



Lesson 4: Map the Invasion

Students map data and use maps to both tell a story and answer questions.

Intended Audience

Middle School

Students Will Be Able To

- Visualize data using maps
- Use technology effectively and efficiently
- Compare and contrast data
- Utilize online applications (optional)

Activities

- Dataset vs. map
- Map invasive species data
- Map observations
- Compare and contrast datasets and maps of invasive species reports

Estimated Time

3 class periods

Longer if using optional online mapping extension: Guided Practice ArcGIS lessons can take about 3 class periods

Standards Addressed

- | | |
|------------|-------------|
| NGSS | Common Core |
| • MS-LS2-1 | • SL.6-8.1 |
| • MS-LS2-2 | |

Ed-Tech

- 2.2.1
- 2.2.2
- 2.3.1
- 2.3.2

Introduction

Maps tell stories. They are a visual way to depict data that can help us find patterns and answer questions in ways that columns of numbers cannot. Students will map invasive species sightings data to learn an alternative data depiction technique and answer questions about invasive species.

Materials

- [Orange County Invasive Species Map](#)
- [Orange County Invasive Species Dataset](#)
- [Dataset vs. Map Questions](#)
- [Dataset vs. Map Answer Key](#)
- Class Invasive Species Data
- Paper
- Writing Utensils
- Colored Pencils
- Optional:
 - ArcGIS Online Resources:
 - o [Guided ArcGIS Online Practice Lessons](#)
 - o [Guided ArcGIS Online Practice Lessons Answer Key](#)
 - o Guided Practice ArcGIS Online Videos: [1](#), [2](#), [3](#), [4](#)
 - o [Orange County Practice Dataset](#)
 - o [ArcGIS Mapping Instructions](#)

Preparation

1) Read the **Teacher Notes** to familiarize yourself with invasive species. It is also ideal for students to have an understanding of what an invasive species is prior to this activity. You can use our PowerPoint presentation from **Lesson 1: What is an Invasive Species?**

TED-Ed also has two introductory videos for a brief alternative introduction or review:

“The Threat of Invasive Species”:

https://youtu.be/spTWwqVP_2s (4:45)

“Attack of the Killer Algae”:

<https://youtu.be/Vd4rgN6MYtg> (3:23)

2) This lesson builds upon data gathered in **Lesson 3: Be a First Detector**. If you class did not do **Lesson 3: Be a First Detector**,

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you can still do the optional ArcGIS Online mapping portion using data readily available from EDDMapS (<http://www.eddmaps.org/>). You need to create an account to access EDDMapS data and have ArcGIS for your school (see **Resources** for how to create an EDDMapS account and set up ArcGIS).

3) **Optional-ArcGIS Online extension.** There are additional ArcGIS Online (AGOL) instructions available if your students would like to map their data on the computer using ArcGIS Online. There are both written and video instruction options. This activity will require your students to have access to an AGOL account (see the Resources section on how to set up ArcGIS Online in your school). If you need additional help, you can contact a Geomenter in your area who may be able to help your class set up their accounts (see **Resources** section for a Geomenter directory).

Procedure

Class 1

Introduction (5 minutes)

Define or re-define **invasive species** with the class. If you have completed previous lessons, you can have students mention key points they remember.

Explain to the students that today they will be mapping invasive species data. Maps are useful tools. They help tell stories and can help us answer questions that would be hard to answer if all we had were columns and rows of numbers.

People interested in preventing the spread of invasive species find maps very useful for understanding how far an invasive species has spread, how the invasive species may have arrived in their area, and if there are any things in a particular area that may be assisting in spreading the invasive species further. The better

they understand how a species arrived and how it is spreading, the better the plans they can make for how to stop the invasive species.

Dataset vs. Map (20-30 minutes)

Hand out the provided Orange County, North Carolina invasive species data set.

Explain to students that this is data from first detectors just like them in Orange County, North Carolina. North Carolina is a state on the east coast. Like Washington, it has many different habitats, such as the ocean, agricultural areas, and mountains. In Orange County, there is a big university called UNC-Chapel Hill, so many new people from all over the world travel to and from that area each year. All of these characteristics (diverse habitat, ocean access, and people traveling from around the world) make for great ways for invasive species to spread.

