

Putting Invasive Species on Trial



missouri
environmental
education
association

RECOMMENDED GRADE LEVEL: 6-12

OVERVIEW: This immersive unit challenges students to research invasive species and think about how humans regulate or change the environment through a mock trial. Students will dive deeper into the complex issues between humans and the environment by thinking critically to analyze research and form a statement for their role in the mock trial. Students will consider why invasive species are a concern, learn how invasive species came to be introduced to an ecosystem, how the environment is managed within a community, and what can be done to reduce the environmental impact of invasive species. This lesson is not designed to introduce students to the concept of invasive species. It is recommended that students are already familiar with the term prior to the start of this lesson.

MISSOURI LEARNING STANDARDS:

K-5.ETS1.A.1, K-5.ETS1.B.1, K-5.ETS1.C.1, K.PS3.B.1, 4.PS3.B.1, 4.PS3.B.2, 3.PS1.B.1, 5.ESS1.B.1, 6-8.ETS1.B.1, 6-8.ETS1.B.3, 9-12.PS3.A.3

TIME: Multiple class periods, recommended minimum is at least 10 50-minute class periods. Portions of the research and writing components may be assigned as homework. An example schedule may be:

Week 1:

Day 1: Introduction & review of invasive species
Day 2: Review of trial roles, viewing of St. Louis Trial of Bush Honeysuckle, selection of student groups
Day 3: Selection of roles and begin research
Day 4: Group research on invasive species
Day 5: Group research on invasive species

Week 2:

Day 1: Groups begin to draft trial script
Day 2: Finalize trial scripts
Day 3: Group practice
Day 4: Mock trial presentations
Day 5: Mock trial presentations

ESSENTIAL QUESTIONS:

- How do humans impact the natural world?
- How have humans used laws and regulations to protect the environment? What else could be done?
- Should we (humans) use laws and regulations to eliminate the spread of invasive species?
- What are the advantages and disadvantages of introduced species to an ecosystem?

OBJECTIVES:

By the end of this activity students will:

- Be able to identify local invasive species in their community
- Develop an understanding of the difficulty in managing or controlling invasive species in a

community

- Explore the ecological impacts of invasives an ecosystem
- Research, write, and speak persuasively to defend arguments
- Applying critical thinking skills to analyze and summarize research
- Build understanding of the importance and value of speaking to others in the community about biodiversity and invasive species management

MATERIALS:

- List of invasive species for mock trial subjects
- Research materials
- Examples of public campaigns to educate and build awareness about local invasive species
- Student access to computers or library for research
- Copies of character profiles for each student group
- Mock Trial Student Worksheet

VOCABULARY:

Biodiversity - the variety of life in the world or in a particular habitat or ecosystem

Endemic Species - a species that is native and restricted to a certain place

Invasive Species - a species that is not native to a specific location (an introduced species), and that has a tendency to spread to a degree believed to cause damage to the environment, economy or human health

Native Species - a species that is found in a certain ecosystem due to natural processes, such as natural distribution and evolution

Plaintiff - a person who brings a case against another in a court of law

Defendant - an individual, company, or institution sued or accused in a court of law

PREPARATION:

1. Do some research and find the best local resources available for your community. For Missouri, a good place to start your research is the [Missouri Invasive Plant Task Force](http://moinvasives.org) at moinvasives.org
2. Create a reference list to help direct your students to when they are researching on their own.
3. Create a list of invasive species in your community that you'd like to have students research. Student groups will choose from this list for their project. Alternatively, you can have the students research invasive species in your region on their own and determine which species to put on trial.
4. Determine the number and size of your student groups. Modify the expected roles to fit the size of your groups.
5. Each group needs at least 6 students: plaintiff, plaintiff lawyer, plaintiff witness, defendant, defendant lawyer, defendant witness. Additional students can serve as more witnesses. Groups should not exceed 10 which provides each side of counsel with three witnesses.
6. Determine what logistics you will need to coordinate for the Mock Trial presentations. Will the students perform for the other student groups in the class? The school? Will parents be invited to attend the Mock Trials?

DIRECTIONS:

Note: This is not a lesson that introduces students to the concept of invasive species, but gives students an opportunity to dive deeper and think critically about why invasive species are a concern, how they are managed within a community, and what can be done to address the issue as a whole.

