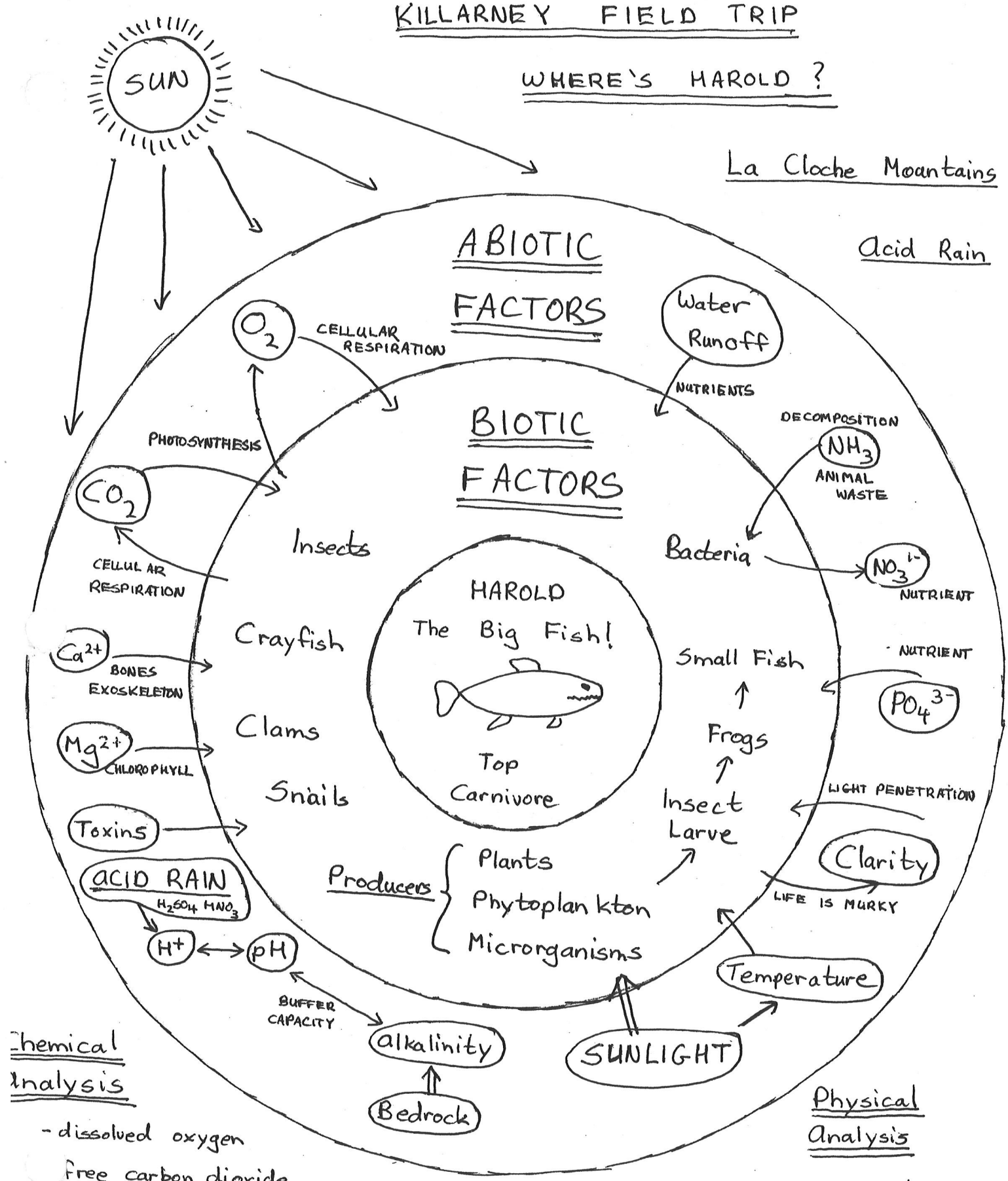
KILLARNEY FIELD TRIP

WHERE'S HAROLD ?



