LAKE ECOLOGY EDUCATION PROGRAM
FALL INDOOR LAB MANUAL

NAME:_____ HOUR_____

LAB MODULE NAME	PAGES	POINTS	
Critical Habitat	2-3	_____	(40)
Water Quality	4-6	_____	(55)
Aquatic Plants	7-8	_____	(30)
Invasive Species	9	_____	(35)
Plankton	10-11	_____	(30)
Fish Management	12-13	_____	(40)
	TOTAL POINTS	_____	(230)
	Optional Extra Credit Activity	_____	*(+25)*

INSTRUCTOR COMMENTS:

INDOOR CRITICAL HABITAT LAB SHEET

Critical Habitat Designation - The Wisconsin DNR Program Every body of water has **critical habitat** - areas that are most important to the overall health of the aquatic plants and animals.

Remarkably, **80% of the plants and animals on the state's endangered and threatened species list spend all or part of their life cycle within the near shore zone**.

90% percent of the living things in lakes and rivers are found along the shallow margins and shores.

- Wisconsin law mandates special protections for these critical habitats.
- Critical Habitat Designation is a program that recognizes those areas and maps them so that everyone knows which areas are most vulnerable to impacts from human activity.
- A critical habitat designation assists waterfront owners by identifying these areas, so they can design their waterfront projects to protect habitat and ensure the long-term health of the lake they where they live

Section 1: What Is Critical Habitat?

1. What does the word "critical" mean?

2. What does the word habitat mean?

(5 pts)_____

Section 2: Why Is Critical Habitat Important? *(this space for note-taking)*

Section 3: Bony Lake Example: Cut and Paste Project

Four handouts will be provided for this section:

a) Bony Lake map
b) Critical Habitat descriptions
c) Animal cut-out
d) Critical Habitat Designation descriptions

Directions:

1. **Underline the location** with the numbers you are assigned and write them here. _____
2. **Read the description** of each Critical Habitat location found on Bony Lake BON0 – BON13 to determine what habitat type is at each location.
3. **Determine the animals** that would be found in this habitat by using the laminated Critical Habitat Designation Descriptions Sheet.
4. **Cut out the animals** that you feel would use the habitat at your assigned locations and **paste onto the Bony Lake map**.

1st lake section cut out and pasted (5 pts)_____

2nd lake section cut out and pasted (5 pts)_____

Summary Questions

1. List 3 or more facts you learned in today's lab session.

(5 pts)_____

2. What percent of living things found in lakes and rivers can be found along the shores and shallow margins? (see introduction pages)

(5 pts)_____

3. What part of the lake do 80% of all plants and animals on the state's endangered or threatened species list spend all or part of their life cycle?

(5 pts)_____

4. What would we lose or not have in the future if we don't continue to protect and respect our Critical Habitat Designated Areas?

(10 pts)_____

TOTAL CRITICAL HABITAT POINTS (40 pts)_____

Factor	Indicates	Affected by	Effects on lake	Method	Acceptable Range
Turbidity	Water clarity	sediment, algae, tannins	Temperature, photosynthesis, clogs gills, spawning	Secchi disc	**Clearer is better**
Dissolved Oxygen	Oxygen available in water	Higher in cold water, wind, storms, shade, running water, springs	Respiration: breathing for fish, insects, bacteria	Chemettes	**Greater than 5, but less than 15 mg/L**
Temperature	Warm/ cold	Air temperature, season, sun, wind, depth of lake	Algae growth increases, Dissolved oxygen decreases	Thermometer	**35-65 F (most fish prefer)**
pH	Acidity	Sediment, type of substrate and rock, pollution	What species can live in that lake	pH paper	**5-9 (7 is neutral)**
Phosphates	Possible pollution	Fertilizer or animal waste	Increased plant/algae growth, killing fish	Lab test	**< 0.1 mg/L**
Nitrates	Possible pollution	Fertilizer, septic systems	Increased plant/algae growth, killing fish	Lab test	**<1 mg/L**

EFFECTS OF ACIDITY ON FISH SPECIES (Olszyk 1980)

pH	Effects
6.5	Walleye spawning inhibited
5.8	Lake trout spawning inhibited
5.5	Smallmouth bass disappear
5.2	Walleye, burbot, lake trout disappear
5.0	Spawning inhibited in many fish
4.7	Northern pike, white sucker, brown bullhead, pumpkinseed, sunfish and rock bass disappear
4.5	Perch spawning inhibited
3.5	Perch disappear
3.0	Toxic to all fish

pH Color Codes

INDOOR WATER QUALITY LAB SHEET

Materials – Get the following materials from your instructor:

