PONDEROSA PINE:
MANAGEMENT, ISSUES AND TRENDS

OCTOBER 18-21, 2004
SHILO INN
KLAMATH FALLS, OREGON

Co-Sponsored by:
USDA Forest Service Pacific Southwest Research Station and Oregon State University

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Schedule at a Glance

Monday, October 18, 2004

6:00 p.m. Registration and Reception

Tuesday, October 19, 2004

8:00 a.m. Welcome and Introductory Remarks - *Martin Ritchie*

8:15-9:00 Keynote - *Hal Salwasser*

9:00-9:45 Keynote - *Russ Graham*

9:45-10:30 Keynote - *John Fiske and John Tappeiner*

10:30-11:00 Break

11:00-12:00 Context of Symposium - *Doug Maguire, Moderator*

11:00-11:30 *Andy Youngblood*

11:30-12:00 *Martin Ritchie*

12:00-1:00 Lunch, on-site

1:00-3:00 Silviculture/Ecosystem Management - *Steve Fitzgerald, Moderator*

1:00-1:30 *Andy Youngblood*

1:30-2:00 *Kevin O'Hara*

2:00-2:30 *Bill Oliver*

2:30-3:00 *Chris Keyes*

3:00-3:30 Break

3:30-5:00 Projects and Case Studies I - *Steve Fitzgerald, Moderator*

3:30-4:00 *Jeff Webster*

4:00-4:30 *Norm Michaels*

4:30-5:00 *Kim Murillo*

Schedule at a Glance (Cont.)

Wednesday, October 20, 2004

8:00 - 5:00 Field Trips

Goose Nest Adaptive Management Area - Tour Leader: *Martin Ritchie*

Pringle Falls Experimental Forest - Tour Leader: *Andy Youngblood*

Winema/Fremont National Forests - Tour Leader: *Norm Michaels*

Sun Pass State Forest - Tour Leader: *Ed DeBlander*

Thursday, October 21, 2004

8:00-10:00 Range and Wildlife Issues and Management - *Doug Maguire, Moderator*

8:00-8:30 *Luke George*

8:30-9:00 *Marty Vavra*

9:00-9:30 *Bill Laudenslayer*

9:30-10:00 *Kerry Farris*

10:00-10:30 Break

10:30-12:00 Soils and Productivity - *Gary Nakamura, Moderator*

10:30-11:00 *Bob Powers*

11:00-11:30 *Terry Shaw*

11:30-12:00 *Matt Busse*

12:00-1:00 Lunch, on-site

1:00-1:30 Soils and Productivity (continued) - *Andy Youngblood, Moderator*

1:00-1:30 *Debbie Page-Dumroese*

Schedule at a Glance (Cont.)

1:30-4:00 Forest Disturbance - *Andy Youngblood, Moderator*

1:30-2:00 *Greg Filip*

2:00-2:30 *Chris Fettig*

2:30-3:00 *Steve Fitzgerald*

3:00-3:30 Break

3:30-4:00 *Gregg Riegel*

4:00-5:00 Projects and Case Studies II - *Martin Ritchie, Moderator*

4:00-4:30 *Carl Skinner*

4:30-5:00 *John Arena*

5:00-5:15 Closing Remarks - *Martin Ritchie*

INTRODUCTION

Ponderosa Pine

Themes and Description

- Structural diversity
- Soils and productivity
- Wildlife habitat
- Range ecology
- Snags and down wood
- Silvicultural systems
- Role of disturbance (fire, insects, disease)
- Projects and case studies

Ponderosa pine is one of the most widely distributed species in North America. As early exploitation of standing timber yielded to intensive reforestation and active stand management, our silvicultural knowledge base has expanded tremendously. Negative public attitudes toward timber harvest, coupled with rapid expansion of residential areas into ponderosa pine forests has compelled foresters to pursue multiple-resource management with a de-emphasis on timber production on many public and private lands. Conversely, demand for ponderosa pine wood has intensified management on other private lands, and large disturbances from fire, insects, and disease have fueled intense debates about rehabilitation efforts. The net result of these debates and the accompanying information need has been a notable increase in our knowledge of ponderosa pine ecosystems and better understanding of human values and perceptions.

The conference will provide a forum to update forest land owners, professional foresters, and forest scientists about current issues, trends and management of ponderosa pine ecosystems, and the scientific information on which they are based.

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Participants Info

Meals

Meals during the conference include lunch and refreshment breaks and a reception Monday evening.

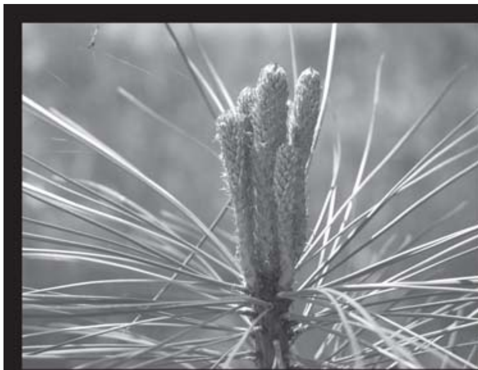
SAF Credits
The event qualifies for 16.5 CFE contact hours in Category 1, which can apply toward a Society of American Foresters continuing education certificate. A copy of the CFE Contact Hour Notice is available at the registration desk.

Presenters Info

Keynote speakers will have 45 minutes, comprised of 30-35 minutes for a presentation and 10-15 minutes for questions. Plenary session speakers will have 30 minutes, comprised of 20-25 minutes for a presentation and 5-10 minutes for questions and moving among concurrent sessions.

If you are using PowerPoint for your presentation, please make sure you submit your presentation when you check-in at the registration desk, so it can be loaded onto the computer. We all know how frustrating it is to wait through delays caused by unexpected problems with computer generated presentations.

PROGRAM



Ponderosa Pine

Monday, October 18, 2004

6:00 p.m. Registration and Reception

Tuesday, October 19, 2004

8:00 a.m. Welcome and Introductory Remarks
Martin Ritchie, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.

8:15-9:00 Keynote - Resources of Ponderosa Pine Ecosystems - Issues, Policies, Future
Hal Salwasser, Dean, College of Forestry, Oregon State University, Corvallis, OR.

9:00-9:45 Keynote - Overview of Ponderosa Pine Ecosystems
Russ Graham, Rocky Mountain Research Station, USDA Forest Service, Moscow, ID.

9:45-10:30 Keynote - An Overview of Key Silvicultural Information
John Fiske, retired, USDA Forest Service, Vallejo, CA; John Tappeiner, Department of Forest Resources, Oregon State University, Corvallis, OR.

10:30-11:00 Break

11:00-12:00 Context of Symposium
Moderator: Doug Maguire, Department of Forest Science, Oregon State University, Corvallis, OR.

11:00-11:30 Past and Future Research at Pringle Falls Experimental Forest
Andy Youngblood, Pacific Northwest Research Station, USDA Forest Service, La Grande, OR.

11:30-12:00 Accelerating Development of Late-seral Features in Second-growth Pine Stands: The Goosenest Adaptive Management Area
Martin Ritchie, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.

12:00-1:00 Lunch, on-site

1:00-3:00 Silviculture/Ecosystem Management
Moderator: Stephen Fitzgerald, Forestry Extension, Oregon State University Corvallis, OR.

1:00-1:30 Silvicultural Systems for Ponderosa Pine
Andy Youngblood, Pacific Northwest Research Station, USDA Forest Service, La Grande, OR.

1:30-2:00 Multiaged Silviculture of Ponderosa Pine
Kevin O'Hara, University of California, Berkeley, CA.

2:00-2:30 The West-wide Ponderosa Pine Levels-of-growing-stock Study at Age 40
Bill Oliver, retired, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.

2:30-3:00 Natural Regeneration of Ponderosa Pine
Chris Keyes, Humboldt State University, Arcata, CA.

3:00-3:30 Break

3:30-5:00 Projects and Case Studies I
Moderator: Stephen Fitzgerald, Forestry Extension, Oregon State University, Corvallis, OR.

3:30-4:00 Lessons Learned on 50,000 Acres of Pine Plantations
Jeff Webster, Total Forestry, Medford, OR.

4:00-4:30 Ponderosa Pine Management in the Klamath Basin
Norm Michaels, Fremont/Winema National Forests, Lakeview, OR.

4:30-5:00 Aspects of Ponderosa Pine Wood Quality Important for Manufactured Products
Kim Murillo, Jeld-Wen, Klamath Falls, OR.

Wednesday, October 20, 2004

8:00 - 5:00 Field Trips

Goose Nest Adaptive Management Area
Tour Leader: *Martin Ritchie, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.*

Pringle Falls Experimental Forest
Tour Leader: *Andy Youngblood, Pacific Northwest Research Station, USDA Forest Service, La Grande, OR.*

Winema/Fremont National Forests
Tour Leader: *Norm Michaels, Fremont/Winema National Forests, Lakeview, OR.*

Sun Pass State Forest
Tour Leader: *Ed DeBlander, Management Unit Forester, Oregon Department of Forestry, Klamath Falls, OR.*

Thursday, October 21, 2004

8:00-10:00 Range and Wildlife Issues and Management
Moderator: Doug Maguire, Department of Forest Science, Oregon State University, Corvallis, OR.

8:00-8:30 Songbird and Small Mammal Responses to Experimental Forest Treatments of Thinning and Prescribed Fire in Ponderosa Pine Forests of Northern California
Luke George, Department of Wildlife, Humboldt State University, Arcata, CA.

8:30-9:00 Ungulate Ecology of Ponderosa Pine Ecosystems
Marty Vavra, USDA Forest Service, Pacific Northwest Research Station, La Grande, OR.

9:00-9:30 Effects of Site and Scale on the Demographics of Standing Dead Trees [Snags] in Eastside Pine Forests
Bill Laudenslayer, USDA Forest Service, Pacific Southwest Research Station, Fresno, CA.

9:30-10:00 Woodpecker and Snag Interactions: an Overview of Current Knowledge in Ponderosa Pine Systems
Kerry Farris, Wildlife Conservation Society, Pacific West Program, Portland, OR.

