



LESSON TITLE: The Python Problem

GRADE LEVEL: 9-12

TIME ALLOTMENT: Two or three 45-minute class periods

OVERVIEW: Using segments from the PBS series *Nature* episode, *Invasion of the Giant Pythons*, students will explore pythons and their impact on other species. In the Introductory Activity, students will learn about python digestion and unscramble photos illustrating a python's digestion of prey. In the Learning Activity, students will learn how pythons have migrated to new environments and the dangers they pose to other species. Students will learn how invasive species, such as pythons, can threaten native species. In the Culminating Activity, students will learn about the Key Largo woodrat and ways scientists are trying to protect the species from pythons. Students will then explore a native species in their own region and create a presentation about the species, how it is being threatened, and efforts to protect it.

SUBJECT MATTER: Science

LEARNING OBJECTIVES:

Students will be able to:

- Explain where pythons live and how they have moved from one environment to another.
- List python prey and discuss the process by which pythons capture and digest food.
- Describe dangers pythons pose to native species.
- Discuss efforts to rescue the Key Largo woodrat and the reasons why scientists are launching these efforts.
- Discuss one endangered or threatened local species and efforts being taken to help that species.

STANDARDS:

National Science Education Standards

http://www.nap.edu/catalog.php?record_id=4962

Grades 9-12:

Content Standard C: Life Science

Fundamental concepts and principles that underlie this standard include:

- **The Interdependence of Organisms**
 - Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.
 - Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.
 - Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human



destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.

MEDIA COMPONENTS

Invasion of the Giant Pythons, selected segments

Clip 1: Dinner Time

An overview of how a python captures and digests its prey.

Clip 2: It's Raining Pythons

A close look at how pythons have entered new environments

Clip 3: Beware: Pythons

A description of the dangers that pythons pose to other species.

Clip 4: Saving the Rats

A look at efforts to protect the Key Largo woodrat from pythons.

Websites

○ **Invasion of the Giant Pythons/ Photos:**

These pages on the *Nature* website illustrate the process by which a python digests its prey. These images can be used in the Introductory Activity.

● **Python digesting an alligator**

<http://www.pbs.org/wnet/nature/episodes/invasion-of-the-giant-pythons/photos-python-digesting-an-alligator/5547/>

● **Python digesting a rat**

<http://www.pbs.org/wnet/nature/episodes/invasion-of-the-giant-pythons/photos-python-digesting-a-rat/5554/>

○ **US Fish and Wildlife Endangered Species Program**

<http://www.fws.gov/endangered/>

This website includes a variety of information about endangered species. The “Species Search” page (<http://www.fws.gov/endangered/species/>), used in the Culminating Activity, features a US map where visitors can locate endangered plant and animal species throughout the country.

Optional (for research in Culminating Activity):

○ **The Comprehensive Everglades Restoration Plan**

<http://www.evergladesplan.org/index.aspx>

This website includes a variety of information about the Everglades, including facts about plants and animals: http://www.evergladesplan.org/facts_info/sywtkma_animals.aspx



- **California Department of Fish and Game/ Invasive Species Program**
<http://www.dfg.ca.gov/invasives/>
This website contains information about invasive species in California and efforts being taken to reduce their negative effects on native species and environments.
- **South Florida Natural Resources Center/ Everglades National Park: Natural Resources Management/ Burmese Pythons**
<http://www.nps.gov/ever/naturescience/upload/PythonFactSheetHiRes.pdf>
This fact sheet provides detailed information about Burmese pythons and efforts underway to monitor and control the python population.

MATERIALS

For the class:

- Computers with internet access
- Computer, projection screen and speakers (for class viewing of online/downloaded video segments)
- One copy of the “Python Digestion Game Answer Key” (download [here](#))

For each pair of students

- 1 copy of the “Python Digestion Game” (download [here](#))

PREP FOR TEACHERS

Prior to teaching this lesson, you will need to:

Preview all of the video segments and websites used in the lesson.

Download the video clips used in the lesson to your classroom computer(s) or prepare to watch them using your classroom’s Internet connection.

Bookmark any websites that you plan to use in the lesson on each computer in your classroom. Using a social bookmarking tool such as del.icio.us or diigo (or an online bookmarking utility such as portaportal) will allow you to organize all the links in a central location.

Print out one copy of the “Python Digestion Game” for each pair of students. If desired, cut the cards along the dotted lines prior to the class and paper clip each set of 6 cards together. If you do not pre-cut the cards, provide students with scissors to cut out the cards themselves.

Print out one copy of the “Python Digestion Game Answer Key.”