- Safety goggles
- Water sample (prepared by instructor)
- Mini secchi disc tube (share) and bucket (share)
- pH paper
- Chemette kit (share)
- Glass thermometer (share)

Directions:

1. Put on safety goggles and keep them on for the entire lab.
2. Test your water as directed by your instructor.
3. Insert the pH paper in the water and record your findings below.
4. Check your water for oxygen using the Chemette vials and record below.
5. Check your water for temperature using thermometer and record below
6. Check your water clarity with the mini secchi disc tube and record below
7. We will not test for phosphate/nitrates.

YOUR TEAM'S WATER SAMPLE #: _____

Factor	**Your Findings** (data)	**Analysis** (acceptable/not acceptable)	
Turbidity (cm)			**(10 pts) ____**
Dissolved Oxygen (mg/L)			**(10 pts) ____**
pH			**(10 pts) ____**
Temperature (Celsius/Fahrenheit)			**(10 pts) ____**

Hint: Use the table on the previous page to determine whether your sample is acceptable or not.

When you are done, report your findings on the board in the front of the room.

Report your data on the board and record all other groups' data below. **(5 pts)____**

Record the data from your classmates' investigations:

Group/ Sample #	#1	#2	#3	#4	#5	#6
Turbidity						
DO						
Temp.						
pH						

1. Provided other factors were okay, why would you consider your water sample to be good or bad for aquatic life? Be prepared to discuss at the end of the lab.

(5 pts)____

2. How did your water sample compare to others?

(5 pts)____

TOTAL WATER QUALITY POINTS (55 pts)_____

AQUATIC PLANTS

FREE-FLOATING – Float, not attached

SUBMERSED – Most below surface

FLOATING LEAF – Leaves on surface

EMERGENT – Leaves above surface

INDOOR AQUATIC PLANT LAB SHEET

Materials – Get the following materials from your instructor:

- Clipboard and pencil
- Resource book ***Through the Looking Glass*** and ***Lake Plants You Should Know*** or other resources provided

Directions:

1. Take one of the sample plants from the front lab table.
2. Look through the resource books and identify the plant.
3. Also tell what type of plant you have:
   emergent (**E**)/free floating (**FF**)/submersed (**S**)/floating leaf (**FL**)
4. Also tell if it is native (**N**) or invasive (**I**)
5. Return the plant to the front lab table and select the next plant until you have completed all the samples or as many as time will permit.

Sample #	**Plant Name** (from text)	**Type** (E/FF/S/FL)	**Native/Invasive** (N/I)	
1				**(5 pts)_____**
2				**(5 pts)_____**
3				**(5 pts)_____**
4				**(5 pts)_____**
5				**(5 pts)_____**

Write three sentences explaining why aquatic plants are important to our lakes

(5 pts)_____

TOTAL AQUATIC PLANTS POINTS (30 pts)____

Extra Credit: (5 pts) For each additional plant identified.

Sample #	**Plant Name** (from text)	**Type** (E/FF/S/FL)	**Native/Invasive** (N/I)	
6				**(5 pts)_____**
7				**(5 pts)_____**
8				**(5 pts)_____**

INDOOR AQUATIC INVASIVE SPECIES LAB SHEET

Team Members:

Background - Things you should know. Answer the following:

1. What are the four types of aquatic plants?
2. What is an invasive species?
3. Name at least four things plants provide for other living things:

Directions: Take a sample from the front lab table and identify what kind of invasive species it is and why it is destructive. Use the resource handouts provided by the instructor. Return the sample to the lab table and take another. Continue the process until you have as many as possible of the samples identified.

Sample #	Name	Destructive Nature	
1			**(5pts)_____**
2			**(5pts)_____**
3			**(5pts)_____**
4			**(5pts)_____**
5			**(5pts)_____**

Explain why some species become invasive. How do they end up taking over?

(5 pts)_____

How can we prevent invasives spreading to other lakes? Explain what ***YOU*** can do to prevent the spread of aquatic invasive species.

