

## **INTRODUCTION**

Riparian zones have been defined in various ways, but essentially they consist of fairly narrow strips of land bordering creeks, rivers, lakes, or other bodies of water. Plant species, soil types, and topography are distinctive when compared to the surrounding, drier upland area.

Although riparian areas generally occupy only a small percentage of the area of a watershed, they are crucial components of the ecosystem. A healthy riparian area: provides excellent fish and wildlife habitat; increases groundwater recharge; reduces flooding; and often increases the overall quality of the adjacent waterway.

This unit helps students identify the characteristics and benefits of productive riparian systems, and leads them to a better understanding of and appreciation for effective riparian management.

## **THE ACTIVITIES**

## **TIME REQUIRED**

Introduction to Riparian Areas	30 minutes
Riparian Areas and Watersheds	20 - 30 minutes
A Transect of Riparian Vegetation	90 - 120 minutes
Wildlife Blind	45 - 60 minutes (can be repeated)
Riparian Assessment	60 minutes

## **COMBINING THE ACTIVITIES**

The activities can be combined in any manner depending on time available, knowledge and level of students. Students should complete the first activity if they are to participate in the "Riparian Evaluation."

The last three activities generally require access to a riparian area. If none is available near your school or meeting location, you may consider a field trip in order to allow students to do any of the last three activities listed above.



## **CURRICULUM RELATIONSHIPS**

### Social Studies

1. Find out which government agencies are involved with riparian area management. Write a paper describing how they identify and manage riparian habitats.
2. With the help of a public agency (and perhaps in conjunction with other school groups), adopt a disturbed riparian area.

### Science

1. Conduct physical and/or biological tests of the water quality in the waterway surrounded by the riparian zone.
2. Establish a year-round, perennial study to determine whether (and how) the riparian area changes seasonally.

### Mathematics

1. Using a map of your state, calculate the percentage of land which is considered to be riparian.
2. Assuming the data you calculated in the transect study was accurate, calculate the relative percentage of plant types in the transect study area.

### Language Arts

1. Write a persuasive paper to ranchers encouraging them to consider restricting their cattle from grazing in riparian areas.
2. Write and illustrate a short children's book which introduces the audience to the riparian area.

### Creative Arts

1. Make a poster that shows the stages a riparian area goes through as it matures.
2. Make stationery illustrating various plants and/or animals found in the riparian area.
3. Work with other students to construct a mural or diorama that displays the features and benefits of the riparian system.



## **INTRODUCTION TO RIPARIAN AREAS**

<b>CONCEPT</b>	Change, System, Interaction
<b>PRINCIPLE</b>	Participants use their observation skills to identify typical characteristics of undisturbed and disturbed riparian systems.
<b>OBJECTIVE</b>	<ul style="list-style-type: none"><li>• The student will be able to identify, list, and discuss qualities of a healthy riparian area.</li></ul>
<b>PREPARATION</b>	Facilitator should photocopy Activity Sheet A and be familiar with characteristics and function of riparian areas before the activity.
<b>MATERIALS USED</b>	<ul style="list-style-type: none"><li>• Activity Sheet A: Introduction to Riparian Areas</li><li>• Pens or pencils</li></ul>
<b>PROCESSES USED</b>	<ul style="list-style-type: none"><li>• Observe</li><li>• Infer</li></ul>
<b>TIME</b>	30 minutes



**DOING THE ACTIVITY** (indoors)

A. Set the Stage

The features of a riparian area -- plants and animals present, stream flow, bank slope and stability, etc..., are the result of not only the physical conditions of the area, but of the presence or absence of disturbances, such as livestock grazing. Like most areas, riparian systems have been changed dramatically because of disturbances. The result is often a system that provides less environmental benefits.

This activity introduces students to the various characteristics of riparian zones by contrasting typical qualities of simple (disturbed) areas with complex (healthy, undisturbed) riparian regions. Hand out Activity A: Introduction to Riparian Areas. Tell them they will do the activity by themselves and that they have 30 minutes to complete the activity. NOTE: The activity sheet is intentionally left vague as to which one is disturbed or undisturbed. Lead a discussion on characteristics of disturbed and undisturbed areas.

B. Retrieve Data

30 min.  
individual

**ACTIVITY SHEET A: Introduction to Riparian Areas**

**Introduction:** Below are two illustrations, one of a riparian system disturbed by human or grazing activity, and a second illustration of an undisturbed riparian area.

