

Essential Question

How do Earth's major systems interact?

NGSS Disciplinary Core Idea

ESS2.A: Earth Materials and Systems – Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Learning Objective

By the end of the field trip, 3rd through 5th grade students will understand how a watershed is connected in terms of where water is going and how it is moving particles (soil as well as dissolved nutrients and chemicals) around.

Overall Assessment:

After being given the chance to explore the Tryon Creek watershed, students will be able to design a model watershed that considers how urban runoff is given a chance to filter through soil before entering the water table.

Curriculum Overview

Thank you for choosing Tryon Creek State Natural Area for your field trip!

This program outline can be used to give you an idea of what sorts of things your students will be doing during their field trip. **Please note that times are flexible and not all student groups will do every activity listed here** – our volunteer Nature Guides will be incorporating activities into their routine throughout the trip, but we encourage our educators to let the interests of the group guide their instruction, taking advantage of teachable moments and letting students ask questions that they would like to investigate.

This outline has been written to align with the [Next Generation Science Standards](#) (NGSS), which were developed based on the National Research Council's [Framework for K-12 Science Education](#), published in 2012. The Oregon Department of Education adopted the NGSS in 2014 and each district has developed a 5-year implementation plan. To the left you can review the specific Disciplinary Core Idea (based on the 3rd to 5th grade band) that is addressed in this program, as well as specific Performance Expectations for each grade level below. In addition, each activity on the following pages highlights specific Science and Engineering Practices that students may use during their field trip.

NGSS Performance Expectations supported by this curriculum:

Learn more about how [our programs support your curriculum goals](#).

Third Grade

3-LS4-4, 3-LS4-3

Fourth Grade

4-ESS2-1

Fifth Grade

5-LS2-1, 5-ESS2-1

Some vocabulary that may be used during this field trip includes:

- Continental Divide
- Gravity
- Permeable
- Dissolved O₂
- Groundwater
- pH
- Ecosystem
- Infiltration
- Pollution
- Erosion
- Impermeable
- Saturation
- Filtration
- Landscape
- Salmon
- Forest Canopy
- Macroinvertebrate
- Substrate

Revised by Friends of Tryon Creek on 9/19/2018



WATERSHEDS

YEAR-ROUND • 3RD TO 5TH GRADE • 2 OR 4 HOURS

Introduction - Jackson Shelter - 10 minutes

Welcome to Tryon Creek State Natural area! Chaperones will be invited to meet with a Nature Guide to discuss their role on the field trip, while students have some important questions to answer about their day:

Why are we all here in the forest together today?

- Hiking
- Learning
- Finding animals (or evidence of animals!)

Let them know that we will indeed be doing all of those things, with the goal of answering this question:

What are ways that water moves around in a watershed and what does that mean for the creek habitat?

Give logistical information (groups will be starting or ending with an activity in the classroom, and will be hiking for about an hour and 15 to 20 minutes). Make sure to bring your layers and go before you go!

Systems Investigation - Jackson Shelter - 20 minutes

Crumpled Paper Watershed Models

Guiding Question: What and where are watersheds?

Content Goal: Watersheds are everywhere and can come in many shapes and sizes

Activity Procedure

1. Students break into groups around the shelter with their nature guides
 - a. Have students work in pairs to complete the following instructions:
 - i. Crumple up a piece of recycled paper
 - ii. Unfold gently and tape to floor so there are peaks and valleys on their paper
 - iii. Outline all high points with blue marker
 - iv. Spray water on paper and observe the ink bleed, creating pools of blue water
2. Discuss where students are observing watersheds in their model
 - a. *How many are there? Are they all the same size?*
 - b. Compare to the relief map of Oregon. *Where do you see different watersheds?*

Science and Engineering Practices Applied

2. Developing and Using Models
 - *Identify limitations of models.*
 - *Develop and/or use models to describe and/or predict phenomena.*
 - *Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.*

Hike Activities - Tryon Creek Trails - 1 hour & 20 minutes

Infiltration Investigation

Guiding Question: What are some ways that water can move downhill?