*To find lessons that better serve as an introduction to the topic of invasive species consider the lesson: *Invasive Species in Missouri: What Makes a Good Invader?* included in the Appendix of this activity guide.*

1. On the whiteboard, chalkboard, or smartboard at the front of the class create a list of different examples of invasive species. This list can include local, regional, and global examples the students may know or can focus only on your local area and the species students may be using as part of their projects. You may also elect to use images of these species to create your “list”. Do not tell the students that this is a list of invasive species.

An example list of invasive species in Missouri:

- Bush Honeysuckle
 - Emerald Ash Borer
 - Tree-of-Heaven
 - Garlic Mustard
 - Gypsy Moth
 - Zebra Mussel
 - Asian Longhorned Beetle
 - Bighead Carp
 - Callery Pear
 - Wintercreeper
2. Ask the students to look at the list and see if they recognize any of the species on it. Give students an opportunity to share what they know about species they recognize.
 3. Ask students to think about what all of these species may have in common. Use questions and pieces of information to help students figure out that this list is a list of invasive species.
 4. Follow with a brief question-led discussion about invasive species for review. Some example questions you may ask include: What makes them an invasive species? Why are invasive species a problem for our ecosystem? What can be done about invasive species? What are characteristics (easy to reproduce, easy to spread, can withstand disease, limited predators, etc.,) of invasive species?
 5. Be sure that students understand the definition of invasive species, endemic species, and native species before moving on to the next step.
 6. Explain that for this project, students are going to be researching invasive species and learning more about how these species impact the environment. Then, they will use what they have learned to write statements and put on a mock-trial.
 7. Ask the students to think about how humans have impacted the spread of invasive species? How do humans manage these troublesome species? If there are specific laws or regulations in your area be sure to provide the students with this information. If you wish to provide specific examples of strict regulations provide information about how invasive species are managed in places like the Galapagos Islands or Antarctica where strict regulations are in place to prevent the introduction and spread of invasive species.

8. If available, show students local resources that might be attempting to build awareness and advocate for invasive species management.
9. Ask students to think about how other laws are enforced and regulated in the United States? Try to prompt students to bring up the topic of the justice system and courts. Explain that the judiciary system allows for a fair hearing of both sides of an argument. Trials are designed to provide information for both sides of an argument and have the people make decisions based on facts and evidence.
10. Explain that for the mock trial project they will be working in a group to research, write, and perform their own mock trial putting an invasive species of their choice on trial. You, the educator, will serve as the judge (if you wish to get others involved you can engage a community environmental/plant expert, judge, the principal, or other figure to serve as the judge for your students' trials), the students will each serve a specific role in the trial, and serve as jury for the other student groups.
11. Break students into groups of 6 (minimum) to 10 (maximum). Review the logistics and timeline of how the mock trials will work and important due dates. Be sure to explain that each student will take on a specific role for the case and this role will influence what statements they prepare based on their research.
12. Have students watch the recording of the St. Louis Trial of Bush Honeysuckle. If the video is not available, a transcript of the trial is available for students to review. Character Profiles are also available to help students better summarize and understand the St. Louis Trial of Bush Honeysuckle.
13. Have the students brainstorm important pieces of the trial. Who were the key people involved? What were their roles? What was the ruling? Discuss student responses as a class.
14. Hand out the Student Mock Trial Worksheet and review how to use this worksheet to take notes, prepare their statements, and organize their group's mock trial. Describe each role for the students and have them assign who will do what in their group. Everyone will work together, but the statements and questions they prepare will be different depending on their unique role.

For each student group you will have the following roles:

Plaintiff (Against the Invasive Species)

- Plaintiff - this person will write a summary statement as to why the invasive is harmful for the region and should be removed and managed carefully
- Lawyer - will summarize the arguments of the case and question the witnesses; the lawyer will need to generate thought provoking questions to ask the defendant about their species
- Witnesses (1-3) - Each witness will choose one specific impact of the species and explain in their statement details and examples of how it is harmful, why it should be removed.

