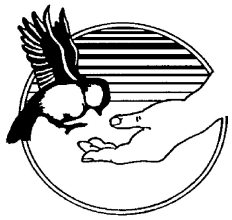
SNC 1P/1D: Ecology

Aquatic and Terrestrial Ecology

Alternative (in-class) Assignment



Wrigley Corners
Outdoor and Environmental
Education Centre

Aquatic Ecology – Ponds

Our activity today is to assess the health of Golden Pond. As part of a scientific assessment it is important to document our work and quantify our results.

1. The biotic (living) and abiotic (non-living) components of the pond have been surveyed and the results provided here, use the information provided below to determine if this is a healthy pond.

<u>Characteristics to consider</u>:

Oxygen: is an important limiting factor, many organisms are sensitive to low oxygen levels and the presence or absence of these organisms can be an important indicator of water quality. The beakes biotic index ranks the health of a pond using these sensitive organisms as indicators. Few fish can survive with less than 5mg/L of oxygen, larger fish need greater than 10.

Carbon Dioxide: can be dangerous in large quantities (>25 mg/L), so less is generally better. Carbon dioxide levels fluctuate depending on the mineral composition of the soil, active photosynthesis and decomposition but are generally lowest mid summer.

Temperature: Some fish (Bass and Sunfish) prefer warm water around 26 celsius, while others (Trout) prefer colder temperatures below 20 celsius. Although stratification is less common in ponds, often deeper water is colder while water near the surface is warmer. The temperature of water changes its density, which can cause seasonal thermal inversions if the pond or lake is deep enough.

Conductivity: The amount of electricity that water can conduct changes depending on what and how much is dissolved in it. Distilled water does not conduct well, 0-1 us/cm3, while salt water, with lots of NaCl, does > 50000 us/cm3. In fresh water systems, conductivity is a cheap way of determining if a habitat has been polluted. Road salt, fertilizer, mine waste, and sewage all increase conductivity in ponds, rivers and lakes. Water with a conductivity greater than 1500 us/cm3 should not be drunk.

Turbidity: if conductivity measures pollution, turbidity measure how 'dirty' the water is. Sediment, minerals, microscopic organisms and algae when suspended in water can decrease how deep light penetrates through the water column. High turbidity is often associated with nutrient rich (Eutrophic) systems, sometimes caused by contamination of water from fertilizers. Nutrient poor water is typically very clear and called oligotrophic.

Diversity: Higher species diversity is generally better. Polluted systems will often be missing species sensitive to their abiotic environment or the presence of invasive species. However, some lake systems are naturally nutrient poor and their natural state is low diversity.

Abundance/Niche: of individual species is related to their limiting factors, typically the number of organisms at each trophic level is relatively even. When one species is disproportionately abundant it may indicate the presence of an invasive species or nutrient contamination. The number of organisms often increases lower in the food web.

2. Complete two scientific drawings
3. Complete the Beakes Biotic Index
4. Complete the summary questions.

Aquatic Ecology - Grade 9

Name:_____ Date:_____

1a) Use the information on the cover page to fill in the 'healthy ranges'.

1b) Abiotic: **a) Based on these variables is this a healthy ecosystem?** _____

Dissolved Oxygen (mg/L) *(Healthy range:)*	7.5	Dissolved Carbon Dioxide (mg/L) *(Healthy range:)*	6
Air Temperature (C°) *(Changes daily)*	20	Water Temperature (C°) *(Changes seasonally)*	15
Conductivity (uS/cm^3) *(Healthy range:)*	340	Turbidity (cm) *(Healthy range:)*	100

1c) Using the picture provided, identify all the species, count their abundance and describe their niche.

	Species	Abundance (Keep a running total)	Niche	Adaptation
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

1d) Biotic: **Total Diversity:** _____ **Most abundant species:** _____

2a) Beakes Biotic Index (modified):

Quantifying organic pollution using the presence or absence of invertebrate species

Organisms	Score
Group 1 – Animals sensitive to pollution - Dragonfly - Damselfly - Dobson fly, fishfly, hellgrammite - Mayfly - Stonefly - Caddisfly	Score: 1 point if one order (kind) is found, 2 points if two are found, 3 points if three or more are found Points:
Group 2 – Animals able to survive in low levels of pollution - Scud (side swimmer) - Aquatic sow bug - Snails - Clams - Crayfish - Cranefly larva - Water striders - Diving beetles	Score: 1 point if one to two orders are found, 2 points if three or more orders are found Points:
Group 3 – Pollution tolerant animals - Leeches - Midge larva (Blood and Phantom) - Tubifex (aquatic) worms - Mosquito larva - Blackfly larva - Water mite - Water bugs (crawling and Giant) - Water Scorpion	Score: 1 point if one or more orders are found Points:

Score: _____ + _____ + _____ = _____

Group 1 + Group 2 + Group 3 = Result

Results:

6 (Unpolluted) – All types of animals (sensitive to tolerant) can live here.

