Burmese Pythons

An Invasive Species

Burmese Python wrapped around a tree. Public Domain.

Keywords

- Animal Rights
- Apex Predator
- Biodiversity
- Carnivore
- Common Property
- Ectotherm
- Eradication
- Extinction
- Humane Killing
- Institution
- Invasive Species

Chapter Menu

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Introduction

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Figure 1. Burmese Pythons have been classified as an invasive species

Since the dawn of humanity, man has always had pets. It started with the domestication of dogs around 20,000 to 40,000 years ago and has continued on since then (Botigué). Since then mankind has taken a great deal of many different pets. People enjoy having their pets and spending time with them or doing activities with them such as taking them on walks, playing with toys, or taking them out to parks to socialize with other pets and their owners. Pets have permeated many parts of society. Depictions of dogs have been found in early cave paintings, the Egyptians worshipped cats, mummified them, and the pharaohs were even buried with them so they could live on in the afterlife. Dogs and horses have accompanied men into war and have received medals for their contributions. This has been included in popular culture and widespread media, such as comic strips like Calvin and Hobbes and Marmaduke. Many people enjoy spending time with their pets such as walking their dog or cuddling with their cats. In fact, people enjoy the company of animals so much that 68 percent of households in the United States have at least one pet (Pet). In this day in age, almost any animal can become a pet. Through the dominion view towards nature, humanity has extended this to include animals that are not considered traditional pets and can vary from tarantulas and turtles to more exotic animals such as tigers or lions.

In 1997 Colombia pictures released a horror movie, *Anaconda*, starring Ice Cube and Owen Wilson. The movie takes place in South America where the protagonists are pitted against a giant snake and must fight for survival. These giant snakes, much like sharks, have elicited a sense of fear in humans for many ages. These reptiles have often been portrayed as fierce and terrifying forces of nature. Such movies as *Anaconda* and *Snakes on a Plane* have immortalized these creatures and made them infamous. The above films show them as the dangerous, although admittedly exaggerated, predators they are. A recent trend in exotic animals that people have more recently come to enjoy as pets are snakes. Snakes can be kept safely as pets and are harmless if certain cares and precautions are taken. They are considered exotic pets due to the fact that snakes cannot be domesticated such as dogs or cats.

When the owners of the unusual pets realize that their pet snake requires more work than a normal pet such as a cat or dog, they panic and the humans tend to do what they do with trash, simply throw it away somewhere and forget about it. The issue with trash is that it can pile up and have effects on nature and the ecosystem. The Burmese python is one

such animal that humans tend to simply "throw" away and try to forget about. This has caused a huge issue in the state of Florida where people have released their captive pythons into the Florida Everglades. The effect of this action has wreaked havoc upon the ecosystem there. The main reason that people choose to release these animals into the Florida Everglades is how tough they are to keep in captivity due to their inability to be domesticated like most other pets. People often acquire the Burmese python through black market means and are often ill-prepared and ill-informed on how to take care of them. Due to this lack of education and awareness, they believe that they can simply release the animals into the wild since it will be in nature and they believe the snakes will be fine. The owners will subsequently not have to worry about it or deal with them anymore and will just simply move on with their life and forget about it altogether. The problem with this approach is that these creatures come from a different part of the world and as such do not belong in the Florida Everglades' ecosystem. The Burmese python is an animal that is indigenous to Southeast Asia and has a habitat range from Myanmar to China to Indonesia (Burmese).

The Burmese python (*Python bivitattus* see Figure 1*)* is currently invading the Florida Everglades (Szalay). An illegal pet trade has led this species to invade the swamp land and wreak havoc on the wildlife. These reptiles are **carnivorous** and feed on a wide variety of animals. Their prey include mammals, birds, and other reptiles such as the alligator. The Burmese python, like the more famous anaconda, attacks and kills its prey by constriction, which is where the snake wraps its body around its prey and squeezes the prey's body until it dies. The python then swallows its prey whole. It does this by use of its special jaw which contains a special bone called the quadrant bone which allows it to be multi-hinged and swallow the prey whole (Sartore). These **ectothermic** reptiles are able to grow up to 25 feet in length and can weigh up to 300 pounds (Burmese). One interesting fact about the Burmese python is that it is an excellent swimmer and can climb trees. However, once they reach adulthood they stick mostly to the ground. These highly agile predators hunt through chemical receptors in their tongues and heat sensors along their jaws. Their vision is quite poor so they rely on these two senses for survival and catching prey (Sartore). The Burmese python typically lays its eggs every two years and they lay around 40 eggs at a time (Szalay). In their native habitat, these reptiles are considered to be quite vulnerable due to being hunted for their skin (Burmese Rock).

