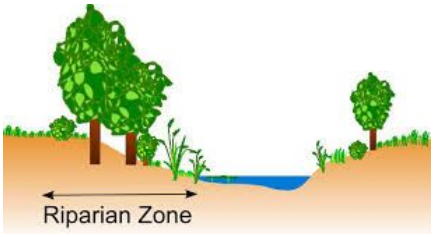
Riparian Ecology



OBJECTIVES

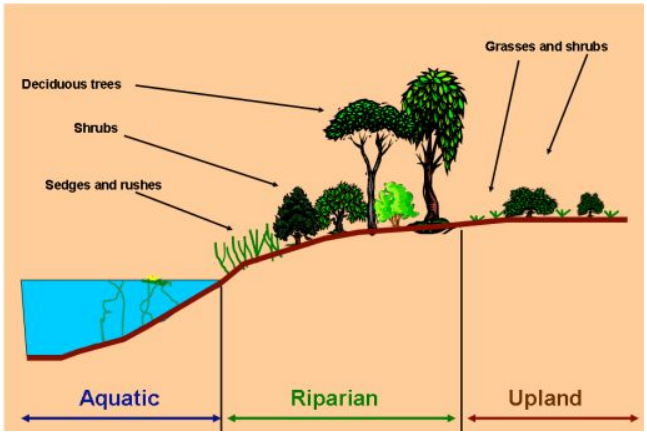
Students will:

1. Learn what a riparian area is and the ecological functions healthy riparian areas provide by studying various aspects of a local riparian area.
2. Use scientific inquiry to analyze the health of five components of a riparian area (plant diversity, hydrology, instream habitat, and substrate).
3. Determine the overall health of a riparian area based on the health of several components & make management recommendations based on their findings.

MATERIALS

- Photos of spherical densiometer (for canopy cover study)
- Clipboard, data sheets, pencil
- Native plant guide (**Found in the Native Plant/ Plant Press packet)**
- ***Sample Riparian Photos*** (to use if you cannot observe a riparian zone or stream)
  - *These can be found at Calapooia.org/Watershed-Discovery-Kits*

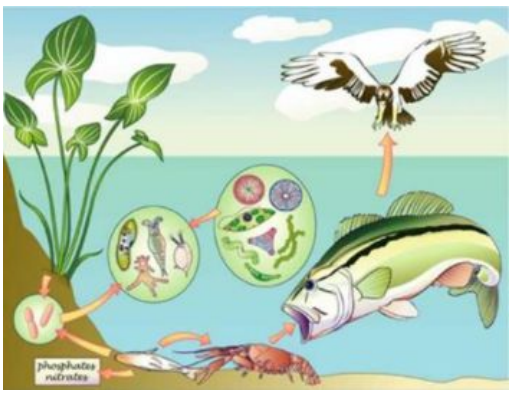
VOCABULARY



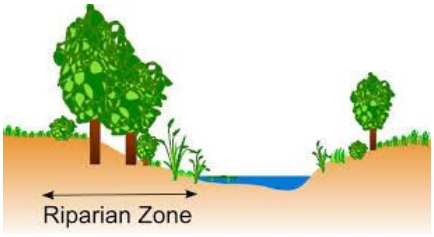
Riparian: The land around a body of water, and are regularly flooded. Riparian zones can affect the health of the water body. Riparian areas can sometimes be narrow strips of vegetation along a waterbody or wide forests.

Upland: The land beyond the riparian zone, which is not regularly flooded.

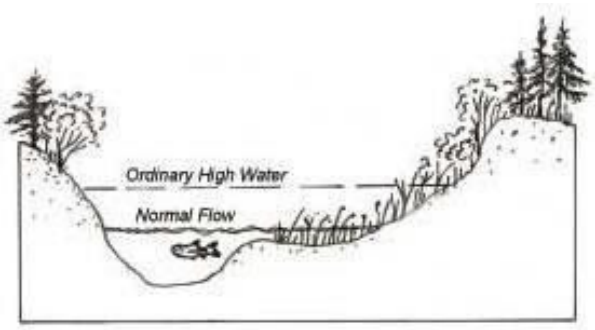
Ecology: The study of how animals interact with each other and their environment.



Riparian Ecology

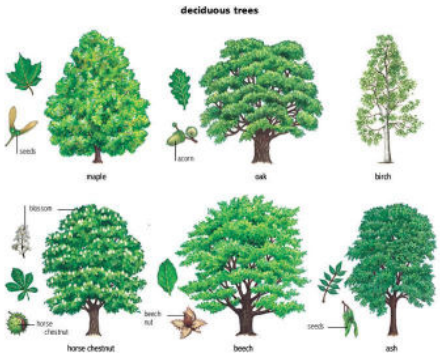


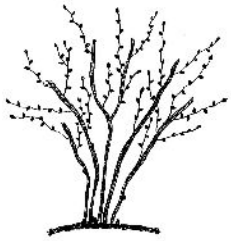
Ordinary high water line: The highest level of water in a river, lake or stream when it is NOT flooded. Usually, you do not find many plants growing below this line.



