthropod is detected in the state. Some turn  
5 out to be serious agricultural pests, such as Mediterranean and Oriental fruit flies, brown  
6 citrus aphid, citrus leaf miner, Asian citrus psyllid, and small hive beetle. Others, such as  
7 the bromeliad weevil and the cactus moth, attack native plants in natural areas. Many  
8 become established and their environmental impacts are unknown. In some cases, these  
9 pests or potential pests are effectively eradicated. Yet in many cases it is not biologically  
10 or economically feasible to eradicate them.

11 During the 1970s and 1980s, most of the nonindigenous insects introduced into  
12 Florida were from the Neotropical region—the tropical and subtropical areas in Central  
13 and South America and the Caribbean. But in the last 10 years the number of insects  
14 from Asia has increased until they now almost equal the number from the Neotropics.  
15 Trade with Asia, particularly with China, has substantially increased (Figure 5).



16

17 **Figure 5. Sources of insect immigration into Florida.**

18

19 Many manufactured goods are being produced in China and imported into the  
20 U.S. This has created yet another pathway for pest introduction. Wooden crates used for  
21 packing serve as sources of nonindigenous weevil and beetle introduction. Holiday crafts  
22 made with rice straw and other natural products have been found infested with pests.

1 These “non-traditional” sources of plant and animal pest introduction have placed an  
2 additional burden on Florida’s safeguarding system.

3 Commercial smuggling, ever changing trade routes, and manufactured or  
4 processed products are just a few examples of the changing pathways for pest  
5 introduction into Florida. Likely there are more as-yet-undiscovered pathways that need  
6 to be addressed, particularly in regards to the interdiction of commercial smuggling.

7 The U.S. Department of Agriculture’s Animal and Plant Health Inspection  
8 Service (USDA-APHIS) and the Florida Department of Agriculture and Consumer  
9 Services (FDACS) are the primary federal and state agencies charged with protecting  
10 Florida’s animal and plant resources. Federal laws contain a number of separate acts that  
11 govern importation of plants, animals, and plant and animal products from other countries  
12 and interstate movement in accordance with federal plant or animal quarantine  
13 restrictions. The movement of these products into Florida from other states and their  
14 intrastate movement is governed by specific chapters in Florida Statutes and rules.

15 In addition to federal and state laws, various United Nations treaties govern  
16 international trade of agricultural products. One example is the International Plant  
17 Protection Convention (IPPC) that seeks to standardize entry requirements for plants and  
18 plant products using biological justification as a basis. The IPPC has developed  
19 guidelines for conducting scientifically based pest risk analysis, and USDA uses these  
20 analyses when making decisions regarding the importation of plant or plant products.  
21 Entry requirements vary depending on the commodity and the country of origin. In most  
22 cases, phytosanitary or animal health certificates are required. The U.S. entry process  
23 permits the entry of plants and plant products without phytosanitary certification  
24 preclearance programs in 29 countries for several types of fruit and flowering bulbs  
25 whereby the products are inspected by the USDA prior to being exported to the U.S.  
26 USDA does not have an established preclearance program for animals, but will travel to a  
27 country to inspect animals prior to shipment on a case-by-case basis. USDA monitors  
28 compliance with import requirements at U.S. ports of entry by verifying that the correct  
29 documents have accompanied the shipment and inspecting the shipment for pests or  
30 diseases. The USDA notifies FDACS of incoming shipments by mailing copies of the

1 notice of imports. This enables FDACS to conduct a secondary, in-depth inspection at  
2 the destination provided the shipment has not been dispersed to other locations.

3 Likewise, FDACS permits the entry of plants and animals from other states  
4 provided a certificate of inspection accompanies them. Plant products, such as fruits and  
5 vegetables, may need a certificate of inspection depending on the state of origin and the  
6 pest concerns. In the case of plants and plant products, a certificate of inspection does  
7 not necessarily mean the individual shipment was inspected; it may only mean the  
8 nursery or farm is under a routine inspection program for pests and diseases.

9 Anyone shipping agricultural products into Florida by truck is required to stop at  
10 the FDACS Agricultural Inspection Stations located on all roads crossing the Suwannee  
11 and St. Mary's Rivers. These stations verify certification status, reject non-enterable  
12 shipments, and notify the respective divisions of the shipment in case follow-up  
13 inspections are needed. In cases where there is a pest-concern, the truck may be returned  
14 to its origin or required to enter under seal, which can only be removed at its destination  
15 by an authorized FDACS representative.

## 16 **Findings**

- 17 • A critical need exists for a comprehensive invasive plant pest detection system in  
18 the United States. An effective state and federal partnership is needed to establish  
19 pest detection priorities and clearly define action plans for coordination of pest  
20 detection activities at the state, regional, and national levels.
- 21 • Base funding is not adequate to respond to the increasing number of pest  
22 introductions occurring throughout the state.
- 23 • There is presently no standardized formula in place to identify the funding  
24 responsibilities or partnerships between agencies with respect to invasive species  
25 activities and their resulting financial obligations.
- 26 • Presently, there is no mechanism in place for identifying and determining the roll  
27 of stakeholders or primary beneficiaries.
- 28 • Presently, the authority of regulating invasive plants is divided between FDACS  
29 and FDEP with no clear enforcement authority assigned to either agency.

- 1 • A coordinated plan should be developed and implemented to integrate Florida’s
- 2 efforts with the various databases on invasive species not known to occur in the
- 3 U.S. with those of other organizations, both nationally and internationally.
- 4 • A proactive public out-reach plan should be developed and coordinated between
- 5 all agencies involved with biological invasions in Florida.

6

7

### **Division of Aquaculture**

8

The culture of aquatic species in Florida has a long history, dating from the 1880s,  
9 that has included the culture and sale of nonnative species. The Florida Legislature  
10 created the Division of Aquaculture (AQUA) in 1999 as a one-stop shop for all  
11 environmental regulations related to aquaculture.

12

To obtain permission to culture non-native species, aquaculturists in Florida must  
13 design and operate their holding, transport, and culture systems in a manner to prevent  
14 escape of all life stages: egg, seed, fry, larvae, seedling or adult. Written authorization  
15 is required by the Florida Fish and Wildlife Conservation Commission (FWC) to import  
16 non-native vertebrate and invertebrate aquatic species. Restricted nonindigenous species  
17 are listed under a FWC rule and the Division of Aquaculture enforces the provisions of  
18 this rule. Prohibited vertebrate and invertebrate aquatic species, as identified by FWC  
19 rule, are not eligible for culture and may not be possessed by aquaculturists in Florida.

20

### **Findings**

21

- A mechanism needs to be established for rapid communication between the  
22 Division of Aquaculture, FDEP, and FWC when invasive species are found on a  
23 farm.
- The Division needs to prepare an integrated agency rapid response plan and Best  
24 Management Practices to address invasive species found on farms.
- Memorandums of Understanding need to be signed between the FDACS and  
25 FDEP and FWC delineating lines of jurisdiction for purposes of inspection for  
26 invasive species.
- Funding needs to be obtained for surveying Florida for invasive species.
- The Division strongly supports the reasonable and common sense approach to  
27 regulating nonnative species in a farm environment that focuses on public  
28  
29  
30  
31

1 education, prevention (science-based screening systems and risk assessments) and  
2 incentives for private landowners to remove or control invasive species.

