

Ecosystem Disturbance Activity

Study the Hubbard Brook Experiment, and answer the questions below.

The Hubbard Brook clear-cut experiment is probably the most quoted ecosystem-scale study. An ecosystem-scale study examines the response of various components in an ecosystem, including time and space, to a type of change. Few studies like this exist, because it is difficult to maintain such a complex experiment over a long period of time. Herb Bormann and Gene Likens chose this region of the White Mountains in New Hampshire because the Hubbard Brook Experimental Forest could be partitioned into reasonably-sized, specific watersheds each drained by its own stream. Impermeable bedrock beneath the site allowed researchers to conduct input-output measurements by sampling precipitation and stream water at the base of the watersheds. For this study they monitored plant nutrient (calcium, potassium, nitrate) loss from the six watersheds by placing a weir across the stream exiting each watershed. A weir is a V-shaped dam that is used to create a small pond, allowing the researchers to gather water samples while at the same time continuously measuring flow and water height.

In one of the experimental watersheds “Watershed 2,” all vegetation was cut during the fall and winter of 1965, and an herbicide was applied for 3 years to inhibit regrowth. They measured concentration of major ions in stream water before and after the deforestation, including the years when herbicide was used.

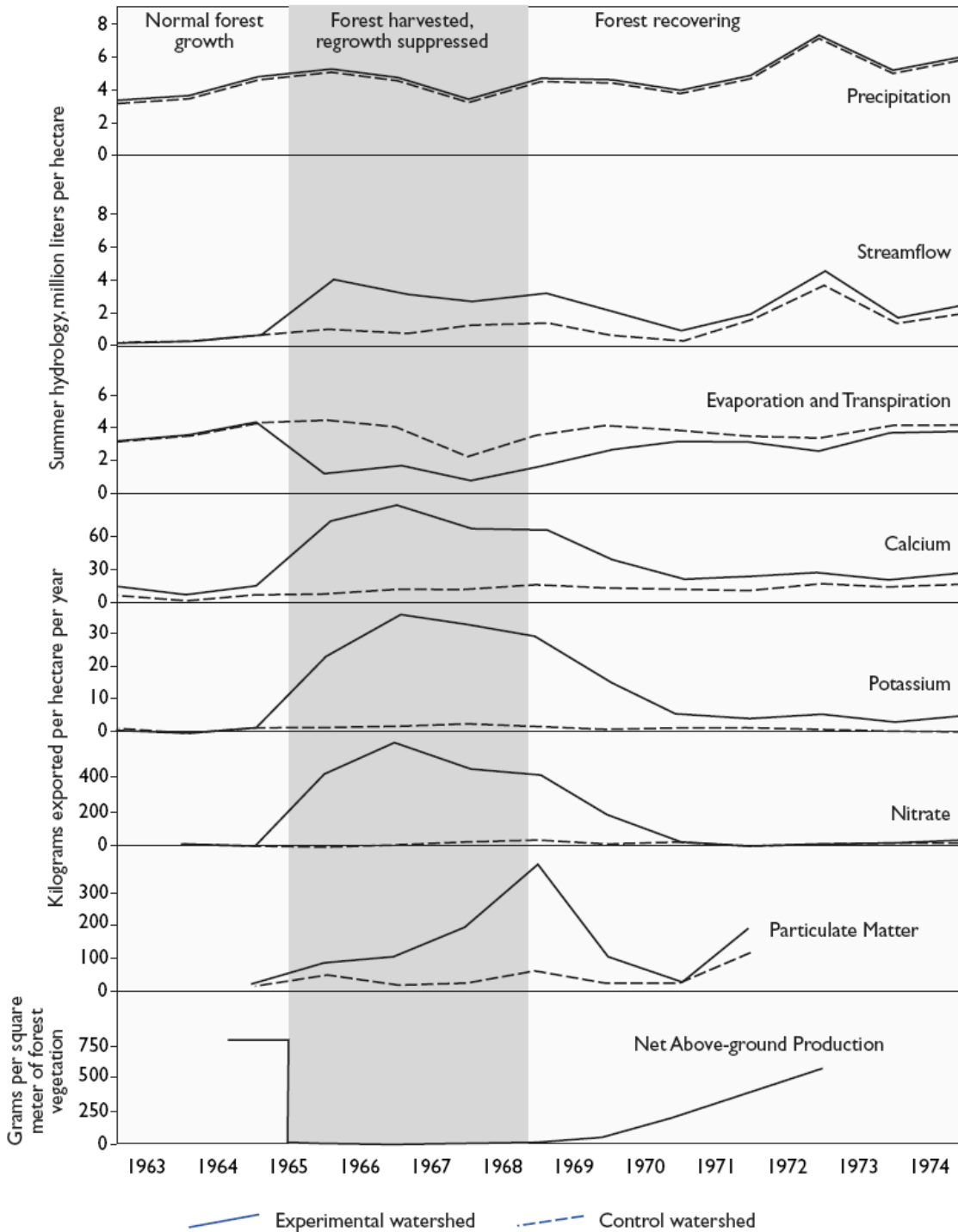
Answer the following questions:

1. Why did the researchers use herbicides to inhibit plant growth after deforestation?
2. Streamflow increased in streams exiting the deforested watershed. Why? Where did the extra water come from?
3. The research site was selected because it had impermeable bedrock. Why was this important in the experiment?
4. What happened to the levels of nitrate in the deforested watershed? Why do you think this happened? Why is this important?
5. Why did they measure aboveground biomass production (i.e. aboveground plant growth)? What does this tell you about the ecosystem?
6. Why do you think the researchers included a control watershed? Why couldn't they just measure the 'before,' 'during' and 'after'?
7. Based on this research, what can you say about the effects of deforestation?

Figure 1 shows precipitation, stream flow, net export of nutrients and particulate matter, and aboveground production in two watersheds in the Hubbard Brook Experimental Forest. Watershed 2 (solid line) was clearcut in 1966 and herbicides were applied monthly from fall of 1966 to winter 1969. Watershed 6 (dashed line) remained undisturbed. Nutrients and particulates were measured in a stream draining the watershed. Data are a composite from Likens, G.E., F.H. Bormann, R.S. Pierce, and W.A. Reiners. 1978. “Recovery of a deforested ecosystem.” *Science* 199:492-496.

Figure 1.

HYDROLOGY AND NUTRIENT EXPORT FROM TWO WATERSHEDS AT HUBBARD BROOK EXPERIMENTAL FOREST



Reference: Based on an activity by Charlene D'Avanzo from the Teaching Issues and Experiments in Ecology website: <http://tiee.ecoed.net>. Vol 1, 2004.