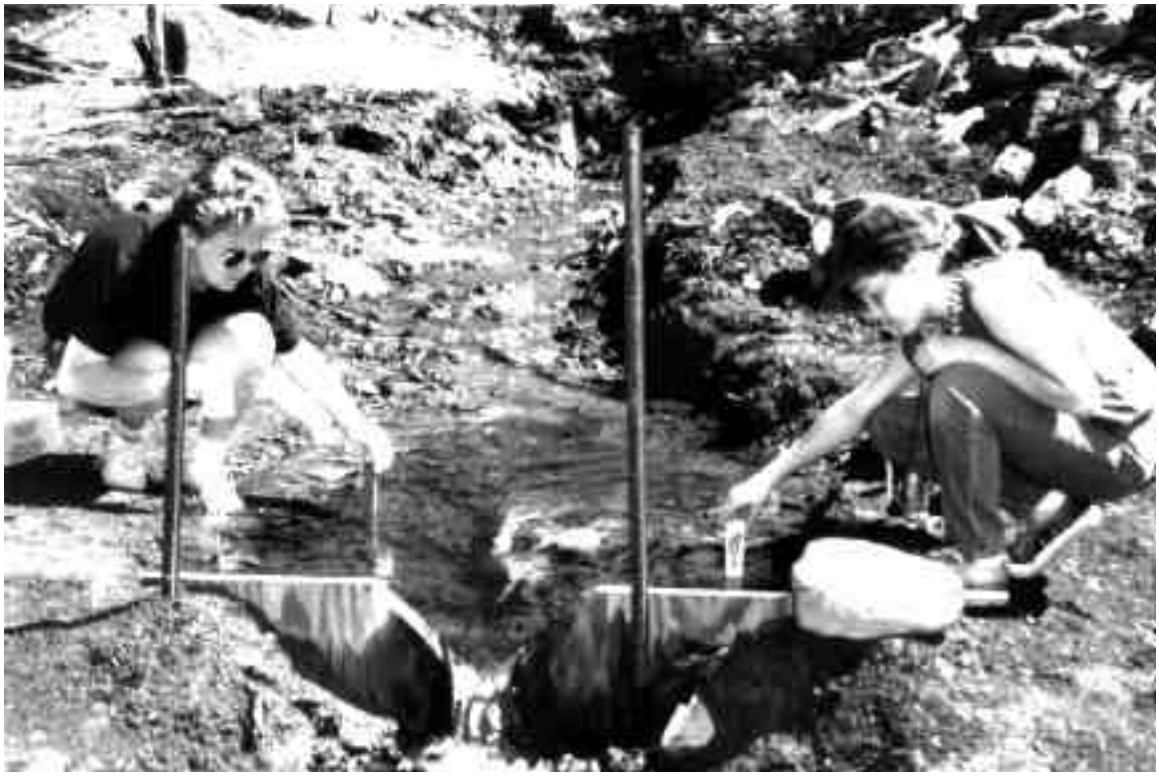
#15: Acidity/Acid Precipitation



Danielle Swanger and Robin Clark take pH water tests at a polluted stream impacted by acid mine drainage.

Goal:

The students will examine the effects acidity/acid rain has on the environment in general and in more detail on water quality and aquatic life.

Objectives:

1. **The students will define and recall the term "acid rain" as well as other related acid rain terminology.**
2. **The student will explain the impact burning fossil fuels has on the creation of acid precipitation.**
3. **The students will explain the difference between acid and base using pH parameters.**
4. **The students will explain the consequences high levels of acidity have on aquatic life.**
5. **The students will list examples of acidic and alkaline substances.**

6. **The students will describe the consequences that increased usage of fossil fuels has on the environment.**
7. **The students will appreciate the cost involved in attempting to resolve environmental problems created by burning excessive amounts of coal.**
8. **The students will learn/recall what can be done to reduce acid rain.**
9. **The students will conduct pH tests of local waterways.**
10. **The students will apply computer technology to enter, store, and retrieve collected pH data.**

Procedures:

The students study the topic of acidity/acid rain in the classroom and then visit a coal mine to witness first hand the impact that coal mining has on the environment. Numerous water monitoring tests, e.g., pH, dissolved oxygen, total hardness, alkalinity, occur to compare the water in this area to streams of good water quality. Tests are also conducted at an abandoned coal mine know to have acid mine drainage. The information is entered into a computer for different independent studies or projects of interest to the students.

