Mountain meadows dwindling in the Pacific Northwest

November 2 2012

Conditions for a dense tree invasion are even more favorable near a 1934 debris flow off Mount Jefferson, compared to the islands of old trees dispersed in the meadow. Credit: Harold Zald, courtesy of Oregon State University

(Phys.org)—Some high mountain meadows in the Pacific Northwest are declining rapidly due to climate change, a study suggests, as reduced snowpacks, longer growing seasons and other factors allow trees to

invade these unique ecosystems that once were carpeted with grasses, shrubs and wildflowers.

The process appears to have been going on for decades, but was highlighted in one recent analysis of Jefferson Park, a subalpine meadow complex in the central Oregon Cascade Range, in which tree occupation rose from 8 percent in 1950 to 35 percent in 2007.

The findings of that research, which was funded by the Pacific Northwest Research Station of the USDA Forest Service, were published in the journal Landscape Ecology.

The changes in Jefferson Park are representative of a larger force that is affecting not only this beautiful meadow at the base of Mount Jefferson, scientists say, but many areas of the American West.

"We worry a lot about the loss of old-growth forests, but have overlooked declines in our meadows, which are also areas of conservation concern," said Harold Zald, a research associate in the College of Forestry at Oregon State University and lead author of this study.

Trees invade this mountain meadow near Mount Jefferson, Oregon, as a result of climate change. Credit: Harold Zald, courtesy of Oregon State University

"The first awareness of declining meadows dates back to the 1970s, and we've seen meadow reduction at both high and low elevations," Zald said. "Between climate change, fire suppression and invasive species, these meadows and all of the plant, animal and insect life that depend on them are being threatened.

"Once trees become fully established, they tend to persist, and seed banks of native grass species disappear fairly quickly," he said. "The meadows form an important part of forest biodiversity, and when they are gone, they may be gone forever."

The meadow decline takes place over several decades, like the melting

of glaciers. This also provides a way to gauge long-term climate change, Zald said, since the forces at work persist through seasonal, annual and longer patterns that are variably more wet, dry, hot or cold than average.

"It takes a long time to melt a glacier or fill in a meadow," he said. "It's a useful barometer of climate change over decadal time periods."

In this study, it appears that snowpack was a bigger factor than temperature in allowing mountain hemlock tree invasion of Jefferson Park, a 333-acre meadow which sits at the northern base of Mount Jefferson, a towering 10,497-foot volcano northwest of Bend, Ore. Seedlings that can be buried by snow many months every year need only a few more weeks or months of growing season to hugely increase their chance of survival.

The study also found surprising variability of tree invasion even within the meadow, based on minor dips, debris flows or bumps in the terrain that caused changes in snowpack and also left some soils wetter or drier in ways that facilitated tree seedling survival.

"The process of tree invasion is usually slow and uneven," Zald said. "But if you get all the conditions just right, some tree species can invade these meadows quite rapidly."

There's some suggestion that alpine meadows may simply move higher up on the mountain in the face of a changing climate, Zald said, but in many cases slopes become too steep, and poor-quality, unstable soils are unable to harbor much plant life.

In other research in recent years, Zald said, he looked at meadows on lower-elevation mountains in the Oregon Coast Range – what are called "grass balds" on the tops of some of the higher peaks, such as Mary's Peak, the highest point in that range west of Corvallis, Ore. In a study of

five Coast Range sites, Zald found that these "bald spots" had declined by an average of 50 percent between 1950 and 2000.

More information:
ir.library.oregonstate.edu/xmlui/handle/1957/34256

Provided by Oregon State University