

**First Annual
College of Forest Resources**



**GRADUATE
STUDENT
SYMPOSIUM**

February 27, 2004

Schedule of Events

9:00 – 9:10: Dr. Bruce Bare, Dean, College of Forest Resources

9:10 – 9:30: Keynote Speech
Dr. Dave Shaw, Research Manager, Wind River Canopy Crane

9:30 – 10:50: Session I

9:30 – 9:35: Michael Case, Moderator

9:35 – 9:50: Melisa Holman

9:50 – 10:05: Kara A. Whittaker

10:05 – 10:20: Heather D. Heuser

10:20 – 10:35: Rodney Pond

10:35 – 10:50: Emil A. Cherrington

10:50 – 11:10: Break

11:10 – 12:45: Session II

11:10 – 11:15: Bill Webb, Moderator

11:15 – 11:30: Lin Robinson

11:30 – 11:45: Carson Sprenger

11:45 – 12:00: Daniela Shebitz

12:00 – 12:15: Mariano M. Amoroso

12:15 – 12:30: Jennifer French

12:30 – 12:45: Amberlynn Pauley-Cawley

12:45 – 1:30: Lunch

1:30 – 3:05: Session III

1:30 – 1:35: Amy Ramsey, Moderator

1:35 – 1:50: Anne G. Andreu

1:50 – 2:05: John Withey

2:05 – 2:20: Crystal Elliot

2:20 – 2:35: Indroneil Ganguly

2:35 – 2:50: Bronwyn Scott

2:50 – 3:05: Lucy Edmonds

3:05 – 3:25: Break

3:25 – 5:00: Session IV

3:25 – 3:30: Mariano Amoroso, Moderator

3:30 – 3:45: Joshua Tree Tallis

3:45 – 4:00: Ryan D. Bidwell

4:00 – 4:15: Derek Churchill

4:15 – 4:30: Jeremy S. Littell

4:30 – 4:45: Philip Figuera

4:45 – 5:00: Paul Cereghino

5:00 – 5:15: Closing remarks

5:30 – 6:00: Poster session

Session I

Melisa Holman

Variability in forest growth response and sensitivity to climate change across multiple scales in the Olympic Mountains, Washington

Knowledge of the spatial and temporal patterns of tree growth is central to understanding how forest productivity will be affected by future climate change. Most dendrochronological studies are performed on dominant trees often growing at the upper edges of their ranges, selected because they are presumed to be the most responsive to climate. However, there is little data to suggest how the growth patterns of lower elevation forest ecosystems, some of which are highly productive and offer extensive ecosystem services including carbon storage, will be affected by future climate change. We sampled increment cores from trees representing all size classes and species in 100 forest plots (0.05 ha) spanning the diversity of forest types and growing conditions found in the Hoh watershed, on the wet, west side of the Olympic Mountains, and the Dungeness watershed, within the eastern rain-shadow. We compared annual basal area increment (BAI) during two different time periods (1947-1976 and 1977-2000) at different spatial scales (stand, forest type, watershed, subregion) to determine the scale of the dominant growth influence during these periods of substantial environmental change. Low small-scale correlations of BAI patterns suggest that trees in the Olympic Mountains are responding to very local growth conditions. However, significant positive growth correlations between all adjacent forest types ($R=0.440-0.852$) and between watersheds ($R=0.430$) indicate that there is a common overarching growth-limiting factor (or set of co-occurring factors) that similarly affects the growth of many trees over large areas. Because the magnitude and direction of future climatic variability remains uncertain at the regional scale, we also estimated the sensitivity of forest types to annual variability in growth limiting factors. The Hoh Sitka spruce forest type is the most sensitive to environmental change with the highest mean sensitivity (0.345), the highest potential for annual growth change (mean BAI=0.0047 m²), the highest growth variability (coefficient of variation=0.498, range in variability=4.40 m²), and is most likely to exhibit extreme growth responses (4.2% of years have extreme growth above the mean). Thus, widespread positive growth correlations at large scales suggest that forests of the Olympic Mountains are responding to an overarching climate-growth signal. Furthermore, the Hoh Sitka spruce forest type and other widespread low elevation Pacific Northwest forest types will likely play an important role in storing carbon under scenarios of future climate change.