10:00-10:30 Break

10:30-12:00 Soils and Productivity
Moderator: Gary Nakamura, University of California, The Center for Forestry & Cooperative Extension, Redding, CA.

10:30-11:00 Will Ponderosa Pine Plantations Respond to Intensive Management? Long-term Case Studies from California
Bob Powers, USDA Forest Service, Pacific Southwest Research Station, Redding, CA.

11:00-11:30 Management of Ponderosa Pine Nutrition through Fertilization
Terry Shaw, Intermountain Forest Tree Nutrition Cooperative, Forest Resources Department, University of Idaho, Moscow, ID.

11:30-12:00 Long-term Trends in Soil Productivity: Who Will Speak for the Soil?
Matt Busse, USDA Forest Service, Pacific Southwest Research Station, Redding , CA.

12:00-1:00 Lunch, on-site

1:00-1:30 Soils and Productivity (continued)
Moderator: Andy Youngblood, Pacific Northwest Research Station, USDA Forest Service, La Grande, OR.

1:00-1:30 Coarse Woody Debris: Is There a Nutritional Legacy?
Debbie Page-Dumroese, USDA Forest Service, Rocky Mountain Research Station, Moscow, ID.

1:30-4:00 Forest Disturbance
Moderator: Andy Youngblood, Pacific Northwest Research Station, USDA Forest Service, La Grande, OR.

1:30-2:00 Disease as an Agent of Disturbance in Ponderosa Pine
Greg Filip, USDA Forest Service, Pacific Northwest Region, Portland, OR.

2:00-2:30 Bugs in the System: New Research Focuses on the Development of Tools to Minimize Ponderosa Pine Losses from Western Pine Beetle
Chris Fettig, USDA Forest Service, Pacific Southwest Research Station, Davis, CA.

2:30-3:00 Fire Ecology of Ponderosa Pine Ecosystems
Steve Fitzgerald, Forestry Extension, Oregon State University, Corvallis, OR.

3:00-3:30 Break

3:30-4:00 Managing Antelope Bitterbrush in Ponderosa Pine Forests: Who Will Speak for the Understory Vegetation?
Gregg Riegel, USDA Forest Service, Pacific Northwest Region, Central Oregon Interagency Ecology Program, Bend, OR.

4:00-5:00 Projects and Case Studies II
Moderator: Martin Ritchie, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.

4:00-4:30 Reintroducing Fire in the Blacks Mountain Research Natural Area
Carl Skinner, USDA Forest Service, Pacific Southwest Research Station, Redding, CA.

4:30-5:00 Determining the Levels of Growing Stock for Uneven-aged Management
John Arena, Bureau of Indian Affairs, Branch of Forestry, Warm Springs, OR.

5:00-5:15 Closing Remarks
Martin Ritchie, Pacific Southwest Research Station, USDA Forest Service, Redding, CA.

ABSTRACTS

Ponderosa Pine

Arena

DETERMINING THE LEVELS OF GROWING STOCK FOR UNEVEN-AGED MANAGEMENT

John Arena[1]

There are over 60,000 acres of ponderosa pine forests on the Warm Springs Indian Reservation (WSIR) that are managed using an uneven-aged system. The Bureau of Indian Affairs had questions concerning the optimum level of growing stock on the reservation ponderosa pine forests. The WSIR installed twelve 2.5-acre plots in 4 areas of the ponderosa pine forest. Three densities of 35 sq. ft. BA/A, 48 and 61 were replicated over the four areas. These plots were remeasured every 5 years beginning in 1985. All trees greater than 1.5 inches DBH were tagged and measured. Ingrowth was tagged and measured during each measurement. In 1991 all trees were stem mapped and entered into our GIS database. Some problems were discovered such as different plant associations, actual beginning basal areas, and wildfires.

In 2005, WSIR will do a silvicultural treatment and remeasure the plots to three new levels of growing stock. Five thousand measured and mapped trees in these plots will provide an invaluable resource for verifying growth models and growing stock levels suited to WSIR.

[1] Bureau of Indian Affairs, Branch of Forestry, Warm Springs, OR

Busse et al.

LONG-TERM TRENDS IN SOIL PRODUCTIVITY: WHO WILL SPEAK FOR THE SOIL

Matt Busse[1], Gregg Riegel[2], and Martin Jurgensen[3]

Preventing soil degradation is a legal and ethical responsibility of federal land managers. Learning from historic examples of degraded soils and the human hardships that often follow, we now view the protection of soil productivity as a common-sense requirement for managing lands, regardless of the desired social or economic product. Our presentation will examine the determinants of soil productivity, and ask whether forest management practices alter (positively or negatively) the productivity of soil. Ponderosa pine forests of the central Oregon pumice plateau, where infertile soils and limited annual precipitation dominate the landscape, will serve as the backdrop for this discussion. Specifically, results from two long-term studies of soil productivity will be highlighted. In the oldest on-going study in the region, forty-five years of ponderosa pine monoculture has led to a decline in soil fertility compared to plots where the natural vegetation has established. The initial benefits to tree growth from eliminating competing vegetation are no longer expressed, which begs the question — are the long-term changes in tree growth a reflection of altered soil productivity? Conversely, results from a 15-year study of prescribed fire and thinning in second-growth pine stands indicate that most treatment-induced changes in soil properties are subtle and of little cause for concern. Loss of nitrogen (N) and surface organics due to repeated fire are exceptions to this rule, however. Repeated burning on a 20-year cycle would result in a loss of nearly 50% of the total ecosystem N pool during a 100-year period. Measures to avoid this excessive loss in soil productivity include burning at less frequent intervals, using alternative mechanical treatments such as mowing and thinning, and encouraging the reestablishment of N-fixing shrubs. Maintaining soil productivity should not be difficult in these forests, particularly if practitioners from all resource disciplines speak for the soil.

[1] USDA Forest Service, Pacific Southwest Research Station, Redding, CA
[2] USDA Forest Service, Pacific Northwest Region, Central Oregon Interagency Ecology Program, Bend, OR
[3] Michigan Technology University, Houghton, MI

Farris and Zack

WOODPECKER AND SNAG INTERACTIONS: AN OVERVIEW OF CURRENT KNOWLEDGE IN PONDEROSA PINE SYSTEMS

Kerry Farris[1] and Steve Zack[1]

Standing dead trees (snags) with cavities are a critical ecological component of western coniferous forests. These structures provide foraging, roosting, and nesting habitat for numerous species of invertebrates, amphibians, reptiles, birds, and mammals. Snags may be created through a variety of interrelated processes including wildfire, drought, insects and disease. However, dead trees containing cavities require the influence of woodpeckers, which excavate nest cavities on a yearly basis. While the specific factors leading to cavity generation in certain snags is not well understood, the manner in which a tree dies likely plays a significant role. Our objective is to provide an overview of woodpecker and snag interactions organized around each of the major mortality agents in ponderosa pine systems. A better understanding of how woodpeckers use snags created by various modes of mortality and how they interact along the gradient of decay can provide a valuable management prospective for snag management in ponderosa pine forests.

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[1] Wildlife Conservation Society, Pacific West Program, Portland, OR

Fettig

BUGS IN THE SYSTEM: NEW RESEARCH FOCUSES ON THE DEVELOPMENT OF TOOLS TO MINIMIZE PONDEROSA PINE LOSSES FROM WESTERN PINE BEETLE

Chris Fettig[1]

The western pine beetle, *Dendroctonus brevicomis* LeConte, is a major cause of ponderosa pine mortality in the western USA and particularly in California. Under certain conditions, the beetle can aggressively attack and kill apparently healthy trees of all ages and size classes. The average loss is substantial, and has been estimated at 1 billion board feet annually. Currently, the availability of pest management techniques for preventing and suppressing infestations is rather limited. In general, our research efforts focus on (1) the development of chemical, silvicultural and semiochemical-based monitoring and management tactics for minimizing the amount of western pine beetle-caused tree mortality in ponderosa pine stands, and (2) determination of short and long-term implications to forest health of prescribed fire and/or mechanical treatments in the large-scale restoration of ponderosa pine ecosystems. Regardless of landowner objectives, large amounts of bark beetle-caused tree mortality are undesirable. For example, the value of a mountain home may be severely reduced by the mortality of adjacent shade and ornamental trees. The value of these individual trees, the cost of removal, and the loss of aesthetics often justify protection until the main thrust of an infestation subsides. This situation emphasizes the need for assuring that effective insecticides are available for individual tree protection. Currently, we are evaluating two new chemistries, bifenthrin and permethrin +C, for protecting individual, high-value ponderosa pines from western pine beetle attack. Preliminary results suggest that bifenthrin is effective for preventing attack during the first field season following treatment. The use of pheromones to monitor bark beetle populations is a relatively unexplored area in the western USA. Aggregation pheromones have been identified for the western pine beetle, and monitoring traps are commercially available. However, at present, there are no acceptable methods that correlate trap catch with relative population indices, status (epidemic/endemic), or stand hazard. We are currently attempting to develop a model that predicts the amount of western pine beetle-caused tree mortality based on pheromone-baited trap catches at 44 locations throughout California. Verbenone is the primary antiaggregation pheromone of several bark beetle species including the mountain pine beetle, *Dendroctonus ponderosae* Hopkins, southern pine beetle, *Dendroctonus frontalis* Zimmermann, and western pine beetle. It was first identified in males of the southern and western pine beetles by Renwick (1967), and subsequently in the hindgut of emergent and feeding female mountain pine beetles. In recent years, verbenone has been evaluated as a tool for mitigating stand losses due to bark beetle infestations, and is now available commercially in a slow-release polyethylene pouch. Our research efforts concentrate on the use of verbenone for small-scale ponderosa pine stand protection. Verbenone released from multiple points within 2 ha plots significantly reduced the amount of western pine beetle-caused tree mortality in some stands, but not others. Under the National Fire Plan, the hazardous fuel treatment program has, and likely will, continue to increase in the future. During FY 2001, 2.25 million acres of federal land were treated to reduce the hazardous fuels component by applications of thinning, prescribed fire, and/or a combination of these and other treatments. One of the key goals of this program is the reduction of hazardous fuels within the wildland urban interface (WUI). At present, much of the biomass that has been removed is not merchantable as markets have yet to be developed for small dimensional lumber. On many Forest Service districts, this material is now chipped, and/or cut and lopped, and distributed on site. Previous research has focused on developing guidelines for slash management. We have initiated a study to determine the most effective means of minimizing impacts caused by Ips and other bark beetle species when treating slash, by chipping, generated during hazard fuel reduction projects. Preliminary results suggest that timing of treatment (spring vs. fall) and the distribution of residual material are important. In general, the amount of subsequent bark beetle attacks on residual trees following harvest was: chipped stands > chipped stands with chips raked 1 m away from the base of residual ponderosa pine > lop-n-scattered plots > untreated controls.

