



NEXT GENERATION STEWARDS

INTRODUCTORY LESSON

OVERVIEW:

Students will start by completing a pre-program assessment in their science journal. Then, using the reintroduction of wolves to Yellowstone National Park, they will be introduced to the intricate connections of a healthy ecosystem.

OUTCOMES:

- 1) Students will gain awareness of natural systems.
- 2) Students will identify various parts of a natural system.
- 3) Students will make a model that illustrates the interconnectedness of a natural system.

SUGGESTED GRADES: 4th - 5th

TIME: Approx. 90 minutes

NEXT GENERATION SCIENCE STANDARDS:

Please visit mtsgreenway.org/get-involved/education/standards for a complete listing.

SCIENCE JOURNAL:

Students use their Next Generation Stewards science journal in the classroom and in the field to record their observations and reflections. This Introductory Lesson is paired with Pages 1-4 in the science journal.

MATERIALS:

Items provided by Greenway Education Program:

- Next Generation Stewards science journals
- Example of ecosystem connection activity (page 5).
- Optional: images of Yellowstone National Park plants and animals (included on pages 6-7). To be printed and cut out.

Items provided by classroom teacher:

- "How Wolves Change Rivers" video (4:34 minutes), found here: blog.ted.com/2014/02/18/video-how-wolves-can-alter-the-course-of-rivers/
- Blank paper and writing/drawing utensils

PROCEDURES:

1 Science Journals (5 minutes)

Give each student a Next Generation Stewards science journal. They should write their name, teacher's name, and school on the front cover. Tell them they will use this science journal in the classroom and on their field study trip to record their observations, new knowledge, and reflections. After their field trip, a Greenway Educator will visit their classroom to reflect on all they have learned. During this reflective lesson, they will take a pledge to become a Next Generation Steward of the Mountains to Sound Greenway. Being a steward of nature means that they will do what they can to protect this beautiful landscape, continue to learn about and enjoy its many wonders, and share what they know with their friends and family.

2 Pre-Program Assessment (30 minutes)

The first third of this Introductory Lesson is a pre-program assessment on pages 1-4 in the science journal. It is important they do this assessment before the rest of this lesson. Please assure your students that this is not a test. They will do the same drawing and questionnaire before and after their field trip. We look at these to see what students are learning from this curriculum and to any make needed adjustments to our teaching materials.

Give your students about 20 minutes to do pages 1-2 ("Picture This!") in their science journal. They will be asked to create a drawing based on this prompt: "Draw a healthy Pacific NW forest ecosystem. Label your drawing."

Give your students about 10 minutes to answer the questions on pages 3-4 ("Show Us What You Know") in their science journal.

3 Video and Ecosystem Connections (approx. 45 minutes)

Students will watch a short video about the reintroduction of wolves to Yellowstone National Park (called "How Wolves Change Rivers"), and then do an activity. The video link is in the Materials list, and Key Terms are listed on page 4. Note: the narrator refers to 'elk' as 'deer,' which can be confusing.

Introduce the video:

We're going to watch a video about a special place called Yellowstone National Park. Yellowstone is a park in Wyoming that is larger than King County. It is protected as public land by the federal government. Yellowstone is special because it contains so many types of natural landscape features, plants, and animals. There are canyons, lush forests, meadows, rivers, hot springs, and geysers. In the forests and along rivers, there are aspen and cottonwood trees; and in the meadows there are beautiful wildflowers. It is home to many large animals like moose, bison, elk, mountain goats, and bears; and smaller animals like rabbits, beavers, weasels, fish, frogs, and all sorts of bugs. More than 300 species of birds live there! This video focuses on one animal in particular: the wolf. Although wolf packs used to roam from the Arctic to Mexico, the wolf populations in the United States were almost completely gone by the early 1900s. As white settlers built farms and homesteads, the wolves lost much of their habitat and food. So, they started preying on the farmers' livestock – cows, goats, sheep, chickens – causing the farmers to get angry and to try to keep the wolves away from their farms by shooting, trapping, or poisoning them. Wolves weren't even safe in Yellowstone National Park. By the 1970s – about 35 years ago – scientists couldn't find any evidence of wolves in the park. Then the Endangered Species Act, passed in 1973, helped protect wolves and other wildlife species. About 20 years ago (between 1995-97), 41 wolves from Canada and Minnesota were released into the Yellowstone National Park ecosystem. This video is about the incredible things that happened as a result.