**Directions:** Below the illustrations is a chart. Your task is to complete the chart based on your observations of the illustrations. When you have completed this, you will have identified the typical qualities that make a riparian system either healthy or degraded.

Characteristics	Disturbed System	Undisturbed System
Vegetation		
Stream Flow		
Water Temperature		
Habitat/Forage		
Wildlife Diversity		
Topography		
Other		



After students have completed Activity Sheet A, ask students the following:

1. What are the important features of riparian areas compared to other natural areas?
2. Ask students to compare the characteristics of undisturbed vs. disturbed riparian areas.
3. Would more streamside plants be important to fish and bank stability? Why?
4. What factors might be responsible for disturbed riparian areas?
5. Using the factors discussed in question number 4, have students brainstorm possible solutions.
6. Ask students to list as many riparian areas near their community as they can think of. How do these areas differ from one another? How are they similar?

**CLOSURE** Discuss why it is important to protect riparian areas.

**TRANSITION** Riparian areas are often a watershed and by definition, part of a larger watershed. Now that we have seen some general characteristics of riparian areas, let's look at the key role of riparian systems in watersheds.

## **RIPARIAN AREAS AND WATERSHEDS**



<b>CONCEPT</b>	Cause-Effect, Interaction, System
<b>PRINCIPLE</b>	Participants observe the importance of watershed protection.
<b>OBJECTIVE</b>	The student will construct a model watershed and analyze its ability to control erosion.
<b>PREPARATION</b>	Facilitator needs to select a site where watershed construction is possible. A sandy area is optimal. A knowledge of watersheds and the essential elements for healthy watersheds is important.
<b>MATERIALS USED</b>	<ul style="list-style-type: none"> <li>• Trowels or small shovels</li> <li>• Watering Can</li> <li>• Ground cover such as sticks, leaves and grass</li> </ul>
<b>PROCESSES USED</b>	<ul style="list-style-type: none"> <li>• Observe</li> <li>• Define Operationally</li> <li>• Hypothesize</li> <li>• Control variables</li> <li>• Predict</li> <li>• Formulate models</li> <li>• Communicate</li> </ul>
<b>TIME</b>	20-30 minutes
<b><u>DOING THE ACTIVITY</u></b>	(outdoors)



### A. Set the Stage

All of the land area that is drained into a body of water is a watershed. A watershed may be as small as a single field or as large as several states. The watershed of the Mississippi River, for example, includes almost half of the United States.

A watershed void of plants will not absorb water and hold the soil in place. Instead, the soil is washed into the streams and reservoirs. Muddy water can run off rapidly and cause floods. A healthy watershed prevents floods by absorbing and storing this runoff.

The purpose of this next activity is to see how a healthy watershed can reduce erosion.

### B. Procedure

1. Divide class into groups of four.
2. Hand out two shovels/trowels to each group.
3. Instruct the groups to discuss those qualities that make a healthy watershed.
4. After they have discussed this, tell the groups that they will have 15 minutes to construct one healthy and one unhealthy watershed. The general watershed shape should be defined by several streams that drain into a common river. Watershed health will be tested by the teacher as she/he simulates a severe rain storm using a watering can.
5. Stress to students that materials for ground cover may be collected from the surrounding area but that they may not uproot growing plants.
6. When all groups have finished making their model watersheds, gather the class together. Visit each watershed site, where the teacher will "rain on" the watersheds one at a time, while students observe the result.

### C. Retrieve Data

Discuss the following with the entire group:

1. Identify the watershed(s) that provided the best protection from erosion. What made these watersheds better than others?
2. How do watersheds affect the water quality of a water system?
3. What human activities damage/improve the health of watersheds?
4. How are cities affected by their watershed? What might happen if several of the small streams draining into an urban area's watershed were polluted from livestock or mining operations?
5. Generate a list of positive actions we can take to maintain and protect watersheds. Try to include activities that could be done locally.

**CLOSURE** How do the narrow riparian strips along each stream contribute to the function and health of the watershed?

**TRANSITION** then In the next activity, participants will conduct a transect study of a riparian area and pool their data to show vegetative bonds.



