



Humanities and the Sunshine State

What Sustains Us?

Florida Ecosystems in an Era of Rapid Change

University of Florida 20-24 June, 2016

'Website' - nature.nps.gov (acid rain)

ACTION PLAN TEMPLATE

Teacher(s): Coolican, Michelle

Grade(s): 8th

Subject(s): Science

Title of Lesson: Understanding what gases contribute to acid rain.

Learning Objectives:

Introduce students to acid rain and how it affects the Smoky Mountains National Park and beyond

Standards Addressed:

Acids, base, salts

Scientific methods (Nature of Science standards)

Lesson Outline:

Background Info $\Rightarrow$ Already taught (Cornell Notes, powerpoint, etc)
- pH scale, Def. of Acid Rain, Facts about Acid Rain:

- "Acid rain" coined in 1852 by Robert Angus Smith
- He made connections between London's polluted skies and the acidity of its rainfall
- Normal rain pH of 5.6
- Rain (pH of 7) H_2O reacts with CO_2 to form weak carbonic acid a thening pH.
- When pH is less than 5.6 it is considered acid rain
- Gases ^{that} rain reacts with in atmosphere SO_2 (NO_x) ^{nitrous oxides}
- The (H_2O) water captures (attracts) hydrogen (H^+) ions from the gases.
- How Acid Rain is measured - pH ^{paper} of some type of indicator

Systems thinking connection (learning habits and/or tools used):

How is acid rain connected to Human Impact and natural activities. How does $SO_2 + NO_x$ affect acid rain, CO_2 , Man + Industry, Lakes + Streams, Land, Natural Resources

Learning Strategies:

Models, Interpreting relationships (Cause + effect)

Science Concept(s): - Explaining Acids, pH scale, atoms, elements, molecules, compounds, pollution, Acid Rain, Climate, water cycle

Humanities Concept(s):

- Human's impact on natural resources, our role for preserving Natural Resources, Industry vs Environment

Student Assessment Strategies:

- What causes acid rain? ... where might acids form in the atmosphere? - What are some man made reasons for $SO_2 + NO_x$?

- What is causing an increase in $SO_2 + NO_x$? ... What is the US doing to reduce the amount of $SO_2 + NO_x$ in the atmosphere? ...

Benefit to my students:

- What can you do to help prevent acid rain? Why should you preserve our natural resources?

• Assessments would be mostly discussions followed up by a final writing explaining how our actions can affect our environment and our resources and ultimately what does it mean to us for our future.

Resources and Materials (supplies needed for activities):

- Systems Diagram for Acid Rain
- Background notes
- markers (orange, red, blue, green)
- lesson plan on nature.nps.gov (acid rain)

- Sources of Acid Pollution

- Since 1930 - 1950 Acidity of Rain in Eastern US has increased significantly

- SO_4 + NO_x mainly responsible

- these gases are caused by industrial factories, power plants + car emissions

- in 1980 22 million tons of NO_x were put into the atmosphere in the US

- Natural Sources - forest fires, lightning, Volcanoes etc.)

• Soil that has become acidic

• Air currents that carry NO_x + SO_2 long distances also pollutants in air

• Storm systems

Solutions

- Reduction of Pollution

- Cleaner Vehicles

• Nothing - How could Acid Rain affect our
make our Earth look in 20 yrs - Fictional writing
Human Impact

- Effects from Acid Rain

• Changing pH of lakes, streams etc

• 1978 NADP

• Damaging Natural Resources in our
National Parks

• what is the relationship between
human impact → acid rain → and natural resources

Then measure rainfall
and calculate the pH
and compare it to other regions
in the US.

Systems diagram
small groups / discussions

extension
- how does acid rain form and
- how does it affect US?
compute systems diagram

↓
- Teach Acids + Bases
- pH scale
- Lab -

Actual Lesson:

- Name 2 gases which significantly increase acidity of rainfall and ~~list~~ what contributes to this

①

- ① Have Students complete Systems diagram about how NO_x and SO_2 affect Acid rain and the effects of acid rain

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- ② Color code the main areas
 - where gases come from
 - orange for sources
 - Red for formation
 - Green for land
 - Blue for water

Systems Thinking: 3

- How do humans affect SO_2 + NO_x levels
- How do SO_2 + NO_x levels affect Forests + Lakes + Land?
- How does Industry affect Acid Rain?
- What would happen if we increased Industry?
- What would happen if we increased the amount of acid rain to our environment?
- How does the amount of CO_2 affect SO_2 + NO_x ?
- How does pollution affect our Land + Lakes?
- What does acid rain affect in our local environment? In the US? Globally?

- Where do we find a balance or what is the tipping point?

- Do humans have any control in the damage Acid rain does to our natural resources?

- Does it matter to humans if our natural resources are being affected by acid rain?
How & Why?

Carbon Dioxide

Acid Rain

Sulfur Dioxide

Nitrous Oxides

Forests

Humans + Industry

Land

Water