Kara A. Whittaker

Effects of urbanization on the dispersal of native forest songbirds

The goal of this research is to describe the process of bird dispersal in a heterogeneous urban landscape characterized by a pattern of fragmented forest patches. Relative rates of dispersal and philopatry will be measured and these rates will be compared to patterns of natal patch quality, forest connectivity, and urban land use intensity as well as identification of barriers or corridors for dispersal on local and landscape scales. Post-fledging movements will be tracked with radio telemetry, and natal and breeding dispersal estimated by resighting and recapturing

color-banded birds at local and regional scales (preliminary results presented). With a better understanding of how patterns of land use and land cover are related to changes in bird dispersal, this work will provide useful recommendations to policy makers and land developers regarding the characteristics of habitats and settlements that are most compatible with sustainable native bird populations.

Heather D. Heuser

In search of the Younger Dryas at Elikechan Lake, northeast Siberia

The Younger Dryas (YD) was a late Pleistocene climatic oscillation that occurred approximately 11,000-10,000 ¹⁴C yr B.P. (13,000-11,500 cal yr B.P.), after a millennium of post-glacial climate amelioration. Characterized by dramatic and abrupt climatic cooling over much of the world, the YD has been of great scientific interest particularly due to its extremely rapid termination. The global distribution of the YD signal has also been the focus of much attention and better understanding of the global geographic extent will be essential for determining the mechanisms and causes of paleoclimatic change.

Although it has been referred to as a global event, analysis of paleological data from the North Pacific indicates that not all high latitudes experienced a climatic response to the YD. In Alaska and eastern Siberia the YD signal is complex. Southern areas of Alaska appear to reflect dramatic cooling during the YD; northern and interior areas of Alaska register continuous warming through the last-glacial-interglacial-transition (LGIT) and/or a period of warmer-than-present temperatures. Most of eastern Siberia shows uninterrupted warming into the Holocene. Importantly, many of the studies conducted in eastern Siberia were not of high enough resolution to have recorded the brief and abrupt climatic event of the YD, or they did not have well-constrained dating control. To address this issue, this study employs multiproxy, high resolution analysis to identify any YD signal in a laminated sediment core from Elikechan Lake, northeastern Siberia. The sediment core was analyzed for sediment magnetic susceptibility, grain size, fossil pollen assemblage, organic carbon content, and biogenic silica content at approximately 100-year intervals. Interestingly, the data show a strong signal marking the glacial to interglacial transition but they do not reflect any abrupt changes that would be expected for a YD event.

Rodney Pond

Re-establishing riparian terrace vegetation on a former gravel mine in the North Cascades: native plant survival and growth in response to soil amendment and mulch treatments

Glacial outwash deposits along Pacific Northwest rivers and creeks have yielded easily extractable aggregate materials such as gravel, sand and cobble for construction for over a hundred years. Discontinued mines throughout the North Cascades may be subject to volunteer colonization by seral native plant species. However, highly altered topography, lack of topsoil, risk of erosion and threat of invasive plant establishment precludes reliance on a passive approach to restoration. Techniques supporting native plant establishment and survival on former gravel mines and other disturbed sites lacking significant topsoil have involved accelerating the development of biologically active soils through the use of amendments and mulches.

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Rodney Pond continued

The Goodell Creek Gravel Mine Restoration project is a 0.7-acre portion of a 6-acre site on the eastern bank of Goodell Creek, a tributary of the Skagit River, in the North Cascades National Park Complex near Newhalem, Washington. Gravel mining ceased approximately 20 years ago at Goodell, and this site has since been used as a construction staging and aggregate storage area. The restoration site occupies the riparian terrace zone immediately adjacent to the creek. Using two reference sites as models, three native tree species and a seed mix of 19 native understory species were selected for the site that acts as both a restoration and research project.