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[1] USDA Forest Service, Pacific Southwest Research Station, Davis, CA

Filip

DISEASE AS AN AGENT OF DISTURBANCE IN PONDEROSA PINE

Greg Filip[1]

There are several diseases that affect the growth and survival of ponderosa pine in the Pacific Northwest and serve as agents of disturbance. Probably the most widespread and damaging diseases are the dwarf mistletoes, which cause serious growth loss and mortality of ponderosa pine. Dwarf mistletoes (Arceuthobium spp.) are higher seed plants that can parasitize all age classes of pine. Decades of research and observation have shown that although dwarf mistletoes spread slowly within and among trees, their localized affects can be quite spectacular. Root diseases caused by Armillaria ostoyae, Heterobasidion annosum, and Leptographium wageneri caused localized mortality resulting in small gaps in affected forests. Root diseases spread by root contact but also spread by airborne spores or insect vectors depending on the species of root disease fungi. Stem decays caused by Phellinus pini and Fomitopsis officinalis result in single-tree gaps if trees break as a result of advanced decay. Decay fungi infect wounds on living trees, and decay may take decades to develop to the point where tree integrity is compromised. Stem cankers caused by rust fungi such as Cronartium comandrae and Peridermium stalactiforme can kill the tops of trees or result in whole-tree mortality. Decayed and cankered trees can serve as habitat for a wide diversity of wildlife. Disturbances in ponderosa pine forests caused by forest diseases can affect forest succession, insect outbreaks, fire frequency and severity, and both animal and plant diversity.

[1] USDA Forest Service, Pacific Northwest Region, Portland, OR

Fiske and Tappeiner

AN OVERVIEW OF KEY SILVICULTURAL INFORMATION

John Fiske[1] and John Tappeiner[2]

In this presentation we review what we consider to be the key silvicultural information for ponderosa pine. Our experience with ponderosa pine and consequently much of our information comes from Oregon, and California. We did not attempt to examine the entire literature on this species, which is enormous! Rather, we focused on what we think is the most important information, similar to a "top-ten" approach, by category. We included older information that too often is overlooked, probably because it is not in electronic reference lists. Also, there are proceedings of at least two symposia devoted primarily to ponderosa pine (Baumgartner and Lotan, 1987, and Robson (1983) and summaries of ponderosa pine silvics (Barrett, 1979, and Oliver and Ryker, 1990) and silvicultural systems (Schubert, 1974, Oliver, Powers, and Fiske, 1983; Ryker and Losensky, 1983; and Boldt, Alexander, and Larson, 1983), all of which have very helpful information.

Our presentation is divided into categories (for example, different aspects of reforestation, growth, and yield), with an abstract of the main points in this part of the literature. There is overlap among categories. For example information on bark beetles occurs under stand growth and density as well as under insects pathogens, animal and snow damage.

Undoubtedly we omitted important information that ought to be included. Perhaps this review can be considered a work in progress, and during this symposium participants can add other references, and a revised list be made available to them in the proceedings.

1. Regeneration and TSI. Fully recognizing that regeneration and TSI are best thought of as a complete system, and that failure occurs if any single component fails, for the purposes of this presentation, we divided "regeneration" and "TSI" into the following categories.

Natural Regeneration:
Natural regeneration, using seed-tree or shelterwood systems, has been used effectively in many parts of ponderosa pine's natural range (for example, Heidmann, 1988, McDonald, 1976 a/c, Roy, 1983, and Shearer and Schmidt, 1970), especially if sites are well-prepared, including rodent control, and coinciding with good seed crops. Pearson (1923) was the earliest example of the rich scientific literature we found.

Seed Collection and Handling:
In contrast to the other major western conifer species, proper collection and seed handling methods for artificial regeneration of ponderosa pine were comparatively easy to determine and are well established. Early work (in the 1940's and 1950's) focused on germination and cold storage. The most significant single development was the establishment of seed zones, elevational bands, and seed transfer guidelines, beginning in

the 1940's in California (Fowells, 1946, Buck et al, 1970), later elsewhere (for example, starting in the1950's in Oregon, Roy, 1955).

Nursery Practices:
Volumes have been written over the last 5 decades about culturing of ponderosa pine seedlings, which now is very well understood and practiced. We focus on just three key developments. The first was the development of fumigation (initially primarily methyl bromide) to control root diseases in bare-root seedlings (for example, Bega and Smith, 1960, and Smith and Bega, 1966). Although ponderosa pine is somewhat resistant to seedling root diseases (compared to most other commercial western conifers), fumigation use significantly improved production efficiencies for ponderosa pine. The second key development was the concept of how nursery practices and seed source (genetics) affect the potential for growing new roots upon out-planting (root growth capacity or root regeneration potential) and lifting windows (for example, Jenkinson, 1980, Stone 1955, Stone and Benseler, 1962, Stone and Schubert, 1959a/b, and Stone, Schubert, Benseler et al 1963). The third key were the enormously successful developments in container nurseries, starting in the 1960's (Tinus and McDonald 1979 and Tinus, Stein, and Balmer, 1974), which are best summarized in The Container Tree Nursery Manual (Landis, Tinus, McDonald, and Barnett 1989, /1990a/b, 1992, and 1995). Container nursery technology is continuing in the western United States and Canada, primarily by private nurseries, often in cooperatives.

Site Preparation and Release:
Still more volumes have been written on the theory and practice of controlling unwanted vegetation (for example the Proceedings of the Annual Forest Vegetation Management Conference, 1981 to date, and Walstad and Kuch, 1987). The theory of "why" is well established. Practices have undergone continual development, in part to reduce unit costs, and because of controversies over herbicide use. Just about every conceivable alternative method to herbicides has been tried somewhere during the last three decades (including dynamite!).

We focus on just three key aspects: the development and application of herbicides, the USDA Forest Service National Administrative Study, and the scientific understanding of the interaction between site quality and determination of the need to release vs. precommercial thinning.

Herbicide use started in the 1950's with adaptation of agricultural aerial application techniques of the phenoxy herbicides. Later, appropriate use of a much broader range of herbicides was established on a scientific basis, including human health and ecological risk considerations. Additions to the scientific literature continue, and (in part because of legal challenges) comprehensive risk assessments are scheduled for almost continuous updating. The current risk assessments for hexazinone, sulfometuron methyl (OUST), imazapyr (Arsenal, Chopper, and Stalker formulations), glyphosate, and triclopyr) are available on line (SERA 1997a, 1998a/b, 202, 203a/b, respectively).

The National Administrative Study focused on release in northern California (a 20-year-plus study), and continues to establish much of the long-term scientific basis for herbicide and non-herbicide treatments (Fiddler and McDonald, 1983). Comparable long-term study results for site preparation and release are becoming available elsewhere in California and in Oregon.

Our third focus is on the relationship between determining needs for release vs. precommercial thinning, as influenced by site quality. If investment funds are limited, and only one kind of treatment can be done, which treatment should receive priority, and how does site quality affect the decision? Bill Oliver compared results of both kinds of treatments on a high-quality and a low-quality site in northern California (McDonald and Oliver, 1984), and established the important principle that on low-quality sites, inter-tree competition in ponderosa pine plantations is insignificant, compared to competition between the trees and shrubs. That is, precommercial thinning is a wasted investment unless the thinning follows, or is done concurrently with, effective release treatments. On such sites, lack of effective release treatments can result in unacceptably high tree mortality rates. In contrast, on high-quality sites, inter-tree competition can be greater than tree-shrub competition, so a single precommercial thinning treatment can yield a better investment return, compared to a single release treatment.

Precommercial Thinning:
Practical experience with early ponderosa pine plantations (early part of the 20th century) and widely-distributed spacing studies led to commonly-used residual stocking levels of approximately 100 to 250 trees per acre, depending on site quality, management objectives (including wood quality), and other factors. Two significant quantitative models for predicting growth of pre-commercial-sized ponderosa pine in plantations have been developed. Oliver and Powers (1978) developed the first quantitative model for spacings of 6, 8, 10, and 12 feet, respectively, for a range of site qualities in northern California. Powers, Ritchie, and Ticknor (1989) developed the first quantitative model (SYSTUM 1) to include the effects of shrub competition (also at different tree spacings), based largely on ponderosa pine (and Douglas-fir) plantation data from southwestern Oregon and northern California.

