Invasive Species & Biodiversity
LESSON PLAN

GRADE: 7

SUBJECT & STRAND: Science, Understanding Life Systems, Interactions in the Environment

LESSON(S) TOPIC: How Do Invasive Species Influence Ecosystems?

DURATION: 120 minutes

CURRICULUM EXPECTATIONS

Big Ideas

- Ecosystems are made up of biotic and abiotic elements, which depend on each other to survive.
- Ecosystems are in a constant state of change. The changes may be caused by nature or by human intervention.
- Human activities have the potential to alter the environment. Humans must be aware of these impacts and try to control them.

Overall Expectations

- Assess the impacts of human activities and technologies on the environment, and evaluate ways of controlling these impacts.
- Investigate interactions within the environment, and identify factors that affect the balance between different components of an ecosystem.
- Demonstrate an understanding of interactions between and among biotic and abiotic elements in the environment.

Specific Expectations

1.2 Analyze the costs and benefits of selected strategies for protecting the environment.

2.1 Follow established safety procedures for investigating ecosystems.

2.3 Use scientific inquiry/research skills to investigate occurrences that affect the balance within a local ecosystem.

2.4 Use appropriate science and technology vocabulary, including sustainability, biotic, ecosystem, community, population, and producer, in oral and written communication.

2.5 Use a variety of forms to communicate with different audiences and for a variety of purposes.

3.8 Describe ways in which human activities and technologies alter balances and interactions in the environment.

LEARNING GOALS

» Develop a definition of invasive species.
» Identify and describe pathways of invasive species introduction and spread.
» Identify characteristics of common invasive species and how they influence ecosystem interactions.
» Identify human actions that can mitigate the effects of invasive species.

ENVIRONMENTAL EDUCATION CONNECTIONS

KNOWLEDGE

- The nature of ecosystems and biomes, their health, and their interdependence within the biosphere.
- The dependence of humans on environmental resources for life and sustenance.
- The characteristics of human societies, including nomadic, hunter-gatherer, agricultural, industrial, and post-industrial, and the impact of each on the natural environment.
- The interconnectedness of political, economic, environmental, and social issues in the present world.

SKILLS

- Define such fundamental concepts as environment, community, development, and technology, and apply these definitions in local, national, and global contexts.
- Use a range of resources, communications skills, and technologies in addressing environmental questions.
- Develop problem-solving skills and critical and creative thinking skills, including the ability to reason and apply logic, to recognize and apply abstract patterns, to identify connections and relationships between ideas and issues, and to test ideas against new information and against personal experience and beliefs.
- Recognize the need to incorporate an environmental perspective in decision-making models.

ATTITUDES

- Appreciate the resilience, fragility, and beauty of nature and develop respect for the place and function of all living things in the overall planetary ecosystem.
- Appreciate that human life depends on the resources of a finite planet.
- Appreciate the challenges faced by the human community in defining and implementing the processes needed for environmental sustainability.
- Maintain a sense of hope and a positive perspective on the future.

LESSON PART 1: MINDS ON/GETTING STARTED

(20-25 MIN)

NATIVE, INTRODUCED, OR INVASIVE?

(WHOLE CLASS/SMALL GROUPS)

- Show students 4 – 6 images of various plants and animals (e.g., sugar maple, emerald ash borer, honey bee, etc.)
- For each image, have students work in groups of three to discuss whether the species pictured is ***Native, Introduced*** or ***Invasive***
- Each group will record their guesses on a small sheet of paper
- After showing students all the images, review the images and have a whole class discussion to categorize each species pictured in the images together
- After reviewing the images, as a class, create a Frayer Model for the terms ***Native Species, Introduced Species,*** and ***Invasive Species*** using whiteboards or chart paper (Refer to the Invasive Species Centre web-site or Invasive Species Council of BC's Education Activities & Teacher Resources document for definitions of each term)
- Frayer Models are an effective literacy tool for developing students' understanding of new vocabulary, a Frayer Model template for the term ***Invasive Species*** is pictured below:

- During the class discussion, address any misconceptions students may have about each of the three terms
- Display the Frayer Models in the classroom for the duration of the lesson, or over the course of the unit for student reference
- Tell students: "Today we are going to learn about local invasive species and how they affect our local eco-systems. While there are many different kinds of invasive species, our focus will be on invasive plants."
- Share learning goals to help students monitor learning throughout the lesson:
  - » Develop a definition of invasive species and identify common invasive species
  - » Identify and describe pathways of invasive species introduction and spread
  - » Describe how invasive species alter ecosystem interactions
  - » Identify human actions that can mitigate the effects of invasive species

LESSON PART 2: WORKING ON IT

(50-65 MIN)

ACTIVITY 1: INVASIVE VINE TAG

(WHOLE CLASS)

(Adaptation of "Invader Tag" from BC Girl Guides' Alien Invaders Challenge)

- Review the *Invasive Vine Tag Instructions* with students and play the game to demonstrate how invasive species interact with native species to influence biodiversity within local ecosystems
- After the first round of the game, debrief by posing the following questions to students:
  - How did the invasive species influence our woodland community?
  - How did the invasive species influence the biodiversity in our woodland community?
  - How would this influence the animal species that depend on the native plants in the woodland community?
- After the second round of the game, debrief by asking students to compare the impact of the invasive species on the woodland community in the two rounds.

