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Python Patrol: Combatting The Problem of Evasive Non-Native Snakes in Florida

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PYTHON PATROL: COMBATTING THE PROBLEM OF INVASIVE NON-NATIVE SNAKES IN FLORIDA

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ABSTRACT

The Florida hotspot of non-native invasive species has long been recognized as a fascinating, yet perplexing environmental issue since the late 1900s. After decades of patchwork efforts by the federal and state government, it has become clear that a more holistic approach must be taken to help eradicate the Burmese Pythons that have overtaken Southern Florida. This article highlights the prior efforts taken federally and state-wide to combat this issue and assesses the current gaps in these efforts and what must be done to achieve a more holistic approach. Other states are used as points of comparison in regard to their legislation and handling of non-native invasive species in order to display effective or ineffective efforts. As it currently stands, the environment and ecosystem of Southern Florida are suffering immense devastation at the hands of this non-native invasive species and something must be done to control, contain, and hopefully eradicate the issue at-hand.

INTRODUCTION

Florida is considered to be the invasive species hotspot of the United States. Native to Southeast Asia, Burmese pythons are an exotic, nonnative species in South Florida. These serpents are also considered an invasive species, which means that they are not constrained by natural factors as much as they would be in their native habitat.[1] By definition, invasive species have the potential to harm their new environment.[2] Indeed, the threat that invasive species pose is second only to the direct destruction of habitats through development.[3] Because Florida's climate is so hospitable, invasive species cause more of a crisis there than anywhere else in the continental United States.[4] The fact that Florida is the world leader in the reptile trade compounds the problem.[5]

Invasive species generally make their way into the United States through the pet trade. When the owners of unusual, exotic animals realize that their animal requires more work than a typical pet such as a cat or dog, owners often panic and simply dump the animal somewhere. The Burmese python is

[1] Rebecca G. Harvey et. al, *From Pets to Invasive Predators: Burmese Pythons in the Everglades*, UNIV. OF FLA. (Apr. 2009), https://crocdoc.ifas.ufl.edu/publications/posters/invasiveburmesepythons/.

[2] *Id*.

[3] *Slowing the Spread of Invasive Species*, THE NATURE CONSERVANCY, https://www.nature.org/en-us/about-us/where-we-work/united-states/florida/stories-in-florida/combating-invasive-species-in-florida/ (last updated Sept. 30, 2022).

[4] *Id*.

[5] *Id*.

one such animal that humans tend to treat in this way.[6] An inexperienced snake keeper who takes home a twenty-inch hatchling is, within a year, responsible for an eight-foot predator. Unable to handle their giant snakes and unable to find new homes for them, some owners illegally release them into the wild.[7] These snakes also have made their way into the Florida ecosystem through the wreckage of some of the most notable hurricanes in the United States, such as Hurricane Andrew.[8]

Burmese pythons are popular pets in the United States due to their attractive color pattern, reputed docility, and the allure of owning a big snake. According to the U.S. Fish and Wildlife Service, approximately 99,000 Burmese pythons were imported to the United States between 1996 and 2006 (compared to only 17,000 between 1970 and 1995).[9] This fearsome predator has been released into the Everglades and has little to no competition when it comes to catching prey for survival.[10] The Burmese python has even been known to target and kill alligators. A new animal introduced into the delicate ecosystem can have a huge impact on the wildlife ecosystem and can disturb its natural order.[11] The Burmese python is considered to be an invasive species in the Florida Everglades due to how these animals are impacting the local ecology and food web.

This article will explore reptile laws and their effectiveness within Florida, as well as propose possible solutions to encourage an eradication of the invasive Burmese python. Part I will provide a brief background into invasive species more generally and the effects Burmese pythons have had on Florida's ecosystem. Part II will examine reptile laws of states including Florida, as well as an examination of federal law. Lastly, Part III will provide a multifaceted eradication approach to handle the current population of Burmese pythons in Florida.

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6 Harvey et. al, *supra note* 1.

7 Rebecca G. Harvey et. al, *Burmese Pythons in South Florida: Scientific Support for Invasive Species Management*, UNIV. OF FLA., INST. OF FOOD & AGRIC. SCIS. EXTENSION 2 (July 2008), https://www.humanwildlifeconflicts.msstate.edu/docs/florida_extension.pdf.

8 Christian Capehart et. al, *Burmese Pythons: An Invasive Species*, UNIV. OF OKLA. 6 (2018), https://shareok.org/bitstream/handle/11244/317115/Pythons.pdf?sequence=1&isAllowed=y.

