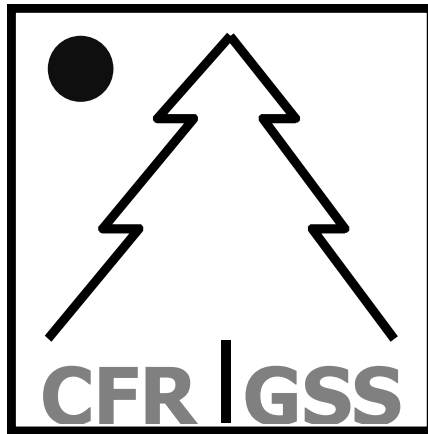


Third Annual

College of Forest Resources



**GRADUATE
STUDENT
SYMPOSIUM**

February 24, 2006

Schedule of Events

8:45 – 9:00: Dr. Bruce Bare, Dean, College of Forest Resources

9:00 – 10:05: Session I

9:00 – 9:05: Introduction and remarks by session moderator
9:05 – 9:20: Jenna Tilt
9:20 – 9:35: Thomas Unfried
9:35 – 9:50: Kara Whittaker
9:50 – 10:05: Deborah Brown

10:05 – 10:20: Break

10:20 – 11:40: Session II

10:20 – 10:25: Introduction and remarks by session moderator
10:25 – 10:40: Glenda Singleton
10:40 – 10:55: Jamie Banaag
10:55 – 11:10: Jessica Taylor
11:10 – 11:25: Josh Smith
11:25 – 11:40: Nicholas Brazee

11:40 – 12:10: Lunch

12:10 – 1:30: Session III

12:10 – 12:15: Introduction and remarks by session moderator
12:15 – 12:30: Lesley Hoare
12:30 – 12:45: Tobey Clarkin
12:45 – 1:00: Andrew Larson
1:00 – 1:15: Jared Seifert
1:15 – 1:30: Anna Vainio

1:30 – 1:45: Break

1:45 – 3:05: Session IV

1:45 – 1:50: Introduction and remarks by session moderator
1:50 – 2:05: Philip Higuera
2:05 – 2:20: Mark Swanson
2:20 – 2:35: Philip Monsanto
2:35 – 2:50: Carrie Lee
2:50 – 3:05: Hakjun Rhee

3:05 – 3:10: Closing remarks

3:30 – 5:30: Kenton Miller, CFR Distinguished Alumni Seminar

5:30 → Poster session, reception, and Dead Elk Party

Session I

Jenna Tilt (presenter) and Thomas Unfried

Neighborhood Greenness, Walkable Destinations and Health

Active living studies have shown that enjoyable scenery and shops and other destinations within close proximity to one's home increases physical activity (walking) in residential neighborhoods. This study examines the relationship between greenness, destinations and walking behavior using both objective and subjective measures.

We used GIS Network Analysis to identify residential parcels within the city limits of Seattle, Washington that are within walking distance to different destinations using the existing street network. To measure greenness throughout the city, we used the normalized difference vegetation index (NDVI) which is calculated from remotely-sensed satellite data. To triangulate the objective measures of walkability of neighborhoods in Seattle, a mail questionnaire was sent out to 3300 Seattle residents. We selected addresses for the quality of life survey from GIS network data of residential parcels within the Seattle city limits using stratified random sampling of areas differing in walkability and NDVI values. The survey collected data about perceptions of what destinations the resident felt were within walking distance, walking behaviors, the greenness of their neighborhood, neighborhood satisfaction, quality of life and health (BMI was calculated), as well as demographic information.

The GIS Network results showed that within the City of Seattle, 27% of parcels were within walking distance of 0-2 services, 45% within walking distance of 3-5 services, and 28% within walking distance of 6-12 services. There was a subtle but significant negative relationship between walkability score and NDVI. Our survey results showed a suggestive but not significant relationship between quality of life and body mass index (BMI); however an individual's total amount of walking was significantly related to quality of life and sense of community. In addition, we found a significant relationship between BMI and level of vegetation—as the level of vegetation cover rises, BMI decreases.

