

NYSDEC's Invasive Species Curriculum: 2018 – 2019 Pilot Program

Grades 6 - 8

The purpose of this unit is to bring students through the scientific process to develop their own scientific research poster focusing on the statewide issue of invasive species. Student groups will be brought through the steps to develop a group research poster. The process will occur over about two weeks including a speaker to visit, field work, optional field trip and a summary poster session. The groups will be led through prompts to research invasive species topics including what are invasive species, how do they impact students' lives, how do they travel, does the school campus and local areas have invasive species, what can be done to manage and prevent invasive species from coming to the area?

Day 1: What are invasive species? <i>Introduction writing</i>	Day 2: How do invasive species spread? <i>Introduction writing</i>	Day 3: What do invasive species look like? <i>Optional speaker and hands on plant identification</i>	Day 4: What invasive species are an issue locally? <i>Methods writing and field day preparation</i>	Day 5: What invasive species are on the school grounds? <i>Campus field work</i>
Day 6: Are there any patterns in the class data? <i>Data analysis, results writing and methods editing</i>	Day 7: What are local managers doing about invasive species? <i>Optional Field trip</i>	Day 8: What is done about invasive species? <i>Conclusion writing</i>	Day 9: What did students learn? <i>Poster session</i>	Coming soon: Day 10: Action day <i>Optional invasive species community service day</i>

Aims and objectives:

Students will be able to:

- Create a group research poster summarizing their invasive species study.
- Analyze their field data to be used in their invasive species study.
- Summarize what invasive species are and how they impact humans.

New York State P-12 Learning Standards	MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about shifts in populations due to changes in the ecosystem.]
Science and Engineering Practices	<p>Engaging in Argument from Evidence - Engaging in argument from evidence in 6–8 builds on K– 5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)</p> <p>Connections to Nature of Science <i>Scientific Knowledge is Based on Empirical Evidence:</i> Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)</p>
Crosscutting Concepts	<p>Stability and Change Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)</p>
Disciplinary Core Ideas	<p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)</p>
Common Core State Standards Connections/ Next Generation New York State English Language Arts Standards (2017)	<p>Common Core State Standards Connections: <u>ELA/Literacy [Next Generation New York State English Language Arts Standards (2017)]–</u> <u>RST.6-8.1</u> Cite specific textual evidence to support analysis of science and technical texts./[6-8 RST1: Cite specific evidence to support analysis of scientific and technical texts, charts, graphs, diagrams, etc. Understand and follow a detailed set of directions.] (MS-LS1-6),(MS-LS2-1),(MS-LS2-4) <u>RI.8.8</u> Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims./[8R8: Trace and evaluate an argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient and recognizing when irrelevant evidence is introduced.] (MS-LS2-4) <u>WHST.6-8.1</u> Write arguments to support claims with clear reasons and relevant evidence./[WHST1: Write arguments focused on discipline specific content.] (MS-LS2-4) <u>WHST.6-8.9</u> Draw evidence from informational texts to support analysis, reflection, and research. [6-8 WHST7: Draw evidence from informational texts to support analysis, reflection, and research.] (MS-LS1-6),(MS-LS2-4)</p>

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Day 1: Introduction to invasive species

40-minute lesson

Driving questions:

- What are invasive species?
- How do invasive species impact our lives?

Objectives

Students will be able to:

- Summarize what an invasive species is and how they impact society.

Materials:

- Chromebooks/laptops/desktop computer
- Notesheet (Supplement provided online)
- Student working poster
- Colored pencils/markers/construction paper (if hand writing intro)

Entry event:

To begin the unit, the students will brainstorm what they already know or may have heard about invasive species. Students will be asked to think-pair-share their ideas. The teacher will record students' ideas on a sheet of paper, whiteboard, or smartboard, etc. This should be left up for this class period for a starting point in the groups research (5 minutes).

Activity:

Teacher will begin the unit PowerPoint (provided online). Within the first slides is a video which explains what invasive species are, how they have already affected communities and how they are transported. These are the major topics students will be researching for the introduction of their poster (5 minutes).

Teacher will continue to use the PowerPoint for the rest of the lesson. Students will be split into their working groups for the project. Teacher should decide whether groups are pre-picked, randomized or student choice depending on the class. When the groups have been created, students will be introduced to the group project they will be working on; PowerPoint will be used to explain to students the group project. Teacher will show groups the example provided with the curriculum (image in PowerPoint). Teacher will hand out permission slip for students to download the iMapinvasives app (permission slip example online) (10 minutes).