4-5 (slight pollution) – Sensitive species reduced in numbers or absent, group 2 species well developed and increasing in numbers.

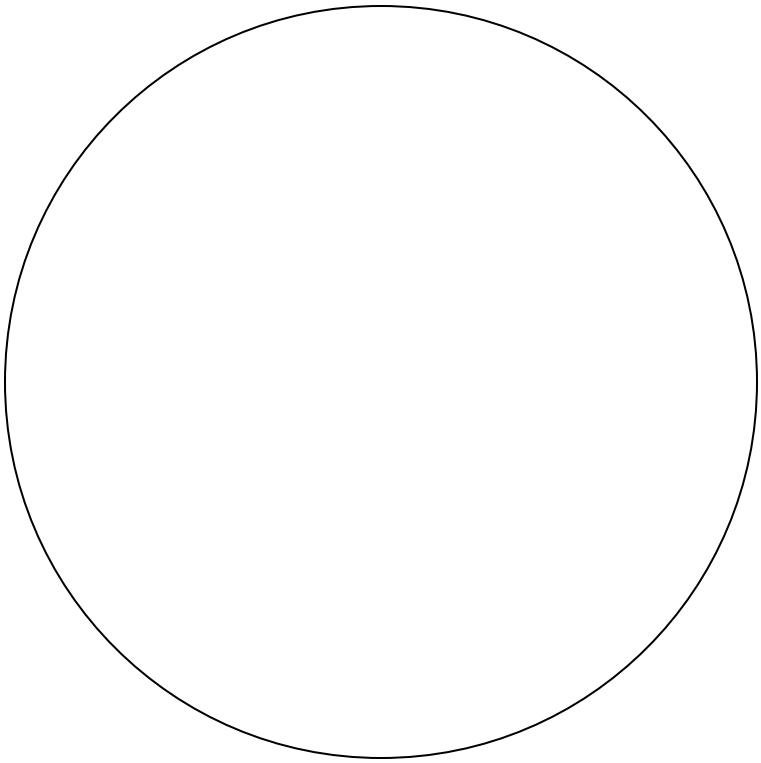
3 (Moderate pollution) – All sensitive species absent

2 (Moderate to heavy pollution) – Group 2 species reduced, only species insensitive to low oxygen present in large numbers.

1 (Heavy pollution) – only most tolerant species present (Tubifex and air breathers)

0 (Severe pollution, usually toxic) – No macro invertebrates present.

2b) Draw 2 organisms that you saw in your photo sample. (Show Scale)

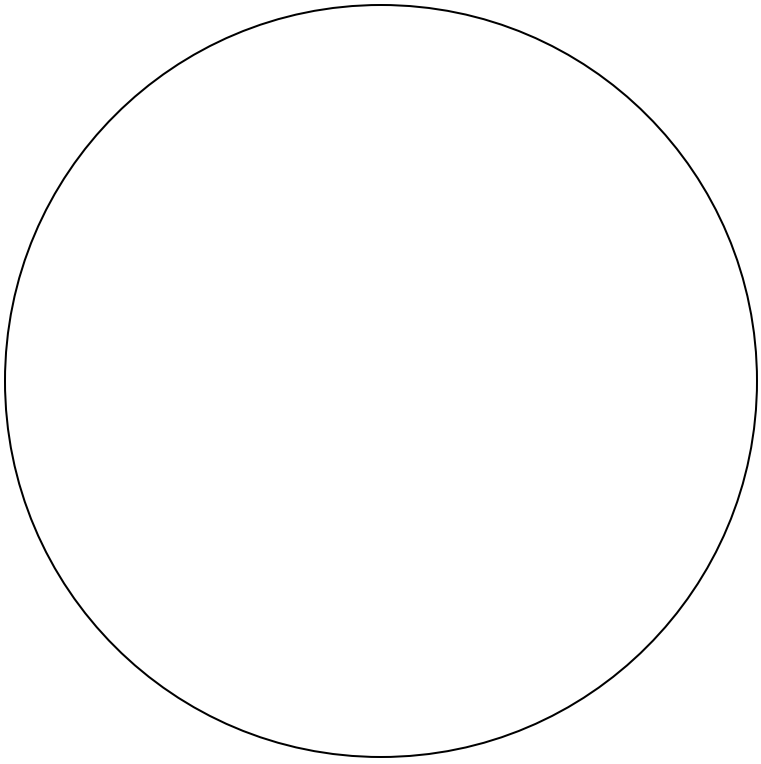


Name:_____
Size:_____

Description:

Adaptation:

Picture?



Name:_____
Size:_____

Description:

Adaptation:

Picture?

3) Complete the following summary questions and hand in to teacher.