Thomas Unfried

Song Sparrow (Melospiza melodia) population structure and dispersal in a fragmented urban landscape

The forests of the Seattle metropolitan region have been fragmented by urban development, which has impacted forest songbird reproduction, survival, and dispersal. The change in landscape cover may create a new population structure, such as a metapopulation of isolated populations loosely connected by dispersal. The goal of this study is to understand the population structure and dispersal of Song Sparrows (*Melospiza melodia*) in the Seattle metropolitan region. The primary objective is to determine whether forest fragmentation has created new population structure, and to relate population connectivity to land cover. Molecular marker methods have some advantages over traditional marked-individual methods for estimating dispersal and population structure. Blood and/or feather samples have

been collected from 251 Song Sparrows at 25 sites throughout the Seattle region. These samples will be analyzed at 8 microsatellite loci. The multilocus genotypes generated can be analyzed in several ways to generate estimates of dispersal, connectivity, and population structure. It is expected that Song Sparrow populations have become isolated by fragmentation, and that dispersal is related to particular patterns of land cover. These results would contribute to understanding the effects of urban development on wildlife, and could generate recommendations for future planning.

Kara A. Whittaker

Differences between species in dispersal probabilities, movement patterns, and characteristics of urban landscapes used during the post-fledging period

Habitat loss and fragmentation as a result of urbanization are altering the population dynamics and community composition of forest songbirds in the Puget Sound Region and leading to the extirpation of species in some areas. For bird populations to remain connected after their habitat becomes isolated into separate patches, they must be able to successfully disperse between habitat remnants. The process of dispersal is essential for maintaining metapopulations, source/sink dynamics, and gene flow. The primary objective of my research is to understand the process of bird dispersal in a heterogeneous urban landscape characterized by a pattern of fragmented forest patches.

As a part of this research, I am using radio telemetry to investigate post-fledging movement patterns of six bird species at twenty study sites located across the urban gradient of the Seattle metropolitan area. I will present preliminary results testing hypotheses regarding (1) the costs and benefits of natal dispersal versus philopatry, (2) differences in dispersal probabilities and movement patterns between species, and (3) differences in the characteristics of landscapes used during the post-fledging period between species. My ultimate goal is to use this understanding of bird dispersal to help guide regional land use policies and land cover patterns so that future developments have the least negative impact on this important process.

Deborah Brown

A Tree Management Plan for the University of Washington, Seattle campus

Trees define the landscape of the 750-acre Seattle campus of the University of Washington, but there is currently no comprehensive system of tree management. We must first assess this resource in order to manage it. In the past, record-keeping efforts have been sporadic and are now functionally obsolete. Two years ago, the Grounds Department embarked on a project to create a GIS-based tree inventory. At present only certain parts of the campus have been inventoried, yet this project is limited to the southern portion of campus. In the preliminary stage, the south campus trees were located and numbered, and diameter at breast height (DBH) and tree height were recorded. In addition, another layer of information is being added: species, condition, and maintenance needs. Once the inventory is complete, we will integrate this information into a management plan. The plan will include a description of our methods, a prioritized list of management goals, and a framework for making

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Deborah Brown continued

data-based maintenance decisions. The goal of this project is to help provide the impetus to complete the inventory and formulate management plans for the rest of campus.

Session II

Glenda Singleton

Phytoremediation: TCE uptake by Transgenic Aspen

Trichloroethanol (TCE) is a common toxicant of soil, groundwater and air and is in 23 SuperFund Sites in Oregon and Washington. TCE is hepatotoxic and a suspected carcinogen but has been heavily used as a degreaser, dry cleaning agent and pesticide in the past. Phytoremediation, the use of plants to uptake and degrade toxins, can be an efficient means of ridding TCE from these contaminated areas. Our laboratory studies the use of genetically altered aspen trees to metabolize TCE to increase its phytoremediation potential. The transgenic aspen (*Populus tremula* x *P. alba*) have been transformed with the gene encoding the mammalian protein cytochrome P450 isoform 2E1 that metabolizes a variety of halogenated hydrocarbons, like TCE. Differential levels of P450 2E1 expression result in varying abilities to metabolize TCE. Poplar cuttings grown in TCE-dosed hydroponics were tested for TCE and its metabolic byproduct trichloroethanol (TCEOH). Levels of TCE removal from the hydroponic solution increased as the level of CYP450 2E1 expression increased, with our best transgenic line having a TCE removal rate 2.5 times higher than the null vector and no plant controls. TCE metabolism also dramatically increased with our best transgenic line showing increased TCEOH levels over 150-fold, with an average increase of about 71-fold higher than in control plants. Transgenic aspen could be a resourceful way to degrade and remove TCE from contaminated areas.