Defendant (Defending the Invasive Species)

- Defendant - this person will stand in for the invasive species that cannot speak for itself and explain what the plant is, why it likes the area, how it came to the state (or country), etc.,
- Lawyer - will summarize the arguments of the case and ask thought-provoking questions of the witnesses
- Witnesses (1-3) - Each witness will choose one specific advantage or reason the invasive is planted, or used around the community and explain in their statement how the invasive is not harmful enough to warrant being removed

15. If students are struggling to understand the different roles, it may be helpful to view the St. Louis Trial of Bush Honeysuckle again, pausing at specific spots to highlight the different players or refer back to the Character Profiles provided.
16. After the students have assigned the roles have each group select an invasive species to put on trial. Students can either choose from a list you provide them or from conducting their own research for their state.
17. Allow the students to plot their course for research and preparation. Remind the students to use the Mock Trial Storyboard Worksheet to plan their Mock Trial. This worksheet has specific questions, ideas, and parts for each student in the group to complete and can serve as a basic script for the mock trial. This will also be turned in to the judge so the judge can help follow-along and keep the Mock Trial running smoothly during the performance.
18. Allow students time to visit the library and/or conduct research on their invasive species. All students in the group should work together to research their invasive species - no matter which side of the court they are playing in the mock trial.
19. Once students have gathered enough information, have them begin to write their statements. Students should plot out specific facts, points, and opinions that they want to bring up during their mock trial. The statement is the part of the mock trial that the students will read, or speak, during the trial. The group will arrange their statements in an order that will become the script, the plaintiff and defendant groups will need to work together to create their final script.

Students should craft statements based on information they find about how the species was introduced to the area, why it is a problem, how it may currently be managed, and why some people may not view the invasive species as a problem.

20. Allow students time to write their statements, arrange the scripts, and practice running through the whole thing before holding their mock trials.
21. Remind students of the general format for the mock trials. The format may change dependent on when you are having the students present, who you are engaging as judges, and jury. In general, the educator serves as the judge, and you can select one of the alternative groups in the class as a jury. This is a great opportunity to engage parents, school leadership, and other community members in your mock trial unit.

Review the Mock Trial Outline attached to this activity guide for an overview of how to format the mock trials. The Mock Trial Storyboard Worksheet is set-up to mirror this format.

22. Unless you have other plans for who will be the jury, explain that while one group is holding their trial, the others will serve as the jury. At the end of each trial, the jury will be given time (5-10 minutes) to discuss the case and decide if the case will be awarded in favor of the plaintiff or the defense.
23. Hold the mock trials. After each student group has gone, begin wrapping up the project with the final discussion.
24. To continue student learning think about planning an extension activity such as an invasive species removal project or more. More information about possible extension activities located on page 6.

WRAPPING UP:

After all groups have gone, have students reflect quietly in a journal or on a piece of paper about the experience. After some time of independent reflection, discuss this process as a class.

Some questions for students to consider:

- What did they learn?
- What do they think about the invasive species they learned about?
- How humans impact the environment and spread of invasive species?
- How can humans help create solutions to invasive species?
- In what ways do we currently use the law to help reduce the impacts on the environment?
- Should humans introduce new species to an environment or try to control the existence of certain species in the ecosystem?
- Are there currently laws or regulations in place that help reduce invasives? In what ways does the law not address invasive species?
- Are there examples where laws and regulations have led to strict removal or enforcement of invasives control?
- Why is the justice system important? How is it a fair process?

RECOMMENDED OPTIONAL EXTENSIONS:

A. Have students spend more time researching how invasive species are regulated throughout the world and in their community prior to the start of this lesson. Are there local weed ordinances? This is a great opportunity to explore places such as the Galápagos Islands, rich in biodiversity and highly protected from introduced species. Have students use this research when they are serving as jury to help draft a recommended “sentence” for the end of the mock trial.

B. Provide the students with an opportunity to take action and help address issues with invasives in their local community by creating brochures, posters, or PSAs to advocate for addressing invasive species in their community. For example, students could create a brochure telling homeowners what to plant, how to get rid of an invasive species, or write and film a PSA warning about the negative ecological impacts of a specific species.

C. Plan and implement a service-learning project that removes invasives from either the schoolyard or local community area. Partner with a local environmental or plant organization on this project to help select a site, organize volunteers, and provide tools.

MODIFICATIONS:

While this lesson is originally designed to focus on invasive species relevant to the local ecosystem, this project can be used to explore different areas around the world. If desired, students can select a region or location of interest to them, research, and write their Mock Trial around that location. This variation can present a fantastic way to discuss how species that are invasive to Missouri are not invasive or a problem everywhere. In some places those species are found they are part of the native ecosystem.

Student groups and their roles can be altered slightly to fit your needs, for example you can have more than one lawyer that works together to write the opening and closing statement, and questions.

If an entire research unit is too big of a project for your classroom, but you still want to do a mock trial you can assign specific roles and use the St. Louis Trial of Bush Honeysuckle script to provide your students with their statements. Students can be given the opportunity to elaborate or rewrite the statements they are given before the mock trial begins.

