Cary Institute of Ecosystem Studies

Data Explorations in Ecology Project

Name _____ Date _____

Salt Pollution & Land Use

1. Explain how pollutants get from the surface of the ground into the water underground.

_____

_____

_____

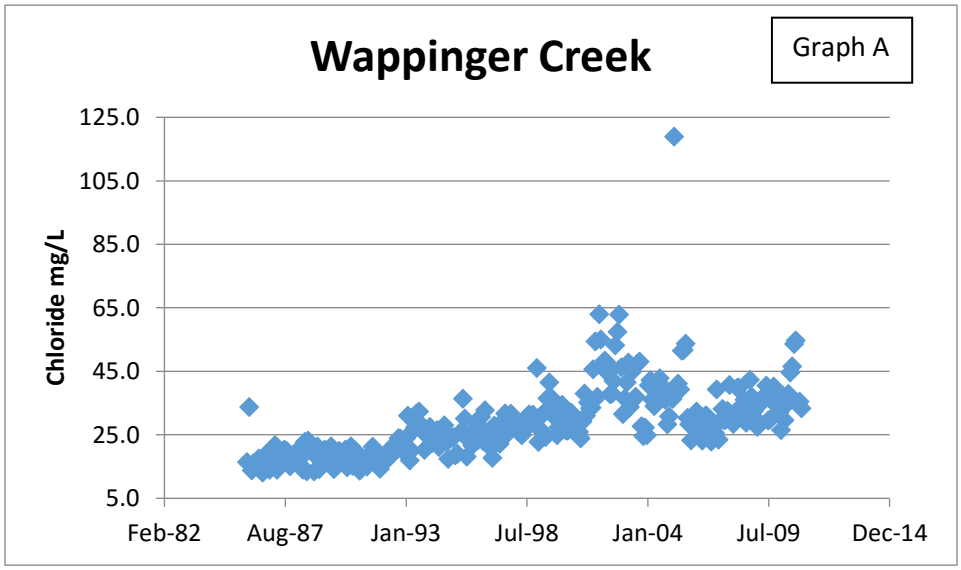
2. If current practices continue, what do you think will happen to the concentration of salt in groundwater and surrounding streams? Why?

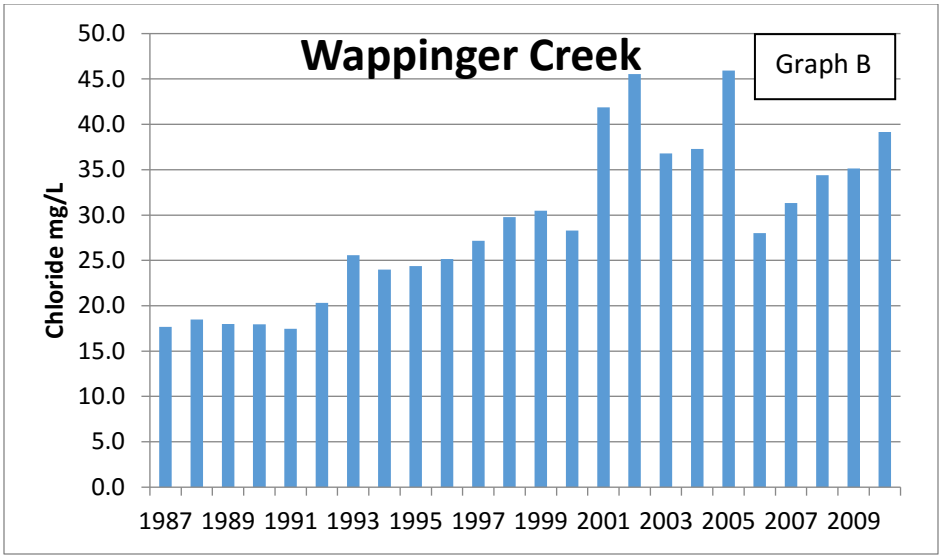
_____

_____

_____

3. Use the graphs to answer the questions that follow. Both of the graphs show the same data; in Graph B, all of the data for each year (one sample per month) have been averaged together.