Jaime F. Banaag

CO₂ uptake and Nitrogen Use Efficiency as Affected by Leaf Development and Nitrogen Fertilization in Hybrid Poplar

Plant productivity can be expressed in terms of photosynthetic CO₂ uptake. My research focuses on the effects of leaf development (leaf age) and nitrogen fertilization (nutrient availability) on CO₂ uptake in hybrid poplars. Plant productivity can also be expressed in terms of biomass per unit of nitrogen or as nitrogen use efficiency. Hybrid poplars are ideal trees for this study considering their production potential.

Two related poplar hybrids (*Populus trichocarpa* x *P. deltoides*) were grown at two nitrogen relative addition rates (RAR, 1.5% vs. 6%, or low vs. high nitrogen, respectively) during August 2003 in a greenhouse. Weekly measurements showed 27% taller plants at 6% RAR accompanied by higher chlorophyll/nitrogen, larger leaves, and 50% more leaves compared to plants at 1.5% RAR.

For leaves of similar Leaf Plastochron Indices (LPI), CO₂ uptake was 58% greater in plants grown at 6 vs. 1.5% RAR. Highest rates of photosynthesis were observed in LPIs 6 to

12. Nitrogen use efficiency (NUE) was 31% higher in the trees grown at 6% compared to 1.5% RAR. NUE is expressed as the leaf dry weight gain per chlorophyll/nitrogen content.

CO₂ uptake, related photosynthetic parameters, and nutrient use efficiency are better expressed and more easily understood when analyzed according to leaf age (i.e., LPI) and its nutritional status. Increasing nitrogen availability should increase the productivity of hybrid poplars.

Jessica C. Taylor

Effects of riparian buffers on soil nitrogen mineralization in headwater stream watersheds

Little is known about the effects of forest harvesting on the chemistry of non-fish bearing headwater streams in lowland western Washington and how this harvesting affects downstream salmonids. Nutrient exports can have a significant effect on downstream processes. The ecological objectives of this research are to investigate the connection between riparian buffers and nitrogen mineralization within the buffer zone.

Nine headwater streams will be included in the soil nitrogen mineralization study. Three with riparian buffers left intact, three control sites with 70 year old second growth forests, and three recently harvested sites with no riparian buffers. In addition to the nitrogen data, stream water will be monitored and analyzed for nutrient export. Results of this research will be the production of a predictive model for headwater stream nutrient concentration in relation to soil processes and disturbance.

Joshua C. Smith

Predicting seed germination in the sediments of Lake Mills after removal of the Glines Canyon Dam on the Elwha River

In 2008, two dams on the Olympic Peninsula's Elwha River, the Glines Canyon Dam and the Elwha Dam, will be removed in an effort to restore native fisheries to the Elwha watershed. Although many smaller dams have been removed throughout the world, the natural colonization of plant species into newly exposed sediments is poorly understood.

Seed banks are known to play a crucial ecological role in the initiation of plant communities following ecosystem disturbance. Over 13.8 million cubic yards of sediment have been impounded in Lake Mills behind the Glines Canyon Dam. Identifying seed banks within the Lake Mills sediments may help predict the presence of native and exotic species, and provide an in situ source of desirable species to initiate the re-vegetation of the lake's basin after denudation. In May 2005, I collected 122 sediment samples from Lake Mills and conducted a seed bank analysis using the greenhouse emergence method. In the spring of 2006, I will physically extract seeds from the samples to further investigate seed densities within the sediments. To supplement our understanding of the relationship between seed germination and the sediments, I will measure the germination rates of four native

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Joshua C. Smith continued

species on different sediment treatments. These studies may provide essential information to the restoration effort and to our understanding of natural seed recruitment in a newly exposed lake basin.