3  
4 **Division of Forestry**

5 The Florida Department of Agriculture and Consumer Services, Division of  
6 Forestry (DOF) has responsibility for three main program areas in the state of Florida:  
7 management of the state forest system, protection of resources from wildfire, and  
8 landowner assistance through the Cooperative Forestry Assistance program. All  
9 programs are cross-funded. Examples of this include wildfire response crews perform  
10 prescribed burning on State Forests or other public land. When it comes to catastrophic  
11 incidences, all resources work together to accomplish results. The DOF manages over  
12 900,000 acres of State Forest public land. It is the lead management agency for 31 state  
13 forests ranging in size from the 183,670-acre Blackwater River State Forest to tracts of  
14 less than 50 acres. More than 184,000 acres are managed under special agreement with  
15 other state agencies, several counties, and water management districts.

16 The DOF practices multiple-use land management on lands in the state forest  
17 system, as defined in Section 253.034(2)(a), Florida Statutes. The mission of the  
18 Division is “to protect and manage Florida’s forest resources through a stewardship ethic  
19 to assure these resources will be available for future generations.” One of the Division’s  
20 strategies to fulfill this mission is “to manage public lands to retain their unique  
21 character, and to provide multiple public benefits.” Ecosystem management is the overall  
22 framework within which multiple use management occurs. Ecosystem management is an  
23 ecological approach to management that focuses on protecting native biodiversity, as well  
24 as ecosystem processes such as fire, hydrology, and species interactions. Public benefits  
25 include recreation, environmental education, protection of rare or sensitive natural  
26 resources (including endangered plants and animals as well as rare plant communities),  
27 watershed protection, and generation of revenue for both state and local governments  
28 through forestry and recreation. All of these aspects of state forest management are  
29 improved or enhanced by the control or management of nonindigenous, invasive species.  
30 Management of nonindigenous, invasive species is included in all state forest five-year  
31 management plans, and considered in review of all proposed management activities.

1           The practice of the DOF is to locate, identify, and control invasive, nonindigenous  
2 plants and animals on State Forests. A majority of nonindigenous species issues in State  
3 Forests are invasive plant species. When nonindigenous plants on the Florida Exotic  
4 Pest Plant Council’s (FLEPPC) list of most invasive plant species are discovered, a  
5 monitoring and control plan is developed and implemented based upon the severity of the  
6 infestation, its location, native species impacted, and availability of staff and funding.  
7 Across all state forests, approximately 46,000 acres are infested with FLEPPC Category I  
8 and II plant species. This includes approximately 43,000 acres infested in Picayune  
9 Strand State Forest.

10           Primary plant species of concern include: cogon grass, skunk vine, air potato,  
11 Japanese climbing fern, Old World climbing fern, melaleuca, Brazilian pepper, Chinese  
12 tallow, mimosa, and privet species; however, all FLEPPC Category I and II species are  
13 considered targets for control. Several of the state forests have nonindigenous feral hog  
14 populations established either on state forest property, or on adjacent lands, with  
15 encroachment into the forest. The Division works with the FWC to expand the hunting  
16 season in feral hogs on several of the state forests in an effort to reduce population sizes  
17 and reduce the natural resource damage done by these animals.

18           The Division’s general strategy for addressing these complex and resource-  
19 demanding land management activities is to seek opportunities for utilization of  
20 contractual services. With regards to management of nonindigenous, invasive species,  
21 contractual services provide resources for accomplishment of large-scale, labor-intensive  
22 projects. From 1995 to 2001, the Division spent more than \$500,000.00 of in-house  
23 funds on invasive plant control efforts in both contracts and in-house work. Additionally,  
24 greater than \$350,000.00 of state and federal grant funding was spent on invasive plant  
25 control work, primarily in the form of contractual services. However, oversight of  
26 contracts, survey of properties for identification of treatment needs, follow-up treatments  
27 on sites, and treatment of areas too small to reasonably contract, or for which contractual  
28 funds are not available, necessitate a minimum staffing level which varies from forest to  
29 forest dependant upon site-specific issues. In 2001, four state forests spent greater than  
30 5% of a full time employee’s time on invasive plant management. While current staffing  
31 levels meet the invasive plant management needs of some forests, certain key others have

1 needs which exceed current levels. The Division has recognized the need for assistance  
2 with internal invasive plant management program development. In 2000, the Division re-  
3 classified a position in the Forest Health Section within the Forest Management Bureau  
4 to assist state forest managers with developing and implementing invasive plant  
5 management programs in the state forests.

6 Increasingly, as lands are acquired through the various public land acquisition  
7 programs in the state, they enter into public management with established nonindigenous  
8 invasive species populations. Management of these populations on newly acquired lands  
9 is dependent upon survey and identification of the populations, successful application for  
10 grant funding, or adequate internal budget and staff, and available current control  
11 technologies for specific species.

12 The presence of invasive non-indigenous species on state forest lands makes  
13 management more difficult by diverting staff and other resources to control efforts,  
14 disrupting ecosystems functions, and by displacing native species. For example,  
15 nonindigenous plants can drastically change fire ecology where they invade.

16 Some factors interfere with present nonindigenous species management efforts.  
17 This includes a lack of staff to manage those aspects associated with nonindigenous  
18 species, and a lack of public education about the harm these invasions cause. As a result,  
19 adjacent non-control of invasive plant populations can act as seed sources for new  
20 invasions to state forests. When surveyed in 2001, State Forest managers identified other  
21 natural resource responsibilities as the single greatest impediment to accomplishing  
22 invasive plant management goals and priorities. As is true in all state land management  
23 agencies, personnel are being required to “do more with less.” The diversity of  
24 responsibilities given to the limited staff of many state forests, especially when coupled  
25 with the Division’s responsibilities for wildfire protection and emergency response in the  
26 state, often leave invasive species management with a lower priority. Some aspects of  
27 this can not be completely remedied with contractual services, and require a specifically  
28 dedicated approach to staffing and/or funding levels for key state forests.

29 The Division maintains an established relationship with Florida’s forest industry  
30 and private, non-industrial forest landowners, primarily through the Cooperative Forestry  
31 Assistance (CFA) program. Through a network of county foresters, this program

1 provides technical assistance in forest management through development of Forest  
2 Management plans, which includes in some cases Forest Stewardship plans.  
3 Additionally, the CFA program assists landowners with application for federal cost share  
4 programs. Each of the federal grant programs has some provision for funding of invasive  
5 plant management/control measures in specific situations. This relationship with private  
6 forest landowners provides an avenue for the dissemination of information on  
7 management, control, and prevention of nonindigenous, invasive pest problems.

8 The Division has provided or currently is providing technical expertise and field  
9 support that addresses prevention and survey of nonindigenous forest/tree pests and  
10 diseases including: Asian longhorned beetle, exotic ambrosia beetles, dogwood  
11 anthracnose, oak wilt, and many others. Additionally, the experience and training of  
12 Division personnel in emergency response through the Incident Command System, the  
13 Division assists, at the direction of the FDACS, with rapid response control and  
14 eradication programs for nonindigenous agricultural pest species such as Mediterranean  
15 fruit fly and Asiatic citrus canker.