Chemical Analysis

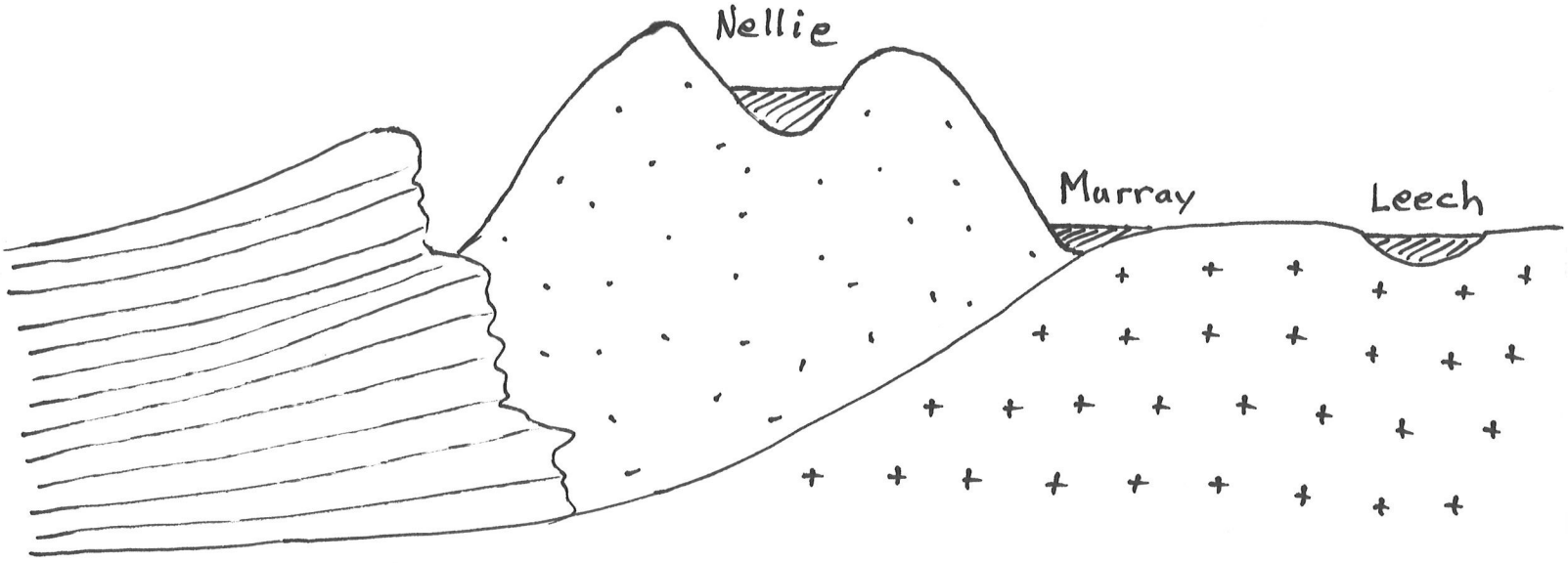
- dissolved oxygen
- free carbon dioxide
- alkalinity
- pH ([H+])
- Ca^{2+}
- Mg^{2+}
- PO_4^{3-}
- NH_3

Biological Surveys

Physical Analysis

- light penetration
- temperature profile
- water flow

La Cloche Mountains Cross Section



La Cloche Mountains

- quartzite (metamorphosed sandstone)
- ancient sea floor 700 million years old)
- upthrust by geological activity
- little to no buffering capacity

Underlying Bedrock

- basaltic lava from a volcanic epoch
- 1.2 billion years old
- reasonable buffering capacity

Limestone Bedrock

- same formation as the Niagara Escarpment
- 500 to 300 million years old
- excellent buffering capacity

GEOLOGY:

How many major tectonic events have helped shape this area?

What is the chemical composition of the white quartzite rock? Why does it have some areas of different colour?

What is the approximate age of this rock?

Would you expect to find fossils in this rock, why or why not?

Would you classify this rock as sedimentary, metamorphic or igneous?

What is the origin of this rock and how did it get so high above sea level?

Are the rock to the north older or younger and how do you know?

Are the rock to the south (Manitoulin Island and Bruce Peninsula) older or younger and how do you know?

What is name, age, approximate chemical formula, origin and extent of the rock to the south?