Conifer (Coniferous Trees)s: Also called evergreens. Trees and shrubs that keep their leaves year-round. Conifers also produce cones. Examples: fir, cedar, pine trees.

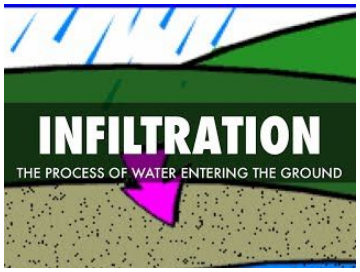
Deciduous: Plants that lose their leaves, usually in the fall. These trees produce seeds (no cones). Examples: oak, maple, ash, cottonwood trees.



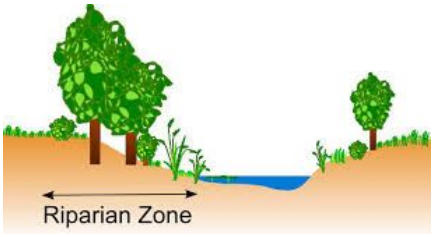


Shrubs: Sometimes called bushes. Shrubs have many branches, with no main trunk. They are often (not always!) smaller than trees. Examples: willows, red flowering currant, Oregon grape, roses.

Infiltration: when water soaks into the ground. Infiltration is part of the natural water cycle in most areas. Water that infiltrates into the ground can be stored and filtered as it flows through the soil.



Riparian Ecology

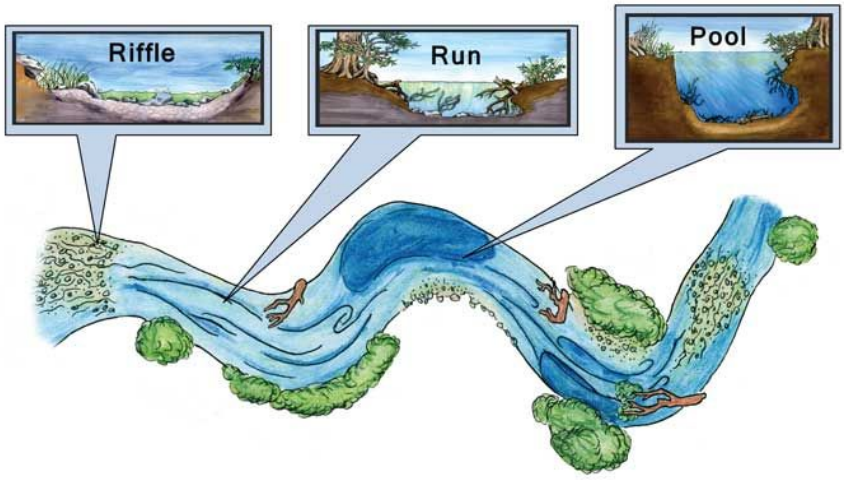


Runoff: Water that cannot infiltrate (or soak) into the ground is called runoff. Runoff can pick up pollutants and deposit them in nearby waterways.

Riffle:A rocky part of the stream with rougher water (adds oxygen to the water)

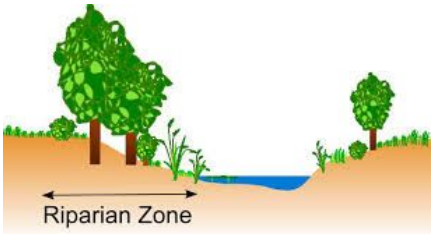
Pool: Area where the water slows down and water gets deeper.