Nicholas J. Brazee

The role of Armillaria spp. in canopy gap formation within the temperate, old-growth rainforests of the Hoh River Valley, Olympic National Park

Ecologists have long ignored the impacts of pathogenic fungi in forest systems, despite their role as dominant disturbance agents. A wealth of information exists concerning *Armillaria* in managed stands, yet very little research has been performed in old-growth forests. *Armillaria* is the most common pathogenic fungus causing root rot within the Olympic National Forest, and is very common within Olympic National Park. Previous researchers have found five species of *Armillaria* on the Olympic Peninsula: *A. cepistipes*, *A. gallica*, *A. nabsnona*, *A. ostoyae*, and *A. sinapina*. Like many forest pathogens, *Armillaria* has a significant impact upon forest structure, regeneration patterns, plant species diversity, and forest succession.

For this study one hundred isolates of *Armillaria* were collected, primarily from western hemlock, across ten canopy gaps along three trail transects in the Hoh River valley. Restriction fragment length polymorphism (RFLP) analysis of rDNA has shown that *A. sinapina* is the dominant species present. Random amplified polymorphic DNA (RAPD) analysis will show clone distribution, and size. *A. sinapina* is believed to be only weakly pathogenic, not able to cause significant decay in live hosts. Yet, the majority of blown down trees have extensive portions of their root systems rotted. Because the environmental conditions in the western Olympics are so favorable for tree growth, western hemlock may have up to 75% of its root system decayed by *Armillaria*, yet show no physiological symptoms of decline. Only after windstorms expose this weakness are the effects of *Armillaria* visible. Based on these results, it appears that *A. sinapina* is more pathogenic than previously thought. This study is not likely to resolve this issue, but raises doubt about our understanding of *Armillaria* pathogenicity, especially in forests that do not experience fire and are not bound by artificial rotation lengths.

Session III

Lesley Hoare

Contributions of Low-Income Workers to Forest Management and Production

Latino migrant workers are an increasing percentage of low-income, manual forest laborers in the Pacific Northwest. They have important ecological knowledge learned through years of experience and can be seen as a primary human resource in forest management. They are involved in the harvesting of floral greens and mushrooms, pre-harvest thinning and tree planting, all of which directly affect the health and productivity of the forest. Semi-

structured interviews and participant observation with salal (*Gaultheria shallon*) harvesters and community members in a rural town in Western Washington provided data on what practices and knowledge are being applied daily in the forest. This research also looks at the diversity of the stakeholders involved, identifying five languages and three countries of origin outside of the United States. Worker responses highlight challenges to implementing ecologically sustainable practices under the current management system and suggest possible changes. This is especially important with the recent shift in focus from timber production to sustainable forestry and ecosystem management. Non-timber forest products provide both ecological diversity and an economic alternative to timber production.

Tobey Clarkin

Modeling global positioning satellite signal under forest canopy using LIDAR estimated canopy density

A dual-frequency, global navigation satellite system (GNSS) receiver is capable of receiving signals from both global positioning system (GPS) and global orbiting navigation satellite system (GLONASS) satellites. GNSS will be used to model positional error of 60 ground points under varying forest canopy as a factor of the laser detecting and ranging (LIDAR) derived point-cloud density/intensity between each point and the satellites from which it acquires signal. Vectors between points on the ground and each satellite contributing to the point's position coordinates will be imported into the LIDAR Fusion™ software environment. This will determine the LIDAR point-cloud density/intensity through which each satellite signal traveled. The averaged values of LIDAR point-cloud density/intensity which all satellite signals traveled through in determining the position coordinates of an occupation will be regressed against positional error of the GNSS receiver coordinates as determined from control coordinates obtained from traditional surveying methods. The correlation of LIDAR point-cloud density/intensity to positional error of GNSS receiver coordinates under forest canopy will offer data-collection specialists in the forest sector a strong estimator of the accuracy of GNSS data collected under canopy and a valuable supplement to traditional GNSS mission-planning for future work.