16 The Division has a key role in Florida’s future regarding nonindigenous species  
17 management. As managers of state forests and other state lands, and with established  
18 relationships with industrial and non-industrial private forest landowners and managers,  
19 the Division is situated to provide important outreach, support, and information about the  
20 management of nonindigenous plant species.

## 21 **Findings**

- 22 • Complete comprehensive surveys of State Forests to accurately identify  
23 nonindigenous invasive plant and animal problems.
- 24 • Complete assessment of current invasive species situation and threats,  
25 including possibly review of adjacent landowners, considering regional  
26 nonindigenous species issues, and subsequent development of written  
27 invasive species plans for each forest or as a component of the five year  
28 resource management plan.
- 29 • Ensure communication with state and federal research entities regarding  
30 assessment of introduced or proposed nonindigenous “fast-growing” fiber  
31 and landscape species with regards to potential invasiveness. When

1 appropriate, ensure that Division planting recommendations do not include  
2 species with high likelihood of invasiveness.

- 3 • Review silvicultural activities with regards to potential for vectoring  
4 invasive species in state forests (eg. timber harvest, site preparation, tree  
5 planting, etc.)
- 6 • Ensure that training and interagency cooperation needs are identified and  
7 fulfilled.

8  
9

### **Division of Animal Industry**

10 The Mission of the Florida Department of Agriculture and Consumer Service’s  
11 Division of Animal Industry is to prevent, control, and eradicate certain infectious or  
12 communicable diseases of livestock and other domestic animals. The Division receives  
13 its primary direction from Chapter 585, Florida Statutes, to focus on goals and objectives  
14 to protect the animals and citizens of Florida from exposure to disease, thus providing  
15 value for Florida’s quality of life. The Division’s activities directly affect the general  
16 economic infrastructure of the State of Florida.

17 In protecting Florida’s animal populations from these dangerous diseases, the  
18 Division also protects the human population against diseases that cross species lines.  
19 Continually challenged by new and emerging issues/diseases that require the continuance  
20 of current activities and the development of new activities or methods involving the  
21 testing, vaccination, surveillance and monitoring of animals, the Division moves forward  
22 to prevent, control and eradicate animal diseases through:

- 23 • Detecting diseases by inspection of livestock on farms/ranches, through  
24 programs and sentinel sites.
- 25 • Testing livestock using animal-related diagnostic laboratory procedures.
- 26 • Promoting and mandating healthy, sanitary, and humane care and  
27 confinement of livestock; vaccination of livestock, and identification of the  
28 origin and health status of imported animals.
- 29 • Regulating, administering and enforcing laws alongside identifying the  
30 origin and health status of imported animals via permits and health  
31 certificates.

- 1           •       Teaching producers, private practitioners, and the public about regulatory  
2                   requirements, successes, and consequences of failure to prevent, control  
3                   and eradicate animal diseases through news releases, brochures, and the  
4                   internet.
- 5           •       Developing and practicing emergency response plans in the event of  
6                   foreign animal diseases and other natural or man-made disasters affecting  
7                   animals and animal food production.

8           The Division has been successful in the control and eradication of many animal  
9           diseases, including food-borne zoonotic diseases in livestock. Division successes through  
10          the years include eradication of many diseases such as bovine tuberculosis, hog cholera,  
11          equine piroplasmiasis, various poultry diseases; and pests such as screwworm and the  
12          cattle fever tick.

13          Continuation and enhancement of activities to reach the objective, despite the  
14          Division's slowing successes created by the continual decline in Federal support and  
15          funding, and the drain on dwindling Division resources from State personnel and budget  
16          reductions, are increasingly critical. The goals of providing a safe, affordable, quality  
17          assured, and abundant food supply, a healthy animal population in general, and protecting  
18          the public can only be met by addressing head-on the threats of infrastructural decline,  
19          emerging diseases, and bioterrorism.

20          The Division of Animal Industry, designated as the lead agency for Emergency  
21          Support Function (ESF) 17, Animal Issues, in the State's Comprehensive Emergency  
22          Management Plan (CEMP), is responsible for coordinating the response of state agencies  
23          in assisting local and volunteer organizations to provide for animals affected by a disaster  
24          and to work with counties to secure the availability of animal shelters, along with food,  
25          water and medical supplies for animals displaced during natural disasters or other  
26          emergency situations. The Division utilizes the emergency management system for  
27          responding to a foreign animal disease outbreak in cooperation with USDA and is  
28          incorporating in its plan the inclusion of bioterrorism response issues.

29          Through news releases, brochures, and the Internet  
30          (<http://doacs.state.fl.us/ai/aiindex.htm>), the Division continues to put an emphasis on  
31          public information, awareness, and education. The Division realizes a well educated and

1 informed public is a healthy and safe public, and one better able to address the hardships  
2 that would be caused by many of the potential diseases to Florida.

3         The Bureau of Animal Disease Control is responsible for administering this  
4 state’s animal disease control and eradication programs. The Bureau, in cooperation with  
5 USDA, has moved beyond traditional perceptions of animal disease control and  
6 eradication programs by addressing public health issues and major economic impacts  
7 with the development of new programs. The recent outbreaks of Foot-and-Mouth  
8 Disease (FMD) outside the United States, and West Nile Virus (WNV) in the United  
9 States, only emphasize the necessity of having a strong active animal disease-monitoring  
10 program in place with an open line of communication with public officials. No longer  
11 perceiving disease control and eradication programs as bureaucratic obstacles, the public  
12 is demanding that more be done to protect the nation’s animal-origin food supply. These  
13 needs, as perceived by the producer, the consumer, and associated animal industries, will  
14 influence the overall acceptability and effectiveness of future disease control and  
15 eradication programs. Many of the Bureau’s current program activities take these factors  
16 into consideration.

17         The Bureau’s program activities also take into consideration the changing face of  
18 animal industries in Florida and throughout the United States. Numerous species  
19 previously considered exotic or wildlife have straddled or altogether crossed the line  
20 between wildlife and agriculture. Government and industry both are faced with daunting  
21 learning curves in veterinary medicine and disease risk analysis for unfamiliar species,  
22 with few or no precedents. The Division recognizes the need to include these emerging  
23 animal industries with traditional livestock industries so they can coordinate and respond  
24 to a greater range of issues.

25         The monitoring of the movement of livestock into Florida through the  
26 requirement of a veterinarian-issued Official Certificate of Veterinary Inspection, OCVI,  
27 (health certificate) is the Division's first line of defense against the transmission of animal  
28 diseases. All livestock transported into Florida are subject to certificate verification by  
29 Agricultural Law Enforcement officers.