Why is acid rain a problem here, but not at home?

Regan Katie and Ashley

PLANTS:

What do mosses lack? Why don't moss grow more than a few inches high?

What do club mosses have?

How big did club mosses once grow and what other plants did they share the "forests" with?

What reproductive advantage do mosses, club mosses and ferns have?

What feature to all gymnosperms have. What is the reproductive advantage of this?

What feature do angiosperms have in common? What types of plants belong to this group?

Regan Katie and Ashley

CONIFER IDENTIFICATION:		
GENUS	COMMON NAME	DISTINGUISHING CHARACTERISTICS
Juniper		
Cedar		
Pine		
Tamarack		
Fir		
Spruce		
Hemlock		
Yew		

Keir Tristen and Shane

SUCCESSION:

What is the principle behind succession that will eventually lead to tree covered rock?

What is a primary colonizer? What are the primary colonizers in this area?

What is truely unique about lichens? Describe the relationship and how it works.

Identify and describe two very difference "styles" of lichens

How do lichen cope with the drastic shifts in moisture in their environment.

Describe the sequence of organisms in succession that eventually lead to the prime vegetation of white pine, jack pine or red oak.

Mitchell and Jessica

LAKE TYPES:

Draw a sketch of each type of lake, including amount of bottom sediment, varying amounts of plant life and its location, size and abundance of fish. In the box below indicated relative depth, age, water clarity, biomass.

Oligotrophic:

depth: age: water clarity: biomass:

Mesotrophic:

depth: age: water clarity: biomass:

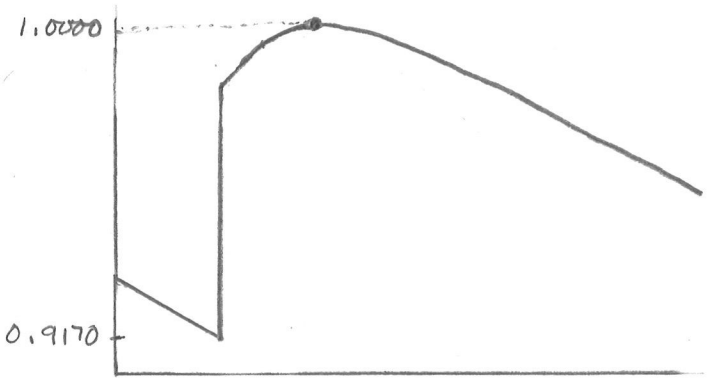
Eutrophic:

depth: age: water clarity: biomass:

Mitchell and Jessica

LAKE DYNAMICS:

Label the axis and provide a scale for each axis for this graph that represents the relationship between density and temperature for water.



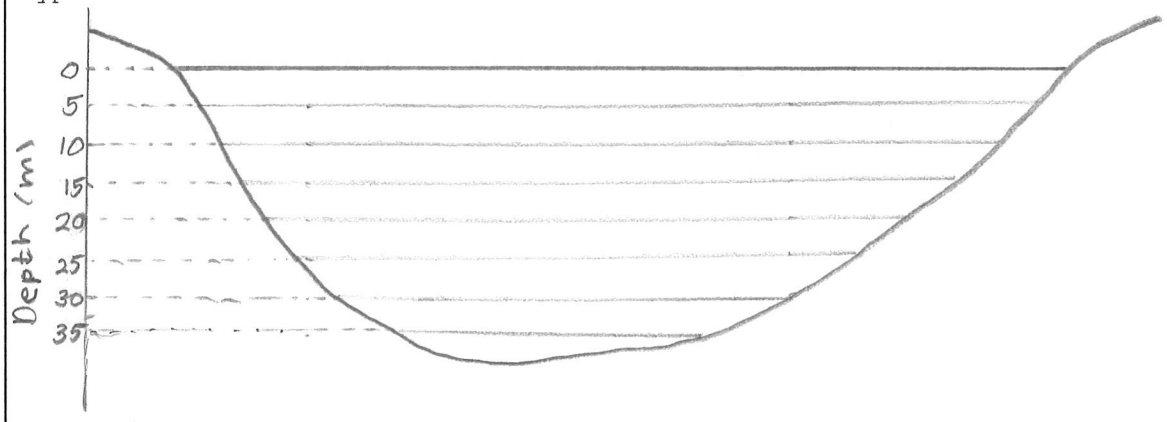
Where does the change of state between solid and liquid take place? What happens to the density at this point?

