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Subcommittee on Forests & Forest Health
Committee on Resources, US House of Representatives

Field Hearing
Scientific Research and the Knowledge-base concerning Forest Management Following Wildfires and Other Major Disturbances.
February 24, 2006
Medford, Oregon

Good afternoon. I am Tom Atzet and I am delighted to admit that I no longer have any particular affiliation other than family. I was however, the area ecologist for the Rogue River, Siskiyou and Umpqua National Forests for almost thirty years. Both my advance degrees were completed here in the Klamath Mountains. You all have access to my specific background, so I will go on.

It is an honor to be here among colleagues that have dedicated their careers to studying and understanding ecosystem and the processes that maintain them. I have great respect for all of you. I also appreciate the time and effort my government has taken to help assure and maintain excellence in science.

I spent 36 years as a public servant, bringing sound, and unblemished science to the decision makers. They expected nothing less to care for our public ecosystems. Science was, and is, the "life-blood" of what I do.

Today my objective is to review some of the major processes for promoting our renowned ecological richness (biodiversity) of the Klamath Province. I believe this background helps provide context for planning and applying research in southwestern Oregon. It is similar to taking a psychological profile before attempting to treat a patient.

Diversity of process creates structural and compositional diversity, the essential element of resilience and sustainability. Although average climatic conditions are often used to describe ecosystems, such as average annual temperature or average annual precipitation, it is the extremes that more often determine survival, growth and reproductive success. I will highlight process and emphasize why it is necessary to "save the tails", to maintain diversity.

We tend to vilify extremes (for example, extensive fires) as "catastrophic" and on the other hand, accept those of less acreage as part of the "norm" in the normal distribution. That strategy cuts off the tails, the extremes. If we used that strategy in hiring, we would be assuring ourselves of uniformity and mediocrity. The stresses of acute change continually hone organismic process of reproduction, survival and growth. This overarching process, called evolution, discards failure, keeps what works, and passes the learning on to the succeeding generations.

To provide a detailed profile of the history of the Klamath would take a major treatise. Instead, I have provided an outline of the major factors involved and some detail for selected factors.

Outline of major factors affecting diversity in the Klamath Geologic Province

1. Geology and associated compositional and structural diversity
    a. Triassic (300,000,000 years old) through recent alluvium.
        i. Volcanic island arch intrusion and erosion produced shallow sea sediments and resistant volcanic peaks.
    b. Plates hosting ancient ecosystems slowly rotated northwest from 20 degrees south latitudes (~ Mexico City)
    c. Volcanics and sediments metamorphosed (folded, faulted and re-crystallized) pressured by the Gorda Plate part of the Pacific Plate
    d. Nevadian Orogeny inserted granitic and dioritic peaks
    e. Sea floor (Josephine Ophiolite) scraped off onto the continental terrain
    f. Continued metamorphosis and erosion through the Ice Ages

2. "Library" of genetic material for evolving and migrating flora & fauna
    a. Old conifer species and continued recombination (Triassic)
        i. A sink for tropical and arctic sources during plant migrations
            1. Climate change the driver
                a. Recombination of the Tertiary floras
                b. Invasion of chaparral flora during the Xerothermic Period
                c. Influence of the "Little Ice Age" on species regeneration and migration processes.
        ii. Klamaths were a genetic source for emerging surrounding terrain
            1. Building Cascade ranges received species from the Klamaths
            2. Emerging California & Oregon Coast ranges were populated by the Klamath species migrations
    b. Angiosperms evolved 60 million years ago (Cretaceous)
        i. Added new reproductive processes

3. Present Global position affects diversity of climate and rates of change
    a. Continental ice spared southwestern Oregon plant communities.
    b. Scattered alpine cirques and glaciers provided northeast facing coves
    c. Within the transition zone between Temperate and Mediterranean
    d. Pacific Coast High Pressure area promotes dry summer fire weather
    e. Pacific marine influx grades into inland continental climates

4. Transverse orientation (rather than north-south) of the Klamaths
    a. Blocks cyclonic storms stabilizing adjacent systems to the north and south
    b. Links Coast Ranges and Sierras forming an "H" pattern
        i. Allows for continued migration and genetic mixing
        ii. Maintains the sink-source character of the Klamath Province

5. Elevation grades from sea level to above timberline
    a. Provides temperature and precipitation gradients and niche breadth

6. A variety of disturbance agents and regimes increase diversity
    a. Fire, the primary agent, provides an acute rate of change
    b. Insects and diseases, usually secondary provide chronic stress and change

The "H" configuration

From a satellite view only the major rivers, valleys and mountain ranges stand out. The Cascade-Sierra chain and the California-Oregon Coast ranges appear as north-south parallel tracks, with the Cascades appearing as occasional white-capped volcanic peaks. The Klamath Geologic Province stands out as a crosstie joining the tracks, like the crosstie of a gigantic capital 'H.' The Klamath and Columbia Rivers completely breach the Cascade barrier. They appear as deep, winding gorges allowing water, air, spores, seeds, fish and other animals lowland passage through the Cascade mountain barrier. The Klamath River effectively joins east with west, sagebrush, juniper and aspen with Sitka spruce, madrone, Douglas-fir and shore pine.

