# L.E.E.P.
## Lake Ecology Education Program

## LAKE ECOLOGY EDUCATION PROGRAM
## FALL <u>INDOOR</u> LAB MANUAL

**NAME:**_____**HOUR**_____

| <u>LAB MODULE NAME</u> | <u>PAGE</u> | <u>POINTS</u> |
|---|---|---|
| **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** _____**(230)**
**With Extra Credit** _____**(255)**

**INSTRUCTOR COMMENTS:**

**CRITICAL HABITAT**
**INDOOR LAB**

**Critical Habitat Designation – a 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 are provided for this section:

|   |   |
|---|---|
| a.  Bony Lake map | c.  Bony Lake critical habitat designation |
| b.  Animal cut-out sheet | d.  WI DNR 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 WI DNR 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)_____**

# WATER QUALITY
# INDOOR LAB

**Materials:** Get the following materials from your instructor:
- Safety goggles
- Water sample (prepared by instructor)
- Mini Secchi disk 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 disk 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.

**Report your findings on the board in the front of the room and continue to the next page.**

**(5 pts)** _____

**Record your classmates' data from the board into the table below.**

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

**Summary Questions:**

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) _____**

# WATER QUALITY RESOURCE TABLE

| 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 | Which 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** |

**pH Color Codes**

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 |

# AQUATIC PLANTS
# INDOOR LAB

**Materials –** Get the following materials from your instructor:
- Clipboard and pencil.
- Resource books *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)_____** |

# AQUATIC PLANTS

## FREE-FLOATING – Float, not attached

## SUBMERSED – Most below surface

## FLOATING LEAF – Leaves on surface

## EMERGENT – Leaves above surface

# AQUATIC INVASIVE SPECIES
# INDOOR LAB

**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)_____** |

![L.E.E.P. Lake Ecology Education Program logo]

**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.
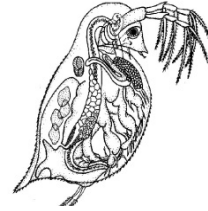
### PHYTOPLANKTON: ALGAE & DIATOMS


PLANKTON AND OTHER SURFACE WATER ALGAE
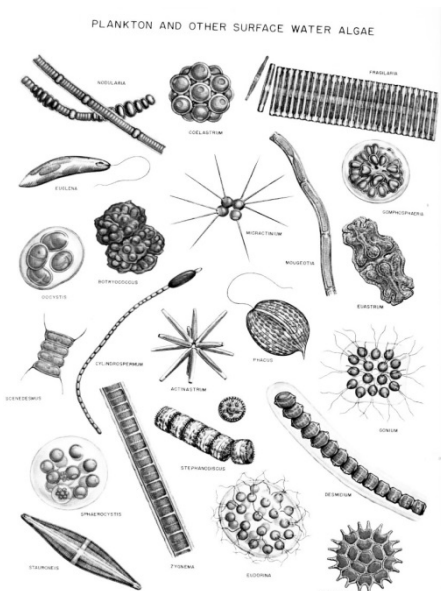
### ZOOPLANKTON: COPEPOD
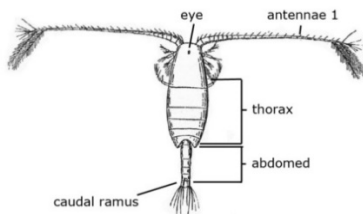


### ZOOPLANKTON: DAPHNIA



**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.
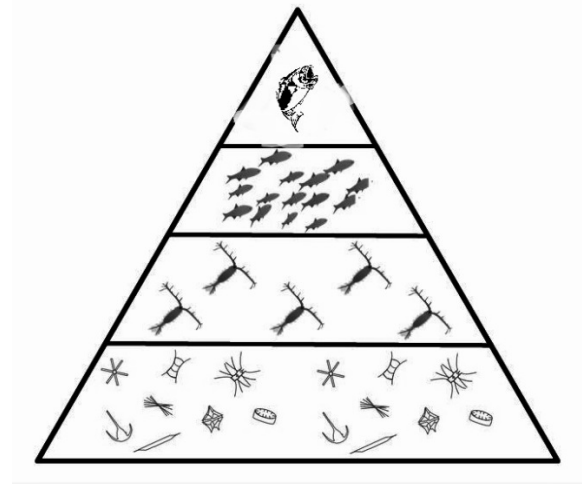


### PHOTOSYNTHESIS

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).


$$CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$$
Carbon dioxide — Water — Chlorophyll — Sugars — Oxygen — Sun's energy
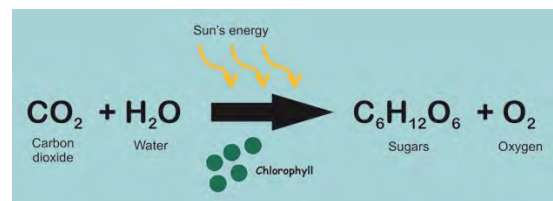
**Materials –** Get the following materials from your instructor:
- Lake water sample.
- Plastic bulb pipettes.
- Plain glass microscope slides and coverslip, glass microscope slide with central depression but no coverslip.
- Monocular microscope at each pair of student's desk, stereo dissecting zoom 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)** |
|---|---|---|

1. 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) _____**

# FISHERIES MANAGEMENT
# INDOOR LAB

## Section 1.  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<br><br>LMB-can be caught between **May 4-March 1**, **must be 14**"<br><br>SMB- May 4th-June 14th **catch and release only**.<br>June 15-March 1, can keep if they are **over 14"** | -Five total LMB and SMB<br><br>LMB- can be caught between **May 4-March 1**<br><br>SMB- May 4th-June 14th **catch and release only**.<br>June 15-March 1, can keep only one if **over 18"** |

\* Example above is from 2019 regulations

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                                                         Makes sure that fish aren't being caught or
(you can only keep big fish)                             disturbed during the months that they reproduce

Size limits                                                         Allows anglers to catch fish, but the fish can
(you can only keep small fish)                          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)_____**