Student directed “Estuary Exploration Ed-Venture program” via kayak in Lake Superior’s Fish Creek Estuary.

SAMPLING YOUR ESTUARY
Level IIA- ESTUARY EXPLORATION

GOAL
Through field observations, students will document an estuary’s physical and biological characteristics and hypothesize the impact of natural and human activities on the environment.

OBJECTIVES, students will:

1. Improve their abilities to observe and quantify their observations on the estuary’s characteristics

2. Complete the **ESTUARY EXPLORATION SURVEY & SITE MAP** and share their observations of impact of natural and human activities on the estuary.

3. Validate and add information to the Master Estuary Map

4. Establish a permanent record keeping system to document observations made at each survey site.

SETTING
Field trip to the estuary

MATERIALS

Recommended list of Items to take along:
- Photocopies of topo map of the estuary
- Comfortable rubber boots or waders
- Clothing that is appropriate for the weather
- Clip boards with waterproof cover
- Estuary Exploration Survey forms
- Pencils
- Folding ruler or tape measure
- Camera and film in waterproof bag
- Leather gloves
- Whistle
- First Aid Kit
- Cell Phone

If you are away from urban or residential areas, the following are also recommended for safety:
- Extra dry clothes in a waterproof bag
- Fire starter (candle, cheap lighter, tinder)
- Flashlight and extra batteries

BACKGROUND

Visiting an estuary is one of the best ways to get students involved and excited to learn about its unique ecology. Estuaries can be accessed by foot or by boat.

It is strongly recommended that teachers visit the estuary in advance to determine the safest locations to conduct the field sampling required in this unit.

Before starting any estuary field explorations or surveys, teachers and students should keep in mind the following cautions:

- Get the permission of landowners to cross any private or tribal land, posted or not. **Do Not Enter Areas Without Permission.** Use public access points (such as city/county/state parks and campgrounds).
- Always have students work in groups, never individually
- Do not put yourself in danger to gather survey information
- Be careful of ticks, poison oak, nettles, and insects. Bring repellent. Wear long pants and boots
- Do not drink the water -- it is unsafe
- Do not walk on unstable banks; your footsteps could speed erosion
- Be alert for spawning areas in the stream. Do not walk on them. They will look like a round or elliptical area of clean gravel about 1-3 feet long
- Be aware that the streambed can be very slippery, uneven, and unpredictable
- **Do not attempt to walk across streams that are swift and above the knee in depth**
- Be careful of streamside vegetation - disturb it as little as possible
- Keep on eye on the changing weather. If you feel if conditions are unsafe, end your Estuary Exploration immediately and seek shelter

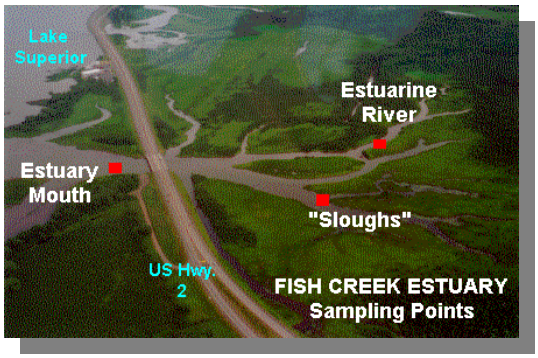
We encourage teachers to contact local groups involved in environmental issues with the estuary's watershed. This serves two purposes: one, these groups may be able to provide you with information and background for your Estuary Exploration; and you may be able to piggyback on an existing program.

Visit EPA's web page, http://www.epa.gov/adopt/network.html or contact a local Wisconsin Department of Natural Resources Office to find a group within the watershed.

This unit includes research based on general field observations.
More detailed biological sampling is done in:
Level IIB-What's In the Water?- Water Quality Sampling
Level IIC-Who Lives Here?- Plant and Animal Diversity

ACTIVITIES

With the class, establish "permanent" **Estuary Exploration sampling points** in advance of your field trip. Using the **MASTER ESTUARY MAP** created in unit Level IC, students should select a minimum of 3 sampling sites within the estuary. Mark these sampling sites on the Map. The sites must include at least one sampling point located in these areas of the estuary:



Example of sampling points used in Fish Creek "Estuary Exploration" Level IIA programs conducted by UW-Extension at the Northern Great Lakes Visitor Center.