MATERIALS:

- *Invasive Vine Tag Instructions*
- Open, outdoor space, or indoor gym space
- Pylons to mark boundaries

ACTIVITY 2: INVASIVE SPECIES CLASS ID GUIDE

(SMALL GROUPS)

- Inform students that invasive species are difficult to monitor because of their rapid spread. Organizations like the Invasive Species Centre rely on citizens to monitor invasive species in their local communities to effectively manage the spread of invasive species across the province.
- Tell students that today we will take on the role of citizen scientists to monitor the invasive species in our school community.
- The data we collect will help the Invasive Species Centre, researchers and other organizations monitor and manage invasive species in Ontario
- To help students identify local invasive species, create an *Invasive Species Class ID Guide*
- Split students into groups of four and have each group research and create an identification guide for one of the following invasive species to be included in the *Invasive Species Class ID Guide:*
  - European/Glossy Buckthorn
  - Garlic Mustard
  - Dog Strangling Vine
  - Phragmites
  - Giant Hogweed
  - Wild Parsnip

MATERIALS:

- Personal Devices/ Chromebooks
- Invasive Species Class ID Guide Template
- Markers
- Paper
- Pencil Crayons
- Glue
- Graphic design tools (e.g., Canva, Piktochart, Google Jamboard, Google Drawings)

- To create the ID guide for their chosen invasive species, each group of students will use the *Invasive Species Class ID Guide Template* which requires each species ID guide to contain the following criteria:
  - Name of the invasive species
  - Image of the invasive species
  - Place of origin
  - ID Features of the invasive species
  - Description of how the invasive species spreads
  - The social, economic, and/or environmental impacts of the invasive species
- Teachers may choose to print the *Invasive Species Class ID Guide Template* or have student work with the template using one of the online graphic design tools suggested in the materials section
- Teachers may also choose to co-create additional criteria to be included in the *Invasive Species Class ID Guide Template*
- Provide students with the following links to guide their research and encourage further student research beyond these resources:
  - **Invasive Species Centre – Invasive Plants**
  - **Ontario's Invading Species Awareness Program - Plants**
  - **Ontario Invasive Plant Council - Impacts**

ACTIVITY 3: TAKING ACTION – MAPPING LOCAL INVASIVE SPECIES
(SMALL GROUPS/WHOLE CLASS)

- In groups of four, students will map and identify native, introduced and invasive species in an appropriate area in the school yard or local community selected and assessed by the teacher
- Assign each group two unique 5m x 5m quadrats within the class sampling area to avoid overlap in students' data collection and citizen science contributions
- Students will identify invasive species using the *Invasive Species Class ID Guide*
- In preparation for the field study:
  - Review the use of the *EDDMapS Ontario* app by showing students the **"How to report invasive species using the EDDMapS Ontario mobile application"** video
  - Use *EcoSpark's Citizen Science Phone Apps* guide to assist students in using Seek by *iNaturalist* to identify all other species (native and introduced)

MATERIALS:

- Computer & projector
- Personal devices
- *EcoSpark's Citizen Science Phone Apps* guide
- *Invasive Species Class ID Guide*
- *Invasive Species Monitoring Data Sheet*
- *Calculating Biodiversity Indices* document
- Markers
- Chart Paper

- Invasive species data will be submitted to EDDMapS Ontario, all other data will be recorded in the *Invasive Species Monitoring Data Sheet*
- Following the field study, have students calculate the biodiversity index for each of their sampling sites (refer to the *Calculating Biodiversity Indices* document to choose an appropriate tool for students to calculate biodiversity)
- Using the data collected by students, create a class community map of local invasive species using either markers and chart paper, or an web mapping application such as ArcGIS Online

PRO TIP

Refer to the EcoSpark's York Regional Forest Story Map for an example of how to develop the class community map of local invasive species!