What is the name given to the unusual behaviour of observed for the density temperature behaviour of water in the liquid state?

At what temperature is water the most dense?

What does this mean with respect to the stratification of water in a larger body of water?

Fill in approximate temperature that could represent the stratification of water in this lake cross-section in the early summer (note the depth given in meters). This will show the thermocline in this lake. Label the hypolimnon.



In order for turnover to occur (surface and bottom water freely mixes, what must happen? What time of the year does this happen

Mark Reed and Pierino

ABIOTIC REQUIREMENTS FOR LIFE:

What is the name of the process by which solar energy is trapped by plants? Write the balanced chemical equation for the overall process including an energy term?

What is the name of the process by which all most all eukaryotic cells access chemical energy? Write the balanced chemical equation for the overall process including an energy term?

What are the sources of free CO_2 in lake water?

What consumes free CO_2 in lake water?

What could happen if CO_2 concentrations becomes higher than an acceptable range

What are the sources of dissolved O_2 in lake water?

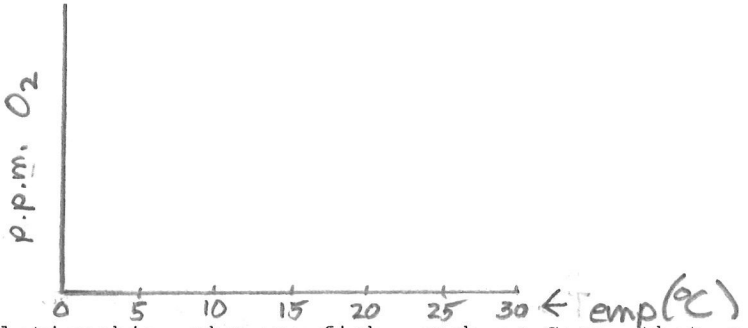
What can remove dissolved oxygen from lake water?

What could happen if dissolved oxygen levels becomes lower than an acceptable range?

What does it mean when water is said to be saturated with dissolved oxygen?

Connor Sam and Ryan

Sketch a curve that represents the saturation level of oxygen in water versus temperature.



Given the above relationship, why are fish, such as Carp, that can live in low oxygen levels often found warm shallow water?

Why are fish such as Trout, that require relatively high levels of oxygen often found only in deep waters during the warmer months of summer?

What are some of the uses of the essential mineral calcium?

Why would a crayfish have greater difficulty with low calcium levels than a minnow?

Why is the ground and lake water in the Owen Sound area particularly rich in calcium and magnesium (i.e. water hardness is very high in this area)?

What are the sources of the nutrients nitrogen (ammonia and nitrate) and phosphorus (phosphate)

What effect does low levels of these nutrients have on an aquatic ecosystem?

What does pH stand for, what is the mathematical relationship? what does this mean with respect to a pH change of one pH unit?

What is the pH of neutral water?

What would be a healthy pH range for an aquatic ecosystem?

Keir Tristen and Shane

BIOTIC REQUIREMENTS FOR LIFE:

Where does the energy requirements for both terrestrial and aquatic ecosystems ultimately come from?

When energy is transferred up the food chain (web), what is the approximate percentage of the energy is available for use to the next trophic level? What are some reasons for this?

What organisms are at the bottom of the food chain (web) in an aquatic ecosystem?

Give an example of as long as possible of a food chain (web) in an aquatic ecosystem. List the trophic level for each entry in your food chain.

What organisms or stages of lift are most affected by poor water quality (i.e. reduced pH due to acid rain)? Why is this so?

What effect does this have on the rest of the food chain (food web)?

What visual evidence "clearly" indicates at there is a problem in Nellie Lake? How does this compare with Murray Lake

Why are beaver and humans not vulnerable to the reduce pH present in Nellie Lake?

Connor Sam and Ryan

ACID RAIN:

What is the source of natural acid rain? What is the name and formula of the acid that forms from this natural source? What is the chemical equation for its formation.

