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## Current Invasive Exotic Plant Control Program for the City of Sanibel, Florida, or Why Sanibel's Brazilian Pepper are "Shakin' in Their Roots"

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### *Abstract*

Sanibel Island has long been viewed as an environmentally progressive community. Since incorporation in 1974, the City of Sanibel has been considered a shining example of a "Sanctuary Island". This is evident by the strict environmental performance standards in development planning, zoning (by eight naturally occurring ecological zones), and the fact that almost 70% of the island is held in public ownership for conservation purposes. The driving force behind the environmental legislation and protection of Sanibel is citizen involvement and support. Sanibel's residents continue to shape their own future by maintaining the vision of the "Sanctuary Island." The latest example of public support of the preservation of the natural ecosystems of the island is the acceptance of an island-wide Brazilian pepper removal program. The program's goal is to remove this plant in a phased approach over the next 13 years until eradication is achieved. The program targets all properties on the island, including rights-of-way, city parks, publicly-owned conservation areas, and private holdings such as single family residences, commercial properties, and vacant lots. The City Council passed legislation approving the program in May 1997; additional legislation (ordinances) will require the removal of Brazilian pepper within individual phases. The City offers financial incentives to residents for removal of this plant, and arranges special debris pick-up dates and disposal sites on public land. A formal agreement between the three largest landowners/managers on Sanibel (J.N. "Ding" Darling National Wildlife Refuge, Sanibel-Captiva Conservation Foundation, and City of Sanibel) has facilitated the receipt of numerous grants for Brazilian pepper removal and other restoration efforts in natural areas, with many projects planned, in progress, or already in maintenance phases. Residents of Sanibel have united in support, the City Council is passing legislation, island land managers are committed and cooperating, and the pepper is "shakin' in its roots!"

### **Introduction**

Sanibel Island is an 11 000 ac coastal barrier island which lies off the coast of Fort Myers in Lee County. The City of Sanibel was incorporated in 1974 when self-

determination grew from a perceived need for orderly development to preserve the island's natural features (City of Sanibel 1997). Today, the community of Sanibel strives to sustain ecological balance and preserve and restore natural settings for residents, visitors, and wildlife. Direction to achieve this balance is outlined in the "Vision Statement" of the City of Sanibel which states: "Sanibel is and shall remain a barrier island sanctuary, one in which a diverse population lives in harmony with the island's wildlife and natural habitats. The Sanibel community must be vigilant in the protection and enhancement of its sanctuary characteristics" (City of Sanibel 1997). Through this devotion to protecting and enhancing the island's sanctuary characteristics, the city's Natural Resources Department was formed. The Department focuses on a variety of environmental issues and community support items such as sea turtle monitoring, environmentally sensitive lands acquisition, local environmental legislation, conservation lands management, listed and protected species management, development review, environmental code enforcement, beach and dune management, environmental education, and exotic plant species control and management. Departmental staff work toward these ends intragovernmentally and through a cooperative agreement with the U.S. Fish and Wildlife Service (J.N. "Ding" Darling National Wildlife Refuge) and the Sanibel-Captiva Conservation Foundation.

### **Program History**

Sanibel Island has a history of hurricanes, agriculture, and moderate development, contributing to the availability of sites for the myriad of exotic plants invading southern Florida. During the late 1970s and early 1980s, several workshops and meetings were held throughout southern Florida where land managers, predominantly governmental agency conservation land managers, joined to discuss the threat and ultimate control of exotic pest plants on property they managed.

One such workshop took place at the Sanibel-Captiva Conservation Foundation on December 2, 1978, and concerned control techniques for Brazilian pepper (*Schinus terebinthifolius* Raddi) in southern Florida. Since over half of the total acreage on Sanibel Island was in public and private conservational ownership at that time, the public's involvement with and exposure to invasive exotic plants grew. This involvement paved the way for an early, general understanding of the threats these plants posed to the "sanctuary island" atmosphere. Since melaleuca (*Melaleuca quinquenervia* (Cav.) S.T. Blake) generated the greatest concern throughout southern Florida at that time, the City of Sanibel began adopting local legislation, as early as 1981, to control and remove this species from the entire city. Since then, melaleuca has been removed from all public and private properties on Sanibel and is in a "controlled" state through scheduled maintenance island-wide.