(5 pts)_____

TOTAL INVASIVE SPECIES POINTS (35 pts)_____

Extra Credit: (5 pts) For each additional species identified.

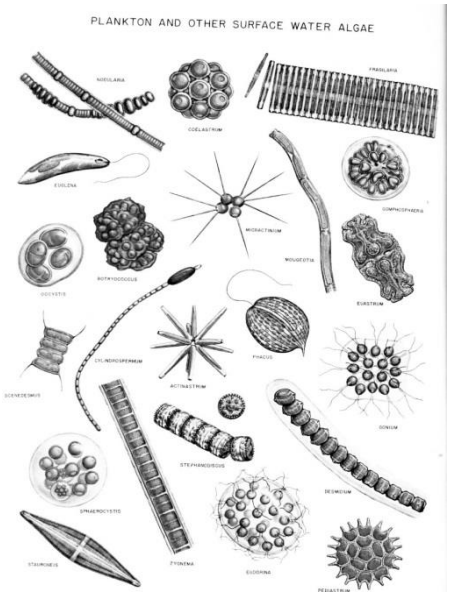
Sample #	Name	Destructive Nature	
6			**(5 pts)_____**
7			**(5 pts)_____**
8			**(5 pts)_____**

INDOOR PLANKTON LAB SHEET

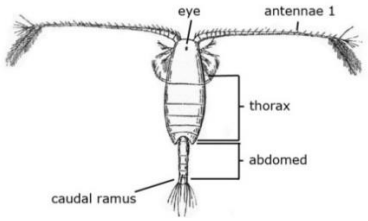
Plankton: *Plankton* are small aquatic organisms that drift with water movements.

Phytoplankton (microscopic plants) comprise mainly **green algae** and **diatoms,** carry out photosynthesis ("primary producer") and form the base of the aquatic food-chain. Many are single-celled and free-floatng but others attach to each other forming filaments, spheres and other shapes. **Zooplankton** (animals) are small microcrustaceans (including **Copepods and Daphnia**) and protozoans (one celled animals) that feed on phytoplankton These are barely visible with the naked eye but seen better with the "dissecting" stereo microscope.

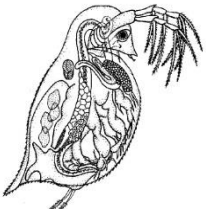
PHYTOPLANKTON: ALGAE & DIATOMS



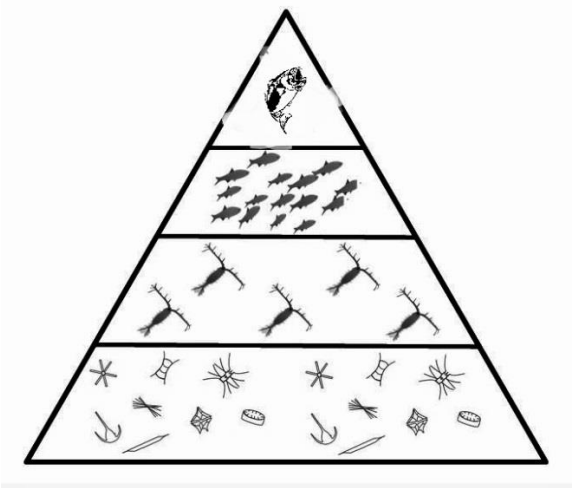
ZOOPLANKTON: COPEPOD



ZOOPLANKTON: DAPHNIA

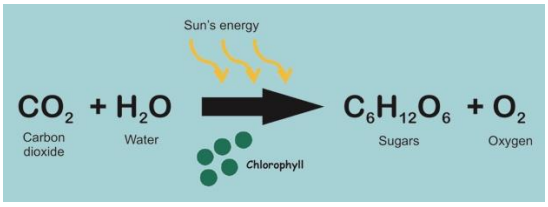


LAKE FOOD AND ENERGY CHAIN/WEB: Herbivores eat plants. Carnivores eat animals and animal parts. Omnivores eat both. Because of photosynthesis, algae (microscopic plants containing chlorophyll) are the lake's "primary producers". Zooplankton eat algae and are the lake's "primary consumers". Minnows and other animals that eat them are "secondary consumers". Other animals eat them.