Where and what is the most significant source of acid rain in this locality?

What is the name and formula of this acid that forms from this pollutant? What are the chemical equations for its formation?

Where else are significant quantities of sulphur dioxide produced?

What is the second most significant source of acid rain from human activity? What is the name and formula of this acid that forms from this pollutant? What are the chemical equations for its formation?

What is meant by buffering capacity in water with respect to acid rain?

What is the chemical reaction for the natural buffering that occurs in the Owen Sound area? How is this related to the bed rock in that area?

How can low pH levels in lake water affect the levels of other potentially toxic substances? Give a specific example.

Mark Reed and Pierino

Temperature Profile Study (Nellie Lake):

Temp. (°C)	Resist. (Ω)
0.5	34.0
1.0	33.7
1.5	33.2
2.0	32.5
2.5	31.7
3.0	31.2
3.5	30.6
4.0	29.8
4.5	29.3
5.0	28.5
5.5	27.7
6.0	26.8
6.5	26.0
7.0	25.4
7.5	24.5
8.0	24.0
8.5	23.3
9.0	22.6
9.5	22.1
10.0	21.6
10.5	21.2
11.0	20.5
11.5	19.9
12.0	19.4
12.5	18.9
13.0	18.4
13.5	18.0
14.0	17.6
14.5	17.2
15.0	16.8
15.5	16.3
16.0	15.9
16.5	15.5
17.0	15.2
17.5	14.9
18.0	14.5
18.5	14.1
19.0	13.7
19.5	13.4
20.0	13.1

Depth (m)	Resist. (Ω)	Temp. (°C)
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

Depth (m)	Resist. (Ω)	Temp. (°C)
20		
21		
22		
23		
24		
25		
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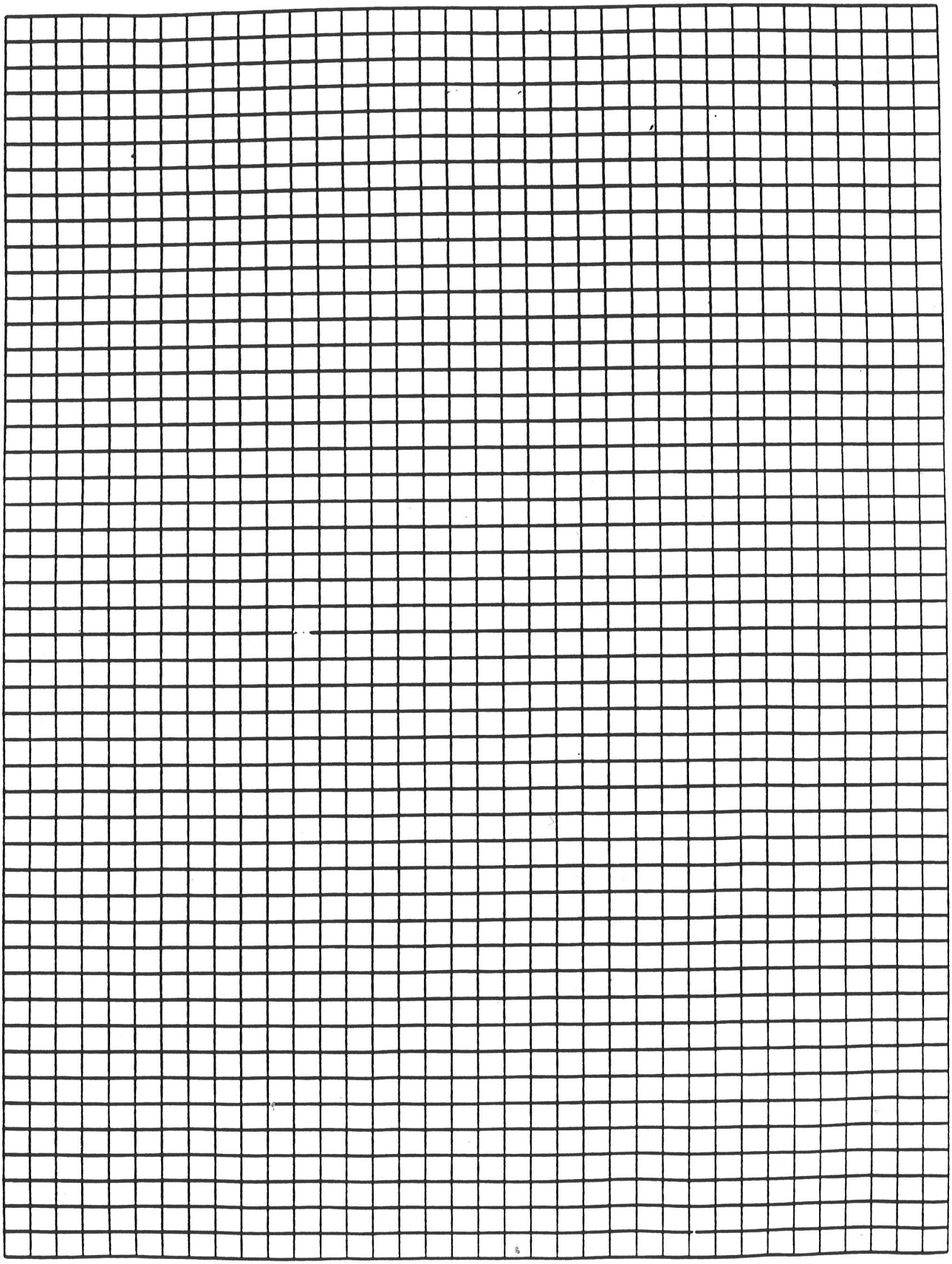

