



**Invasive Species Lesson
Plans**

Washington Pest Watch Invasive Species Lesson Plans



The Washington Pest Watch Invasive Species Lesson Plans are a product of the Washington Invasive Species Council, housed within the Recreation and Conservation Office. Funding for the Washington Pest Watch Invasive Species Lesson Plans provided by the United States Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine.

The council wishes to express its appreciation to the many individuals who contributed time and expertise to the development and testing of these lesson plans. Please note that while the council has endeavored to be thorough and complete in this list, we apologize in advance for any unintended omissions.

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Washington Pest Watch

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The goal of these lesson plans is to provide students with meaningful, hands-on science experiences while increasing the number of invasive species detectors in Washington. Students will learn about interactions between living organisms, the impacts of humans on the environment, basic ArcGIS skills and practice researching and synthesizing information from a variety of sources.

These lesson plans are sequential and build upon each other. However, each lesson cites resources that can quickly provide your students with background on invasive species so you can select the components of the lessons that best fit your needs if you do not have the time to work through the entirety of each lesson. The **Table of Contents** page highlights the focus of each lesson.

Given that the lessons are written to build upon one another, they sometimes reference information from previous lessons, such as vocabulary words. A science notebook or a similar way for students to capture their data and notes may be a useful tool.

The provided **Standards Chart** outlines which standards each lesson addresses.

Invasive Species Overview

An invasive species is a plant, animal or other organism introduced to an area outside of its native range, usually by humans, that negatively impacts the economy, the environment, and health. Left unmanaged, invasive species can spread beyond human control. They tend to take over the resources our native species, species who are historically from a geographic area and have evolved there, need for survival.

Invasive species are a problem that negatively affect all of us. For example:

- Americans spend over \$137 billion dollars annually combatting invasive species.
- Invasive species harm native species directly through predation and indirectly through resource competition.
- Invasive species can degrade water quality, increase the risk of wildfires, and carry diseases.

Luckily, invasive species experts are working to keep invasive species at bay. The Washington Invasive Species Council (WISC) is an interagency group made up of tribal, state, federal, non-profit and commercial groups working together to manage invasive species issues in our state.

We know how to manage invasive species, but we need everyone's help! We want people to learn ways to prevent introducing and spreading invasive species. And, if people see an invasive species, they just need to report it to the experts. It's that simple.

People who make invasive species reports are called "first detectors," because they are often the first ones to detect invasive species in an area. From 1990-2016, the public (people like you and me) reported an estimated 36% of newly detected invasive species in Washington¹!

¹ Looney, C., T. Murray, E. LaGasa, W.E. Hellman, and S.C. Passoa. 2016. Shadow surveys: How non-target identifications and citizen outreach enhance exotic pest detection. *American Entomologist*, 62(4):247-254.





ArcGIS Online Overview

These lesson plans contain optional extensions that utilize ArcGIS Online. ArcGIS Online is a computer software created by Esri that allows users to create interactive maps. On ArcGIS Online, users can store and share data to build custom maps that answer unique questions and visualize data. Many organizations utilize GIS software, so being familiar with this software can build the foundation for useful, job-competitive skills. In these lessons, students have the opportunity to begin exploring this program, but it will not require any previous experience with any GIS software.

Vocabulary

- **ArcGIS:** program that allows users to create interactive maps
- **Attribute:** descriptive data, such as the name of a building or the length of a road
- **Basemap:** bottom layer of a map, provides a background for the additional data added to a map
- **Ballast water:** water that keeps a boat balanced that can unknowingly contain and spread invasive species
- **BioBlitz:** event where participants identify as many species as possible in a specific location in a short period of time; these events help track biodiversity
- **Early Detection and Rapid Response (EDRR):** detecting, or finding, a problem early and quickly acting to stop it before the problem can get bigger
- **Ecosystem:** a community of living things interacting with one another and their environment
- **Eradicate:** remove completely
- **First detector:** individuals who report invasive species, sometimes preventing the spread of a new invasive species threat
- **GIS:** geographic information system; it is a program that allows us to store information that we can use to make maps
- **Invasive species:** plant, animal or other organism introduced to an area outside of its native range, usually by humans, which negatively impacts the economy, the environment, and health
- **Layer:** way to display map data in ArcGIS; most maps contain many layers that stack on top of one another to make a more informative, detailed map
- **Native species:** a living organism that originated and evolved in that region
- **Pathway of spread:** ways invasive species reach new locations, such as burs latching onto an animal's fur or insect eggs traveling across the ocean in cargo ships
- **Prevention:** keeping something, in this case allowing invasive species into Washington, from happening; this is the most effective way to manage invasive species
- **Stewardship:** the act of taking care of something
- **Washington Invasive Species Council (WISC):** an interagency group made up of tribal, state, and federal, non-profit, and commercial groups working together to manage invasive species issues in our state



The following grade 5/8 SEP, DCI, and CCC terms are utilized within these lesson plans.

- **Advantage:** benefit
- **Behavior:** how something acts; anything that an organism does in response to a stimuli
- **Biodiversity:** the variety of living things in an area
- **Characteristic:** trait, something that helps identify an organism
- **Compare:** finding similarities and differences between two or more things
- **Device:** a piece of equipment designed and used to perform a specific task, often electronic
- **Data:** factual information, can be numeric or descriptive; singular for: datum
- **Decrease:** when something becomes smaller or is reduced
- **Describe:** use words, figures, models or pictures to represent or explain something
- **Design:** create, to come up with and plan out
- **Ecosystem:** organisms living and interacting with one another in a particular habitat
- **Environment:** everything around you, both living and non-living
- **Evidence:** pieces of information that help you answer a question or support a claim
- **Habitat:** where something lives, it ideally contains all that the organism needs to survive
- **Impact:** effect on a situation or organism, can be positive or negative
- **Increase:** when something grows larger or greater in quantity
- **Investigation:** studying a topic and making observations; research
- **Model:** way to measure a natural phenomenon in a controlled manner to answer questions, often made up of multiple variables (measurable factors) that can be manipulated in order to see how changing certain factors affect the outcome of an event
- **Observation:** a comment based upon things that you see and hear
- **Offspring:** children
- **Organism:** any living being
- **Population:** a collection of the same organism living in the same area; they can be native, invasive, and/or introduced; habitats can only support a particular number and size of populations at any given time, which can lead to competition
- **Predator:** organism that preys upon another organism for survival; they can be helpful in keeping populations in balance
- **Predict:** make an educated guess or hypothesis about the outcome of a situation based upon the facts you have
- **Scientist:** a person who uses facts to systematically test hypotheses and answer questions
- **Solution:** way to solve a problem
- **Species:** a unique group of organisms grouped together based upon shared traits
- **Survive:** continue to live, often despite hardships or challenges
- **Trait:** unique characteristic

Lesson 1: What is an Invasive Species?

Students learn about the issue of invasive species, and what they can do to prevent it!



Intended Audience

Middle School

Students Will Be Able To

- Define “invasive species”
- Describe negative impacts of invasive species
- Explain characteristics that make invasive species successful
- Describe how invasive species spread
- Identify ways to prevent and address the invasive species issue

Activities

- Explore invasive species materials
- “Introduction to Invasive Species” presentation
- Review activities:
 - Loteria game
 - Verbal or written review questions

Estimated Time

2-3 class periods

Standards Addressed

- | NGSS | Common Core |
|------------|-------------|
| • MS-LS1-4 | • SL.6-8.1 |
| • MS-LS1-5 | |
| • MS-LS2-1 | |
| • MS-LS2-2 | |
| • MS-LS2-4 | |

Introduction

An **invasive species** is a plant, animal or other organism introduced to an area outside of its native range, usually by humans, which negatively impacts the economy, environment, and health. Invasive species affect all of us, whether we realize it or not. Luckily, invasive species professionals know how to stop most invasive species but we need people’s help reporting them. By learning more about invasive species in Washington, you can help report invasive species and potentially prevent the next invasion!