9 Harvey et. al, *supra* note 7.

10 *Id.*

11 *Id.*

I. THE HISTORY BEHIND BURMESE PYTHONS ENTERING THE UNITED STATES, AND THEIR EFFECT ON THE ECOSYSTEM.

A. INVASIVE SPECIES AND WHY THEY MATTER

An invasive species is an introduced, nonnative organism (disease, parasite, plant, or animal) that spreads or expands its range from the site of its original introduction and has the potential to cause harm to the environment, economy, or human health. More than 6,500 of these harmful, non-native species cause more than 100 billion dollars in damage each year to the U.S. economy.[12] Costly effects include crop decimation, clogging of water facilities and waterways, wildlife and human disease transmission, threats to fisheries, increased fire vulnerability, and adverse effects for ranchers and farmers.[13] Invasive species wreak havoc on the environment in which they are introduced because they are not native to the land.[14] Thus, the native plants and animals are not assimilated to living alongside the species. Both native plants and animals lack key survival characteristics when introduced to an invasive species simply because they have not had time to evolve to protect themselves. In a situation like this, the invasive species will thrive and take over while the native plants and animals are left defenseless.

Florida in particular has become one major source of invasive species. Florida's subtropical climate with elongated growing seasons and few freezes is extremely hospitable, resulting in invasive species causing more of a crisis there than anywhere else in the continental United States.[15] Florida is particularly vulnerable to invasive species given, "there are more than 35 international ports of entry and an annual influx of nearly 120 million tourists each year [...]."[16] Furthermore, this problem is exacerbated by the fact that Florida is the world leader in the reptile trade, and serves as a point of entry for almost three-fourths of all plants imported into the U.S.[17] According to one estimate, nearly 85% of the 140 nonnative reptiles and amphibians that disrupted food webs in Florida's coastal waters between the mid-nineteenth century and

[12] Wetland and Aquatic Rsch. Ctr., *What is Invasive Species?*, U.S. GEOLOGICAL SURV. (Feb. 23, 2021), https://www.usgs.gov/news/invasive-species-science-warc.

[13] *Id.*

[14] *Id.*

[15] *Invasive Species*, UNIV. OF FLA., INST. OF FOOD & AGRIC. SCIS. EXTENSION, https://sfyl.ifas.ufl.edu/sarasota/natural-resources/ecology-and-natural-resources/invasive-species/#:~:text=Florida%20has%20a%20unique%20mix,growing%20seasons%20and%20few%20freezes (last updated Oct. 20, 2022).

[16] *Id.*

[17] *Slowing the Spread of Invasive Species*, THE NATURE CONSERVANCY, https://www.nature.org/en-us/about-us/where-we-work/united-states/florida/stories-in-florida/combating-invasive-species-in-florida/ (last updated Sept. 30, 2022).

2010 are thought to have been introduced through the exotic pet trade.[18] A study published in June in *Frontiers in Ecology and the Environment* found this trade is already responsible for hundreds of nonnative and invasive species establishing themselves in locations around the world.[19]

Pythons have increasingly become an issue within South Florida, especially in the Everglades. Between 1996 and 2006, roughly 99,000 pythons were imported into the United States as pets. It is believed the pythons began breeding in the wild as a result of two primary causes.[20] The first reason is that owners often release their snakes into the wild once they grow uncomfortable with the risks involved in feeding, housing, and caring for a large reptile in their home. The second reason is that these animals have escaped their cages as a result of destructive hurricanes.[21] For example, in 1992, Florida's Hurricane Andrew was responsible for destroying a python breeding facility.[22] Due to the python's camouflaged bodies and stealthy abilities, it is difficult to estimate the exact population.[23] Nonetheless, data points to the fact that from early 2000 to present day, the population of breeding pythons in the Everglades has increased to well over 30,000. Because pythons live twenty-five years or more and females can lay up to eighty-seven eggs per year, these reptiles will continue to exponentially take over the Everglades.[24]

B. INVASIVE PYTHONS RESULTING IN SEVERE MAMMAL DECLINES IN FLORIDA

One direct effect Pythons are having on the Everglades is on the mammal population within Florida's native wildlife. In essence, they are almost completely decimating the population of various native mammals. A study conducted in 2011 by Michael Dorcas, a herpetologist at Davidson College in North Carolina, documented "severe declines" in mammal sightings. The 2003 to 2011 surveys compared mammal sightings to data from surveys conducted in 1996 and 1997—before the python was breeding in the wild.[25] As the population of pythons has increased in the last two decades, populations

[18] Jim Daley, *How Do We Prevent Pets from Becoming Exotic Invaders*, SCI. AM. (Oct. 7, 2019), https://www.scientificamerican.com/article/how-do-we-prevent-pets-from-becoming-exotic-invaders/#:~:text=Exotics%20to%20Invasives&text=According%20to%20one%20estimate%2C%20nearly,by%20the%20exotic%20pet%20trade.

[19] Julie L. Lockwood et al., *When Pets Become Pests: The Role of the Exotic Pet Trade in Producing Invasive Vertebrate Animals*, 17 FRONTIERS IN ECOLOGY AND THE ENV'T 323, 325 (2019); Daley, *supra* note 18.

[20] Michael Sarill, *Burmese Pythons in the Everglades*, BERKELEY INT'L & EXEC. PROGRAMS (2016), https://iep.berkeley.edu/content/burmese-pythons-everglades.