Treatments of straw, woodchips, or no mulch were laid over an incorporated partially digested paper mill sludge soil amendment or no amendment in a 2 x 3 factorial design. The six treatment combinations were evaluated for their effect on the survival and growth of the selected plant species. Height measurements indicate trees respond positively to mulches and amendment while seed mix germination varied due to species but generally favored no mulch cover.

Emil A. Cherrington

The Belize debt-for-nature swap: foundations of a prospective evaluation framework

Between 1987 and 2003, the conservation-financing mechanism known as the debt-for-nature swap (DNS) provided debt relief to 34 nations worldwide, to the tune of US \$3.7 billion. While debt swaps simultaneously funneled U.S. \$1.2 billion into conservation projects, in those countries, the impacts of these swaps have not been demonstrated due to general lack of monitoring and evaluation. In 2001, the Central American nation of Belize became the beneficiary of a swap, through the U.S. Tropical Forest Conservation Act, subsidized by a substantial contribution from The Nature Conservancy. In the absence of monitoring of the Belize DNS, this study presents an evaluation framework that could be utilized to map the environmental and socio-economic impacts of such swaps.

Session II

Lin Robinson

Twenty-five years of sprawl in the Seattle region: growth management responses and implications for conservation

An exploratory study of growth management on urban fringe areas in Washington state's Puget Sound region was conducted to document and quantify transformations in land cover and land use between 1974 and 1998. Geo-referenced aerial photographs (orthophotos) of a 474-km² study area east of Seattle were digitized, then classified, to compare vegetative patterns (clustered vs. dispersed vegetation, remnant vs. planted vegetation, patch size), development type (single family housing, multi-family housing, commercial), and percent vegetative cover between 1974 and 1998. Changes in interior forest (greater than 200m from a forest edge) and amount of edge were also calculated. This study showed that suburban and exurban landscapes increased dramatically between 1974 and 1998 at the expense of rural and wildland areas. Single-family housing was the primary cause of land conversion. Increased settlement

transformed the majority of rural land (61%) and a substantial amount of exurban land (22%) into a suburban landscape. Moreover, light settlement of natural forest lands (exurban development) also increased substantially (by 193%). Settled lands became more contiguous while rural and wildland areas became more fragmented. Interior habitat in wildland areas decreased by 41%. Vegetative cover within single-family housing developments was largely dispersed and highly fragmented, and no interior habitat remained within these developments. Current growth management efforts are focused on increasing the density of housing within established urban areas delimited by urban growth boundaries, while limiting densities outside these boundaries through the use of restrictive zoning policies and long-term designation of forest and agriculture production areas. This study showed that densification occurred within urban growth boundaries, but that sprawling, low-density housing beyond the urban growth boundaries in rural and wildland areas constituted 72% of land developed in the study area. The study also revealed that current policies to reduce the density of settlement outside of urban centers, in part to protect ecological systems, may in fact have unintended environmental consequences.

Carson Sprenger

Fire history of Bitte Baer Preserve, Waldron Island, Washington: investigating an indigenous cultivated landscape

A century or more of encroachment by Douglas-fir (*Pseudotsuga menziesii*) and other woody species is threatening many meadow and oak communities throughout the Puget trough. Recent development patterns in these environments are largely attributed to the exclusion of fire. Historically, Native Americans occupied the northern Puget trough and it is generally agreed they practiced repeated burning in key areas. A contemporary management goal for these open forests and meadows is to restore them to their pre-encroachment state. Such efforts often require an understanding of the unique history of individual environments.

Targeting mixed woodlands and relict meadows that were likely used for the cultivation of camas (*Camassia quamash*), a valued food source for Coast Salish tribes, I will be using dendro-chronological techniques to analyze fire scars and establishment patterns across a 200-acre preserve in the San Juan Islands. Historical documents, land survey records, and previous vegetation mapping will also be evaluated. This study is in conjunction with archeological and ethnographic work currently being done on Waldron Island.