The following questions can be answered verbally as a class discussion or you may choose to turn it into a written response exercise (handout included with lesson).

Pose the following questions to your students about invasive species in Orange County, North Carolina. In this first round, they will only have the provided datasheet to help them. Only spend a few minutes on this round. Your students should be able to answer questions 1 and 2, but without seeing the data mapped out, they will not be able to answer questions 3-5.



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1) Which invasive species were reported?

- Brown marmorated stink bug
- Glossy Privet
- Amur Honeysuckle
- Chinese Privet
- Tree-of-Heaven

2) Which invasive species was reported the most?

- Brown marmorated stink bug

3) Which invasive species was reported closest to the city of Chapel Hill?

- Glossy Privet

4) Did these first detectors report any invasive species in University Lake?

- No

5) Which invasive species was found in the Carolina North Forest?

- Brown marmorated stink bug

Hand out the provided map. Tell the students that the dataset you gave them was used to make this map. Go over the questions again with the map to help them out.

Discuss (10 minutes)

Ask your students which tool, the data set or the map, was easier to use to answer your questions. The main take-away is that sometimes it is hard to answer questions using data when it is all in rows and columns of numbers. That is why we turn data into things like graphs and maps, so it is easier to see the story the data are telling us. Again, this is important for invasive species because the more we know about an invasive species, the better plan we can make to stop their spread.

Class 2

Make a Map (Time varies)

Now your students will make a map of their invasive species data from **Lesson 3: Be a First**

Detector. Choose the following option that works best for your class:

1) Draw maps

Provide each student with a blank sheet of paper and have them sketch their survey site from **Lesson 3: Be a First Detector.** This does not need to be a masterpiece, but remind students to add useful landmarks such as buildings, streets, and natural features (water bodies, trees, etc.). Labels are particularly helpful.

Once the survey area is mapped, have them plot and label their invasive species data. Tell them to use the landmarks to choose the approximate location of where they found their invasive species (e.g., Was it by the slide? Near the flag pole? Etc.). Or...

2) Print Maps

Use an online map program, such as Google Maps, to look up your survey site and print out maps for your students. Have students plot and label their invasive species data. Tell them to use the landmarks to choose the approximate location of where they found their invasive species. Or...

3) Project maps

Use an online map program, such as Google Maps, to look up your survey site and project the map on the board.

Have a few volunteers plot and label the class invasive species data. Or...

4) ArcGIS Online

Have students utilize ArcGIS Online to digitally map their reporting data (or a selected data set from EDDMapS). There are step-by-step directions included with this lesson (**ArcGIS Mapping Instructions**) that walk you through the entire processing of downloading your data and turning it into a map.

If your students would like some practice

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before working with their data set, have them work through the **Practice Mapping Exercise** that utilizes a provided data set. There are instructional videos or written directions to accommodate different learning styles. The skills practiced in this exercise should make making a map using their own reporting data a simple task.



Class 3

Map Observations (20-30 minutes)

Using their maps, host a class discussion or have students type their answers to the following questions:

- 1) Which invasive species did you find in your survey area?
- 2) Was one invasive species more common than the others?
- 3) Do you notice any patterns with your invasive species? For example, do certain invasive species appear near particular habitats?
- 4) With your data points on a map, can you identify any ways the invasive species may have gotten to your survey site?

Possible responses:

- People planted the invasive species
- Seeds hitchhiked on shoes
- Someone released an unwanted class pet into the wild.

- 5) Can you identify any potential pathways of spread (how the invasive species may

continue to spread)?

If so, how could you block the invasive species from spreading further?

Possible responses:

- Talk with the groundskeeper about planting more native plants
- Set up boot brush areas around the playground
- Teach classes the dangers of releasing unwanted plants and animals into the wild

Compare and Contrast (20 minutes)

Continue the class discussion, but now have students compare their invasive species reporting map with the provided map of Orange County invasive species.

- 1) Are any of the invasive species from the North Carolina map problems in Washington state too?
 - Brown marmorated stink bug
 - Tree of Heaven
- 2) Do your two survey areas have any invasive species in common?
- 3) If your survey sites do have invasive species in common, why do you think that is? How do you think the same species got to these two different locations?
- 4) If you survey sites do not have invasive species in common, why do you think that is? Could it be something about the habitat? The type of invasive species?

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