Materials

- [“Introduction to Invasive Species” Presentation](#)
- [Loteria Game Boards](#) (different board for each group)
- [Loteria Playing Cards](#) (1 deck)
- Space Markers (e.g. dried beans, tangrams, buttons)
- Optional:
 - [Invasive Species Supply Kit](#)
 - Prizes
 - [“Introduction to Invasive Species” Guided Questions Worksheet](#) (1 per student)
 - [“Lesson 1 Review Questions” Worksheet](#) (1 per student)

Preparation

- 1) Read the **Teacher Notes** and go through the “Introduction to Invasive Species” PowerPoint presentation to familiarize yourself with invasive species. There are guiding notes that go along with each slide to help you through the presentation.
- 2) Print the “Introduction to Invasive Species” guided questions worksheet, if using.
- 3) Select invasive species to focus on. We suggest setting up enough stations so that students can work together in small groups of 3-4.

Lesson 1: What is an Invasive Species?

For help selecting focal species you can:

- Refer to the **Regional Lists** included on the **Resources** page which list invasive species of concern for different regions in Washington.
- Contact your local natural resource professionals who should be able to tell you a few invasive species commonly found in your area:
 - Conservation Districts** often have education directors and interns who can help identify local invasive species.
 - o Conservation District Directory: <http://www.wadistricts.org/partnership-directory-4.html>
 - County Weed Noxious Weed Control Board** (NWCB) have information on local invasive plants. Some NWCBs may even be able to do a site visit to identify invasive species on your schoolyard.
 - o Noxious Weed Control Board directory: <https://www.nwcb.wa.gov/find-your-county-weed-boards>
 - Washington State University** (WSU) extension locations and their volunteer Master Gardener educators often have information on local invasive species.
 - o WSU Extension locations: <http://pubs.cahnrs.wsu.edu/location>

If you intend to do **Lesson 3: Be a First Detector**, it would be useful to highlight a few invasive species you may find in your area so your students will have an idea of what to look for.

Leave these stations in place if you intend to continue to Lesson 2: BioBlitz! You will use them again.

4) Set up a research station for each species you select. Include materials such as fact sheets, photos, and specimen models (see **Resources**

page for sources). If available, you may borrow our **invasive species supply kit**, which includes a variety of specimens and educational materials.

Computers will be useful for showing videos, especially during the in-depth data gathering portion of this lesson, as well as to allow the students to look up additional information that may not be explicitly covered in the materials you provide.

If you intend to do **Lesson 3: Be a First Detector**, it would be useful to highlight a few invasive species you may find in your area so your students will have an idea of what to look for. Leave these stations in place if you intend to continue to **Lesson 2: BioBlitz!** You will use them again.

4) Gather supplies for the Loteria review game. Color copies of the game boards and playing cards are included in the invasive species supply kits. Otherwise, you can print your own copies using the included PDFs. See the **Resources** page for a guideline on how to print the Loteria playing cards front and back. You will need to cut out the deck of clue cards and ensure that you have enough space markers and game boards for all of your groups (3-4 students/group recommended).



Lesson 1: What is an Invasive Species?

Procedure

Class 1

Explore invasive species materials (30-40 minutes)

*While optional, this activity allows students to engage with invasive species specimen in an unstructured way and create their own inquiries. If there is insufficient time, however, you can start with the introductory PowerPoint; students will get to interact with the outreach materials during **Lesson 2: BioBlitz!***

Allow your students to explore the different invasive species stations you set up. This is an unstructured time for the students to interact with the various specimen and outreach materials. When they return to these stations in later lessons, there will be worksheets to guide their interactions. During this time, you may ask your students:

- What questions are these objects raising for you?
- Which station(s) do you find the most intriguing?

This can help you understand which invasive species may be most engaging for your class moving forward.

Once your students have had sufficient time to engage with the materials, have students share their experience and questions. You can write their questions and post them in the classroom so students can see if their questions get answered during the “Introduction to Invasive Species” PowerPoint presentation. If the questions don’t get answers, hold on to them- they may be great research topics during later lessons!



Class 2

Presentation (30-40 minutes)

Pass out the “Introduction to Invasive Species” guided questions worksheet, if using.

Go through the “Introduction to Invasive Species” PowerPoint with your students. Questions and videos embedded in the presentation enhance the talk and engage the audience, but you may skip them depending on class length. If the videos do not work on your computer, the link for each video is included in the notes for that slide so you can pull the videos up before class and navigate to them at the appropriate times.

Review

Loteria (10-15 minutes)

Once you have completed the presentation, break students into small groups of 3-4 to play the Loteria review game. This bingo-style game is a fun, quick review of invasive species and their impacts.

Pass out a Loteria game board and space markers to each group. Tell your class that they need to cover three invasive species in a row to win (if time allows, you could make it so they need to cover the whole board to win). Explain to students that, while the presentation covered



Lesson 1: What is an Invasive Species?

many concepts and invasive species, some of the game boards include things we have not yet discussed. However, if they listen carefully to the clue cards, they should still be able to infer what the answer is.

As you read the clue cards aloud, groups will work together to match the answers to the spaces on their game board. The first group to fill out their board wins. If time allows, keep playing until you have gone through the entire deck of clues in order to have a full review. Teams can get prizes for finishing first, second, third, etc.

Review Questions (10-15 minutes)

*Answer the following questions as a class discussion or assign as a written assignment (a printable worksheet with these questions is provided in the **Lesson 1** materials).*

1) What is an invasive species?

An invasive species is a plant, animal or other organism introduced to an area outside of its native range, usually by humans, which negatively impacts the economy, environment, and health.

2) Think of at least three behaviors or physical characteristics that give invasive species an advantage over native species.

Explain how this trait helps an invasive species to increase in numbers and spread.

- Occur in many areas- more places from which it can spread
- Lack natural predators (nothing eats it)- nothing naturally reduces its numbers
- Spread quickly- hard to keep up with removing the invasive
- Grow quickly- hard to keep up with removing the invasive
- Breed early- their kids get access to

resources first and may outcompete native species before they have a chance to use those resources

- Have many offspring- hard to keep up with removing the invasive, more opportunities to spread
- Eat many different things- not impacted as much by the loss of a certain plant or animal in the ecosystem, they can adapt
- Tolerate many types of environments- when they spread, it's easier for them to adapt and thrive, whereas native species often need very specific habitats

3) Scenario:

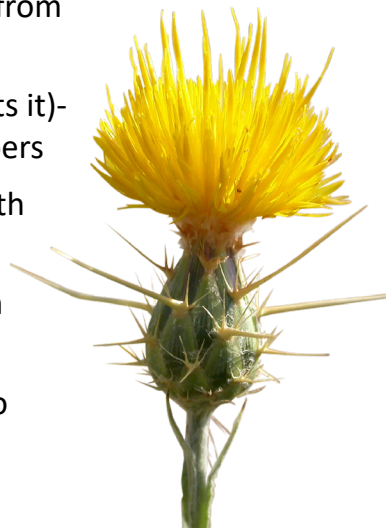
An invasive plant, the Grandosa, was accidentally introduced to your schoolyard.

The Grandosa grows up to 6 feet tall, depriving plants below it of sunlight. It also has deep roots that suck up lots of water. It is spreading quickly. The Grandosa does not have any natural predators, meaning there are no insects or other animals that will help take care of this problem, and it can produce up to 10,000 small, light seeds a year!

