

ECOS Inquiry Template

1. **Contributor's Name:** Sarah Bisbing

2. **Name of Inquiry:** Who Rules the Schoolyard? : Natives vs. Exotics

3. **Goals and Objectives:**

a. Inquiry Questions: What is a weed? What is a native plant? Why are natives important? Why do we try to eliminate exotics? What do exotics do to our native plants and natural ecosystems? Why do we try to protect these native ecosystems and the elements within them?

b. Ecological Theme(s): Looking at the impact of exotics on the natural landscape of the Missoula Valley. This topic is especially relevant to the properties surrounding our schoolyards.

c. General Goal: To get the students to take a closer look at the natural areas that play a major role in their lives.

d. Specific Objectives:

1. Give students the opportunity to make observations on their schoolyard and become more aware of their natural surroundings.
2. Encourage students to learn to distinguish between native and exotic plants.
3. Students will use naturalist skills (journaling and sketching) to make observations in the field.
4. Students will use basic identification skills and the ECOS Natural History Guide to identify specimens collected.
5. Students will not only learn how to identify the common exotics of the schoolyard but will also learn a little about their life histories (range, habitat, status, lifeform, etc).

e. Grade Level: 7-12

f. Duration/Time Required:

→ **Prep time** none

→ **Implementing Exercise During Class** 2 class periods

→ **Assessment** Included in activity through use of worksheets

4. **Ecological and Science Context:**

a. Background (for Teachers):

Every organism has a home in some part of the world where it existed for thousands of years. Species that occur in a particular region or habitat are **native** species. Over time, physical and biological factors changed the distributions of these organisms in nature. This slow process of evolution and change in distribution is a natural occurrence. If organisms occur in locations beyond their known historical natural ranges, they are considered **non-native**. These are species that humans brought in from other regions, ecosystems, and habitats. European settlers brought hundreds of plants to North America for a variety of reasons, including: food, medicine, and ornamental display.

Invasives are those species that take over a new habitat where there were not previously found, often to the detriment of the native species. These species disrupt the local ecosystem and are not kept in check by grazing, climate, or other natural means. These species are known to grow and spread rapidly, allowing them to establish over large

areas. In many instances, these invaders create monocultures, which are areas of growth possessing a single organism. The term **noxious** is a legal designation used specifically for plant species that are known to be major pests of agricultural ecosystems and are subject to restrictions.

Over 4,000 species of exotic plants have free-living populations in the United States. And, many of these are in our own backyard! Plant introductions are increasing due to enlarged populations, increased urbanization, and expanded international trade and travel. Many of these plants are replacing the native plants of North America. Our native fauna are dependent on native plants for food and shelter. Exotic plants replace our native flora, reducing host plants necessary for the survival of our native wildlife.

Invasive non-natives are one of the greatest threats to our native ecosystems, destroying the natural history and identity of these areas. These species are disrupting the ecology of natural ecosystems, displacing native plants and animals, and degrading diverse biological resources. Invaders may do so by reducing the amount of water, light, and nutrients available to a species. They may also alter soil chemistry, increase erosion, reduce water-holding capacity, and excrete toxic chemicals. Due to their aggressive, invasive characteristics, over 1,000 of the 4,000 exotic plant species are a threat to our native flora and fauna.

b. Background (to present to Students):

Over 4,000 species of exotic plants have free-living populations in the United States. Over 1,000 of these plants are a threat to our native plants. And, many of these are in our own backyard!

Ecological Impacts of Invasive Plants:

- Reduction of biological diversity (decrease in overall species and variety of species present)
- Loss of habitat (homes) for native plants, insects, birds, and other wildlife
- Loss of food sources for wildlife
- Changes in plant communities (families are disrupted!)
- Displacement of native plants and animals

Invasive Plants:

- Compete with native plants for water, light, and nutrients
- Reduce the range (homes) of our native plants
- Eliminate localized/specialized plant species
- Reduce food sources for native wildlife
- Increase erosion (degradation of our land)

5. Motivation and Incentive for Learning: Students will be given the chance to go outdoors and explore their own backyard (in this case, the schoolyard). Outdoor activities tend to stimulate children and provide a little variety in their methods of learning. The variety in learning continues throughout this investigation. In this inquiry, students will participate in classroom discussion, observe their collected specimens, use their naturalist skills (through observing, journaling, and sketching), access the ECOS Natural History Guide, fill out the attached worksheet, and present their findings to the class. Variety is always a nice way of stimulating interest and accommodating short attention spans. The overall goal is to give the students a better understanding of what is actually going on in their environment.