The student groups will begin their research focusing on two questions: 1. What are invasive species and 2. How do they impact our lives? These questions should be visible to the students while they are researching; the questions are on a slide within the unit PowerPoint. Students may use online sources (list included), pamphlets and fliers (reach out to local NYDEC for pamphlets) or texts from the school library. Students should take notes on these two focusing questions including their citations in the student note sheet, provided (10 minutes).

Summary:

To finish the class period, students will begin writing their introduction. This part of the introduction is to explain what an invasive species is and how they are impacting human lives. Students will use their notes, citing their sources, to develop a paragraph or two on the topics. This can be written on a sheet of paper or typed in a Word or Google doc to be added to the following class and added to the poster (10 minute).

Teacher tips:

- The video to introduce the unit is a Ted talk which explains what invasive species. URL here, https://www.youtube.com/watch?v=spTWwqVP_2s
- Another video that could be shown following the video shows specific invasive and scenarios in New York State. The video is by The Nature Conservancy. URL here, <https://www.youtube.com/watch?v=P76NJire3A>
- If you record the brainstorm on a sheet of paper or smartboard document, you can use it at the end of the unit to show students their growth.
- PowerPoint is available online, <https://www.dec.ny.gov/animals/114620.html>, to download and modify to classroom needs. For example, teachers can add student groups into the blank slide to assign project groups.
- **Contact iMapinvasives one to two weeks prior to starting the unit to set up teacher and student account information. Email: imapinvasives@nynhp.org**

Day 2: Risk of spread

40-minute lesson

Driving questions:

- How do invasive species arrive in NY?
- What are some simple steps people can take to prevent introductions?

Objective

Students will be able to:

- Describe how invasive species spread.
- List preventative steps to stop invasive species from entering an area or spreading.

Materials:

- Chromebooks/laptops/desktop computer
- Notes sheet (supplement provided online)
- Student working poster
- Colored pencils/markers/construction paper (if hand writing intro)

Entry Event:

The unit PowerPoint will instruct student groups to analyze maps, Google maps or paper maps, looking specifically at the methods of transportation within New York State (land and water). Students should have a few minutes to become comfortable in using the maps looking at the key and understanding the scale and the icons. When students have identified the key transportation pathways in New York State, groups should pinpoint areas which may be an invasive species hotspot (areas which have many pathways coming together/highly trafficked areas like cities). (10 minutes).

Activity:

Groups will conduct new research for the second part of their introduction. In this class, students will focus their research on the following questions: 1. How do invasive species spread, 2. How can people prevent the spread of invasive species. Teacher will project the focusing questions to the class via the unit PowerPoint. Students will use research methods like the previous lesson, internet search (web list), pamphlets, or library books. Students will take notes, recording their sources, to then be used in their introduction (15 minutes).

Summary:

Students will summarize their research on how invasive species spread. Students should also use this time to ensure their introduction from the previous class flows with today's research (15 minutes).

Homework: Students can watch a video or read an article to introduce them to basic botany terms and characteristics.

Teacher Tips:

- On iMapinvasives, you can access the spatial prioritization model map filters. This day looks at the spread of invasive species and one part of the model is the risk of spread. This map, which is colored red, shows how likely a transportation pathway could move an invasive species. The darker or thicker the buffer around the road, highway, or pathway, the more likely it is to be a transportation pathway for invasives.
 - You can access the map layer in the map section on the online iMapinvasives site and find your local area to show students the risk in the area.
- It is highly recommended that teachers become comfortable on the iMapinvasives site before having students work with the maps.
- Homework examples include: <https://www.youtube.com/watch?v=5Aj82u2he6s>, <https://basicbiology.net/plants/physiology/leaves>,

Day 3: Plant identification

40-minute lesson

Driving questions:

- How can we identify which plant species are invasive?
- Are there any native look-a-likes?

Objectives

Students will be able to:

- Identify key plant characteristics of the 10 common invasive species of NYS.
- Sketch two to three common invasive species brought into the classroom.