Carnivore: an animal that feeds on flesh

Ectotherm: a cold blooded animal that cannot regulate its own body temperature internally. It requires an outside source to warm up, such as the sun

This fearsome predator that has been released into the Everglades, has little to no competition when it comes to catching prey for survival, and it has been known to target and kill some alligators. A new animal introduced into the delicate ecosystem can have a huge impact on the wildlife ecosystem and can disturb the natural order of it. The Burmese python is considered to be an invasive species in the Florida Everglades due to how they are impacting the local ecology and also the food web.

In this chapter, we will explore a short history of the Burmese python's existence and effect on the Everglades of Florida. Furthermore, we will explore how the illegal pet trade has caused a rise in these animals in an unnatural habitat, the risks and hazards they now pose in their new habitat, the ethics involved with the killing and handling of these reptiles, and how the institutions and commons management of the species of the Burmese python is.

Short History

The problem of Burmese pythons in the Everglades is a relatively new one, as they have only appeared in the region in the last few decades (Walsh 2015). Burmese pythons are considered an apex predator, meaning they have no natural predators and are at the top of the food chain. The swampy environment of the everglades is perfect for the pythons to thrive in away from their natural habitat. The USGS categorizes them as an invasive species, meaning that they are not native to southern Florida but were introduced here by humans. Their rapid spreading across the Everglades has caused many problems for the delicate ecosystem. One such issue is the drastic decline of the local mammal populations. Dealing with these invaders has the National Park Service looking everywhere for a solution; they have even started hiring professional snake hunters.

Just how Burmese pythons were introduced to the Everglades is still up for debate, but there are a few prevailing theories. Many believe that they were kept as pets by the people living in south Florida, but then released into the swamps when they grew too big. Others believe that they were accidentally released into the wild during the devastation of Hurricane Andrew in 1992. If this is the case how did a few pets being released into the wild grow into the populations we see today? Well for starters, pythons are incredibly hard to track, as they camouflage well, do not require a lot of food, and are very adaptable. They also hatch their eggs in clutches ranging from 8-100 eggs per birth (Willson et. al). Numbers like this make it easy to understand how the population has grown exponentially since the 1990's. Based on population densities in India, the Burmese python population in the Everglades National Park is estimated to be around 30,000 (Wilson et. al). While there are examples of invasive snakes taking over an area, these are normally small islands, not large areas like the Everglades. Research suggests that

Intentional release of large numbers (100–1,000) of pythons is unlikely given the high value of these snakes and lack of motivation for a large scale release. Moreover, accidental release (e.g., resulting from hurricanes or other natural disasters) of large numbers of founders from reptile breeder/importer facilities in southern Florida is inconsistent with the spatial and temporal pattern of pythons captures in the region (Willson et. al).

While the original cause of the python's establishment in the Everglades can never be fully proven, we can still make educated guesses, "We conclude that the most parsimonious

scenarios for establishment of pythons in the region involve the release of a relatively small number of founders in the southern portion of the Everglades prior to 1985" (Willson et. al). Although the date of 1985 doesn't match up with the increase in sightings during the 1990's, this is explained by the python's low detectability.