Run: Faster moving water between riffles and pools**.**



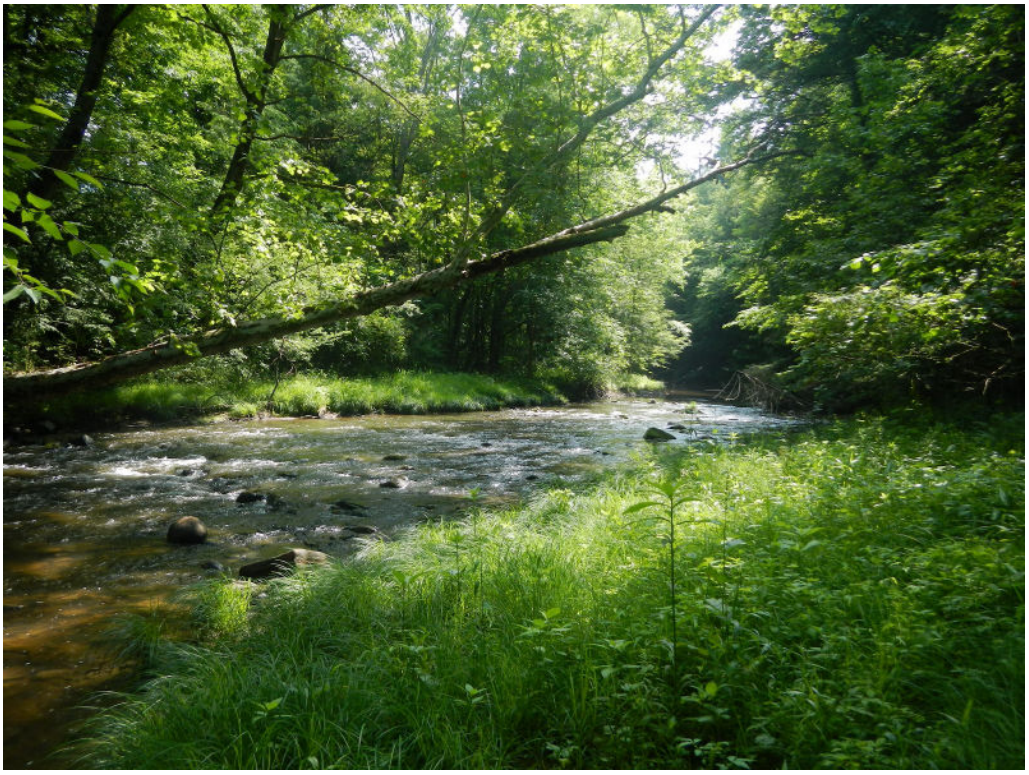
Substrate: the makeup of the river bottom (rocks, sand, silt, etc.)

Riparian Ecology

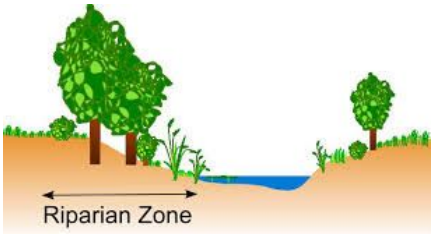


INTRODUCTION

- A Riparian Area (or Riparian Zone) is the land along any water body, including rivers, streams, even the ocean!
- Riparian areas are also referred to as stream and river banks, or shores.
- Healthy riparian areas perform *4 main functions* that contribute to the health of the waterway. Think of these as jobs or services that nature does to help keep the watershed healthy. Riparian functions include:
  - **Bank Stability** (also called erosion control) keeps soil on the land instead of washing into the water. Plant roots hold the soil in place.
  - **Shade** helps keep the water cool, which is important to salmon and trout. *Cooler water also holds more oxygen*, which fish need to survive.
  - **Water storage and filtering.** When water is able to infiltrate into the ground, it can stay in the soil until the dry season when it is slowly released back into the waterbody. As the water infiltrates into the ground, the soil is able to filter (or clean) the water, keeping our rivers, lakes, and streams healthier.
  - **Habitat.** Riparian areas are places where wildlife can find food, shelter, and a safe place to raise their young. Riparian areas with a lot of plant diversity provide more habitat than areas with few plant types.



Riparian Ecology



Today, you will play the role of several different scientists and conduct an assessment of the riparian area. In the professional world, scientists study many different things in and surrounding a riparian area to understand how healthy it is. Then they make recommendations about how to improve the *function* of the riparian area. This is much like a doctor uses tests to understand how healthy your body is, and then prescribes a treatment, if needed.

Forest biologists conduct a CANOPY COVER SURVEY. ***Do this activity inside*.**

Botanists study VEGETATION TYPES and VEGETATION DIVERSITY.

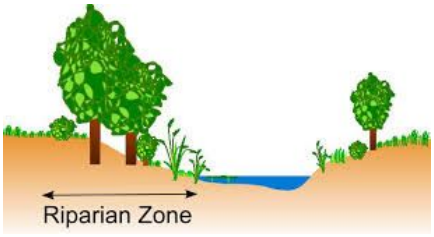
Aquatic biologists conduct a STREAM SURVEY and an INSTREAM HABITAT SURVEY.

Geologists conduct a SUBSTRATE SURVEY (rocks and sediment that make up the river bottom).

To begin, choose a site near a waterbody for your assessment.

- The City of Albany created a map of areas where water can be safely accessed in Albany. The map is available at Calapooia.org/watershed-discovery-kits
- If you do not have access to a waterbody, you can conduct the Botanist assessment in any area with trees or other vegetation.
- **If you do not have access to an outdoor space, please use the *Sample Riparian Photos* for each assessment, provided at Calapooia.org/Watershed-Discovery-Kits.**
- Start with the Forest Biology Canopy Cover assessment. This can be done indoors using the photos below.
- You will use three data sheets (Botanists, Aquatic Biologists, Geologists) and your clipboard, and your pencil!