Outline of a Mock Trial

1. Opening Statements:

The plaintiff's attorney and the defendant's attorney will explain what their evidence (based on the students' research) will be and what they will try to prove. Students should write statements that summarize the big ideas and important facts of their side's case and research.

2. Plaintiff/Prosecution Direct Exam of Witnesses:

After opening statements, the plaintiff's lawyer will present their case. The lawyer will call upon the plaintiff first, and then each of the witnesses to testify (direct examination). Witnesses will each read their statement based on an economic, social, or environmental reason why the invasive should be removed.

3. Defendant Cross Exam of Witnesses:

After each witness is questioned by the plaintiff's lawyer, the defendant's lawyer will be able to question (cross-exam) each witness. This is the defendant's opportunity to ask additional questions to help provide evidence for their argument. If no questions are posed the defense will rest and the case will move on.

4. Defendant Direct Exam of Witnesses:

After the plaintiff's lawyer has called all their witnesses, it is the defense's turn to present their case. This process is the same as the previous step except that defense calls witnesses for direct examination and cross-examination is done by the plaintiff's lawyer.

5. Closing Statements:

An attorney for each side reviews the evidence presented and asks for a decision in their favor. This is an opportunity to make a persuasive statement and highlight the most important arguments from the trial.

6. Jury Instructions:

The Judge explains to the jury appropriate instructions or rules of law to consider in weighing the evidence. Give the jury 5-10 minutes to discuss the case, have the students vote to side with either the plaintiff or the defense.

7. Final Discussion:

Ask students to reflect on their role and process of the mock trial. This can also be used as an opportunity to discuss what should be done with the invasive species, what should the sentence or ruling be? When all the arguments were presented was it easy or hard to determine the fate of the invasive species?

Mock Trial Outline -- Student Guide

Who is in your group?

What invasive species is your group researching for the mock trial?

Why did your group select this species?

What does your group already know about this invasive species?

Assign each student in your group a role to play during the mock trial:

Plaintiff Side <i>Arguing the Invasive Species Poses an Environmental, Economic, or Health Problem</i>	
Lawyer	
Plaintiff	
Witness 1	
Witness 2	
Witness 3	

Defendant Side <i>Arguing the invasive species does not pose a significant problem for the environmental, economy, or human health</i>	
Lawyer	
Defendant	
Witness 1	
Witness 2	
Witness 3	

For each part of the mock trial, write the key points from each student’s statement to create an outline of your group’s mock trial presentation. As your group is completing the outline, be sure to check that each witness is making unique points, presenting facts and important information, and that the opening and closing statements summarize these points in a persuasive manner.

PART 1 OPENING STATEMENTS			
ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Plaintiff Lawyer	Summarize the argument and evidence from the plaintiff and witnesses statements; argue why the invasive species is an environmental, economical, or risk to human health		
Defendant Lawyer	Summarize the argument and evidence from the defendant and witnesses statements; argue why the invasive species is not an environmental, economic, or risk to human health		
Other notes to keep in mind for the opening statements:			

PART 2 | PLAINTIFF/PROSECUTION DIRECT EXAM OF WITNESSES

The plaintiff's lawyer will call upon the plaintiff first, and then each of the witnesses to testify (direct examination) and other physical evidence or arguments is introduced. The order of the trial will follow as outlined in the table below.

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Plaintiff Lawyer	Call the plaintiff and ask questions to help bring up the information in the plaintiff's statement. Between your questions and the plaintiff's responses you should present at least one big reason why the invasive species poses a problem for the community.		
Plaintiff	Respond to the lawyer's questions using information in your prepared statement to help persuade the jury that the invasive species is a problem for the environment, economy, or human health.		
Plaintiff Lawyer	Call upon each of the witnesses, ask them to describe who they are and ask questions that help them present the information prepared in their statements.		

PART 2 | PLAINTIFF/PROSECUTION DIRECT EXAM OF WITNESSES, CONTINUED

The plaintiff's lawyer will call upon the plaintiff first, and then each of the witnesses to testify (direct examination) and other physical evidence or arguments is introduced. The order of the trial will follow as outlined in the table below.