Like all invasive species, the Burmese python can cause some serious damage to an ecosystem that is not prepared for it. Swamps and marshes are especially delicate ecosystems as well, so the introduction of a new apex predator can be devastating. They have already wiped out a few native species and decimated several others. Most ecosystems are delicate and can be easily disrupted, even without the introduction of a new apex predator. Burmese pythons have already left their mark on the Everglades, and perhaps done irreparable damage to its food chain. For example, the marsh rabbit is native to the Everglades but has been nearly hunted to extinction in the last decade, the time period in which python sightings have become much more common (Walsh). These rabbits are not the only creature to have its population decimated by predation. "In a 2012 study, populations of raccoons had dropped 99.3 percent, opossums 98.9 percent, and bobcats 87.5 percent since 1997" (USGS). It appears, through the road surveys involved in this study, that it might already be too late to stop this epidemic, as Burmese pythons have a permanent mark on the Everglades.

While these pythons have already done considerable damage to the Everglades delicate ecosystem, we can still try to stop them from completing disrupting the food chain, as well as stopping them from spreading outside of South Florida. One such effort is snake hunting, the state wildlife agency has already sponsored hunts like these to try and get a handle on the problem. The Florida Fish and Wildlife Conservation Commission is the agency behind this hunt, as they held a contest to see who could catch the most pythons in an attempt to see which method was most effective (Fears). The Fish and Wildlife Conservation Commission is not the only organization trying to combat this problem, the South Florida Water Management District has already hired professional hunters. As discussed earlier, Burmese pythons can be incredibly hard to track, especially in a swamp or marshy environment. This is made clear by the fact that hundreds of hunters could only bag about 200 snakes in a span of two months (Fears). Killing the snakes has never been the issue, finding them is what is so difficult. So difficult in fact that the Fish and Wildlife Conservation Commission sought outside help, hiring two professional snake hunters all the way from India. This strategy seems to work as the two men have already caught as many snakes in two weeks as others did in a month (Fears). These two men, from the Irula tribe arrived with two translators to help locals learn new techniques in tracking and killing pythons (Rozsa). The Irula are renowned for their snake catching abilities, but two of them cannot stop the problem by themselves. Floridians have even taken to training dogs to help track the snakes. So far not many of the techniques employed by these Florida organizations have been effective.

Regardless of how they got there or how their population exploded, it is clear that Burmese pythons present several risks and hazards to the south Florida region. Since the problem was created by humans one should ask the question "Is it our responsibility to remove these snakes or have we disturbed the Everglades enough"? One would hope that organizations in Florida will approach this problem with an open minded view and do what is best for the Everglades ecosystem and not just what is best for the people of south Florida. However, there is a cause for concern as very few people are qualified for such a dangerous task, and regulating who gets access to the Everglades to hunt these pythons will prove difficult as people will try to take advantage of the situation. There is also the concern for tourists, as many people from across the country flock to the Everglades to see the wildlife that lives there. Will tourism still generate money for the state of Florida if its famed wildlife is wiped out by an invasive species that most people would not want to see up close in person? Some people still keep Burmese pythons as pets even though they have seen the damage that has been done. So what can be done to prevent this problem from getting any worse before we make it better?

Ethics

The state of Florida has seen in the past 15 years a dramatic increase in a snake known as the Burmese Python. The Burmese Python is one of the largest snakes in the world and records show that some can grow up to 20 feet in length. This phenomenon has happened in a region that is special to Florida known as the Everglades. The Everglades are a swampy, grassy environment that is home to numerous kinds of animals and plant life. The number one predator in the Everglades has historically been alligators, but ever since the invasion of the pythons, they have now become the number two predator. Experts believe that the root cause of this invasion is two fold. First, they believe that people who kept Burmese Pythons as pets released them out in the wild once they got too big to take care of and manage. As babies, these pythons only need one to two rats every two weeks. But as they get old and more mature, their eating necessities increase, obviously as well as their bodies and sheer mass size. Once they got too big to take care of, the owners would just release them in the Everglades so they wouldn't have to take care of them anymore. Once this happened, they were able to mate and one female Burmese Python can lay up to 100 eggs at a time. Another reason why this has become an epidemic is because of Hurricane Andrew back in 1992. Once the hurricane hit Florida, all of the python shelters were swept away by the hurricane, releasing hundreds of pythons into the wild and eventually, they made their way to the Everglades.