## A TRANSECT OF RIPARIAN VEGETATION

<b>CONCEPT</b>	Organism, Population, System
<b>PRINCIPLE</b>	Participants will record plants located along a transect established perpendicular to a stream or shoreline on regular intervals.
<b>OBJECTIVE</b>	<ul style="list-style-type: none"><li>• Students should be able to identify and record vegetation types located along a transect.</li><li>• Students should be able to describe the relationship between vegetation and the water system, and explain vegetation zones.</li></ul>
<b>PREPARATION</b> ideal tion zones	<p>Facilitator needs to select a suitable riparian area for this activity. The site would be a creek or stream with at least three distinct vegetation zones running generally parallel to it.</p> <p>The facilitator also needs to set up a number of transects equal to the number of small groups that will be gathering data. Transects should run perpendicular to the bank or shore and parallel to each other at 5 meter intervals. This distance is not critical. The length of the transect will vary based on the site. It needs to be long enough to encompass the desired vegetative bands; generally 10-25 meters on each side of the water should be sufficient. Data can be gathered only on one side, if desired. This is recommended for lakes or other large water bodies.</p> <p>If you want students to identify plant species, they will need some advanced training and reference materials (i.e., identification guides or collections). Otherwise, identifying general plant <b>types</b> (sedges, shrubs, trees) should yield satisfactory data.</p>
<b>MATERIALS USED</b>	<ul style="list-style-type: none"><li>• Stakes for transects (4-6 per transect)</li><li>• Flagging (optional)</li><li>• Plant identification references</li><li>• Activity Sheet B: Transect of Riparian Vegetation</li><li>• Metric tape</li><li>• Pens or pencils</li><li>• 1m x 1m sampling square frame, hula hoops or string can be used</li></ul>
<b>PROCESSES USED</b>	<ul style="list-style-type: none"><li>• Classify</li><li>• Measure</li><li>• Infer</li><li>• Interpret Data</li></ul>
<b>TIME</b>	90-120 Minutes



## DOING THE ACTIVITY

### A. Set the Stage

As you walk away from a stream or lake, the plant community often changes quickly and dramatically. Along the bank you are likely to find plants that are able to survive frequent flooding. Next are plants that thrive in soggy soils, but may not be able to withstand flooding. Finally you will encounter plants that do not require much water at all. You may find four or five distinct "bands" of plants within this riparian transition area.

In this activity students will gather data along a plant transect that runs perpendicular to the bank or shore of a waterway. Several small groups will work along parallel transects, recording the most dominant plant found in a one square meter frame. Later, all data will be joined to construct a map of the plant "zones" that are present in the riparian system.

### B. Procedure (Inside)

1. Divide class into the the same number of small groups as there are transects. Assign each group to one transect.

2. Distribute to each group: hand-sketched map of area; metric measuring tape, frames, pens or pencils, reference materials as required, Activity Sheet B.

3. Stress any necessary safety and environmental concerns.

#### (Outside)

4. Place the sampling square along the transect line at 1 meter intervals. Always place one side of the frame along the right side of the transect as you move away from the water.

#### ACTIVITY SHEET B: A Transect of Riparian Vegetation

90-120 min.  
small groups

Use this sheet to record the dominant plant type found at each stop. Record data from a transect of up to 25m in length on each side of the stream or waterway (total 50 meters). The 25 stops on the "+" (left) column should be on one side of the waterway, while the other 25 stops correspond to the other side. Stop numbers correspond to meters from the water; therefore, the #1 (both + and -) samples are a single meter from the water, while the 25th stop are 25 meters from the water.

Transect # \_\_\_\_\_

Group Members \_\_\_\_\_

Stop #	Dominant Plant
+1	
+2	
+3	
+4	
+5	
+6	
+7	
+8	
+9	
+10	
+11	
+12	
+13	
+14	
+15	
+16	
+17	
+18	
+19	
+20	
+21	
+22	
+23	
+24	
+25	

Stop #	Dominant Plant
-1	
-2	
-3	
-4	
-5	
-6	
-7	
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-25	

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5. Record the name or description of the single most dominant type of plant located within the frame. If plants appear to be co-dominant, name them both. If you can't get the frame around the plants, draw a one-meter square line in the soil with a stick. Use the frame to measure the line.
6. Continue until the entire transect has been sampled at 1 m intervals.

### C. Retrieve Data

Gather the class together. (Indoors)

1. Have a large map (hand-sketched is fine) of the water and transect lines on display for all to see. The map should be on a grid with each line representing 1 m.
2. Have a representative from each group place a dot along their transect line wherever the dominant plant type changed.
3. Once the dots are on the map, a single word that describes the plant type (e.g., "sedge") should be written between the dots.
4. Connect the dots vertically **for similar plant types** to illustrate the vegetative zones in the area. Only connect dots of plants that occur in at least three transects and where connecting these will not bisect another zone.
5. Make up a legend for the map.