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Plaintiff Witness 1	Based on your focus (environment, economy, human health) answer questions, provide facts, and persuasive arguments based on the lawyers questions.		Focus:
Plaintiff Witness 2	Based on your focus (environment, economy, human health) answer questions, provide facts, and persuasive arguments based on the lawyers questions.		Focus:
Plaintiff Witness 3	Based on your focus (environment, economy, human health) answer questions, provide facts, and persuasive arguments based on the lawyers questions.		Focus:

PART 2 | DEFENDANT CROSS EXAMINATION OF WITNESSES

The plaintiff's lawyer will call upon the plaintiff first, and then each of the witnesses to testify (direct examination). The lawyer will use the witnesses statements to introduce evidence and key arguments for their case. The order of the trial will follow as outlined in the table below.

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Defendant Lawyer Cross Exam Witness 1	Ask questions based on Witness 1's statement and the plaintiff to try and disprove their argument.		
Defendant Lawyer Cross Exam Witness 2	Ask questions based on Witness 2's statement and the plaintiff to try and disprove their argument.		
Defendant Lawyer Cross Exam Witness 3	Ask questions based on Witness 3's statement and the plaintiff to try and disprove their argument.		

PART 3 | DEFENDANT DIRECT EXAM OF WITNESSES

The defendant's lawyer will call upon the defendant first, and then each of the witnesses to testify (direct examination). The lawyer will use the witnesses statements to introduce evidence and key arguments for their case. The order of the trial will follow as outlined in the table below.

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Defendant Lawyer	Call the defendant and ask questions to help bring up the information in the defendant's statement. Between your questions and the plaintiff's responses you should present at least one big reason why the invasive species poses a problem for the community.		
Defendant	Respond to the lawyer's questions using information in your prepared statement to help persuade the jury that the invasive species is a problem for the environment, economy, or human health.		
Defendant Lawyer	Call upon each of the witnesses, ask them to describe who they are and ask questions that help them present the information prepared in their statements.		

PART 3 | PLAINTIF CROSS EXAMINATION OF WITNESSES

The defendant's lawyer will call upon the defendant first, and then each of the witnesses to testify (direct examination) and other physical evidence or arguments is introduced. The order of the trial will follow as outlined in the table below.

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Plaintiff Lawyer Cross Exam Witness 1	Ask questions based on Witness 1's statement and the defendant to try and disprove their argument.		
Plaintiff Lawyer Cross Exam Witness 2	Ask questions based on Witness 2's statement and the defendant to try and disprove their argument.		
Plaintiff Lawyer Cross Exam Witness 3	Ask questions based on Witness 3's statement and the defendant to try and disprove their argument.		

PART 4 | CLOSING STATEMENTS

ROLE	WHAT YOU ARE DOING	STUDENT	Key Points for Statement
Plaintiff Lawyer	Summarize the argument and evidence from the plaintiff and witnesses statements; argue why the invasive species is an environmental, economical, or risk to human health. This is your last chance to make a persuasive argument.		
Defendant Lawyer	Summarize the argument and evidence from the defendant and witnesses statements; argue why the invasive species is not an environmental, economic, or risk to human health. This is your last chance to make a persuasive argument.		

Other notes to keep in mind for the closing statements:

APPENDIX

Note: This is not a lesson that introduces students to the concept of invasive species, but gives students an opportunity to dive deeper and think critically about why invasive species are a concern, how they are managed within a community, and what can be done to address the issue as a whole.

Here are a few resources to help students review what they have already learned about invasive species with your students before beginning this project:

- Hungry Pests Invade Middle School (contains several lessons and activities to help students explore the concept of invasive species):
https://www.aphis.usda.gov/hungrypests/partner-tools/HP_InvadeMS_Curriculum.pdf
- Missouri Department of Conservation Invasive Species Field Guide:
<https://nature.mdc.mo.gov/status/invasive>
- National Geographic Resource Library Encyclopedia Article - Invasive Species:
<https://www.nationalgeographic.org/encyclopedia/invasive-species/>
- National Geographic Resource Library Video - Impact of Invasive Species:
https://www.nationalgeographic.org/media/impact-invasive-species/?utm_source=BiblioRCM_Row
- National Geographic Resource Library Activity - Introduction to Invasive Species:
<https://www.nationalgeographic.org/activity/introduction-invasive-species/>
- Other Resources available from United States Department of Agriculture:
<https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/usda-efforts/educator-tools>

Invasive Species in Missouri

What Makes a Good Invader?