Nellie Lake Data - 2015

Site Location:	Date:

Site Description:	Water Surface Temperature
	pH:
.	secchi depth:

alkalinity	_____ mL(tt) x 1.0009 / _____ L(sv) = _____ p.p.m. $CaCO_3$	
	Nellie: _____ p.p.m. Bognor: _____ p.p.m. Murray: _____ p.p.m.	
dissolved cxygen	_____ mL(tt) x 0.0992 / _____ L(sv) = _____ p.p.m. CO_2	
	surface (1 m) _____ mL(tt) _____ p.p.m. O_2	bottom (___ m) _____ mL(tt) _____ p.p.m. O_2
total hardness	_____ p.p.m. $CaCO_3$	
	Nellie: _____ p.p.m. Bognor: _____ p.p.m. Murray: _____ p.p.m.	
*titrant volume in mL / sample volume in L = p.p.m. (stoichiometric simplification!!)		

Aquatic Macroinvertebrate Study

Result of Trent Biotic Index:_____

Nellie Lake Data - 2015

Site Location:	Date:

Site Description:	Water Surface Temperature
	pH:
	secchi depth:

alkalinity	_____ mL(tt) x 1.0009 / _____ L(sv) = _____ p.p.m. $CaCO_3$	
	Nellie: _____ p.p.m. Bognor: _____ p.p.m. Murray: _____ p.p.m.	
dissolved cxygen	_____ mL(tt) x 0.0992 / _____ L(sv) = _____ p.p.m. CO_2	
	surface (1 m) _____ mL(tt) _____ p.p.m. O_2	bottom (___ m) _____ mL(tt) _____ p.p.m. O_2
total hardness	_____ p.p.m. $CaCO_3$	
	Nellie: _____ p.p.m. Bognor: _____ p.p.m. Murray: _____ p.p.m.	
*titrant volume in mL / sample volume in L = p.p.m. (stoichiometric simplification!!)		

Aquatic Macroinvertebrate Study

Result of Trent Biotic Index: _____

ALKALINITY

The alkalinity of a water sample refers to its capacity to neutralize acid. It is caused by bases (alkalis) and basic salts in the water. The most common bases are the hydroxides of sodium, calcium, magnesium, and other metals. The most common basic salts in natural waters are the carbonates and bicarbonates of the same metals. Alkalinity is not a pollutant. It is a measure of the sum total of all the substances in water which have "acid-combining" ability. ***Alkalinity levels within natural waters should range between 100mg/l and 120mg/l.*** Bodies of water with lower alkalinity levels are more susceptible to fluctuations in pH, threatening aquatic plants and animals.

