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## Climate change pushes Northwest forests

BY ELLIOTT NORSE  
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A FEW years ago, a Northwest newspaper ran a whimsical story "quoting" a dinosaur: "This is how it happens," he said. "Drought, fire, hurricanes and floods. Throw in a little radon, and the next thing you know, you're extinct." Unfortunately, global warming could condemn our ancient forests to the same fate.

Of all the factors affecting the Earth's biological diversity, climate is the most important. It determines the kinds of organisms that can live in an area, their abundance, life span, rates of reproduction, growth, and death. Our forests are different from those in California or Alaska because our climate is different.

Although the Earth's climate has varied over time, conditions in the Pacific Northwest have been quite stable over the last 6,000 years. A nearly ideal coincidence of climatic factors — ample rainfall, dry summers and occasional subfreezing temperatures — has favored our forests with more species of giant conifers (ones reaching 200 feet) than anywhere on Earth.

That stability may soon end. The Earth's climate is beginning to change in ways that will affect virtually every aspect of life. Human activities — especially the use of fossil fuels — contribute to the "greenhouse" effect. This includes warming and changes in precipitation, wind and ocean current patterns. If this continues, in the next century we could experience warming as great as any since the end of the last ice age.

Our ancient forests will not escape the heat. The National Oceanographic and Atmospheric Administration expects temperature in our region to increase by 2-5 degrees over the next century. This is not trivial. Although trees are better adapted to withstand normal weather fluctuations than most living things, such changes will certainly affect them.

Even if warming doesn't alter precipitation, forest environments will nevertheless become warmer and drier. Warmer winters will decrease snowfall, and winter snowpacks will melt earlier, thereby lengthening the period of low summertime stream flow. Soils will dry out faster, and trees will need more water in summer, affecting everything from mushrooms to salmon.

Climatic zones will shift higher in mountains as well as northward. Species at higher elevations, such as sub-alpine fir and mountain hemlock, could become locally extinct as warming pushes them upward until there



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is nowhere higher to go. And because mountains are bigger at the base than higher up, they have less room for lowland species being pushed to higher altitudes. With less suitable habitat, populations will be smaller and more vulnerable.

Our forests will have trouble escaping as warmer climates spread northward at one to several miles per year. Because trees cannot retreat that fast, they will be overtaken by climates to which they are not as suited. Stands of trees that were established in cooler times will be more vulnerable to fires, pests, and diseases.

Even if trees could spread their seeds fast enough to stay ahead of the warmer climate's advance, they will encounter unprecedented barriers. Forests are now increasingly fragmented by cities, shopping centers, roads, clear-cuts and tree plantations. While warming climate is pushing trees to disperse northward, these barriers will stop them.

What will happen to forests that can't retreat northward? Even in a region renowned for its wetness, our unusually dry summers prevent tree seedlings from surviving in many years. As our climate warms, tiny Western red cedars and Western hemlocks will have a poorer chance of making it through their first summer. Even slight warming could eliminate those rare, favorable years that our forests need to regenerate.

Unfortunately, climate change is just one human-caused problem affecting our for-

ests. Logging and development, combined with global warming, set the stage for larger forest losses than we can now imagine. Forests create their own internal climates that are cooler in the summer, warmer in the winter, moister and less windy than surrounding non-forested areas. As forests are fragmented, the climates within remaining fragments get dryer, windier and more extreme in temperature. Species that need moderate climatic conditions will have less success in reproducing and surviving. Regional climatic changes will likely worsen the effect of this fragmentation on our forests.

Our biologically diverse ancient forests are the essence of the Northwest spirit and a crucial part of our life-support system. They absorb our waste products, provide recreation and protect our watersheds. Although human-induced climate change is already under way, we can and we must limit the damage. To protect the remnants of the world's finest coniferous forests for our children and their children, it's not enough to spare them from the chain saw. We have to use less gasoline and coal, depend more on clean energy sources, and support innovative ways to stop global warming. Let's not be the generation that let our ancient forests go the way of the dinosaurs.

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