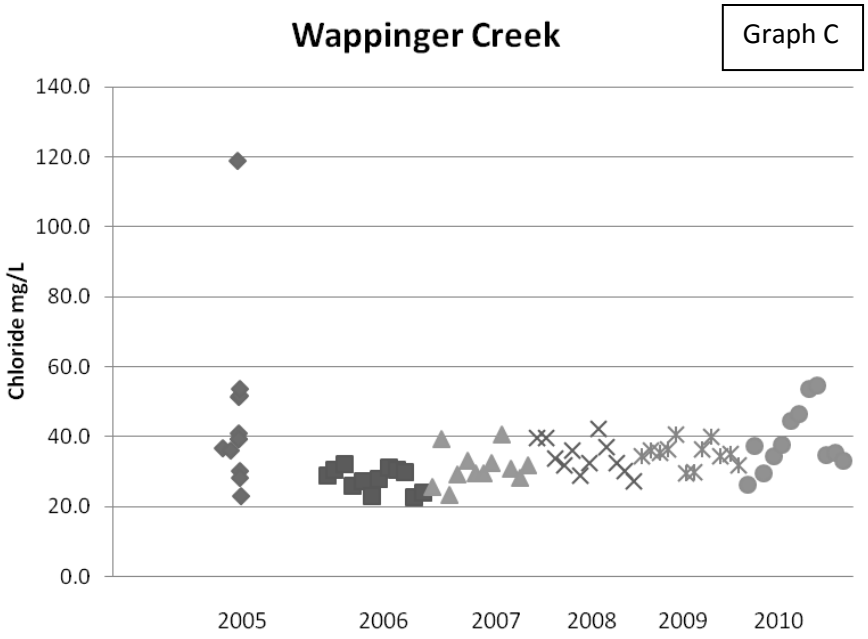
a. Explain the trend you see in chloride concentrations in the Wappinger stream.

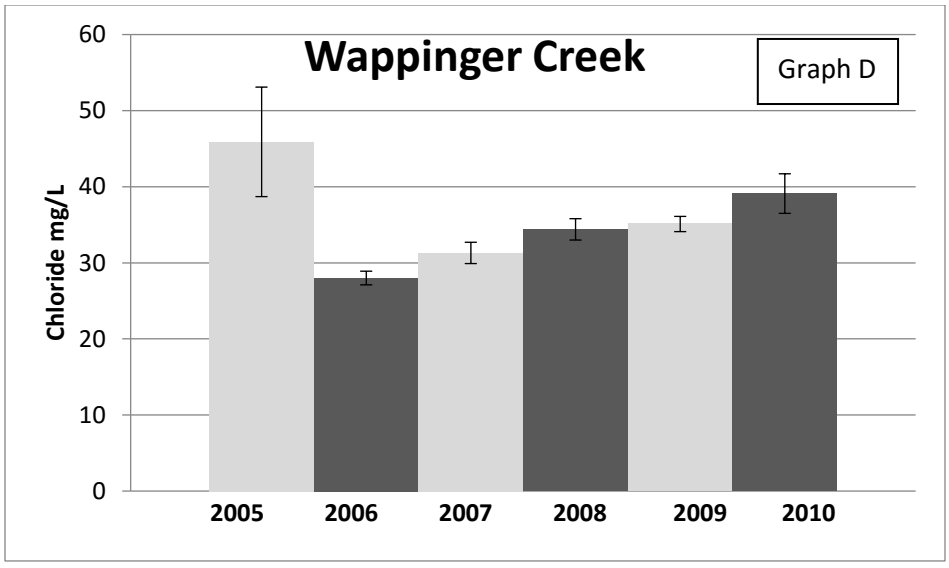
b. Which graph do you think more clearly shows the trend? Explain.

c. Complete the chart below for Graphs A & B:

Benefits of the scatterplot: (Graph A)	Benefits of the bar graph: (Graph B)
Drawbacks of the scatterplot:	Drawbacks of the bar graph:

4. Use the graphs to answer the questions that follow. Both of the graphs show the same data. In Graph D, all of the data for each year have been averaged together. The error bars show you how much of a difference there is between the average of each year and the range of the data (standard deviation). The larger the error bar, the larger the standard deviation of the data in that year – so, because of the outlier in 2005, the spread of the data are larger and the error bar is larger.





a. Explain the trend you notice in the Wappinger Creek chloride levels from 2005-2010.

b. Which graph do you think more clearly shows the trend? Explain.

c. Complete this chart for Graphs C and D:

Benefits of the scatterplot (Graph C):	Benefits of the bar graph w/ error bars (Graph D):
Drawbacks of the scatterplot (Graph C):	Drawbacks of the bar graph w/ error bars (Graph D):

