

SAMPLING YOUR ESTUARY

Level IIC- WHO LIVES HERE?

Plant & Wildlife Diversity

Estuaries are a “land on the edge”. They are transitional zone between upland areas, rivers, and the Lake. Species that make their home in the estuary have the ability to survive in its unique environment.

GOAL

Students will understand that plants and wildlife living in an estuary are adapted to an environment of both land and water.

OBJECTIVES, students will...

1. Record direct and indirect observations of estuary plants and wildlife.
2. Hypothesize how the estuary’s habitat and water quality affects the diversity of plant wildlife species based on data they collected in Level II B & C.

SETTING

Estuary field tour

MATERIALS

Materials needed for each sample team are listed below. The forms indicated in blue are included in this unit.

**See Level IIA-“Materials”
for a list of safety items to
take on a field tour**

Wildlife Sampling:

Field guides, collection containers, estuary base maps, binoculars, fine gauge D-ring or hand nets, plastic ice cube trays, plastic spoons and tweezers, pencils, clipboard, waders, antibacterial hand wipes for cleanup

Key to Macroinvertebrate Life In the River (included in this unit) This chart is taken from “Wonderful Wacky Water Critter” publication GQQ023. Copies are available from any UW-Extension county office or by calling toll free 877-947-7827.

Macroinvertebrate Tally Sheet Instructions

Macroinvertebrate Tally Sheet

Wildlife Survey Results*

Plant Sampling,

Measuring tape, aquatic and terrestrial plant field guides.

Vegetation Survey Results*

* These forms are copied back to back and can be found at the end of this unit

BACKGROUND

Level IIC activities may be conducted as a separate estuary field trip or combined with Level IIB-What's In the Water? Both activities use the same 3 primary estuary sampling points to encourage the collection of comparative data.

Students will participate in researching the wildlife and plants at their sampling point. Teachers can assign a team of students to do all of the sampling procedures one point, or divide up the sampling duties between all of the students at each different point.

Teachers should evaluate the safety of allowing students to wade the estuary's waters to collect samples.

Students may not be familiar with the presence of aquatic macroinvertebrates and where to find them. Teachers may need to show students how to sample for these animals.

ACTIVITIES

Wildlife and plant sampling in this unit should be done at 3 sampling sites established in Level II-B.

WILDLIFE SAMPLING

Begin your approach to the estuary quietly to avoid scarring off wildlife. Follow these procedures after you arrive at your sampling point.

Within an approximate 100 yard radius of your sampling point, look carefully for evidence of wildlife. This can include direct observations (actually seeing an animal) or indirect observations (seeing evidences of animals like burrows, feathers, scat, tracks, dens; hearing evidences of animals like bird song; smelling evidences like skunk!). Use your senses and look all around!

Identify each species observed, if possible. Use the field guides to help. If identification is not possible, record the type of evidence you observed (example: "Unknown Bird Song" or "deer track")



Observe and sample for the following:

1. Mammals and Birds: Estimate the number and type of species you observe or find evidence of on the **WILDLIFE SURVEY RESULTS** form. Identify and observe at least 5 species.
2. Terrestrial Insects: Observe and record insects found on the ground or in the air. Sweep the D-Neck through the vegetation at your sampling point. Estimate the numbers

of each type of insect you observe and record this on the **WILDLIFE SURVEY RESULTS** form.

3. **Macroinvertebrates**: These aquatic organisms give us important clues to the estuary's water quality information. The numbers and diversity of species are important because: 1) they are excellent indicators of water quality and, 2) they are an important source of food for other estuary species.

Sample the water for "macroinverts". Sweep the D-net through the water along and under the bank of the estuary's vegetation. Put any insects you collect in the collection basin with some water. If you come up with any fish or minnows in your sweep, make note of it, but return them to the water immediately!

Sweep the D-net under the water through any floating vegetation masses and along the bottom to collect aquatic macroinvertebrates that live on there. Put these animals in a collection basin with some water.

If your sampling site includes a stream or river with rocks on its bottom AND IT IS SAFE TO WADE OR REACH INTO THE WATER, pick up rocks, leaves, lily pads, debris and examine them to see if any insects are attached underneath. Gently rub their surface to dislodge aquatic macroinverts that are attached and put them into the collection basin.



Stone Caddis Fly
larvae- a Group 2
macroinvertebrate

Take time to identify or "key out" the macroinverts in your collection basin by following the instructions on **MACROINVERTEBRATE TALLY SHEET**. Use the **KEY TO MACROINVERTEBRATE LIFE** to help identify the animals.

Use the ice cube tray to help you sort insects into different types. Circle each type of animal found in each of the 4 Groups shown on the Biotic Index form. Don't count individual animals. Add up the number of animal types found in each Group.