[21] *Id.*

[22] *Id.*

[23] *Id.*

[24] *Id.*

[25] *Id.*

of raccoons have dropped 99.3%; opossums 98.9%; bobcats 87.5% since 1997; and marsh rabbits, cottontail rabbits, and foxes effectively have disappeared.[26]

It is important to note this study produced correlative evidence and not causative evidence. Nonetheless, the above-listed mammals simply have no instinctive defense or fear from a large carnivorous snake like the python, leading to the inference that there may be more to this study than just correlation.[27] The above-listed mammals lack defensive skills against these pythons because, before the Burmese python in early 2000, the last large snake to live in this region was 16 million years ago, when a boa-like snake became extinct.[28] As a result, these mammals become easy prey.[29]

Pythons' diet consists of just about anything they can get their mouths around.[30] Given the extremely stretchy cartilage joint connecting their jaws to their heads and their ability to extend their windpipe outside their mouths so they can breathe while their mouths are entirely occupied with swallowing, pythons can eat many kinds of animals.[31] Some scientists argue that the animals falling prey to pythons is merely a representation of a survival of the fittest theory.[32] However, non-invasive species of predator and prey evolve together over time and come to live in a harmonious balance, with prey animals developing natural instinctive defenses from their predators.[33] For example, in the Burmese python's native habitat in Southeast Asia, they do not cause a 90%-plus decline in the population of their prey.[34] Yet, the animals of the Everglades have no natural instinctive defense from these large snakes, which is resulting in their mass decimation. If 30,000-plus pythons are presently causing an over 90% decline in the population of native mammalian life, then this level of growth is completely unsustainable. Food sources will simply run out.[35] Native species will go extinct.

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[26] *Id.*

[27] *Id.*

[28] *Id.*

[29] *Id.*

[30] Ian Frazier, *The Snakes That Ate Florida*, SMITHSONIAN MAG. (July 2019), https://www.smithsonianmag.com/science-nature/snakes-ate-florida-180972534/.

[31] *Id.*

[32] *Id.*

[33] Sarill, *supra* note 20.

[34] *Id.*

[35] *Id.*

II. PREVENTATIVE RESPONSES TO INVASIVE SPECIES IN THE UNITED STATES

A. FEDERAL LAWS

Many federal laws address aspects of invasive species. These laws date as far back as 1900 with the Lacey Act, which has provisions to curtail the introduction of injurious species.[36] The injurious wildlife provisions of the Lacey Act are one tool that the U.S. Fish and Wildlife Service ("Service") uses to prevent illegal introductions of invasive species and manage existing invasive species.[37] Under the Lacey Act, importation and interstate transport of animal species determined to be injurious may be regulated by the Secretary of the Interior.[38] The Service implements the injurious wildlife provisions through regulations.[39] Species are added to the list of injurious wildlife to prevent their introduction or establishment through human movement in the United States to protect the health and welfare of humans, the interests of agriculture, horticulture or forestry, and the welfare and survival of wildlife resources from potential and actual negative impacts.[40] The Service lists Burmese pythons as an injurious species under the Lacey Act, preventing the importation of these constrictor snakes into the United States.[41]

Federal work on the issue also includes various executive orders put in place to control against invasive species. In particular, Executive Order 13112 created the National Invasive Species Council ("Council") and the Invasive Species Advisory Committee ("Committee"), which work together with stakeholders, concerned members of the public, and member departments to address invasive species. The Council is made up of federal agencies, and the Committee is a group of non-federal experts and stakeholders.[42] Together, they formulated an action plan for the nation to improve coordination, prevention, control, and management of invasive species by the federal

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[36] Cassandra Burdyshaw, *Detailed Discussion of the Laws Concerning Invasive Species*, MICH. STATE UNIVERSITY: ANIMAL LEGAL & HIST. CTR. (2011), https://www.animallaw.info/article/detailed-discussion-laws-concerning-invasive-species.

[37] 16 U.S.C. § 3372; Rebecca F. Wisch, *Overview of the Lacey Act (16 U.S.C. SS 3371-3378)*, MICH. STATE UNIVERSITY: ANIMAL LEGAL & HIST. CTR. (2003), https://www.animallaw.info/article/overview-lacey-act-16-usc-ss-3371-3378.

[38] 16 U.S.C. § 3372.

[39] *Id.*

[40] *Injurious Wildlife: A Summary of the Injurious Provisions of the Lacey Act (18 U.S.C. 42; 50 CFR 16)*, U.S. FISH & WILDLIFE SERV. (2007), http://www.aquaticnuisance.org/wordpress/wp-content/uploads/2009/01/Injurious_Wildlife_Fact_Sheet_2007.pdf (article found at non-USFWS website).

[41] Press Release, U.S. Wildlife & Fish Serv., Service Lists Four Nonnative, Large Constrictor Snakes as Injurious Wildlife (Mar. 6, 2015), https://fws.gov/press-release/2015-03/service-lists-four-nonnative-large-constrictor-snakes-injurious-wildlife.