Daniela Shebitz

Towards restoring a cultural landscape: beargrass savanna on the Olympic Peninsula, Washington

This project incorporates cultural land management practices in the restoration of an historic beargrass (*Xerophyllum tenax*) savanna. Savannas maintained through anthropogenic burning were a dominant form of vegetation in the Puget Sound lowlands before 1850. Air photographs from 1929, General Land Office Survey records and accounts from early residents and botanists indicate that there were savannas throughout the Olympic Peninsula. Since that time, fire suppression has accelerated succession in these areas. A beargrass savanna restoration project was initiated by the Forest Service in 1995. A 33-acre unit in the Olympic National Forest was burned in autumn 2003. The recovery of beargrass and associated species is being monitored.

Mariano M. Amoroso

Are mixtures more productive than pure stands? An example for the Pacific Northwest

Single species plantations are preferred when timber production is the primary objective of management. Mixed species stands, on the other hand, are usually favored to achieve non-timber objectives. One consequence of using mixed species stands is an assumed sacrifice in productivity (Kelty 1992). However, ecological theory suggests that species in a mixture may utilize resources of a site more completely and efficiently than a single species would be able to do, leading to a greater overall productivity (Vandermeer 1989).

We examined this proposition in pure and mixed Douglas-fir (*Pseudotsuga menziesii* (Mirb.)) Franco) and western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) plantations on the Olympic peninsula, Washington. Two study sites containing pure Douglas-fir and pure western hemlock plantations, as well as 50/50 mixtures of the two species, were established at a wide range of densities. Growth and productivity were studied for the first 12 years after establishment at the tree and stand level at three densities (200, 450 and 700 TPA).

As components of the mixed stand, Douglas-fir resulted in greater height, diameter, and individual tree volume compared with western hemlock at all densities at age 12; these differences appeared early in the stand development. Compared with their performance in pure stands, mixed stands of Douglas-fir exhibited a better performance at the high density level while western hemlock, in contrast, experienced a reduction. At the medium density level, both pure Douglas-fir and western hemlock stands averaged higher volume per acre than the mixed stand; however, at the highest density, the mixture showed the highest absolute yield. At this density (700 TPA) Douglas-fir, as a component of the mixture, resulted in the same volume per acre as the pure hemlock stand. The relative yield (RY) of western hemlock was disproportionately lower at all densities; Douglas-fir presented considerably higher RY values at both 450 and 700 TPA densities. It is clear that the mixture of the two species benefited from the yield of Douglas-fir, but results are different among density levels. While at low and medium density levels the pure stands resulted in the highest yield, the mixture appeared as the most productive alternative at higher densities.

Jennifer French

Ecological relationships between insects and western hemlock dwarf mistletoe

Western hemlock dwarf mistletoe, *Arceuthobium tsugense*, is a diminutive vascular plant that parasitizes western hemlock trees. Although dwarf mistletoe is often reviled as a forest pest, it is widely recognized as an essential component of forest canopy ecosystems. Dwarf mistletoe facilitates structural and vertebrate diversity in forest stands. However, little work has been done investigating interactions between insects and western hemlock dwarf mistletoe. The interactions between western hemlock dwarf mistletoe and insects was explored during the summer of 2003 at the Wind River Canopy Crane Research Facility. An introduction to the project and preliminary results will be presented.

