

Invasive Exotic Animals: Managing a Threat to Everglades Restoration

Non-native plant and animal species are defined as those species living in an area outside their native range. If a non-native species causes or is likely to cause economic or environmental damage or pose a threat to human health and safety, it is considered an invasive species. Invasive species have infested millions of acres of natural areas in the United States with the associated loss of native species, including rare and endangered species. Particularly pervasive in Florida, invasive species have been documented to alter the ecological structure and function of entire ecosystems, sometimes leading to irreversible changes in ecosystem processes and food webs.

Invasive exotic species cause serious environmental and economic losses and the management and control of these species costs billions of dollars each year in the United States. Research in the United States, United Kingdom, Australia, South Africa, India, and Brazil indicates that over 120,000 non-native species of plants, animals, and microbes have invaded these countries. Many have

caused major economic losses in agriculture and forestry, as well as negative impacts to ecological integrity (Pimentel et al. 2001). Feral cats and pigs, for example, are responsible for the extinction of various native animal species and habitat damage around the world. Though precise economic costs associated with some of the most damaging exotic species are not available, it is estimated that non-native species invasions in the above six nations are causing more than \$314 billion per year in damages (Pimentel et al. 2001).

Invasive animal species are a rapidly increasing environmental and economic problem in south Florida. Florida is second only to Hawaii in the severity of the threat posed by invasive species and is particularly vulnerable to the introduction and spread of invasives because of its subtropical climate, major ports of entry, and the pet, aquarium, and ornamental plant industries. Of the known and thriving animal species introduced into south Florida, four are amphibians, 32 are fish, 12 are birds, 46 are reptiles, 17 are mammals, and approximately 79 are invertebrates (SFWMD 2008). One high-profile example in the Everglades is the Burmese python (see photo at left). According to Fish and Wildlife Service records, legal wildlife shipments into the United States between 2000 and 2004 comprised over one billion individual exotic animals, representing 2,241 different species from 190 countries (Aldhouse 2007; Smith et al. 2009). This number does not include any parasites or diseases these individuals might have harbored. Only a small percentage has been subjected to risk analysis, a critical need to prevent and manage unwanted introductions.

Whereas invasive exotic plants have been the focus of various planning, prevention, and management activities for the past 35 years, the focus on invasive animals essentially began within the past decade. In addition, invasive animals are much more difficult to manage and eradicate. Experts in every taxonomic group (mammals, reptiles, amphibians, fish, invertebrates, etc.) are needed to work collaboratively on invasive animals. The lag in time and the expansive scope of the invasive animal issue present an immense challenge in the Everglades. However, the management of invasive animal species can draw from the many lessons learned regarding invasive plants. The exact methodologies may differ, but the same primary strategies apply.



Ongoing scientific research provides insight into the habits and impacts of Burmese pythons in the Everglades ecosystem. Photo courtesy Everglades National Park.

Strategic Management of Invasive Species in the Everglades

To assist the South Florida Ecosystem Restoration Task Force in fulfilling its intergovernmental coordination duties with respect to invasive species, the Working Group established two teams, the Noxious Exotic Weed Task Team (NEWTT) and the Florida Invasive Animal Task Team (FIATT). Through the efforts of these teams, individual agency programs for detection, eradication, control, monitoring, and research have been better coordinated and integrated, particularly at the field-level. Agencies involved with these two teams developed an Everglades Cooperative Invasive Species Management Area (ECISMA) — an organizing approach well-established in western states for dealing with invasive species — that provides a mechanism to coordinate invasive species management efforts in the Everglades. Together, these three volunteer-based groups working along with individual agencies have developed a strategy for approaching invasive species problems in the Everglades that follows well-established, internationally accepted elements at the field-level, as well as at management and policy levels.

Element 1: Prevent, Detect, and Assess

Element 1 focuses on primary prevention by controlling importation (at U.S. borders—a Federal departmental-level endeavor) of species that may become invasive. Element 1 also includes a secondary level of prevention in which monitoring programs are in place to detect new species that have escaped and are becoming naturalized. It is at this initial stage of invasion that detecting and rapidly assessing the relative invasive threat of a species is necessary in order to prioritize actions under Element 2 (see below). This stage is critical for successfully eradicating new infestations and reducing the need for continued long-term costly management.