The City of Sanibel has passed five resolutions and five ordinances related to local regulation of eight species of invasive exotic plants. The City of Sanibel Natural

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Resources Department and its local partners are in the process of controlling an estimated 38 species of highly invasive exotic plants on the nearly 7700 ac of conservation land (or 70% of the entire island) on Sanibel Island.

### **Management Strategy**

The City of Sanibel has enacted an integrated, two-tier approach for the control of exotic pest plants on Sanibel Island. The first tier is the adoption of local legislation, through public environmental education, aimed at the regulation and ultimate eradication of the exotic plants documented as the most invasive in Sanibel's parks and natural areas. Some examples are the required removal of eight species of exotic plants from a parcel of land approved for development (the parcel must be maintained free of these plants in perpetuity), and a 12-yr phased approach to remove Brazilian pepper from all areas of the city, including private developed and undeveloped, residential and commercial, governmental, and nonprofit organizational properties.

The second tier is the coordinated partnership of the City of Sanibel, the U.S. Fish and Wildlife Service, and the Sanibel-Captiva Conservation Foundation to collectively restore the island's conservation lands. The restoration process entails considerable invasive exotic plant removal, hydrological reconfiguration, and native plant recruitment and enhancement. Areas restored are maintained free of exotic plants through the implementation of a rotating maintenance program employing herbicide treatments, prescribed fire, and native plant enhancements.

### **Control Methods**

Since the City of Sanibel regulates eight species of invasive exotic plants, namely Brazilian pepper, melaleuca, earleaf acacia (*Acacia auriculiformis* Benth.), lead tree (*Leucaena leucocephala* (Lam.) de Wit), Java plum (*Syzygium cumini* (L.) Skeels), air potato (*Dioscorea bulbifera* L.), exotic inkberry or beach naupaka (*Scaevola sericea* Vahl), and bowstring hemp (*Sansevieria hyacinthoides* (L.) Druce), many homeowners and private property owners employ various methods for their removal and control. The most common method is contracting with landscaping, tree service, and lawn maintenance companies who remove and control exotics mechanically and chemically for their clients. Other ambitious homeowners conduct removal and control on their own volition.

The City of Sanibel controls exotic plants on conservation lands in much the same manner that other large environmental land management agencies do. The eight regulated species, and an additional 30 species, have been observed invading these lands and are being controlled. Techniques utilizing heavy machinery such as root-rakes, track hoes, feller/bunchers, hydro-axes, whole tree chippers, bulldoz-

ers, and loaders are used when conditions warrant large scale removal. A typical strategy combines mowing vegetation with a hydraulically operated mower deck mounted on tracked or rubber-tired vehicles to reduce biomass and removing and piling the remaining stumps using track hoes or bulldozers armed with root-rake attachments. These piles are seasoned and burned. Sites cleared using this technique are then meticulously combed by ground crews who treat stump and root sprouts and smaller missed plants with herbicides.

Wetlands, high density native vegetation, critical wildlife habitat, road rights-of-way, and highly visible public locations receive special consideration to protect resources and maintain visual aesthetics. Herbicides are regularly used; applicators are trained in their use to protect personnel and non-target species.

Physical control of invasive exotic plants (primarily Brazilian pepper) on Sanibel Island has been implemented since the development of an advanced surface water control program. A system of weirs, installed in 1995 at a cost of \$4.5 million, maintains surface water at historic levels of 3.2 ft NGVD. The system provides flood protection for residents while restoring interior fresh water wetlands. The return of water to historic levels has caused some Brazilian pepper, which invaded transitional areas between cordgrass/leather fern swales and tropical hardwood hammock ridges, to become stressed or die due to lengthy periods of inundation. This control method needs further study.

The use of prescribed fire to manage areas containing scattered invasive exotic plants is routinely used on Sanibel Island, usually in conjunction with herbicide treatments. The coordination and timing of fire and herbicide application has been shown to be effective in controlling some species such as Brazilian pepper, but may not be effective with certain species such as air potato.