2. Stand growth (John Tappeiner)
Genetics, Autecology:
Ponderosa height growth varied by elevation. Trees from seed sources grew slower than those from other elevations, and had lower height to diameter ratios. Trees from mid elevations grew well when plated at lower and higher elevations but were susceptible to snow damage at higher elevations.
Ponderosa pine has the ability to grow roots into rock fissure s in the unweathered soil horizons and extract water stored there. Shrubs that grow on the same sites have the same ability; where as Douglas-fir is much less able to use water stored in rock fissures. Conckle 1973; Zwieniecki and Newton 1994, 1995, 1996;

Growth and Yield: These references contain yield estimates from normal yield tables, and growth models, yield estimates by habitat types, and a method for predicting site index for young ponderosa pine stands, based upon height growth rates of young trees. Demars and Barrett 1973; Oliver and Powers 1978; Dunning 1942; Meyer 1938; Oliver 1972; Verdyla and Fischer 1989;

Tree Growth and Stand Density (tree and shrub)—Thinning: Several studies on thinning and the growth of ponderosa pine at a range of stand densities have been reported in the last several decades. These studies indicate that young, even-age ponderosa pine stands respond to thinning like most other conifer species. Thinning increases diameter growth, maintains crown lengths. Heavy thinning tended to decrease volume yield per acre, but at high densities or with light thinning net volume yield was low because of mortality from bark beetles. These studies indicate that western pine beetles may determine the upper levels of stand density, and that snow breakage is another important cause of mortality at high densities. On dry sites shrubs (Ceanothus and Manzanita sp.), may reduce ponderosa pine during stand establishment and reduce or delay it even after the ponderosa pine has overtopped the shrubs. It appears that eventually the pines may shade out the shrubs and increase their growth rates. As stated above, undoubtedly the effects of tree/shrub competition vary with site productivity, density and species of shrubs and method of regeneration (planting, natural regeneration from seed or release of advanced regeneration. Barrett 1982; Cochran and Barret 1993; Fiddler et al. 1989; Gordon 1962; Helms et al. 1986a,b; Oliver 1984, 1985, 1990, 1997; Oren et al. 1987; Busse et al. 1996;

Fertilization, Stand Growth Effects of Shrubs: Ponderosa pine responds to fertilizers but only after shrub control. Where shrub density is high control of shrubs appears necessary to provide the water needed for fertilizers to be effective. Most growth response resulted from removal of shrubs; the direct effect of fertilizers is secondary. Powers and Jackson 1978: Powers and Ferrell 1996, Powers and Cochran 1988;

Measures of Stand Density: Measures of density for stands in the pine region have been developed. These measures are mainly based on SDI (stand density index), and stockability, and can be adjusted for specific sites. Cochran 1992; Cochran et al. 1994; Hall 1983; Peterson and Hibbs, 1989;

Uneven Age Management: Techniques for developing stocking guidelines for un-evenage stands have been developed. These guidelines are based on distributing the desired level of SDI (possibly half of maximum) throughout several diameter classes. The resulting distribution can be evaluated by calculating the numbers of trees and basal area by diameter class. Shifting different amounts of SDI into various diameter classes can modify the distribution. Thus the method is quite flexible Cochran 1992; McDonald 1986a,b; McDonald 1994; Lillieholm et al. 1990; O'Hara and Gersonde 2004; Olson and Helms 1996;

Insects, Pathogens, Animal and Snow Damage: This work has provided insight into the relationships between drought, diseases, bark beetles, high stand densities, and

ponderosa pine mortality. Root diseases (Heterobasidium) and mistletoes, and dense stands weaken trees and make them susceptible to bark beetles (Dendroctonus) especially during periods of drought. Bark beetles may often be the symptoms of trees under stress from these factors rather than the direct cause of mortality.
Barrett and Roth 1985; Hawksworth and Wiens 1986; Filip 1986; Filip et al. 1989, 1999; Megahan and Steele 1987; Miller and Keen 1960; Scharpf and Bega 1981; Schmid et al. 1984; Smith 1982; Storm and Halvorson 1967; Stosek 1973;

Old Stand and Tree Management: Older work has provided tree classification systems for determining the vigor of ponderosa pine and its susceptibility to insects. Recent work has shown that older ponderosa pine stands and trees can respond to thinning. For example a sustained 1.5 to 2.0 increase in tree basal area growth was common for trees (+200yr) in stands thinned 15 to 30 years previously. Removal of understory trees established after fire may improve the vigor of old ponderosa pine as well as protect them from fire. Dunning 1928; Keen 1946, 1943; Dolph et al. 1995; Latham and Tappeiner 2002; McDowell et al. 2003; Biondi 1996

Understory Vegetation and Stand Density: Recent studies have documented the interactions between overstory densities and understory development. At higher levels of levels of overstory density understory is “shaded out” and its density is reduce from lack of water and light. Understory vegetation added organic matter and nutrients to the forest floor. Riegel et al. 1992; Riegel 1995; Busse et al. 1996; Harris and Covington 1982;

Fire History and Use of Prescribed Fire/Thinning: There considerable information on the history of fire in ponderosa pine and prescribed fire and thinning are being increasing used to reduce the potential for fire in ponderosa pine stands. Some important emerging issues include the effect of fire on mortality of large trees, control of slash/dead trees from an initial fire, and the effects of fire in stimulating germination of buried seed and vegetative buds. How best to use fire, commercial and precommercial thinning and combinations of treatments to achieve objectives needs more effort both in practice and research.
Covington and Sacket 1894, 1986; Covington and More 1994; Harris and Covington 1982; Hall 1976; McNeil and Zobel 1980; Mutch and Parsons 1998; Parsons and Benedetti 1979; Weaver 1959, 1961; White et al. 1973;

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Fitzgerald

FIRE ECOLOGY OF PONDEROSA PINE ECOSYSTEMS

Stephen Fitzgerald[1]

Wildfire is an important disturbance process that greatly shaped pre-settlement ponderosa pine forests. Fires were quite frequent in ponderosa pine forests, re-occurring on average every 8-10 years. However, the range in fire occurrence may be as short as 2 years and as long as 30 to 35 years. This fire pattern was also influenced by changes in regional climate and in local areas by native American burning. These fires tended to be low-intensity surface fires that removed accumulated fuel and reduce understory tree regeneration and large wood. Most of these fires occurred in late summer and fall. Frequent fire maintained more open forest conditions with large diameter trees ranging from about 12 to 40 trees per acre, with some grouping to the over all tree pattern. In the last century the structure and density of ponderosa pine forests have changed dramatically, mostly due to fire exclusion and other land use changes that have change the natural fire regime, and from timber harvests that removed the large, fire-resistant trees. Because of these structural changes, ponderosa pine forests today are more susceptible to stand replacement wildfires and more prone to insect problems. Restoration of old growth ponderosa pine ecosystems will be critical for the long term survival of old growth trees.

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George et al.

SONGBIRD AND SMALL MAMMAL RESPONSES TO EXPERIMENTAL FOREST TREATMENTS OF THINNING AND PRESCRIBED FIRE IN PONDEROSA PINE FORESTS OF NORTHERN CALIFORNIA

T. Luke George[1], William Laudenslayer[2], and Steve Zack[3]

Ponderosa pine forests have likely been the most ecologically altered western forest-type due to a century of fire suppression and large-tree logging. The historic, park-like appearance of these pine forests, which were the result of frequent, low-intensity fires, have been replaced by dense stands of pines and encroaching fir and Douglas-fir. The avifauna of these forests has been likewise affected with several species considered in decline. Our ongoing collaborations with PSW researchers at Blacks Mountain Experimental Forest and at the Goosenest Adaptive Management Area (GAMA) have allowed us to evaluate the diverse responses of songbirds and small mammals (GAMA only) to large-scale experimental contrasts of forests with and without prescribed fire treatments, and with and without forest thinning treatments. In general, we are finding that a foraging guild of “bark gleaners” tends to respond positively to thinning and prescribed fire, while a foraging guild of “leaf gleaners” tends to respond negatively to such treatments. Golden mantled ground squirrels (Spermophilus lateralis) and yellow-pine chipmunks (Tamias amoenus) have responded positively to thinning and burning while other species have shown little response to the treatments. Both of these species are important prey items of Northern Goshawks (Accipter gentilis) and therefore thinning and burning may benefit goshawks. It seems clear that working with, and not against, fire helps create structures and revitalizes processes important to wildlife.

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PONDEROSA PINE ECOSYSTEMS

Russell Graham[1] and Theresa Jain[1]

The distribution of ponderosa pine extends from southern British Columbia into Mexico and from the Pacific coast in Oregon/California to western Nebraska. Although the species is most often associated with the dry forests it also occurs as an early seral species in moist grand fir/white fir and western redcedar forests. Historical fire regimes where ponderosa pine grows includes both frequent (~20 years) low intensity, non-lethal fire regimes and mixed fire regimes. The later is a combination of both non-lethal and lethal fires. Fire, or its absence, along with other disturbances (weather, insects, disease), creates a variety of tree and ground level vegetation compositions and structures ranging from widely spaced ponderosa and bunch grasses, to late seral grand fir/white fir tree complexes. During the last 100 years climate cycles, domestic livestock grazing, timber harvest, and successful fire exclusion individually and in combination have contributed to significant changes in forests capable of growing ponderosa pine. In many forests, the tree component changed from being dominated by large, yellow pines to being dominated by multiple tree canopies of mid and/or late seral species (e.g., Douglas-fir, grand/white fir). These alterations have greatly impacted how wildfires tend to burn in these forests. Instead of being burned by mixed and low-severity fires they are being burned by large, highly intense wildfires that can severely damage the vegetation and soil components. Along with changes in the tree component, the modifications of ground level vegetation, insect and disease relations, and often overlooked changes in the forest floor and soil components are just as dramatic and critical. Even though many ponderosa pine forests have been significantly altered from those that historically occurred, they still provide many opportunities for restoration, recreation, commodity production, and wildlife. Both multi-aged and even-aged stands commonly occur and a clumpy nature of stems is often a characteristic of many ponderosa pine stands. Regeneration success ranges from poor to highly successful and compared to lodgepole pine or Douglas-fir, it has wide genetic amplitude, indicating greater seed transfer among settings than lodgepole or Douglas-fir. Because of its thick bark, it is tolerant of low intensity surface fires, even at a young age. In general it is more resistant to endemic diseases than many of its associates (e.g., Douglas-fir, white fir, grand fir) and its relations with native insects and mistletoe are relatively well understood. Probably as important as any other attribute the species invokes a “sense of place” when large, old, yellow, pines dominate a site in which one can walk through unencumbered.