Tell your students that as they watch the video, they need to pay special attention the names of animals and plants mentioned as well as how they are connected. Ask them for some examples of how animals and/or plants might be connected. Examples: birds use trees for homes, wolves eat rabbits, etc. After the video, they will create their own ecosystem connections model to illustrate how various parts of the Yellowstone National Park ecosystem are connected.

Watch "How Wolves Change Rivers". You may choose to watch the video more than once. Give your students time to create their ecosystem webs. Encourage groups that finish quickly to add more species to their model.

Ecosystem Connections Model Directions:

1. On your paper, draw and label at least 5 animals and at least 2 non-animal parts of the Yellowstone National Park ecosystem. You must include a wolf. (Alternative: use the images included in this lesson). Use the whole paper so that each drawing has plenty of space around it.
2. Identify how one part is connected to another. Draw a line between them. Along the line, write a brief description of that connection. For example, between a wolf and rabbit, you could write "wolves eat rabbits"; between a songbird and tree, you could write "birds make nests in trees."
3. Draw and label as many connection lines as you can.

4 Debrief Discussion (5-10 minutes)

Debrief the activity with questions such as:

- Q1 Before the wolves were reintroduced, why were there so many elk?

There were so many elk because their main predators was gone for so long.

- Q2 How did the wolves reduce the amount of erosion along the river?

Wolves drove out elk and other animals from certain areas, allowing vegetation to grow and stabilize the river banks.

- Q3 How would you define "ecosystem"?

A collection of living and non-living parts that are connected.

- Q4 Yellowstone National Park is an ecosystem: What smaller ecosystems exist within it? What larger ecosystem is the park part of?

Examples of a smaller system: river system, one tree, one canyon.

Example of a larger system: the National Parks system, the Rocky Mountains, the United States.

- Q5 How do think this ecosystem would change if a non-native invasive species were introduced?

Non-native invasive species can spread aggressively in a new ecosystem because their natural pests and predators are not present. These plants can decrease the biodiversity of an ecosystem.

- Q6 After learning about the wolves of Yellowstone National Park, how would you interpret this quote from the famous naturalist John Muir: "When we try to pick out anything by itself, we find it hitched to everything else in the universe."

Everything in an ecosystem is connected, directly or indirectly. When the wolves were removed, the ecosystem became unbalanced and less biodiverse.

5 Optional Extensions

- Research invasive plant or animal species and discuss how they might impact the current collection of species in Yellowstone. (www.nps.gov/subjects/invasive/plants.htm)
- Repeat the ecosystems connection activity using plants and animals that live in your neighborhood.

ECOSYSTEM CONNECTION EXAMPLES:

1. Wolves are carnivores. Their primary prey are elk, but they will also eat small mammals like beavers and rabbits.
2. Bears eat berries, carrion (dead, decaying animals), rodents, insects, elk calves, grasses. Their numbers increased because there was more food (especially carrion and berries).
3. Elk eat grasses, sedges, shrubs, aspen bark. When they started avoiding parts of the park, vegetation regenerated, which stabilized the riverbanks and helped prevent erosion.
4. Beavers eat grasses, sedges, inner tree bark. They are “ecosystem engineers”: their dams create habitat for many other wildlife species.
5. Rabbits eat shrubs, conifer tree needles. Along with mice, their numbers increased because some of their main predators – coyotes – were killed by the wolves.
6. Birds eat seeds, insects, berries, fish. Birds make nests in trees. Their numbers increased when the plants near rivers regenerated.
7. Eagles eat fish, carrion, ducks.
8. Weasels eat rodents, snakes, squirrels, insects, birds, frogs, eggs.
9. Coyotes eat small mammals, carrion, squirrels, birds, deer. Some were killed by the wolves.
10. Otters, Muskrats, Ducks, Reptiles, Amphibians, Fish: More habitat created by the beavers.

11. Trees, especially those near rivers, grew taller and older after wolves were reintroduced, providing more habitat for birds and changing the behavior of the rivers.
12. Rivers: Meandered less. Less erosion. Channels narrowed. More pools and riffles. All of this is great for wildlife habitat. This was possible because the regenerating vegetation stabilized the river banks, so they collapsed less often.

