AN INTRODUCTION TO THE
H.J. ANDREWS EXPERIMENTAL FOREST

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HJ Andrews Experimental Forest
Long-Term Ecological Research Program

Hidden deep in the Oregon woods is a majestic, wild and ancient place known to a generation of scientists as the Andrews Experimental Forest.

The Hidden Forest: A biography of an ecosystem by J. R. Luoma

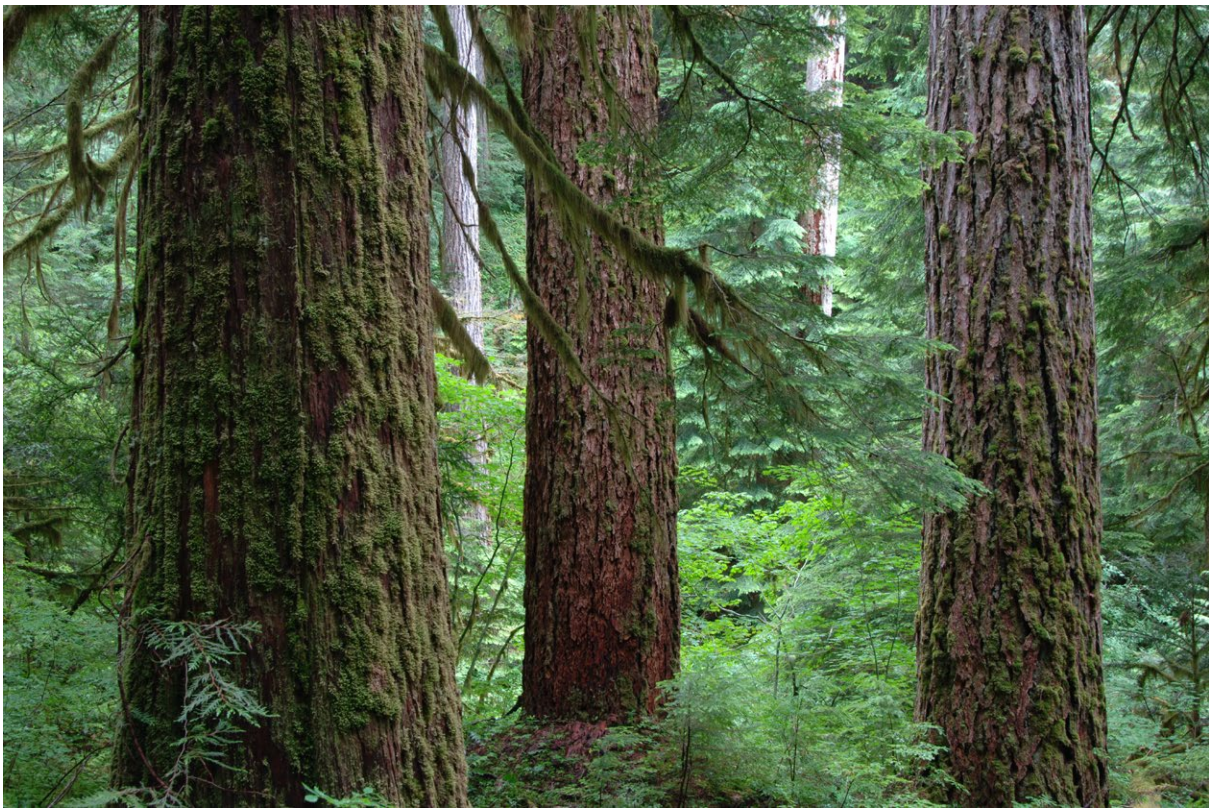

Figure 1. Old-growth forest along Mack Creek at the Andrews Forest. Photo by Tom Iraci.

The massive centuries-old Douglas-fir and hemlock forests of the Pacific Northwest that cover a large portion of the Andrews forest have special scientific and social status (Fig 1). They represent an opportunity to understand how old-growth forest ecosystems and watersheds function and they provide a control to learn how human activities alter the function of forested ecosystems and production of ecosystem services. These ancient forests also have high cultural values to society in a highly commercialized and human-dominated world.

Broadly representative of the partially-logged, rugged mountainous landscape of the Pacific Northwest, the Andrews Forest contains excellent examples of the region's conifer forests and associated wildlife and stream ecosystems (Fig 2). Situated in the 15,800-acre (6400-ha) drainage basin of Lookout Creek, the Andrews is more than just a place to study old-growth conifer forests in steep terrain. It is also place to understand how forests of all ages, managed landscapes (Fig. 3), road networks, streams, and mountain ecosystems function and change as a result of natural processes and human activities.

