



## EnLET Educator Resources

# 20 Years Later: Where are Snakeheads Now? A Habitat Analysis Activity

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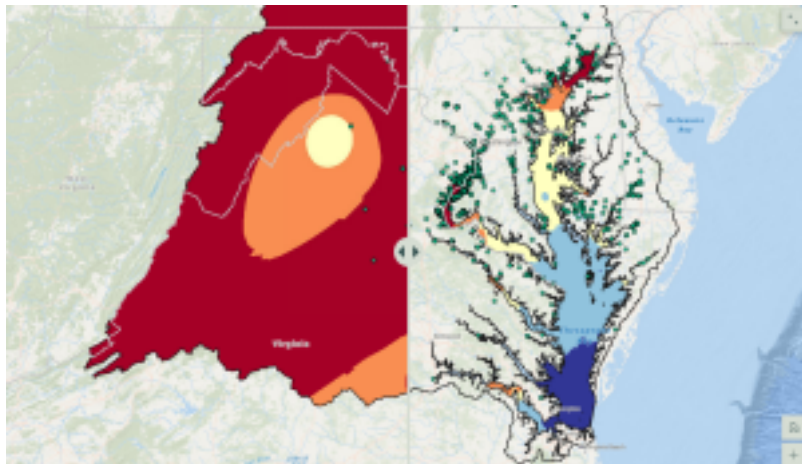
## I. Summary

**Grade Level** 9th-12th **Time Required** 30 min - 1 hour **Keywords** invasive species, mapping

### Lesson Overview Learning Objective

Since the introduction of the invasive snakehead fish in 2002, snakeheads have spread through the Chesapeake Bay like wildfire. Using the maps provided in this activity, students will make connections between water quality and the spread of the invasive snakehead. Mapping is a helpful tool for scientists studying habitat and animal movement; this activity will teach students to use maps to study snakehead habitat suitability.

Students will learn to read maps featuring four different water quality parameters: salinity, dissolve oxygen, turbidity, and pH. Each of these maps is overlaid with recent snakehead sightings (green points). Broadly, this activity will teach students to use multiple data sources to make environmental predictions. Specifically, students will learn about the spread of one of the most invasive species in the region. They will be challenged to hypothesize why snakeheads might be living in certain areas of the Bay over others.



## II. NGSS Linkages

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

## III. Preparation

### Teacher Preparation Steps

1. Using the [Snakehead StoryMap](#), familiarize yourself with the northern snakehead along with the environmental issues they present. Explore the maps at the bottom of the StoryMap (Activity 2), and get acquainted with the map features: zoom with the + and - buttons, click and pan with your mouse, and swipe between “Chesapeake Bay watershed” and “Chesapeake Bay only” views.



1. (Optional) Either pre-divide the class into groups, or have a plan for dividing the class into groups of two or more.
2. Print blank copies of the discussion questions included in this lesson plan. Alternatively, upload the questions somewhere that is easily accessible to students.

### Background Information

See: [Invasive Spotlight: The Northern Snakehead StoryMap](#) (This is Activity 2)

### Materials

Computers/iPads Writing utensils/paper

### Key Definitions

#### Invasive Species Watershed

A species that is introduced to a new area and causes harm to human, environmental, and/or economic health.

A large area of land that drains into a body of water, like the Chesapeake Bay. The rivers, streams, and creeks in the area collect water that runs off the land, which eventually flows into the

Bay.

### Dissolved Oxygen Turbidity

A measurement of the oxygen dissolved in water (the same way salt dissolves in water!).

Dissolved oxygen is measured in milligrams oxygen per liter water (mg/L).

### pH Salinity

A measurement of acidity. Low pH substances are more acidic (think: lemon juice). High pH substances are less acidic (think: milk). The pH of water ranges from 6.5 to about 9 standard units (SU).

A measurement of the cloudiness of water.

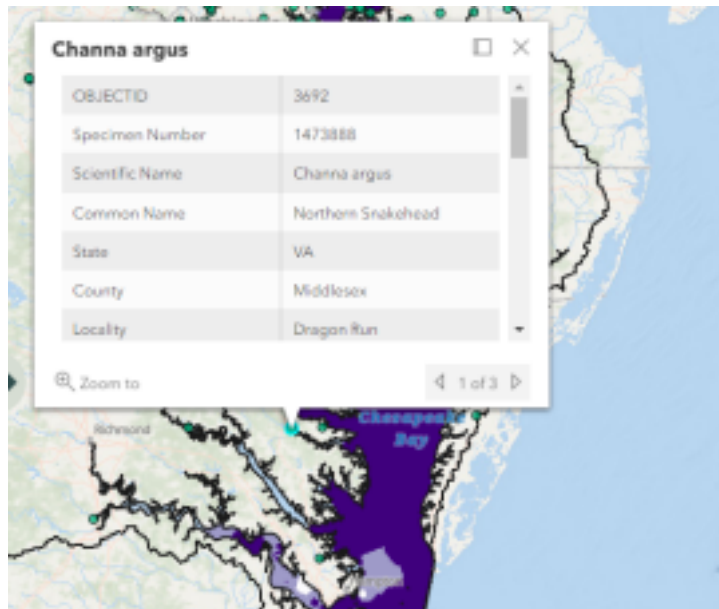
Clear water has a low turbidity, while muddy water has a high turbidity. Turbidity is measured in Nephelometric Turbidity Units (NTU).