In the Klamath Province, the backbone or "crosstie" of the Siskiyou Range provides a high elevation east-west corridor and a sink for genetic material uninterrupted by the glacial advances. The Siskiyous have been an "intersection" for migration and dispersal of fauna and flora for at least the last 60 million years. Genetic material from the Oregon and California Coast Ranges, the Sierras and Cascades, the Klamath River corridor and southern lowland chaparral species, migrate in, recombine and disperse. Wittaker and Axelrod both alluded to the Klamath's "central significance" on the west coast.

Transitional Latitude

Southwest Oregon, transitional from Temperate to Mediterranean ecosystems, is habitat for 29 conifers including endemics such as Brewer spruce, Baker's cypress and Port-Orford-cedar. It is the latitudinal extreme for coast redwood, silver fir and Alaska yellow cedar. It has approximately ten fold more sensitive species than typical Temperate forests to the north.

Geologic Diversity

Geology ranges from the ultramafic ophiolites of the Josephine Peridotite Mass to the scattered granite plutons of the Nevadan Orogeny that poked through existing metamorphosed volcanics and metamorphosed sediments of Triassic and Jurassic age, including the limestone at Oregon Caves. Continual deformation of the terrain, by forces associated with the Pacific Plate, has resulted in steep, complex geomorphology and chaotic drainage patterns.

Elevation ranges from sea level to just over 7,000 feet at Mt. Ashland, the highest peak in the Siskiyou Range. Pacific fog often reaches inland valleys even during the early summer, supporting Port-Orford-cedar, particularly in protected drainages, such as Grayback creek.

Recent Climate Change

Recently the Xerothermic (8000 to 4000 years before present) and the Little Ice Age (1400 to 1850) have modified local vegetation. On south slopes, new migrants from southern California (ceanothus and manzanita species for example) were frequently burned. To this day south slopes have shallow soils and xeric vegetation. Looking north from any Siskiyou lookout provides a view of sparse vegetation and occasionally grassy balds. The north aspects on the other hand support older and denser forests.

Since the average forest on Federal land in southwest Oregon is less than 300 years old, most stands were generated during the Little Ice Age, when selective and competitive stresses were likely different. Survival may have favored species that tolerated higher frequency, intensity and duration of frost. Today as processes, particularly fire, create mortality and opportunities for

regeneration, a new generation of genetic material will be selected under different selection criteria. Fire adapted, fire resistant, or species that avoid fire may be increasingly favored. Suppressing selection, by dampening mortality, regeneration and disturbance extremes may result in lowering resilience and diversity in the long run.

Agents of Change: Lightning suppressed fires in southwest Oregon

Lightning has always been a dependable ignition source. Humans have become increasingly active. Native Americans, for example effectively used fire to manage ecosystems for game, crops and water. Natives were much more than an incidental ignition source. Forests were repeatedly and consistently burned and thinned creating vegetation mosaics and plant communities. Natives also stimulated root and berry crops, planted crops, burned to maintain habitat for game, and cultured materials for tools, ceremonies and lodging. Shrub cover was low, and herb and grass vegetation was constantly recycled. Ranchers and miners burned to replace forest cover, control forest pests, and for fun on a Saturday night.

Today records indicate, in southwest Oregon, about 60 percent of the 200 to 300 yearly fires are human caused. On the Siskiyou national forest (included in the Oregon Department of Forestry Database) the proportions are about the same (60 percent human caused), but the average number per year is about fifty. The Oregon Department of Forestry suppresses 70 percent of their fires before they reach a tenth of an acre. Eighty-eight percent are less than one acre. Since 1920, approximately 15,000 fires have been suppressed.

The Future

Decades ago Leopold, Weaver, Biswell, Kilgore Arno, Agee, Mutch, Martin, Atzet, Skinner, Pyne, all predicted the consequences of fire suppression:

- an increase in total forest biomass
- an increase in the percentage of high severity fire
- an increase in the number of total acres burned/time
- an increase in insect activity
- an increase in the occurrences of diseases
- an increase in extent and abundance of exotic species
- a decrease in vigor of older stands
- lowering of crown ratios, increasing inter-tree competition
- increasing risk to late seral landscapes and early seral pines
- increase in hardwood carbohydrate reserves (hardwoods on steroids)
- decreasing conifer abundance and extent
- change in competitive relationships

Our attempt to suppress process (fire in this case) and force stability on ecosystems has resulted in unwanted consequences. Change creates stress, but stress creates diversity. Dampening the extremes, cutting off the “tails”, in the short run, may eliminate what we consider “catastrophic” events, but in the long run may magnify unwanted consequences.