The Everglades are a perfect environment for the pythons to breed. The swampy marshes provide excellent conditions for the pythons to thrive. In addition, the pythons have a perfect food source with the abundance of prey. However, with the phenomenon that

has taken place and with pythons reproducing at the rate that they are, they have caused many societal and environmental problems that the state of Florida has taken measures to address. With the extravagant increase in pythons comes the exponential decrease in their prey, which in turn throws the equilibrium of the natural food chain off and disrupts the natural processes of the Everglades. The question then becomes how do we manage the python population without crossing any ethical boundaries. Back in 2013, the Florida Fish and Wildlife Conservation Commission sponsored an event called the Python Challenge Contest where they urged hunters to kill the most amount of pythons they could and the winner gets a $1,500 price and the hunter to kill the longest snake earns a $1,000 prize (Stapleton, 2013). In the beginning of the contest, the preferred way to kill a python was by decapitation - cutting off the head of the snake. However, animal rights activists have urged and protested that this is not a humane way to kill the snake because they say that this leaves the snake in pain and in agony for up to an hour. They are urging hunters to change the way they kill the snakes and use a gun to shoot the snake in the head (See Figure 2). This will eliminate the agony and kill the snake instantly. **Humane killing** is a term used to describe the most ethical and effective way to kill an animal while reducing the amount of time the animal is in anguish. This ethical term is especially relevant pertaining to the python situation in Florida because many animal activists have complained that the current way the hunters are killing the snakes is not humane and that change needs to occur. According to the rules in the Python Challenge, the hunters have an "ethical obligation," to euthanize the snakes in a humane way (Stapleton, 2013). Another ethical issue is the fact that we humans were the main factor that caused this invasion to happen, so is it really fair to now be killing these pythons in large efforts in the first place? Due to human selfishness, pet owners of these snakes practiced irresponsible pet ownership and instead of giving the snakes to breeders once they got too big to own in a home, the owners just released them into the wild after they didn't want them anymore, taking the easy way out. On the other hand, the breeding shelters getting destroyed by Hurricane Andrew is not necessarily a human caused issue, but many pythons were still released into the wild. So is it ethical to kill as many pythons as possible when in reality we are the ones responsible for their population increase in the first place. As humans, we are obviously responsible for how we manage animals. It is to say that we cannot expect an instinctive species to be released into the wild and not try to survive and reproduce as they naturally do. As a consequence of our own human behavior, we now have an invasion of pythons in the Everglades. But since it is a problem that we created, is it right to fix our problem by killing the exact species that we released into the wild? That is where animal rights has to be thought about and determined. **Animal rights** is defined by the rights believed to belong to animals to live free from use in medical research, hunting, and other

Humane Killing: The most ethical and effective way to kill an animal while reducing the amount of time the animal is in anguish

Animal Rights: The rights believed to belong to animals to live free from use in medical research, hunting, and other services to humans

services to humans. Since we are killing the pythons, this ethical dilemma would be broken. So in reality, is it really our ethical duty to decrease a python population that we ourselves created? Is it fair to the snakes?

"15 Foot Long Python" by Michael Freifeld is licensed under CC BY-NC-ND 4.0

Figure 1. Two python hunters display a large python that they caught

Burmese Pythons are very illusive and hard to spot. In addition, many are afraidto go anywhere near them. What are some ways the Florida Wildlife Management could reduce people's fear of the snakes? In addition, there has been debate as to what the most humane ways to eradicate the pythons are. Is trying to eliminate the python population humane? If so, what techniques would constitute as humane in order to eliminate the Burmese python population? What other ethical issues do you think arise when determining how to manage the Python population in the Everglades?

Risks and Hazards

When it comes to the growing problem of the invasive Burmese Python in the Everglades National Park, an important part to research is the risks and hazards that these snakes are causing to both themselves and the environment. There have been reports of these snakes being spotted in the Everglades since the early 1980's. What risks and or hazards have these Burmese pythons introduced to this area since they have began inhabiting the area? For example, Many mammals native to this area of Florida have been experiencing falling rates of population due to many of these animals falling prey to this predator, some species could even face **extinction**. After seeing these mammal populations fall many people want to try and stop this