30         The Division, through its Emerging Animal Disease Assessment Unit (EADAU),  
31 continues to work with the Florida animal industries, and state, federal and local

1 government entities initiating and assisting with cooperative programs such as foot-and-  
2 mouth disease (FMD) intervention, West Nile virus (WNV) epidemiology, and feral/wild  
3 (F/W) swine seroprevalence investigations and studies. Using infrared thermography, the  
4 EADAU studied the efficacy and speed of aerial infrared for locating F/W swine in their  
5 natural environment during disease outbreaks of major importance such as foreign animal  
6 diseases. Citing repeated incidents of brucellosis-infection of dairy cattle that co-mingle  
7 with infected F/W swine, the EADAU began a study involving the oral brucellosis  
8 vaccination of the F/W swine. This vaccination process was designed to prevent or  
9 reduce the incidence of brucellosis in the cattle and swine. Working with the USDA and  
10 researchers at Louisiana State University, Virginia Polytechnic Institute, and the  
11 University of Florida, the EADAU has assisted in the development of new, multiple  
12 disease, oral vaccines for use in combating specific diseases in wildlife and especially  
13 F/W swine. With existing available funds and working extensively with industry and the  
14 USDA, the EADAU is critically involved in the achievement of a practical Florida Swine  
15 Brucellosis and Pseudorabies Program.

16 The EADAU also works with owners of captive cervid herds on disease  
17 management programs. With the USDA's transition over the next few years to  
18 incorporate captive cervid herds into each state's disease status for bovine brucellosis and  
19 tuberculosis, management solutions must be found for disease testing and eradication in  
20 cervid herds. This is underscored by Michigan's ongoing battle against bovine  
21 tuberculosis which maintained itself silently for years in the deer population before  
22 spreading to domestic cattle and other animal populations.

23 Providing critical services at reasonable fees to our state's widely diverse animal  
24 industry, the Bureau of Diagnostic Laboratories (BDL), certified by the American  
25 Association of Veterinary Laboratory Diagnosticians (AAVLD) as an all species,  
26 full-service laboratory system, is composed of veterinarians and technicians with highly  
27 specialized training in various diagnostic disciplines both diligent and vigilant in their  
28 system of animal disease diagnosis. They are a first defense against potential hazards to  
29 the rest of the nation, providing state-of-the-art diagnostic laboratory services to the  
30 various animal industries and populations of the State of Florida. With a professional  
31 staff of veterinarians and technicians with specialized training in the various disciplines

1 of diagnostic veterinary medicine (toxicology, pathology, bacteriology, virology), the  
2 BDL provides the knowledge and experience necessary to perform highly technical  
3 analyses, studies, monitoring and surveillance of animal diseases, and testing for other  
4 diseases of public health significance, such as Lyme's disease and Rocky Mountain  
5 Spotted Fever.

## 6 **Findings**

- 7 • There is a lack of sufficient resources both in dollars and personnel to  
8 provide adequate protection to the agricultural industry and the citizens of  
9 Florida from dangerous invasive organisms.
- 10 • Currently, the Division is unable to perform necessary high level  
11 biosecurity diagnostics due to the lack of a biosecurity level 3 building in  
12 the Kissimmee Diagnostic Laboratory. The Kissimmee Laboratory is  
13 approximately one-third the size (in square feet) of comparable state  
14 laboratories (built in other states) in the last 10 years.
- 15 • Funding is needed to purchase, develop and maintain a web-based  
16 information input-retrieval structure. This would provide for advanced  
17 surveillance and monitoring data integration to allow tracking and  
18 mapping to predict and analyze animal disease/bio-terrorism events from  
19 data collected by various entities and agencies in a system compatible  
20 across-the-board with USDA, FDACS, FBI, etc.
- 21 • Funding is needed to purchase mobile above-ground air curtain  
22 incinerators. These incinerators would be dispatched within 24 hours to  
23 begin the proper disposal of diseased, exposed, or other carcasses of  
24 public health concern. This quick response capability would greatly  
25 reduce the potential spread of dangerous contamination and would  
26 therefore reduce the economic impact of any such event.
- 27 • A public outreach program needs to be developed to increase public  
28 awareness of dangerous and infectious animal diseases, along with the  
29 proper mechanisms and systems available to reduce the public's risk of  
30 exposure and the risk of exposure to the State of Florida.

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**Florida Fish and Wildlife Conservation Commission (FWC)**

The Florida Fish and Wildlife Conservation Commission (FWC) was created July 1, 1999, by merging the Florida Game and Fresh Water Fish Commission (GFC) – Freshwater Fisheries, Wildlife, Environmental Services, Law Enforcement, Informational Services – with elements from the Florida Department of Environmental Protection (Marine Fisheries, Florida Marine Research Institute, Florida Marine Patrol) and the Marine Fisheries Commission (rule making and stock assessment). FWC has the constitutional responsibility for managing and regulating wildlife, freshwater, and marine life. In 2000, fish and wildlife related recreation resulted in an economic impact in Florida of \$7.8 billion that supported 138,210 jobs, based in part on \$336 million in sales of hunting and fishing products.

Introduced species in the marine and freshwater environments are exposed to different ecological and socioeconomic constraints, and therefore require different management approaches. Moreover, until 1999, marine and freshwater resources were managed by different agencies with different management mandates, rule-making authorities, and enforcement powers. During the past 20 years, the primary focus of the marine staff has been primarily directed towards the assessment and management of exploited native stocks of commercial and sport species, while freshwater and wildlife staff have had the opportunity to address a broader range of resource issues based on GFC’s 1943 constitutional authority to “exercise the regulatory and executive powers of the state with respect to wild animal life and fresh water aquatic life (State Constitution Article IV, Section 9).” As a result, different philosophies and management strategies have been developed and applied to these different groups of introduced organisms.

Nonindigenous species are big business in Florida. Importation, exhibition, sale, and breeding of non-native species generate \$300 million annually. There are 8,000 entities authorized to possess fish and wildlife for private and commercial purposes, including 300 zoological attractions and 300 exotic fish farms, e.g., the tropical fish industry. In 2000, wildlife inspectors inspected 5,352 facilities and seized 111 illegal specimens.

1 Many of these nonindigenous species can be found in Florida’s coastal waters,  
2 freshwater waterbodies, and on public conservation lands. There are 31 species of exotic  
3 fishes reproducing in Florida’s fresh waters. More exotic freshwater fishes exist in South  
4 Florida than anywhere else in the world. An additional 43 exotic freshwater fish species  
5 have been collected without evidence of reproduction. Private individuals introduced  
6 many of these non-native species. In addition, Florida’s long coastline, deepwater ports  
7 and international airports are potential points of entry for vertebrates and invertebrates;  
8 invertebrates are the principal concern for marine ecosystems, with ballast water an  
9 ongoing source of exotic organisms. By some estimates, 26% of South Florida’s fauna is  
10 not native.

11 The Division of Freshwater Fisheries first conducted research on a non-native  
12 species in 1961. In response to growing concerns about introduced freshwater fishes, the  
13 Non-native Fish Research Project was established in 1966. In 1973, a ground-breaking  
14 law enforcement unit was created and staffed by specialty trained Wildlife Officers, most  
15 of whom possess degrees in zoology, to enforce rules and regulations dealing with  
16 imported fish and wildlife species. There are 13 Wildlife Inspectors that conduct  
17 statewide inspections of a variety of facilities containing non-native animals. Both the  
18 Non-Native Fish Research and Wildlife Inspector programs remain active today.

