

Right Plant! Right Place!

Training Manual for Naturalist Staff



Sponsored by the
King County Noxious Weed Control Program 2011

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Grade: 3-5

Time: 60 minutes

Overview of Activity: Through games and group activities, students will become aware of the impact of invasive plants on native plants in ecosystems. Students will learn how to identify invasive plants, how these plants spread, and why they need to be controlled or removed in our own backyards and community.

Objectives:

- 1) Students become aware of the problem and want to help.
- 2) Students understand why invasives need to be removed or prevented in some areas, perhaps in their own neighborhoods.
- 3) Students consider volunteering in stewardship activities in the community, creating more eyes out there to alert KC staff to problem areas, and advocating for invasive plant removal in natural areas.

Key messages:

- The right plant in the right place promotes a healthy environment.
- Fighting invasive plants can help the health of our environment.
- Invasive plants can take habitat away over time.
- **Invasives interfere with farmer's crops and have other detriments to the environment.**
- Native Plants are our heritage.
- Early detection/rapid response can help reduce the negative effects of invasive plants.
- An invasive plant is a plant that has a way of spreading rapidly that out-competes natives.
- Invasive plants can create bio-diversity deserts.
- Weeds are about human perception and invasives are about ecosystems.

Vocabulary:

- Native Plant
- Non-native plant
- Invasive Species
- Noxious Weeds
- Ecosystem
- Adaptation

- Out-compete
- Stewardship

Essential Academic Learning Requirements:

Grade 3

EALR 1 Systems: Systems (SYS)

- A system is a group of interacting parts that form a whole.

EALR 2 Life Science: Structures and Functions of Living Organisms (LS1)

- Plants have life cycles that include sprouting, growing to full size, forming fruits and flowers, shedding seeds (which begin a new cycle) and eventually dying. The details of the life cycle are different for different plants.

EALR 4: Life Science: Ecosystems (LS2)

- *Ecosystems* support all life on the planet, including human life, by providing food, fresh water, and breathable *air*.
- Some changes in *ecosystems* occur slowly and others occur rapidly. Changes can affect life forms, including humans.
- Humans impact *ecosystems* in both positive and negative ways. Humans can help improve the health of *ecosystems* so that they provide *habitats* for plants and animals and resources for humans over the long term. For example, if people use fewer resources and recycle waste, there will be fewer negative impacts on natural *systems*.

EALR 4: Life Science: Biological Evolution (LS3)

- Sometimes differences in *characteristics* give individual plants or animals an advantage in surviving and reproducing.

Grades 4-5:

EALR 4: Life Science: Structures and Functions of Living Organisms (LS1)

- Plants and animals can be sorted according to their structures and behaviors.
- Certain structures and behaviors enable plants and animals to respond to changes in their *environment*.

EALR 4 Life Science: Ecosystems (LS2)

- An *ecosystem* includes all of the *populations* of living *organisms* and nonliving physical factors in a given area. Living *organisms* depend on one another and the nonliving physical factors in their *ecosystem* to help them survive.
- *Ecosystems* can change slowly or rapidly. Big changes over a short period of time can have a major impact on the *ecosystem* and the *populations* of plants and animals living there.

- All plants and animals change the *ecosystem* where they live. If this change reduces **another organism's access to resources**, that *organism* may move to another location or die.
- People affect *ecosystems* both positively and negatively.

EALR 4: Life Science: Biological Evolution (LS3)

- In any *ecosystem*, some *populations* of *organisms* thrive and grow, some decline, and others do not survive at all.

Grade 6

EALR 4: Life Science: Ecosystems (LS2)

- An *ecosystem* consists of all the *populations* living within a specific area and the nonliving *factors* they interact with. One geographical area may contain many *ecosystems*.
- *Ecosystems* are continuously changing. Causes of these changes include nonliving *factors* such as the amount of light, range of *temperatures*, and availability of water, as well as living *factors* such as the disappearance of different *species* through disease, predation, *habitat* destruction and overuse of resources or the introduction of new *species*.

EALR 4: Life Science: Biological Evolution (LS3)

- *Adaptations* are physical or behavioral changes that are inherited and enhance the ability of an *organism* to survive and reproduce in a particular *environment*.

Environmental and Sustainability Education Standards (OSPI WA State 2009)

Standard 1: Ecological, Social, and Economic Systems

Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

Standard 3: SUSTAINABILITY & CIVIC RESPONSIBILITY

Students develop the knowledge, perspective, vision, skills, and disposition necessary to make personal and collective decisions and take actions to promote sustainability.

PROGRAM PRESENTATION STARTS HERE.