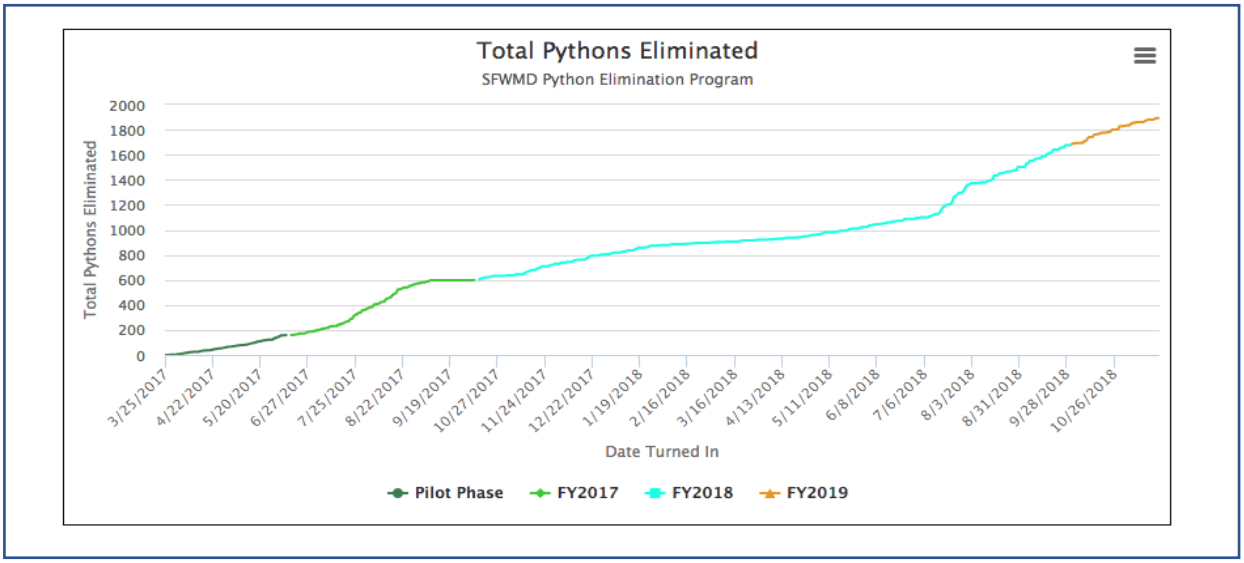
Extinct: (regarding a species) having no living members

Eradication: to remove or destroy utterly

problem from continuing, but **eradication** of the Burmese pythons after they have been in this land for so long, is nearly impossible.

To show how severe some mammals are struggling from the invasion of these pythons a study was conducted in the Everglades National Park in 2012, they looked at road surveys of both dead and alive animal sightings during 1996-1997, and compared that number to the road surveys from 2003-2011, and saw a dramatic drop in various animal sightings. The reason these specific time frames were selected was due to the belief that the pythons began "invading" the area around 2000, though there has been evidence of these snakes being in the park as early as the 1980's. The results of this study were very worrisome, it showed that observations of raccoon's fell by 99.3%, opossum fell by 98.9%, whitetail deer fell by 94.1%, bobcat fell by 87.5%, along with many other mammals that are on these snakes menu (Wilson, et al.). Although this study does not directly link the snakes to eating these animals, these animals are all a favorite meal for these snakes. When the population of raccoon's began to fall, it wasn't worrisome, during the 1980's the Everglades had a major problem with raccoon's. They caused many disturbances to many different visitors over the years, so much that the park even created a control program to limit these instances from continuing to happen, but there has been zero incident reported since 2005 (Wilson, et al.). This Example, along with many more, point fingers at the pythons for wiping out many small animal populations since the early 2000's.