Do the math as explained on the Tally Form. You should come up with a **BIOTIC INDEX SCORE** that will help you judge the health of your section of the estuary. Put that number on the **WILDLIFE SURVEY RESULTS** form, in the lower right hand corner.

Using the Key, identify at least 5 different macroinvertebrates in your sample and list their names under the Macroinvertebrate "Species" column.

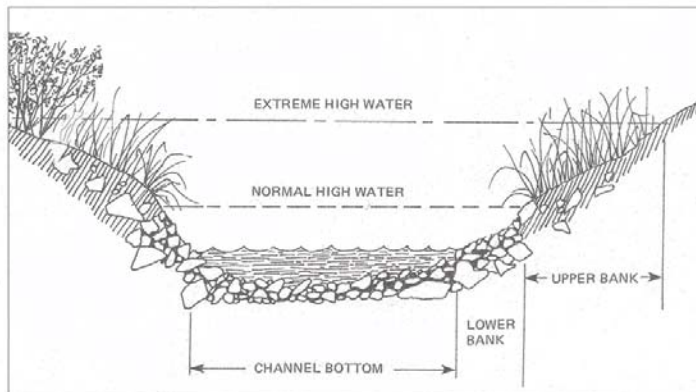


Aquatic macroinvertebrates are small animals without backbones that live in the water and are visible to the human eye. They give important clues to the estuary's water quality.

**Before leaving the sample site
return all macroinverts to the estuary.**

PLANT SAMPLING

At the sampling site, establish the location of the following 3 zones: AQUATIC ZONE, LOWER BANK ZONE, and UPPER BANK ZONE.



This illustration shows the location of the 3 vegetation zones to sample: Aquatic, Lower Bank, and Upper Bank.

Observe and record the following information for plants found each of these sections of the estuary's stream bank profile:

1. Identify at least 5 major types of plants found in each zone and list these on the **VEGETATION SURVEY RESULTS** form in the order of their predominance (#1 being the most predominant or common). Be as specific as possible, identifying plants by their common name. If you are unable to identify the species of plant, indicate the type of plant (i.e. grass, sedge, rush, etc.).
2. Indicate the height of each major plant type (using measuring tape)
3. Make observations of the plants at the sampling point such as:
 - Are the plants alive or dead; healthy or unhealthy?
 - Is there anything unusual at the sampling site that might influence the kinds of plants growing there, such as evidence of flooding, natural or human-caused disturbances, etc?

ESTUARY VEGETATION ZONES

AQUATIC ZONE (channel bottom)

Plants are rooted underwater in the estuary's channel bottom to the edge of the bank. These are plants that can live with wet feet! They supply important food and cover for aquatic wildlife and insects.

LOWER BANK ZONE

This is a transitional zone. Plants are rooted in soil at the edge of the water, but the soil may be waterlogged.

The sampling team will need to determine how far back from the edge of the water the lower bank extends. The lower bank region often saturated with water, but is not permanently underwater.

UPPER BANK ZONE

Here plants are rooted in drier soils on the slopes of the estuary's banks. This area may only get waterlogged during times of extreme high water and flooding.

- Are any of the plants present in all 3 zones?
- Can you observe any differences in the diversity of plants that are growing in each of the three stream bank zones?
- What do the plants at this sampling site tell you about the estuary's water quality and overall health?



Angelica is a common estuary plant found in the Lower Bank Zone

PUTTING LEVEL II RESEARCH TOGETHER

Generally, there is a correlation between the type of habitat and water quality and the type of plants and animals that will be found in each of the 3 sections of the estuary. Students may also find some results point to problems that may be affecting the estuary's health and species diversity such as human disturbances, water pollution, sedimentation, etc.

Using the results gathered in Level IIB and C, each sampling team should answer the following questions and share the results with the other teams. Teams should investigate the correlation between the habitat and water quality data they collected at each sample site and the types of animals and plants they found there.

1. What were the results of habitat and water quality sampling in Level IIB and the wildlife and plant sampling from Level IIC for each sampling site? How are they different, how are they alike?
2. What do the different plants and animals observed indicate about the habitat and water quality of the estuary at each sampling site?
3. What is the correlation between the estuary's habitat and water quality at the sampling site affect or influence the types of plants and wildlife found there?
4. Are the species that were observed what the team expected to find at the sampling site? Were any plants or animals found at the sampling site that were unusual or not expected to be present in that habitat or in that quality of water?
5. Based on the research your team collected, how would you evaluate the health of the estuary at your sampling location? Support your conclusion with research you collected.
6. If past sampling data is available for the sampling sites, compare how the data collected in this investigation compared to data collected earlier. What has changed or stayed the same? Hypothesis why these changes may have occurred.

7. What issues affecting the health of the estuary do your observations suggest might be occurring now or could occur in the future? What additional information/research needs to be collected to determine if a problem exists?