[42] Exec. Order No. 13112, 64 Fed. Reg. 6184 (Feb. 8, 1999).

agency.[43]

Finally, there are federal laws that stop people from killing endangered species, including some snakes. The 1973 Endangered Species Act (ESA) protects more than 1,600 plants and animals in the United States. Any animal that is likely to become extinct can be covered by the Service, which considers them for inclusion based on how threatened they are.[44] However, Burmese pythons are not on this list, making them eligible for execution by poachers or bounty hunters.

B. STATE LAWS

i. Arizona

Arizona has some of the strictest laws regarding exotic animals. The state restricts ownership and possession of a variety of exotic animals to entities that have the animals for wildlife management, wildlife rehabilitation, public health, education, or commercial photography. Those entities must have a special permit to keep exotic animals for specific purposes.[45] Arizona Administrative Code covers restricted wildlife in the state. One section includes a comprehensive list of animals that are prohibited from being kept in the state as pets.[46] This list includes poisonous snakes and many other types of wild snakes. Another section of the code makes it illegal for anyone to import, transport, release, or possess live wildlife within the state.[47] Only specific wildlife authorized by the Arizona Game and Fish Commission is permitted to be kept as pets in Arizona. Also, it is unlawful to import, transport, or release any species of wildlife listed as endangered or threatened under the Endangered Species Act of 1973.[48] A person who violates this law can be charged with a felony.[49] While there is a lack of updated data on the amount of citations issued, between 2005 and 2015, the Arizona Game and Fish Commission issued eighty-eight citations for the possession, importation, or exportation of restricted live wildlife. Importantly, these citations encompass a multitude of offenses beyond restrictive wildlife.[50] Thus, it stands to reason that eighty-eight citations over the span of ten years would indicate that a relatively small number of restrictive wildlife issues are occurring in Arizona.

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[43] *Id.*

[44] 16 U.S.C. §§ 1531.

[45] *Arizona Exotic Animal Laws Explained*, ORENT LAW OFFICES (Sept. 2, 2020), https://www.orentcriminallaw.com/blog/arizona-exotic-animal-laws-explained/.

[46] *Id*.

[47] Ariz. Admin. Code § 12-4-406 (2022).

[48] 16 U.S.C. § 1538(a)(1).

[49] *Id*. at 16 § 1540.

[50] Amanda Ames, *Arizonans Take a Bite Out of Exotic Wildlife Trade*, AZ CENT. (Apr. 26, 2016), https://www.azcentral.com/story/news/local/arizona/2016/04/19/arizonans-take-bite-out-exotic-wildlife-trade/82953342/.

Furthermore, in 2012, southern Arizona welcomed the nation's first Animal Welfare Court, designed to adjudicate animal abuse and wildlife cases.[51] While the court has yet to hear a poaching case, game officials hope to use it as a future tool.[52]

ii. Hawaii

Snakes are illegal to transport or possess in Hawaii.[53] They are illegal to own because they have no natural predators in the region; thus, they pose a serious threat to Hawaii's environment because they compete with native animal populations for food and habitat.[54] Furthermore, many species also prey on birds and their eggs.[55] Therefore, the introduction of snakes would increase the threat to endangered native birds.

In Hawaii, there are no "traditional" snakes in the natural environment. Hawaii only has two small species of snakes, the common Island Blind Snake and the less common Yellow-Bellied Sea Snake.[56] Considering Hawaii is an isolated archipelago, the only way for a snake to arrive in Hawaii would be to fly or swim across the ocean.[57] While snakes may mistakenly arrive in Hawaii via cargo imports or other means, Hawaiian wildlife laws seem to have molded the culture to prioritize the environment by turning the snakes over under the state's Amnesty Program.[58] The no-questions-asked policy allows individuals to drop off any prohibited animal for free and without fear of punishment at any zoo, Humane Society, or Hawaii Department of Agriculture office in the state. This is a good deal considering that importing or owning a snake is a class C felony and can lead to up to three years of jail time and fines of $200,000.[59] Pet owners are encouraged to take advantage of the Amnesty Program instead of releasing a snake into the wild.[60] Healthy animals will not be euthanized but will be sent to an appropriate facility on

[51] Tim Vanderpool, *In Arizona, Reptile Poaching Made Easy: Why Some Wildlife Crimes are Difficult to Prosecute*, HIGH COUNTRY NEWS (Nov. 28, 2016), https://www.hcn.org/issues/48.20/in-arizona-reptile-poaching-made-easy.

[52] *Id.*

[53] HAW. REV. STAT. § 150A-6(3) (2022).

[54] News Release, Haw. Dep't. of Land & Nat. Res., Snake Hitchhikes to Maui in Backpack (June 12, 2019), https://dlnr.hawaii.gov/blog/2019/06/12/nr19-115/.

[55] *Id.*

[56] *Are There Snakes in Hawaii?*, HAWAII LIVING (Feb. 13, 2017), https://www.hawaiiliving.com/blog/are-there-snakes-in-hawaii/.