Content Goal: Gravity pulls water down to the lowest point either across a hard surface or through the soil. Ground compaction (or looseness) effects how quickly water gets into the ground.

Activity Procedure

1. Students brainstorm different ways that water could move downhill, concluding that it can move underground or across the surface
2. Choose a method to test infiltration rate:
 - a. Infiltration Rate Can:
 - i. Place metal tube firmly in the hard-packed soil of the trail, using clay to seal bottom edge if needed
 - ii. Pour 1 cup of water into tube and start stopwatch
 - iii. Stop time when all water has been absorbed and take note of how long it took
 - iv. Repeat the exercise in loose soil off trail. Ask students to make predictions about how fast water will be absorbed in the new location, then repeat steps i-iii
 - b. Infiltration Observation:
 - i. Pour a small amount of water onto the hard-packed soil of the trail
 - *What is happening to the water/where is it going?*
 - ii. Next, pour a small amount of water onto loose soil off trail
 - *What is different? Where is the water going this time?*
3. Discuss student's observations
 - a. *In which spot was the water absorbed faster?*
 - b. *Which spot allows water to stay cooler?*
 - c. *Which spot allows water to travel more slowly?*
 - d. *What might water be picking up as it moves quickly across hard-packed surfaces like trails, roads, and sidewalks?*
4. As the hike continues, ask students to keep an eye out for places where water is allowed to slow down and sink into the soil.
 - a. *Are there any animals that might help water slow down on its way to the creek?*

Science and Engineering Practices Applied

6. Constructing Explanations and Designing Solutions
 - *Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.*

Soil Critters

Guiding Question: What role do animals play in keeping a watershed healthy?

Content Goal: Burrowing animals like moles and worms create space within the soil, which allows water to infiltrate into the ground more quickly.

Activity Procedure

1. As groups find different areas where animals are burrowing underground (mole hills or worm holes), students are reminded of the infiltration activity:
 - a. *How does the activity of these creatures help water slow down and travel underground?*
2. Students make observations of the mole pelt, noticing things about its body (cylindrical shape, large digging feet) that make them effective at tunneling through the ground.
 - a. *What other 'ecosystem services' might moles and worms provide/Why else might a forest need loose soil?*

Science and Engineering Practices Applied

6. Constructing explanations
 - o *Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.*

Water Quality Testing

Guiding Question: What do water quality indicators like pH, temperature, and Dissolved Oxygen tell us about the health of the watershed?

Content Goal: Scientists use water quality indicators to assess the health of the whole system.

Activity Procedure

1. Make observations about physical appearance of the creek
 - a. Sediment type (gravel or fine sediment?)
 - b. Water depth
 - c. Flow rate
 - d. Turbidity (how 'murky' it looks – can you see the bottom?)
2. Collect and make note of temperature, pH, and dissolved oxygen data:
 - a. Students compare their results to the charts on ideal parameters
 - i. *What might cause the results to fall outside of these 'ideals'?*

Science and Engineering Practices Applied**4. Analyzing and Interpreting Data**

- *Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.*

Making a Splash

Guiding Question: What role do plants play in a watershed?

Content Goal: The duff (organic matter on top of soil) as well as living plants can help to decrease the effect of erosion from rain hitting the ground.

Activity Procedure

1. Using the splashboards provided, students compare the effect of erosion on bare ground vs. ground where the soil is protected by the leaves of plants.
 - a. Find a spot where there is loose, bare soil and place the splashboard
 - b. Students take turns spraying the water bottle on the soil at the base of the splashboard
 - i. *How is the soil moving? Where is it going?*
 - c. Repeat the activity in a place with some ground cover or thick duff
 - i. *How do plants help keep the soil in place when it rains?*

Science and Engineering Practices Applied**6. Constructing explanations**

- *Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.*

General Observations and Teachable Moments

Guiding Question: How could all parts of an ecosystem influence watershed health?

Content Goal: Because all water eventually makes its way to the stream, every part of the surrounding ecosystem has an impact on the watershed.

