Name_____Date_____Hour_____

ACID RAIN AND CARBONATED LAKES

Lesson Outcomes:

Through this lesson you will understand the dynamics of acid rain and its impact on the living and non-living environment.

Hypothesize how acid rain affects the pH levels in two different lake systems with two differing watershed features.

Make graphs using two sets of data.

Interpret data from graphs.

Objectives:

You will be investigating the relationship between acid rain and pH levels in two lakes: Morehouse Lake in the Adirondacks and Seneca Lake in the Finger Lakes. To do this you will be using data on pH levels collected from both lakes for the years 1993-2007 and making a graph. Using this graph and one provided for you, you will be using these graphs to answer questions.

Activity:

Using the data provided on Morehouse Lake and Seneca Lake, make a graph that shows the pH levels over the years given. Use the graph paper provided.

Morehouse Lake Data

Year	Avg pH
1993	5.6
1994	5.1
1995	4.4
1996	4.2
1997	5.6
1998	6.1
1999	6
2000	6.3
2001	5.9
2002	6.3
2003	5.8
2004	5.8
2005	5.7
2006	5.8
2007	6

Seneca Lake Data

Year	Avg pH
1993	8.3
1994	8.2
1995	8.2
1996	7.9
1997	8.1
1998	8.5
1999	8.7
2000	8.7
2001	8.7
2002	8.5
2003	8.8
2004	8.5
2005	8.5
2006	9.2
2007	9.3

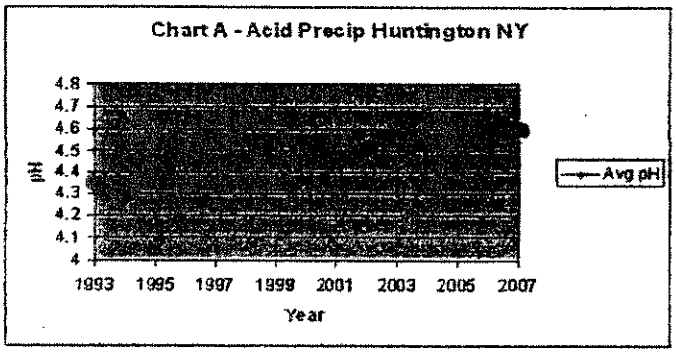
Questions and Analysis:

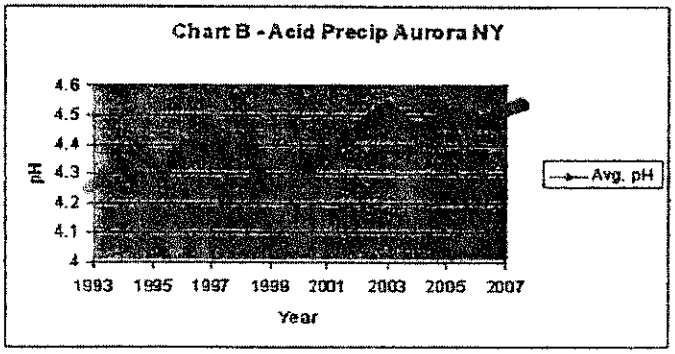
1. What is the general trend of the pH levels in the lakes over the past ten years?

2. How would you explain this trend?

3. Which lake has a greater potential to buffer the effects of acid rain? Why?

Refer to the charts below and answer the following questions.





4. What trend do you see in these charts?

5. Explain the possible reasons for this trend.

6. Are there differences or similarities between the acid precipitation in the Adirondacks (Huntington, NY) and the Fingers Lakes (Aurora, NY)? How do you know?

7. Using the graphs you made, explain how acid rain in both regions impacts pH levels in the lakes.

8. Why are their differences in how the acid rain affects the pH levels in Morehouse Lake vs. Seneca Lake?

Using the chart below, answer the following questions.

9. During the years 1993-1999 what would the health level of aquatic life have been in Morehouse Lake and how would this have affected aquatic life found in the lake?

10. How does the health level of Seneca Lake compare to Morehouse Lake? How would aquatic life have been affected in Seneca Lake?

pH and Effect on Aquatic Organisms

Health Level	pH	Effect
1	3.0 - 3.5	Unlikely that fish can survive for more than a few hours in this range.
2	3.5-4.0	Known to be lethal to salmon species.
3	4.0-4.5	All fish, most frogs, and insects are absent.
4	4.5-5.0	Mayfly and many other insects absent. Most fish eggs will not hatch.
5	5.0-5.5	Bottom dwelling bacteria (decomposers) begin to die. Leaf litter and detritus begin to accumulate, locking up essential nutrients and interrupting chemical cycling,. Plankton begin to disappear. Snails and clams absent. Mats of fungi begin to replace bacteria in the substrate. Metals (aluminum, lead) normally trapped in sediments are released in the acidified water, which are toxic to aquatic life.
6	6.0-6.5	Freshwater shrimp absent. Unlikely to be directly harmful to fish.
7	6.5-8.2	Optimal range for most organisms.
8	8.2-9.0	Unlikely to be directly harmful to fish. Indirect effects could occur due to chemical changes of the water.
9	9.0-10.5	Likely to be harmful to salmon species and perch if level persists.
10	10.5-11.0	Rapidly lethal to salmon species. Prolonged exposure is lethal to species such as carp and perch.
11	11.0-11.5	Lethal to all species of fish.