Amberlynn Pauley-Cawley

*Giants in the headwaters: terrestrial *Dicamptodon tenebrosus* movement patterns and microhabitat associations*

Dicamptodon tenebrosus is the top predator in many headwater streams in Washington, where it may be found in the Cascades and coastal Willapa Hills (Leonard et al. 1993), two of the three major mountain ranges in Washington. Some work has been done on the ecology of aquatic *D. tenebrosus*, but very little is known concerning the terrestrial form (Johnston and Frid 2002). I propose surgically implanting 20-40 terrestrial salamanders from small order streams in the Willapa Hills with Holohil PD-2H transmitters to track their movement patterns and microhabitat associations. The Willapa Hills, and much of the range of *D. tenebrosus*, has been logged historically. Buffer design of riparian systems is a concern for conservation of Washington's native stream-associated fauna. While the listing of Pacific salmonid stocks under the Endangered Species Act has driven buffer design in larger order streams, smaller order streams have received less study concerning their wildlife associations and ecological processes. The results of this work will help guide buffer design in headwater streams and contribute to the conservation of this endemic Northwest species.

Session III

Anne G. Andreu

The effects of fire on regeneration from the seed bank in western Washington grasslands: potential implications for restoration

Grasslands in western Washington have been altered compositionally and structurally by the encroachment of native woody species and the invasion of non-native species due in large part to fire suppression. Managers are currently using prescribed fire as one method to combat these invasions and restore native prairie grasses and forbs. Fire is generally effective for controlling native woody species encroachment; however, several studies have shown that fire has varied effects on invasive species in western Washington and Oregon prairies (Schuller 1997, Tveten and Fonda 1999, Maret and Wilson 2000, Dunwiddie 2000). The seed bank can be important in communities that rely on disturbances such as fire for maintenance or restoration. Recruitment in gaps created by the disturbance can influence or define the future composition of the community. More information regarding the dynamics of recruitment and establishment following fire in western Washington grasslands is needed to facilitate the development of more effective prescribed fire regimes. In this study, the goals were to 1) determine the seed bank composition of western Washington prairie systems; 2) observe direct effects of fire on available surface and subsurface soil seed banks; 3) relate the observed trends to species and site characteristics such as seed dispersal phenology, germination phenology, seed size, and seed depth in the soil. This study aims to contribute new information on the dynamics of recruitment following fire to aid in the development of more successful prescribed fire regimes for grassland restoration.

John Withey

Reproduction and survival of American crows along a gradient of urbanization

Crow populations in the Seattle area have increased dramatically over the last 20 years. For the last six years, color-banded crows have been monitored to study nesting success and survival at sites along an urban gradient from downtown Seattle to wildland near North Bend. Crows have higher reproductive success in less-urban areas. Juvenile survival is lower than adult survival, which is relatively high across the gradient. Dispersal from less-urbanized to more-urbanized landscapes explains some of the growth of the urban population.

Crystal Elliot

Environmental and historical factors driving vegetation communities on Russian Island, Columbia River Estuary

The Columbia River Estuary drains a watershed that covers over 650,000 km², including areas in seven U.S. states and the Canadian province of British Columbia. This is the second largest estuary on the west coast of the United States serving as a transition point for anadromous organisms like endangered Pacific salmon, thereby playing a crucial role in the success of these organisms in the Pacific Northwest. Shrinking habitats, such as the tidal marshes (50-75% historical loss), in this highly developed estuary are essential to the rearing of juvenile salmon, particularly Chinook (*Oncorhynchus tshawytscha*) and chum (*O. keta*). To date, an understanding of the ecology, history, and evolution of these diverse, crucial habitats has not been achieved. Better understanding is essential for the planning of successful restoration projects.

The objective of this study was to document plant community variability on a representative small marsh island and attempt to explain observed differences using collected information about the environmental conditions. Factors investigated include elevation, soil salinity, soil texture, organic matter content, and relative age of the sites.

Plant community and environmental data was taken on field visits to Russian Island in the summer of 2003 (with soil tests currently pending). Information on island evolution and relative ages of study sites was acquired through comparison of historic and current maps and imagery using GIS in the fall of 2003. Results from a multivariate analysis hope to reveal the role of the various factors in driving the spatial variability in the plant communities of Russian Island, thereby increasing our understanding of what environmental factors will most influence the success of future tidal marsh restoration projects in the Columbia River Estuary.