Riparian Ecology



FOREST BIOLOGISTS

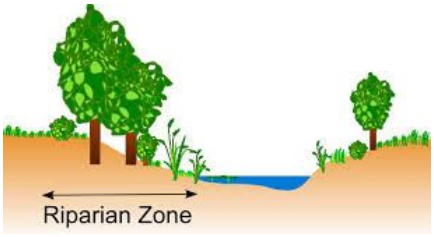
This activity is to be done indoors.

- In the field, a spherical densiometer (see photo) is used to measure how much shade covers the stream by measuring the amount of leaf cover that is reflected in each square on the mirror.
- You will use pictures of densiometers to determine the canopy cover of your imaginary stream.
- The data sheet has the same grid as the densiometer, with letters in each square.

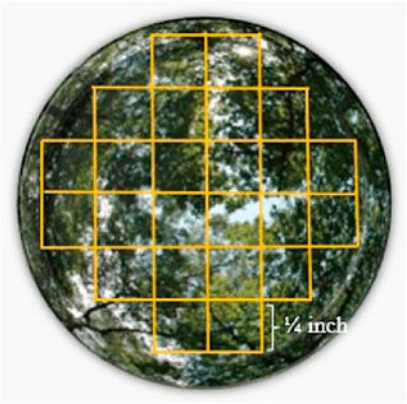
Activity

1. Imagine your spherical densiometer (SD) has letters in each square, matching the data sheet.
2. Starting at the first photo (facing toward the stream), fill in the boxes on the data sheet that match the squares that have ANY leaves reflected.
3. Add up the number of filled in boxes, and record it on the data sheet.
4. Repeat steps 3 and 4 for the other 3 pictures.
5. Add up the total number of filled in boxes for all 4 photos and record it on the data sheet.
6. Place an “X” in the box of the data table that matches the number of filled boxes to determine the health of the canopy cover and **Circle the score.**

Riparian Ecology



Facing the stream

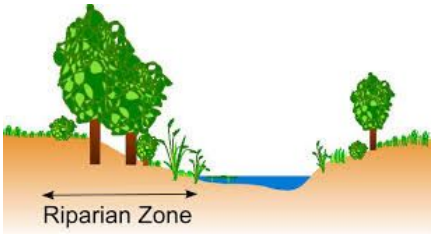


Facing away from the stream

Facing downstream

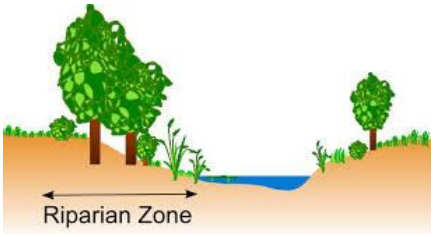
Facing upstream

Riparian Ecology



FOREST BIOLOGIST DATA SHEET (2 pages)