### Step 1

A measurement of the salt dissolved in water. In other words, it's the "saltiness" of water. Salinity is measured in parts salt per thousand grams water, or parts per thousand (ppt).

## IV. Procedure

Give the class 15-20 minutes to explore the [Snakehead](#) short follow-up what makes invasive species and learn about their students are reading split the class into on the number of iPads you have



minutes to explore [StoryMap](#). Have a discussion about snakeheads and why it is important to spread. While over the StoryMap, groups depending computers and/or available.

### Step 2

Show students how to swipe between the Chesapeake Bay watershed view (left-hand side) and Chesapeake Bay only (right-hand side) views. Demonstrate how to use the zoom buttons and click on a sighting point to pull up information about individual snakehead fish. Point to how salinity, dissolved oxygen, turbidity, and pH change throughout the region. You can even zoom into your town - maybe it lies within the Chesapeake Bay watershed!

### Step 3

Allow time for students to explore the maps independently or in groups. Remind them to record answers

to the activity questions to prepare for a whole-class discussion.

## Step 5

Once groups are finished exploring the maps, draw their attention to the front of the class. Review the discussion questions as a class, and **talk about how maps are useful when studying invasive species and habitat suitability.**

## V. Discussion Questions\*

### Question 1 :

Based on the sightings map, do northern snakeheads prefer saltier or less salty waters?

### Answer 1 :

Most snakehead sightings have been reported in the freshest water range (below 1.5 ppt - red). There is also a large number of sightings in the near-fresh to slightly salty ranges, with next to none in the saltier water. This might mean that snakeheads are less tolerant of saltwater, or that they prefer prey that lives in freshwater.

### Question 2 :

Based on the sightings map, do northern snakeheads prefer waters with more or less dissolved oxygen?

### Answer 2 :

Snakeheads seem to prefer high (8.5-9.5 mg/L - light blue) dissolved oxygen, but they can survive in areas with even the lowest dissolved oxygen (below 6.5 mg/L - yellow). Remember those special air chambers that allow snakeheads to survive on land? Those chambers also help these fish tolerate low-dissolved oxygen water.

### Question 3 :

Based on the sightings map, do northern snakeheads prefer water that is clearer (low turbidity) or more murky?

### Answer 3 :

There is not as clear a pattern here, meaning some of the other parameters – like dissolved oxygen and salinity – probably outweigh turbidity when snakeheads are searching for new habitat. Snakeheads seem to be living in moderately clear (6-20 NTU - peach) and murky (20-317 NTU - bright orange) environments. Turbidity may not pose a barrier to the spread of snakeheads.

### Question 4 :

Based on the sightings map, do northern snakeheads prefer more or less acidic water?  
Remember: the lower the pH, the more acidic the water.

### Answer 4 :

The light purple areas, representing 7.3 - 7.7 salinity units (SU), which are more basic, host the majority of snakeheads in the Chesapeake Bay, although they can survive in other pH ranges.

### Question 5 :

Take a look at your answers to the previous four questions, and if needed, re-read the habitat section of the StoryMap. If you were to develop a plan to protect habitats from a future snakehead invasion, what types of habitats would you look for?

### Answer 5 :

You would first want to look for habitats with plenty of aquatic plants, since snakeheads love to hide in areas with high vegetation. Then, you would want to make sure the water quality matches what you know snakeheads prefer: the water should be nearly-fresh and somewhat murky with high to medium levels of dissolved oxygen and more basic pH.

### Question 6 :

Do you think the sightings data might be biased in any way?

### Answer 6 :

Most likely, yes. Many of these sightings are reported from coastlines, because people live on the coasts. It is unlikely that there are many snakeheads living in the middle of the Bay, but that number could appear lower on the map than in reality, because snakeheads in the middle of the Bay are less likely to be spotted.

\*These are just sample responses. Adjust based on your class discussion.

## VII. Resources

Snakehead StoryMap: [link](#)

Nonindigenous Aquatic Species Database: [link](#)

What is GIS? (Mapping Resource): [link](#)