19 Three key elements have emerged to deal with non-native animal populations in  
20 Florida: prevention, assessment, and management of established populations. There are  
21 four aspects in preventing new introductions:

- 22 • Regulations and enforcement
- 23 • Raising public awareness through news releases, brochures, public service  
24 announcements, and school educational programs
- 25 • Multi-jurisdictional coordination with other local, state, and federal agencies
- 26 • Eradication of new species found in ponds or physically restricted areas; although  
27 desirable, eradication is rarely possible for newly introduced freshwater fish  
28 species found reproducing in rivers, lakes or canals, and even more difficult when  
29 it involves marine or wildlife species.

30 After prevention has failed, and eradication is not feasible, FWC begins a  
31 thorough assessment of newly established freshwater fish species by documenting

1 distribution, abundance, potential for spread, life history, environmental limiting factors  
2 (e.g., temperature and salinity tolerances), and associations with native species. Based on  
3 these assessments, management strategies are developed to minimize deleterious effects  
4 of these undesirable species (e.g., increased predation or legalizing commercial and  
5 recreational fishing).

6 The butterfly peacock is the only legally introduced established nonindigenous  
7 fish, following extensive risk assessment conducted by the FWC. This introduction has  
8 proved a successful management effort in that butterfly peacock have helped to control  
9 exotic forage fish in extreme southeast Florida, while providing substantial sportfishing  
10 opportunities.

11 Currently, FWC has no programs dedicated to nonindigenous wildlife and marine  
12 species, although non-native species are considered in the course of other management  
13 and research activities. Nonindigenous pet owners appear to be a major pathway of  
14 introducing new species into Florida. Both the divisions of Wildlife and Marine Fisheries  
15 have staff expertise but lack funding to develop nonindigenous species programs. The  
16 Florida Marine Research Institute's (FMRI) Fisheries Independent Monitoring Program  
17 has accumulated information on occurrence of non-native species, but due to funding  
18 constraints, no analysis or interpretation has been done. The Division of Marine  
19 Fisheries, in conjunction with FMRI, is evaluating selected marine organisms for  
20 restricted species status. Critical concerns identified by the FWC are introduction  
21 pathways, habitat alteration and loss, research and monitoring, information and  
22 education.

### 23 **Findings**

- 24 • Although very few exotic species are invasive, those species that are invasive can  
25 alter the composition and function of natural communities or ecosystems.  
26 However, the presence of non-native species is not inherently harmful to native  
27 species.
- 28 • There is a need to adopt clear and consistent definitions for commonly used terms,  
29 e.g., invasive species should refer to those species that can or do cause significant  
30 ecological or economic harm, as determined by science-based studies.

- 1       • A statewide invasive species management plan should consider differences  
2       between categories of invasive species (e.g., plants vs. animals) as well as  
3       philosophical differences among stakeholders.
- 4       • There is a lack of adequate resources (staff and funding) for basic research and  
5       monitoring of wildlife and marine invasive species. Permanently funded  
6       programs to study and manage the ecological and socioeconomic consequences of  
7       invasive species are desirable.
- 8       • There is a lack of adequate funding to present effective public information  
9       regarding the consequences of illegal introductions and emphasizing prevention  
10      of new introductions.
- 11      • FWC’s list of prohibited and restricted species may need additions and/or  
12      revisions.
- 13      • An interagency task force is recommended to coordinate a prevention message,  
14      respond to immediate threats, help coordinate enforcement activities, and share  
15      information and assessment plans.

### **Water Management Districts**

19       Florida’s Water Management Districts (WMDs) manage invasive plants and feral  
20      hogs on approximately 2 million acres of conservation lands, and in some 240,000  
21      surface acres of public lakes and rivers, WMD waters, and flood control canals. Funding  
22      for these operations come from trust funds administered by FDEP, Ad Valorem tax  
23      revenues, mitigation and special revenue funds, and county funding. The WMDs own an  
24      additional 400,000 acres of conservation lands that are managed by other entities. In  
25      fiscal year 2000, the WMDs spent \$7.5 million managing weeds in sovereign waters,  
26      \$5.0 million in flood control canals, \$276,000 in WMD-owned waters, and \$5.7 million  
27      on conservation lands. Operations are implemented through contractual services and in-  
28      house crews.

29       The water management districts have been cooperating for many years to identify  
30      and combat the threats associated with invasive exotic plants and wild hogs. The WMDs  
31      fund and conduct ecology and management related research projects on the most

1 problematic plant species. Studies include research into biological control agents,  
2 screening trials for herbicides and site-specific evaluations of non-target damage to native  
3 plant communities after control operations have been conducted. The WMDs carry out  
4 regional assessments and survey and mapping inventories for invasive pest-plants on  
5 managed properties. The WMDs produce and fund many educational materials on the  
6 invasive plant issues, and participate in public outreach opportunities. In 1995, the  
7 WMDs formed a working group to facilitate greater communications and improve  
8 cooperation between the WMDs. In 1997, a cooperative Inter-District report (“Exotic  
9 Plant Invasion on Florida’s Water Management District Lands”) was compiled that  
10 described the Districts’ ongoing exotic species management activities and plans for the  
11 future.

12 Control operations on water management district waters and lands are currently  
13 aimed at achieving maintenance control of large-scale infestations of invasive non-native  
14 plants and elimination of new, small or isolated infestations when the potential for rapid  
15 infestation and reinfestation is unlikely. Maintenance control is achieved when invasive  
16 nonindigenous plant infestations are reduced to the lowest feasible level where they no  
17 longer significantly impact native plant communities or ecosystem functions and their  
18 potential spread is minimized. The additional funds and workforce needed to completely  
19 eliminate invasive species from a specific property often can not be justified when the  
20 property will likely be reinfested from adjacent unmanaged lands.

21 At present, each of the water management districts has invasive exotic plant  
22 problems to varying degrees. The districts have developed active control programs  
23 commensurate with their needs. Levels of spending, therefore, range from thousands of  
24 dollars to millions of dollars annually.

## 25 **Findings**

- 26 • Unmanaged areas often act as reservoirs for exotic species infestations, which  
27 allow the re-infestation of WMD and other conservation lands. Incentives or  
28 funding should be considered to address this problem in critical areas.
- 29 • The amount of state funding available to study invasive species ecology, to  
30 develop effective current control recommendations, to fund long term control

- 1 options such as biological control and to develop standardized assessment  
2 methods to quantitatively assess infestation levels should be increased.
- 3 • The Districts and other land management agencies need to develop effective  
4 protocols to minimize spread of invasive species resulting from management  
5 activities, recreational utilization and agricultural operations on conservation  
6 lands.
  - 7 • A standardized assessment method needs to be finalized and adopted to ensure  
8 compatibility between agencies in assessing and reporting infestation levels.
  - 9 • The status of feral hogs on WMD lands ranges from game animal to pest species  
10 even though their negative impacts on habitat structure, plant and animal species  
11 abundance and composition, and ecological processes are well documented. This  
12 species should be considered a pest species and appropriate measures  
13 implemented to reduce populations to maintenance control levels on all WMD  
14 lands.
  - 15 • A risk assessment procedure for newly introduced non-indigenous species should  
16 be initiated at the state and federal level to assist in preventing new invasive  
17 species introductions and to help prioritize and gauge the response necessary to  
18 deal with escaped species.