PHOTOSYNTHESIS

Photosynthesis by algae: In the presence of chlorophyll (plant's green pigment) & sunlight, dissolved carbon dioxide (CO_2) plus water (H_2O) are changed into carbohydrate (sugar) and oxygen (O_2). This takes place in *phytoplankton* (and other green plants).



Materials – Get the following materials from your instructor:

- Lake water sample
- Plastic bulb pipettes
- Plain glass microscope slides and coverslip, glass microscope slide with central depression but no coverslip
- Monocular microscope at each pair of student's desk, stereo dissecting zoom binocular microscope at front of room

Directions:

1. Work in groups of two, sharing one water sample and one microscope.
2. Using a plastic bulb pipette, place a drop of lake water on a slide
   a. One drop on a plain glass slide; cover the drop with a small glass coverslip & observe for algae using your monocular microscope. Identify algae & diatoms.
   b. On a depression slide, place two or three drops and observe without a coverslip, using binocular stereo dissecting microscope at front of classroom. Identify zooplankton: copepod, Daphnia
3. Identify phytoplankton (know which ones are algae and diatoms) and zooplankton (identify copepod or Daphnia)
4. Record your findings on the worksheet
5. Seek instructor to confirm your identifications
6. Add points and record at bottom of page.

After each of your identifications, make a check next to the organism and get confirmation from teacher.	**Teacher Initials**	**Points (5 pts each)**
Use depression slide at stereo microscope to identify zooplankton.		
___ Copepod	_____	_____
___ Daphnia or other "water flea"	_____	_____
___ Other zooplankton, for example a rotifer.	_____	_____
Identify and rate how much phytoplankton you have:		
2. Using a plain glass slide, look for **ALGAE** - tiny green particles.		
___None ___Few ___Many	_____	_____
3. Look for **DIATOMS –** tiny geometric shaped algae	_____	_____
___None ___Few ___Many		

Why are plankton important to the lakes?

(5 pts)_____

TOTAL PLANKTON MODULE POINTS (30 pts) _____

INDOOR FISH MANAGEMENT LAB SHEET

Section 1: Fisheries Management. Case Study Analysis:

Work with your table partner to examine the fishing regulations for the two lakes below.

Fishing Regulation	Bony Lake	Lower Eau Claire Lake
Panfish (bluegill, pumpkinseed, yellow perch, crappie)	Only 10 panfish can be kept	25 panfish can be kept
Walleye	**Five** total can be kept: Fish must be **less than 14"** except **one fish over 18"** may be kept	**Five** total can be kept: Fish must **be over 18"** to keep
Bass – largemouth (LMB) and smallmouth (SMB)	-Five total LMB and SMB LMB-can be caught between **May 4-March 1**, **must be 14**" SMB- May 4th-June 14th **catch and release only**. June 15-March 1, can keep if they are **over 14"**	-Five total LMB and SMB LMB- can be caught between **May 4-March 1** SMB- May 4th-June 14th **catch and release only**. June 15-March 1, can keep only one if **over 18"**

1. What are three regulations that you notice are different between the two lakes?

(10 pts)_____

2. Brainstorm three reasons why the fishing regulations differ between Bony Lake and Lower Eau Claire Lake.

(5 pts)_____

Section 2: Fish ecology model

Work with your table partner to make a conceptual model of different factors that affect the population size of **panfish, walleye, or bass** (circle which one you choose).

Used all the words listed **(5 pts)_____**
Showed relationship between the factors and the fish **(5 pts)_____**

Section 3: Fisheries Management: Balancing fish populations for today and the future

1. What is the main job a fishery manager is expected to do? **(5 pts)_____**

2. Draw a line from the fishing regulation to the matching management strategy:

Fishing regulation type	Management strategy
Bag Limits	Keeps larger fish in the lake to reproduce
Size limits (you can only keep big fish)	Makes sure that fish aren't being caught or disturbed during the months that they reproduce
Size limits (you can only keep small fish)	Allows anglers to catch fish, but the fish can continue to grow and reproduce in the lake
Open Seasons	Limits the number of fish taken out of a lake. Keeps population numbers at a good level.
Catch and release	Reduces the number of big fish in the lake. Could be used if there are too many fish.

(5 pts)_____

3. Why do fisheries managers have to **make sure there are enough** fish in the lake? What would happen if there **were too many** fish in the lake?

(5 pts) _____

TOTAL FISH MANAGEMENT POINTS (40 pts)_____