Although some mammals are facing extinction due to the new food chain that was introduced when these snakes came into this area, it is far from the only risk of hazard these Burmese pythons pose to the environment. The biggest threat to their environment is their presence in general. Meaning, that the snakes have many effects on their surrounding environments both positive and negative, but the problem is how to successfully limit down this snake population so the natural food chain and balance of nature in the Everglades Park can recover permanently. Many efforts with various hunting techniques have been made from people around the world, but nothing is working as efficiently as needed. According to



"Total Pythons Eliminated" by South Florida Water Management District is licensed under CC BY-NC-ND 4.0

Figure 2. The python elimination program has eliminated over 1,800 Burmese pythons

the South Florida Water Management District (SFWMD), a new Python Elimination Program started in March 2017 with the hopes to take aggressive action towards the invasive snakes and eliminate them from the land by using a selected 25 hunters to eradicate this destructive snake and protect the park and surrounding areas. As of November 8, 2018, a little over a year after this program was implemented, 1,861 Burmese pythons have been removed from the area (see Figure 3). This program is still in effect, and this is a big step in relation to this growing problem and more actions like this one need to be taken if the park ever wants to eliminate the problem and keep it Burmese python free permanently (Python Elimination Program, SFWMD).

We have covered the risks and hazards the snakes pose to our environment, now let's look into the risks and hazards Burmese Pythons pose to humans. Many people associate a big snake with danger, but this is not the case in every circumstance. Burmese Pythons have never been known to be aggressive when it comes to human contact, but that doesn't mean this snake can't be dangerous. Over the course of 2003-2012, only 5 known cases of strikes on humans have been found in the Everglades National Park. All strikes were at biologists that were deep in the wetland areas, Burmese pythons are known to be most prevalent here, and only 2 of the 5 strikes resulted in a minor injury. No cases of constriction on a human were found. All 5 of the strikes were believed to be a mistake, not with the intent to prey on a human. Statistically this is promising, The Everglades National Park sees over 1,000,000 visitors each year, and not one visitor has been in harm's way (Reed, Snow).

It is important to keep in mind that this is not the only invasive species in the United States, the Burmese Python is such a noteworthy environmental problem right now due to the amount of snakes present in a specific area. Many actions are being taking both locally and nationally in order to control this issue the best we can before it is too late to save the Everglades Park. Efforts by the State of Florida have proven to work, and in the future more programs like the Python Elimination Program will be started. With these increased efforts of hunting, it is hoped that the native animals will be able to repopulate to natural levels and in turn see the ecosystem of the park repair itself with time. With increased amount of hunters and biologist studying the area and being deeper in the wetland areas of the park, it is important to keep in mind that these snakes are not known to be aggressive, but always take caution with any predator, especially when you are in their environment. This issue is more of a threat to our environment than anything else and if it is not taken care of in a timely manner we may lose specific animals to extinction, hurt the Everglades National Park as a whole, or even see this invasive species spread to even more dangerous levels.

Institutions and Commons

It is hard to estimate the number of Burmese Pythons that are present within the borders of the Everglades National Park since they are very illusive and easily camouflaged, but evidence strongly suggests that their population has grown to levels that threaten to

devestave the everglades ecosystem. Current estimates show their population in Florida to be around 100,000, and the presence of the ever growing population of pythons has had, and will continue to have, very significant consequences. The road surveys discussed previously in the short history section of this chapter reveal startling decreases in several rodent populations, including raccoons, opossums, white tailed deer, and bobcats. While we cannot use this information to directly infer that only a few percent of the respective populations are still living, it does strongly suggest severe population declines which results in reduced **biodiversity** as well.

Biodiversity: The total variability and variety of life forms in a region or ecosystem

This is significant for a couple of reasons. First, as rodent populations decline sharply as a result of the growing python population the "natural" food chain of the ecosystem is disrupted. Significant decreases in rodent populations leave many predators competing for few prey. This can cause population declines moving up the food chain and a domino effect could take place resulting in a radically altered, and perhaps unsustainable, ecosystem. Secondly, the python population could grow enough that they completely eradicate the species they have been preying on. This has severe consequences also as pythons will then be forced to seek out other food sources, and will extend their range into areas where the animal populations have not yet been exhausted. Many of these areas could be populated ones as well, and thus the risk for those living there would increase dramatically.