[57] *Snakes*, BIG ISLAND INVASIVE SPECIES COMM., https://www.biisc.org/pest/snakes/ (last visited Dec. 2, 2022).

[58] *See Amnesty Program*, STATE OF HAW. PLANT INDUS. DIV., https://hdoa.hawaii.gov/pi/pq/amnesty-program-2/ (last visited Dec. 2, 2022) (stating that Hawaii's state amnesty program "allows the voluntary surrender of illegal animals" with no penalties if a person in possession of the animal(s) surrenders them before the start of an investigation by the State).

[59] *Snakes*, *supra* note 57.

[60] *Id.*

the mainland.[61] Hawaiian government officials work hard to maintain a zero-snake policy throughout the state for the good of the land, the native animals, and the people.[62]

iii. Florida

Eradication of Burmese pythons is a very difficult, time-consuming task. In eradicating invasive species, prevention, early detection, and rapid response are crucial. With 30,000-plus pythons slithering throughout Florida, authorities are operating under the assumption that the only solution is to contain the population and prevent its spread.

As of 2021, Florida laws put Burmese pythons on the list of prohibited species in the state. The code states, "No person, party, firm, association, or corporation shall keep, possess, import into the state, sell, barter, trade, or breed the following species for personal use or for sale for personal use [...] Burmese or Indian python (Python molurus)."[63] However, "if a person, party, firm, association, or corporation holds a permit issued before July 1, 2010, under subsection (1) to legally possess a species listed in paragraph (a), that person, party, firm, association, or corporation may possess such reptile for the remainder of the life of the reptile."[64] Thus, there is still a way to legally possess a prohibited species within the state.

Nonetheless, any person who, "knowingly releases a nonnative venomous reptile or reptile of concern to the wild or who through gross negligence allows a nonnative venomous reptile or reptile of concern to escape commits a Level Three violation."[65] Florida does protect Burmese pythons with their anti-cruelty laws.[66] However, pythons can be killed on private property with landowner permission, and they can also be killed year-round and without a permit on twenty-five Florida Fish and Wildlife Conservation Commission-managed lands in South Florida. In fact, the Florida Fish and Wildlife Conservation Commission encourages people to kill wild caught pythons whenever possible.[67]

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[61] *Id.*

[62] *See* id.

[63] FLA. STAT. ANN. § 379.372(2)(a) (LexisNexis 2022).

[64] *Id.* at § 379.372(2)(c).

[65] *Id.* at § 379.305(2).

[66] *See id.* at § 828.12(1)–(2)(a) (stating the circumstances under which one may be charged with animal cruelty); *see also Burmese Python*, FLA. FISH AND WILDLIFE CONSERVATION COMM'N, https://myfwc.com/wildlifehabitats/profiles/reptiles/snakes/burmese-python/#:~:text=Burmese%20pythons%20are%20not%20native,private%20property%20with%20landowner%20permission (last visited Dec. 2, 2022) (stating that Burmese pythons are "not protected in Florida except by anti-cruelty law and can be humanely killed on private property with landowner permission).

[67] *Removing Pythons in Florida*, FLA. FISH AND WILDLIFE CONSERVATION COMM'N, https://myfwc.com/wildlifehabitats/nonnatives/python/removing/, (last visited on Dec. 2, 2022).

Florida has taken many different approaches in effort to contain the population of Burmese pythons. In February 2012, the Florida Fish and Wildlife Conservation Commission initiated a thirty-day hunt to raise public awareness on this issue. Around 1,600 people from thirty-eight states participated in the hunt. Sixty-eight pythons were killed. Based on a 2013 study, scientists estimate there are about 30,000 in the wild; the sixty-eight pythons that were killed represent a mere .2% of the python population.[68] The primary reason for this low number is that the snakes are notoriously difficult to locate. However, the bounties continued, and during Florida's 2016 Python Challenge, 106 pythons were captured. This represents an improvement from 2013, but hardly puts a dent in the total number in the wild.[69] The 2021 Florida Python Challenge yielded better results with participants removing 223 invasive Burmese pythons from south Florida.

Like Hawaii, Florida also launched the Exotic Pet Amnesty Program in an effort to reduce the number of nonnative pets being released into the wild.[70] This program allows owners of nonnative species to face no legal penalties, regardless of the regulatory status of their pet, by surrendering their pet through the program.[71] These owners can surrender their pets at any time, for any reason, at no cost.[72] While this effort is helpful in preventing nonnative species from entering the environment, it seems too little too late in preventing the invasion of the Burmese python. Nonetheless, it could better protect Florida from future nonnative species, while also preventing a small number of future pythons from being released into the wild.

Florida's Nature Conservancy also launched a Python Patrol program in 2008 where citizens were trained to alert authorities of snake sightings, who then capture the snakes.[73] The program was effective in the Florida Keys and then was expanded mainland to the Everglades with support from the National Park Service and the Florida Fish and Wildlife Conservation Commission. In total, 400 python capture responders were trained.[74] Contractors have removed more than 55% of the over 16,000 Burmese pythons from the wild

[68] Sarill, *supra* note 20.