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Keyes and Maguire

NATURAL REGENERATION OF PONDEROSA PINE

Christopher Keyes[1] and Doug Maguire[2]

For forest management that depends on natural regeneration, the recruitment of a cohort of seedlings is the first and most critical process following harvest or stand-replacing disturbance. The spatial and temporal patterns of seedling recruitment set the stage for all subsequent stand developmental patterns; hence, the seedling recruitment phase strongly influences future management options. An understanding of natural regeneration processes, and the stand elements that have bearing on those processes, is vital to attaining stand goals. It is also useful for those objectives wherein regeneration is undesirable, for example the maintenance of fire resistance via structures characterized by open understories that are free of ladder fuels.

A complex blend of climate, overstory stand structure, understory plant communities, forest floor substrates, and seed-caching and seed-predating animals constitutes the environment in which the natural regeneration of ponderosa pin seedlings must occur. The dynamic spatial patterns of seedling reproduction are the product of all of these elements as they influence the fate of reproduction from seed to established seedling. The process of recruitment leading to an established seedling cohort may be divided into several relatively discrete stages: seed production and seedfall; post flight seed losses and redistribution; and seedling germination and establishment. At each of these stages, seeds or seedlings are exposed to a stage-specific host of influential factors that determines the probability of successful recruitment.

The objective of this presentation is to summarize the fate of ponderosa pine individuals from seed to established seedling, and to summarize the relative influences of stand elements on those fates. The presentation includes a review of the primary influences on ponderosa pine regeneration. Investigations into ponderosa pine regeneration processes during the previous century have been numerous, and the findings of those studies are directly relevant to the issues faced by forest managers today. The focus of this review is on the spatial and temporal patterns of seedfall, and on the roles of overstory trees, shrubs, forest floor substrates, and small mammals as stand characteristics that directly or indirectly influence the process of ponderosa pine natural regeneration process at various stages. This presentation also includes a summary of recent research into seedling recruitment processes in ponderosa pine stands with partial overstories in central Oregon; relevant findings from observational studies and planned experiments from parts of the Deschutes National Forest will be noted. The presentation also highlights the need for additional work to elaborate on the fine scale of the ponderosa pine seedling establishment process, particularly in stands with partial overstories.

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Laudenslayer, Jr.

EFFECTS OF SITE AND SCALE ON THE DEMOGRAPHICS OF STANDING DEAD TREES [SNAGS] IN EASTSIDE PINE FORESTS

William F. Laudenslayer, Jr.[1]

The last several decades have seen many publications on the value of snags to forests and their inhabitants. They have resulted in management standards and guidelines that ought to meet objectives for species such as cavity-nesting birds, but the numbers they require may not be attainable or sustainable throughout the forest of interest. Since 1989, we have been investigating snag demography on 24 5-ha study plots in eastside pine forests. While snags have been present on most of the 24 plots throughout the 14 years, the number of snags and their relative "life-spans" depend on site characteristics including tree species composition, tree size distribution, soil characteristics, and topography. For example, snags persist for longer periods on our Lassen Volcanic National Park sites where the soils are covered by up to 0.5 m of volcanic ash but these same sites support fewer snags than our other sites because of the relatively low tree densities. These findings suggest that management standards and guidelines need to consider the nuances of a complex and highly variable landscape to be effective and sustainable.

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Michaels

PONDEROSA PINE MANAGEMENT IN THE KLAMATH BASIN

Norm Michaels[1]

This presentation will highlight the properties that will be visited on two field trips on Wednesday. Common to all ownerships is uneven aged management, a concern for large numbers of small tress, and a concern for catastrophic wildfire. One tour will visit Sun Pass State Forest, Bob Mezger property, and J-Spear property. Sun Pass management must secure the greatest permanent value to the state, which has been defined as "healthy, productive, and sustainable forest ecosystems that over time and across the landscape provide a full range of social, economic, and environmental benefits to the people of Oregon." Bob Mezger is managing to retain and improve the value of his land, balancing investment and income decisions, while meeting FSC certification. Considering preservation of wildlife habitat and retention of some old growth, it is the J-Spear Ranch Co. philosophy to maximize sustainable timber growth and value per acre by maintaining appropriate stocking levels and diameter class distribution. This uneven aged management philosophy allows the best quality trees to continually move into larger diameter classes.

The second tour will visit Forest Service and Jeld-Wen stands. Jeld-Wen is focused on growing high grade products to provide the material desired for its manufacturing operations, and is attempting to balance growth rates with wood quality. The Forest Service is charged with providing a variety of values to the public and to the Klamath Tribes, focusing on reducing overstocked conditions and managing for larger trees.

[1] Fremont-Winema National Forests, Lakeview, OR

ASPECTS OF PONDEROSA PINE WOOD QUALITY IMPORTANT FOR MANUFACTURED PRODUCTS

Kim Murillo[1]

TBA

[1] Jeld-Wen, Klamath Falls, OR

O'Hara

MULTIAGED SILVICULTURE OF PONDEROSA PINE

Kevin O'Hara[1]

Ponderosa pine is remarkably well-suited for management in multiaged or uneven-aged stand structures over much of its range. Despite its relative intolerance of shade, it often occurs at low stocking levels that allow sufficient understory light to support subordinate canopy layers. There have been many approaches to managing ponderosa pine in multiaged or uneven-aged stand structures. Among these are the selection cutting procedures documented by Meyer in the 1930s, the "maturity selection system" and the "improvement selection system". Another more recent approach that is not specific to ponderosa pine is the BDq approach where stocking is limited by a total amount of basal area and a target diameter frequency distribution. Two other approaches to stocking control use either stand density index or leaf area to represent occupied growing space. Either of these later approaches have the advantage of providing greater flexibility to meet alternative stand structure objectives and are also applicable to other species. All multiaged stands experience periods of regrowth following cutting treatments as residual trees and regeneration expand to occupy growing space. The length of these periods or cutting cycles is proportional to the amount of cutting that occurs: longer cutting cycles are associated with more severe cutting treatments. The relatively slow growth rates of many ponderosa pines and the openings required for regeneration tend to favor longer cutting cycles and relatively heavy cuttings. Although previous studies have been mixed, some current work is presented that indicates comparable relative productivity between multiaged and even-aged ponderosa pine stands.

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Oliver

THE WEST-WIDE PONDEROSA PINE LEVELS-OF-GROWING-STOCK STUDY AT AGE 40

William W. Oliver[1]

In the 1960's a series of levels-of-growing-stock studies was established in young, even-aged stands throughout the range of ponderosa pine in the western United States. Using a common plan, studies were begun in the Black Hills of South Dakota, eastern and central Oregon, the Coconino Plateau of Arizona and the westside Sierra Nevada in California. Innovative features for the time were tests of a wide range of stand densities from open-grown to densities high enough to jeopardize stand health, and to periodically rethin the plots back to the stand density level originally assigned. Long-term results from the four installations in interior ponderosa pine demonstrate profound changes in stand structure and the overwhelming influence of site quality in explaining growth differences. Other explanatory variables in order of importance were reserve basal area and mean stand diameter. The importance of reserve basal in explaining growth was clouded in some installations because of periodic waves of mortality. The influence of stand density on height growth remains an enigma, despite a growth record exceeding 30 years. All installations have been maintained and have exceeded their original, rather limited, objectives.

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Page-Dumroese et al.

COARSE WOODY DEBRIS: IS THERE A NUTRITIONAL LEGACY?

Deborah Page-Dumroese[1], Robert F. Powers[2], and Martin F. Jurgensen[3]

Is there nutritional value in large, woody debris in advanced decay? We addressed this through a 15-month study of soil nutritional processes at Blacks Mountain Experimental Forest. Our work centered on decaying ponderosa pine remaining as cull logs or fallen snags following harvesting operations 5 decades earlier. We sampled six 8-ha plots reflecting two harvesting conditions: complete (80+%) and minimal (15%) overstory removal (structurally simple and structurally diverse). Variables included non-symbiotic N fixation, N mineralization, soil C and N content, fine root density, and biotic communities. At the conclusion we quantified the degree and mass of decay in 54 1-m-long tree sections. Total mass of downed wood was about half-again greater (~ 60 Mg ha-1) in structurally diverse stands, but nitrogen contents were less than 200 kg N ha-1. Logs were rich in fungal diversity but arthropods were rare (a single spider). Mycorrhizal root tips were abundant in decaying wood, but they also were common beneath other ground covers. Prorated for proportion of ground coverage, N-fixation rates of free-living organisms in decaying wood were low compared to rates beneath ground covers of bitterbrush or pine needles and grass. Nitrogen mineralization rates also were lower beneath decaying trees than beneath other ground cover types. We conclude that decaying wood plays a minor role in the nutrition of eastside pine forests.

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Powers

WILL PONDEROSA PINE PLANTATIONS RESPOND TO INTENSIVE MANAGEMENT? LONG-TERM CASE STUDIES FROM CALIFORNIA

Robert F. Powers[1]

Because ponderosa pine is common on poorer soils, an impression persists that its growth rates are inherently low and that it is a poor bet for intensive silvicultural investments. Perhaps the longest-running study of plantation response to vegetation control was established in 1966 on poor, volcanic soil near Mt. Shasta. Shrub control had little effect on tree survival, but standing volumes after 30 years were 160 times greater without a shrub understory. Fertility also plays a part. The first experiment combining shrub control with fertilization was established in 1975 in 9-year-old pine planted on two soil types on the Eldorado National Forest. On the poorer and less-fertile soil, shrub control tripled 5-year volume growth. Nitrogen fertilization alone had no effect on the poorer soil, but increased growth more than 8-fold when combined with shrub control. On the better soil, both fertilization and shrub control each increased 5-year growth by 56 and 110 percent, respectively, and growth was tripled when these treatments were combined. The N fertilization effect soon dissipated and by 28 years the combination treatments were similar to those of shrub control, alone (but still 80 to 600 percent greater than the controls). Retreating some of the plots a decade after initial treatments led to the greatest gains of all, increasing increments another 1000-1500 ft^3/ac on the poorest and best soils, respectively. Shrubs persisted on control plots, leading to a brushfield and stunted trees on the poorer soil and a persistent ladder of dead fuels on the better soil. Benefits of vegetation control endure, but N fertilization effects are short-lived. Yet, impressive responses are possible with repeated treatments that supplement N with other nutrients. Fifteen-year findings from the Garden of Eden experiment suggest that yield potentials of ponderosa pine plantations are far greater than previously believed. On the best sites, MAI may approach 200 ft^3/ac by 15 years. The most favorable economic returns to intensive management will be on the best sites.