Written by Allison Brown- Missouri Botanical Garden

Modified from Elizabeth Schultheis, Melissa Kjelvik- Michigan State University

OVERVIEW:

Students will learn about invasive species in Missouri, characteristics that make species good invaders, factors that can influence plant community assembly, and the role that people play in causing and proliferating invasions.

OBJECTIVES:

- At the conclusion of the lesson, students will be able to:
- Provide examples of invasions causing economic and ecological concerns in Missouri
- Identify characteristics (traits) that are common among many invasive species
- Present information on the role that people play in the establishment and spread of invasive species
- Recognize some common native and invasive plant species in Missouri
- Talk about populations, communities, and the niche

TIME:

This lesson can be completed in about an hour if the activity is only played once. Ideally it should be played multiple times so students can observe different outcomes depending on what events were spun on the wheel and to redistribute the species cards so each student can be a new species with different traits than their first. Ideally, a 1.5-hour session would be best. An example outline is as follows:

- 15 minutes – Introduction: Do you know of any invasive species? Give examples of invasive species in Missouri, go over characteristics that make species good invaders, read background paragraphs
- 5 minutes – Summary of introduction: students should now be able to describe characteristics that make a good invader
- 5 minutes – describe the instructions for the activity
- 45 minutes – play 2-3 rounds of the activity
- 15 minutes – Summary: have students describe what got them “into the community”. Do the characteristics that made them a good invader match the ones we discussed in the introduction? What characteristics of the native species made them successful/unsuccessful? Does the outcome of the activity change between rounds?

MATERIALS:

- One species card per student (8 invasive, 9 native species cards)
- 1 laminated event sheet
- Dry erase marker and eraser/Kleenex
- 3 stage signs (Grow, Seed, Disperse)
- Rope, stick etc. to mark start and finish line
- A large room (gym is the best) or outdoor space (soccer field) to conduct activity

BACKGROUND

Invasive plants are species that are not native to our region and have negative effects on our economy, environment, or human health. They are highly competitive and persistent. It is estimated that 18% of the plants in national parks in the Midwest are non-native species, many of which are highly invasive. The percentage of invasive plants is even higher in areas with greater disturbance from human activity, such as roadsides or pastures. Different researchers have estimated that there are from 1,000 to over 22,000 species of potentially invasive plants that have yet to be introduced into the US. Many non-native species do not cause problems in the areas where they are introduced and can be important for agriculture, horticulture, medicine, or other uses. It is often difficult to know in advance if a new species that is introduced will become invasive. This illustrates the need to be vigilant and to step-up efforts to prevent invasive plant introductions into this country. Stick with native species instead!

Some individuals may think that they don't cause invasive plants to spread, because they live in an urban or suburban setting, not near natural areas. Even if you don't live near a natural area, your yard could be a source of invasive plants. Seeds of invasive plants can be dispersed in many ways—by water carrying seeds from your yard into sewers that lead to rivers or streams, or by car tires or shoe treads when you travel to parks. The best way to prevent the spread of invasive plants is to not plant them in the first place.

Invasive plants can affect your ability to enjoy natural areas, parks, and campgrounds. Hikers, campers, cyclists, runners, and horseback riders enjoy traveling along trails in natural areas. These trails can be degraded by the overgrowth of invasive plants, making them difficult to navigate. Natural scenic beauty and diverse wildlife sought by nature enthusiasts are compromised by invasive plants, which often form single-species stands, displacing attractive native flowers. Most of those responsible for fighting plant infestations realize that it is less expensive to prevent invasive plant introductions than to try to control or eradicate plants once an infestation has occurred. Understanding and managing the pathways by which non-native species are introduced into new regions is considered the most effective way to prevent future biological invasions.

To prevent future invasions it would be helpful to know the answers to a few questions: Are there characteristics that are common between different invasive species? How can we tell which habitats are most at risk?

Invasive plant species have certain characteristics that tend to make them successful:

- Rapid growth and short life cycle: go from seed to producing seed very rapidly – sometimes within a few weeks!
- Prolific flowering
- Able to grow in a wide range of habitats
- High number of seeds produced
- Long seed dormancy
- Efficient method of seed dispersal
- Able to reproduce asexually (ex. parts of a plant that can break off and make new roots).
- If reproducing sexually, they are able to make use of insects, birds, bats or other pollinators found in the new environment.
- Provide shade, which can be a great detriment for native plants.
- Release of chemicals into the surrounding soil that prohibit the growth of other plants.
- Resistant to grazing.

DIRECTIONS:

The lesson has two parts: the introduction and activity.