Assessment:

Teacher-Made Test; Performance Assessments, e.g., students 1) conduct water monitoring tests like pH, dissolved oxygen, dissolved solids; Alternative Assessment, i.e., voluntary individual/small group environmental projects

Resources to Implement:

Teacher handouts:

- **Basic Facts About Acid Rain (from Acid Rain: A Student First Sourcebook)**
- **Water Pollution (Pennsylvania Fish/Boat Commission)**
- **Acidity in Pennsylvania (Pennsylvania Fish/Boast Commission)**

Videos:

- **Acid Rain: Requiem or Recovery (Pa Fish and Boat Commission)**

Transparencies:

- **pH range that supports aquatic life (Water Wise Lessons in Water Resources)**
- **How Acid Rain Forms (KARE Water Resources in PA)**

Literature:

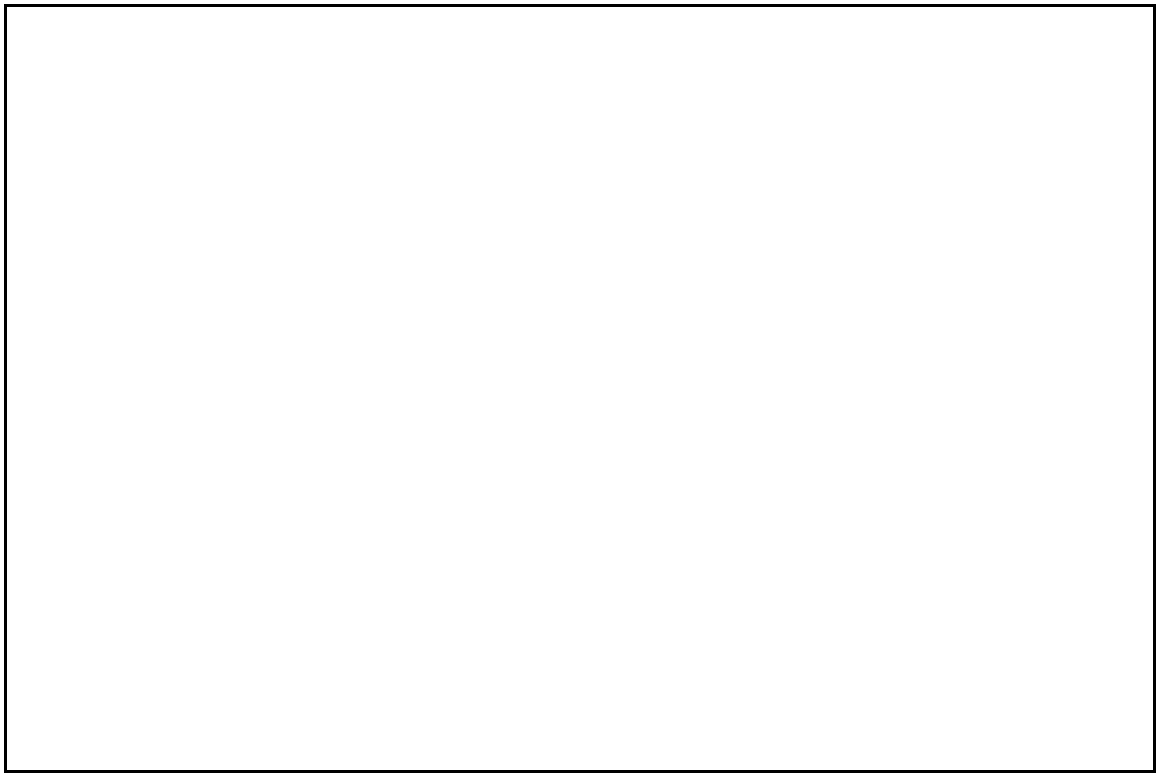
- **Acid Rain: A Student First Sourcebook, 1990 (EPA)**
- **How Acid Rain Forms (KARE Water Resources in PA)**
- **pH of Common Substances (Water Wise Lessons in Water Resources, 1989)**
- **pH range that supports aquatic life (Water Wise Lessons in Water Resources)**

Equipment:

- **Water Monitoring Kits (e.g., dissolved oxygen, water hardness, alkalinity)**
- **Water Monitoring Meters (e.g., dissolved oxygen, pH, dissolved solids)**
- **hip boots**
- **pH 7.0 Buffer solution**
- **VCR/TV**
- **Overhead Projector/Screen**

Field Study:

- **Joller Mine (abandon coal mining town/reclamation project)**



Students tour and examine this reclamation project consisting of several holding cells and wetlands to resolve an acid mine drainage problem.

Posters:

- **Numerous**

PA Academic Standards for Environment and Ecology:

- **4.1. Watersheds & Wetlands**
  - **Explain the effects of water on the life of organisms in a watershed**
- **4.3. Environmental Health**
  - **Know that plants, animals and humans are dependent on air and water**
  - **Identify how human actions affect environmental health**
  - **Describe how human actions affect the health of the environment, e.g., land use**
- **4.6. Ecosystems and their Interactions**
  - **Understand that living things are dependent on nonliving things in the environment for survival**
  - **Identify how ecosystems change over time**
  - **Explain how ecosystems change over time**
- **4.7. Threatened, Endangered & Extinct Species**
  - **Explain natural and human actions in relation to loss of species**
- **4.8. Humans and the Environment**
  - **Explain how human activities may change the environment**
  - **Explain how people use natural resources**
  - **Explain how human activities may affect local and regional environments**
- **4.9. Environmental Laws and Regulations**
  - **Know that there are laws and regulations for the environment**
  - **Explain the role of environmental laws and regulations**