INTRODUCTORY ACTIVITY

1. Explain that during this lesson, students will be learning about pythons and the threats they and other non-native species pose to native species. Ask students to brainstorm what they know about pythons. Write down students’ answers in a central location where the class can review them later. (*During the discussion, ask students whether or not they think pythons are poisonous. Ask students to brainstorm how they think pythons get from one environment to*



another, as well as to hypothesize what they think pythons eat.)

2. Distribute the “Python Digestion Game Cards.” Explain these cards illustrate the process by which a python digests an animal. Challenge students to place the cards in order from the 1st day after feeding to the 6th day after feeding, and to identify the animal being digested.
3. Once the students have finished the task, ask students what animal is being digested. (*An alligator.*) Using the “Python Digestion Game Answer Key,” reveal the order of the photos from the 1st day after feeding to the 6th day after feeding. [*Correct Order: C (1 day after feeding), A (2 days after feeding), E (3 days after feeding), B (4 days after feeding), F (5 days after feeding), D (6 days after feeding).*] If desired, project the following page on a screen to illustrate the correct order to students:
<http://www.pbs.org/wnet/nature/episodes/invasion-of-the-giant-pythons/photos-python-digesting-an-alligator/5547/>
4. *Optional:* Project the following images of an alligator digesting a rat and discuss them with the students: <http://www.pbs.org/wnet/nature/episodes/invasion-of-the-giant-pythons/photos-python-digesting-a-rat/5554/>
5. FRAME Video Segment #1 “Dinner Time,” explaining that the students will now see a video segment illustrating the process by which a python captures and digests prey. Provide a FOCUS, asking students to observe the process by which the python digests its food.
6. PLAY Clip #1. After playing the clip, FOLLOW UP by asking students to describe the process by which the python digests its food. (*The python uses powerful stomach acids- hydrochloric acid and the enzyme pepsin- to completely dissolve a meal. The prey is passed from the esophagus to the stomach. After the meal has been broken down in the stomach, the remains are passed along to the small intestine. It takes about 6 days for a python to completely digest an alligator or a rat.*).
7. Review the list that the class compiled earlier about the python. Modify the list based on the information learned in this clip. (*Some information to include in the list: The python is not poisonous. Pythons eat a variety of prey, including alligators, mice, rats, squirrels, rabbits and raccoons.*)

LEARNING ACTIVITY

1. FRAME Clip #2, “It’s Raining Pythons” by explaining that pythons are originally from Asia, but now there are thousands of pythons in Florida. Ask students to brainstorm how they think snakes might have ended up in Florida. (*Accept all answers.*)
2. Provide a FOCUS for Clip #2 by asking students to list two factors contributing to the increased number of pythons in Florida.
3. PLAY Clip #2. After the segment, FOLLOW UP, by asking students to list factors that have contributed to the increased number of pythons in Florida.
Possible answers:



- *Pythons have arrived in Florida, via airplane, including 140,000 wild caught pythons shipped to Florida within the last 4 years.*
 - *People who had pythons as pets have released them into the wild.*
 - *Snakes have escaped from animal warehouses when the warehouses were hit by hurricanes.*
 - *Snakes have used the waterways in Florida as a means to travel to migrate to the interior of the state.*
4. Ask students to brainstorm how this invasion of pythons might impact species native to Florida. (*Accept all answers.*)
 5. FRAME Clip #3: “Beware: Pythons,” by telling students the next video segment illustrates some of the threats pythons pose to native animals. Provide a FOCUS by asking students to find at least three dangers pythons pose to other species.
 6. PLAY Clip #3. After the segment, FOLLOW UP with a discussion of the threats pythons pose to native species. (*Include the following information in the discussion: Pythons provide competition with native animals for food and space. They can spread disease and provide safety dangers to humans.*)
 7. Ask students to review the list they compiled earlier and revise it to include additional information that they now know about pythons. (*Items to include: Pythons are originally from Asia and have been released into the wild in the US by humans and by storms. Pythons can eat almost any animal, including pigs, rodents, deer, bobcats and birds.*)