Activity Procedure

1. As different plants, animals, or evidence of different animals are found along the trail, students make observations about their physical characteristics, behavior, and relationships with water/soil. Students use visual aids such as pelts, skulls, preserved leaves, or pictures to investigate these characteristics.
 - a. *How does this animal use the stream?*
 - b. *How might this plant interrupt the flow of water?*
 - c. *How do seasonal habitat changes affect the flow of water?*

Science and Engineering Practices Applied**6. Constructing explanations**

- *Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.*

Goodbye - Jackson Shelter - 10 minutes

Thank students for coming and make sure they are aware that they just spent the day in a state park, which means it belongs to everyone, and everyone is invited back anytime! Friends of Tryon Creek is a community supported non-profit whose mission, in partnership with the Oregon Parks and Recreation Department, is to nurture and inspire relationships with nature in our unique urban forest. Providing field trips is just one way that we work towards this mission, so checkout our website for information about our fun Nature Day Camps offered throughout the year, weekend family and adult programs, special events, and more!

Remind students that even if they never make it back to Tryon Creek, they can still be exploring nature, asking questions, and learning about how animals survive in their habitats.

Invite adults to checkout promotional materials before leaving and turn things over to classroom teachers for bus/lunch instructions.

Afternoon Extension (Optional)

For an additional fee, teachers may choose to extend the program from 2-hours (outlined above) to 4-hours. This extension includes a 30-minute lunch break in the Jackson Shelter, then two activity rotations designed to supplement the morning's hike.

Each of the following activities are designed to be run in approximately 35 minutes, with time built in for bathroom breaks, transitions, and a closing circle.

Trail Activity - Forest Canopy Investigation

Guiding Question: What role do plants play in a watershed?

Content Goal: Canopy cover affects the amount of water that actually reaches the ground.

Activity Procedure

1. Groups will hike to pairs of buckets placed along the trail fairly close to the Nature Center
2. Upon reaching the buckets, have students make some observations about the differences in each bucket (one has less water)
3. Tell students that buckets were placed at the same time and have had no water added or removed other than the recent rainfall.
 - a. *Why are we seeing a difference in the amount of water in each bucket?*
4. Using the canopy cards, students make an estimation of current canopy cover
 - a. *How might this change as we move through different seasons?*

Nature Classroom Activity - Building a Watershed

Guiding Question: How do our choices effect the rest of the watershed?

Content Goal - Assessment: After being given the chance to explore the Tryon Creek watershed, students will be able to design a model watershed that considers how urban runoff is given a chance to filter through soil before entering the water table.

Activity Procedure

1. Students split up into their groups around the classroom and are each given a piece of paper with part of a stream on it
2. Each piece of paper represents a plot of land in a watershed. Students will have 10minutes to complete the following instructions:

- a. Develop your land! You can choose to build a house/shopping center/amusement park/farm/natural area/etc. Draw all buildings, roads, and trails, making sure to also make note of where plants are growing
3. After all students have finished drawing, each group works together to put their properties together (as marked by the number on their papers – finished watersheds will be ordered 1-10 on a 2x5 grid)
 - a. *Which direction is water flowing?*
 - b. *How did your designs effect the surrounding properties?*
 - c. *What does this mean for the wildlife in your creek? The rest of the watershed?*

Back at School (Optional)

Third Grade (3-LS4-4)

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

- Write a story about the watershed that was created during the afternoon extension, describing how changes made to the ecosystem impacted the animals that could live there.
- If students did not create a watershed at the park, complete that activity in class and discuss.

Fourth Grade (4-ESS2-1)

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

- Use a tub of moist, fine play sand to create model watersheds. Students should include natural elements such as rocks and trees as well as human elements like buildings, roads, and parking lots. Use a watering can to simulate rain at the end, making observations about the movement of water and effects of erosion in different places throughout the watershed.

Fifth Grade

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

- Create an aquatic food web that might exist in Tryon Creek and discuss how poor water quality might impact the different species in that food web.