### **Florida Department of Transportation**

19  
20 Years ago, before the Florida Department of Transportation (FDOT) began  
21 working with FDEP and other agencies, invasive nonindigenous species were only  
22 addressed by roadway maintenance personnel. Now, the problem of invasive organisms,  
23 limited to invasive plant species, is addressed in roadway design, construction, and  
24 maintenance. The department's major problem associated with invasive plant species is  
25 the reinfestation of rights-of-way from adjoining private properties. FDOT is not  
26 authorized to control invasive species on private lands to prevent reinfestation. This  
27 problem has been particularly persistent with cogon grass. Another problem that FDOT  
28 is working to solve is the dissemination of invasive plant species through the movement  
29 of soil, hay, and sod on rights-of-way. These activities in highway construction can  
30 rapidly spread species throughout the state.

31

1 **Findings**

- 2 • The plan should identify the state's top land management priorities; what species,  
3 where, and when.
- 4 • With priorities clearly established, FDOT's efforts can be placed where the state  
5 and department get the greatest benefit. Same for research priorities.
- 6 • FDOT requests increased cooperation from FDACS to verify that sod and hay  
7 are not contaminated with invasive species; some type of product grade or  
8 certification that can be relied upon and easily verified.

9

10 **University of Florida Institute of Food and Agricultural Science (IFAS)**

11 The Institute of Food and Agricultural Sciences (IFAS) is a federal, state, and  
12 local government partnership dedicated to education, research, and extension. IFAS is  
13 administered through Florida's Land-Grant and Sea-Grant programs. Invasive species  
14 (before they were called that) including weeds, animals, and diseases, which have  
15 become agricultural pests, have been traditionally addressed through this Land-Grant  
16 tripartite. Since their inception, land grant institutions have broadened out to encompass  
17 programs of on-campus instruction, research, and off-campus extension work in many  
18 areas beyond the initial needs of agriculture. Natural resources are now an important  
19 component of the Land-Grant mission. As the importance of invasive species in natural  
20 areas has increased, IFAS has responded with efforts to address this issue in education,  
21 research, and extension programs. At least eight courses at the University of Florida  
22 address invasive species. Four of these have their main focus on invasive species in  
23 natural areas. Research priorities include developing management programs and  
24 understanding ecology and physiology of the state's worst invasive species,  
25 environmental impacts of invasive species, and development of predictive indices for  
26 invasiveness. Extension efforts include a pesticide applicator certification training  
27 program for invasive plant management in natural areas, an assessment of invasiveness to  
28 help in making recommendations for horticultural commodities, providing information to  
29 increase the public's awareness of their role in helping solve invasive species problems,  
30 and training of County Extension Faculty. Some of these programs will be discussed in  
31 detail below.

1 **Current Efforts**

2 **School of Forest Resources and Conservation**

3 The Natural Resources Education Program in the Department of Forest Resources  
4 and Conservation addresses invasive species in a variety of ways. Within the 4-H  
5 program, an activity is included in the 4-H project book, “Florida’s Fabulous Forests,”  
6 and the Leader Guide, about invasive exotic plants in natural areas. It encourages youth  
7 to find out more about the invasions in their region and how they can work to stem the  
8 tide. Invasive exotic plants are highlighted on a Web site and CD on Florida Forest Plants  
9 and Ecosystems being developed to assist audiences with identification of forest plants.  
10 A forest-based community service-learning program “Give Forests a Hand” asks youth to  
11 explore their local forests and identify concerns they could address with service projects.  
12 Information on invasive species is provided to assist them. Invasive species are  
13 addressed in a summer undergraduate Natural Resource Communication course that  
14 explores the wildland-urban interface. Invasive plant species are addressed in “Restoring  
15 the Urban Forest Ecosystem” CD-ROM.

16 **Entomology and Nematology**

17 Classical biological control programs against the citrus pests, citrus leafminer,  
18 Asian citrus psylla, and brown citrus aphid have been developed over the past nine years.  
19 Graduate students are trained in the methods of classical biological control through this  
20 research, and growers are taught about classical biological control. Studies are in  
21 progress for arthropod biological controls against Brazilian pepper, hydrilla, and *Solanum*  
22 spp. Invasion biology, including ecology and genetics of *Aedes albopictus* is under  
23 study.

24 Public information and education is provided on the use of host-specific insects to  
25 control invasive plant species. An extension program is being coordinated with Natural  
26 Resource County Agents and other faculty to provide critical information for end-users  
27 for the most effective and accurate use and monitoring of insect biological control agents.

28 **Environmental Horticulture Department**

29 The Environmental Horticulture Department’s role in invasive plant species  
30 education, research, and extension is critical because of its close relationship with the  
31 horticulture industry. The department has increased its efforts extensively in recent

1 years. Invasive plant species are addressed in courses such as “Florida Ecosystems and  
2 Landscapes” and “Florida Native Landscaping.” Several research projects are in progress  
3 that are studying the invasiveness of new and existing ornamental species and cultivars;  
4 nutrient use and efficiency and photosynthesis for evaluating potential invasiveness of  
5 ornamental species; and economic impacts of phasing out invasive ornamental plant  
6 species. Training and education material related to invasive plant species are provided to  
7 County Horticulture Agents in cooperation with Agronomy Weed Science Extension  
8 programs.

### **Plant Pathology Department**

9  
10 Efforts are directed at biological control of such invasive weeds as waterhyacinth,  
11 hydrilla, tropical soda apple, torpedograss, and cogongrass. Several bioherbicides (i.e.,  
12 plant pathogens used as weed control agents) have been developed and field-tested  
13 against these weeds. A course titled “Microbiological Control of Plant Diseases and  
14 Weeds,” which deals with the theory and applications of the use of microbial agents as  
15 bioherbicides is offered.

### **Department of Veterinary Medicine**

16  
17 Research has determined the exotic tick species introduced into Florida on  
18 imported reptiles; identified the optimal acaricide for the safe and efficacious treatment of  
19 tortoises, snakes and lizards for exotic tick infestations; established a safe and effective  
20 method for the eradication of exotic tick infestations from premises containing infested  
21 tortoises; determined that certain species of exotic ticks are efficient vectors of at least  
22 one disease (heartwater) that is highly pathogenic for cattle, sheep, goats, and deer;  
23 determined that at least one shipment of exotic ticks into Florida was infested with the  
24 rickettsia causing heartwater; and disseminated information to ended users and the  
25 scientific community.

### **Agronomy Department**

26  
27 In addition to traditional agriculturally oriented weed science courses, two  
28 courses, “Biology of Invasive Species” and “Biological Invaders” are offered. The latter  
29 is a course for non-majors designed to educate students enrolled in non-biological  
30 curricula on the topic of invasive species.

1 Weed Scientists in the Agronomy Department conduct research on invasive  
2 species in crops and non-crop areas, including aquatic habitats and natural areas. Studies  
3 are in progress on seed and reproductive biology of several invasive plant species,  
4 examining the use of molecular tools for better understand the genetics of invasive plant  
5 species, reproductive biology of several aquatic plant species, and developing control  
6 strategies and studying the biology of several upland invasive plant species.