CULMINATING ACTIVITY

1. FRAME the next clip by explaining that there are a variety of native species that could be endangered by the increased presence of pythons. One of the species at risk is the Key Largo woodrat. Provide a FOCUS for the next clip, by asking students to observe efforts underway to protect the Key Largo woodrat from pythons.
2. Play Clip #4 “Saving the Rats.” After showing the segment, FOLLOW UP by asking students to describe current efforts to protect the Key Largo woodrat from pythons. *Possible answers:*
 - **Traps:** *There is a network of more than 60 traps across Key Largo to trap pythons arriving from the mainland. Each trap includes a rat, which serves as a lure for the pythons. The python approaches, smells the rat, enters the cage and the flaps close behind it to prevent it from escaping. The python can’t get to the rat from within the trap. The trap is checked daily and trapped pythons are removed. Native animals, including native snakes, can exit through escape hatches. No pythons have been caught yet.*
 - **Breeding program:** *Disney’s Animal Kingdom and Tampa’s Lowry Park Zoo have created a breeding program to increase the woodrat population.*
3. Ask students why people are trying to save the woodrat. (*The Florida Keys is the only home to the Key Largo woodrat. The woodrat was first listed as threatened in 1969. Its population*

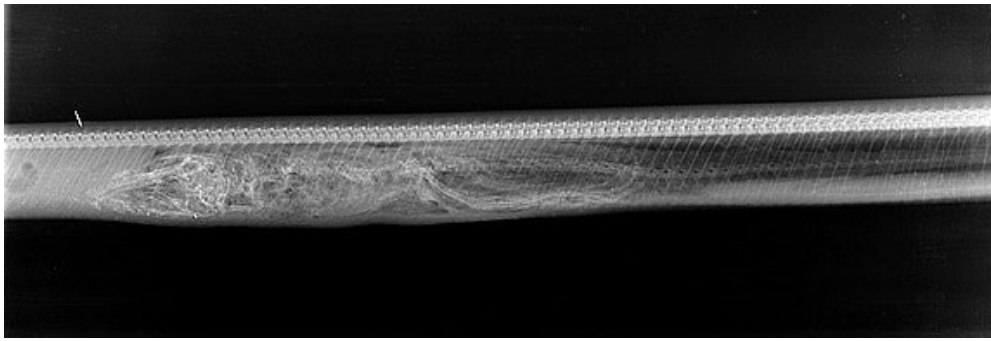


has decreased since then. Currently, fewer than 200 woodrats live in the wild.)

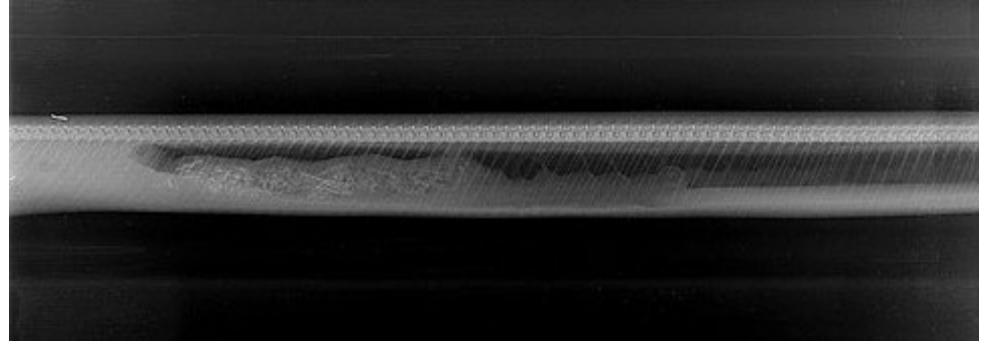
4. Explain that in the final activity for this the lesson, students will find out more about local endangered species.
5. Demonstrate how to use the US Fish and Wildlife Endangered Species Program’s “Species Search” map by doing the following:
 - Display the map: <http://www.fws.gov/endangered/species/>
 - Click on a state.
 - Scroll down the page to the lists of species. Click on one of the species labeled “E” (Endangered) or “T” (Threatened) to display additional information about that species.
6. Divide students into pairs and ask each pair to use the “Species Search” map to select a state (it’s fine for all students to select the same state). Ask each pair to explore the list of threatened and endangered species and to select one species. Ask students to conduct research about that species using a variety of print and online resources. Based on their research, students will create a presentation about the species, including basic information about the species and its native habitat, why it is threatened or endangered and steps, if any, being taken to protect the species.
7. Ask students to present their findings to the group. Lead a discussion about the various species the students have researched and current efforts being taken to protect threatened/endangered species.

