INDOOR MACRO MODULE LESSON PLAN

Subject Area/s: Water quality & Macroinvertebrates
Season/instructional time: Spring before outdoor water studies/45 minutes

I. Learning Goal/s: Learners will be able to use macroinvertebrate data to evaluate lake/river/stream quality/health

II. Objective/s:

- Learners will be able to identify and record macroinvertebrates
- Learners will determine which macros indicate good water quality
- Learners will differentiate between complete & incomplete metamorphosis

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.3** Use techniques such as modeling and simulating to organize information gathered in their investigations
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information

IV. Setting/Area: Indoor classroom
V. Materials/Resources: Students divided into small groups of 3-5

- Enclosed lab sheet to compare and record "collected" macroinvertebrates
- "Key" to Macroinvertebrates
- Pencils/clip boards
- Enclosed "critter" macro sheet for each group
- Preserved macros
- Stamper
- Transparencies
- Overhead projector

VI. Delivery:
Introduction of Lesson:

- Review macroinvertebrates (animals without backbones that can be seen)
- Review life cycles of aquatic insects (complete/incomplete metamorphosis)
- Review water "quality/health"

Large Group: Go over introductory materials and hand out equipment
Small Group: Each small group goes to a lab/desk area. Learners will identify the macros on the sheet according to their "groups," count and record them. The learners will complete the "***Tally Sheet Recording Form***" and determine the water's ***index score***.

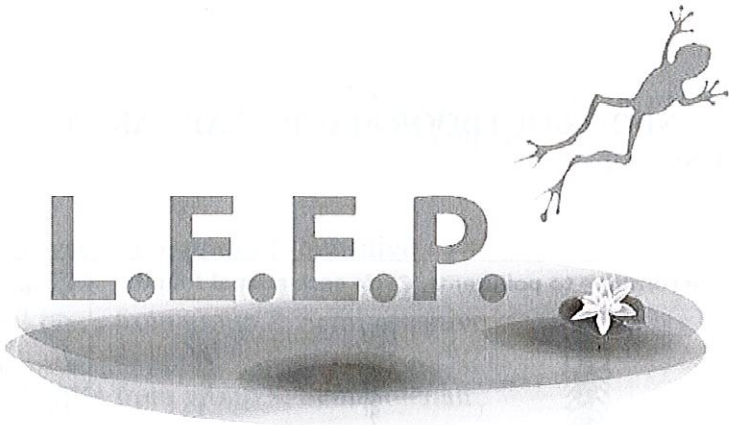
VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the ***Tally Sheet***.
- Have an informal class discussion (wrap-up) about the activity.

Macro Samples- Recharge
4.6.19

If you have macroinvertebrate samples that you have collected, you may need to recharge the solution that is preserving them. The bottles can be recharged with hand sanitizer that you might have at home. If you need new samples, you can collect them on the day of the field trip. Be sure to fill the vial half full, then carefully drop in the macro and finish filling the vial. You can fix them by draining the fluid carefully and recharge as described. Discard if any legs, antenna, etc. are damaged.

If you need to add watery fluid, use denatured alcohol.



Lake Ecology Education Program

SPRING INDOOR LAB MANUAL

NAME:_____ **HOUR**_____

MODULE NAME	PAGE	POINTS
Tree Study	2-6	(40)_____
Macroinvertebrates	7-10	(25)_____
Shoreline Restoration/Reforestation	11-12	(35)_____

TOTAL (100)_____

INSTRUCTOR COMMENTS:

LEE

INDOOR/OUTDOOR MACRO LAB PART 1

TEAM MEMBERS:

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

Relative Size Key:
(+) = larger than picture
(-) = smaller than picture


Stonefly Larva

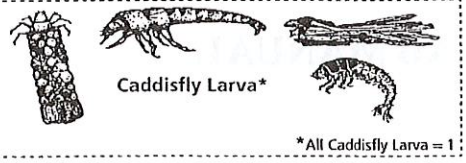

Dobsonfly Larva


Alderfly Larva


Water Snipe Fly Larva

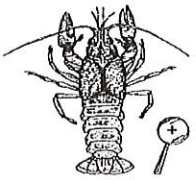
Number of group 1 animals circled: ☐

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

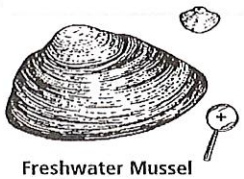

Caddisfly Larva*
*All Caddisfly Larva = 1


Dragonfly Larva


Water Penny


Crawfish


Crane Fly Larva


Freshwater Mussel or Fingernail clam


Mayfly Larva


Damselfly Larva


Damselfly tail (side view)

Number of group 2 animals circled: ☐

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


Black Fly Larva


Non-Red Midge Larva


Snails: Orb or Gilled (right side opening)


Amphipod or Scud

Number 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


Tubiflex Worm

Number of group 4 animals circled: ☐

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Collected samples of macros……(5 pts)_____

INDOOR/OUTDOOR MACRO LAB PART 2

DIRECTIONS: Calculate how many of each category of ***benthic macroinvertebrates*** you have counted and multiply by the designated number.

	(A)	(B)
Number of animal types from group 1: Sensitive	_____ X 4 =	_____
Number of animal types from group 2: Semi-sensitive	_____ X 3 =	_____
Number of animal types from group 3: Semi-tolerant	_____ X 2 =	_____
Number of animal types from group 4: Tolerant	_____ X 1 =	_____
TOTAL NUMBER OF ANIMAL TYPES (A)	_____	
TOTAL VALUE AFTER MULTIPLYING (B)		_____

Calculated Total Value……(5 pts.)_____

Calculate the ***Index Score*** by dividing the total value of (B) by the total number of animal type (A)

$$\text{Index Score} = \frac{(B)}{(A)} =$$

Calculated *Index Score*…….. (5 pts.)_____

The ***Index Score*** will tell us how healthy our lake/river/wetland is. Circle the appropriate health:

Excellent = index score of 3.6 or higher
Good = index score of 2.6 - 3.5
Fair = index score of 2.1 - 2.5
Poor = index score of 1.0 - 2.0

Determined "Health" of lake area…….. (5 pts.)_____

Write a sentence to support your evaluation of the health of the lake you have just studied:

Comment about water resource……..(5 pts.) ____

List some characteristics that may be affecting the health of the lake area based on the index score that you calculated.

Total Macro Points……..(25 pts.) _____

INDOOR/OUTDOOR MACRO LAB PART 1

TEAM MEMBERS:

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Dobsonfly Larva


Alderfly Larva


Water Snipe Fly Larva

Number of group 1 animals circled: ____

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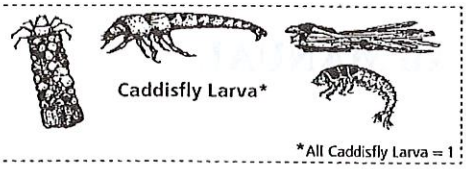
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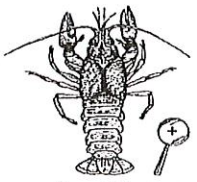
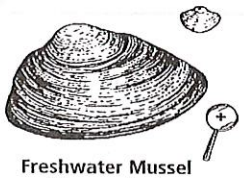
*All Caddisfly Larva = 1


Dragonfly Larva


Water Penny


Crawfish


Crane Fly Larva


Freshwater Mussel or Fingernail clam


Mayfly Larva


Damselfly Larva


Damselfly tail (side view)


Riffle Beetle Larva*

Riffle Beetle Adult*

*All Riffle Beetles = 1

Number of group 2 animals circled: ____

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


Black Fly Larva


Non-Red Midge Larva


Snails: Orb or Gilled (right side opening)