As the invasive species experts at your school, everyone is turning to you to answer the following questions:

a) What are some pathways through which the Grandosa might have been introduced into the schoolyard?

- Seeds carried on the wind
- Someone planted it on purpose, not knowing it was an invasive species
- Seeds carried in from someone's clothes, backpack, etc.





Lesson 1: What is an Invasive Species?

- Seeds carried on an animal's fur
- A class grew it as a science project and didn't want to destroy the plant afterwards so they planted it outside instead

b) What effects do you predict the Grandosa might have on the native plants on your schoolyard?

It can keep native plants from growing because it is taking up all the sunlight, water, and space that plants need to grow.

c) What effects do you predict the Grandosa might have on the native animals on your schoolyard?

Native animals depend on native plants for food and shelter. Without the native plants, these animals may get eaten by predators, go hungry, or need to find a new place to live.

d) What are some solutions you can think of to deal with the Grandosa problem?

- Report the sighting to an invasive species professional (e.g., Washington Invasive Species Council).
- Research how to remove the plant and plan a stewardship day for the community to remove it.
- Focus on preventing the plant from spreading beyond the schoolyard.
- Create informational brochures, flyers, etc. and post them around the community to teach people about this invasive plant and how to prevent its spread.

Lesson, introductory presentation, and review game adapted from West Coast Sea Grant's "Menace to the West" curriculum. Original materials found here:

- Introduction: <https://seagrant.oregonstate.edu/menacetothewest/introduction>
- Loteria game: <https://seagrant.oregonstate.edu/menacetothewest/lesson/loteria-game>

Lesson 2: BioBlitz!

Students conduct a fast-paced investigation of invasive species using fact sheets, specimens, videos, and other materials.



Intended Audience

Middle School

Students Will Be Able To

- Gather data from a variety of sources
- Summarize and present data to peers
- Identify regional invasive species

Activities

- BioBlitz
- Pair and Share
- Review activity:
 - Verbal or written review questions

Estimated Time

2-3 class periods

Standards Addressed

NGSS	Common Core
<ul style="list-style-type: none">• MS-LS1-4• MS-LS1-5	<ul style="list-style-type: none">• RST.6-8.1• RST.6-8.2• WHST.6-8.1• WHST.6-8.2• WHST.6-8.7• WHST.6-8.8• WHST.6-8.9
<ul style="list-style-type: none">• Ed-Tech• 1.3.2	<ul style="list-style-type: none">• RI.6.7• SL.6-8.1• SL.6-8.4

Introduction

A **BioBlitz** is commonly an event where participants identify as many species as possible in a specific location in a short period of time. Your students will perform a modified BioBlitz in the classroom where they will learn about a selection of invasive species they may encounter in Washington. They will make observations about each species on their datasheets. Then, in groups, they will take more in-depth notes about one species and share what they learned with other groups.

Materials

- [BioBlitz Datasheets](#) (1 per student)
- Materials for each Invasive Species Station (e.g. photos, videos, fact sheets, etc.)
 - Note:** [Invasive species supply kit](#) available for teachers to borrow- includes fact sheets, photos, and specimen
- Optional:
 - Laptops or Tablets

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) Select which species you would like to highlight in the BioBlitz. It is recommend to choose an even number of species; it will make the later **Pair and Share** activity easier. Students will end up working in small groups of 3-4 students, so set up enough stations so that each group will have their own space and unique species to research.

Lesson 2: BioBlitz!

For help selecting focal species you can:

- Refer to the **Regional Lists** included on the **Resources** page which list invasive species of concern for different regions in Washington.
- Contact your local natural resource professionals who should be able to tell you a few invasive species commonly found in your area:
 - Conservation Districts** often have education directors and interns who can help identify local invasive species.
 - o Conservation District Directory: <http://www.wadistricts.org/partnership-directory-4.html>
 - County Weed Noxious Weed Control Board (NWCB)** have information on local invasive plants. Some NWCBs may even be able to do a site visit to identify invasive species on your schoolyard.
 - o Noxious Weed Control Board directory: <https://www.nwcb.wa.gov/find-your-county-weed-boards>
 - Washington State University (WSU)** extension locations and their volunteer Master Gardener educators often have information on local invasive species.
 - o WSU Extension locations: <http://pubs.cahnrs.wsu.edu/location>

If you intend to do **Lesson 3: Be a First Detector**, it would be useful to highlight a few invasive species you may find in your area so your students will have an idea of what to look for.

Computers will be useful for showing videos as well as to allow the students to look up additional information that may not be explicitly covered in the materials you provide.

3) Gather the materials needed for the BioBlitz and set up a research station for each species you select. Include materials such as fact sheets, photos, and specimen models (see **Resources** page for sources). If available, you may borrow our **invasive species supply kit**, which includes a variety of specimens and educational materials.

Computers will be useful for showing videos, especially during the in-depth data gathering portion of this lesson, as well as to allow the students to look up additional information that may not be explicitly covered in the materials you provide.



Procedure

Class 1

Introduction to BioBlitzes (10 minutes)

Define or re-define **invasive species** with the class. If you have completed **Lesson 1: What is an Invasive Species?**, you can have students mention key points they remember.

Explain to your students that you will be conducting an invasive species BioBlitz, an event where participants identify as many species as possible in a specific location in a short time period. These intense investigations help get people interested in the plants and animals around them and the data they gather helps local scientists track which species are in an area, gives them an idea of environmental health, and can sometimes uncover new species- native and invasive. Uncovering invasive species is very important. Reporting an invasive species early is the key to preventing them from spreading and taking over.

Tell students they will perform a modified BioBlitz in the classroom where they will learn about a selection of invasive species they may encounter in Washington. They will get a chance to quickly observe all the species. Then you will break them into groups. Each group will be assigned one species to investigate in more detail.



Conduct a BioBlitz (20-30 minutes)

Students rotate quickly through research stations (a few minutes per station), reviewing the provided materials and writing their observations on their **BioBlitz: Round 1** datasheet.

During this first round, students need only record the species name (common and scientific), what type of species it is (plant, animal, or disease), and write a brief description of the species (full sentences are not required).

Class 2

Research single species (20-30 minutes)

Break students into small groups and assign each group one of the BioBlitz species to research. Using the materials at their station, each group will answer the questions on their **BioBlitz: Round 2** datasheet.

Pair and Share (15 minutes)

Keep students in their BioBlitz groups. Pair the groups off and have them share what they learned during their in-depth research. Give each group in the pair will have a few minutes to share. Once each pair has finished sharing, make new group pairs and repeat the process. If time allows, continue this process until all the groups have shared with one another.

Review

Answer the following with the whole class (5-10 minutes):

- 1) What is one interesting thing you learned about an invasive species from a classmate during the pair and share?**
- 2) Why do we conduct BioBlitzes?**
 - Identify which species are in an area
 - Assess environmental health (especially biodiversity)
 - Get people involved in science

Lesson 2: BioBlitz!



3) Where can you conduct a BioBlitz?

- Their own backyard
- Around the schoolyard
- The park
- Pretty much anywhere!

Remind students that taking pictures and bringing a field guide (available to borrow from the local library) can help them identify all the neat new things they find during a BioBlitz.

Being aware of the plants and animals in your area is especially important for invasive species detection. If you know what species you should be seeing, you can report anything that looks out of the ordinary and you may prevent the next invasive species invasion in Washington!