[69] *Id.*

[70] *Exotic Pet Amnesty Program*, FLA. FISH AND WILDLIFE CONSERVATION COMM'N, https://myfwc.com/wildlifehabitats/nonnatives/amnesty-program/ (last visited Dec. 2, 2022).

[71] *Id.*

[72] *Id.*

[73] Sarill, *supra* note 20.

[74] *See Python Patrol: Stopping a Burmese Python Invasion*, THE NATURE CONSERVANCY (Oct. 14, 2019), https://www.nature.org/en-us/about-us/where-we-work/united-states/florida/stories-in-florida/stopping-a-burmese-python-invasion/.

in South Florida as of the end of 2022.[75] This Python Patrol program is certainly a beneficial step in further promoting community awareness and responsibility for this issue.[76]

Unfortunately, a fundamental flaw exists with Florida's attempt at containment. Reducing the population of pythons decreases the competition for remaining food resources. As a result, the pythons that do remain become healthier, stronger, and more fertile.[77] The python population continues to grow at high rates; thus, decreasing the population in the short-term will actually cause it to spike in the long-term.[78] Florida must seek a different approach to adequately combat the python issue.[79]

III. PROPOSED SOLUTION FOR FLORIDA

With all the efforts Florida has taken, the question remains of how pythons are still a problem. Florida's efforts seem to be a way of publicly displaying that the state is "taking action" against the issue, yet efforts appear to be disjointed without a clear goal. It seems as if Florida has been operating under the assumption that the odds of eradicating the python population are very low in light of the massive spread that has already occurred. As previously noted, this massive spread is a failure on behalf of Florida Authorities to quickly address and respond to the issue.[80] Nonetheless, putting resources towards attempting to eradicate the python population seems to be one route that has yet to be pursued.

A. Preventative Avenues for Eradication

As previously noted, reducing the population of pythons decreases the competition for remaining food resources.[81] The population continues to grow at high rates; decreasing the population in the short-term will actually cause it to spike in the long-term.[82] The only way to truly solve the issue is to remove every last python from the Florida ecosystem.[83] In doing this, the scientific community of snake biologists, ecological scientists, and

[75] *Python Action Team Removing Invasive Constrictors (PATRIC)*, FLA. FISH AND WILDLIFE CONSERVATION COMM'N, https://myfwc.com/wildlifehabitats/nonnatives/python/action-team/ (last visited Dec. 2, 2022).

[76] *See Python Patrol: Stopping a Burmese Python Invasion*, *supra* note 74.

[77] Sarill, *supra* note 20.

[78] *Id.*

[79] *See id.*

[80] *Id.*

[81] *Id.*

[82] *Id.*

[83] *Id.*

extermination experts should be enlisted for their expert knowledge. This team of experts can experiment with ways to attract the animals in order to capture them for extermination. For example, male pythons could potentially be attracted by female pheromones and could then be exterminated; female pythons could be attracted with a similar tactic and then exterminated.[84] In doing this, scientists could slowly eradicate the species by luring them in and then killing them. Furthermore, this would prevent any reproduction between males and females, thus eliminating new generations being born.

Rocky Parker, a chemical ecologist at James Madison University in Virginia, attempted a similar experiment when he analyzed the brown tree snakes that infected Guam and what pheromones would be effective in trapping them. Previous studies in the late 1990s by Robert Mason, a reproductive biologist at Oregon State University, had hinted at a role for a group of chemical compounds called methyl ketones in brown tree snakes' mating behavior.[85] In Parker's research, he saw some response to the methyl ketones by the wild snakes in Guam; however, more needs to be done on this avenue to ensure success.[86] This approach does not appear on its face to have any unintended consequences, other than being costly and time consuming.[87] Despite its disadvantages, the use of pheromones should continue to be built upon with the enlistment of further scientific experts.

Beyond the scientific community, the use of bounty hunters has received a great deal of support and has continued to remain one minor solution.[88] As previously noted, the first hunt in 2012 killed approximately sixty-eight pythons.[89] In 2016, 106 pythons were captured; in 2021, 223 pythons were captured.[90] As seen in the graph below, the bounties being put on these reptiles are making a dent, albeit small, in the python population.[91] While bounties are still one viable solution to help assist other eradication methods, they are not sufficient on their own.

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[84] *Id.*

[85] Steve Graff, *Researchers Look to Sex Pheromones to Trap an Invasive Snake*, THE SCIENTIST (July 1, 2018), https://www.the-scientist.com/notebook/-researchers-look-to-sex-pheromones-to-trap-an-invasive-snake-64341.