- **Along the estuarine river or stream bank before it enters the estuary**
- **Along the bank of the backwaters wetlands or "sloughs"**
- **At the mouth of the estuary where it enters & mixes with the Lake**.

Other sampling points may be added to this list.

These will become "permanent" survey locations, for all Level II activities. It will be easier for future estuary explorers to locate and return to these sites for follow-up observations if they are near landmarks (roads, highways, and tributaries). Give each permanent site a name or number to identify it for future records.

For each sampling point, complete an **ESTUARY EXPLORATION SURVEY** (attached). Students should make their observations based on what they see within a 100 yard radius from their sampling point, unless directed otherwise on the Survey.

Results of what the students have observed should be shared with the entire class. Students should answer that following questions:

Note: Teachers may vary the size of the area in which students will make their observations depending on the number of students and the size of the area. Survey sites should at least 200 feet apart. Students should only record what that observe, not what they may have previously seen.

1. **What are observations were similar between different sampling sites and what was different. Why?**
2. **How did the water and habitat quality at each site affect the plants and wildlife found there?**
3. **What is your evaluation of the health of the estuary based on observations made at the sample site?**
4. **What additional information needs to be gathered in the future to assess the health of this estuary?**

FOLLOW-UP

Establish a permanent recording system for student observations at each survey site. By doing so, a “track record” of changing environmental conditions will be created and will help students understand the impact of natural and human change on the estuary.

Monitoring is always more useful when it occurs over a sustained period of time

Level IIA- ESTUARY EXPLORATION SURVEY

Complete one survey for each sampling point where observations are made

Background Information

Date: _____

Team Members:_____

Affiliation: _____

Study Group: _____

Sampling Site: _____

Site Definition

Use information gathered in Level IA

1. Estuary location:
Nearest city or town:_____ County:_____ State:_____

Body(ies) of water adjacent to the wetland: _____

Name of Watershed Where the Estuary is Located: _____

General Conditions

2. Weather at time of visit
Air temperature: _____ degrees F

Wind direction: _____

Beaufort Scale Rating: _____

Current Weather
q storm q showers q snow
q clear (cloud cover 0-10%)
q partly cloudy (cloud cover 10-90%)
q overcast (cloud cover 90-100%)

3. Weather for previous 24-48 hours
q storm q showers q snow
q clear (cloud cover 0-10%)
q partly cloudy (cloud cover 10-90%)
q overcast (cloud cover 90-100%)

Beaufort Wind Scale

Number Description Observation

0 calm smoke rises vertically (0-1 mph)
1 light air smoke drifts slowly (2-3 mph)
2 slight breeze leaves rustle; underbrush moves (4-7 mph)
3 gentle breeze twigs move; flags extended (8-12 mph)
4 moderate breeze branches move; dust (13-18 mph)
5 fresh breeze small trees sway (19-24 mph)
6 strong breeze large branches sway (25-31 mph)
7 moderate gale trees in motion (32-58 mph)
8 fresh gale twigs break off trees (39-46 mph)
9 strong gale branches break; roofs damaged (47-54 mph)
10 whole gale trees snap; damage evident (55-63 mph)
11 storm widespread damage (66-72 mph)
12 hurricane extreme damage (73-82 mph)

Site Map

4. Use a piece of paper to **sketch out a map** of the estuary from your observation point. In your drawing, include areas of open water, vegetation, and observed water inflows and outflows.

5. Estimate the size, in acres of the estuary:
q Less than one acre acres q 1-10 acres q Greater than 10 acres

Vegetation Observations

6. The average vegetation buffer width (buffer = the vegetation around each side of the estuary) is:
q no apparent buffer q less than 50 feet q 50 to 100 feet q More than 100 feet

7. What vegetation type is most dominant (makes up more than 30% of the total vegetation) at your sampling site:

q Trees and shrubs over 20 feet tall (forested)
q Woody vegetation less than 20 feet tall (shrubs-scrub)
q Grasses and plants that have fleshy and not woody stems (emergent)

8. Is there any indication of exotic species, especially Purple Loosestrife?

q Yes, if so, what percent of the vegetation is exotic? _____ %
q No

Draw the areas of different vegetation types you can observe on your map. Include the location of exotic species, if they are present.