If students find an invasive species while they are out enjoying nature, they should report it to the Washington Invasive Species Council (WISC) at:

- WISC website: <https://invasivespecies.wa.gov/report.shtml>
- WA Invasives app: [Apple](#) or [Android](#)

Optional Extensions

- Invite a local scientist or naturalist to help conduct the indoor BioBlitz. They could help explain to the students what a BioBlitz is and act as a primary information resource for the students as they research their invasive species.
- Conduct a BioBlitz outside with a local environmental organization. University extension groups are a good resource for finding these events.

Lesson adapted from West Coast Sea Grant's "Menace to the West" curriculum. Original materials found here:

- BioBlitz: <https://seagrant.oregonstate.edu/menacetothewest/lessons/bioblitz>



Lesson 3: Be a First Detector

Students model species' interactions and use technology to collect invasive species data in their community.

Intended Audience

Middle School

Students Will Be Able To

- Form hypotheses about the interactions of organisms in varying environmental scenarios
- Explain the importance of first detectors in preventing the spread of invasive species
- Identify and report an invasive species in their community
- Utilize tools to collect data

Activities

- First Detector Game
- First Detector Survey
- Review activity:
 - Verbal or written review questions

Estimated Time

3 class periods

Standards Addressed

- | NGSS | Common Core |
|-------------|--------------|
| • MS-ESS3-3 | • WHST.6-8.1 |
| • MS-ESS3-4 | • SL.6-8.1 |
| • MS-LS1-4 | |
| • MS-LS1-5 | Ed-Tech |
| • MS-LS2-1 | • 2.2.1 |
| • MS-LS2-2 | • 2.2.2 |
| • MS-LS2-4 | • 2.3.1 |
| • MS-LS2-5 | • 2.3.2 |

Introduction

Prevention is the best strategy for invasive species management. If invasive species do sneak into an area, however, early detection and rapid response (EDRR) are key. The quicker we can address a problem, the less time it has to grow. Luckily, specialists know how to deal with invasive species, but they need the public's help in detecting them. Students will learn the importance of EDRR and practice detecting and reporting invasive species.

Materials

First Detector Game

- Strips of Blue Cloth or Other Distinguishing Markers
- Strips of Yellow Cloth or Other Distinguishing Markers
- Large, Flat Playing Field or Classroom
- Timer
- [First Detector Game Datasheet](#) (1 per class or 1 per student)
- [First Detector Game-Outdoor Directions](#)
- [First Detector Game-Indoor Directions](#)
- Writing Utensil
- Optional:
 - Cones or Markers for Boundaries of the Playing Field

First Detector Survey

- Reporting Device (cell phone, iPad, or tablet)
 - Note: If no reporting devices are available at your school, use a camera and upload reports using our [online form](#)*
- [First Detector Survey Datasheet](#) (at least 3 per group)
- Optional:
 - Invasive Species Pictures
 - Hard Surface to Write On
 - Magnifying Glass
 - Object for Scale (e.g. coins, ruler, anything with a defined size)
 - [Example First Detector Survey Datasheet](#)
 - ["How to Report" Handout](#)
 - ["Quality Photo Tips" Handout](#)
 - ["How to Report" PowerPoint Presentation](#)
 - [Field Trip Template](#)
 - ["Oh Deer" Invasive Species Style](#)

Lesson 3: Be a First Detector



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) Download the “WA Invasives” app: [Apple](#) or [Android](#)

3) Create an EDDMapS account: <https://www.eddmaps.org/index.cfm?freg>. Making a class account and having students submit their reports using one e-mail address is the simplest option. This will ensure that all the data is stored in one place. However, students may each make their own account if preferred.

4) Gather the materials necessary for the **First Detector Game**.

5) Gather the materials listed for the **First Detector Survey**. If your class completed **Lesson 2: Bioblitz!**, you can reuse materials from the research stations. Students can also review their

notes and/or bring them along during the survey to help better identify invasive species.

6) Identify at least three invasive species in your survey area. This will ensure that your students will find something and help focus their search.

- **If you do not feel confident in identifying invasive species in your area**, see **Resources** for potential volunteers who can help you.
- **If you cannot find invasive species in your available survey area**, you can hide some of the specimen from the lesson plan toolkit or photos of invasive species in your survey area. Students still get to practice data collection and can still make a report using the “WA Invasives” app (Simply write “Test” in the notes of your report). Try to use species they would likely find in your area so they form useful search images and can still use their data for **Lesson 4: Map the Invasion**.

This could also be a great discussion about why the schoolyard does not contain invasive species, showing that it is in fact possible to control invasive species. You may be able to invite your groundskeepers to discuss with students what they do to manage the area.

This is also a **way to conduct the survey indoors** if the weather or your location preclude an outdoor survey.

7) **NOTE:** Each report is verified prior to being posting on EDDMapS. As such, there will be a lag between when you collect data and when the data will be available to download for **Lesson 4: Map the Invasion**. If you are on a tight schedule, you can contact the Washington Invasive Species Council (WISC). This will help them be on the alert for reports and hopefully expedite the process. E-mail WISC at: invasivespecies@rco.wa.gov.

8) This lesson is a great field trip activity. See **Resources** for a field trip template and game idea.

Lesson 3: Be a First Detector



Procedure

Class 1

Introduction (5 minutes):

Define or re-define **invasive species** with the class. If you have completed either of the previous lessons, you can have students mention key points they remember. Tell students that today they will be learning about **early detection and rapid response (EDRR)**. EDRR is when we detect, or find, a problem early and quickly act to stop it before the problem can get bigger. For example, if you knocked over a glass of juice on the table, it is much easier to quickly clean up the juice on the table rather than waiting and letting it spread onto the carpet too. After **prevention** (stopping invasive species from entering an area in the first place), EDRR is the most effective way to stop the spread of invasive species.

For example, in Washington, we set up thousands of traps to detect invasive insect species. Have you ever seen bright red and orange triangles hanging up around your neighborhood? Those are insect traps. Biologists check these traps regularly to see if they have caught any invasive insects. If they find an invasive, specialists act quickly to remove the insects from the area before they can spread.

No matter how many traps we set up, however, some invasive pests manage to sneak into the state. Reports from the public are crucial for tracking invasive species and preventing outbreaks. From 1990-2016, the public (people like you and me) reported an estimated 36% of newly detected invasive species in Washington¹. We call these people who make reports **first detectors**. One example of first detectors saving

the day is the case of the Asian Longhorned Beetle. Asian Longhorned Beetles prey upon many trees, including maple trees, which, among other things, give us maple syrup. Thankfully, a first detector saw the strange insect, reported it, and we were able to stop the beetles before they could do a lot of damage. Next time you enjoy a stack of pancakes or waffles smothered in syrup, you may have a first detector to thank!

First Detector Game (20-30 minutes)

Select one of the **First Detector games** to help students model the positive impacts of first detectors and EDRR against the spread of invasive species. There are two options; choose whichever best fits the ability and personality of your class.

- The outdoor version is a Freeze-Tag style game that involves running around outside.
- The indoor version is a Heads-Up, Seven-Up style game that can accommodate any level of mobility.

Optional extension:

If you would like your students to practice with graphing, you can use the provided **First Detector Game Datasheet** to collect their hypotheses and data (either take one for the whole class or have each student fill out their own). The students can then graph their data to help them visualize how changing variables between rounds impacted the number of invasive species. (**Note: Time for graphing is not included in the time estimated for this activity**).

Class 2

Introduction (5 minutes)

Tell your students that they are going to practice being First Detectors. They will survey their community (e.g., schoolyard, local park, block around the school, etc.) for invasive species. They will take down detailed data for the different invasive species they find and make a report to

¹ Looney, C., T. Murray, E. LaGasa, W.E. Hellman, and S.C. Passoa. 2016. Shadow surveys: How non-target identifications and citizen outreach enhance exotic pest detection. *American Entomologist*, 62(4):247-254.