Python Digestion Game

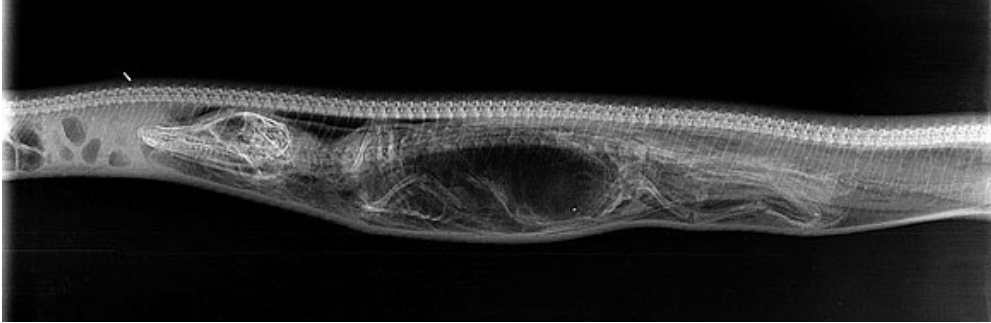
These images show a python digesting an animal over a six-day period. Cut out the cards below and see if you can place them in the right order and identify the animal.



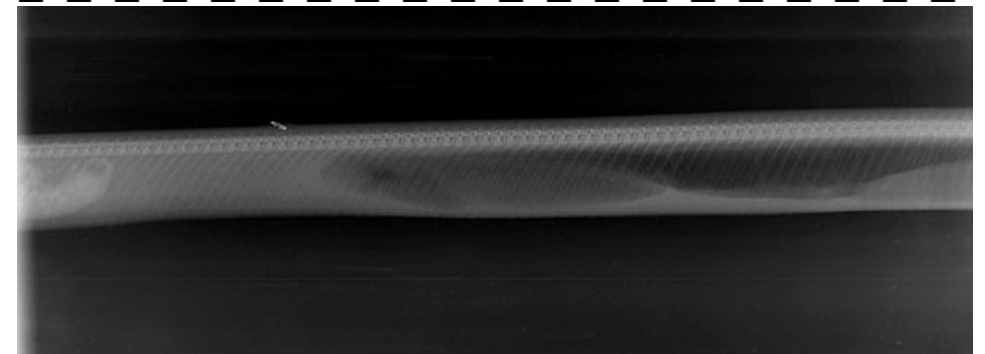
A



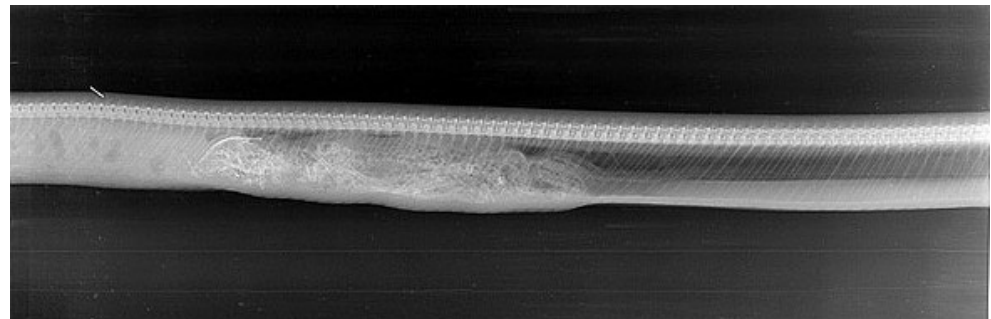
B



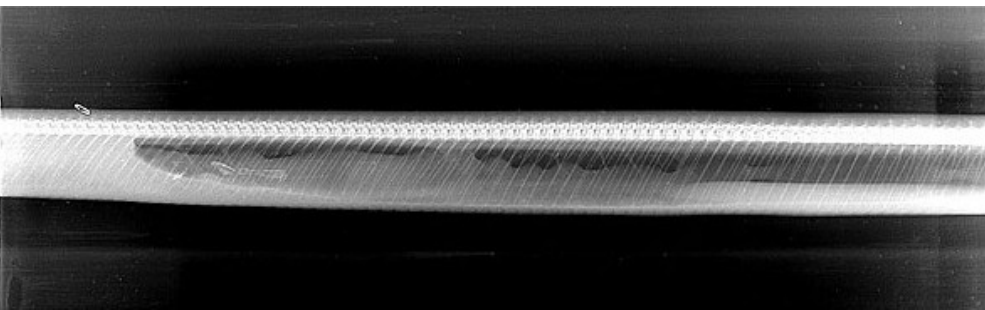
C



D



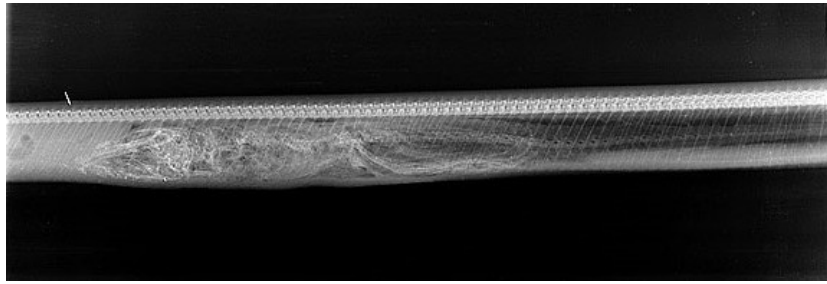
E



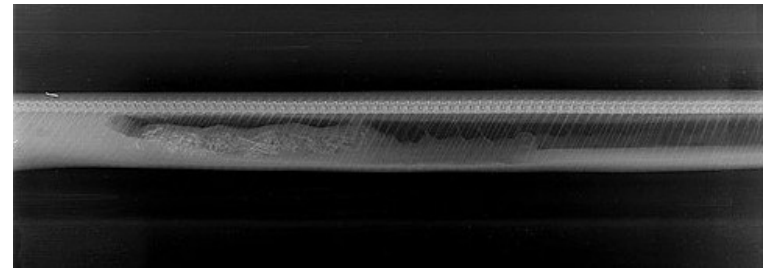
F

Python Digestion Game : ANSWER KEY

These images show a python digesting an *alligator* over a six-day period. The cards below are in scrambled order. See bottom of page for correct order.