Riparian Ecology



OSU Oregon State University Extension Service

StreamWebs™

Student Stewardship Network

Canopy Cover Survey

Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

www.streamwebs.org

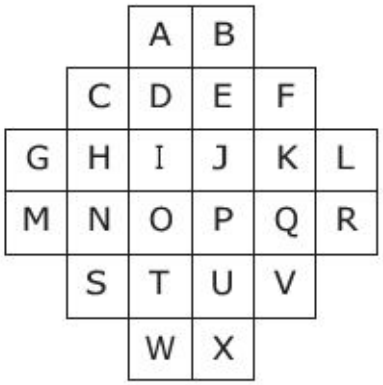
Name: _____

School: _____

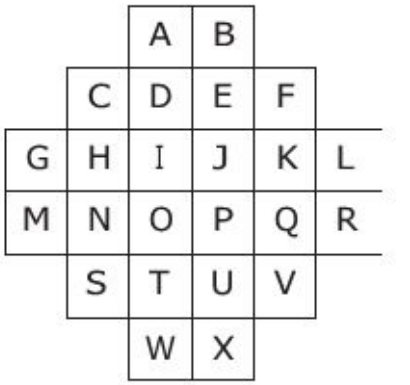
Teacher: _____

Date: _____ Time: _____

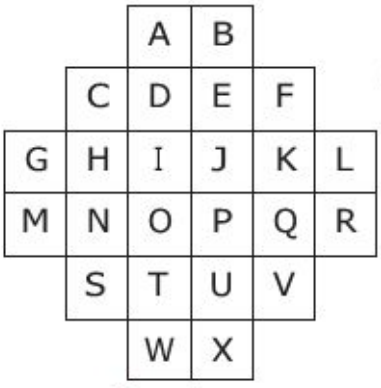
Stream/Site Name: _____ Weather: _____



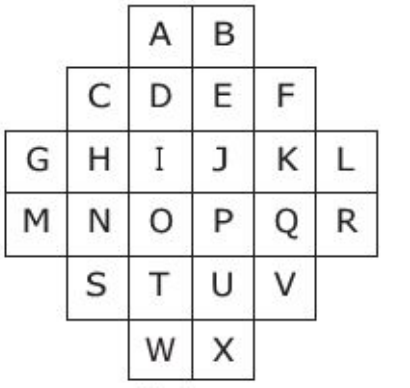
Facing stream
Shaded Boxes _____



Facing away from stream
Shaded Boxes _____



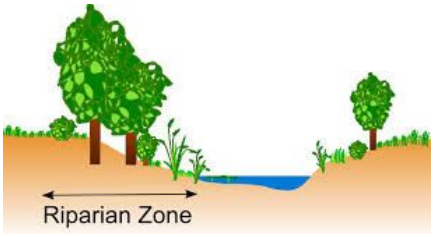
Downstream
Shaded Boxes _____



Upstream
Shaded Boxes _____

_____		_____		_____		_____		_____
Facing stream	+	**Away from stream**	+	**Downstream**	+	**Upstream**	=	***Estimated %***

Riparian Ecology



Canopy Cover (How many boxes were filled in)	72 or more boxes filled	48 - 71 boxes filled	19 - 47 boxes filled	Less than 19 boxes filled
Percent Shade Cover	**75%**	**50 - 74%**	**20 - 49%**	**less than 20%**
Place an **X** in the corresponding box				
SCORE	10	7	3	1
	Excellent	Healthy	Unhealthy	Poor

Conclusions:

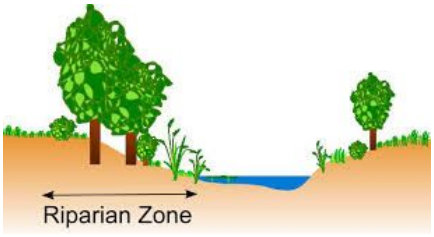
- Was the area at least 75% shaded (72 or more boxes filled)? Why do you think this is important?

- Is there enough shade along the stream?

- What would you recommend to make the steam healthier?

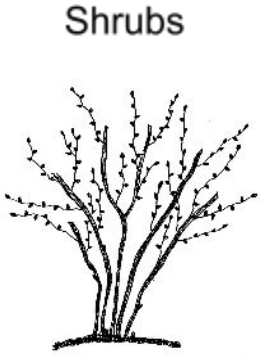
- What would happen if trees were cut down along the stream?

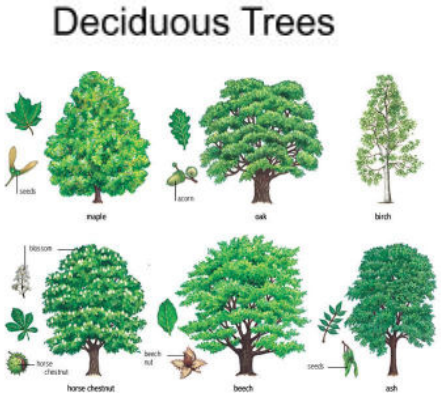
Riparian Ecology



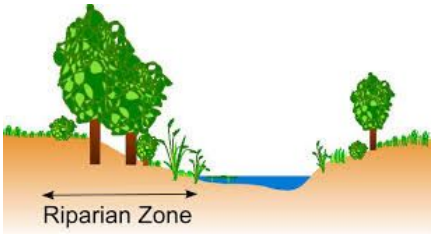
BOTANISTS

- Look around the riparian zone & record how many vegetation types you observe on the *Vegetation Type* table. Place an "X" in the box that corresponds to each vegetation type.
  - If you do not have access to an outdoor area, use the ***Botanist: Vegetation Type sample riparian photo***.
- Add up the total number of vegetation types you observed and record the total by placing an "X" in the *Vegetation Cover* table. **Circle the score.**
- Write the name of any plants or trees you can identify on the Plant Identification table, such as willow, Oregon ash or Reed canarygrass, and whether you think it is beneficial to the health of the riparian area. See data table for example.
  - If you do not have access to an outdoor area, use the ***Alternate Plant Identification sample riparian photos*** comparing the health of 2 riparian areas, and record your observations on the Plant Identification table.