Lesson 3: Be a First Detector

the Washington Invasive Species Council. These reports are received by invasive species professionals who check each report for accuracy. Your reports help these professionals get an idea of how far different invasive species have spread around the state and could help stop new invasive species outbreaks!

Identify the target species (15 minutes)

Introduce your students to the species they will be searching for using pictures or actual specimen (**Note: If using actual plant specimen, throw them in the trash after your lesson and be cautious of any seeds**). Photos are nice either way because they provide you with a quick identification reference when you're out collecting data. Point out to the students the unique features of the species they are searching for and maybe a few interesting facts (fact sheet sources can be found on the **Resources** page).

Note: This is a great day to invite an invasive species professional to your class to introduce the invasive species found in your area. See the **Resources** page for a list of organizations to contact to find a potential guest speaker.

Practice Report (15-25 minutes)

Demonstrate to your students how to fill out their **First Detector Survey Datasheet** and how to make a good report. If they pay close attention, next class period they may get a chance to make their own reports using a reporting device.

Note: Allowing students to use a reporting device is at the discretion of the teacher. You must decide if you think they are responsible enough to treat them properly. Set expectations accordingly (e.g., I will make reports vs. You will make reports).

Indoor options:

- 1) Walk your students through an example **First Detector Survey Datasheet**. You can use the provided example datasheet or fill out an example for your specific location.
- 2a) Go through the **“How to Report” PowerPoint presentation** with students.
OR
- 2b) Project the screen of your reporting device using a projector or connect your reporting device to a projector using an HDMI cable. Go through the different steps to make a report (outlined in **“How to Report” handout** and **PowerPoint** slides).

Outside option:

- 1) Walk your students through an example datasheet. You can use the provided example datasheet or fill out an example for your specific location.
- 2) Lead class to an invasive species on your school ground. Go through steps to make a report using your reporting device (outlined in **“How to Report” handout** and **PowerPoint** slides). It is useful to locate an invasive species prior to taking the students out for this demonstration so you do not use up class time searching.

Class 3

Assign groups and gather data (30 minutes)

Break students into small groups (2-3 students).

Pose this data gathering task as a challenge. For example, “In class yesterday we talked about some invasive species commonly found in our community. There are at least three of those invasive species between the fence and the soccer goal. Which group can find all three first?”

Give each group three **First Detector Survey Datasheet** (or



Lesson 3: Be a First Detector



more, depending on how many invasive species you would like them to find). They need to use the datasheets to describe where they found the invasive species and what characteristics the invasive species has. Explain that their notes need to be detailed enough that they can guide you back to the spot to make a digital report. Even though in the end you will make a digital report, remind them that many scientists keep a physical copy of their data in case the digital collection tool malfunctions. It is also another task to keep all the students actively engaged.

Reiterate the survey area boundaries and remind students to be aware of their surroundings (watch out for holes, standing water, thorny vines, etc.). Once a group finds all the invasive species you challenged them find and completely fills out their datasheets, they report back to the teacher. The students must then guide their teacher to the invasive species. The teacher uses their reporting device to make the report for the class (Note: if you have responsible students, you can choose to let your students make the report. You could pose this as the reward for being the first group to find all of the pre-identified invasive species AND filling out all the areas of their datasheet properly).

If your students and you are unsure about a report, that is OK. We would rather be safe than sorry. Have them make their best guess and then the experts will verify their report.

If you do not have a cell phone or other reporting device available, use a camera to take a photo of the different invasive species. While not necessary to make a report, it is nearly impossible to verify a sighting without a photo. Data and photos can be entered using our online reporting forms: <https://invasivespecies.wa.gov/report.shtml>. Online reports are verified and added to the EDDMapS database just like reports from our “WA Invasives” app.

Decontamination (5 minutes)

After their search, have students check their clothes for any hitchhiking seeds. Also stomp their shoes to dislodge any mud that may also be harboring seeds. Researchers have unwittingly spread many invasive species!

If possible, throw seeds away. Otherwise, leave them on-site; the invasive species is already present there. The goal is to not help it leave that area.

Note: *This can be done during class discussion if done outside.*



Lesson 3: Be a First Detector



Review

Use the following questions to facilitate a group discussion or assign as a writing exercise (10-15 minutes).

- 1) Which invasive species did you discover during your survey?**
- 2) Did you see any interactions between the invasive plant species and the other plants in the area?**
For example, in the areas you found invasive species, was there a variety of different plants, or mainly just the invasive plant?
- 3) Did you notice any difference in animal activity between the areas with invasive plants compared to those without invasive plants?**
(If you didn't notice any animals in your area, hypothesize how their behavior might differ.)
- 4) How do you think the invasive species got to your survey site?**
 - Think of at least three potential pathways of spread (ways the invasive species are moved to new locations).
 - For each pathway of spread you identify, come up with at least one way you could prevent more invasive species from arriving from that pathway.

Stewardship Tag Game-Outdoor adapted from Oregon Sea Grant's "Menace to the West" curriculum:
https://seagrant.oregonstate.edu/sites/seagrant.oregonstate.edu/files/invasive-species/toolkit/lp-t-stewardship-tag-game_0.pdf



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**,

Lesson 4: Map the Invasion



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.





Lesson 4: Map the Invasion

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

Lesson 4: Map the Invasion

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?

Maps and screenshots throughout this lesson plan were created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri® software, please visit www.esri.com.



Lesson 5: Presenting- The Worst Invasive!

Students practice their persuasion and public speaking skills while advocating for their invasive species project.

Intended Audience

Middle School

Students Will Be Able To

- Utilize a variety of sources to conduct research
- Creatively form a solution to a problem
- Form and support a fact-based argument
- Make presentations using technology
- Rank projects based on sound arguments

Activities

- Research
- Create presentations
- Deliver and score presentations
- Rank presentations

Estimated Time

4-6 class periods

Varies by allotted in-class preparation time and length of presentation

Standards Addressed

NGSS	Common Core
• MS-ETS1-2	• RST.6-8.1
• MS-ESS3-3	• WHST.6-8.1
• MS-LS2-2	• WHST.6-8.2
• MS-LS2-4	• WHST.6-8.6
• MS-LS2-5	• WHST.6-8.8
	• WHST.6-8.9
Ed-Tech	• RI.6.7
• 1.3.2	• SL.6-8.1
• 2.2.1	• SL.6-8.3
• 2.2.2	• SL.6-8.4
• 2.3.1	• SL.6-8.5
• 2.3.2	• 6.SP.B.5

Introduction

Projects cost money, especially managing for invasive species. In the United States alone we spend over \$137 billion each year on invasive species management. While that might seem like a lot of money, it's still not enough to address all of the invasive species problems in our country. As such, professionals need to focus their efforts and make convincing arguments for why their invasive species project should receive funding. Working in groups, students will present their plan for managing an invasive species and peers will score the plans. The highest scoring plan, if feasible, could provide the basis for a stewardship project for your class.

Materials

- [Presentation Checklist Handout](#) (1 per group)
- [Rubric](#) or [Feedback Score Sheet](#) (1 per student)
- Optional:
 - Prize for Highest Scoring Project(s)
 - [Prompting Question Cards](#)
 - Materials on Selected Invasive Species (e.g. photos, videos, fact sheets, etc.)
 - Computers, Laptops, or Tablets
 - Materials for Physical Presentations (e.g. poster boards, writing utensils, etc.)

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://yoVd4rgN6MYtg> (3:23)

Lesson 5: Presenting- The Worst Invasive!

