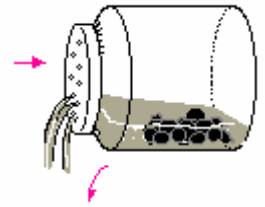


# Rock Bottoms

## Procedure

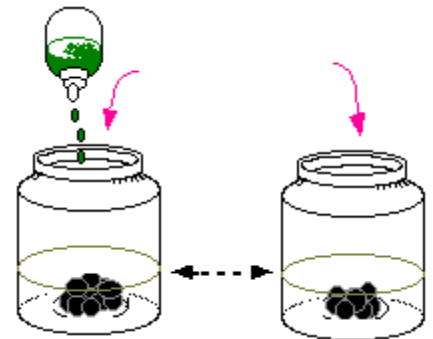
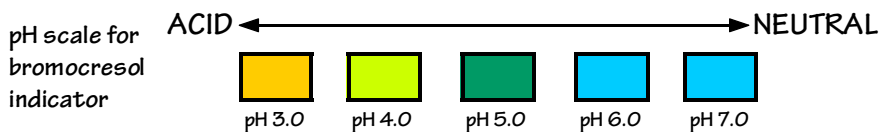
1. Always wear safety goggles.
2. Rinse the big jars without dumping the rocks out. To do this, remove the lids, pour some water into the jar, and put the lid back on. Swirl the jar a few times and then pour the water into the sink.

3. Remove the lids from both jars. Fill both jars to the black line with water. (These are your sample "lakes.")



4. Add 8 drops of bromocresol green indicator to each jar. Swirl or shake each jar to mix.

What color is the water in each jar?



5. Use the graduated cylinder to measure and add 10 ml of "acid rain" (nitric acid) to each jar.

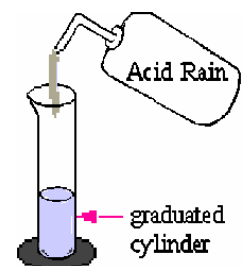
Does the water color change?

6. Put the lids on the jars and shake them to mix. Continue to shake both jars for 30 seconds.

What color is the water in each jar now?

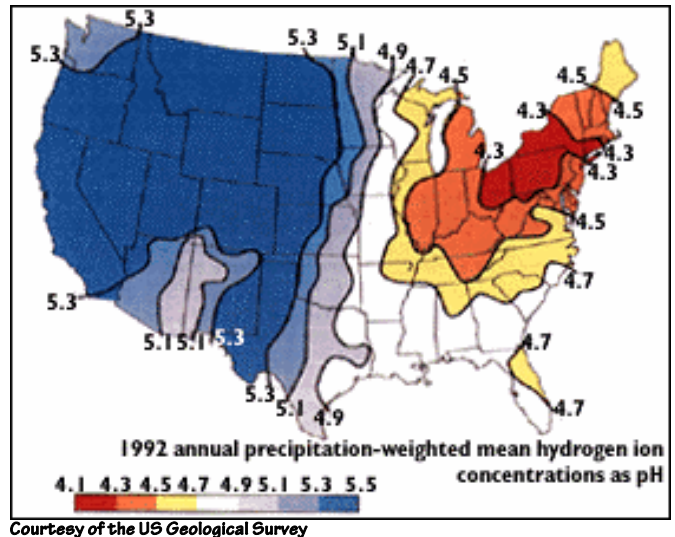
Are they the same or different?

Try adding more acid rain to the limestone lake. What happens?



7. To clean up, repeat step 2.

How can rocks in our lakes protect them from acid rain?



## A Closer Look:



In this experiment, you used bromcresol green, an **indicator** that is blue in neutral solutions and yellow in acid solutions. The blue color shows that the water in each lake started out neutral. When you added “acid rain,” the lakes became acidic and the indicator turned yellow. Gradually, the limestone lake returned to neutral (turned blue again), but the granite lake remained acidic.

Limestone is made mostly of calcium carbonate ( $\text{CaCO}_3$ ). Calcium carbonate reacts with acid in water, producing hydrogen carbonate ( $\text{H}_2\text{CO}_3$ ) and a neutral salt. Granite and other silicon-based rocks do not react with acid.

When two lakes receive the same amount of acid rain, only the lake with a limestone bottom will be able to neutralize the acid and remain neutral. Thus, a limestone lake will undergo fewer of the harmful environmental effects of acid rain.

As you can see from the map above, most acid rain in the US falls in the northeast. There, engineers are lining granite lake bottoms with a layer of limestone rock in order to protect them from acid rain.