7 The Agronomy Department has a statewide Extension program in “Ecology and  
8 Management of Aquatic, Wetland, and Upland Vegetation.” Through this program,  
9 current control methodologies for invasive plant species are made available to land  
10 managers. A curriculum, training manual, and testing were recently developed to certify  
11 land managers for application of herbicides to control invasive plant species in natural  
12 areas. Workshops will be held across the state to deliver this program and provide  
13 continuing education for re-certification. A program is also conducted for certification  
14 and re-certification of herbicide applicators that manage invasive aquatic plant species.  
15 Public education workshops are conducted in cooperation with Water Management  
16 Districts and other agencies.

### 17 **The Department of Fisheries and Aquatic Sciences**

18 The Department of Fisheries and Aquatic Sciences (FAS) includes research or  
19 extension projects involving invasive species in Florida in all three of their major  
20 program areas, Aquaculture, Freshwater, and Coastal. Some non-native fish or shellfish  
21 have been legally imported into Florida as valued aquaculture species, while other  
22 species have been introduced without public support and are perceived as real or potential  
23 pests. In the case of aquaculture, FAS research and extension faculty are seeking to  
24 incorporate issues surrounding the culture of non-native fish and shellfish into state-  
25 approved best management practices. In the coastal environment, there has long been a  
26 perception that invasive species do not pose the same level of threat to Florida that they  
27 have in other parts of the United States, such as New England, Chesapeake Bay, and the  
28 West Coast. Two recent developments have challenged that assumption: First, the only  
29 careful review of coastal species in Florida revealed over 30 non-native invertebrates, a  
30 third of which had been observed but not previously recognized as non-native. Some of  
31 these invasive species, such as barnacles and shipworms, are abundant pests. Although

1 Florida and its marine industries have adapted, it is obvious that Florida is not immune to  
2 significant invasions. Second, green mussels have recently invaded Tampa Bay, a  
3 tropical Indo-Pacific species. The green mussel has rapidly attained very high abundance  
4 and is spreading from Tampa Bay to other parts of Florida. The economic and  
5 environmental impacts of this new invader, which is similar in some important ways to  
6 the notorious zebra mussel, have yet to be measured reliably. FAS will be committed to  
7 cooperation with state agencies in developing and implementing a statewide Invasive  
8 Species Management Plan and in cooperation with other Florida university departments,  
9 will develop components of Prevention, Rapid Response, Control and Management, and  
10 Public Education regarding invasive species.

11 FAS is conducting an EPA-funded study on spread and impacts of the invasive  
12 green mussel, which is currently the dominant benthic organism in many areas. The  
13 present distribution includes most of Tampa Bay and extends south to Charlotte Harbor.  
14 This species is conservatively expected to spread south through the Florida Keys and  
15 around the tip of Florida to the Indian River Lagoon. Potential economic impacts include  
16 increased costs associated with fouling of vessels, navigation equipment, and seawater  
17 intakes. Potential ecological impacts include altered benthic habitats, competition with  
18 native shellfish, and changed plankton dynamics by filter-feeding (as has been observed  
19 for zebra mussels, a common pest in other parts of the United States). Research efforts to  
20 date have focused on understanding the spread of green mussels, its impact on benthic  
21 habitats, and its role as an abundant filter feeder. Other issues have arisen, but funds are  
22 lacking for their study.

23 Florida Sea Grant has convened a marine invasive species working group,  
24 comprised of key researchers and managers in Florida. This group will determine needs  
25 for Florida and identify tools, expertise, and resources to address these needs.

26 Faculty of the FAS Tropical Aquaculture Lab in Ruskin, are engaged in  
27 developing and disseminating best management practices for ornamental aquaculture in  
28 Florida. Prevention of the release of non-native species is incorporated as a crucial part  
29 of best management practices.

30 Effects on Florida freshwater ecosystems of the purposefully introduced peacock  
31 bass, which is native to South America, are under study. Peacock bass, a predator,

1 consumes both native fish and invasive species such as spotted tilapia, but how it changes  
2 native fisheries is not understood. Research is intended to guide management by Florida  
3 state agencies, and optimize Florida’s economically valuable recreational freshwater  
4 fisheries.

5 A survey of invasive marine species in Tampa Bay, on behalf of the Tampa Bay  
6 Estuary Program (also EPA-funded) is being conducted. This project will synthesize  
7 available information on invasive species in Tampa Bay. As a major seaport, Tampa Bay  
8 is among the most susceptible sites in Florida, and is also a secondary source of invaders  
9 for other parts of Florida. This project’s results will be used to plan further research,  
10 extension, and management efforts.

11 A series of fact sheets describing important coastal invaders in Florida is being  
12 developed cooperatively between FAS and the University of Central Florida. These fact  
13 sheets will raise awareness of coastal invaders in Florida with the intention of reducing  
14 the risk of new invasions through public education, and gaining information from the  
15 public on the distribution and impacts of invaders in Florida. The Florida Sea Grant  
16 College Program funds this project.

17 Studies are being conducted on management of the freshwater Asian clam  
18 (*Corbicula*). *Corbicula* occurs throughout Florida, and greatly outnumbered native  
19 freshwater bivalves. *Corbicula*, which is an effective filter-feeder, has been proposed as  
20 the final stage in agricultural waste treatment in the Kissimmee-Okeechobee watershed.  
21 FAS researchers have a USDA-funded program at the Sam Mitchell Aquaculture  
22 Demonstration Farm (near Blountstown) to study management of *Corbicula* in the  
23 context of Best Management practices for agriculture, but plans to close the Mitchell  
24 Farm means that the project, including ponds and raceways, will have to be moved to a  
25 new location. Research is being conducted on the spread, populations, and impacts of the  
26 invasive Asian swamp eel in Florida.

### 27 **The Center for Aquatic and Invasive Plants**

28 In 1978, the Center for Aquatic and Invasive Plants was established as a  
29 multidisciplinary unit within IFAS to promote and coordinate a statewide aquatic plant  
30 research program and to develop environmentally sound techniques for managing aquatic  
31 vegetation. During the years since the Center’s initiation, much has changed about the

1 methods and objectives of resource management within the state. The list of invasive,  
2 nonnative species has expanded, the economic and ecological benefit of efficient and  
3 systematic management of invasive vegetation has been demonstrated, and shifts in  
4 emphasis within state and federal programs have changed the funding available for  
5 academic programs. The continuing thread remains the attempt to match research  
6 interests, funding opportunities, and available personnel to the spectrum of problems and  
7 products that are the heart of invasive plant research, education, and extension. Base  
8 support for the Center is provided by an annual General Revenue allocation. Research  
9 and Extension programs are supported by funds allocated by IFAS Administration and  
10 the Dean’s Office and driven predominantly by outside grants and contracts from other  
11 state and federal agencies.