[86] *Id.*

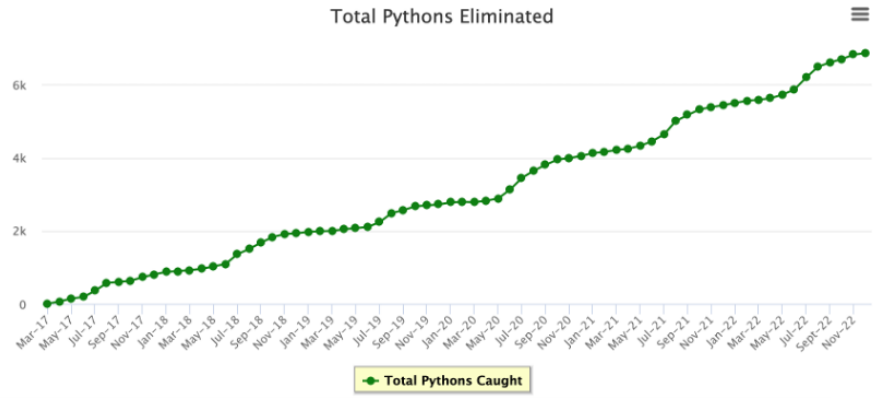
[87] *See generally id.*

[88] *See Hundreds of Burmese Pythons Removed During 2022 Florida Python Challenge®*, FLA. FISH & WILDLIFE CONSERVATION COMM'N (Oct. 20, 2022), https://myfwc.com/news/all-news/python-challenge-1022/.

[89] Sarill, *supra* note 20.

[90] Craig Pittman, *Florida's Python Hunt Promotes Politician, Fails to Eliminate Invading Reptiles*, GA. RECORDER (Aug. 4, 2022), https://georgiarecorder.com/2022/08/04/floridas-python-hunt-promotes-politician-fails-to-eliminate-invading-reptiles/.

[91] Sarill, *supra* note 20; *Python Elimination Program*, S. FLA. WATER MGMT. DIST., https://www.sfwmd.gov/our-work/python-program (last visited Jan. 18, 2023).



It is worth nothing that containment and eradication are both extremely difficult tasks to accomplish. Florida has put forth massive amounts of money and effort in the past towards containment with very minimal success. Containment is extraordinarily difficult to achieve; therefore, directing energy, money, and resources towards removal appears to be a more viable solution.

B. Educational Avenues for Eradication

In order to prevent the release of pet pythons, Florida must work to promote responsible pet ownership through education, limiting ownership, and providing proper disposal sites for unwanted animals. Clearly, it is too late to prevent the invasion of pythons; however, it is still extremely important to educate the community on dealing with the established species to understand their extent, behavior, potential ecological impacts, and how to remove them.

One possible solution would be devising responsible ways for owners to relinquish their pets, even if they are prohibited. This would involve protecting owners under these circumstances from legal repercussions. Florida already appears to be doing this with the establishment of an amnesty program that allows owners to surrender their exotic pets with no questions asked.[92] According to Stephanie Krug, a nonnative-species education and outreach specialist at FWC, people need to "make it as easy as possible" to turn in an animal.[93] So far, more than 6,500 animals have been turned over to the program, she says.[94] This program is similar to the amnesty program used in

[92] Fla. Admin. Code Ann. § 68-5.008 (2021).
[93] Daley, *supra* note 18.
[94] *Id.*

Hawaii, which seems to be highly effective.[95] Since Florida already has this program, the state should simply expand it. In doing this, outreach steps will need to be taken to alert the community of this program and its benefits.

Furthermore, as seen within Hawaiian culture, there must be some form of societal peer pressure to abide by these laws and to utilize this program in order to preserve the ecosystem of Hawaii.[96] Societal peer pressure can be seen through the news articles documenting the multiple turn over of snakes to the amnesty program upon their discovery.[97] The community in Hawaii seems to understand the detrimental effect these reptiles can have on their ecosystem and, thus, collectively holds the goal to ensure these reptiles do not establish themselves on Hawaiian soil.[98] There is an aspect of societal pressure holding these individuals accountable to report any snake sightings for the betterment of the island's ecosystem.

Hawaii's societal pressure component to its amnesty program is something Florida can use as a model. Florida can expand its amnesty program by educating the community on the impact of released pythons on the ecosystem, as well as the difficulties of owning and raising a python. This form of education will need to be easy to understand for the layperson. Maceda-Veiga's study recommends educating buyers of juvenile exotic animals about how large they will eventually grow [...]."[99] Individuals should also be educated on the effects pythons have already had on the ecosystem to ensure they truly understand the gravity of the problem.[100] In pursuing this expansion of education, ideally Florida's community members will begin to hold each other accountable with the knowledge they each hold individually.

C. Legislative Avenues for Eradication

In conjunction with both action-based and education-based efforts, legislation is a crucial piece to solving the python puzzle. Regulatory measures

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[95] *Id.*; *Amnesty Program*, STATE OF HAW. PLANT INDUS. DIV., https://hdoa.hawaii.gov/pi/pq/amnesty-program-2/ (last visited Dec. 2, 2022).

[96] *Cf.* Luciano Minerbi, *Indigenous Management Models and Protection of the Ahupua'a*, UNIV. OF HAW., https://www2.hawaii.edu/~aoude/ES350/SPIH_vol39/16Minerbi.pdf (last visited Dec. 2, 2022).