From these studies and the resulting consequences it is clear that it is important that the python population is kept under careful control. One question that arises is who is responsible for controlling the python population? Even though the Everglades National Park is owned by the United States government, it is still considered common property. Typically the regulation and management of **common property** is done collectively through discussions and decisions made among property users, but this is not the case for the Everglades. Being a national park, the National Park Service assumes the responsibility of managing the area and in enforcing area regulations and policies (What We Do (U.S. National Park Service), 2018). The question then becomes how can the National Park Service do this? In 2000 Congress approved the Comprehensive Everglades Restoration Plan (CERP) to come up with a plan for managing the south Florida ecosystem. This plan, with a price tag of about $10.5 billion, spans over 35 years and is the "largest hydrologic restoration project ever undertaken in the United States" (CERP). Even with this funding and extensive management systems put in place by the National Park Service the python population in the Everglades has continued to grow. A large factor in this is that an enormous amount of help is needed to capture the snakes. There are many authorized personnel that are working to capture and eradicate pythons inside of the everglades but access to the area is tightly controlled and restricted. This is beneficial in that it prevents harmful human activities from further degrading the ecosystem, but it appears to be

Common Property: A good or resources who characteristics make it difficult to fully enclose and partition

detrimental as well in that people are unable to enter the national park to assist in capturing the pythons.

Box 1: Would You Like Some Python on That?

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Figure 3: In some restaurants customers can add python as an additional topping on their pizza

One unique method that has been used to help to control the population of pythons has been to entice people to add them to the menu at their restaurants. One example of this is with *Evan's Neighborhood Pizza* in Fort Myers, Florida. In this pizza shop they offer a meal called "Everglades Pizza," which is topped with python, alligator, frog legs, and swamp cabbage (Restaurant's). If restaurant owners could make money off of customers eating pythons then many more pythons might be captured and killed. Very few restaurants still serve python, however; as research has shown significant levels of mercury in pythons. Some questions remain as to why pythons have such high levels of mercury, but it is thought that a large contributor is from the area's high moisture content that promotes tall thunderstorms that can mix with mercury present higher in the atmosphere. The Everglades in general have pretty high levels of mercury as a result. This mercury can also end up in pythons via the food chain. The mercury brought to the surface by rain and other water sources can be absorbed by plants. Animals then eat these plants or drink the contaminated water bring the mercury into their system. Pythons eat essentially whatever they can find and as a result they absorb more mercury. As a result of this mercury content many are afraid to eat them or even sell them and thus one way of reducing the population has essentially disappeared.

In parts of Florida adjacent to the Everglades people are able, and even incentivised to capture and eradicate pythons. The Python Challenges, mentioned in the ethics section of this chapter, captured 68 pythons in 2013 and 106 pythons in 2016. In 2013 a majority of the pythons caught were non-reproductive males (Mazzotti, 2013). In order to most effectively limit the python population growth you need eliminate more of the reproducing females. While these catches are valuable they fall dramatically short of solving the problem as there are tens of thousands of more pythons in the area. The 2016 Python Challenge was the last one to occur, and it was replaced by the South Florida Water Management District's Python Elimination Program in 2017. This program has captured and killed over 1800 pythons since early 2017. These numbers would likely be higher if participants were allowed to enter the national park boundary to capture the pythons.

"Everglades National Park" Courtesy of the National Park Service is licensed under CC BY-NC-ND 4.0

Figure 4. The boundaries of Everglades National Park are well defined, but cover a large amount of land

Easing access regulations is tricky and must be done with caution. For example, if the policy was changed so that anyone was able to access the national park, then you would have enabled python hunters to gather many additional pythons, but at the same time you will have opened the door for people to enter the park and abuse its resources or cause ecological harm. Therefore, there must be a middle ground between open access and highly restricted access. This could be accomplished if python hunters, and other approved personnel, were able to enter the parks boundaries. A problem that might arise here is in how to assure that only approved python hunters enter the park? Perhaps an even better solution is to allow approved python hunters to access the everglades but only with the escort of a member of the park management team. This would help to eliminate trespassers in that anyone seen in the park without an escort would be there against the park's policy. An added benefit of this is that if the hunter gets injured while in the park the park management member would have the ability to quickly contact personnel for medical treatment and transport. Still another issue arises here. The Everglades National Park is very large, approximately 1,542,526 acres (Everglades), and while it has defined boundaries, as shown in Figure 4, it is hard for the park management team, to monitor the

entire area. One could argue here for the addition of personnel to monitor the park and its boundaries, but with that comes an added cost with little benefit. Each of those workers would have to be paid, and even if a significant number of monitoring personnel were added there would still be many holes in the monitoring, because of the size of the park, and monitoring would not be continuous. This issue might be better resolved by using an automated monitoring system including cameras. The initial costs of this may be higher but it enables continuous monitoring and the ability to review previous footage. This would help greatly in ensuring that only approved python hunters enter the area.