Introduction

1. Ask the students about their prior knowledge on invasive species. Can they name any invasive species? Do they know the issues caused by those species or what people are doing to control them?
2. Give examples of dramatic invasions in Missouri (bush honeysuckle, multiflora rose, wintercreeper, etc.)
3. What characteristics did all these invaders share? See if they can come up with their own list before explaining the characteristics. Read brief background paragraphs above.
4. Tell students that they will now be participating in activity to learn about the characteristics of invaders that make them successful.

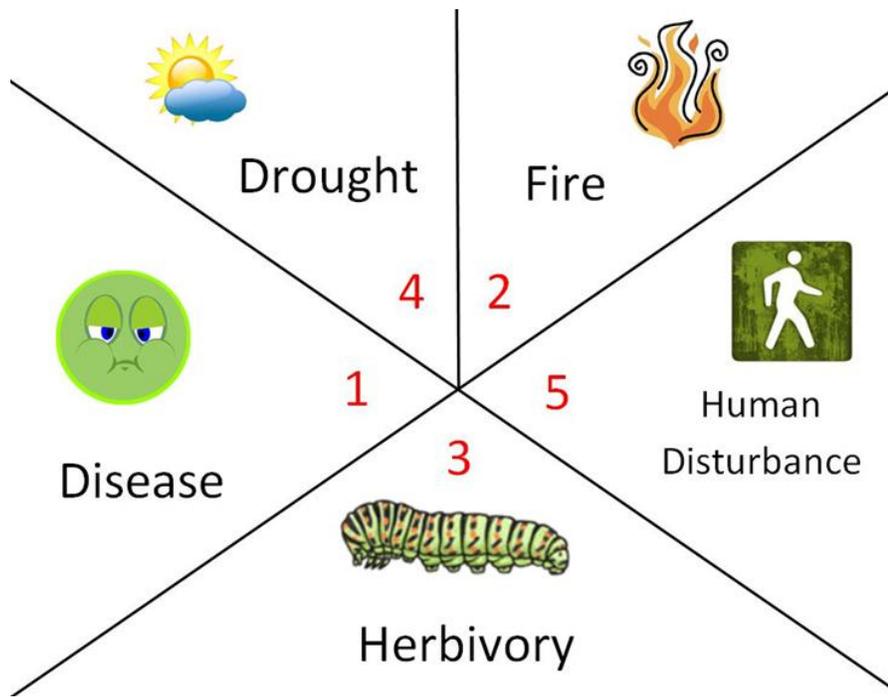
Activity

1. Introduce the instructions for the activity. Go over species cards, stages, and events. Describe how students will move backwards and forwards heel-to-toe and that the students who cross the finish line will be “in the community” and will have to describe to the class how they got there. If students are not moving heel-toe steps or taking more steps than indicated on their cards, they must move back 5 steps.
2. Gather students in a large, open room or outdoor space.
3. Students line up, shoulder to shoulder on the start line, facing the facilitator who is standing at the finish line. Facilitator can stand closer to the students if necessary so students can clearly hear the instructions.
4. Give each student a species card (17 cards in set- 8 invasive & 9 native, but you can easily make more with different species using the PowerPoint template or print multiple copies of each species to increase the number of cards)
5. Before starting each round, randomly number the events on the laminated event sheet 1-5 with a dry erase pen. (see example)
6. Explain that students will move forward for stages (growth, seeds, distribution) when the different stage signs are held up. For backward steps, call on a student to pick a number 1-5. The number they choose will correspond with numbers you wrote with the dry erase pen, determining which event has taken place. Students will take the appropriate number of steps back (ex. fire, herbivory, human disturbance).
7. Start the activity – 2 stages
8. Hold up a sign for one of the stages
9. Students move forward the number of steps indicated on their card.
10. Monitor students closely for too large/many steps.
11. Repeat with a different stage, or the same stage.