[97] *See, e.g.*, *A Dozen Illegal Animals Turned in in Two Weeks*, STATE OF HAW. DEP'T OF AGRIC. (July 18, 2011), https://hdoa.hawaii.gov/blog/news-releases/a-dozen-illegal-animals-turned-in-in-two-weeks/ (noting that twelve illegal animals were turned in during two weeks under the amnesty program in Hawaii); *California Kingsnake Turned in Under Hawaii's Amnesty Program*, STAR ADVERTISER (Oct. 3, 2019), https://www.staradvertiser.com/2019/10/03/hawaii-news/newswatch/california-kingsnake-turned-in-under-hawaiis-amnesty-program/ (reporting on a particularly important surrender under the amnesty program in Hawaii); *12 Illegal Reptiles Turned in to State in Recent Weeks*, STAR ADVERTISER (July 18, 2011), https://www.staradvertiser.com/2011/07/18/breaking-news/12-illegal-reptiles-turned-in-to-state-in-recent-weeks/ (noting the same twelve reptiles surrendered under Hawaii's amnesty law from another new agency).

[98] *See Amnesty Program*, *supra* note 96.

[99] Daley, *supra* note 18.

[100] *Id.*

are currently in place to prevent the spread of South Florida's Burmese python population. As of 2021, Florida legislators have put into place provisions targeted at the release of exotic snakes into the wild.[101] Further, in 2008, the Florida Fish and Wildlife Commission instituted regulations requiring permits to own or possess boas and pythons as well as tags implanted in the snake's skin for identification purposes.[102] This measure aims to prevent the introduction of snake species such as the Burmese python to other regions beyond South Florida.[103] Here, the exception allowing the ownership of pythons is only granted to those who acquired a python before 2010.[104] The implantation of microchips, similar to those used for dogs and cats, is an ingenious way to identify the pet's owner, thus curbing illegal releases. However, this requires that owners legally acquire their pets with a license, which does not always happen. Similar to the Arizona Animal Welfare Court, Florida should implement an ancillary court designed specifically to adjudicate wildlife cases such as ones involving Burmese pythons.[105]

Further, at the federal level, the United States Department of the Interior placed four additional species of snakes, including the Burmese python, under the Lacey Act provisions.[106] According to these provisions, importation of Burmese pythons to the United States is illegal as of January 2012.[107] Thus, Florida has federal support in advancing its goal. It is important to note that all the aforementioned legislation arose in reaction to the python issue, rather than proactively. Nonetheless, taken all together, these state and federal legislative efforts along with the action and education-based efforts will holistically aid in the fight to eradicate pythons completely.

CONCLUSION

No reliable alternatives exist except complete removal. As Burmese pythons spread along the southeastern coast, eating the mammal populations in Florida and causing danger of extinction, this problem has the potential to expand beyond Florida. Preventing the spread of these animals is an enormously challenging undertaking that Florida has grappled with for decades. Its fragmented, incomplete approach has yet to prove effective. At this point,

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[101] *Rules for Invasive Nonnative Reptiles*, FLA. FISH & WILDLIFE CONSER. COMM'N, https://myfwc.com/wildlifehabitats/nonnatives/rule-development/ (last visited Dec. 2, 2022).

[102] FLA. ADMIN. CODE ANN. § 68-5.006 (2021).

[103] LEROY RODGERS ET AL., 2010 SOUTH FLORIDA ENVIRONMENTAL REPORT 9-15 (2010).

[104] FLA. ADMIN. CODE ANN. § 68-5.007 (2021); FLA. STAT. § 379.372 (2010).

[105] Vanderpool, *supra* note 51.

[106] 50 C.F.R. §§ 16.15(a)(2), (a)(4)-(6) (2022); Injurious Wildlife Species, 77 Fed. Reg. 3330 (Jan. 23, 2012) (to be codified at 50 C.F.R. pt. 16).

[107] Injurious Wildlife Species, *supra* note 107.

Florida must take a more holistic approach in an attempt to eradicate the python population. While certainly a monumentally challenging undertaking, considering the effect this species is having on the ecosystem, it is at least worth trying.

To accomplish this, Florida must take a multifaceted approach. This will require a team of knowledgeable scientific experts working to attract male and female pythons for execution, which will in turn prevent any future reproduction. Bounty hunters should continue to be used as a means of ensuring "all hands are on deck" in executing the species. On top of this, Florida should capitalize on its amnesty program—taking note of Hawaii's success—by extensively educating the community to instill societal pressures to abide by the law. The enhancement of education will likely prove successful alongside the state and federal legislation prohibiting newly owned pythons, while allowing legally registered and microchipped pythons acquired before 2010, all of which can be heard and adjudicated in an Animal Welfare Court similar to Arizona's. Energy, resources, and money funneled towards this plan will be the most effective approach at restoring what remains of the Everglades. This python problem is entirely human-generated, and it will take the same human-generated efforts to solve it.

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