Materials:

- Invasive species specimens (collected the day before or the morning of)
- 10 common invasive species (supplement provided online)
- Observation worksheet (supplement provided online)

Optional Entry event:

A speaker will come in to discuss invasive species in the area, how managers are addressing the invasive species and what they do in their profession. (Teachers will need to reach out to the PRISM to find an individual to speak to their class. Contact list included. The best place to start to seek a speaker is through the local PRISM. If they are unable to come into the classroom, they will know groups/volunteers which may have better availability) (10-15 minutes).

Activity:

Student groups will be given the 10 common invasive species packet to follow along when going over plant characteristics. Teacher and/or speaker will walk students through the specimens brought in to the classroom. Students will be introduced to botany terminology to describe plant structure. Students groups will be given the 10 common invasive species identification packet to use to identify invasive species the speaker and/or teacher has brought into the classroom. Teachers should look on the school grounds, on the edges of wood and travel ways to find invasive species (10 minutes).

Within student groups, students will choose one to three invasive species (depending on time) they will become a specialist on, observe the species and sketch drawings of the ones they choose (15 minutes).

Summary:

Students will share their sketches with their groups, going over key characteristics (5 minutes).

Homework: Each group member will go through the Midwest Tutorial or Alice Ferguson Foundation interactive dichotomous key to further their identification skills.

Teacher Tips:

- While doing the observation drawings, students do not need to be artists. Students should be sure to focus on details on the observations (leave edges, veins, stems, flowers).
- If teacher is unable to find a speaker for the day, the lesson should be changed into a hands-on workshop for students to learn the different characteristics of each common invasive species.
 - Skip the introduction event and teacher will take students through the 10 common invasive species. Many of these invasive species can be found on the edges of properties, roads and other disturbed areas. Students should focus on more than just one invasive species when conducting and sketching their observations.
 - If teacher is uncomfortable with teaching the characteristics and students have individual internet availability, students can work through the Midwest tutorial to become familiar with invasive species.
- Alice Ferguson Foundation link: <http://fergusonfoundation.org/btw-students/plant-identification/>
- Midwest invasive species trainings link: <https://www.misin.msu.edu/species-training/>

Day 4: iMapinvasives introduction

40-minute lesson

Students will be able to:

Driving questions:

- Which species are an issue on a local scale?

- Plan the procedure for their groups field work the following lesson.
- Use the iMapinvasive website map.

Objectives

Materials:

- Smart device (1 per group)
- Field forms (supplement provided online)
- Computer
- Procedure note sheet (supplement provided online)
- Colored pencils/markers/construction paper (if hand writing intro)

Entry event:

Students will be introduced to iMapinvasives. The class will walk through a step by step tutorial introducing the app, logging into the app, setting the preferences and sending a test point. Students will then go through a walk-through of how to use the iMapinvasives online portion. **Students will need to download the app prior to this lesson.** (15 minutes)

Activity:

The teacher will go over the procedure for the next class, the field day. Student groups will be taking notes so they can write up their procedure at the end of class for their poster. Teacher will need to define different size concepts that will be encountered while entering data into iMap. (10 minutes).

Summary:

Student groups will summarize the methods they will be completing the following lesson. This will only be a draft; students will revisit their methods following the field day to change anything that was different when executing the field work (15 minutes).

If time allows, students should complete the activity below. If not, students can explore iMapinvasives for homework.

Students will log into iMapinvasives and roam the local areas looking for different invasive species. The members of the groups will each choose a different invasive species to see the known locations of each in the local area. It is important to explain to students these are not the only places where the given invasive species is found. These locations within the database are areas where people have identified and sent in the

location to iMapinvasives. There are many invasive species which were unidentified and known by the database. Students will then compare the locations of the species. Are they in the same or different areas? Is a singular species clumped all together or spread out? (~10 minutes)

Teacher Tips:

- If classroom is flipped or teacher is willing assign such homework, students can go through the walkthrough PowerPoint before class. This will give students more time to go over the procedure for the field day, work on their methods and other areas of their group poster.
 - A great tool to use for the PowerPoint is EdPuzzles at <https://edpuzzle.com> . Edpuzzle is an easy-to-use platform where you can make any video or PowerPoint your lesson. Check out an example here: <https://edpuzzle.com/media/5b04517a31e825408328d9f8> .
- Before lesson, teacher should explore iMapinvasives themselves to predict complicated areas that students may need help understanding how to use. Area to focus on is the map which has many different tools and layers for students to use.