2) If you plan on using EDDMapS or ArcGIS Online, ensure that you have the necessary accounts. See the **Resources** section for guides on how to set up those accounts.

3) Gather the necessary materials. What you need will depend upon which presentation style your students and you choose. The resources and materials from **Lesson 2: BioBlitz!** could be great resources for your students as they do their research.

There are two score sheet options, the **Rubric Score Sheet** and **Feedback Score Sheet**. Each sheet highlights different skills.

- The **Rubric Score Sheet** is more quantitative in nature. Students will need to allot points based on different criteria and total the points for a final score.
- The **Feedback Score Sheet** is more qualitative in nature. Students will still provide a numerical score, but they choose a number between 0 and 10 for the whole presentation. In addition to the numerical score, they provide constructive feedback, specifically two things the group did well and one way they could improve. For example:
 - *I like how you each took turns talking.*
 - *I like how many details you gave about your invasive species.*
 - *I wish you had used a different colored font, because it was really hard to read neon yellow letters against the green background.*

While this lesson is broken into three class periods, you could expedite the process by assigning the research and presentation construction as take-home portions. Each member of the group, for example, could be responsible for answering one or two of the research questions and the students could have 10-15 minutes during class to discuss what they found out with their group.

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. Tell your students that they will be working in groups to select an invasive species they think is a threat to their community. They must create a presentation that highlights why this invasive species is a threat and how they propose to combat this problem. They will present to their classmates, who will score their presentation. The highest-scoring presentation wins and may even be acted upon by the class if the resources are available.

If you completed **Lesson 3: Be a First Detector** and/or **Lesson 4: Map the Invasion**, the species you found are great candidates for these presentations. However, groups may select an invasive species that is not currently in Washington, but still poses a threat. Remember, prevention and early detection are excellent, and relatively low-cost invasive species management options.

Research (30-40 minutes)

Break students into small groups (3-4 students). Assign each group a number; you will use these later during scoring.



Lesson 5: Presenting- The Worst Invasive!



Give each group a **Presentation Checklist** handout to help guide their research. Allow 5-10 minutes for selecting a focal species. If multiple groups want to focus on the same species, that is fine; they may come up with alternative management ideas. Even if multiple groups have the same species and management tactic, they can still distinguish themselves through their presentation skills. This is good experience for students, showing that powerful rhetoric can make you stand out. If students are having trouble choosing a species, you can direct them to the list for your region (included with **Lesson 2: BioBlitz!**) or the Washington Invasive Species Council's priority invasive species list: <https://invasivespecies.wa.gov/documents/priorities/Top50InvasiveSpecies.pdf>.

Allow groups to research their species, answering the questions on their **Presentation Checklist**. If you have materials on the invasive species (fact sheets, photos, brochures, etc.), you can pass these out to the groups. They may ask you clarifying questions, but they should not ask you how to manage the invasive species, that is for them to decide. They can propose a standard method or come up with their own solution, as long as they can support their idea with a sound, fact-based argument.

Class 2-3

Build presentations (45 minutes)

Here are a few options:

- **Spoken presentation:** groups stand in front of their peers and state their argument sans visual materials. While less visually compelling, this presentation style can be quicker to prepare. This style also requires the students to be stronger presenters as they, and not pictures, need to convey their ideas and arguments clearly and convincingly.
- **Poster presentation:** groups create a poster

to illustrate their argument. Have half of the groups set up their posters. The remaining groups visit the posters that are set up. After all the students have visited the posters, have the groups switch. This is a very common presentation style for researchers at conferences.

- **Digital presentation:** groups use a computer program (e.g.-PowerPoint or Prezi) to create a presentation to support their argument.

ArcGIS Online (AGOL) has its own presentation template called story maps. They are a beautiful visual tool and they are easy to use. If your class completed the optional ArcGIS portions of **Lesson 4: Map the Invasion**, students can even directly upload their maps into their story map presentation (see **Resources** page for links to tutorials and examples).

Be sure to tell groups how long you are giving them for their presentations so that they can plan accordingly.

Class 4-6

Present and Score (45 minutes)

Break the presentation time equally amongst the groups. On average, each group will likely receive up to 10 minutes for presenting and answering questions.

Pass out a Rubric Score Sheet or Feedback Score Sheet to each student.

After a group presents, their classmates will have the opportunity to ask a question and/or provide constructive feedback. Assigning extra participation points to students who ask quality questions is a great way to incentivize total participation. The emphasis is on thought provoking, open-ended questions such as, "How do you think removing that invasive plant may impact the other plants in the area?" or, "Once you've removed the invasive species, how do you

Lesson 5: Presenting- The Worst Invasive!



plan on keeping more from getting introduced?" Not, "What is the name of your species again?" A few question prompt cards are provided with this lesson if students need help.

Score and Rank Presentations (5 minutes)

Have each student add up the scores on their sheet. Then, in their groups, have them average their scores. Have one group member go up to the board and record the average scores from their group. You can draw a table on the board while the students do their calculations so students clearly know where to write the average from their group.

As a class, average the total presentation score for each group and rank the projects. The highest scoring project wins and may be the basis for a stewardship project for your class. You may choose to award the winning group with a prize.



Lesson 6: Time to Act!

Students make a positive impact in their community through implementing an invasive species management project.



Intended Audience

Middle School

Students Will Be Able To

- Plan and implement a project
- Collaborate with peers to achieve a common goal
- Identify positive impacts they can have on their community

Activities

- Select a project
- Design the project
- Implement the project
- Review activity:
 - Write a reflection letter

Estimated Time

3.5 classes

Varies by project

Standards Addressed

- | NGSS | Common Core |
|-------------|-------------|
| • MS-ETS1-1 | • SL.6-8.1 |
| • MS-ESS3-3 | |
| • MS-LS2-5 | |

Introduction

The data your students collect using the “WA Invasives” app informs research and action plans for invasive species professionals. In this lesson, students take their data one step further and use it to help them design and execute their own stewardship project. Stewardship projects can vary in complexity, from something as simple as writing a letter to something a bit more involved such as pulling invasive species at a local park. No matter what you choose to do, remember, everything your class does makes a difference.

Materials

- Optional:
 - [Logic Model](#)
 - [Example Logic Model](#)
 - [Invasive Species Reporting Sign Template](#)
 - [Example Invasive Species Reporting Sign](#)

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) If time or your students’ abilities do not allow for them to design their own stewardship project, you can choose an activity. If you need help, try contacting a local environmental group to coordinate a stewardship project for your class. There are multiple contacts for support for project partners on the Resources page who may be able to provide time, tools, and expertise.



Lesson 6: Time to Act!

Here are a few project ideas:

- Community or school presentation on invasive species (Ex: “What is an Invasive Species?”; “What Invasive Species are in Our Community”; “How to Stop the Spread of Invasive Species”)
- Invite a guest speaker to teach your school about invasive species
- Write a letter to your principal, groundskeeper, or local government about the invasive species problem on your school ground or in your community and offer potential solutions
- Design and distribute signs to plant nurseries about the dangers of invasive plants and alternative plants gardeners can use
 - Note:** *If your students are bi-lingual, encourage them to make a copy in their non-English language as well as English. This way they can reach even wider audience and will help them consider this tactic when making outreach materials in the future.*
- Design a control plan for an invasive species on your schoolyard
- Pull invasive plants
- Plant native plants
- Install and monitor insect traps for invasive species (partner with WSDA)
- Install boot cleaning station at local park

Otherwise, work through the lesson plan with your students to guide them through the process of designing their own project.

As your class plans its project, keep in mind what kind of permission you need to complete a project. For example, your class cannot go to a national park and start pulling weeds or go to a local plant nursery and post fliers without permission.