Alkalinity:

A measure of the amount of carbonates, bicarbonates, and hydroxide present in water. Low alkalinity is the main indicator of susceptibility to acid rain. Increasing alkalinity is often related to increased algae productivity. Expressed as milligrams per liter (mg/l) of calcium carbonate (CaCO3), or as microequivalents per liter (ueq/l). 20 ueq/l = 1 mg/l of CaCO3.

CARBON DIOXIDE

Carbon Dioxide is an odorless, colorless gas produced by animals and bacteria that respire. All animals and most bacteria need oxygen to breathe, but the waste product of this is Carbon Dioxide. Plants in a body of water use carbon dioxide to grow and release oxygen as their by product. Without the plants, carbon dioxide levels would grow to such a highly concentrated level that the area will not be able to sustain fish. Fish can tolerate up to to 6.0 mg/L, but will try to avoid these waters if possible. Most fish can adapt to low levels of CO2, and have no side effects, but if the level of CO2 exceeds 12 mg/l most fish will begin to die. Carbon dioxide combines with other organic compounds in water to form carbonic acid. This can cause fluctuations in the pH of a body of water which in turn can affect toxicity of other compounds in water such as ammonia nitrogen. ***For these reasons carbon dioxide levels in bodies of water should not exceed 6.0 mg/l.***

Key to the Genera

1. Leaves not evergreen ..... Larch
1. Leaves evergreen 2
2. Leaves needlelike 3
2. Leaves scalelike 10
3. Leaves in fascicles (bundles) of two or more ..... Pine
3. Leaves growing singly 4
4. Trees 5
4. Shrubs 9
5. Leaves square in section (except Sitka Spruce), growing from woody pegs ..... Spruce
5. Leaves not square in section 6
6. Leaf scars flat, circular; buds round, resin-coated ..... Fir
6. Not as above 7
7. Cones with trident-shaped bracts; buds pointed ..... Douglas-fir
7. Not as above 8
8. Trees with drooping leader; leaves not more than 2 cm long, with thin stalk ..... Hemlock
8. No drooping leader; leaves dark above, pale below, up to 2.5 cm long ..... Yew
9. Leaves stiff, curved, sharp, with white line ..... Common Juniper
9. Leaves flat, dark green above, pale green below ..... Yew
10. Branchlets bushy ..... Juniper
10. Branchlets forming flat sprays 11
11. Pairs of scale leaves alternately flat and folded ..... Arborvitae
11. All pairs of leaves partly folded ..... False-cypress

Key to the Spruces

1. Leaves almost flat; near the west coast ..... Sitka
1. Leaves square in cross section; not near west coast 2
2. East of Lake Superior 3
2. West of Lake Superior 5
3. Twigs completely hairless ..... White
3. Twigs fuzzy with short brown hairs (use a lens) 4
4. Cones long and narrow ..... Red
4. Cones short, almost spherical ..... Black
5. Leaves short (about 1.2 cm long), twigs hairy ..... Black
5. Leaves longer (about 3 cm) 6
6. Leaves acid-tasting when chewed ..... Blue
6. Leaves not acid-tasting 7
7. Cone-scales smooth-edged, scarcely longer than seed wings ..... White
7. Cone-scales rough-edged, much longer than seed wings ..... Engelmann

Key to the Pines

1. Two or three needles per bundle (hard pines) 2
1. Five needles per bundle (soft pines) 6
2. Two needles per bundle 3
2. Three needles per bundle 5
3. Western tree ..... Lodgepole
3. Eastern tree 4
4. Needles 10 cm or more in length ..... Red
4. Needles 6 cm or less in length ..... Jack
5. Western tree ..... Ponderosa
5. Eastern tree (St. Lawrence valley only) ..... Pitch
6. Needles thick and stiff. Exposed mountain habitats 7
6. Needles slender and soft. Tall forest trees 8
7. Cones long (more than 7 cm), cylindrical ..... Limber
7. Cones short (less than 7 cm), egg-shaped ..... Whitebark
8. Eastern tree ..... Eastern White
8. Western tree ..... Western White