Introduction: 5 minutes

Introduce self, agency, and concepts. **Say something like:** *"Good morning (or afternoon)! We are so glad to be here with you. This program is a gift to you from the King County Noxious Weed Division. They are the adults in our community (a government agency) that are responsible to make sure our environment is the healthiest it can be by not having as many invasives and encouraging native vegetation. Also, it is our hope that when all of our citizens understand how our NW ecosystem works, then our community does a better job of taking care of it sustainably. This program is helping out that goal.*

So to start, let's cover together the definition of "Invasive" and "Native" with students. Write the words **"Invasive"** and **"Native"** on the board. Ask students what they know already about these terms. *An invasive species is a non-native, introduced species that thrives and reproduces successfully in its new location, spreads and establishes beyond where it was originally introduced, out-competes or harms the native species in its new location, and disrupts local ecosystems. Native plants are those that naturally occur in its ecosystem; was growing there before humans introduced other plants from distant places. Now, let's look at some native and invasive plants..."*

Power Point Slide Show Prompts

15 min

Title Slide Right Plant! Right Place!

What is a Native Plant?

What makes a Native Plant so great? Native Plant benefits include:

- They use less water and save energy.
- They need less gardening time to maintain.
- **They are resistant to disease and don't need** pesticides to survive.
- They help control erosion and maintain good soil conditions for ground micro-organisms.
- They reduce flooding and clean our water and air.
- They provide proper food and shelter for wildlife.
- They belong to the Northwest ecosystem and help to keep the natural balance of life going.

What is a Weed?

- A plant growing where opportunity allows, not where it was intentionally planted (like a dandelion).
- A plant that takes water, food, or habitat from desired plants.
- Sometimes weeds can be useful in one place and harmful in another, like blackberry brambles.

However, some weeds move beyond that and become what we call **"invasives"**.

What is an Invasive Plant? A plant introduced here from somewhere else in the world that escapes into our natural areas and disrupts the ecosystems

Non-native plants that are able to out-grow, out-spread and out-compete native plants

Cause much more harm than "regular" nuisance weeds (again like dandelions)

Where do invasive Plants come from? . All over the world! People bring plants from their old place to their new homes – memories of the place they left – sentimental value. However, these plants adapted quickly to the new habitat, there are no predators, and they spread outside the intended gardens. Plants came here from other places in cargo holds of boats, inside feed sacks, or stuck to clothing to name just a few ways. Some plants get a special designation or term we call "noxious".

What is a Noxious Weed? Noxious is a legal term for the term "invasive plants".

They are a plant bullies – grabbing resources before natives get a chance at food, water, space and sunlight. Once established are difficult to control and get rid of. Some are poisonous to people and animals, others destroy native plant communities. They often have defenses to protect themselves from people and animals like thorns, poisons, nasty smells and flavors. They are opportunistic – quick to grow into new openings and disturbed places.

How do they do this? They spread, using multiple methods...

Weeds Spread by...

- Wind - Seed get carried on the wind to sometimes far-places.
- Water – carries them to different places downstream.
- Animals – seeds with **barbs hook into animal's fur** travel to new locations.
- People activities – cars, boats, socks, etc. pick up seeds and transport them

No matter how they travel, weeds can germinate within a wide range of temperature and moisture conditions. They have rapid growth that uses soil nutrients before the native plants can. They develop deep root systems that rob native plants of water. And some plants release a chemical into the soil that prevents other plants from growing nearby.

How are invasive plants damaging to ecosystems and wildlife?

As the invasive plant takes over, it reduces habitat and food choices for native wildlife. Invasive plants are the second most important impact after habitat loss. For example, the Oregon Silver spot Butterfly is no longer found in Washington partly because invasive plants, like Scotch Broom, crowded **out the butterfly's** native food source. Here are some reasons why we should discourage invasive plants:

- Attract and lure pollinators away from natives.
- Crowd out native plants.
- Decrease biodiversity – not as many animals or plants in the area.
- Clog waterways and streams, making it difficult for boats to navigate, animals and people to swim.

How invasive change the ecosystem Here's an example of how it all happens.

Invasive changes to landscape

Into the Ecosystem comes...

...And it takes over.

Are Invasive plants dangerous to livestock and farms? When invasive plants compete with crops, decreasing the amount of food a farmer can grow. Some weeds are toxic to people and animals. For example, i.e. tansy ragwort causes fatal liver damage in horses.

How can we prevent, control, and remove invasive plants?