Andrew Larson

Scales of Spatial Dependency in Abies amabilis Forests

Question: (1) Are different canopy strata spatially correlated; (2) If present, what are the spatial scales of correlation between canopy strata in natural *Abies amabilis* forests? Does the strength and scale of spatial segregation between modeled overstory and subcanopy trees differ when tree locations are determined by (1) endogenous factors alone, that is, only interactions between trees; and (2) endogenous factors plus exogenous forcing of overstory tree spatial patterns?

Location: Montane forests of the western Cascade Range, Washington, USA.

Methods: Stem maps of three large study areas (1-2 ha) were created. Spatial cross-covariance functions were estimated between canopy strata in natural stands and also for simulated

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Andrew Larson continued

stands where tree locations were modeled with stochastic spatial point processes.

Results: Strong segregation between subcanopy trees and areas of high overstory occupancy and significant spatial correlation between tree size classes at spatial scales up to approximately 30-40 meters were the key findings for natural stands. Similar spatial scales of segregation were observed only when tree locations were modeled as a function of both endogenous and exogenous factors together.

Conclusion: Competitive interactions between trees and endogenous population process create spatial segregation between canopy strata at local scales. External forcing of overstory tree locations by processes that result in overstory mortality, such as disturbance and pathogens, leads to segregation between canopy strata at larger spatial scales.

Jered Seifert

Dynamic modeling of common unit operations in the paper industry to aid in the education of the industry's future workforce

The American paper industry, feeling the effects of world globalization, is looking for opportunities to reduce their high cost of manufacturing. New paper capacity is continuing to be built, but in countries where the cost of labor is significantly lower. The American paper industry has not been able to considerably decrease its cost of labor. One strategy being implemented is school base training to create a highly skilled workforce. The training will teach students a wide array of skills needed to be successful in the paper industry, among them process behavior and how to utilize computer tools. With this new work force the industry should see reduced downtime, decreased training time, and an overall increase in productivity allowing it to compete with the overseas paper industry.

The objective of my research is to create dynamic models of common paper industry unit operations for computer based training. The dynamic models will be integrated into an OPC server, which enables communication between the dynamic model and a wide consortium of programs. This resulting computer dynamic model will utilize pre-existing interface software, which is customized to each dynamic model. The students will use these simulations to gain knowledge in process behavior, troubleshooting, and how to use the vast array of computer tools within the industry. The goal is to give the student a realistic appearance and feel without having to train them on the real unit operation.

Anna Vainio

The effect of internal sizing with ASA on paper strength properties

Alkenyl succinic anhydride (ASA) is used in papermaking to modify fibre surfaces so that liquid penetration into paper can be controlled, for example in newsprint grades to prevent printing ink from spreading. ASA is typically used when there is a demand for alkaline papermaking conditions. The properties, optimal usage and sizing effect of ASA have

been studied, but not much information is available on how ASA affects the mechanical properties of paper. The objective of this study is to examine if and how paper strength is affected as ASA content of the paper is altered.

100% thermomechanical pulp (TMP) handsheets are made with different ASA dosages, with precipitated calcium carbonate (PCC) as filler. Later on, also a TMP-deinked pulp-kraft pulp mixture and various papermaking chemicals will be used, to imitate the composition of an actual mill paper. The strength properties examined include tensile strength, elastic modulus, burst strength, Scott bond strength and in-plane tear strength. Also image analysis will be used to look at the fracture and bonding properties of the paper more closely.

Preliminary results suggest that, at commercial addition levels, ASA does not influence paper strength significantly. At very high dosages, both tensile properties and z-directional strength decrease. Cationic starch present in the ASA emulsion does not help to maintain tensile strength when PCC is added, although Scott bond values of the ASA treated sheets are slightly higher. The difference is not statistically significant. However, it is possible to maintain an acceptable level of strength with the help of dry strength chemicals and by retaining more fines in the sheet, and still have the desired sizing degree and even increase the amount of filler in the papermaking furnish.