Day 5: Campus field work

40-minute lesson (can vary)

Driving questions:

- Which species do we have on our school grounds?

Objective

Students will be able to:

- Use the 10 common invasive species packet to identify invasive species on the school grounds.

Materials:

- 10 common invasive species packet (supplement provided online)
- 1 Field form per group (supplement provided online)
- 1 Clipboard per group
- 1 smart device per group
- Lens
- Pencils
- Observation sheets (completed in day 3 lesson)

Entry event:

The class will review the key characteristics for common invasive species in the area; teacher can use any leftover specimens to have students review. Students will look over the 10 common invasive species and drawing they made from the plant identification lesson. Students will need to bring the following tools with them into the field:

- Clipboard with field sheet
- 10 common invasive species packet
- Smart device with the *Mapinvasives* app already downloaded, logged in and preferences set.
- Lenses

(5-10 minutes)

Activity:

Teacher will need to preview areas on the campus that are safe for students and have invasive species. Students will go to these areas, in their groups, and identify **one** invasive species, record the species and information about the species on the field sheet, and plot where the invasive is on the campus using *Mapinvasives* app. It is recommended that teacher blocks off areas for each class to monitor. This will help when students are trying to analyze their data in the next lesson. Student groups should add more observations in field form for analysis in project. (30+ minutes)

Summary:

Students will return to class and upload observations on Wi-Fi.

Teacher Tips:

- Preparation for this day should include: a survey of the school grounds, marking of the different class area (to ensure students are surveying a good portion of the campus and not a small corner), and group materials are together and prepared.
 - A student helper could help prepare these materials for the lesson.
- This would be an ideal day to have a volunteer, the speaker, come to help student identify and find densities of the invasive species.
- **Each student group should only plot one invasive species on the iMapinvasive app.** This is to ensure the iMapinvasive team is not overloaded with the same or similar data. It is also important to share with students that it is important to be certain with a species and define the density. Multiple points in the same area is not as effective as defining the infestation with one point describing the density and size.
- This data will be used by New York State and other scientists. This is important to bring up to students so they know this data is not only something they will be used but by the State and other organizations.

Day 6: Analysis of class data

40-minute lesson

Driving questions:

- Are there any patterns to where the class plotted data on invasive species are located?

Objectives

Students will be able to:

- Assess the research methods and modify for any changes that may have occurred in the field.
- Separate class data to point out issues areas on campus.

Materials:

- Computers
- Completed field sheets
- Colored pencils/markers/construction paper (if hand writing intro)

Entry event:

Students will take a look at their class's data. The previous day, students should have stayed in a specific area to allow for students to know where each class took data. Students will log on to *Mapinvasives* and in their groups, students will analyze the class data looking at patterns of species or locations. Students will need to use the lasso tool on *Mapinvasives* to show all the data for a given area. Students will then hypothesize two methods in which the invasive species could have arrived on the school grounds. As groups come up with these hypotheses, students should write them on the board for the class to see. There should be no duplicate hypotheses; challenge students to think outside of the box. (20 minutes)

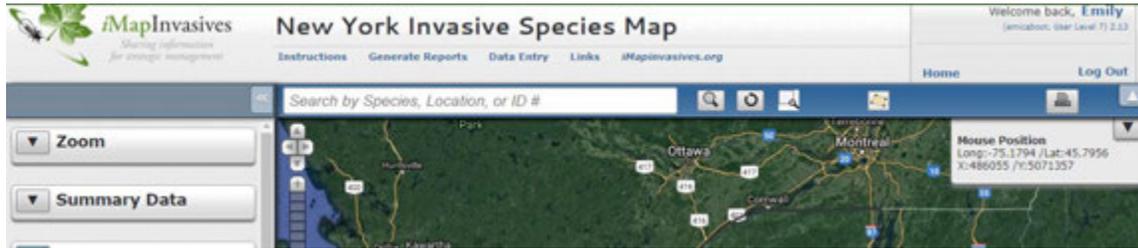
Activity:

Student groups will use their field sheets to summarize the data they collected in the field. Students are to summarize their information in complete sentences. Images or data tables (density or town comparative data) are appropriate for this section of the poster. (10 minutes)

Summary:

Students will review their methods sections and edit any part of the procedure they may have changed while in the field. (10 minutes)

Teacher Tips:



- The lasso tool is the circled image above. When using the lasso tool, click to create multiple points around the area you want to see data for, creating a polygon, and double click to finish the area. This will show the current data points in the area. You may have to create a few different polygons at different scales to find data. There may not be data in a small scale depending on where you are looking. A few trails may be necessary.