Water Observations

9. Another important factor in describing estuaries is the presence and extent of water.
Check the description(s) which best describes water conditions at your site:

q There is standing water q There is flowing water

q There is no visible water at time of visit, but there is evidence of past standing/flowing water
⇒ If there is no standing water, is the soil soggy?
q yes, water oozes from the soil
q no, but the soil is just damp
q no, the soil is dry

10. If there is water at your site, what condition is the water? *(check all that apply)*

COLOR	**POSSIBLE CAUSES** (evidence of potential sources of non-point & point pollution)
O Clear	
O Muddy….	Erosion of soil from upstream areas
O Greenish…	Algae growth in water may exceed normal limits due to excessive nutrients in the water
O Yellow/Brown…	Natural acids, called tannins" released from decaying plants stain the water the color of tea
O Orange/Red	High erosion of clay soil or result of bacterial action on iron in the soil or water
O Colored Sheen	Rainbow colors on water indicate that oil has entered the estuary
O Foam…	Cream colored foam less than 3 inches high is natural, excessive foam indicates detergents are entering the estuary
O No Smell	
O Fishy Smell	May indicate excessive algae growth or dead fish
O Rotten Egg Odor…	May indicate sewage entering estuary, often a natural smell of rotting wetland vegetation
O Musky Odor…	May indicate untreated sewage, livestock waste, or algae
O White Cottony Masses or Slime…	May indicate sewage or other pollution

Other water quality observations:

_____

11. Is there evidence that water levels at this site are influenced by seiches?

q Yes, what evidence: _____

q No

12. Within 100 yards of your site, how much of the estuary's surface is covered in water?

q 0% - 30% q 30% - 60% q 60% - 100%

Identify any visible areas or structures through which water flows into the estuary and then draw and label them on your map. Indicate the direction from where water is flowing in on your map. Which of the following are sources of water inflow? *(check all you can observe)*

q streams q culverts q ditches q storm drains q ponds or lakes q impervious surfaces

Identify any visible areas or structures through which water flows out of the estuary and then draw and label them on your map. Indicate the direction from where water is flowing in on your map Which of the following are places were water is traveling out? *(check all you can observe)*

q streams q culverts q ditches q storm drains q ponds, lakes q pumps q impervious surfaces

Wildlife Observations

13. A healthy wetland is home to a variety of animals. Which of the following wildlife have you observed at your survey site? *(Please identify the species, if possible.)*

q fish	q aquatic insects	q flying insects
q birds	q ducks	q frogs
q lizards	q snakes	q rabbits
q mice	q deer	q domestic pets (cats, dogs)
q livestock		

Others: _____

14. Check any other animal sign you have observed

q Carcasses/remains of dead fish or other wildlife ⇒ What species: _____

q Animal Tracks ⇒ What species: _____

q Animal Scat

Indicate the location and type of wildlife observed on your map

Human Impact

15. Which of the following land uses are found in or adjacent to the estuary?
(check all that you can observe from your site)

q Undisturbed natural vegetation
q Residential housing
q Construction site
q Agriculture, livestock grazing, or cultivation of crops
q Non industrial commercial development (e.g. office buildings,stores, gas stations)
q Industrial development
q Logging
q Roads, paved or unpaved
q Railroads

16. Indicate which, if any, of the following activities appear to be taking place within the estuary:
q dumping of soil, gravel and/or vegetation
q dumping of man-made materials
q grading, evidenced by tracks and scraped soil
q draining of water evidenced by pipes or ditches leading out of the wetland
q channelizing of water evidenced by ditches or trenches
q bulkheads built between shore and wetland
q tracks of recreational vehicles
q livestock access, evidenced by animals observed in the area, or animal tracks
q pipes or culverts which transport storm water from parking lots or roads into the wetland
q areas that have been dug out or dredged
q areas that have been filled in

Include the location of the observations you make in questions #15 and #16 on your map.

17. How would you grade the health of the estuary at this survey point?
q Grade A- Appears in natural condition, No indication of disturbance or signs of pollution
q Grade B- Few signs of disturbance and/or pollution
q Grade C- Signs of disturbance and/or pollution evident
q Grade D- Appears to be serious disturbed and/or polluted

ATTACH YOUR ESTUARY OBSERVATION MAP TO THIS SURVEY

Be sure to label the map with the:

Names of all investigators
Sample site name
Date observations were made