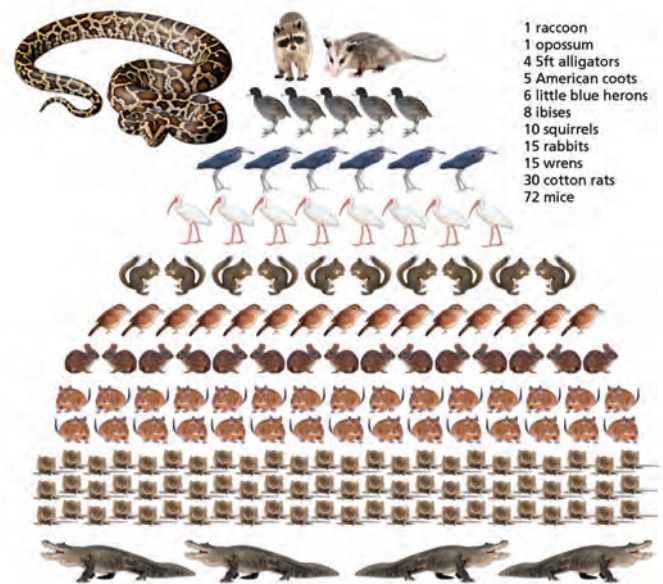
Element 2: Assess, Manage, Control, and Restore

Element 2 focuses on determination of spatial extent and stage of an invasion to develop control and management action plans for a species or population in a specific region. Assessments and recommended actions should be closely coordinated to provide agencies with a unified, regional plan for managing and controlling a species and, where appropriate, for restoring natural resources that have been impacted. This stage helps us assess the likelihood of successful eradication versus the need to implement long-term control programs.

Element 3: Inform, Advise, and Educate

Element 3 includes all levels of communication for promoting awareness and education about the problems

and risks that invasive species pose. This includes, but is not limited to, scientific and technical findings related to these species. Nontechnical communication products developed by scientists and agencies are necessary to provide managers, policy makers, and the public with accurate and understandable information about invasive species issues, including how agencies are responding and what the public can do to help.



Good communication tools, like this hypothetical diet for the growth of a 13-foot Burmese python in the Everglades, effectively relay the urgency of action. Image courtesy of SFWMD, Dr. Stephen Secor, University of Alabama, and Skip Snow, NPS.

Element 4: Organize, Coordinate, and Plan

Element 4 includes some of the most difficult aspects of invasive species management, that of multi-agency coordination and integration. Although much progress has been made at local and regional levels for the management of some species — especially in the Everglades — those who work in the field of invasive species management often find that planning, cooperation, integration, and resource sharing are the most difficult elements for managers at the field-level to accomplish. These problems can be due to agency policies and regulations (or simple inertia) that slow, and sometimes prevent, interagency cooperation and integration. Upper-level managers and policy makers need to ensure that invasive species management is an explicit part of their overall planning, budgeting, and coordination efforts.

In addition to this four element strategy, the interagency community, through the coordinating efforts of NEWTT, FIATT, and the ECISMA, has produced several key documents that outline a comprehensive and coordinated approach to controlling invasive exotic plants and animals in south Florida. NEWTT developed a comprehensive plan (*Weeds Won't Wait*) for dealing

with invasive exotic plants (Doren and Ferriter 2001). This plan has been in place for almost a decade and has provided both guidance and a unified approach for dealing with invasive exotic plants. The Everglades invasive plant management program has provided a standard for such programs elsewhere and serves as a model for the management of invasive exotic animals.

Coordinated Management of Everglades Invasive Exotic Animals

A draft invasive exotic animal plan with a list of the exotic animals that are considered the highest priority for management (prevention, eradication, control, and research) has been put forth by FIATT. Similar in nature to the concept of *Weeds Won't Wait*, this list provides a well-considered scientific consensus of the approximately 26 identified priority species, including mammals, birds, reptiles, amphibians, and invertebrates.

Each year, the ECISMA develops a coordination action plan that includes select regions for management of priority invasive species, coordinated actions and strategies, and desirable research programs for the control and management of these species. ECISMA has also developed an Early-detection, Rapid-assessment, Rapid-response Plan, including a web-based reporting system for invasive species observations, and an online system that tracks exotic plant management projects. This system provides a uniform, cross-agency data system for entering field data on the control and management of exotic plants. The same system, with adequate funding, also has the capability to be used for reporting and tracking invasive exotic animals.

Because of the nature of invasive exotics management, multiple approaches are necessary. Different species, at different stages of invasion, require different control techniques. For example, the Gambian giant pouched rat was detected early in its initial infestation and spread, and has essentially been eradicated



The successful control of the Gambian giant pouched rat in the Florida Keys helps illustrate the effectiveness of early detection and rapid response. Wildlife monitoring remote camera photo by FFWCC.

through the use of baited traps, thus eliminating the need for a long-term management program. This successful effort highlights the need for better early detection along with contingency funding for such projects. The Burmese python and the boa constrictor, however, have already established populations and we must now develop control approaches and strategies in response. This is a very long-term, perhaps perpetual, and extremely costly effort in both financial and ecological terms, whereas the near eradication of the giant Gambian pouched rat was accomplished in fewer than six years, for just a few tens of thousands of dollars compared to other more expensive, long-term control projects. Details of the status and management plans for the species discussed above can be found in the Additional Resources listed at the end of this document.