### **Monitoring**

Conservation areas managed to control invasive exotic plants are monitored in various ways. The City of Sanibel maintains two volunteer groups, i.e., Wildlife and Vegetation Committees, who receive direction from the City Council. Both groups routinely survey city properties and maintain inventory records of wildlife and vegetation before, during, and after restoration. The Natural Resources Department maintains photopoints on various parcels to document vegetative changes and overall restoration progress, conducts regular aerial surveys, and collects data on fishes, frogs and alligators. One such city parcel was inventoried and found to have 45 plant species prior to exotic plant removal and over 170 species within one year after removal. Anecdotal observations are recorded and monitoring is conducted routinely by various field crews during the restoration of each parcel.

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## Partnerships

The City of Sanibel entered into a formal cooperative agreement in 1996 with the U.S. Fish and Wildlife Service, who manages J.N. “Ding” Darling National Wildlife Refuge, and the Sanibel-Captiva Conservation Foundation (SCCF). The City of Sanibel owns and manages 500 ac of parks and conservation lands on Sanibel Island; the refuge owns and manages 5800 ac of conservation lands on Sanibel Island; SCCF owns and manages 1500 ac of conservation lands on and around Sanibel and Captiva Islands. The agreement facilitates the sharing of personnel and equipment for the restoration and maintenance of all conservation lands held by each respective owner or manager.

Several grants have been received for exotic plant removal and environmental restoration on these lands, and for large-scale projects such as major invasive exotic plant treatment along 1.5 mi of the primary ridge within the refuge. Recent partnerships for invasive exotic plant removal and control have been formed with the Florida Department of Environmental Protection, the Lee County Tourist Development Council, and the U.S. Fish and Wildlife Service.

## Discussion

During the 1998 fiscal year, the Natural Resources Department operated on a budget of \$997 183. Nearly 75% of these funds were used directly or indirectly for the removal and control of invasive exotic plants within the incorporated limits of the city. Over half of the entire budget was received from external sources in the form of grants. Invasive exotic plants were expunged from over 400 ac of Sanibel’s conservation lands, and two phases of a Brazilian pepper removal program have been implemented, ridding nearly 350 private properties of this species. Innovative contracting over longer-than-normal durations, with several different companies, has enabled the city to receive low prices for mechanical removal and ground crews.

Dense, monotypic stands of invasive exotic plants are being removed for less than \$1000 per acre: a hydro-ax equipped with a mower deck averages \$500 per acre, while a root-rake equipped track hoe, bulldozer, or loader averages \$700 per acre. Ground crews treating stump and root sprouts and more heavily infested areas, with herbicides are accomplishing the task with excellent results costing from \$250 to \$600 per acre, depending on plant densities.

## Successes and Challenges

Many challenges exist for the invasive exotic plant removal and control program on Sanibel Island. Typical fluctuations in staffing and funding will continue to be

a major factor in the program's success. As the city's major partners are the U.S. Fish and Wildlife Service and the SCCF, unpredictable, fluctuating budgets will continue to affect the program.

Many new residents are moving to the City of Sanibel and gradually shifting the face of the community. As property values increase and migration to Florida continues, newer and often more affluent residents may not understand the threat these plants have to the island; they may be of the opinion that removal and control of these species is not a priority. Some of the invasive exotic plants threatening natural areas such as Australian pine and beach naupaka are viewed by parts of the population as aesthetically important. Public environmental education concerning these invasive exotic plants needs to take into account these population characteristics and shifts.

Removal and control techniques aimed at specific sites and plant species, competitive contracting to reduce costs, effective partnerships, and an informed and concerned public and city government have resulted in a successful invasive exotic plant removal and control program on Sanibel Island. *Melaleuca* has been virtually eradicated from the island and the Brazilian pepper removal program has met with overall acceptance; large numbers of properties are currently free of this species. Large-scale removal projects, including the 400 ac State Botanical Site, the island's largest contiguous invasive exotic plant removal project, are currently underway. Long-term maintenance of restored sites is paramount; adequate funding is required to ensure the continued success of restoration projects on Sanibel Island.

### **Literature Cited**

City of Sanibel. 1997. *The Comprehensive Land Use Plan of the City of Sanibel*. City of Sanibel, Fla.