12. Continue the activity – Create 1 event
13. Allow a student that has been paying attention and following the directions to pick a number 1-5. Match the number they chose with the corresponding number on the event sheet and call out the event.
14. Students move backward the number of steps indicated on their species card.
15. Monitor students to make sure they are taking steps backwards.
16. Repeat steps (7) and (12) five times or until you have about half of the students across the finish line (these students are “in the community”)
17. Have students in the community (the half that crossed the finish line) line up along the finish line, with invasive and native species on opposite sides.
18. Have each student in the community read their species name, state whether they are invasive or native, and explain what helped them the most. How is it that they made it into the community? The students should remember which of the events hurt them the most or which stage allowed them to take the most steps. (This should be different depending on what species they are and what sorts of events were chosen for this round).
19. Ask some of the students behind the line why they did not make it. Help students link the characteristics of the invasive species that made it into the community to some of the themes and invasive species examples brought up in the introduction.
20. You may repeat the activity as time allows (usually 2-3 rounds). Point out how the outcomes differ between rounds. What events caused the outcomes to change? Did certain things come up more often than others? What events led to a community consisting of mostly invasive species? Native?

EXAMPLE EVENT SHEET:

Randomly number the five events on the laminated sheet 1-5 (numbers in red) each round with a dry erase pen. Erase and renumber before each round to mix up the numbers. Do not show students the event sheet once it has been numbered, to make sure they don't cheat and pick an event that would not damage their species as much as others.



EXAMPLE SPECIES CARD:

FRONT



BACK



Using this species as an example, when there is a growth stage, the student will take four steps forward (indicated by the four plant images). During an herbivory event, the student would take one step backwards (indicated by one caterpillar).

About This Project

This project summarizes the work and creativity of many individuals from the St. Louis region who are dedicated to environmental education, sustainability, and ridding the environment of harmful, invasive species.



ABOUT THE AUTHOR

Katherine Golden is the Sustainability Education Manager at the EarthWays Center, the sustainability division of the Missouri Botanical Garden in St. Louis, Missouri. Kat is a long-time sustainability educator dedicated to building connections between people and place. She is passionate about using education as a way to nurture stewardship; creating citizens that are knowledgeable, empowered and active players in solving the challenges facing our planet. Graduating from Truman State University with a degree in Environmental Studies in 2010, Katherine went on to work at the St. Louis Science Center before joining the EarthWays Center team at the Missouri Botanical Garden. Kat also holds a Masters in Education for Global Sustainability from Webster University. When not working, Kat is likely at home hanging out with her cat Harper, dog Ripley, or traveling to Montana hunting for dinosaur fossils. Learn more at mobot.org/ewc.

ABOUT NATIONAL GEOGRAPHIC'S GROSVENOR TEACHER FELLOWSHIP

The seeds of this project began as part of a transformative fellowship program that Kat took part of in 2018. Selected as a 2018 Grosvenor Teacher Fellow, Kat explored the Galapagos Islands aboard Lindblad Expedition's *Endeavor II* and learned how to think like an explorer. When she returned to St. Louis she set out to develop new lessons and activities inspired by her expedition connecting exploration and sustainability. Inspired by the St. Louis Trial of Bush Honeysuckle and strict approach to managing invasive species she witnessed while exploring the Islands, Kat developed this activity to help others learn and build understanding about the delicate ecosystems we all depend on.

The Grosvenor Teacher Fellowship (GTF) is a professional development opportunity for pre-K–12 educators made possible by a partnership between Lindblad Expeditions and the National Geographic Society. An annual competitive application process is used to select educators and host them aboard Lindblad Expeditions' voyages for a life-changing, field-based experience.

ABOUT THE ST. LOUIS TRIAL OF BUSH HONEYSUCKLE

The Trial of Bush Honeysuckle took place April 4, 2018, in the historic Old Courthouse of St. Louis. A real (retired) judge, environmental lawyers, expert witnesses and a jury heard the case as artist and woodworker Dale Dufer "sued" an invasive plant - in an educational partnership with the National Park Service! This trial combined the civic process of our judicial system with ecological issues of a seriously invasive species. Mr. Dufer produced the Trial of Bush Honeysuckle as a dramatic extension of Think About Tables, his ongoing work with this invader's sturdy wood building stick-leg folk art furniture, and teaching honeysuckle table-making workshops for adults and youth. Learn more at woodworms.net.

ABOUT MISSOURI ENVIRONMENTAL EDUCATION ASSOCIATION

The Missouri Environmental Education Association is delighted to be part of this project, which fits squarely into our vision of an environmentally literate Missouri citizenry. Our mission is to connect educators with a variety of resources that help them provide effective, highly-engaging environmental education. As environmental education evolves, we understand more and more the importance of social literacy as a key piece of environmental education. The format of a mock trial encourages an examination of the social forces that intersect with land management, and is a great way to integrate civic engagement and an understanding of social systems with an understanding of ecology and natural systems. Learn more at meeaa.org.