Procedure

Class 1

Introduction (10 min.)

Define or re-define **invasive species** with the class. If you have completed previous lessons, you can have students mention key points they remember. In past lessons, your students collected invasive species data. Ask your students what happened to the data they collected. *The data your students collect using the “WA Invasives” app is verified by professionals and helps those professionals track invasive species’ spread, plan management projects, and prevent outbreaks of new invasive species.*

Ask your students if they think only invasive species professionals can help manage invasive species. If they say, “Yes,” explain that they don’t need to leave it up to the specialists to act upon their data. They can take action too! In fact, by making reports, they have already started to help combat invasive species.

Tell your students that they will be working together to do an invasive species stewardship project. **Stewardship** is the act of taking care of something. Ask your students for examples of some of the things they help take care of, such as a pet or a younger sibling. Explain how with this project, students will be taking care of their community by managing for invasive species. Using their data and invasive species knowledge, they will design and act upon a plan to manage an invasive species of their choice.

Choose a Project (30 minutes)

If the top-scoring project from **Lesson 5: Invasive Species Presentation** is feasible, start planning how to implement it as a class. If not, work with your students to select an invasive species management project you can do with the resources you have. Remind them that no idea is

Lesson 6: Time to Act!

too small- everything we do makes a difference.

These questions may help prompt some ideas:

- When we conducted our survey, which invasive species was having the biggest negative impact in our community?
- Is there a certain invasive species that interests you the most?
- What kind of invasive species (plant, animal, or disease) do you want to manage for?
- What kind of work do you want to do (e.g., work outside, teach, design educational materials)?
- Where do you want to do a project (e.g., at school, in the community, nationally)?
- What kind of resources do we have available?

You can also refer back to the list of project ideas in the **Preparation** section of this lesson if your students are having trouble coming up with a project. You can present them with a few options and have them vote as a class on which they want to pursue.



Class 2

Plan Your Project (45 minutes)

Once you decide upon your project, then you need to start planning the details. You can brainstorm as a class, or you can break the class into groups and have each group plan a portion of the project. **Things to consider:**

Resources

- What are the different ways to manage this

invasive species?

- What resources do we need to be successful? Where can we get these resources?
For example: tools, money, plants, traps, poster board, etc.
- Do we need help from any community partners? If so, how will you contact them?
- Do you need any extra volunteers? If so, how will you recruit them?
- How long will this project take?
- When will we do this project?
After school or during school? Does our project need to happen during a certain time of the year, such as planting native plants?
- Where are we doing our project?
- Do we need special permission to do this project? If so, who can grant us that permission?

Activities

- What steps do we need to take to achieve our goal?
For example: gathering supplies, recruiting volunteers, getting permission to do the project, etc.
- Will your project require long-term monitoring? If so, who will monitor it?
For example: who will plant native plants in a patch on your schoolyard after you remove the invasive plants? Who will water any plants you install?

Outputs/Goals

- What are our project goals? What positive impacts will your work have?
For example: How much scotchbroom do we want to pull? How many insect monitoring traps do we want to install? How many people do you want to teach about butterfly bush?
- What are some problems you might run into doing this project? What can you do to prevent them?



Lesson 6: Time to Act!

Older students might find a logic model helpful to organize their thoughts. A template is provided with this lesson plan. For younger students, you may need to go over these different categories together as a class and write their ideas on the board.

Go over your students' plan together. Revise the plan as need be so the class can accomplish it in the time you have available.

*Again, if this level of planning seems like too much for your class, contacting a local environmental group is a good route. They will have projects your students can help with but not need to maintain and they often have all the necessary tools for the job. See the **Resources** page to find an environmental group in your area.*

Class 3 (Varies upon complexity)

Implement Your Project

Follow your plan and adapt as needed. If you run into large obstacles, explain to students that things don't always go to plan and that they now get to be creative and come up with a solution.

Review

Class 4

This can be done in class or be assigned as a homework activity (20 minutes).

Have students write a letter to a friend or family member about their stewardship project. They should include the following information:

- Describe your project.
- Why did you choose this project?
- How did it go?
- What was your favorite part?
- What would you do differently?
- Are there any other environmental or community projects you want to get involved with now?
- Add a picture or a drawing of your project

After you grade them, encourage student to send their letters. It will help them inform another person about the invasive species issue and can keep students thinking about what they learned. It will also be a good opportunity for most of them to learn how to address an envelope!

Potential Grants/Funding sources

- Contact local businesses, especially banks, they often have small grants for community projects
- Contact local environmental groups, they occasionally get grants for community projects
- Donors Choose: <https://www.donorschoose.org/>
Fundraising site for teachers
- Project Learning Tree GreenWorks! Grants: <https://www.plt.org/resources/greenworks-grants/>

Washington Pest Watch Standards Chart



Standard Addressed	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
NGSS						
MS-ETS-1						X
MS-ETS1-2					X	
MS-ESS3-3			X		X	X
MS-ESS3-4			X			
MS-LS1-4	X	X	X			
MS-LS1-5	X	X	X			
MS-LS2-1	X		X	X		
MS-LS2-2	X		X	X	X	
MS-LS2-4	X		X		X	
MS-LS2-5			X		X	X
Common Core						
RST.6-8.1		X			X	
RST.6-8.2		X				
WHST.6-8.1		X	X		X	
WHST.6-8.2		X			X	
WHST.6-8.6					X	
WHST.6-8.7		X				
WHST.6-8.8		X			X	
WHST.6-8.9		X			X	
RI.6.7		X			X	
SL.6-8.1	X	X	X	X	X	X
SL.6-8.3					X	
SL.6-8.4		X			X	
SL.6-8.5					X	
6.SP.B.5					X	
Ed-Tech						
1.3.2		X			X	
2.2.1			X	X	X	
2.2.2			X	X	X	
2.3.1				X	X	
2.3.2			X	X	X	

Washington Pest Watch Resources



ArcGIS

Account set-up

- Request Your FREE Schools Mapping Software Bundle: <https://www.esri.com/en-us/industries/education/schools/schools-mapping-software-bundle>
- Create individual accounts: https://doc.arcgis.com/en/arcgis-online/reference/create-account.htm#ESRI_SECTION1_24871ED982AC41ED86FF1937E7604CDE
- K12 Schools ArcGIS Online guide: https://www.esri.com/~media/9D2B921A445543EC8E6FB284812ED814?adumkts=industry_solutions&aduse=education&aduin=K12&aduc=email&adum=regular&utm_Source=email&aduca=gbd17k12_connected&adut=224706_Resources_ConnectED_Post_Show

Geomentors directory

Geomentors are individuals who volunteer to help educators use GIS with their students. They can help you request and set up your schools mapping software bundle, create student accounts, and more.

- <http://education.maps.arcgis.com/apps/MapSeries/index.html?appid=c369c6d9bb6d4232bb3ad066cd5b9280>
Select bubble 4 on the top left of the map to find Geomentors in your area

Story Maps

- **Example story maps:**
 - Asian Carp eDNA Monitoring- Fish and Wildlife: <https://fws.maps.arcgis.com/apps/Cascade/index.html?appid=bb1c15be82f3421a94ac291ed004a531>
 - How Invasive Species Threaten Salmon- Recreation and Conservation Office: <https://wa-rco.maps.arcgis.com/apps/Cascade/index.html?appid=82845d44d6ee4e84813b160aee2ae123>
 - Invasive animals in U.S. forest- U.S. Endowment for Forestry and Conservation: <https://usforests.maps.arcgis.com/apps/Cascade/index.html?appid=c7870ab214384a3db164b660a3e1a752>
- **Step-by-step tutorials:** <https://storymaps.arcgis.com/en/app-list/>
There are multiple styles from which to choose. Story Map Cascade is a particularly simple to use and visually appealing option. Each style has a tutorial.