12 Fifteen to twenty faculty from eight departments cooperate through the Center on  
13 invasive plant research. Examples of current research include: developing control  
14 methods (including biological, chemical, and mechanical) for integrated management of  
15 specific invasive species, community, physiological, and reproductive ecology of  
16 invasive plant species, invasiveness of horticultural cultivars, and population genetics.  
17 Center Extension Programs are aimed at public education and training of invasive plant  
18 management personnel. Fact sheets pertaining to invasive plant species are available to  
19 County Agents and the general public on the Center’s Web site (<http://plants.ifas.ufl.edu>),  
20 and the IFAS publication Web site (<http://edis.ifas.ufl.edu>). Information pertaining to  
21 invasive plant species is delivered through existing programs with established audiences  
22 such as the Master Gardeners program and Florida Yards and Neighborhoods. The  
23 Center’s Aquatic and Invasive Plant Information Office provides an “Aquatic and  
24 Invasive Plant Information Retrieval System” and an abundance of teaching aids, which  
25 are available to high school teachers and other educators. The retrieval system provides a  
26 cataloged and instantly retrievable bibliographic database of aquatic and invasive plant  
27 literature, with searchable Internet access.

### **IFAS Invasive Plants Working Group**

28  
29 Because of its multidisciplinary role, IFAS programs can have conflicting  
30 messages concerning invasive species. For example, recommendations can be found for  
31 landscape use of the same species which control methods are also provided. To address

1 these issues, IFAS has a multidisciplinary Invasive Plant Working Group that is charged  
2 by the Deans of Extension and Research to develop sound science-based resolution of  
3 these conflicts. A major accomplishment of this Working Group has been development  
4 of the “IFAS Assessment of Nonnative Plants in Florida’s Natural Areas”, which is used  
5 for making recommendations on use of nonnative horticultural products.

## 6 7 **Findings**

- 8 • IFAS faculty have the interest and expertise to conduct research needed to address  
9 invasive species problems in Florida and the nation and are conducting education,  
10 research, and Extension programs within the limitations of budget, personnel, and  
11 facilities. Research and Extension programs of faculty are supported principally  
12 by external grants and contracts from state and federal agencies, and programs are  
13 limited by available funding. Increased funding is needed for coordinated (with  
14 state agencies) development and printing of Extension educational materials and  
15 to enhance delivery of invasive species education programs. Increased funding is  
16 needed to expand invasive species research.
- 17 • Specific areas in which invasive plant research efforts need to be increased  
18 include the following: 1) Methods to determine invasiveness of potential new  
19 introductions, 2) Limiting the use and expansion of potentially invasive exotic  
20 plant species in the landscape by developing cultivars of native species to replace  
21 invasive exotics and development of sterile forms of exotics, and 3) Ecological  
22 impacts of invasive species.
- 23 • Statewide invasive species management can benefit from increased General  
24 Revenue funds provided directly to support research and additional cooperative  
25 agreements with state agencies to support invasive species research and Extension  
26 efforts.
- 27 • A new faculty position is needed for a botanist with expertise in pathways of  
28 introduction and to determine origins of introduced species by genetic methods.
- 29 • USDA-APHIS no longer evaluates risks associated with releasing parasitoids or  
30 predators of pest arthropods; therefore, there is no federal oversight for risk  
31 assessment of such introductions. IFAS Entomology and Nematology

- 1 Department uses a voluntary, peer review system. More oversight is needed for  
2 entomologists carrying out classical biological control programs involving pest  
3 arthropods.
- 4 • There is a need for biotech business ventures to service small-market needs  
5 created by specific invasive species to help develop, register, and commercialize  
6 highly specialized bioherbicide products.
  - 7 • Research and extension in areas of invasive freshwater and coastal species is  
8 currently conducted by faculty and staff who have additional responsibilities to  
9 other aquaculture, freshwater, and coastal constituencies. Adding to this pressure  
10 is the loss of several existing faculty through attrition, including the critical areas  
11 of fisheries and aquaculture genetics and aquaculture extension. Unless those  
12 positions are filled, some vital issues related to invasive species may slip through  
13 the cracks. The hiring process is limited both by lack of space for new personnel  
14 in the department and hiring freezes. In the interim, staff to assist in invasive  
15 species research and extension has been identified as a critical project need.
  - 16 • Predicting the risk posed by recent invaders requires lab studies of environmental  
17 tolerances. FAS currently lacks environmental chambers that meet EPA  
18 requirements for working with invasive species. FAS has been offered space for  
19 these chambers outside the department, but the required chambers will cost  
20 \$10,000.
  - 21 • Researchers of invasive species are currently borrowing trucks and vessels from a  
22 variety of other programs. Funding for a heavy-duty truck (\$25,000) and small  
23 vessel suitable for scuba operations (\$20,000) is needed.
  - 24 • The expected closure of the Sam Mitchell Demonstration Farm near Blountstown  
25 will force FAS researchers to relocate existing research facilities on *Corbicula*  
26 clams. A minimal system requires two 1-acre ponds and a catchment basin with  
27 research flumes. \$30,000 will be required to recreate ponds, and replacing the  
28 flume system will cost an additional \$30,000.
  - 29 • Additional space to address FAS infrastructure limitations could take two forms.  
30 A permanent solution would be a multi-purpose research, education, and  
31 extension building capable of housing the entire department (projected cost

1           \$15,000,000). In the interim, some of the most critical needs can be met by one  
2           or more smaller, multi-purpose buildings modeled after an existing structure  
3           recently built for FAS (projected cost \$300,000 per structure).

4           • Green Mussel Impacts on Fisheries: Green mussels may impact finfish negatively  
5           by covering benthic habitats required for feeding or spawning, or by feeding on  
6           plankton causing changes in the base of the food web. However, green mussels  
7           may also provide a new food resource for certain fish or crab species that have  
8           direct human value. Research needs in this area have been discussed by FAS and  
9           federal agency researchers, but funding is needed.

10          • Green Mussel Fishery Value: If green mussels remain abundant, one means to  
11          manage them may be through harvest for human consumption or animal feed.  
12          Harvest methods, food value, and market potential need to be determined  
13          specifically for Florida. Research and extension in this area would be driven by  
14          the findings of other research on green mussels (including potential human health  
15          threats).

16          • Green mussels and human health: The green mussel is an edible species, and  
17          occurs in provisionally approved shellfish waters, where it is certain to be  
18          harvested recreationally. It is not known whether this species feeds on toxic  
19          marine plankton, or whether it can accumulate toxins to the point of being a  
20          health hazard if consumed. Research requires collaboration within IFAS and  
21          among several agencies. Additionally, if human health hazards are suspected,  
22          outreach efforts to educate the public should be mounted in areas where green  
23          mussels might be encountered and consumed. [To date, no human health  
24          problems associated with green mussels have been reported, and there are no data  
25          on the extent to which they are consumed in Florida.]

26          • Research has demonstrated the potential problems associated with introduced tick  
27          species. This research was terminated due to a lack of funding and technical  
28          support positions. Additional funding is needed to continue research and  
29          extension efforts to determine impacts and solve problems associated with  
30          invasive tick species.

- 1 • Funding is needed for a faculty position and start-up funds to study the potential  
2 of arbovirus transmission by invasive mosquitoes.
- 3 • A faculty position, biologist and operating funds are needed by the IFAS Tropical  
4 Aquaculture Laboratory (Ruskin) to adequately study potential invasiveness of  
5 introduced ornamental fish species.
- 6 • Funding is needed for additional faculty and skilled technical support positions  
7 for collaborative research extension programs among IFAS satellite campuses.

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