**Instructions**:

Read the two following sections from the WP Chemistry Online Textbook. Then complete the assignments.

1. [3.10 Focus on the Environment – Acid Rain](http://www.wou.edu/chemistry/courses/online-chemistry-textbooks/3890-2/ch104-chapter-3-ions-and-ionic-compounds/#acidrain)
2. [4.6 Focus on the Environment – The Love Canal](http://www.wou.edu/chemistry/courses/online-chemistry-textbooks/3890-2/ch104-chapter-4-covalent-bonds-and-molecular-compounds/#lovecanal)

**Part 1 Assignment**: **Acid Rain and Related Topics**

Follow the link to [EPA Acid Rain Page](https://www.epa.gov/acidrain) under Related Links at the course homepage. Read the information at this page, and explore others too if you want. Follow the top link on the left to: [What Is Acid Rain?](https://www.epa.gov/acidrain/what-acid-rain) Go to the bottom of this page and link to [National Atmospheric Deposition Program (NADP).](http://nadp.slh.wisc.edu/)

At the top of the NADP web page, select the third blue tab from the left labeled “Maps and Data”. Follow the link on the left to [Annual Maps](http://nadp.slh.wisc.edu/data/annualmaps.aspx). At that page beneath “Available Maps”, link to “NTN maps” (animated maps are optional), and follow the link to Annual Gradient Maps near the top. Explore and view the maps (pdf files are easiest). These maps show the U.S. distribution of pH and concentrations of different oxides and cations that are relevant to acid rain and its products, for the years 1985 to 2016, and how conditions have changed through time. The term “Deposition” refers to accumulation by rain, fog and snow.

Answer the following questions (these can be typed or handwritten)

1. View maps for Lab pH and Lab H+ (especially earlier years) to see the distribution of acid rain in the U.S. What part of the country has the biggest acid rain problem? Why is it located there?
2. 1. Look at the maps of Lab pH. Overall did the pH increase or decrease from 1994 to 2015? Does this reveal a change to more acid or less acid rain?
   2. What has been the main control on the change in pH over time? Hint: read “Acid Rain Program” at the Acid Rain home page, please think about the information provided here.
3. Now look at maps for SO4. How has the concentration of the sulfate ion changed through time (increase or decrease)? Do you think this change is related to changes in pH? Why or why not?
4. 1. What is the main factor that controls the concentration of Ca2+ in the U.S.? Hint: look at the geologic map of the U.S. at the course web page (posted next to the link to EPA Acid Rain).
   2. How does the presence of limestone in a lake or watershed help to moderate (buffer) pH? For b, please include the relevant chemical reactions that we discussed in class.
5. For any given year (see for example 2006), what is the geographical distribution of the highest chloride (Cl) ion concentrations (mg/L)? Why are the high values located where they are?
6. Go to the PRISM Climate Data page for precipitation at <http://www.prism.oregonstate.edu>. This is an excellent source of climate data. Link to Comparisons, and then Anomalies.
   1. In March, 2015, where were the two highest positive precipitation anomalies in the U.S.?
   2. In March, 2016, what two states had the most severe negative precipitation anomalies in the U.S.?
   3. Select annual comparisons and look at precipitation in California for the years 2010 and 2013. Which of these two years had the positive anomaly, and which year had the negative anomaly?

**Part 2 - EPA Assignment:**

1. Explore the [EPA Superfund Website.](https://www.epa.gov/superfund)

2. Scroll down to the bottom of the page and select ‘Sites Where You Live’

3.  Select ‘Your State’ and Show ‘All Sites’.

4. Select a Superfund site within your state and write a 1-2 paragraph summary describing your chosen site. In the first paragraph, describe the type of toxic waste that is found at the site and what the health and environmental impacts are due to the pollution. In a second paragraphs, describe who is responsible for generating the pollution and what has or is currently being done to restore and clean up the site. Be sure to include the monetary cost of the clean up in your response if it is disclosed and what parties are paying for the clean up.