Session IV

Philip Higuera

The relative importance of vegetational vs. climatic controls on post-glacial fire regimes in the southern Brooks Range, Alaska

The post-glacial history of vegetation and climate in northern Alaska provides an excellent opportunity to document relationships between changes in vegetation, climate, and fire regimes. Over the past 13 k years at least four distinct vegetation assemblages have existed in the southern Brooks Range, and climate has trended towards cooler and moister conditions after maximum warmth in the early Holocene. We use multiple lake-sediment records to refine vegetation history and, for the first time, reconstruct fire history for the region with macroscopic charcoal stratigraphy. Select sites are used to reconstruct summer temperatures or moisture with fossil chironomids and oxygen isotopes. Our records suggest that frequent fires occurred during late-glacial times, when the region was approximately three degrees C cooler than present and dominated by birch shrub tundra. Fire occurrence decreased when vegetation assemblages changed to deciduous forests dominated by Populus, despite evidence of warmer-than-present temperatures. Coincident with a decrease in Populus and the addition of white spruce to the shrub tundra during the early Holocene, charcoal records suggest an increase in fire occurrence. Climate proxies suggest a gradual cooling on the order of one degree C throughout the Holocene, with moistening around 6-7 k ybp. Despite this trend, the most pronounced change in fire regimes occurred with the addition of black spruce during the mid-

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Philip Higuera continued

Holocene, when both charcoal abundance and peak frequencies increased to maximum levels. Overall, millennial-scale fire history was more strongly linked to changes in vegetation than to changes in climate. These results suggest that vegetation assemblages (i.e. fuels) play an important role in mediating the effects of climatic change on fire regimes. Simple climate-fire relationships cannot, therefore, be extrapolated to predict the response of fire regimes to climatic change without considering patterns of vegetation change.

Mark Swanson

Characteristics of southern beech coarse woody debris in Tierra del Fuego, Chile

Coarse woody debris is an important structural element of *Nothofagus*-dominated forests of southern Chile and Argentina, with ecological functions including carbon storage, nutrient and moisture storage and release, and habitat for organisms. Use of field measurements of coarse woody debris stocks in scientific research or commercial endeavors frequently requires the quantification of attributes such as tissue density, moisture content, and content of carbon, nitrogen, and other elements. Using a system of five decay classes (1 to 5, with 5 being most decayed), the tissue density (g cm^{-3}), moisture content (%), and carbon and nitrogen concentration (%) were determined for two species of *Nothofagus* (*N. pumilio* and *N. betuloides*) at three sites on the island of Tierra del Fuego, Chile. Further micronutrient analysis for each decay class was conducted for *N. betuloides*. Tissue density, carbon content, and nitrogen concentration declined with increasing decay class, while moisture content and C:N ratios generally increased with decay class. Few differences were found between the woody debris of *N. pumilio* and *N. betuloides* in any measured parameter; however, C:N ratios were significantly higher for *N. pumilio* at a moist coastal site compared to a dry site at the forest-steppe ecotone in the interior of Tierra del Fuego. Micronutrients had variable responses to decay class in the woody debris of *N. betuloides*. Some micronutrients decreased in concentration, presumably due to leaching, while others increased in concentration due to decreases in mass with advancing decay. Finally, typical volumes per hectare of coarse woody debris are reported for different forest types in Tierra del Fuego, Chile. Coarse woody debris, which represents on average 35% of the total forest volume measured in plots, is a major component of biomass, carbon storage, and nutrient storage in these *Nothofagus*-dominated forests.

Philip Monsanto

Fire and the Management of Young Stands in the Entiat Watershed, Okanogan and Wenatchee National Forests

Young forests are now emerging in areas that experienced high severity, stand replacing fires in the past three decades. To prevent the likelihood of another stand replacing fire event they must be actively managed to at least fragment future fuel loads at landscape levels. Salvage logging, a management tool involving removal of dead trees after stand replacing fires, is drawing much concern. The argument against salvage logging is that it will cause more damage to an area already disturbed by wildfire. However, reducing the amount of coarse woody debris through salvage logging could make future management

of the young stands easier. Questions addressed for the study area include: Is coarse woody debris loading over time higher in areas unsalvaged than in areas previously salvaged in the study area? Does log loading in salvaged and unsalvaged areas resemble a distribution pattern shaped similarly to a rainbow over time? Does the proportion of higher classes of decayed wood increase over time? Are experimentally burned logs more flammable in partially decayed states (decay class 2+ to 4-), and will they produce greater soil heating?