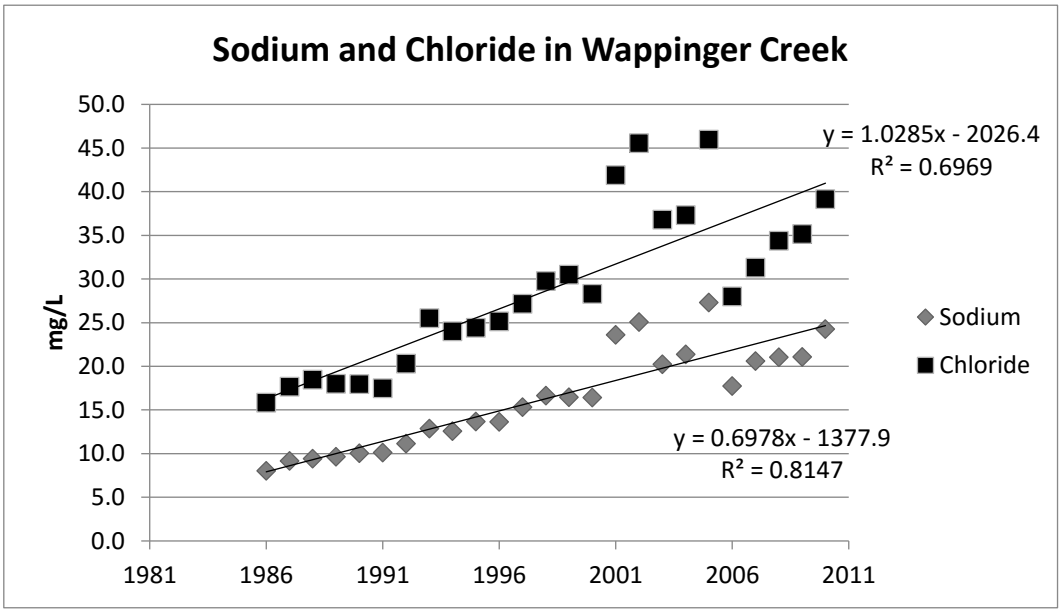
d. Which graph – A, B, C, or D, most clearly supports this claim:

Chloride levels are increasing in the Wappinger Creek.

Circle one: A B C D

Explain your answer:

5. Look at the graph below. This graph shows the trend in sodium and chloride in the Wappinger Creek since 1985.



a. Based on this graph, what has happened to the concentrations of sodium and chloride in the Wappinger Creek since 1985?

b. Look at the two line equations for sodium and chloride. Based on these equations, is sodium or chloride increasing more rapidly in the stream? _____

c. Explain how you got your answer.

d. Each line has an "R^2" value associated with it. This r value is the amount of variation in your data set that is explained by fitting the line, so that you know your relationship is actually valid – in other words, if you have a data set where almost all of the points fall along the line (are "explained" by the line), your r-squared value will be very high. Based on the information in the graph, which variable (sodium or chloride), is better described by the line?

e. Based on what you know about these data, explain how confident you are in the trend you explained in part (a).

6. Finally, look at the chart below that shows the amount of impervious surface in several watersheds around the Hudson River valley. Use this information, plus what you have learned in this unit (especially about your own watershed), to complete the claims-evidence-reasoning boxes that follow. The chloride data are yearly averages from the sites; please note that the East Branch of the Delaware River does not have the same date range as the other sites due to lack of sampling in that period of time, and thus is not included in this chart.

Watershed	**% impervious**	**Chloride changes**	**% increase in Chloride from 1993-2004**
East Branch of the Wappinger Creek	9 %	1993: 25.5mg/L 2004: 37.3 mg/L	146%
Sawkill Creek	14 %	1993: 25.8 mg/L 2004: 39.6 mg/L	153%
Sparkill Creek	50 %	1993: 81 mg/L 2004: 95.7 mg/L	118%
Esopus Creek	7 %	1993: 5.4 mg/L 2004: 5.5 mg/L	2%

Claim: Make a claim about why you think the chloride levels are changing	
Evidence: Provide evidence to support your claim	
Reasoning: Explain how your evidence supports your claim	

7. What else would you like to know in order to feel more confident in your claim?

8. How can you remove salt from water? Explain:

9. Consider what your answer to #8 means for the streams, rivers, and other aquatic ecosystems around the world. Is it actually possible to remove the current salt pollution from our ecosystems? Why or why not? What are the consequences of this for local ecosystems?

10. Based on what you have learned about salt pollution, do you think we should try and reduce our use of salt on our roads? Why or why not?