Indroneil Ganguly

U.S. market profile of structural finger jointed lumber

There are many misconceptions by current and potential end users about the quality and attributes of structural finger jointed lumber (SFJL). An exploratory study on users and potential users of SFJL in the construction industry was conducted; specific objectives included identification of reasons builders are or are not using SFJL, builders' perceptions of SFJL, and the level of satisfaction amongst SFJL users. Primary data was collected by mailing

surveys containing mostly fixed-set questions. Of 192 respondents nationwide, 25.5% are users of SFJL. Results show that lumber companies are the main source of information to builders, followed by trade publications. 73% of users reported being satisfied with the performance of SFJL, while only 20% of users describe themselves as dissatisfied. The mean rating obtained from the responses shows that in a number of attributes SFJL ranked better than solid sawn softwood. Respondents feel that SFJL experiences significantly less warping and twisting than sawn softwood lumber; the number of defects is also perceived to be much lower. The results further show that jobsite waste of SFJL is much less than sawn lumber and has fewer adverse environmental effects. Moreover, the respondents believe that SFJL is more dimensionally stable, experiences less price fluctuation, and is available in longer and more variable lengths. However, the survey participants also believe that it is significantly more expensive than sawn lumber and that there are problems with availability and supply consistency. The most important factors in making a usage decision of the product are its dimensional stability and general availability. The most significant predictors responsible for the existing users of the product to consider increasing their usage of SFJL are strength and overall quality.

Bronwyn Scott

Temporal effects of Ulex europaeus on the soil ecosystem and how they relate to modeling the impacts of invasive species

Invasive plants contribute to biodiversity loss and cause extensive economic damage and loss. Understanding the ecological impacts of invaders and why they are capable of displacing other species and communities is a priority. Some of these plants, such as gorse (*Ulex europaeus*) are capable of altering the soil and disturbance regimes. These plants may continue to alter the ecosystem as they stay resident. My research will examine gorse's ability to alter biogeochemical cycling in the soil over time, including nutrient mineralization/immobilization

and soil and water chemistry. The research will be done on the coast of Washington, where gorse is found growing on sand. Its progression over time is documented with aerial photos. The results will be used as empirical evidence to help assess the current status of ecological impact models. With improvements in impact models, and better understanding of alteration of ecosystem processes, recommendations can be made for more precise prediction, assessment and management of invasives as well as improved recovery of processes to facilitate easier restoration once invasives are removed.

Lucy Edmonds

Policy analysis of conservation easements

I propose to evaluate the long-term effectiveness of conservation easements as a method of land preservation. There are many different perspectives from which the effectiveness of conservation easements can be evaluated, including those within economics, sociology, and ecology, for example. I am determining which of these approaches will receive the focus of my evaluation. This presentation provides an overview of conservation easements, including

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how conservation easements are created and maintained; and some of the costs, benefits and challenges associated with conservation easements. I will dissect an actual conservation easement—possibly the Fisher, Thompson River Valley conservation easement in Northwest Montana—and review the parties involved, their roles, funding of the easement and the timeline for easement implementation. I will review two potential research approaches. The first involves conducting a survey of land trust organizations who manage conservation easements to determine the effectiveness of conservation easements at meeting their stated goals, challenges encountered, and concerns about the future of land protected by conservation easements. The second approach involves selecting a particular conservation easement for deeper analysis. The significantly smaller sample size of the second approach would allow a wider breadth of perspectives to view the long-term effectiveness of the conservation easement evaluated.

Session IV

Joshua Tree Tallis

Mycorrhizal restoration in degraded tropical pastures: Is it necessary? How can it be done?