Finally, We have talked a lot about how to remove and eradicate pythons currently living within the everglades, but an additional factor to consider is how management can prevent any additional pythons from entering the park to begin with. With a ban on imported pythons and a much weaker desire for people to own a python now than in past years, the risk of pythons escaping from their enclosures is significantly less than it was a decade or two ago. Nonetheless it is important to insure that no addition pythons are allowed to add to the problem. Since the pythons that now flood the everglades populated from pythons once owned as pets, a crucial step in preventing future python additions is to educate python owners of the affects a loosed python can have on the surrounding environment. Thankfully the Python Challenge and the Python Elimination Program have greatly increased awareness of the issues pythons cause. There is hope that soon the python population will be brought to a manageable size and that the everglades ecosystem will be able to adjust again to to a more natural state. Without the complete elimination of pythons and the restoration of the numerous animals that have been killed by the pythons, the everglades will never fully be restored to its former condition, but ultimately a balanced and sustainable ecosystem, one in which an unnatural but sustainable python population is present, is an excellent goal to strive for.

The Burmese Python Puzzle

In this chapter we learned that:

- An animal that starts as being domesticated can easily turn into an invasive species.
- Burmese Pythons are such a big threat because they are hard to detect and even harder to kill.
- Their populations have exploded because they are an apex predator.
- The ethical dilemma in the Everglades National Park pertains to the method of reducing the python population.
- Python Elimination Program is a step in the right direction that recruits hunters to help limit down the populations, this program has killed 1861 pythons and counting.
- If the correct steps aren't taken in the future to fix this invasion of these snakes we could see other animal species face extinction.

- Dealing with the Burmese Python is problematic because not just anyone is capable of hunting these large snakes in their own preying grounds.

The Burmese Python problem is here to stay unless drastic measures are taken. How can Florida deal with this issue ethically, while also protecting the hunters themselves? Can the pythons even fully be removed from the Florida Everglades? How can the Florida Fish and Wildlife Conservation Commission better improve their handling of the situation?

The puzzle of the Burmese python is complex and involves a lot of moving parts. In order to move forward these issues must be solved. Furthermore this should be studied and looked at by other states so they can avoid any future potential problems with invasive species of their own.

Exercise 1

Burmese pythons are responsible for the decimation of several local species, list a few of these creatures and determine whether or not their diminished population is due to the introduction of pythons into the area. Are some of these species more important to the ecosystem than others? If so, how do the pythons impact these keystone species? Are burmese pythons the only invasive species causing damage to the Florida Everglades? List the other species. Burmese pythons are considered extremely dangerous, even to humans. What makes them so dangerous and why should the people living near the Florida Everglades be concerned?

Exercise 2

The illegal Burmese python pet trade has had many negative impacts on the environment in the Florida Everglades. The illegal pet trade also entails owners who abandon their pet snakes in the everglades as they do not know how to properly take care of the animals. Can you think of any other animals that are illegally trafficked in the pet trade? What about animals that get dumped or abandoned and how this affects the environment and native species around them? The burmese python is a species that in its native habitat is listed as vulnerable, can you think of any other animals that are threatened currently that are illegally exploited?

Exercise 3

Burmese Pythons are very illusive and hard to spot. In addition, many are afraid to go anywhere near them. What are some ways the Florida Wildlife Management could reduce people's fear of the snakes? In addition, there has been debate as to what the most humane ways to eradicate the pythons are. Is trying to eliminate the python population humane? If so, what techniques would constitute as humane in order to eliminate the Burmese python

population? What other ethical issues do you think arise when determining how to manage the Python population in the Everglades?

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