

# South Florida Ecosystem Restoration Task Force

## Invasive Exotic Species Strategic Action Framework

### *Long-term Management Case Study: Burmese Pythons*

**Burmese pythons** are giant constricting snakes, native to Asia, that have an established invasive population in southern Florida. Adult pythons are large predators with little risk of predation themselves, and the Florida population has the potential to negatively impact a multitude of native wildlife species. Management of the invasive python population has proven very difficult, and the population continues to grow despite an increasingly coordinated effort of several governmental agencies and academic institutions. Burmese pythons are an unfortunate yet apt example of how eradication of established invasive exotic species is costly and problematic.

#### **Case Presentation**

Founded by animals from the pet trade, a population of Burmese pythons colonized Everglades National Park probably 20-30 years ago. Since then, the snakes have spread well beyond the park to become established in at least three counties. We do not yet have a population-size estimate, but approximately 1,400 pythons were removed from the park between 2000 and 2014, and more pythons were removed from the park in 2014 than in any previous year.

Burmese pythons have a remarkable potential for reproduction and growth. Females lay a single clutch of typically 30-50 eggs in the spring, and clutch sizes of over 80 eggs have been recorded in Florida. Like many other python species, the female tends to her nest, protecting her eggs from predation and shivering to keep them warm. The self-sufficient young are roughly 50-80cm in length upon emerging, and exhibit growth rates of up to 20cm/month. Most pythons collected in Florida are reproductive adults and 3.0-3.25m in length, with few individuals exceeding 5m.

The size and eating habits of these giant constrictors lead to a potentially giant ecological impact. The pythons are feeding generalists, capable of eating many appropriately sized terrestrial vertebrate species, with larger snakes eating larger prey. Documented prey items include over 40 species of mammals and birds, as well as American alligators. Some of these

prey items (e.g., wood storks, Key Largo wood rat), are at risk of extinction because of their already low population sizes or limited geographic distribution, and it is unclear how these populations will respond to increased predation pressure. Evidence suggests that many prey populations (e.g., marsh rabbits, raccoons) have declined dramatically since the python's introduction. Research into the effect of the pythons on their prey populations, and the effect of competition on other predator populations, is ongoing.

#### **An Infamous Invader**

Perhaps south Florida's most recognized invasive exotic species, Burmese pythons have become established in at least three counties. The pythons are large predators, dining on a wide variety of native mammals and birds—and even alligators—with little risk of predation themselves. Efforts are now focused on long-term management in order to control the geographic spread and density of these snakes. Lessons learned may help prevent the establishment of other giant constrictors in south Florida.



Photo: Bryan Falk, Everglades National Park.

## Management Actions and Outcome

Currently, there is no evidence to suggest that the Burmese python population in Florida can be eradicated by management activities. Each potentially promising management tool has limitations, and primary among these is a high financial investment into research and/or high maintenance costs. Nonetheless, a suite of well-researched management tools may help control the geographic spread and density of these snakes.

A major hurdle for Burmese python research and management is the extreme difficulty of finding pythons. The probability that a human searcher will detect a python present in the area is 1% or less (i.e., searchers pass by at least 99% of the pythons present in the area they are searching). Furthermore, visual searching is labor-intensive (i.e., costly) and constrained to human-accessible terrain. Some approaches may improve detection probabilities, but each of these has limitations. For example, dogs improve detection probabilities, but training and maintenance is expensive and time-consuming. Moreover, detector dogs may show aversion to pythons after a negative interaction (i.e., an attempted or successful snake bite), which also increases costs if a trained dog can no longer be used to search for pythons. Likewise, employing Forward Looking InfraRed (i.e., heat vision) is of limited benefit because the snakes generally have a similar thermal profile as their surrounding environments. Overall, the factors that contribute to detection probability, and the ways in which it may be improved, are poorly understood and research in this area is ongoing.

Approaches to locate snakes other than visualization have also been employed, but again with limited success. The use of “Judas” snakes (where a captured individual is fitted with a radio transmitter, released, and tracked in order to find other pythons) is an example. Judas-snake activities generally recover only a few additional individuals at a substantially increased cost in both labor and equipment.

Trapping is another common management tool and has been successfully used in the control of other invasive exotic species. Trapping Burmese pythons presents several challenges, however, and principal among these is that pythons are ambush predators (i.e., they sit-and-wait for food, as opposed to active foraging). Since they do not forage, it’s unlikely that they would enter a trap baited with prey. Thus far, strategies to compel the pythons to move (e.g., drift fences, noise deterrents) and thereby increase the probability of trapping success have been, by and large, impractical or ineffective.

Some management tools show potential, but the underlying science is underdeveloped and in need of much additional research. Pheromone attractants are a good example. Male pythons congregate around females in relatively large numbers during the breeding season and are presumably signaled to do so via pheromones. Such an attractant may be an effective bait for trapping pythons (at least adult male pythons) but, unfortunately, the science of chemical signaling in snakes is in its infancy. The isolation and synthesis of python pheromones for use in management, while potentially effective, may be a long way off.

## Key Recommendations/Issues

Whereas eradication of the Burmese python population in Florida may be impossible, and effective management is costly, the lessons learned may help prevent the establishment of other invasive exotic species. Other giant, non-native constrictors (e.g., African rock pythons, reticulated pythons) are imported to Florida via the pet trade and have a similar potential for establishment with a large ecological impact. Given what we know about the difficulties in managing Burmese pythons, any steps taken to prevent the establishment of other giant constrictors are steps well-taken.

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This document is part of a series of case studies developed for the Invasive Exotic Species (IES) Strategic Action Framework. This particular case study highlights issues within the Long-term Management Phase of the IES Invasion Curve. 6/1/15