**CLOSURE**      Ask the students:

1. What were the predominant vegetative zones in the riparian area?
2. What kinds of adaptations would you expect plants from different zones to possess?
3. What environmental factors account for these distinct bands of plants?

**TRANSITION**      Now that we have looked at the plant communities present in the riparian area, we are going to use an observation blind to look for wildlife.

### WILDLIFE BLIND



<b>CONCEPT</b>	Organism, Population, Evolution
<b>PRINCIPLE</b>	Participants will observe and record wildlife in the riparian zone and discuss factors important to wildlife that may be influenced by humans.
<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>• Students will demonstrate observation and data gathering skills by recording wildlife observed.</li> <li>• Students will be able to describe the relationship between riparian zones and animal habitat.</li> </ul>
<b>PREPARATION</b>	<p>The blind may be ready for student use, or students may be involved in its construction. Blinds may be temporary shelters made from readily assembled and dismantled materials (e.g., camouflage tarp tied down with strings and tent stakes), or they may be permanent (e.g., stone or wood) structures. Setting up the blind several days prior to observation, will give wildlife a chance to get used to it. Baiting and seeding the area one or two weeks prior to the study will also increase sightings.</p> <p>If time allows, provide students with an introduction to observation and identification as well as an overview of animals common to the area (especially birds). Some kind of reference material--either a field guide or a simple sheet with those animals--is essential.</p>
<b>MATERIALS USED</b>	<ul style="list-style-type: none"> <li>• Observation blind</li> <li>• Binoculars</li> <li>• Identification guide</li> <li>• Dull colored clothing</li> <li>• Activity Sheet C: Wildlife Blind</li> <li>• pen or pencil</li> </ul>
<b>PROCESSES USED</b>	<ul style="list-style-type: none"> <li>• Observe</li> <li>• Classify</li> </ul>
<b>TIME</b>	45 - 60 Minutes (can be repeated)

**DOING THE ACTIVITY** (outdoors)





After the observation period is concluded, gather students to discuss the following:

1. Which animals were most abundant?
2. Which group found the greatest diversity of species?
3. Does your data support the idea that riparian areas provide important habitat for animals? Where else could you conduct an observation to support this hypothesis?
4. List the factors found in the riparian zone that are important to wildlife.
5. Has human activity impacted this area? If so, is there anything you or the group could do to minimize that impact?

**CLOSURE** Summarize the importance of riparian areas to wildlife.

**TRANSITION** In the first activity you learned how some riparian areas are fairly undisturbed while others have been degraded. Next, we will look at riparian systems in greater detail -- their function in erosion control and their importance to plants and animals. You will also visit and analyze a riparian area for its usefulness as a productive ecological area.

## **RIPARIAN ASSESSMENT**



<b>CONCEPT</b>	System, Change, Interaction, and Order
<b>PRINCIPLE</b>	Participants analyze the health of a riparian area and discuss management considerations.
<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>• The student will observe and collect data on a riparian system.</li> <li>• Using the collected data the student will be able to describe the relationship between riparian zones and management considerations.</li> </ul>
<b>PREPARATION</b>	The teacher may wish to select two or more riparian areas to visit if time permits. It is also recommended that the class review the information discussed during the “Introduction to Riparian Areas” lesson. Photocopy Activity Sheet D.
<b>MATERIALS USED</b>	<ul style="list-style-type: none"> <li>• Activity Sheet D: Riparian Evaluation</li> <li>• Pen or pencils</li> </ul>
<b>PROCESSES USED</b>	<ul style="list-style-type: none"> <li>• Observe</li> <li>• Interpret Data</li> <li>• Communicate</li> </ul>
<b>TIME</b>	60 minutes

**DOING THE ACTIVITY** (outdoors)



A. Set the Stage

As we have learned so far, healthy riparian areas are dynamic and diverse ecosystems. In this activity, you will visit one or more riparian areas to assess their relative health.

In general, the following are characteristics found in mature, undisturbed (or recovered) riparian areas:

- Well-established vegetation and root system; zones apparent
- Steeper banks, stable slopes
- Year-round stream flow
- Cooler water temperatures (shaded)
- Higher water table/better storage
- Diverse habitat/forage/wildlife
- Stream bottom contains some gravel
- Aquatic organisms diverse, require oxygen, include variety of fish

Poorly managed, disturbed riparian areas generally have the opposite features.