KEY TERMS:

Biodiversity: the variety of life in an ecosystem.

Carrion: Dead, decaying animals.

Ecosystem: A system of interconnected parts that are living (biotic) and non-living (abiotic).

Erosion: The movement of soil from one location to another by wind, water, ice, or gravity.

Food chain: A series of organisms interrelated by their feeding habits, the smallest one being fed upon by a larger one, which in turn feeds a larger one, and so on. This is also referred to as a food web.

Habitat: The natural home or environment of an animal, plant, or other organism.

Meander: To follow a winding course.

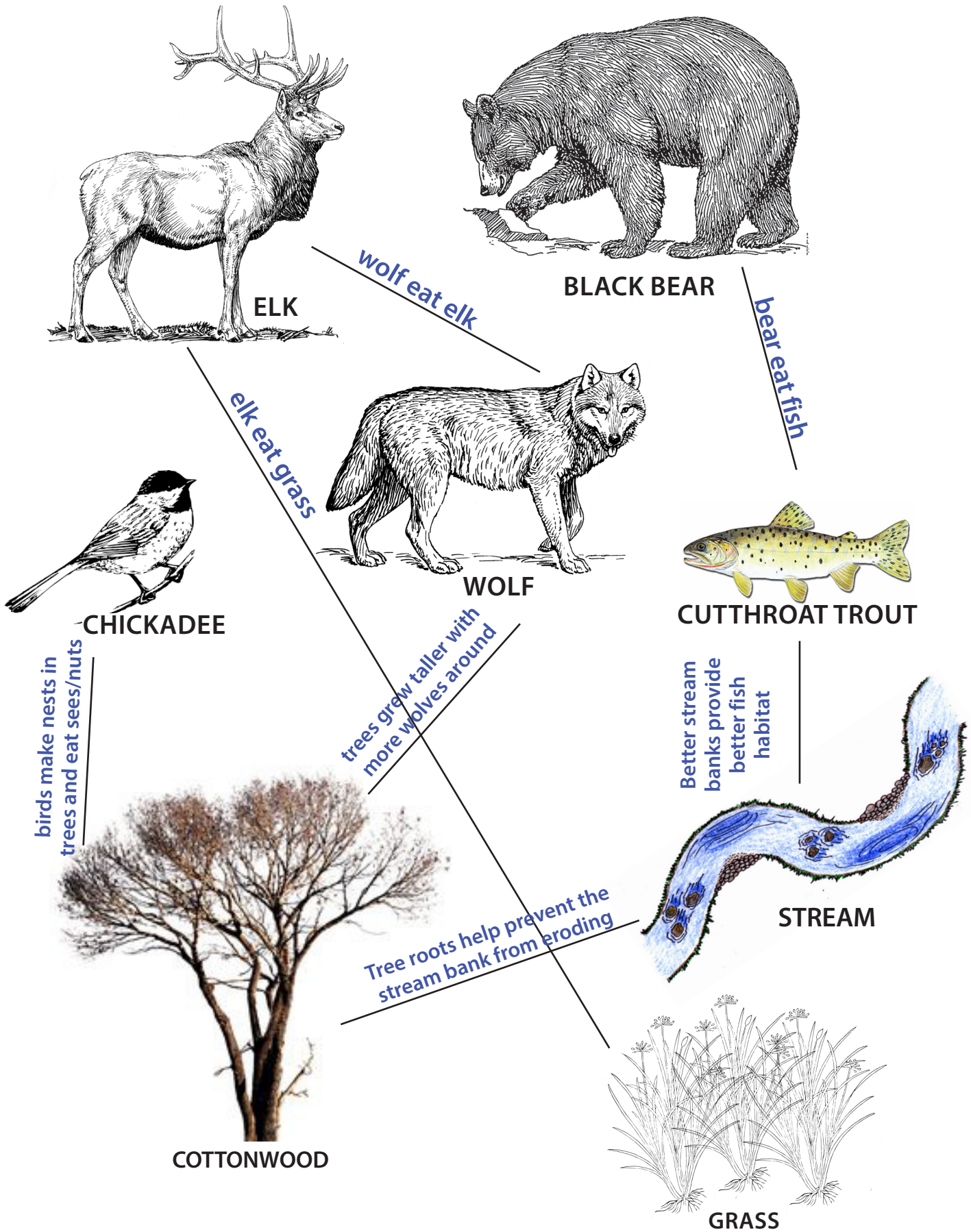
Niche (“neesh”): The place or function of an organism within its ecosystem. Different types of organisms might compete for the same niche.