Restoration of arbuscular mycorrhiza fungal communities in highly degraded soils can potentially play a crucial role accelerating the regeneration of tropical wet forest systems. Few efforts have been made to restore mycorrhizas in the tropics and most of these have employed non-native grasses as hosts. This study proposes using native legume trees to reestablish mycorrhizal communities in order to accelerate the restoration of a native plant community. In addition, nitrogen fixing legume trees can (1) increase labile nitrogen, vital in degraded soils, and (2) accelerate the development of a canopy, which provides habitat, reduces soil temperature fluctuations and minimizes erosive effects of rainfall. Based in southern Costa Rica, this study compares mycorrhizal infectivity using two native legume trees (*Ingaspectabilis* and *Caliandra calothyrsus*) and a common European pasture grass (*Brachiaria decumbens*). All plants were treated with either live mycorrhizal inoculum or a control in six unique blocks. Early results show that both inoculated trees and grass successfully infected soil. A surprising result of pretreatment measurements showed mycorrhizal spores present between 1m and 2m depth, far deeper than mycorrhizal propagules found in any other study according to a literature search. The unprecedented depth of these mycorrhizal communities may suggest that restoration may be unnecessary in tropical wet forest soils.

Ryan D. Bidwell

Nature vs. nurture? Towards a functional typology of collaborative watershed planning groups

Collaborative natural resource partnerships are an increasingly common strategy for addressing complex natural resource management decisions. Despite widespread occurrence, and a

growing body of literature surrounding their strengths and weaknesses, researchers have thus far had little success in developing broad generalizations or theories regarding the utility of these collaborative groups. In many cases this is because research has often focused on the unique contextual factors affecting collaborative processes, while few studies have had the breadth to consider more comparative issues. Previous research suggests that different types of partnerships may be better suited to address certain types of problems. Accordingly, this research aims to refine a typology of collaborative groups that might be useful for managers and policymakers interested in designing collaborative partnerships. Data was gathered through personal interviews with 29 of Oregon's watershed councils. Confirming previous work, the diversity of interests involved in the partnership is found to affect the outcomes of the process. In addition to partnership composition, this research also identifies organizational affiliation as an important consideration affecting performance. These results suggest that partnerships' organizational traits (their "nature") may be equally as important as the process of collaboration between participants (where "nurturing" reportedly occurs). A typology of collaborative partnerships including both nature and nurture characteristics is proposed.

Derek Churchill

Factors influencing understory Douglas-fir vigor in multi-cohort prairie colonization stands at Fort Lewis, Washington

In recent years, changing social values and increasing scientific understanding of forest ecosystems in the Pacific Northwest has led to consideration of multi-cohort management. However, lack of proven management strategies has prevented implementation on a significant scale. Fort Lewis has been experimenting with different approaches to multi-cohort management for over 30 years and offers an excellent opportunity to assess the effects of various multi-cohort silvicultural approaches on the development of understory cohorts of Douglas-fir. This study will survey and broadly characterize stand structure and Douglas-fir advanced regeneration in 20-25 stands and examine the relationships between overstory density and understory vigor, both at the plot and individual tree levels.

Jeremy S. Littell

Tree rings, teleconnections, and transient limiting factors

A large body of research links climate variability to variation in forest processes such as tree growth and wildfire. During the 20th century, Pacific Ocean-derived circulation anomalies the SO (Southern Oscillation) and the PDO (Pacific interDecadal Oscillation) had marked impacts on climate in the western United States through atmospheric teleconnections. These quasi-periodic phenomena were linked to drought and influenced both tree growth and wildfire. How transient have these relationships been through time, and are they consistent in space? In this talk, I describe the results of preliminary analyses of the spatial and temporal variability of climate impacts on tree growth and wildfire in the western United States. I focus specifically on the role of the SO and the PDO as top-down determinants of drought in the West and their linkages with tree-ring reconstructions of climate variability and wildfire.

Philip Higuera

Holocene fire, climate, and forest history from the Southern Brooks Range, Alaska

Interactions between climate, vegetation, and fire regimes are poorly understood but will likely play key roles in determining boreal forest response to future climatic change. With paleological records from lakes across the southern Brooks Range, we are documenting how vegetation and fire regimes have interacted, and how each has responded to climatic changes over the past 10,000 years. Centennial-scale changes in temperature and vegetation are documented with fossil chironomid assemblages and pollen/stomate records, respectively. Continuous records of macroscopic charcoal document landscape burning at decadal time scales.