B. Procedure

1. Discuss with students those characteristics which are indicative of a mature, undisturbed riparian area and those of a poorly managed, disturbed system.
2. Divide class into pairs and hand out one Activity Sheet D to each group.
3. Instruct students that they have 30 minutes to work with their partner to complete the Activity Sheet. Careful observation is essential.

C. Retrieve Data

ACTIVITY SHEET D: Riparian Assessment

50 min. groups

Sketch of Area (quick, birds-eye view)		Typical cross section		
<p><b>Riparian Assessment</b> Ratings: 1 disturbed, 2 only slightly disturbed, 3 undisturbed          Determine the rating for each characteristic then write the rating number in the appropriate box.</p>				
Characteristics	Ratings			Recommendations
	area A	area B	area C	
<b>PLANTS</b> species diversity varied canopy complex root system				
<b>STREAM/WATER QUALITY</b> shade available substrate (bottom) clear, flowing perennial flow				
<b>FISH &amp; WILDLIFE</b> aquatic invertebs. fish type/diversity wildlife forage variety of habitats				
<b>OTHER FACTORS</b> bank steepness bank stability lack of disturbances				
<b>TOTAL SCORE</b>				<b>Key:</b> Excellent = 36-42 Good = 29-35 Fair = 21-28 Poor = 14-20
<b>SUMMARY COMMENTS:</b>				

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When students have completed the sheet, discuss the following questions for each area evaluated:

1. Do you feel this area is undisturbed and productive, or has its ecological condition been reduced due to disturbance?
2. Are there certain species that seem to be present mainly in undisturbed (or disturbed) areas, but not in the other?
3. Do current management practices, if any, seem to be adequate for this area?
4. List any management recommendations you have for this area, (e.g., fences, trails, restricted access, etc.).
5. Summarize the role you feel public agencies and private landowners should play, if any, in the management of riparian areas. What environmental as well as economic factors do you think should be considered in this decision making process?

**CLOSURE** Summarize and discuss the unique role and associated values of riparian systems--their value to watersheds, controlling runoff and erosion, stabilizing stream banks, and as diverse habitat for plants and wildlife.

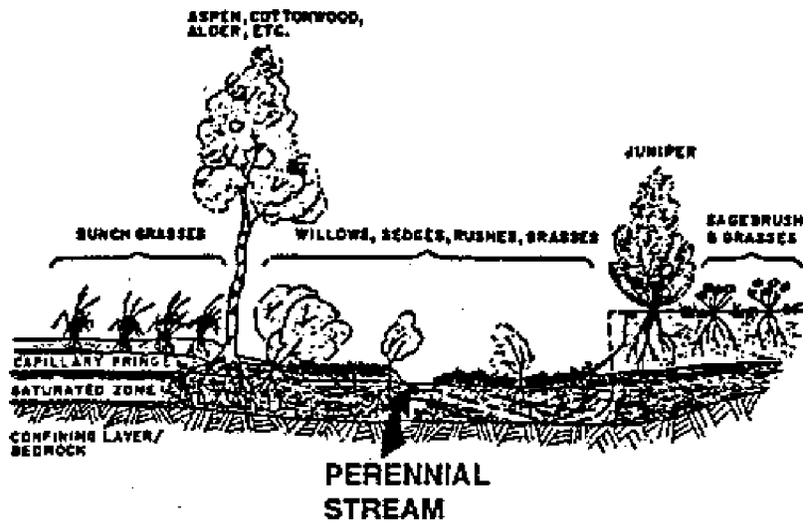
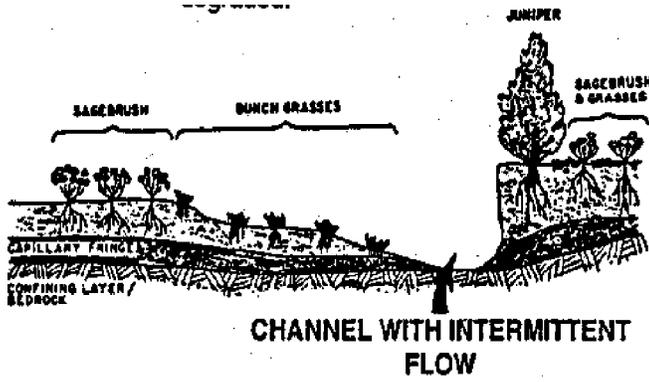


# ACTIVITY SHEET A: Introduction to Riparian Areas

30 min.  
individual

**Introduction:** Below are two illustrations, one of a riparian system disturbed by human or grazing activity, and a second illustration of an undisturbed riparian area.