If your school has a digital camera available, students can create their own pictorial field guide of the plants and animals they find in the estuary. Creating a field guide gives students experience in identifying species, creating photos, writing "field guide" descriptions to accompany photos, organizing information, and desk top publishing.



LEVEL IIC- MACROINVERTEBRATE TALLY SHEET INSTRUCTIONS

(Refer to **Key to Macroinvertebrate Life in the River** for help in identifying species)

1. Fill the ice cube tray ½- full of water.
2. Using plastic spoons and tweezers, carefully sort out all of the macroinvertebrates you have collected from sweeps with the D-ring net.
3. Sort each of the different types of macroinvertebrates you find into separate ice cube compartments. Remember to sort like species together in the same compartment.
4. Look at back of this sheet. You will see 4 different Categories of macroinvertebrates. In each Category several different types of animals are shown. The presence or absence of these animals will indicate the water quality at your sampling point.
5. Now compare macroinvertebrate animals you collected and sorted to this chart. Start with Group 1. Circle the pictures on the chart if you found that animal in your sample. Do not count the individual numbers of insects—only circle the image of the animal if you found it in your sample. Count up how many of the different types of animals listed in Group 1. Put that number in the box under Group 1.
6. Continue through Groups 2-4 using the same technique.
7. You should have a number in each box that corresponds to the number of different types of animals you found in each Group.
8. Do the math... Take the total number for each Group and multiply by the factors shown below

Factor

GROUP 1: Total # of categories= _____ x **1** = _____
 GROUP 2: Total # of categories= _____ x **2** = _____
 GROUP 3: Total # of categories= _____ x **3** = _____
 GROUP 4: Total # of categories= _____ x **4** = _____

TOTAL of the columns _____(A) _____(B)

DIVIDE B by A _____(B)) _____(A) = _____ (C)

9. The result you reach at C is the **BIOTIC INDEX SCORE** for your sampling point.
10. Use the Rating Scale below to tell how clean the estuary is at your sample point.
11. Write the score for your sampling site on the **WILDLIFE SURVEY RESULTS** form.

BIOTIC INDEX SCORE	
Index over 3.5	Poor water quality
2.6 – 3.5	Fair
2.1 – 2.5	Good
1 – 2	Excellent water quality

LEVEL IIC- MACROINVERTEBRATE TALLY SHEET

Circle each animal type found in your sample. Put that number in the box for that

Group 1: These are sensitive to pollutants. Circle each animal found.



Stonefly Nymph



Dobsonfly Larva



Alderfly Larva



Water Snipe Fly Larva

No. of group

1 animals

circled:

Relative Size Key:



=larger than picture



=smaller than picture

Group 2: These are semi-sensitive to pollutants. Circle each animal found.



Caddisfly Larva*



Caddisfly Larva*

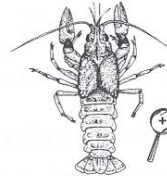


Caddisfly Larva*

*All Caddisfly Larva=1



Dragonfly Nymph



Crawfish

No. of group

2 animals

circled:



Cranefly Larva



Freshwater Mussels or Fingernail Clams



Mayfly Nymph



Damselfly Nymph



Water Penny



Riffle Beetle

Group 3: These are semi-tolerant of pollutants. Circle each animal found.



Blackfly Larva



Non-Red Midge Larva



Snails: Orb or Gilled (right side opening)



Amphipod or Scud

No. of group

3 animals

circled:

Group 4: These are tolerant of pollutants. Circle each animal found.



Pouch Snail (left side opening)



Isopod or Aquatic Sowbug



Bloodworm Midge Larva (red)



Leech



Tubifex Worm

No. of group

4 animals

circled:

Sample Site: _____

Date: _____

Level IIC- VEGETATION SURVEY RESULTS



ZONE	Predominant Plant Types (#1 most common)	Average Height (ft)	OBSERVATIONS
AQUATIC (channel bottom)	1. _____ 2. _____ 3. _____ 4. _____ 5. _____		
LOWER BANK ZONE	1. _____ 2. _____ 3. _____ 4. _____ 5. _____		
UPPER BANK ZONE	1. _____ 2. _____ 3. _____ 4. _____ 5. _____		

Sample Site: _____

Date: _____



Level IIC- WILDLIFE SURVEY RESULTS

	SPECIES OBSERVED OR COLLECTED	NUMBER	OBSERVATIONS or REMARKS
Mammals	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	_____ _____ _____ _____ _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____
Insects	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	_____ _____ _____ _____ _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____
Macro-invertebrates	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	_____ _____ _____ _____ _____	<div style="border: 1px solid black; width: 200px; height: 150px; margin: 0 auto;"></div> <p style="text-align: center;">BIOTIC INDEX SCORE (from Macroinvertebrate Tally Sheet)</p>