First, learn what plants are listed on the WA State noxious weed list. The plants are broken down into categories depending on how widespread and problematic they are. In WA State, every county has a list of priority noxious weeds for that county. The new invaders are the highest priority because there is still a chance to keep them from spreading. Use Best Management Practices to either control or remove noxious weeds. This means using methods or techniques that are effective and achieve the desired results for that location. For example, some people use a method **called "Biological Control", in which we use** living organisms to control weeds. For example it could be beetles, moth larvae, goats, fungus etc. These organisms prevent plant growth or seed production.

What can you do...

- Learn what plants cause problems.
- **Don't plant noxious** weeds in your yard.
- **Check your clothing, bike, boat, and car for noxious weed "hitchhikers"**.
- Never dump your aquarium into a lake or stream.

Invasive Spotting Activity **10 minutes**

- Have students look at and touch 6-10 invasive plant samples outdoors or on tables (real or plastic), and write down what they think each one is.
- Help students identify the species correctly, and have short talk about each one.

Don't Out-compete Me Simulation Game **15 Minutes** **Grade 3-4**

Materials:

- 1.** Blue, red and white poker chips (Blue represents water, red represents nutrients, white represents light)
- 2.** Native plant and Invasive Plant cards

This game is best played in a gym, or outside, in an open field or on pavement.

Discussion points during the game can be: info about **plants'** habitat, where to plant or remove plants, seed dispersal, and what animals/food web connections are there.

Invasive Plant Species Card List:

1. Garlic Mustard (*Alliaria petiolata*)
2. Yellow Hawkweed (*Hieracium caespitosum*)
3. Dalmatian Toadflax (*Linaria dalmatica*)

4. Tansy Ragwort (*Senecio jacobaea*)
5. Spotted Knapweed (*Centaurea stoebe*)
6. Butterfly Bush (*Buddleia davidii*)
7. Himalayan Blackberry (*Rubus armeniacus*)
8. Poison Hemlock (*Conium maculatum*) NOTE: Poison Water Hemlock is a different native species.
9. English Ivy (*Hedera helix*)
10. Knotweed (*Polygonum x bohemicum*)NOTE: Most knotweeds are clones or hybrids of 3 species.
11. Herb Robert (*Geranium robertianum*)
12. Yellow Toadflax (*Linaria vulgaris*)
13. Burdock (*Arctium minus*)
14. Bull Thistle (*Cirsium vulgare*)
15. Milk Thistle (*Silybum marianum*)
16. Meadow Knapweed (*Centaurea jacea x nigra*)
17. *Yellow archangel* (*Lamiaeum galeobdolon*)
18. *Purple Loosestrife* (*Lythrum salicaria*)
19. *Scotch broom* (*Cytisus scoparius*)
20. *Giant Hogweed* (*Heracleum mantegazzianum*)

Native Plant Species Card list:

1. Low Oregon Grape (*Mahonia nervosa*)
2. Bleeding Heart (*Dicentra formosa*)
3. Deer Fern (*Blechnum spicant*)
4. Fringecup (*Tellima grandiflora*)
5. Indian Plum (*Oemlaria cerasiformis*)
6. Bald Hip Rose (*Rosa gymnocarpa*)
7. Pacific Ninebark (*Physocarpus capitatus*)
8. Salal (*Gaultheria shallon*)
9. Snowberry (*Symphoricarpos albus*)
10. Red Osier Dogwood (*Cornus sericea*)
11. Woodland violets (*Viola* spp.)
12. Western Spirea (*Spiraea douglassi*)
13. Camas (*Camassia quamash*)
14. Sword Fern (*Polystichum munitim*)
15. Trillium (*Trillium* spp.)
16. Yarrow (*Achillea millefolium*)

Directions:

- Spread out the poker chips in a set area, large enough for students to spread out standing with arms out.
- Tell students that they are going to be native plants or invasive plants in this game. Each has to get what they need to survive.
- Ask what plants need to survive. Possible responses: CO₂, water, nutrients, light, space.
- Give the students a role card, native plant or invasive plant. Direct a silent moment for students to carefully read their role card. There should be more invasive plants than native plants in the mix: 10-15 native plants and 15-20 invasive plants, depending on class size.

Round 1: Best Native Out-competer

- Tell the students representing native plants to spread out in the space, far enough so that when their arms are out, they cannot touch the fingertips of another student. There should **be about a foot of space between outstretched arms. You don't want students to bump heads or accidentally hit each other.**
- The poker chips represent water, nutrients, and light. You have space and are getting your CO₂ for free from animals.
- **Say,** *"On my signal, carefully reach out with your arms and one leg and get as many chips as you can in 20 seconds. You have to keep the other leg in place at all times; this is your taproot keeping you stable."* Allow students to harvest chips.
- Have students count their chips. Point out the plant that gathers the most chips. Make the point that this one has out-competed the rest. Reiterate that plants with the most resources can grow the largest and stay healthier. For example, plants in a forest compete for resources, and often young trees are outcompeted by older ones and cannot get the resources they need.