**Directions:** Below the illustrations is a chart. Your task is to complete the chart based on your observations of the illustrations. When you have completed this, you will have identified the typical qualities that make a riparian system either healthy or degraded.



Characteristics	Disturbed System	Undisturbed System
Vegetation		
Stream Flow		
Water Temperature		
Habitat/Forage		
Wildlife Diversity		
Topography		
Other		



# ACTIVITY SHEET B: A Transect of Riparian Vegetation

90-120 min.  
small groups

Use this sheet to record the dominant plant type found at each stop. Record data from a transect of up to 25m in length on each side of the stream or waterway (total 50 meters). The 25 stops on the “+” (left) column should be on one side of the waterway, while the other 25 stops correspond to the other side. Stop numbers correspond to meters from the water; therefore, the #1 (both + and - ) samples are a single meter from the water, while the 25th stop are 25 meters from the water.

Transect # \_\_\_\_\_

Group Members \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Stop #	Dominant Plant
+1	
+2	
+3	
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Stop #	Dominant Plant
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# ACTIVITY SHEET D: Riparian Assessment

60 min.  
groups

Sketch of Area (quick, birds-eye view)

Typical cross section

## Riparian Assessment

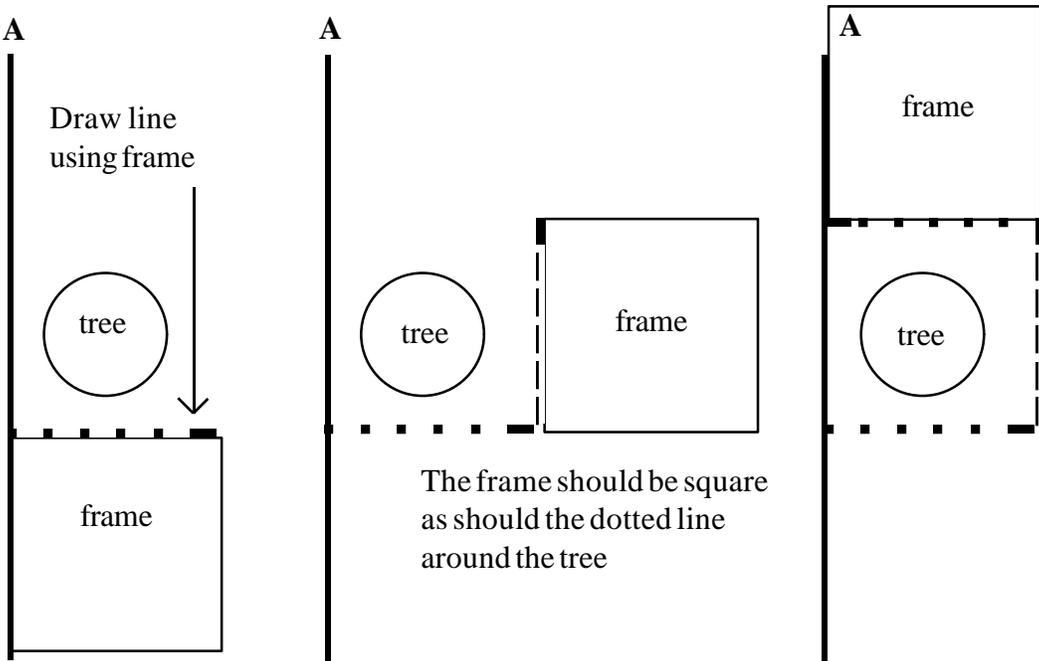
Ratings 1 disturbed, 2 only slightly disturbed, 3 undisturbed  
Determine the rating for each characteristic then write the rating number in the appropriate box.

Characteristics	Ratings			Recommendations
	area A	area B	area C	
<b>PLANTS</b> species diversity varied canopy complex root system				
<b>STREAM/WATER QUALITY</b> shade available substrate (bottom) clear, flowing perennial flow				
<b>FISH &amp; WILDLIFE</b> aquatic inverteb's. fish type/difersity wildlife forage variety of habitats				
<b>OTHER FACTORS</b> bank steepness bank stability lack of disturbances				
<b>TOTAL SCORE</b>				<b>Key:</b> Excellent = 36-42 Good = 29-35 Fair = 21-28 Poor = 14-20

**SUMMARY COMMENTS:**



# ACTIVITY B: Reference



## SAMPLE MAP