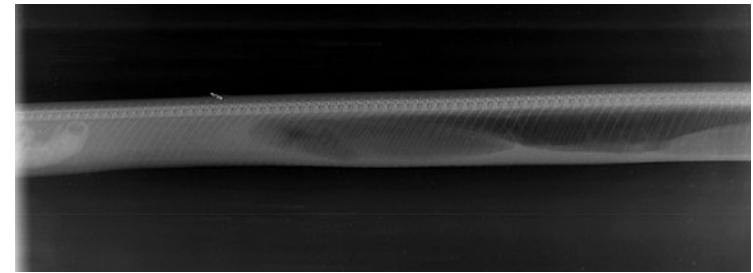
A



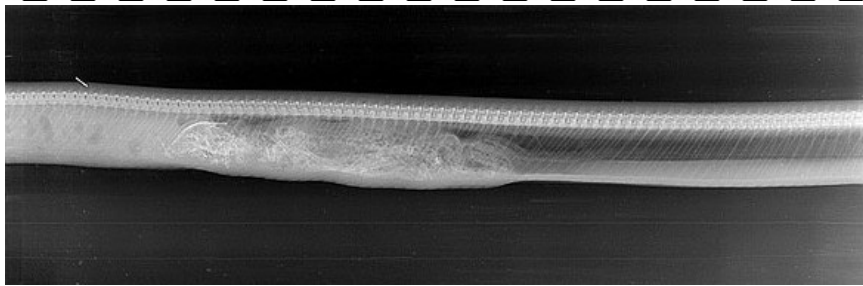
B



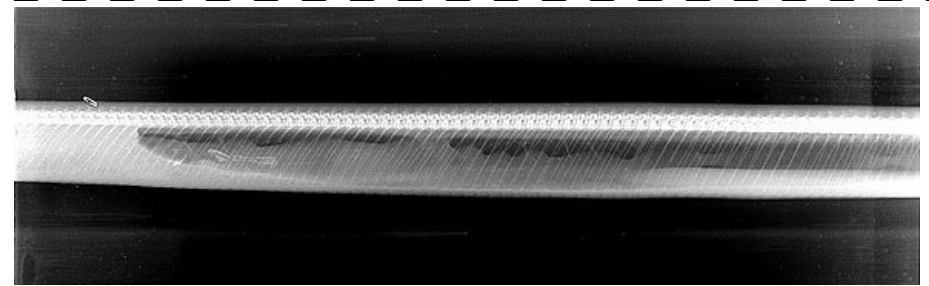
C



D



E



F

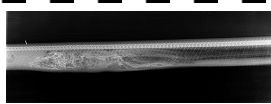
Correct Answers:

One day after feeding



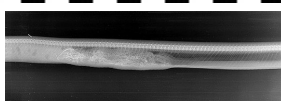
C

Two days after feeding



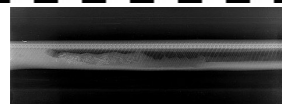
A

Three days after feeding



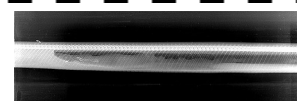
E

Four days after feeding



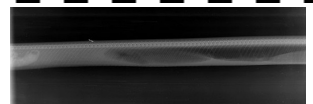
B

Five days after feeding



F

Six days after feeding



D