Amphipod or Scud

Number 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


Tubiflex Worm

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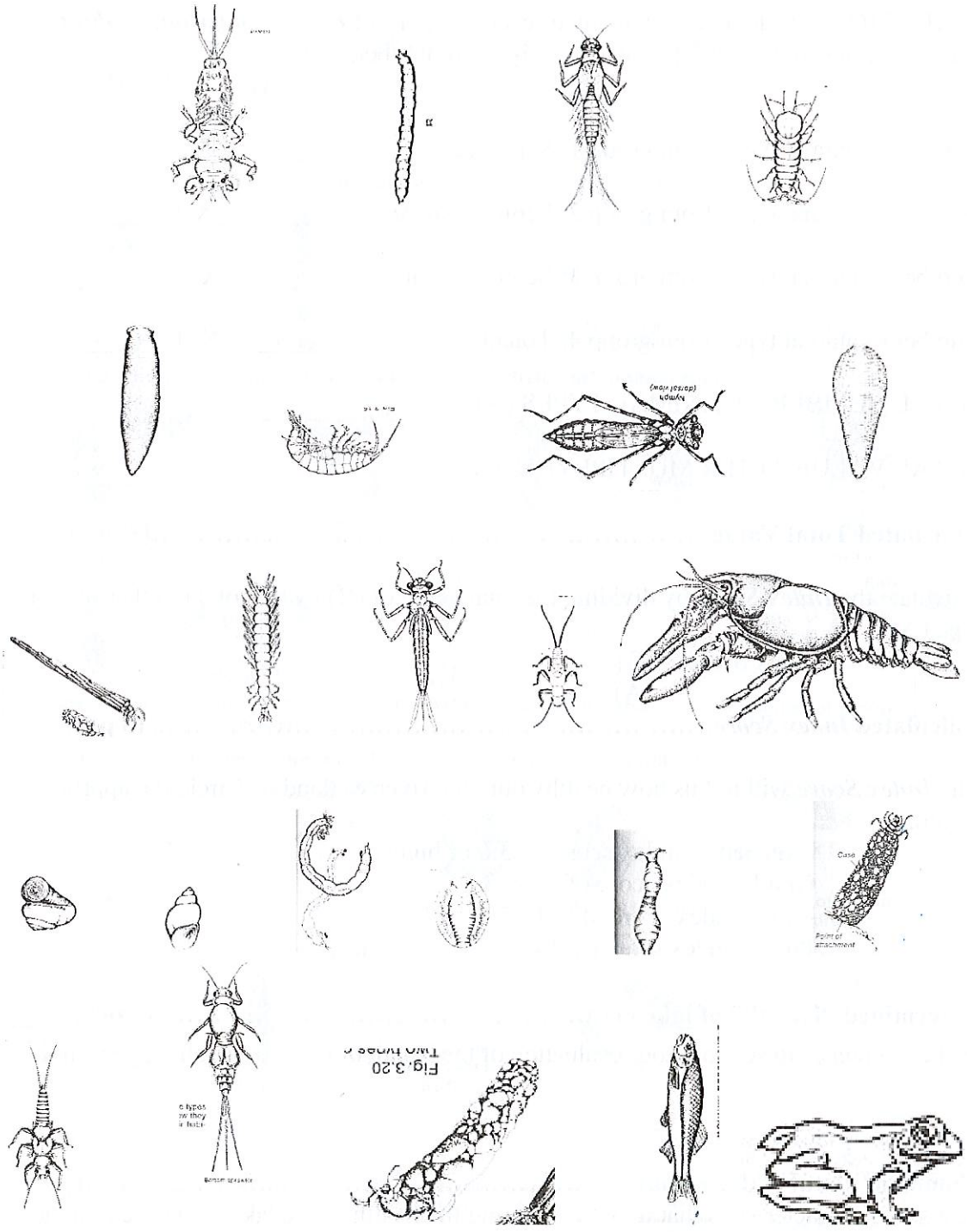
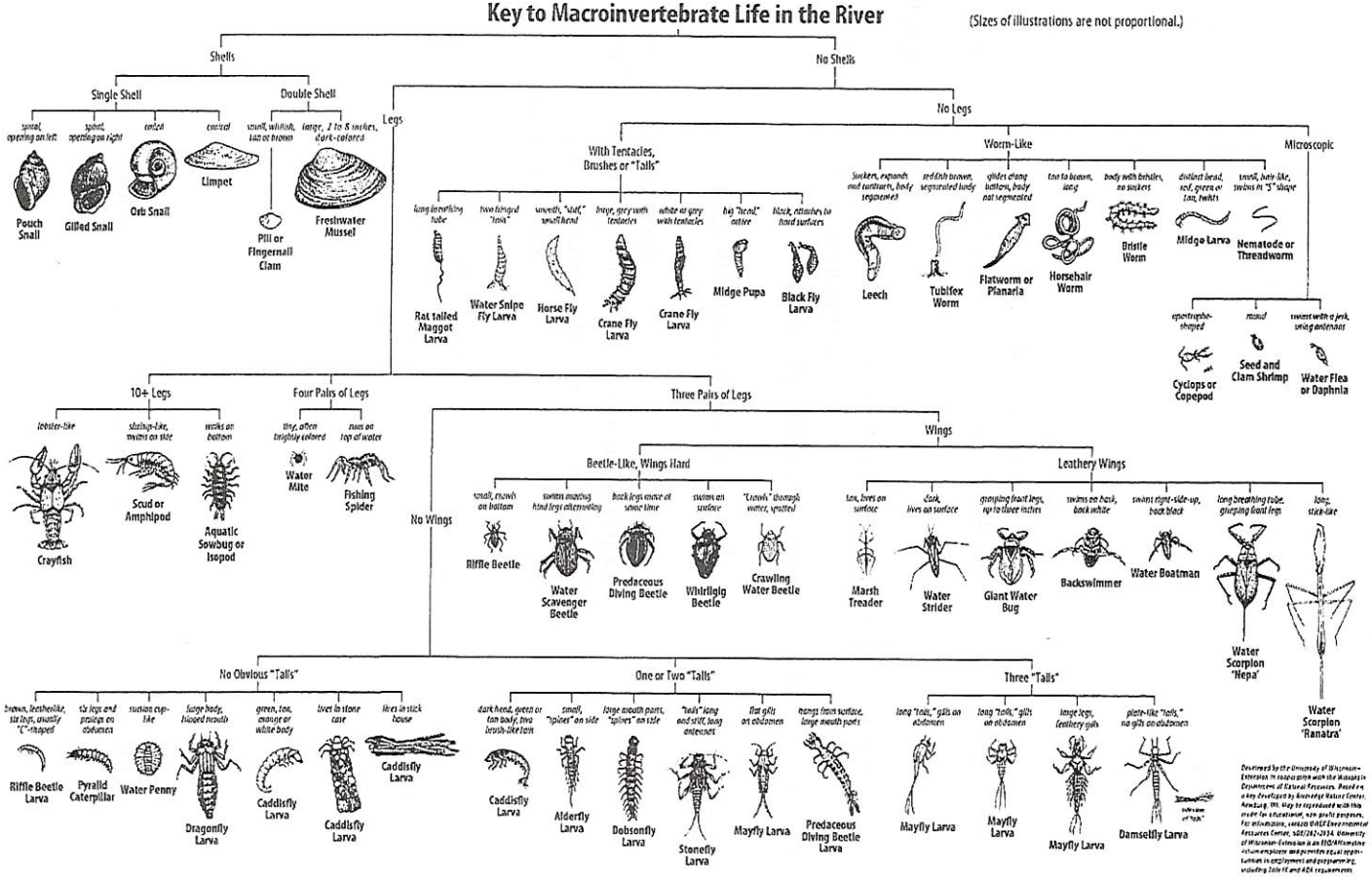
Collected samples of macros.....(5 pts)_____

BENTHIC MACROINVERTEBRATE SAMPLES



Key to Macroinvertebrate Life in the River

(Sizes of illustrations are not proportional.)



GPO U.S. GOVERNMENT PRINTING OFFICE: 2008—560-014/42034