These records show evidence of fire regimes changing both between and within dominant vegetation types. The replacement of shrub tundra with forest ca. 5000 years ago is accompanied by increases in both charcoal accumulation and the frequency of charcoal peaks. The absence of a distinct change in our climate proxy during this period suggests that vegetation, rather than climate, explains this increase in burning on the landscape. During the late Holocene, vegetation assemblages remained stable, but decreased charcoal accumulation rates and lower peak frequencies starting ca. 3000 years ago suggest reduced burning on the landscape. Shifts in fire regimes in the absence of vegetation change imply that fire regimes can be sensitive to climatic changes that do not affect vegetation assemblages.

While climate ultimately controls both vegetation and fire, these records suggest that vegetation can play an important intermediary role between climate and fire. This reinforces the importance of understanding the extent to which forest will replace tundra under future climatic conditions in order to predict the pattern and effects of future disturbance regimes in boreal ecosystems.

Paul Cereghino

Beyond willow stakes—field propagation of snowberry, salmonberry and red-twig dogwood across a wetland-upland moisture gradient

Reducing the costs associated with revegetation allows restoration project designers to expand the scope of restoration plantings with the potential for both short and long-term benefits. Field propagation using “live-stakes” offers an exceptionally cost-effective method of establishing deciduous species that easily form adventitious roots from excised stems. Although a significant number of studies have begun to isolate factors that control adventitious rooting of specific genotypes, rooting response is variable and has been largely limited to studies in artificial environments. Little systematic research has examined the potential for field propagation of genera other than *Salix* (willow) and *Populus* (cottonwood and poplar). This study observed the growth response over one growing season of salmonberry (*Rubus spectabilis*), snowberry (*Symphoricarpos albus*), and red-twig dogwood (*Cornus stolonifera*) planted as dormant hardwood cuttings across a wetland moisture gradient and at two planting times (mid winter and late winter). Results suggest that simple design considerations may allow for the expansion of species propagated as live-stakes.

Posters

Adam Mouton

Remotely sensed forest cover for Okanogan County, Washington

Amy C. Ramsey

The effects of fire and forest thinning on endophytic fungal diversity in woody roots of Douglas-fir and ponderosa pine

Derek Beauchemin

Status of Pinus albicaulis within the North Cascades National Park: specifically the Four-mile watershed

Garrett Liles

Effects of tree harvest on headwater stream chemistry

Jennifer Brickey

Road anti-icers and their potential effects on the rare plant Hackelia venusta

Marianne Elliott

Systematic study of the fungus Nattrassia mangiferae, the cause of madrone canker

Michael Case

A dendroecological study of Douglas-fir and lodgepole pine along altitudinal gradients within the North Cascades National Park

Morris Johnson

Analyzing the efficacy of fuel treatments using an integrated decision support tool

Richard A. Grotefendt

Super large scale aerial photography: a tool for the collection of accurate and cost-effective natural resource data

Silviculture Lab

Silviculture for the future of conservation, restoration and management

Steve Rentmeester

Modeling in-stream wood recruitment and effects of riparian management

Tammy Stout

Treating containerized plant material as bare-root stock; an experiment on above- and below-ground growth

Thomas Unfried

Effects of urban forest fragmentation on songbird dispersal, gene flow, and population structure

Yongjiang Zhang, Derek Beauchemin, and Dr. Tom Hinkley

Study of growth and blister rust in Western white pine: lessons for whitebark pine

Symposium Participants

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Thank you for coming today!

We hope you enjoyed the first annual College of Forest Resources Graduate Student Symposium. Please take a moment to fill out an evaluation form (located on the table near the entrance). Your comments will help us plan future symposiums and tailor the event to a variety of needs.

Please come again next year!

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