What More Can We Do?

Coordinate, Integrate, and Plan:

We need to continue to refine and develop the Invasive Exotic Animal Strategic Plan developed by FIATT. The basic elements of the plan are in place but the plan needs to be formally vetted and accepted at the appropriate levels by all the individual agencies involved. The plan must then be used by agencies and teams to implement the strategies and approaches described in the plan and to coordinate funding for invasive species management. Invasive species do not recognize political or land ownership boundaries and thus our planning, actions, and funding must also cross borders. Through FIATT and ECISMA, and with sufficient monetary support, all involved agencies should be actively refining this plan for execution.

Prevent, Prevent, and Prevent:

The most effective approach to stopping species invasions is to prevent entry. It is well-documented that if a species poses a risk to invade a region, it will eventually escape and establish free-living populations once it is present. If we will not act to prevent invasive species from entering at the U.S. border, then we must catch them very early after release or escape. If we wait, the resulting scenario is a long-term, expensive control program.

Risk Analysis and Screening:

National-level policies and regulations must be based on robust risk analysis and screening tools that can scientifically evaluate the threat a species poses for invasion if it is introduced. There are very effective and well-documented risk assessment tools in use in other nations, including Australia. These tools have been evaluated for use in the U.S. and found to be better than 95% accurate at assessing

the threat a species poses for invasion (Gordon et al. 2008). Even the most well-funded and comprehensive program for prevention and eradication at the local level will not be sufficient to contain and manage invasive species without the support of appropriate national-level policy.

Comprehensive National-Level Interagency Planning and Coordination:

In order for the U.S. to deal comprehensively and effectively with the problems of invasive exotic species, strategic planning must take place at multiple levels of government. Reliance on field-level activities using low-level technological approaches like trapping will not be sufficient. A successful effort will require comprehensive extra- or inter-departmental cooperative agreements for resource sharing, budget planning, and revisions of policies that currently impede or prevent integration of agency activities for management and research. An effective example of such an approach has evolved in the management of wildfires, once the bane of individual agencies. Each agency was individually responsible for a fire when it crossed into their geographic area of concern, no matter where it came from or who may have caused it, and regardless of whether the agency had the resources to deal with the fire or not. Today, through the National Interagency Fire Center, all levels of government and their agencies (federal, state, and local) have a fully integrated (with respect to budgeting, planning, logistical, coordination, implementation, and action) program where all agencies act as one with regard to wildfires across the U.S. This is the approach we must emulate nationally and in south Florida if we are ever to manage the incalculable environmental, economic, and health threats posed by invasive exotic species.



Purple Swamp Hen preying on hatchling native duckling in the Arthur R. Marshall Loxahatchee National Wildlife Refuge. Photo courtesy of Tony Wellington.

A Big Problem Needs A Big Response:

Funding for this immense challenge must be consistent, dedicated, and well-coordinated. Without sufficient resources for monitoring, early detection, developing the capacity to respond rapidly to new incipient populations, and control of those species that are already established, invasive exotic species will continue to be serious and significant threats to Everglades restoration. Programs like the National Interagency Fire Center have clearly proven that when adequate resources are provided and made available through a large, well-integrated resource pool, agencies are able to respond quickly (within hours) to problems and also place resources in key locations to prevent the spread of a problem through early and rapid control actions. Such programs provide a national-level framework and support structure for integration, coordination, budgeting, planning, and logistical support, thereby multiplying the effectiveness of the resources of individual agencies.

Literature Cited

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- South Florida Water Management District. 2008. *South Florida Environmental Report*. Chapter 9: The Status of Nonindigenous Species in the South Florida Environment.

Additional Resources

- Florida Invasive Animal Task Team (FIATT) Draft Strategic Plan for Invasive Animals.
- Draft Early Detection and Rapid Response Plan for Everglades Cooperative Invasive Species Management Area, June 12, 2009.
- South Florida Environmental Report, Chapter 9: The Status of Non-indigenous Species in the South Florida Environment, 2009.
- Everglades Cooperative Invasive Species Management Area, Memorandum of Understanding. No. 4600001287, December 24, 2008.
- Florida Invasive Animal Task Team (FIATT) Priority Advisory List of Invasive Animal Species, March 3, 2009.
- Everglades Cooperative Invasive Species Management Area 2009 Annual Plan.