Riparian Ecology



BOTANIST DATA SHEET (2 pages)

School: Date:

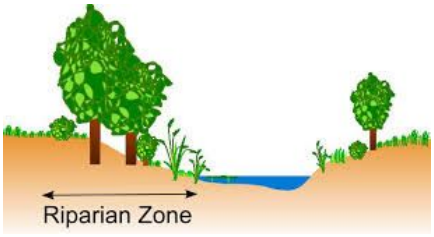
Stream name: Weather (sunny, cold, etc)

Vegetation Type	**Shrubs/ Short trees**	**Coniferous canopy trees**	**Deciduous trees**	**Grasses & Ferns**	**Other Small Plants**	**Gravel**	**Bare Soil**
Place an **X** in the box for each vegetation type you see							

Now, Add up the number of vegetation types you saw in step 1. **Do not include gravel or bare soil.**

Step 2: **Vegetation Diversity**	**4-5 Vegetation types**	**1-3 Vegetation types**	**Bare ground and gravel cover half of the assessment area**	**Bare ground and gravel cover more than half of the assessment area**
Place an **X** in the box for how many types of vegetation you recorded for step 1 *If you saw only shrubs and short trees = 1* *If you saw conifers and grasses = 2, ect*				
SCORE	10	4	2	0
	Excellent	Fair	Unhealthy	Poor

Riparian Ecology



Do you recognize any of the plant species you see? Your Native Plant ID Guide from the Native Plant study can help you identify some plants.

Step 3: **Plant Identification**	**Significance to riparian area** *Do you think this plant is beneficial to the health of the riparian area? Why or why not?*
Pacific Willow	Beneficial - roots hold soil, habitat for animals

Conclusions

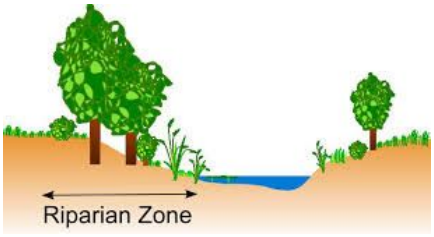
- Did you find all vegetation types in your plot or just one or two?
  The more types you found, the better diversity you have which is good for riparian function. Bare ground or gravel does not count as a vegetation type.

- Was there a lot of bare ground? What could that mean for the health of the riparian area?

- How healthy is the plant cover in the riparian area?

- Would you improve this riparian area, or preserve it how it is? If you would improve

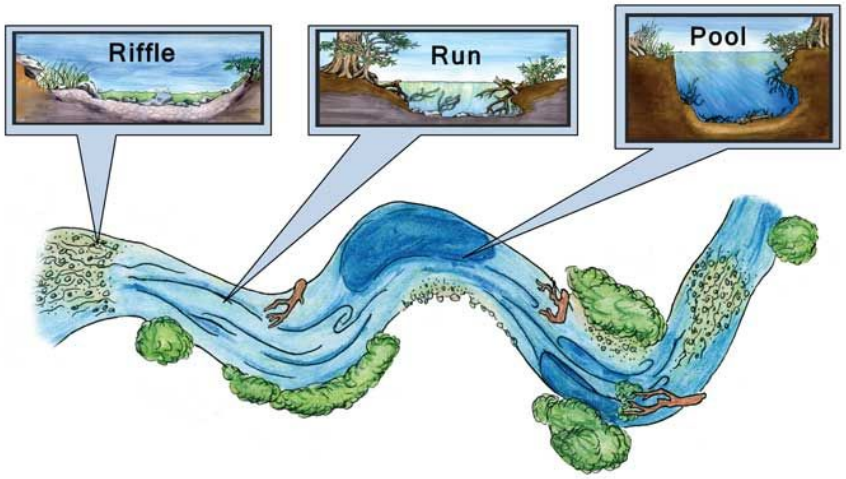
Riparian Ecology



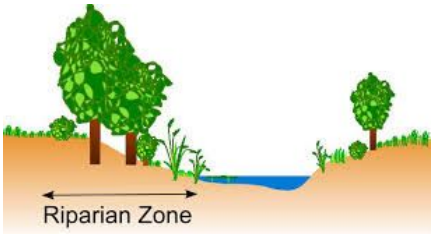
it, how would you do so?

AQUATIC BIOLOGISTS

- Choose an area where you can stand SAFELY on the shore. Looking up and down the stream, record how many riffles, pools, and runs you see.
    - If you do not have access to an outdoor area, use the ***Aquatic Biologist sample riparian photo.***
- Note whether the number of pools and riffles are equal, close to equal or unequal by placing an X in the corresponding box on the *Pools & Riffles* table and **Circle the score.**
- Look up and down the river again, and place an X in each box of the *Instream Habitat Assessment table* for each habitat type you observed.
    - If you do not have access to a riparian area, use the ***Instream Habitat sample riparian photo.***
- Add up how many types were found overall and **circle the score** that corresponds to the number of habitat types found.