6. Vocabulary:

- **Exotic** = an introduced species that is not native to the local ecosystem
- **Native** = grown, produces, or originating in a particular place or in the vicinity
= living or growing naturally in a particular region
- **Weed** = a plant that is not valued where it is growing and is usually of vigorous growth, especially one that tends to overgrow or choke out more desirable plants
- **Noxious** = physically harmful or destructive to living beings
- **Invasive** = a species which takes over a new habitat where it was not previously found, often to the detriment of the species which were there before
= these species disrupt the local ecosystem and are not kept in check by grazing, climate, or other natural means
- **Exotic Invasive** = non-native species disrupting and replacing the species native to the area
- **Lifeform** = the body form that characterizes a kind of organism (as a species) at maturity
- **Range** = the spread of environmental conditions within which a particular species occurs
- **Origin** = the place from which a species begins or rises or from which it derives
- **Biodiversity** = biological diversity in an environment as indicated by numbers of different species of plants and animals, including species richness, ecosystem complexity, and genetic variation

7. Safety Information: Make sure students are aware of any restrictions/limitations on areas of the schoolyard. Be sure to monitor students as they are collecting and wandering around the area. Remind them of the old adage: “Leaves of three, let them be.” Also, tell students to stay away from plants with thorns, spines, etc.

8. Materials List (including any handouts or transparency masters):

- Paper Bags
- Nature Journals for each student
- Computer access (for collaboration with ECOS Natural History Guide)
- Applicable worksheets (attached)

9. Methods/Procedure for students:

a. Pre-investigation work:

Begin by asking the students a series of questions, such as: What is a weed? What is a native plant? What is an exotic plant? Why are natives important? Why do we try to eliminate exotics? What do exotics do to our native plants and natural ecosystems? Why do we try to protect these native ecosystems and the elements within them? Then, ask students if they can name a few native plants and a few exotic plants. You’ll be surprised

at the names thrown out there. These kids know more than we give them credit for. It may be best to make a list of the answers on the board for use as a reference later on in the inquiry.

b. Investigation work:

Separate students into groups and give each group a paper bag for plant collection. Give students 10-15 minutes to collect two plant specimens. Instruct them to make notes and sketches on any relevant characteristics of the plants and their habitats. These notes and sketches will be used later in identification of the species collected.

Bring students back to the classroom and have them spend some time looking at the species they collected. Have students spend some time observing these specimens in the classroom. Students should take a few moments in their groups to discuss the plants found. Have them make an prediction on whether the species they found are native or exotic. In most cases, these assumptions will be wrong but will give students the opportunity to learn how/why exotics are introduced. For example, one student may say, "This plant is pretty, so it must be native." This plant may be exotic, and its introduction may be due to the fact that it is pretty and its introduction is due to ornamental use. After observing and making notes, students will fill out a short worksheet to help them identify the unique characteristics of their specimens. The answers on the worksheet will be used to identify the plant through the ECOS Natural History Guide.

After a group finishes the worksheet, bring them to the computer lab. Have the children bring their nature journals and worksheets with them. Open, or explain how to open (depending on age group), the ECOS Natural History Guide (<http://www.bioed.org/nhguideweb/>). Navigate, or have the students navigate, to the "Identify a Plant" section of the Plant Guide (on the left side of the page, <http://www.bioed.org/nhguideweb/NHGuide/PlantSearch.aspx>). Once in the "Identify a Plant" section, have the students use the answers from their worksheets to select the fields that will lead them to the possible plant species. The students must first select the boxes to the left of the fields to be used in identification (leaf type, leaf arrangement, and flower color). The students will then scroll to the correct characteristic and will type in the color of the plant. Once these characteristics are selected, hit SEARCH at the bottom of the page.

The computer will generate a number of options for the correct name of the plant. This is due to the fact that the characteristics used in identifying are limited by the fields selected. Have the students look through the options (located on the left side of the page). Students should pull out their nature journals and use their sketches/notes to correctly identify the plants. At the bottom of the page, there is a place for the correct name of the species.

Ask the students to turn to the back of the worksheet. There is a series of questions for the students to answer. Have them use the description of the plant and/or photos to answer these questions.

Following the investigation, each group should present their findings to the class. The teacher should make a running list on the board of natives vs. exotics. After doing so, have students take a look at the list and decide whether natives or exotics rule their schoolyard.

10. Assessment: Attached worksheets act as a means of assessment on student's progress and participation in the activity.

11. Extension Ideas: This activity may be taken further by assigning each student a plant species. Tell them they have the opportunity to become experts on their assigned plant. Some students may cover exotics, while others may work on natives. Students can generate a report, going into detail on their assigned plant species. Reports could include drawings/photos and complete descriptions on the plants (including habitat, medicinal uses, cool facts, etc). Students can then present to the class, or posters can be displayed for the rest of the school to use as a learning tool.

Extension for 3-6

This game is an extension of the inquiry and may or may not be included depending on available time. This game gives students the opportunity to visualize changes in native ecosystems due to invasions of exotic species. This game also allows students to see how quickly a native ecosystem can be taken over by exotic invaders. In addition, the game gives students the opportunity to let off a little steam.