The Andrews has a maritime climate of wet, mild winters and dry, cool summers. Precipitation falls primarily from November through March, and varies with elevation, averaging 91 inches (230 cm) at low elevations to over 140 inches (355 cm) at higher elevations. In the wintertime, rain is mixed with snow in the lower portion of Lookout Basin and snow is more persistent at higher elevations (above 1000 m) (Fig 4). Highest streamflows usually occur in November through February during warm-rain-on-snow events.

Forest composition varies from Douglas-fir, western hemlock, and western red cedar at low elevations to Pacific silver fir, noble fir, and mountain hemlock at higher elevations. The Douglas-fir/western hemlock forests in this area are among the tallest and most productive in the world. Average tree heights are in excess of 75 meters and a typical stand stores in excess of 600 megagrams of carbon per ha. These

Figure 2 Lookout Creek at the Andrews Forest. Photo by Tom Iraci.

Figure 3. The Young Stand Thinning & Diversity Study. Heavy thin, light thin and thin with gaps. Photo by Al Levno

Figure 4. Snow pack can exceed 4 meters at high elevations (above 1000 m) in the Andrews Forest. Pictured, the gauging station at Mack Creek in 2008. Photo by Al Levno.

forests and streams are also noteworthy for the large amounts of fine and coarse woody debris they contain. Rapidly flowing mountain streams are the primary type of aquatic ecosystem with seasonal trends in streamflow following the precipitation pattern. Small first and second-order streams under natural conditions are dominated by coarse woody debris and receive large annual inputs of litter which provides the energy base for the aquatic organisms. Larger streams have a higher proportion of the energy base provided by in-stream photosynthesis, but litter inputs and coarse debris remain important components of all stream ecosystems.

Figure 5. More than 30 years ago, some of the original research on the northern Spotted Owl started in and around the H.J. Andrews Experimental Forest

The Andrews Forest supports a rich flora and fauna for a north temperate ecosystem. More than 500 vascular plant species are known to occur. Typical half-hectare plots in the uplands include 35 to 40 species of vascular plants and riparian sites have twice that number. Over 3,400 arthropod species have been reported, which probably represents slightly more than half the actual total. About 20 species of reptiles and amphibians, seven species of fish, and 50 species of mammals occur here. Over 70 species of birds are known to nest in the watershed. Plant and animal species associated with old-growth forests of the Pacific Northwest, including Vaux's swift, northern flying squirrel, red-backed tree vole, Pacific yew and the northern spotted owl (Fig. 5), are especially well represented.

Major themes of Andrews research include conifer forest structure, function, and dynamics; watershed hydrology; carbon dynamics and sequestration; ecology of the fast, cold streams; landscape dynamics resulting from wildfire, flood, and land use. This research has lead to major discoveries including the high ecological value of old growth forests and its importance to the northern spotted owl, the ecological functions of dead wood in forest and stream ecosystems, and the long-term legacies of clearcutting on timing and yield of waterflow from watersheds. All of this research has occurred and continues to occur in within a dynamic social and policy environment regarding the purpose and use of forest lands.

When it was established in 1948, the Andrews Experimental Forest was covered with virgin forest. Before timber cutting began in 1950, about 65% of the Andrews Forest was in old-growth forest (~500 years old) and the remainder was largely in mature stands

developed after wildfires in the mid-1800's to early 1900's. Clearcutting and shelterwood cuttings over about 30% of the Andrews Forest have created young plantation forests varying in composition, stocking level, and age that continue to be studied (Fig 7.). A series of experimental small watersheds had various forest harvest treatments applied as part of a long-term study of impacts of forest management on watershed processes. Wildfire had been the primary disturbance in the natural forest and windthrow, landslides, and lateral stream channel erosion were secondary disturbances.

Figure 6. The Andrews Forest contains mature forests and young plantation forests varying in composition, stocking level, and age. Image from Google Earth.

Figure 7. Willamette National Forest staff present their work alongside researchers at HJA Day, the annual field day at the Andrews Forest. Photo by Lina DiGregorio.

The Andrews has been a dynamic research-management partnership (Fig. 7) for over 50 years. Early research focused on ways to log old-growth forests but over the last 20 years the focus has been on how to conserve and restore forests and landscapes while providing a variety of ecosystem services. Societal conflict over the future of the vast tracts of federal forest lands in the region have been profoundly affected by science findings from the Andrews Forest and, in turn, have strongly influenced the course of science in the Andrews and more broadly. This partnership involves the research community centered on the Andrews Forest LTER site and land managers of the Willamette National Forest. The partnership has made substantial impacts on forest management and policy on topics such as characteristics of and conservation strategies for old-growth forest ecosystems; ecological roles and management implications of dead wood on land and in streams; ecology and population dynamics of northern spotted owl, effects of forest cutting and roads on streamflow, including floods; interactions of road and stream networks; and interactions of climate change with management and policy.