Carrie Lee

Thinning and biomass utilization: evaluating the potential to enhance climate change mitigation through forest management

There is strong consensus among the scientific community that levels of atmospheric carbon dioxide are rising rapidly and will significantly affect global climate. Means to reduce emissions through renewable energy sources and increased carbon sequestration will aid in mitigating rising greenhouse gas levels. Management of forests, which account for 90% of the annual carbon flux of terrestrial ecosystems, provides the greatest potential for increasing terrestrial carbon storage. However, there has been little agreement over the best strategy. This study examines how thinning and woody biomass utilization can be coupled as a forest management tool to increase carbon stored in forest stands and decrease carbon emissions through the generation of a renewable energy source. Measurements of tree growth and biomass, coarse and fine woody debris, and total soil carbon and nitrogen will be used to evaluate the impact of thinning and woody biomass utilization on site and soil productivity. Data measurements were conducted on a 4 x 4 matrix of treatments established in 1995 at the Sappho Long-Term Ecosystem Productivity Site (LTEP) including a no-cut control and late-seral thinned treatments with high, medium, and low levels of woody biomass removal. The Sappho LTEP is located in Sappho, WA on the Olympic Peninsula in a ~60 yr. old regenerated forest stand of primarily Western Hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*). Long-term site and soil productivity will be evaluated by comparing data between treatments and through time using pretreatment data collected in 1995 by LTEP researchers. Conclusions from this study will evaluate the potential to offset carbon dioxide emissions through forest management, while providing the added environmental and societal values of decreased wildfire and insect outbreak risk and increased economic opportunity for rural communities.

Hakjun Rhee

Traffic Impacts on Forest Road Aggregates: Where are fine sediments from?

Forest roads are considered as a major sediment source. It is often observed that forest roads with heavy traffic produce high surface erosion. However, the exact processes that create erodible materials haven't been clearly identified. The objective of this study is to identify the processes that produce fine-grained particles and make them available for surface erosion.

There are three processes that change aggregate particle size related to traffic:

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(1) breakdown - breakage of the surfacing materials, (2) pumping up – forcing upward of fine-grained particles from subgrade, and (3) sorting - sweeping out bigger particles from tire tracks toward the outside of the road by tires.

For this study, forest road surfacing materials (aggregates) were collected from three forest roads within the same road network in Clearwater National Forest, Idaho. They were collected in areas of no traffic, light traffic, and heavy traffic. In each area aggregates were collected from three road locations (tire track, shoulder, and between them) and three depths (surface to 1.3 inches, 1.3 to 2.7 inches, and 2.7 inches and below). Particle size distributions were plotted and compared.

This study has found that breakdown is the process to produce fine-grained particles available for forest road surface erosion. Light traffic produced fine-grained particles mainly on the tire track, but not on the shoulder. However, heavy traffic produced fine-grained particles from the tire track to the shoulder. The results of this study suggest using strong surfacing materials to reduce breakdown process, therefore, minimizing sediment production.

Posters

Miki Fujikawa

What factors influence stream restoration project funding?

In Washington State, hundreds of stream restoration projects are undertaken at a cost of millions of dollars per year. Most literature on stream restoration focuses on scientific assessments and methods for achieving restoration goals. Economic and social issues surrounding which streams are ripe for restoration have received less attention. However, decision-makers must balance economic and social factors with science when choosing which projects to fund. This study addresses the following question: What are the economic and social factors that influence whether or not a potential stream restoration project receives public funding, and how do they interact with scientific information? The population for the study will be publicly funded stream restoration projects in Washington State. A survey administered through telephone interviews with funding decision-makers, combined with archival analysis on publicly available data, will be used to assess the factors influencing funding decisions. I expect to find that while degraded habitat provides the universe of potential restoration sites, social factors, including local support, land ownership, and economic efficiency impose limits on which stream restoration projects are funded. This research will contribute to understanding of how decision-makers integrate science with economic and cultural realities in the context of restoration.