Round 2: Add Invasives

- Ask the native plants to spread their chips back out, and have the invasive plants join the game.
- The space the students are in does not change to accommodate more players, so the students will be closer together this time.
- This time, let both native plants and invasive plants reach out for resources using one arm and one leg for 20 seconds.
- Count chips. Make sure students notice there are fewer resources (chips) available for them this time with the addition of invasive plants.

Round 3: Tough Competition

- Ask students to hand you all the chips. Remove some.
- Decrease the size of the space (development by humans decreases available space and resources).
- Students will have to stand closer to each other, so will have to be extra careful not to bump heads or shove each other.
- Ask the Native plants to place themselves within the space. Now spread out the chips so that it is harder for the natives to reach them.
- Ask the invasive plants to pick strategic places to grow where they will get the most resources and place themselves (invasive plants are opportunistic) in the space.
- Native plants can now only use one foot (no hands) to carefully gather resources.
- Invasive plants can use both hands and one foot to gather, and get a 5 second start on the native plants.
- Count chips. Some natives may have none and all others should have very few.

Discuss why the invasive plants out-competed the native plants.

Great Race for Survival! Game 15 minutes Grade 4-5

*(Adapted from the Great Race for Survival from Alien Invasion: Plants on the Move
http://weedinvasion.org/weed_page.php?page=facts&level=elementary)*

Supplies: plant cards, cones or other markers set at start and finish lines

In this game, you will have a chance to see who survives by competing in a Mother-May-I type race. Each person will represent a native plant or an invasive plant, starting as seeds.

Hand out one card to each student. Can use the same cards as in the "Don't Out-compete Me" game.

Each of you has been given a playing card representing a particular plant. Please take a minute to read it to yourself. Pause. OK, all done? Good. Now you know which plant you will be for the GREAT RACE FOR SURVIVAL. This race is different than what we are used to, in that there will be specific directions on how to move for each role. Listen carefully to directions!

Remember your plant's name as I read the story and the instructions. Sometimes I may have instructions for all native plants or all invasive plants, so remember which you are (native plant cards have a green theme; invasive plants have red). Or sometimes I may ask for all knapweeds, thistles or knotweeds, so listen for those names if you are one of them.

The race represents one year in the life of a plant. So listen for the change of seasons as you play out your role. Throughout the game, I will prompt you to take steps forward or backward. Remember these are normal walking steps. Everyone, show me your normal steps. Good! If necessary ask the teacher to penalize or remove students who cannot comply with the rules of the game.

Now, line up on the starting line, listen carefully to the story, and follow my prompts.

- 1. Each one of you has been magically transformed into a tiny plant seed. You are many different kinds of seeds from many different kinds of plants. You have each been carried here by wind, water, animals, or people. You have been lying dormant in the soil all winter. People and animals using the trail have stirred up the soil and created a disturbance, causing all of you seeds to germinate and start to grow. The events I will describe represent one year in your life. Some of you will keep on growing and moving forward, others will move **backward and won't survive the year**. Remember, when I tell you to step forward or backward, take normal walking steps.*

2. *It is early spring. Rain, warmer temperatures, and longer days result in rapid growth. Over-wintering roots send up new shoots from the soil. Tree buds start to open. Seeds that have lain dormant all winter start to sprout. Everyone step forward four steps.*
3. *Some plants make many more seeds than others so the soil here contains more of those plants than others. Garlic mustard, milk thistle, bull thistle, fringe cup, and any knapweeds step forward two steps. Tansy ragwort, poison-hemlock and purple loosestrife step forward six steps.*
4. *The growing season continues to be favorable. All plants step forward three steps.*
5. *A few species can release chemicals into the soil that stop the growth of nearby plants. All knapweeds and garlic mustard raise your hands. Any plant within 10 feet of these plants, step backward three steps.*
6. *Some plants flower early in the spring and make seeds long before the other plants, giving them an early lead. Garlic mustard and woodland violets step forward three steps.*
7. ***June rainstorms following May's sunshine mean lots of plant growth.** All plants take three steps forward.*
8. *New growth on plants attracts insects and animals that rely on eating plants for their survival. Many more insects and animals are attracted to the native plants they evolved with, mostly leaving alone the strange invasive plants from other parts of the world. The insect damage and grazing by animals slows down the growth of the native plants but not the invasive weeds. All invasive plants step forward two steps, all native plants step backward two steps.*
9. *Some plants have natural defenses that make them taste bitter or make them thorny and difficult to eat. Garlic mustard, yarrow, English ivy, Oregon grape, all thistles, all knapweeds, poison-hemlock, salal, tansy ragwort, Dalmatian toadflax and yellow toadflax step forward two steps.*
10. *Invasive vines send out long, creeping stems that form a dense mat of vegetation, choking out all other species within a five foot radius. English ivy raise your hand. All plants within five feet (about ten steps) of ivy, step backward three steps.*
11. *Some plants are adapted to our wet spring and dry summer climate and grow the most in the rainy spring. Bleeding heart, camas lily, trillium, fringe cup, woodland violets, and garlic mustard take two steps forward.*