Regeneration: Growth again after being lost or damaged.

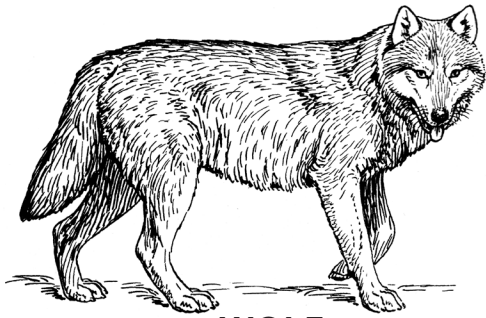
Steward: a person who learns about and protects nature.

Trophic cascade: An ecological process triggered by the removal or addition of a top predator that changes the relative populations of predator and prey throughout a food chain.

EXAMPLE ECOSYSTEMS CONNECTIONS



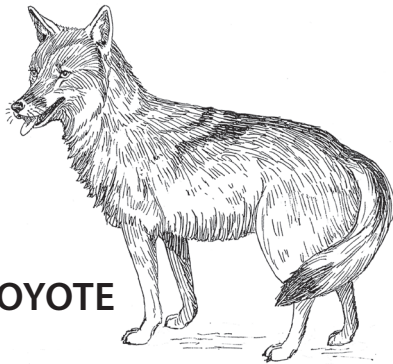
ECOSYSTEM CONNECTIONS IMAGES (TO BE CUT OUT AND GLUED ON BLANK SHEET)



WOLF



ELK



COYOTE



BLACK BEAR



ASPEN



COTTONWOOD

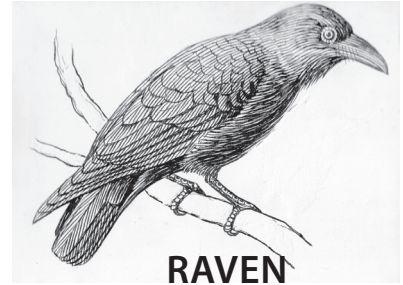
ECOSYSTEM CONNECTIONS IMAGES (TO BE CUT OUT AND GLUED ON BLANK SHEET)



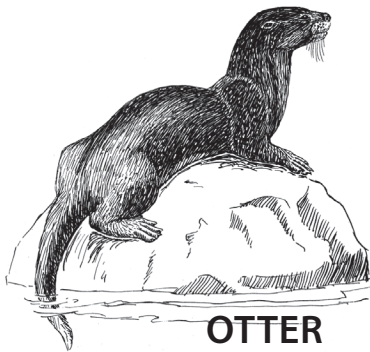
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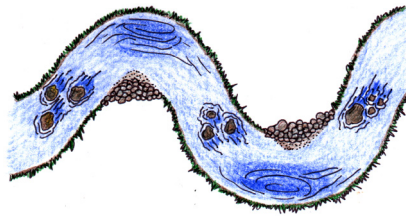
CHICKADEE



RAVEN



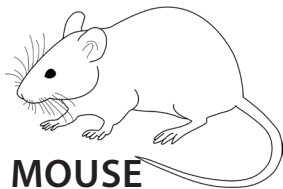
OTTER



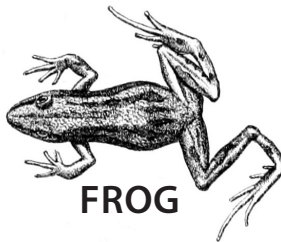
STREAM



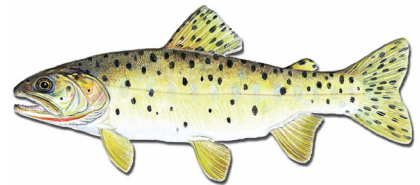
GARTER SNAKE



MOUSE



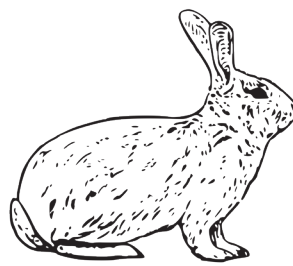
FROG



CUTTHROAT TROUT



GRASS



RABBIT



BEAVER