Dan Perrakis

Post-fire fuel changes and overstory mortality at Crater Lake, Oregon

Managers at Crater Lake National Park (OR) have been using prescribed fire in mixed-conifer stands to achieve restoration goals of reducing fuels and tree density. Numerous challenges have been identified with these treatments, however, and success of the restoration program remains uncertain. This project sought to examine the changes in fuels accumulation and large ponderosa pine mortality 3 years after a series of spring and fall burns. We expect that fuels will have increased from immediate post-fire levels, perhaps negating any benefits from the original burn treatments. Annual mortality among dominant Ponderosa pines is expected to be higher in burn treatments than controls for up to 5-8 years after fire, with mortality after year 1 being primarily caused by western pine beetle attacks. We expect that a second prescribed fire treatment within a decade would help stabilize fuel levels, but with uncertain effects on survivorship of large pines

Julia Tracey

Baseline monitoring of periphyton assemblages in University Slough before the connection of Ravenna Creek

University Slough is one of three drainage channels created on the East Campus of the University of Washington in Seattle, Washington, USA. Following closure of the Montlake Landfill in 1971, the Slough was excavated to take waste surface water from the surrounding area to Union Bay on Lake Washington. Today, nearly 35 years later, the Slough is a slow-moving, in some places nearly-stagnant, watercourse. Nearby Ravenna Creek (RC) is slated to be connected to the Slough (via a trunk line) in early April 2006.

In 2005, a two-year pilot study was initiated to: 1) establish an overall monitoring plan for the microorganisms living in the Slough, particularly the primary producers and 2) follow the periphyton communities at one sample point in the Slough, tracking changes in species abundance/composition when the higher-quality RC water gets added. Periphyton sampling is being accomplished by placing artificial substrata into the Slough every two-week interval between mid-February and mid-July, collecting the accumulated periphyton, and analyzing for total organic productivity, chlorophyll- α , and taxa present. Preliminary results from the first field season indicate, as expected, that taxa present are those tolerant of poor water quality.

William C. Webb

Wildlife in the city: Use of wildlife injury data to explore human-wildlife relationships

Human-wildlife relationships in cities are generally under studied. We explore the spatial relationships between urban wildlife in the city of Seattle with land cover and human demographic factors in a GIS format. Our primary dataset consists of birds and mammals treated at the region's largest wildlife rehabilitation center, Progressive Animal Welfare Society (PAWS). The entire dataset represents over 5000 individual records of birds and mammals recovered within the city of Seattle and treated at PAWS between January

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2001 and December 2004. Our project asks the following questions: What is the pattern of wildlife occurrence in relation to the urban “green print”, urban development, and human density? Do human demographic factors such as the intensity of vehicle traffic correlate with wildlife injury frequency? We believe that recovery data collected by wildlife rehabilitation centers such as PAWS represent an enormous untapped reservoir for improving our understanding of urban wildlife, provided that records are well kept and made accessible. In addition to the analyses mentioned above, we explore the potential for wildlife rehabilitation centers to collect, store, and distribute their data to scientists and managers. Our methods of acquiring, extracting, and use of the PAWS data serves as our primary case study to explore this potential and compares with the results of a nationwide survey of similar institutions regarding their practices of handling recovery data.

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Thank you for coming today!

We hope you enjoyed the third 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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GRADUATE STUDENT SYMPOSIUM VISION

A forum for graduate students to share their research with fellow College of Forest Resources students, professors, staff and members of the larger University of Washington community.

A symposium that will continue to grow as the years go on, becoming an annual event supported and encouraged by the College of Forest Resources.

A time for graduate students to share ideas.

A place for the College of Forest Resources to gather and show others the wealth of knowledge housed in these buildings.