LESSON PART 3: CONSOLIDATION AND DEBRIEF

(30 MIN)

WRAP UP

(WHOLE CLASS)

- Using the class community map as a reference, conduct a whole class discussion to review and analyze the field data collected by students
- Using the following guiding questions to guide the class discussion:
  - » Where in the school were invasive species found?
  - » Why might invasive species be successful in our school yard/ community?
  - » How are these species impacting our local ecosystem biodiversity?
  - » How could we reduce the spread of invasive species in our local community?
- Based on the class discussion and learning throughout the lesson, update class Frayer Models for the terms ***Native Species, Introduced Species*** and ***Invasive Species*** as needed

MATERIALS:

- Computer and projector
- Class community map
- Class Frayer Models from Minds On activity

ADDITIONAL CONSIDERATIONS

EXTENSION ACTIVITIES

- Host an EcoSpark School Watch workshop to learn more about using citizen science to monitor invasive species in the school community and engage students in stewardship initiatives to mitigate the effects of invasive species
- Distribute the class field guide within the school to educate the wider school community about local invasive species and their impact within the local community
- Engage EcoSpark, your local conservation authority and/or your local regional municipality to plan and implement a schoolyard/community restoration project centered around local invasive species

ADAPTING TO DIFFERENT GRADE LEVELS

Senior Level

- Have students compare the invasive species in their local community to that of neighbouring communities using EDDMapS Ontario
- Have students spatially analyze their EDDMapS Ontario contributions to determine how invasive species are spatially distributed and which areas of the local community are of the most concern
- In small groups, have students develop and present a management or restoration plan for one of the invasive species in the local community
- Engage students in thinking critically about the terms invasive species by discussing instances of Canadian invasive species that behave in the same way as non-native invasive species when introduced to non-native ranges within Canada (e.g., Largemouth bass is native to Ontario but exhibits invasive characteristics in other areas of Canada where the species has been introduced by humans)

Junior Level

- Have students create PSAs to raise awareness about an invasive species in the local community, outlining actions individuals can take to mitigate the spread of the species
- When mapping invasive species and biodiversity in the local community, have students monitor one quadrat
- In lieu of Invasive Vine Tag, play the classic survival game (**link**) and add an invasive species in place of "disease, famine, fire or cold"

REFERENCES

- Girl Guides of Canada, British Columbia Council & Invasive Species Council of British Columbia. (2015). *Alien invaders challenge: An invasive species challenge from the BC program committee.* Girl Guides of Canada – Guides de Canada. **http://bc-girlguides.org/web/Documents/BC/program/AlienInvaders.pdf**
- Invasive Species Centre. (n.d.). *Invasive Plants.* **www.invasivespeciescentre.ca/invasive-species/meet-the-species/invasive-plants**
- Invasive Species Council of British Columbia. (2014). *Education activities & teacher resources: Tackle invasive species "hands on" with your students.* **https://bcinvasives.ca/documents/Education_Teacher_Resources_FINAL_06-02-2014.pdf**
- Invading Species Awareness Program. (2020, May 21). *How to report invasive species using the EDDMapS Ontario mobile application [Video].* Facebook. **www.facebook.com/invspecies/videos/240516403715750**
- Ontario's Invading Species Awareness Program. (n.d.). *Invasive Plants.* **www.invadingspecies.com/plants**
- Ontario Invasive Plant Council. (n.d.). *Impacts*. **www.ontarioinvasiveplants.ca/invasive-plants/impacts/**
- Ontario Ministry of Education. (2009). *Acting today, shaping tomorrow: A policy framework for environmental education in Ontario schools.* Ontario Ministry of Education. **www.edu.gov.on.ca/eng/teachers/enviroed/ShapeTomorrow.pdf**
- Ontario Ministry of Education. (2007). *The Ontario curriculum, grades 1 to 8: Science.* **www.edu.gov.on.ca/eng/curriculum/elementary/scientec.html**
- Science World. (n.d.). *Food Web Game.* **www.scienceworld.ca/resource/food-web-game**

SCHOOL WATCH LESSON PLAN

School Watch introduces students, grades 6 to 12, to the world of citizen science through customized curriculum-linked classroom and on-site activities.

EcoSpark's School Watch program provides the lesson plans and tools - such as butterfly nets, binoculars, and tree measuring tools - to deliver citizen science projects suitable for most school grounds. EcoSpark staff lead facilitated two-hour outdoor sessions with students, on or near the school grounds, to bring curriculum based concepts to life. In addition to providing the necessary equipment we supply data sheets and other project materials such as identification keys.

EcoSpark believes strongly in the benefits of outdoor education but also recognizes that during the Covid-19 crisis not all education will take place in traditional school learning environments. In addition to our in-person programs we have modified remote learning options available with flexible scheduling and delivery variations based on board, school and teacher needs and requirements.

For more information or questions, please contact:
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