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Riegel et al.

MANAGING ANTELOPE BITTERBRUSH IN PONDEROSA PINE FORESTS: WHO WILL SPEAK FOR THE UNDERSTORY VEGETATION?

Gregg Riegel[1], Matt Busse[2], Sarah Lovtang[3], and Desiderio Zamudio[4]

Shrubs and herbaceous understory vegetation have historically been viewed as strata that interfere with management objectives of growing trees. Other resource values that speak for the understory vegetation are often viewed as conflicting with the objective of quickly regenerating a forest following logging and natural disturbances such as wildfire. This perspective was fostered by the concern that understory vegetation competed with trees for soil water and nutrients from the seedling through the mid-seral development of a forest. Recent management concern has refocused reducing understory vegetation, especially shrubs, because of their aboveground biomass coupled with plant architecture that increases the probability of fire spreading into the forest canopy. Under the goals of wood production and fire risk reduction the result of understory management looks very similar to vision that was captured by the first written records and photographs of the ponderosa pine forest. Historically, low intensity, frequent fire return intervals (5 to 30 years) favored cover of fire resilient herbaceous species and kept bitterbrush cover at levels two to four fold less than many stands currently carry. Antelope bitterbrush, a fire sensitive shrub, is also the most important browse species for mule deer in much of ponderosa pine region east of the Cascade Range and Sierra Nevada crests of Oregon and northern California. Land managers are now being asked to grow fire resilient large ponderosa pine and maintain bitterbrush for mule deer at levels that are at or above the high end of historic conditions resulting in a direct conflict with fuel management objectives. To complicate the management equation, both fuel managers and silviculturalists lack overstory/understory indices to guide their prescription decisions to predict resource needs for specific understory species. Prescriptions should factor disturbance frequency and intensity as well as residual tree canopy cover and density to match ecophysiologic and population ecology of understory species. Otherwise our attempt to grow fire resilient forest structure may be out of sync with the demands of competing resources with bitterbrush and other understory vegetation.

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Ritchie and Harcksen

ACCELERATING DEVELOPMENT OF LATE-SERAL FEATURES IN SECOND-GROWTH PINE STANDS: THE GOOSENEST ADAPTIVE MANAGEMENT AREA

Martin W. Ritchie[1] and Kathleen A. Harcksen[2]

The Goosenest Adaptive Management Area in northeastern California features a study designed to investigate development of late-successional conditions in second-growth ponderosa pine stands. The experiment has four treatments replicated five times and encompasses 1600 hectares, including controls. Complete treatment implementation took five years, including application of prescribed fire. Initial post-treatment measurements were conducted in 2002. Change in quadratic mean diameter averaged 12.5 cm among thinned stands. Estimates of post-treatment growth indicate little immediate impact of treatments on individual tree growth, however dominant trees increased diameter growth by 11 to 14 percent in the thinned plots during the first three years after treatment. Among those stands treated with a targeted change in species composition, the mean treatment effect was an increase of 16 percent in proportion of pine basal area, with a range from 6 to 29 percent. The control treatment and thin from below treatment showed no significant change in species composition. The initial application of prescribed fire resulted in little mortality (less than 1 percent for large trees) and had no immediate impact on the diameter distribution. Logging damage observed on residual trees varied between 2 and 6 percent, depending on treatment and tree size.

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[2] Parishant National Monument, Arizona Strip Office, St. George, UT

Salwasser

RESOURCES OF PONDEROSA PINE ECOSYSTEMS - ISSUES, POLICIES, FUTURE

Hal Salwasser[1]

Ponderosa pine forests are one of the west's most expansive ecosystems. Ranging from Mexico to the southern provinces in Canada, California to the Rockies, these forests cover every conceivable ownership and cultural context. Some are federal wilderness and some are industry timberlands. Some are urban forests, urban interface, or urbanizing wildlands. Some are in good ecological condition but many are not, the result of well-intentioned practices that had unintended outcomes. Management and restoration of ponderosa pine forests is complicated scientifically and socially. Where public lands and especially federal lands are at stake, the stakeholders can't agree on primary purpose for the forests and thus argue and litigate about means when it is really ends that are at issue. Where unnatural conditions place ponderosa ecosystems at high risk to drought stress, insects or uncharacteristic fires scientists and activists draw lines in the duff putting precautionary theorists on one side and action-oriented experimenters on the other. If the fires have already hit, the lines are drawn even deeper and bolder. These are wicked problems in the classic sense. Is there a way out of our current situation on the lands at greatest risk? Only with some fundamental changes in governance mechanisms, management processes and attitudes and cultures that inhibit adaptive management. We can't tinker around the edges and expect miracles to occur.

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Shaw et al.

MANAGEMENT OF PONDEROSA PINE NUTRITION THROUGH FERTILIZATION

Terry Shaw[1], Mariann Garrison-Johnston[1], Peter Mika[1], and Leonard Johnson[1]

The Intermountain Forest Tree Nutrition Cooperative has established numerous fertilization test studies in ponderosa pine stands throughout the inland northwest since 1985. Ponderosa pine growth response to nitrogen (N) fertilization varies with stand and site characteristics, and in some cases appears to be related to the foliar potassium (K) status. Fertilization with N alone appears to cause increased tree susceptibility to mortality by insect, disease and perhaps physiological causes. Applying K and micronutrients in combination with N appears to protect the trees from N-related mortality while allowing a growth response. Compared to other predominant forest tree species in the inland northwest, ponderosa pine generally shows a lower overall growth response to N fertilization. Under certain rock type and vegetation series conditions, however, ponderosa pine can show high growth responses to multinutrient fertilization. The management implications of our research are that ponderosa pine will not generally show a strong growth response to N fertilization, except on particular rock types on moist sites. If fertilizing mixed-conifer stands, other species in the stand will likely show a better growth response than the ponderosa pine. Fertilization of ponderosa pine should include K and perhaps micronutrients in addition to N, in order to protect the trees from N-related mortality while allowing for positive growth response. The nutritional ecology of ponderosa pine is unique compared to other inland forest tree species, and should be considered when evaluating forest management activities such as harvesting, regeneration establishment, and fertilization.

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Skinner

REINTRODUCING FIRE IN THE BLACKS MOUNTAIN RESEARCH NATURAL AREA

Carl Skinner[1]

Frequent, low-intensity fires were an integral ecological process in the Blacks Mountain Experimental Forest (BMEF) prior to the 20th Century. With rare exception, fires have been successfully excluded from BMEF since the early 1900s. The Blacks Mountain Research Natural Area (BMRNA) covers approximately 210 ha (521 acres) of BMEF in 5 compartments of approximately 40 ha (100 acres) each. With the help of the Lassen National Forest, we have begun to reintroduce fire to BMRNA using prescribed fire. Two compartments have been burned – one in 1997, the other in 2000. Stand conditions and responses are being compared to two compartments where fire has continued to be excluded. The fifth compartment – mostly meadow – is not being studied at this time. Although fire hazard reduction was not a primary goal of this project, the usefulness of the prescribed fire treatments for fire behavior modification is of interest to many. In this paper, the ability of the prescribed fire treatments to alter wildfire behavior is compared to wildfire behavior expected in untreated stands through modeling. Though the application of prescribed fire greatly reduced expected fire behavior initially, within a few years (~ 4-6 yrs) expected fire behavior was again quite high. This is due to ensuing accumulation of dead fuel from the many small trees killed in the initial burns. We estimate it may take up to three applications of prescribed fire to achieve a level of fire behavior modification that is similar to a single application of mechanical treatment followed by a single prescribed fire.

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Vavra et al.

UNGULATE ECOLOGY OF PONDEROSA PINE ECOSYSTEMS

Martin Vavra[1], Kenric Walberger[2], and Timothy DelCurto[2]

Ponderosa pine ecosystems provide important foraging habitats for both wild and domestic ungulates. Livestock typically graze ponderosa pine ecosystems from May through October. Mule deer and elk may utilize these habitats on a yearlong basis in some areas. Stand density has a significant effect on understory production. Competition for soil moisture and nitrogen limit understory production. Since these systems typically exist at lower elevations, south aspects and on rather shallow soils, soil moisture is usually unavailable to understory species by mid summer. Optimal forage quality, therefore, occurs from late spring through mid-summer. Livestock use for optimal production should occur during this time frame. Herbivory by both native and wild ungulates can influence the structure and composition of understory vegetation.
Ungulates, through the act of selective foraging influence the competitive ability of understory plants utilized. Ungulates can by considered agents of change in ecosystems by three processes: the regulation of process rates, modification of spatial mosaics, and action as switches controlling transitions between alternative ecosystem states. Theses understory composition and structure changes may have important implications to such diverse attributes as nutrient cycling, energy flow, biodiversity, stand density, fire type and interval, forest productivity, and ungulate productivity.

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[2] Oregon State University, Eastern Oregon Agricultrual Research Center, Union, OR

LESSONS LEARNED ON 50,000 ACRES OF PINE PLANTATIONS

Jeff Webster[1]

Lessons learned on reforestation of large wildfires and clearcuts in the Mediterranean climate of interior Northern California. From establishment to commercial thinning. Site preparation and soil mitigation of historical, fire and current management activities. Improved seed and seedling performance. The necessity and timing of vegetation management. Mechanical pre-commercial thinning (PCT) v. hand thinning and the balancing of fire risk and soil compaction. Spacing guidelines and the impacts on growth and yield. *Eucosma sonomana* (western pine shoot borer) research, impacts on growth and potential solutions.