Bring the students outside. Tell them that we will be playing a game of tag in which one person will be an exotic invader and all the others will be native plants. Set up boundaries and tell children they will automatically become an exotic invader if they cross these lines. Hint: the smaller the area, the faster you can get through this game. In addition, tell children that once they are tagged they must link arms with the person who tagged them (up to three people). Once a 3-person group tags a fourth, they should break into two groups of two people. The goal of the game is for the exotic invaders to engulf the entire native community. Once done, the game is over. This game can then lend itself to a discussion on how and why exotic invaders are able to overcome a native plant community.

12. Scalability: This exercise may be scaled down to lower grades. In order to do so, teachers should provide one native specimen and one exotic specimen, rather than allowing students to collect their own. Teachers can then go into detail on the differences between these types of plants. The teacher may want to focus more on making sure the children understand the idea of an exotic plant and why it's a detriment to our native ecosystems. Students can focus more on journaling and observing the plant specimens. Sketching and note-taking may be more of the objective for this age group.

13. Science Standards Accomplished:

- Science as a Human Endeavor
- Populations and Ecosystems
- Risks and Benefits
- Diversity and Adaptations of Organisms
- Populations, Resources, and Environments
- Interdependence of Organisms

14. References:

<http://www.britannica.com/>
<http://www.m-w.com/>

<http://www.nps.gov/plants/alien/bkgd.htm>

Brooke McBride (nature sketches)



Who Rules the Schoolyard?: Natives vs. Exotics

Part 1:

Directions: Use the handout, leaf samples, notes, and illustrations to answer the following questions. After finishing the section, we will use a computerized field guide/dichotomous key to accurately identify your species.

To get to the field guide, type <http://www.bioed.org/nhguideweb/> in the "Address" box at the top of the page. Select "Identify a Plant" on the left side of the page. Use the answers from your worksheets to make selections. First, select the boxes to the left of the fields to be used in identification (leaf type, leaf arrangement, and flower color). Then scroll to the correct characteristic and type in the color of the plant. Once these characteristics are selected, hit **SEARCH** at the bottom of the page. You will be given a few plant names. Use your samples, notes, and illustrations to select the correct species.

Species 1:

Leaf Shape: _____ Habitat: _____

Leaf Arrangement: _____ Flower Color: _____

Name of Unknown Species 1: _____

Species 2:

Leaf Shape: _____ Habitat: _____

Leaf Arrangement: _____ Flower Color: _____

Name of Unknown Species 2: _____

Part 2:

Directions: Now that you know the correct names of your samples, let's learn a little about their homes (habitats), histories (origin and uses), and their lives (family, flowering, life cycle). Find your species in the ECOS guide again. Go to "[Select a Plant by Name](#)" and type in the name of your species. Look through the description and answer the following questions.

Species 1:

What is the lifeform of this sample? _____

What family does this specimen belong to? _____

Where does this plant grow? Where is its favorite place to live? _____

What is the origin of this plant? If not native, where does this plant come from? _____

Can you find any interesting facts about this plant? _____

Please make a new sketch of your plant in your journal based off the photos from the ECOS guide.

Species 2:

What is the lifeform of this sample? _____

What family does this specimen belong to? _____

Where does this plant grow? Where is its favorite place to live? _____

What is the origin of this plant? If not native, where does this plant come from? _____

Can you find any interesting facts about this plant? _____

Please make a new sketch of your plant in your journal based off the photos from the ECOS guide.

Part 3:

Directions: Go back and look at your answers to the questions above. Compare and contrast your answers for the two species.

Do these plants have similar characteristics? _____

If so, what are they? _____

What are the major differences between these two plants? _____

If exotics, why and/or how do you think these species were introduced to the United States? _____



Guide to Leaf Arrangements and Leaf Shapes (Drawings by Brooke McBride)

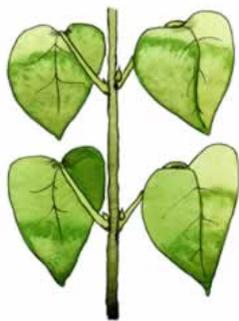
Leaf Arrangement



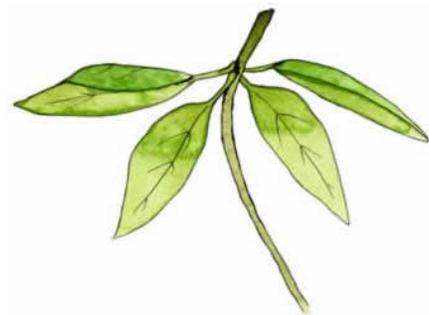
Alternate



Fascicled



Opposite



Whorled

Additional Leaf Arrangement Characteristics:



Bipinnate



Pinnate



Palmately Lobed



Simple



Palmately Compound



Tri-ternate

Leaf Shape



Cordate (heart shaped)



Elliptic



Lanceolate



Linear



Oblanceolate



Oblong



Obovate



Orbicular



Ovate



Acicular (needle-shaped)