12. Some plants gobble up resources and quickly out-grow other plants when there's plenty of rain and sun. All knotweeds, burdock, poison-hemlock, and purple loosestrife take five steps forward.
13. As the growing season continues, summer drought hits this area, and plant growth slows. Deep rooted plants now grow better than the rest. Yellow and Dalmatian toadflax, yarrow, all thistles, sword fern, Oregon grape, all knotweeds and snowberry step forward two steps.
14. Some plants are easily hurt by disturbance to their roots. For example, being this close to a trail means that hikers, dogs, workers and others regularly stress the roots of the plants. Invasive weeds and some native plants have adapted to disturbed areas and are better able to survive this by having extensive roots, growing back quickly, or just being tough. Red osier dogwood, yarrow, sword fern, spirea, and snowberry step forward two steps. All other native plants, step backward two steps. Also, all invasive plants step forward four steps.
15. Plants continue to grow in the early fall months, but shorter days slows growth and much plant energy is now devoted to food storage and seed production. All plants step forward two steps.
16. Plants that are able to send their seeds long distances help ensure their success by finding new areas in which to grow. Knapweed breaks off at the base and tumbles in the wind. Tansy ragwort seeds get caught on animals, people and vehicles. Burdock seeds have hooks on them that attach to fur and clothing. Puncture vine seed spines puncture soles of shoes and tires. Knapweed, tansy ragwort, and burdock, take four steps forward.
17. Several windy days have occurred over the last week, followed by heavy rains. Plants that have seeds that are attached to a plume of fine hairs (like a dandelion) or that are very small, are quickly moved to new places. All thistles, poison-hemlock, sword fern, purple loosestrife, garlic mustard, toadflaxes, yarrow, and tansy ragwort take four steps forward.
18. **Plants that are near the water's edge release their seeds and root fragments to the rising waters and are carried in the water and down into the rest of the watershed.** Purple loosestrife, spirea, and knotweeds take five steps forward.
19. The seeds of plants that make berries are carried by animals to new places. Red osier dogwood, snowberry, English ivy, salal, and Oregon grape take three steps forward.
20. The seeds of many plants simply land near the parent plant and may not have as many chances to find a better place to grow. Bleeding heart, trillium, camas lily, woodland violet, and fringe cup take one small step forward.

21. *It is winter now. All of you plants have ways of surviving over the winter. Seeds are hard and can stay dormant but alive until spring. Perennials die back above ground but have sturdy roots and underground stems called rhizomes that keep them alive through the winter. Some plants have low-growing forms that can persist through cold weather, slowing growing but mostly lying in wait for rapid growth in the spring. Even shrubs and trees slow down their growth and can resist cold weather. All plants are done growing for the year, so you are done moving. Great job, everyone!*

Activity Wrap-up

The year is over. Your position relative to the other plants represents the growth of your plant species this year. If you are way behind the other plants, your survival is questionable. If there were only a few of you in the area to start with, your species may disappear in the near future, out-competed by those plants farther ahead. If you are ahead of the other plants, then your species has out-competed the rest and has a good chance of spreading and taking over this area.

Let's find out how the native plants fared against the invasive plants. Raise your hand if your plant is native. Let's count the hands. Now, raise your hand if your plant is an invasive plant (if you don't know, ask me). Let's count the hands. Which group did better in the race for survival? If the invasive plants weren't here, would the race look any different? Discuss.

Now let's review the benefits of native plants and dialogue about what you have learned about how invasives change things.

Program Conclusion and Review

5 minutes

Review what an invasive plant is, and ways they outcompete native plants. Discuss stewardship, and what students are willing to do to help control and remove weeds. Ask students to please tell their families and peers what they learned today. Suggest ways that students can get involved in their community to help promote natives and control invasive plants. Give students handouts, thank them, and depart.