landscape pattern within
udy stand.
,000 acres each located
:ade Range, the length of
gon Coast Ranges. Forest
d a computer program—
is being used to analyze
n.
/ashington Cascades have
n bird communities. Bird
asing clearcutting, up to
ıdy areas. Bird abundance
ut landscapes, indicating
ırcut areas (*packing*), or a
ntation did not appear to
hibian communities. Fur-
ascade and Coast Ranges
the most heavily logged
hope to provide a better
ıtion on wildlife commu-

s of Old-Growth Forests
l from Mount St. Helens

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gton, Seattle, Washington
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ı May 18, 1980, not only
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area that extends 60 miles
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l event.
t plots in mature and old-

growth forests of Pacific silver fir having a range of ash-damage classes. The distribution of plots covered several factors including distance from the mountain, elevation, and slope position. The measurements we took in our plots include diameter of all trees; radial increment, age and height of selected trees; depth of the ash layer; and a visual assessment of the severity of damage to the trees.

Preliminary results suggest that forest stands that are declining occurred almost exclusively in areas that received the finest ash deposits. However, despite relatively constant levels of this fine ash deposit, decline and mortality were extremely variable from stand to stand, and among trees within stands. Decline and mortality appeared to be closely related to the biological conditions of individual stands prior to the eruption. Clearly, the most vigorous stands (and trees within declining stands) survived better. We identified elevation, the relative dominance of Pacific silver fir within a stand, and the crown dimensions and age of individual trees as the most important factors determining vigor of Pacific silver fir in this area.

Above- and Below-ground Response of Coniferous Ecosystems to Tree-Fall Gaps

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Small canopy disturbances are important to the structure and function of forest ecosystems. Fine-scale disturbances (the death of one to many trees) largely control the population dynamics in our forests between larger catastrophic events. An experimental study of ecosystem responses to the creation of tree-fall gaps of varying size is being conducted in northwestern coniferous forests. Gaps were created in the fall of 1990 in mature (80 to 150 years) and old-growth (400–500 years old) ecosystems dominated by Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*). The research will be done at the H. J. Andrews Experimental Forest in the central Oregon Cascades and at the Wind River Experimental Forest in southern Washington. The study is a collaborative effort among the University of Washington, Oregon State University, Yale University, and the USDA Forest Service. Both above- and below-ground processes will be examined during the first three years of the study.

Five different gap sizes ranging from 0 to over 2,000 m^2 will simulate the death of 0, 2, 8, 16, and 32 trees. The response of understory vegetation to changes in nutrients and moisture, as well as increased light availability, will be closely followed. Spatial patterns of microclimate and soil resources will be examined to determine how within-gap variability affects ecosystem response to the gap. Experiments in which roots are severed by trenches dug around small plots will be conducted to examine the relative importance of below- and above-ground resources in plant growth and community response. The research will greatly enhance our understanding of the role of small disturbances in ecosystems of the Northwest. In addition, the study will provide an ecological basis for alternative silvicultural systems such as group selection methods. Small group cuts, for example, might be used to enhance diversity of younger relatively uniform stands or maintain the canopy cover in older stands, while obtaining some high quality wood products.

Nutrient Cycling in a Temperate Old-Growth Rain Forest, Hoh River, Washington

Ted Thomas and Robert Edmonds, College of Forest Resources (AR-10), University of Washington, Seattle, Washington 98195

As part of a long-term monitoring program sponsored by the National Acid Precipitation Assessment Program, we examined the chemical changes in precipitation occurring after interception by an old-growth temperate rain forest. The study took place in a small watershed at West Twin Creek, a tributary of the Hoh River in Olympic National Park, Washington. Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), and Pacific silver fir (*Abies amabilis*) were the dominant tree species. The chemical nature of precipitation changed significantly as it moved through the forest and into the soil and stream. The amount of change differed by the species, size of individual trees, and the density and character of the tree canopies.

Throughfall is defined as the flow of intercepted precipitation through a forest canopy; it incorporates the leaching of materials from the needles, as well as the contribution of deposited materials from the leaf surfaces. *Stemflow* is the flow of solutions down the stems of trees. The amount of water passing through the canopies (throughfall) was greatest (43% of annual precipitation) for the spe-

Understory vegetation, coarse
collectors on a western redceda
Park. Photo by T. B. Thomas.

cies with the smallest crow
amounts from *Pseudotsuga*
tation), most likely due to
stem surface area of these
were more concentrated th
uents, except nitrate. *Abies*
anion concentrations amor
stemflow. *Thuja* and *Pseudo*
precipitation pH averaged
solved organic carbon (DO
centrations averaged 34 m
stemflow for all four specie
ance deficit (cations minus
compared to throughfall (2
nation of high DOC and
acidic solutions passing int

Further changes occurred
into West Twin Creek. Wit
duced and the streamwater
HCO_3^-, and $SO_4^=$, which we