Riparian Zone Vegetation Survey

In this investigation, students will determine the canopy cover and diversity of plant species in the riparian zone near their water monitoring site. This information will be used to predict the potential for erosion, the potential for polluted surface waters entering the stream and the presence of wildlife habitat.

What is the relationship between the riparian vegetation zone and water quality?

“Riparian” vegetation refers to the grasses, forbs, shrubs and trees that grow on the banks of a body of water. The width of the riparian vegetation zone and the diversity of the vegetation growing there play an important role in water quality and the prevention of erosion in several ways:

**Bank stabilization** The roots of plants and trees strengthen and stabilize the banks. Roots also provide a path for water to flow through soil which prevents the soil from becoming too saturated. As the width of the riparian vegetation zone decreases, stream banks erode and wash away. With little or no riparian vegetation, most creeks will nearly double in width and become much more shallow. Shallow waters usually have higher water temperatures. Little or no riparian vegetation also increases the likelihood of invasive plants.

**Shade** Overhanging trees provide shade which lowers the temperature of the water. Cooler, shaded streams are able to hold more dissolved oxygen and have less algae.

**Pollution** As a result of development and human activity, water running off surrounding land may contain sediment, fertilizers, animal waste, oil, and other toxic substances. The riparian vegetation acts as a buffer zone between the stream and surrounding land.

**Surface water volume** Without vegetation, rain runs directly over the land to a stream or water body. Less rainwater is retained in the soil and more water fills the stream to potentially cause flooding. A well-vegetated riparian zone is able to reduce the velocity of the runoff, allowing time for the sediments and pollutants to soak into the soil before runoff enters the body of water.

**Wildlife habitat** A well-vegetated riparian zone creates a wildlife corridor where birds and other animals can travel freely, as well as providing food, nesting and hiding places. Leaves and branches of riparian plants falling into the water provide a food source for bacteria, macroinvertebrates and fish in the stream. Over 80 percent of all wildlife species in western Washington use riparian areas during part of their life cycle.

**Standards:**

**NGSS (DCI):**

- **Middle:** ESS2.C, LS2.A

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

**Vocabulary:** riparian, diversity, bank stability, erosion, pollutant, invasive plants, buffer zone, parallel, perpendicular, dissolved oxygen, canopy cover, forbs
Engage (classroom, pre-field)

1. Show students’ photographs of riparian zones that vary in the amount and diversity of vegetation. Have students make claims for the riparian zone that would give the most protection from erosion, have the best wildlife habitat, be most likely to have lower stream temperatures, etc. Make sure students provide written explanations that support their claims.

2. Show students the photograph of a riparian zone with very dense and diverse vegetation.

Tell students to identify and count every type of vegetation that is different. Students should start to complain that this is an impossible task. Show them a second photograph that outlines one area of the photograph with a square and have them repeat the task only for the outlined area. Explain that it would be too time consuming for them to identify every plant in their riparian zone, so in the field they will use a one meter PVC frame to randomly sample three areas to develop a representative sample.

Explore (field activity)

Canopy Cover

Materials:
- Tape measure
- Canopy cover tube
- Data sheet

1. See “Guidelines for Investigations” for canopy cover tube construction.
2. Take one tape measure and stretch it out 10 meters along the bank, parallel to the water. Lay it on the bank out of the water.
3. Stand at the zero meter mark (beginning) of the tape measure.
4. Using the canopy cover tube, look through the tube straight up to the sky.
5. Estimate percent canopy cover by observing how many of the four sections are covered by tree leaves and branches. One section is 25%.
6. Record your observation.
7. Move to the 5 meter mark and repeat steps 3-5.
8. Move to the 10 meter mark and repeat steps 3-5.

Plant Diversity Survey Along Water Body

Materials:
- Tape measure
- 1m x 1m PVC frame
- Data sheet

1. See “Guidelines for Investigations” for PVC frame construction.
2. Take one tape measure and stretch it out 10 meters along the bank, parallel to the water. Lay it on the bank out of the water.
3. Stand at the zero meter mark (beginning) of the tape measure.
4. Take a few steps away from the water and place the PVC frame on the ground.
5. Count the number of different types of plants (diversity) and record. Do not count the total number of plants.
6. Estimate the percent of bare soil, leaves and twigs and live plants. Record on data sheet.
7. Move to the 5 meter mark and repeat steps 3-5.
8. Move to the 10 meter mark and repeat steps 3-5.
Explore *(field activity)*

**Plant Diversity Away from Water Body**

**Materials:**
- Tape measure
- 1m x 1m PVC frame
- Data sheet

1. Take one tape measure and stretch it out 10 meters along the bank, parallel to the water. Lay it on the bank out of the water.
2. Take a second tape measure and, beginning at the 5 meter mark, stretch it 10 meters perpendicular to the first tape.
3. Stand at 0 meter mark on the second tape.
4. Take a few steps away from the water and place the PVC frame on the ground.
5. Count the number of different types of plants (diversity) and record. Do not count the total number of plants.
6. Estimate the percent of bare soil, leaves and twigs and live plants. Record on data sheet.
7. Move to the 5 meter mark on the second tape and repeat steps 4-6.
8. Move to the 10 meter mark and repeat steps 4-6.

Explain *(post-field, classroom)*

1. Direct instruction of background information
2. Discussion of results.
3. Develop a claim based on evidence – for example:
   - What does the width of our riparian zone tell us about the potential for erosion at our site?
   - How will seasonal changes like canopy cover affect the riparian zone, and how will that affect water quality?
   - How might the diversity of vegetation impact the food web/food chain at our sampling site?

Evaluate *(field or classroom)*

1. Name three ways riparian vegetation zones affect water quality.
2. Based on our results, design a solution that could improve the riparian zone at our site.
3. Using aerial photographs, compare upstream and downstream riparian vegetation with our monitoring site. Make a claim about how the water quality at your site would compare to these sites.
1. Have a field biologist visit the classroom and speak to the students about their “real life” field surveys.
2. Set up a plant identification activity using dichotomous keys and plant ID resources.
3. Have the students make their own plant identification cards for plants commonly seen at their monitoring site or in southwest Washington. Could also include wildlife ID cards.
4. Project WET Activity *: Invaders!
5. Project Learning Tree *: Lesson #80 Nothing Succeeds Like Succession.
6. Project Learning Tree *: Lesson #12 Invasive Species

Resources

- pubs.er.usgs.gov/publication/sir20045185?currow=263
- www.mswildlife.org/_media/AAS_Streamside_survey_form.pdf

* See "Guidelines to Investigations” for Project WET and Project Learning Tree activities information
Watershed Monitoring Network Riparian Vegetation Data Sheet

Watershed: ___________________________  Names: ___________________________
Location: ___________________________  Class: ___________________________
Site: _______________________________  Date: _______________  Time: _________

Canopy Cover

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<th>Tape measure mark</th>
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Comments: ______________________________________

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