Riparian Zone Tree Survey

In this investigation, students will conduct a tree survey in the riparian zone near their water monitoring site. This information will be used to predict the potential for erosion and flooding, the potential for polluted surface waters entering the stream and the value of this area for wildlife habitat.

**Time:** 30 minutes

**When:** Fall and Spring

**Suggestions:** Conduct this investigation at the same time as the Vegetation Survey if you have trees at your monitoring site.

**Learning Objectives:**
Students will demonstrate the ability to:
- describe how a riparian buffer zone can benefit a stream.
- explain how trees in riparian zones impact water quality parameters like temperature.
- calculate the diameter of trees using the DBH method.

**Materials:** Data sheet(s), 50 meter measuring tape, calculator, tree identification resource, 1 inch PVC pipe cut to 4.5 feet (for DBH measurement), flagging, permanent marker

**Standards:**
**NGSS (DCI):**
- Middle: ESS3.C

Refer to standards matrix for complete grade-level listing of all current and common core standards

What is the relationship between trees in the riparian zone and water quality?

Riparian vegetation refers to the plants, shrubs and trees that grow on the banks near a body of water. The riparian vegetation zone is referred to as a buffer zone because it protects (or buffers) the water body from the harmful effects of excessive surface runoff. The effectiveness of the riparian buffer zone increases with its size and diversity of vegetation within it.

Trees play an important role in the riparian buffer zone. All parts of a tree have a role to play. Just like an umbrella, trees protect the area under it from excessive heat and erosion from heavy rain. The leaves and bark of a tree retain a huge amount of water, allowing some of it to evaporate (transpiration) and some of it to reach the ground more slowly. When surface water is slowed down, the soil is able to absorb more water and naturally filter it before entering the groundwater system. Slowing down surface water flow also reduces the threat of downstream flooding after heavy rain. A typical medium-sized tree in the Pacific Northwest can intercept as much as 2,380 gallons of rain per year. The roots of trees stabilize the soil and control erosion by absorbing excess water in the soil. Trees also provide habitat and food for terrestrial wildlife and shade for aquatic wildlife. Macroinvertebrates, like aquatic insects, eat leaves and other vegetation that ends up in the water.

Trees that don’t lose their leaves, like Douglas fir trees, are called evergreen. Trees that lose their leaves, like maple trees, are called deciduous.

Common species of trees found in riparian zones of southwest Washington include black cottonwood, red alder, western red cedar, Oregon ash and many types of willow.

**Vocabulary:** riparian, buffer zone, runoff, diversity, erosion, pollutant, diameter, circumference, transpiration, surface water, groundwater, dichotomous key, parameter, DBH, evergreen, deciduous
Engage (classroom, pre-field)

1. Show students photos of two different riparian zones – one with many trees and one with none or few trees. Have the students compare and contrast the differences they might expect in regards to the wildlife, potential for erosion and potential for pollutants entering the stream from surface runoff.

2. Take students outside to the school parking lot. Break them into groups of four, assigning each group a different light pole. Tell them they will be measuring the DBH (Diameter at breast height) of the pole, which is the diameter of the pole at a point 4.5 feet off the ground. Have students brainstorm on how to determine diameter then compare results.


Explore (field activity)

Materials:
- 50 meter tape measure
- 1 inch PVC pipe cut to 4.5 feet (for DBH measurement)
- Tree Survey data sheet
- Calculator

Defining a 10 meter by 10 meter square survey area near the water monitoring site

1. Take one tape measure and stretch it out 10 meters along the bank. Lay it on the bank out of the water.
2. Have one student stand at the 0 meter mark and one student stand at the 10 meter mark. The students will be markers for two corners of the survey area.
3. From the 0 meter mark, stretch the tape measure out 10 meters perpendicular to the first tape.
4. Have another student stand at this point.
5. From the 10 meter mark determined in Step 2, stretch the tape measure out 10 meters perpendicular to the first tape.
6. Have another student stand at this point. The four students will act as the boundary points for the 100 square meter survey area.

Tree Inventory and Calculating DBH of Single and Multi-Stem Trees

1. Get an idea of how many trees you will be inventorying and measuring. You may need more than one student to help with this. To keep track of trees, tie flagging with numbers around the trees.
2. Start on one side of your survey area. Does the tree have needles or leaves? Note this on the data form.
3. Use the PVC pipe or the measuring tape to show 4.5 feet on the tree above ground.
4. With the tape measure, measure the circumference of the tree at this level on the tree.
5. Write this number in the data form.
6. If you have time in the field, calculate the diameter of each tree by dividing the circumference by 3.14. This number is called the DBH or the tree Diameter at Breast Height.
7. If the tree is multi-stemmed, then the DBH is found by squaring all of the individual DBHs found on each stem, adding them together, and then taking the square root of the total sum. (see data sheet for formula)
8. Enter this in the data form.
9. Inventory and measure all the trees in your survey area.
**Evaluate (field or classroom)**

1. Demonstrate the ability to calculate diameter using the DBH method.
2. Discuss erosion and how trees not only keep sediment out of the water but also stabilize the bank.
3. Explain what would happen to the stream if the banks eroded and the stream widened.

**Extend (post-field, classroom)**

1. Have students research local riparian zone restoration projects that are currently underway in the community. Invite engineers and biologists to visit the classroom to discuss the project.
2. Have students contact their municipality’s Urban Forestry Department to learn about tree planting or other service learning opportunities in their community.

**Resources**

- City of Vancouver Urban Forestry Department – Healthy Trees, Healthy Watersheds: [www.cityofvancouver.us/urbanforestry](http://www.cityofvancouver.us/urbanforestry)
- Arbor Day Foundation Tree - How Trees Can Retain Stormwater Runoff
# Watershed Monitoring Network Riparian Tree Survey Data Sheet

**Watershed:** ________________________________  
**Names:** ________________________________

**Location:** ________________________________  
**Class:** ________________________________

**Site:** ________________________________  
**Date:** _______________  
**Time:** _________

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<table>
<thead>
<tr>
<th>Tree #</th>
<th>S (one) M (multi) stem</th>
<th>E (Evergreen) or D (Deciduous)</th>
<th>Circumference (inches)</th>
<th>DBH *</th>
<th>Tree Size (DBH) (single stem only) **</th>
<th>Notes (Tree species)</th>
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<td>Small (1-12”)</td>
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* DBH = circumference ÷ 3.1416  
* Multi-stem DBH = $\sqrt{DBH(A)^2 + DBH(B)^2 + DBH(C)^2 + ...}$

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