[1] Total Forestry, Medford, OR

Youngblood

PAST AND FUTURE RESEARCH AT PRINGLE FALLS EXPERIMENTAL FOREST

Andrew Youngblood[1]

Pringle Falls Experimental Forest in central Oregon is a center for silviculture, forest management, and insect and disease research in ponderosa forests east of the Oregon Cascade Range. The 4477-hectare (11,055 acres) experimental forest is maintained by the Pacific Northwest Research Station, in cooperation with the Pacific Northwest Region and Deschutes National Forest, for research in ecosystem structure and function and demonstration of management techniques. Pringle Falls Experimental Forest is the oldest experimental forest and the site of some of the earliest forest management and silviculture research in the Pacific Northwest. During the field trip, participants will 1) view examples of even-aged ponderosa pine stands with experimental controls of sapling release and growth after overstory removal, with and without undergrowth vegetation management; 2) view examples of old-growth ponderosa pine stands and examples of management activities to restore and protect old-growth stands; 3) view examples of management activities to integrate recreation, resource protection, and restoration of disturbance regimes along the Deschutes River; and 4) view stand management activities to enhance and protect historical resources and provide safe living conditions at the experimental forest administration site.

[1] USDA Forest Service, La Grande, OR

Youngblood

SILVICULTURAL SYSTEMS FOR PONDEROSA PINE

Andrew Youngblood[1]

Silviculturists have primarily relied on classical even-aged silvicultural systems for ponderosa pine, with uneven-aged systems used to a lesser degree. Current management practices involve greater innovation because of conflicting management objectives. Silvicultural systems used in the foreseeable future will likely meld traditional systems with greater reliance on variation across the landscape because of differing values and desired outputs. Significant changes in the management of ponderosa pine are reviewed; recent management actions that likely will affect the future management of ponderosa pine systems are listed, and critical gaps in our understanding of ponderosa pine silviculture that may affect our management in the near term are identified.

[1] USDA Forest Service, La Grande, OR

BIOGRAPHIES

Ponderosa Pine

John Arena

John Arena is the Silviculturist on the Warm Springs Indian Reservation in Oregon. John received his B.S. in Forestry from the University of California at Berkeley. From 1978 to 1988 he was a forester on the Nez Perce Reservation in Idaho. Then in 1988 John moved to Warm Springs as a forester in presale and later as the Silviculturist from 1992 to the present. He is a Certified Forester with SAF.

Matt Busse

Matt Busse is a Research Soil Microbiologist with the Pacific Southwest Research Station in Redding, California. Matt received his B.S. in Soil Science from Cal Poly, San Luis Obispo, his M.S. in Agronomy from the University of Nebraska, and his Ph.D. in Soil Microbiology from Oregon State University. He has worked for the Forest Service since 1989, including seven years in central Oregon as a Microbiologist at the Bend Silviculture Laboratory and as an Ecologist with the Regional Ecology program prior to moving to Redding. His current research involves the disturbance ecology of soil organisms and their processes; fire effects and soils; microbial diversity; and the effects of forest management practices on greenhouse gas production.

Kerry Farris

Kerry Farris is an Associate Conservation Ecologist with the Wildlife Conservation Society. She received both her B.S. and M.S. in Wildlife Resources at the University of Idaho where she studied the habitat selection of *Picoides* woodpeckers in relation to ponderosa pine decomposition patterns in the central and southern Cascades of Oregon and California. Her current research focuses on the effects of fire on avian communities with a particular emphasis on the interactions between bark beetles, woodpeckers, and snag decomposition.

Christopher Fettig

Christopher J. Fettig is Principal Research Entomologist in RWU-4502 Chemical Ecology and Management of Western Forest Insects at the Pacific Southwest Research Station in Davis, California. Chris received his B.S. in Forest Management from Virginia Tech University in 1993, M.S. in Entomology from Virginia Tech in 1996, and Ph.D. in Forest Entomology from The University of Georgia in 1999. Since 2001, he has served as a research entomologist with the Pacific Southwest Research Station. The scope of his research effort includes determination of short and long-term implications to forest health of prescribed fire and/or mechanical treatments in the large-scale restoration of fire-adapted forest ecosystems; the development of silvicultural and semiochemical-based monitoring and management tactics for bark beetles; the development of effective chemical control methods for bark beetles and regeneration insects; and determination of the role of semiochemicals in the behavior of several bark beetle species.

Greg Filip

Greg Filip is a regional pathologist with the USDA Forest Service, Forest Health Protection unit in Portland, Oregon. He has almost 30 years of experience in forest health and protection with State and Private Forestry and the PNW Research Station, USDA Forest Service; and with the OSU College of Forestry. He has a B.S. in botany from the University of New Hampshire (1972) and a PhD. in botany and plant pathology from Oregon State University (1976). He enjoys backpacking, mountaineering, microbrews, and gourmet coffees in the great Pacific Northwest.

John Fiske

Product of the UC Berkeley forestry program. Twenty-five year career with US Forest Service, Region 5 (California), primarily working in silviculture certification, reforestation and TSI. Battle-scarred veteran of the Forest Service herbicide “wars” (countless NEPA documents and four lawsuits). Developed site quality evaluation methodology in western Mexico in mid 1970’s. Retired (gratefully) in 2002.

Stephen Fitzgerald

Stephen Fitzgerald is a professor in the Department of Forest Resources at Oregon State University, and works off campus as the Eastern Oregon Silviculture and Wildland Fire Education Specialist for the Extension Forestry Program.

Stephen received his B.S. in Forest Biology from the State University of New York College of Environmental Science and Forestry in 1979, and M.S. in Forest Management at the College of Forestry, Wildlife and Range Sciences at the University of Idaho in 1983.

Fitzgerald has been an Extension Faculty member since 1984 first working on the southcoast of Oregon from 1984 to 1988. Since 1988 Fitzgerald has worked in the dryer forest ecosystems of central and eastern Oregon.

Fitzgerald’s work involves developing and delivering educational programs to professional resource managers, Extension faculty, woodland owners, loggers, decision-makers, and the general public.

Fitzgerald conducts applied research in the dry forest types of central and eastern. His research interest includes fire ecology of interior forests; management of interior old-growth forests; fuel reduction treatments; uneven-age management in ponderosa and mixed-conifer forests; density management; forest regeneration of harsh sites; tree and forest health.

Prior to working for Oregon State University, in 1983-84, he worked as a forester at the University of Idaho Experimental Forest in Moscow, Idaho.

Luke George

T. Luke George is a Professor in the Department of Wildlife at Humboldt State University (HSU). He received his BS from Reed College in 1978 and his Ph.D. from the University of New Mexico in 1987. He started teaching at HSU in the fall of 1991, was promoted to associate professor in 1997 and full professor in 2002. He has served as chair of the Wildlife Department since fall 2002. Dr. George has published over 35 papers in peer-reviewed journals and was coeditor of Studies in Avian Biology vol. 25 entitled "The effects of habitat fragmentation on birds in western landscapes: contrasts with paradigms from the eastern United States". He was named HSU's Scholar of the Year in May 2003. His research interests include restoration ecology, habitat selection, population ecology, and the effects of habitat fragmentation on bird populations.

Russell Graham

Russell T. Graham has over 29 years of research experience in the Rocky Mountains with the Rocky Mountain Research Station, USDA Forest Service. His principle research involves understanding long-term forest productivity and landscape processes. Productivity research concentrated on the management of forest organic materials primarily coarse woody debris and the material stored on the forest floor. He has been heavily involved with understanding and describing northern goshawk habitat and involved with landscape level ecosystem projects throughout the central and western United States. Recently he led the Hayman Fire Case Study Team and is presently leading a national team synthesizing information that can be used for planning fuel treatment projects.

Christopher Keyes

Christopher R. Keyes is Assistant Professor of Silviculture at Humboldt State University in Arcata, California. His areas of expertise include forest regeneration ecology and silvicultural forest fuels management. Dr. Keyes received a Ph.D. in Silviculture with minor in Integrated Forest Protection from Oregon State University in 2002, M.S. in Silviculture from the University of Montana in 1996, and B.A. in International Development from Holy Cross in 1990. His current research at Humboldt State University emphasizes the silvicultural acceleration of old-forest features in second-growth redwood forest reserves.

Bill Laudenslayer

Bill Laudenslayer is a Research Wildlife Ecologist with the Sierra Nevada Research Center, USDA Forest Service Pacific Southwest Research Station, in Fresno, California. Bill received his A.B. in Biology from Eastern Baptist College in St. Davids, Pennsylvania, his M.S. in Biological Sciences from Northern Arizona University, and his Ph.D. in Zoology from Arizona State University. In 1979, he was a lecturer in Wildlife Biology at Mt San Jacinto College in San Jacinto, Calif. He served as a wildlife biologist with the California Desert Plan Staff, USDI Bureau of Land Management from 1977 through 1980 and with the Pacific Southwest Region, USDA Forest Service from 1981 to 1992.During his tenure with the Pacific Southwest Region, Bill was instrumental in the development of the California Wildlife Habitat Relationships System and initiated a long-term snag demography study in Eastside Pine forests now 17 years in length. In 1992, he joined the Pacific Southwest Research Station and has continued and extended his work on snags, conducted studies on small mammals in the Sierra Nevada, and participated in the development and execution of the forest ecology experiments at Blacks Mountain Experimental Forest and the Goosenest Adaptive Management Area.

Doug Maguire

Doug Maguire is Associate Professor of Silviculture in the Department of Forest Science at Oregon State University, and currently holds the title of Edmund Hayes Professor of Silviculture Alternatives. Doug received his B.S. in Forest Management from the University of Maine, M.S. in Botany from Rutgers University, and M.S. in Applied Statistics and Ph.D. in Forest Biometrics from Oregon State University. From 1986 to 1993 he was on the faculty at the University of Washington, where he taught courses in forest mensuration and statistical methods, and concurrently served as Silviculture Project Leader in the Stand Management Cooperative. Doug moved to the University of Maine in 1993, pursued a research program on early regeneration processes in spruce-fir selection forests, and taught graduate courses in Forest Modeling and Statistical Modeling of Spatial Data. In 1996 Doug returned to OSU, where he taught undergraduate Forest Mensuration and graduate-level Advanced Silviculture for several years. His research covers impacts of Swiss needle cast on crown dynamics, growth, and yield of Douglas-fir; performance of uneven-age silvicultural systems, including two-storied stands managed under variable retention; and stand dynamics and regeneration processes in mixed-species stands.