Riparian Ecology



AQUATIC BIOLOGIST DATA (3 Pages)

School: Date:

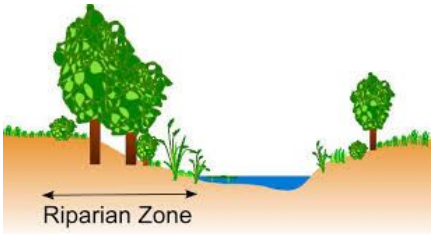
Stream name: Weather:

Stream Survey	How many of each
How many riffles	
How many pools	
How many runs	

Now compare the number of runs and riffles

Pools & Riffles	Equal number of pools & riffles.	Almost equal number of pools & riffles	Many more riffles than pools	Many more pools than riffles	Not many pools or riffles (Most of the stream section is a run)	No pools or riffles (The entire stream section is a run)
Place an **X** in the box that is true for your stream						
SCORE	10	7	5	5	3	0
	Excellent	Healthy	Fair	Fair	Unhealthy	Poor

Riparian Ecology



AQUATIC BIOLOGIST DATA SHEET:

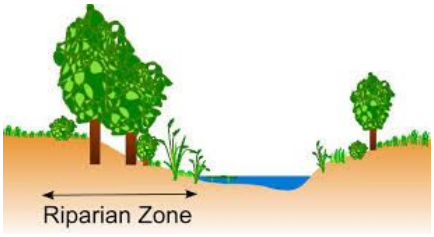
Mark off all the Instream Habitat Types you observe

Instream Habitat Assessment	Who uses this habitat	
Small Woody Debris - Twigs, sticks, small branches (6" or less in diameter, or about the length of a pen).	 small mammals	
Logs / Large Woody Debris – Large branches (larger than 6"), tree trunks, entire trees, large logs.		
Pools – Smooth, undisturbed surface, slow current.		
Riffles – Broken water surface, rougher water running over rocks, moderate to fast current.	 American Dipper	
Overhanging Vegetation – Trees, shrubs, vines, or other plants hanging right over the stream surface.		
Boulders/Cobbles – Boulders are larger than a bowling ball, cobbles are baseball to bowling ball sized.		
Undercut Banks – Eroded areas extending beneath the surface of the bank.		
Thick Water Plants – Beds of plants growing under the water, out of the water, or floating on the surface.		
Disconnected Pools or Side Channels– Pools that have been cut off from the main stream.		
Leaf Packs – Floating and submerged packs of leaves.		

 adult salmon  juvenile salmon  macroinvertebrates  Amphibians

 Reptiles

Riparian Ecology



Instream Habitat	9-10 habitats present	7 – 9 habitats present	5 – 6 habitats present	3 – 4 habitats present	1-2 habitats present
Place an **X** in the box that matches your stretch of river/stream					
SCORE	10	7	5	3	1
	Excellent	Healthy	Fair	Unhealthy	Poor

Conclusions

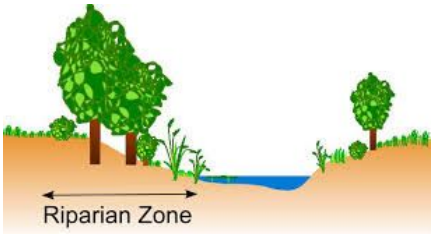
- Did you see all ten habitat types?

- Why is it important to have a lot of different habitat types?

- Will large wood naturally fall into the stream or should it be placed there?

- Can anything be done to add more habitat types to a stream? If so, what do you recommend be done with the area you observed?

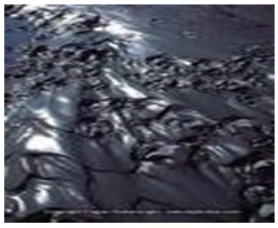
Riparian Ecology



GEOLOGISTS

- Take a moment to observe the stream bottom as far as you can see and determine which types of substrate are present. Many different kinds of substrates can be present in the river. Keep in mind that female Chinook salmon use mostly gravel and cobble to make their redds.
  - If you do not have access to a river or stream, use the **Geologist Substrate Type sample riparian photo.**
- Observe the overall makeup of the substrate. Record your answers in the data table by placing an "X" in the corresponding box and **circle the score**.

Substrate Types



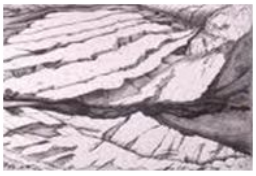
Silt

Sand

Cobble

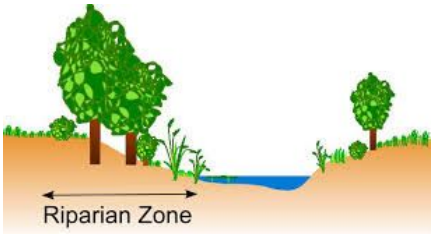
Gravel

Boulders



Bedrock

Riparian Ecology



GEOLOGIST DATA SHEET (2 Pages)

School: Date:

Stream name: Weather:

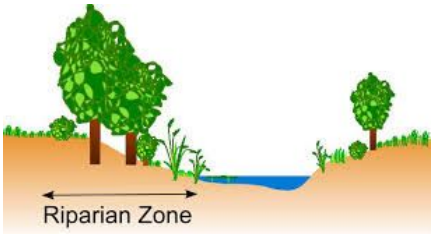
Materials:Data sheets, clipboard and pencil

Substrate Type	Substrate type present?
Silt (very fine sediment, easily kicked up in the water)	
Sand (larger sediment, settles faster than silt when disturbed)	
Gravel (pea to baseball size rocks)	
Cobble (baseball to bowling ball size rocks)	
Boulders (larger than a bowling ball)	
Bedrock (solid rock)	

Gravel and Cobble are what are most commonly used by salmon to build their redds (nests)
Too much silt and sand can choke the gills of fish or smother eggs.