Day 7: Field trip (optional)

Length will vary

Driving questions:

- Can invaded landscapes recover?
- What should the goal of restoration be?
- Will invasive species return to a restored area?

Entry event:

Before the field trip, students will look at the geography of the park/preserve/land they will be visiting. Students will analyze the different transportation pathways, land types around, and different human developments that may affect the land.

Activity:

When arriving at the park/preserve/land students should try to identify different invasive species they may see and note where they find them (side of the road, in the woods, etc). Students will then have a presentation from a park/preserve official or land manager on how they deal with or manage invasive species.

Some discussion points for the presenter could be:

- What invasive species are on the land
- Are they managing the invasive species? If not, why?
- Are there any preventative measures they are doing to prevent invasive species from coming in?
- Are there any measures that patron and students can do when coming and leaving the park?

Summary:

Students will each write a thank you letter to the area they visited discussing one thing they took away from the field trip. In the thank you letter students can discuss any advice they have to managers to prevent more invasive species from coming to their area.

Teacher Tips:

- Grants are available through NY State Parks and Recreation to get funding to transport students of Title 1 schools to parks and recreational areas in New York State.

Day 8: Big picture

40-minute lesson

Driving question:

- What is New York State doing about invasive species?
- Is it realistic for scientists and managers to eradicate all invasive species?

Objectives

Students will be able to:

- Differentiate the different infestation levels of invasive species.
- Evaluate and summarize their research and learning for the group project.

Materials:

- Poster
- Colored pencils/markers/construction paper (if hand writing)

Entry Event:

This final work day, students will be looking at the big picture of the invasive species issues in New York State. Student groups will interact with the a NYS specific invasion curve, within the unit PowerPoint, that explains what each level/part means and what are some examples of each on the scale. The PowerPoint then brings students through examples of prohibited and regulated species defined by the NYS DEC. (10 minutes)

Activity:

The class or groups will look at a few examples of invasive species management in the state and how current science is powering each project; the PowerPoint focuses only on three examples however students are encouraged to search for more examples online. This will show students that all infestations are manageable. (15 minutes)

Students will then have time to summarize their project. Groups will develop their conclusion of their project. Information in this section should include:

- What did the group learn?
- What are some prevention strategies the school, and students, can take to prevent invasive species from spreading?

(10 minutes)

Summary:

Students will put any finishing touches on their project. (5 minutes)

Teacher Tips:

- There are many invasive species management projects occurring across the State. By reaching out to your PRISM you can find out more about management projects that are occurring in your area.
- The prohibited and regulated species list is developed by the NYDEC and can be found here,
https://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf.

Day 9: Poster session

40-minute lesson

Driving questions:

- What have students learned about what are invasive species, how do they arrive new places, how can they be managed and prevented?

Objective

Students will be able to:

- Reframe their research to their peers.

Materials:

- Poster
- Question prompt sheet (supplements provided online)

Entry event:

Student groups will set up their posters spread out around the classroom or other location. Students will decide the order they will stay with the poster as a spokesperson. The poster session will be broken up into 5 minutes segments to give students the opportunity to stand with the poster and describe their research to their peers. (10 minutes)

Activity:

Students will walk around and see other groups' posters and discuss their research with their peers, similar to a science fair. The session will be broken into 5 minutes segments. Teacher will need to keep time so students can switch at the poster correctly. Students who are roaming the classroom will use prompts to start research conversations where they will record discussion points. (25 minutes)

Summary:

Clean up and public presentation. Student work can be displayed outside the classroom or elsewhere in the school to show off their hard work! (5 minutes)

Teacher Tips:

- Invite different audience members for students to present and discuss their work to. Examples are: custodians, grounds personnel, administration, other classes like elementary students working on plant units.
- After the completion of the curriculum, we want to get your feedback! Please fill out our survey: <https://www.surveymonkey.com/r/IScurriculumfeedback>