3263

Recovery Drill

An old volcano teaches ecologists some new tricks

Ten years ago last spring Mount St. Helens exploded, devastating 200 square miles of forest in the Pacific Northwest. The eruption blew down trees 15 miles away and sent avalanches of rock and mud coursing through river valleys. Close to the volcano, the destruction was absolute: a cloud of pumice and gas at a temperature of more than 600 degrees Celsius swept down the north slopes, incinerating everything in its path and creating a sterile "pumice plain." Today tens of thousands of downed trees carpet hillsides around the shattered volcano, recalling the blast's destructive power.

As the blighted landscape recovers, however, researchers are charting evolutionary and ecological processes that, they say, challenge conventional ideas about how ecosystems respond to disturbance. Some of the most intriguing observations arise from a hot stream created by the eruption. The stream, which emerges near the dome in the center of the crater, has a temperature of 80 degrees C at its main source; other outlets reach the local boiling point of 94 degrees C. Yet the steaming brook already harbors new life.

Mats of filamentous blue-green algae line much of the main stream, known as the Loowit. The algae thrive in temperatures of up to 59 degrees C, notes Clifford N. Dahm, a freshwater ecologist at the University of New Mexico. The same species of algae is found at Yellowstone National Park in Wyoming, where it grows at 72 degrees C.

At least two types of an ancient group of single-celled organisms, called Archaebacteria, are also growing in the Loowit. One, a sulfur-eating organism named *Thermoproteus,* survives in temperatures of up to 96 degrees C. Another, which seems to digest methane, now thrives at greater than 60 degrees C. Yet, when it was first sampled in 1982, the methane-digesting microbe could not withstand any temperature greater than 50 degrees C. The organism seems to be adapting rapidly to a new environment.

The main question puzzling Dahm and others is, How did the hot-water bacteria get to Mount St. Helens so quickly? In June, 1981, little more than a year after the main eruption, *Thermoproteus,* together with another bacterium that produces methane, was found in a steaming fumarole whose gases reached temperatures of more than 100 degrees C. Dahm cannot imagine bacteria drifting all the way from Yellowstone. Could they have been underground ever since Mount St. Helens last erupted, in 1800? Dahm says, "That's a hypothesis worth testing."

Many organisms also survived just a few miles away from the pumice plain, in spite of the scorched vegetation and the ash covering some areas to a depth of a foot or more. According to Fred J. Swanson, a Forest Service ecologist, survivors have been neglected in many descriptions of ecological recovery because of a misdirected emphasis. Classic studies focused on fields once used for farming. These fields support fauna and flora unlike those in natural landscapes, and so, according to the traditional view, during recovery species typical of the natural landscape must migrate in from outside, making for slow regeneration.

FIREWEED AND PEARLY EVERLASTING spring up beside shattered tree trunks at Spirit Lake, close to Mount St. Helens. Photo: Tim Beardsley.

At Mount St. Helens, however, many small animals and plants were protected by water or by pockets of snow. Animals dormant in dens or other sheltered areas at the time of the eruption also seem to have had an advantage. "The survivors were species that were keeping a low profile below the ground," Swanson says. "High-profile organisms, such as elk and Douglas fir, took it hard."

Chance also plays a large role in recovery after a major disturbance, says James A. MacMahon, an animal ecologist at Utah State University. Survivors have spread from havens throughout the blast zone, and so the landscape has been recolonized faster than most ecologists would have guessed. Although they cannot wander far from water, salamanders and Pacific tree frogs, for example, are now found throughout much of the blast zone.

Swanson points out that areas clear-felled before the eruption now support more plants than forested areas. The reason, he says, is that hardy weeds such as fireweed and pearly everlasting, which thrive in exposed conditions, were already established in the clear-felled areas.

In some places, species survived only to die later on. Ash-clogged streams often shifted during the years after the eruption, for example, choking seeds that had survived the disaster and were starting to sprout. The result was "terribly dramatic differences" between adjacent areas, according to Arthur McKee, a Forest Service ecologist who studies streams.

Biologists have been impressed by how even the remains of dead organisms can spur recovery. MacMahon has found that the leaves of a species of lupine decompose to woody skeletons that serve as drift nets for organic materials and seeds, including those of lupines. Likewise, downed trees have stabilized soil that might otherwise have been blown or washed away. The pumice plain, where there were no survivors, still supports fewer living things than other places.

Because Mount St. Helens is a unique ecological experiment, workers hope to establish long-term monitoring facilities at the mountain to track the recovery. They are seeking a $900,000 appropriation for the Forest Service to do so. In late September, however, the proposal was being held hostage to budget negotiations. —*Tim Beardsley*