	High substrate diversity: 3-4 types of substrate including gravel and cobble	**High substrate diversity 3-4 types of substrate but not much gravel**	**High substrate diversity 3-4 types of substrate, but not much cobble**	**Low substrate diversity: 1 -2 substrate types**	**Low substrate diversity 1 -2 substrate types, mostly silt and/or sand**
Place an **X** in the correct box					
SCORE	10	5	5	2	1
	Excellent	Good	Good	Fair	Poor

Riparian Ecology



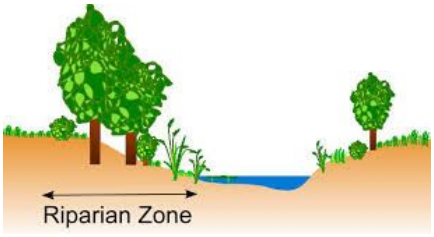
Conclusions

➢ Do you think salmon would want to spawn here?
Salmon want to spawn in clean, cobbley and gravely riffles.

➢ Salmon like cobble and gravel for building their redds. Do you think there are other animals who need different substrates to spawn and live? Can you name any?

➢ Would you change anything in this reach to make it a better habitat?

Riparian Ecology

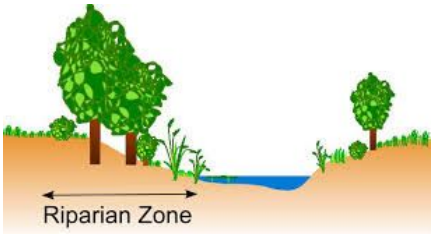


OVERALL RIPARIAN HEALTH (2 pages)

Add all the circled scores from previous assessments to the score column. Add the scores up to determine the health of the overall riparian area on the next page.

Survey	Significance	Riparian Function	Score From each data sheet
Forest Biology: Canopy Cover	The canopy shades the riparian area and the water, helping to keep the water cool and limit algal growth. Cold water can hold more oxygen than warm water.	Shade	
Botany 1: Vegetation Diversity	Insects, birds, and animals use different plants for survival. The more types of native plants present, the more species can live here.	Bank Stability Shade Water Storage & Filtering Wildlife Habitat	
Aquatic Biology 1: Pools and Riffles	Pools are important resting and feeding sites for fish. Riffles are critical for maintaining high species diversity and for serving as spawning and feeding grounds.	Wildlife Habitat	
Aquatic Biology 2: Instream Habitat	A variety of physical habitats in the stream provide shade and cover, allowing fish to hide from predators and have enough oxygen throughout the year.	Shade Wildlife Habitat	
Geology: Substrate Suitability	Salmon need gravel to cobble-sized rocks for their redds. Too much sediment can suffocate fish and their eggs.	Wildlife Habitat	
TOTAL			

Riparian Ecology



Riparian Health	Total ≥ 50	Total 35-49	Total 15-34	Total less than 15
Enter your score in the corresponding box.				
Riparian Value	**Excellent**	**Healthy**	**Fair**	**Unhealthy/ Poor**
	This riparian area is very healthy and provides excellent erosion control, shade habitat for wildlife, water storage and filtering.	This riparian area is healthy and provides adequate erosion control, shade, habitat for wildlife, water storage and filtering.	This riparian area could be in better condition. It provides some functions to some degree and may not provide one or more functions adequately.	This riparian area is not healthy, and does not provide some or any of the functions necessary to the watershed.

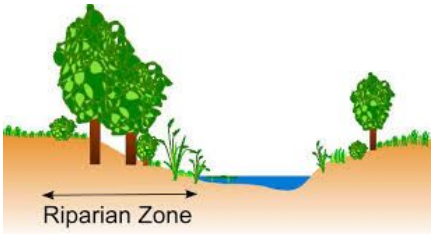
CONCLUSIONS

- Is this riparian area healthy? If not, how do you think it got this way?

- Does it provide the four functions of a healthy riparian area?
  - Which services do you think it provides?
  - Which do you think it does not provide?

- Can anything be done to enhance the health of this riparian area?

Riparian Ecology



- Using the picture below, label the areas of the riparian area that provide the 4 major functions of a healthy riparian zone: Shade, Bank Stability, Habitat, Water filtering & storage (see **Introduction** for more info on the functions).