Field STEM Notebooks

Handouts for gathering data are included with their relevant lesson plan. Science notebooks are an optional resource that provide a central location where students can store all of their observations, sketches, vocabulary, and more. They can attach datasheets to a page in their notebooks to prevent losing their data. Scientists and engineers employ notebooks in their daily work, so this is a good skill to develop.

- <https://www.wastatelaser.org/science-notebooks/>

Washington Pest Watch Resources



Field Trip

This Field Trip Template is an example of how to incorporate different lesson plan activities into a field trip. Estimated times and activity descriptions are included.

- Field Trip Template: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/FieldTripTemplate.pdf>
- “Oh Deer” Invasive Species Style: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/OhDeerInvSpMod.pdf>

Introductory Videos

- TedED “Attack of the Killer Algae”: <https://youtu.be/Vd4rgN6MYtg>
- TedED “The Threat of Invasive Species”: https://youtu.be/spTWwqVP_2s

Invasive Species Fact Sheets

- EDDMapS: <http://www.eddmaps.org/Species/>
- King County select bilingual noxious weed information (Options: Spanish, Vietnamese, Chinese, Somali, and Russian): <https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds.aspx>
- Noxious Weed Board: <https://www.nwcb.wa.gov/>
- USDA APHIS (some materials available in Spanish): <https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat>
- Washington Invasive Species Council: <https://invasivespecies.wa.gov/find-a-priority-species/>

Invasive Species Supply Kits

Teachers may borrow the invasive species supply kit for their region as availability allows. These kits include all of the materials recommended for working through these lesson plans. To borrow a kit:

- Use our online form: <https://invasivespecies.wa.gov/educational-materials/teacher-curriculum/> or contact
- Washington Invasive Species Council: Invasivespecies@rco.wa.gov; (360) 902-3088

Photographs

- Bugwood: <https://images.bugwood.org/>

These photographs are public domain, peer-reviewed, and curated for use in academics (make sure students still cite their source, citation information provided underneath each photo).

Project Partners

Potential organizations who may be able to help you conduct field trips, initial invasive species survey, or stewardship projects and/or be a guest speaker:

- **Conservation District Directory:** <http://www.wadistricts.org/partnership-directory-4.html>
- **County Noxious Weed Board Directory:** <https://www.nwcb.wa.gov/contact-your-county-weed-boards>
- **Project WILD coordinators** (Coordinators can provide contact information for environmental groups in your area): <https://www.fishwildlife.org/afwa-inspires/project-wild/project-wild/project->

Washington Pest Watch Resources



[wild-coordinator-contact#V-W](#)

- **State Parks Directory:** <http://parks.state.wa.us/281/Find-a-park>
- **Washington State Department of Agriculture (WSDA);** WSDA is best for interest in pest management projects, such as setting up and monitoring insect traps:
<https://agr.wa.gov/contact-us>
(Contact the current **Managing Entomologist**, found in the “Contact Directory”)
- **Washington State University Extension/Master Gardeners Directory:** <http://pubs.cahnrs.wsu.edu/locations/>

Regional Lists

- Eastern Washington:
 - Eastern Washington Regional Invasive Species List: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/EWARegionalList.pdf>
 - Eastern Washington Invasive Species Supply Kit Inventory Sheet: https://invasivespecies.wa.gov/wp-content/uploads/2019/10/SupplyKit_EWA.xlsx
- Western Washington:
 - Western Washington Regional Invasive Species List: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/WWARegional-List.pdf>
 - Western Washington Invasive Species Supply Kit Inventory Sheet: https://invasivespecies.wa.gov/wp-content/uploads/2019/10/SupplyKit_WWA.xlsx
- Additional Washington Priority Invasive Species Lists
 - Eastern Washington Noxious Weeds: https://www.nwcb.wa.gov/pdfs/Eastern_WA_fieldguide.pdf
 - Western Washington Noxious Weeds: https://www.nwcb.wa.gov/pdfs/Western_WA_fieldguide.pdf
 - WISC Top Priorities: <https://invasivespecies.wa.gov/priorities.shtml>

Reporting

- Call: (360) 902-3088
- E-mail: invasivespecies@rco.wa.gov
- “How to Report” Handout: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/HowToReport.pdf>
- “How to Report” PowerPoint Presentation: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/HowToReport.pptx>
- “Quality Photo Tips” Handout: <https://invasivespecies.wa.gov/wp-content/uploads/2019/10/PhotoTips.pdf>
- Reporting Webpage: <https://invasivespecies.wa.gov/report-a-sighting/>
- “WA Invasives” app
 - Android: <https://play.google.com/store/apps/details?id=com.bugwood.wainvasives>
 - iPhone: <https://apps.apple.com/us/app/wa-invasives/id826772026?ls=1>

Washington Pest Watch Sources



- Ambrogim. “Thurston_BikeMap” [layer]. Scale Not Given. “Thurston County Washington Bicycle Facilities and Routes”. October 13, 2016. <https://www.arcgis.com/home/item.html?id=8fca4181f2c742e78ca66f6aed211a3d>. (October 25, 2018).
- Bellard, C., P. Cassey, and T.M. Blackburn. 2016. Alien species as a driver of recent extinctions. *Biology Letters*. 12: 20150623. <http://dx.doi.org/10.1098/rsbl.2015.0623>.
- EDDMapS. “Thurston County, Washington, United States invasive species reports”. <https://www.eddmaps.org/tools/query/results.cfm?reporter=&userGroupID=&observationDateStart=&observationDateEnd=&dateEnteredStart=&dateEnteredEnd=&dateUpdatedStart=&dateUpdatedEnd=&objectid=&subjectnumber=&cat=&div=&eradicationstatus=&list=&rank=&habitat=&country=926&state=53&fipscode=53067&township=&layersourceid=&project>. (November 5, 2018).
- ESRI. “Topographic” [basemap]. Scale Not Given. “World Topographic Map”. February 19, 2012. <http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f>. (October 25, 2018).
- Gratwicke, Brian. African clawed frog (photo). <https://www.flickr.com/photos/briangratwicke/8325732255/in/photostream/>.
- Looney, C., T. Murray, E. LaGasa, W.E. Hellman, and S.C. Passoa. 2016. Shadow surveys: How non-target identifications and citizen outreach enhance exotic pest detection. *American Entomologist*, 62(4):247-254.
- Luis A. Solórzano. European green crab (photo). https://www.exoticsguide.org/carcinus_maenas.
- OnlineMapSupport_WSDOT, Jackson, J. “WSDOT – County Boundaries” [layer]. Scale Not Given. “County Boundaries of Washington State”. October 29, 2012. <https://wa-rco.maps.arcgis.com/home/item.html?id=fe229f9df5aa4289b8ccd2a99289951b>. (October 25, 2018).
- Oregon Sea Grant. 2018. Aquatic Invasions! A Menace to the West. <https://seagrant.oregonstate.edu/menacetothewest>. (November 8, 2018).
- Pennsylvania Department of Agriculture, Spotted lanternfly (photo).
- Thurston_GeoData. “Thurston_Parks” [layer]. Scale Not Given. “Thurston Parks”. December 11, 2017. <http://www.arcgis.com/home/item.html?id=598f95bd373c407ea778010903a97b9f>. (October 25, 2018).
- United States Department of Agriculture. 2018. Hungry Pests. <https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests>. (November 8, 2018).
- Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *BioScience*, 48(8):607-615.