Norm Michaels

Norm Michaels is the Forest Silviculturist on the Fremont-Winema National Forest. He received a BS in Forest Management from Oregon State University in 1972, and a MFR in Silviculture from University of Washington in 1983. He has worked for the Forest Service since 1972 in a number of different positions, primarily in silviculture.

Kim Murillo

Kim Murillo is the General Manager at JWMM Klamath Falls and has been employed with Jeld-Wen for twenty three years. Kim started with Jeld-Wen at their sawmill facility in Susanville Ca. where he was in charge of the Planermill and the Shipping and Receiving departments. In 1992 Kim moved to Redmond Oregon and assumed the General Manager's responsibilities of Jeld-Wen/Ponderosa Mouldings. Ponderosa Mouldings produced solid lineal Mouldings out of a high grade Moulding lumber. In April of 2004 Kim moved to Klamath Falls and his current position at JWMM Klamath Falls where they produce Ponderosa Pine window and door components.

Kevin O'Hara

Kevin O'Hara is Professor of Silviculture at the University of California at Berkeley. His education includes a B.S. in Forest Resource Management from Humboldt State University, a MS in Silviculture and Forest Management from Duke University and a Ph.D. in Silviculture from the University of Washington. His research involves applications of stand dynamics to forest management. He has worked on uneven-aged management of ponderosa pine and other species and particularly on the development of new stocking control approaches. He is currently the leader of the International Union of Research Organizations research group on Uneven-aged Silviculture.

William W. Oliver (Bill)
Bill retired in 2002 as Principal Silviculturist at the Silviculture Laboratory of the U.S. Forest Service's, Pacific Southwest Research Station in Redding, California. A native of Pennsylvania, he received a B.S. in Forestry from the University of New Hampshire in 1956 and a Masters in Forestry from the University of Michigan in 1960. Bill joined the PSW Station in 1962 after a stint with the Michigan Department of Natural Resources. His personal research included the influence of competing vegetation in conifer plantations, and spacing/growth relationships of ponderosa pine and true firs. While Project Leader and later Team Leader from 1984 until his retirement, Bill's team developed growth and yield models for conifer stands and coordinated and provided silvicultural and mensurational expertise for two interdisciplinary research projects in the interior ponderosa pine forest type. One project is investigating ecosystem responses (vegetation, small mammals, birds and insects) to contrasting stand structures on the Blacks Mountain Experimental Forest. The other study on the Goosenest Adaptive Management Area is testing silvicultural treatments aimed at accelerating late seral attributes in young even-aged stands. We will be visiting this study as part of the conference.

Bob Powers
Bob Powers is Senior Scientist with the Pacific Southwest Research Station, U.S. Forest Service, as well as Manager of the "*Ecology and Management of Western Forests Influenced by a Mediterranean Climate*" Research Program centered in Redding, CA. This unusually broad Program includes 7 scientists tackling problems in silviculture, fire science, growth and yield modeling, entomology, soil science, and soil microbiology.

Bob holds a Ph.D. in Physiological Ecology from the University of California, Berkeley and a Bachelors degree Forest Management from Humboldt State. He is an Affiliate Faculty member with Oregon State's Department of Forest Resources and is a Fellow in the Soil Science Society of America and. He serves on the editorial staff of the international journal *Forest Ecology and Management.*

His research interest centers on managed forests. Specifically, how management affects carbon cycling, soil processes, and fundamental productivity. He's an originator and technical leader for the North American Long-Term Soil Productivity study (LTSP), and he coleads an intensive management research cooperative comprised of 20 companies in California and Oregon.

His spare time is spent pursuing trout over much of the world.

Gregg Riegel

Gregg Riegel is Area Ecologist/Program Leader with the USFS Pacific Northwest Region Ecology Program for Central and South Central Oregon, since 1991. He holds a B.S. (1976) in Renewable Natural Resources (Botany) from University of California, Davis, a M.S. (1982) in Natural Resources (Forestry) from Humboldt State University, a Ph.D. (1989) in Rangeland Resources (Ecology and Ecophysiology) from Oregon State University, and was a post-doctoral fellow with USDA Agricultural Research Service, Reno, Nevada, working on livestock grazing effects on water and nutrient cycling in montane meadows. Gregg grew up working summers on his family's almond ranch in northern California. He started his career as a fire fighter with California Division of Forestry (1970-1972) and has worked in various biology, fire, and forestry positions throughout California, Nevada, and Oregon for the Bureau of Land Management, Forest Service, and National Park Service (1975-1981). Gregg was a Research Asst. (1982-1987), Lecturer (1988), and currently is Courtesy Asst. Professor with dual appointments in the Depts. of Environmental Sciences and Rangeland Resources at Oregon State University. His current work is focused on fire and alternative fuel treatment effects in ponderosa pine and bitterbrush dominated systems and classification and monitoring riparian ecosystems.

Martin Ritchie

Martin Ritchie is a Forest Biometrician with the Pacific Southwest Research Station in Redding California. Martin received his B.S. in forest management from Humboldt State University, M.S. degree in Forestry, M.S. degree in Statistics and his Ph.D. in Forest Modeling from Oregon State University. He spent five years working on the ORGANON modeling project with David Hann at Oregon State University. He has been with the Pacific Southwest Research Station for 15 years. His research interests include young stand modeling, and methods for quantifying stand density and growth. Currently he is the Forest Manager for Blacks Mountain Experimental Forest and a member of the research teams for the Goosenest AMA research project and the Blacks Mountain Ecological Research Project.

Hal Salwasser

Hal Salwasser is Professor of Forest Resources and Forest Science, Dean of the College of Forestry, and Director of the Oregon Forest Research Laboratory at Oregon State University.

Prior to joining the College of Forestry in July 2000, Hal held numerous positions with the US Forest Service starting as Regional Wildlife Ecologist in California in 1979 and culminating as Regional Forester in the Northern Rockies and Research Station Director in California in the 1990s.

He holds a PhD in Wildland Resource Science, majoring in wildlife and rangeland ecology, from the University of California, Berkeley and a BA degree in biology from Fresno State University.

Hal has published more than 70 professional papers and book chapters and co-edited two books on natural resource issues. He was President of The Wildlife Society in 1993-94 and is a Fellow of the Society of American Foresters.

Hal currently chairs the National Commission on Science for Sustainable Forestry and the Education Committee of the Boone and Crockett Club. He is also a member of the Board of Directors of the World Forestry Center, the Board of Directors of the Oregon Forest Resources Institute, the National Advisory Board of the National Forest Foundation, and the Conservation Education Committee of the Oregon Garden.

Terry Shaw

Terry Shaw is a Forest Research Scientist for the Intermountain Forest Tree Nutrition Cooperative at the University of Idaho, Moscow, Idaho. Terry received a M.S. at the University of Idaho in Forest Resource Management. He has been working in the Inland Northwest forest tree nutrition and forest health fields for the past 15 years. He is currently chapter chair for the Palouse-Snake River Chapter Society of American Foresters and conference chair for the 2005 Society of American Foresters Tri-Society Annual Meeting.

Carl Skinner

Carl Skinner is Research Geographer and Science Team Leader at the Silviculture Laboratory of the U.S.D.A. Forest Service, Pacific Southwest Research Station in Redding, California. Carl received a B.A. from the University of California, Berkeley in 1972 and in 1978 a M.A. from California State University, Chico in Geography. He worked in Fire Management on the Lassen and Shasta-Trinity National Forests from 1968 through 1988. Carl worked in Fire Suppression 1968-1975 and then moved into Fuels Management in 1976 when he began planning a large prescribed fire project designed to enhance several thousand acres of wildlife habitat around Shasta Lake. Carl moved to the Mt. Shasta Ranger District in 1980 where he served as the district Fuels Officer until transferring to PSW in 1988. His research at PSW has been focused on various aspects of fire ecology, fire effects, and fuels management in forested landscapes influenced by Mediterranean climate. Carl is currently manager of the Southern Cascades Site and a member of the Executive Committee of the Joint Fire Science funded National Fire and Fire Surrogates Study designed to assess the ecological, social, and fiscal consequences of alternative silvicultural treatments used to reduce fire hazard.

John Tappeiner

Professor of Silviculture at Oregon State University (retired). He worked in this position for about 24 years. He was Regional Silviculturalist with the US Forest Service California Region for 8 years before coming to Oregon State University.

Marty Vavra

Marty Vavra is a Range Scientist with the Forestry and Range Sciences Lab , La Grande, OR , PNW Research Station, Forest Service. He serves as leader of the Effects of Ungulates on Ecosystems Team. Marty received his BS and MS degrees at the University of Arizona and his PhD at the University of Wyoming. Previously, Marty was with Oregon State University for 32 years serving at the Union and Burns locations of the Eastern Oregon Agricultural Research Center. He was superintendent of the Center for 19 years. Marty's research has covered livestock grazing management, livestock/wildlife relationships, and the impacts of ungulates on their environment.

Andrew Youngblood

Andrew Youngblood is a research forester and silviculturist at the Forestry Sciences Laboratory in La Grande, Oregon. He obtained a doctorate in forest ecology from the University of Alaska Fairbanks. He studies stand development and the role of natural and human-caused disturbances that have the potential to alter forest stand dynamics. His key research interests are the effects of fire in maintaining old-growth ponderosa pine forests, the consequences of alternative fire treatments and techniques for reducing fire risk, and silvicultural options for regenerating and managing mixed white spruce and hardwood stands and landscapes in interior and south-central Alaska.

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