Fourth Annual

College of Forest Resources

Graduate Student Symposium

February 23, 2007

Schedule of Events

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

9:10 – 9:40: Keynote Speech
Dr. Nalini M. Nadkarni, Faculty Evergreen State College, President of International Canopy Network

9:40 – 11:00: Session I
9:40 – 9:45: Moderator: James A. Freund
9:45 – 10:00: Bethany Plewe
10:00 – 10:15: Anna Hohl
10:15 – 10:30: Van R. Kane
10:30 – 10:45: Aldo Compagnoni
10:45 – 11:00: Patrick Schwartzkopf

11:00 – 11:20: Break

11:20 – 12:40: Session II
11:20 – 11:25: Moderator: Glenda Singleton
11:25 – 11:40: Mark E. Swanson
11:40 – 11:55: Laura Six
11:55 – 12:10: Arden Thomas
12:10 – 12:25: Lindsay Malone
12:25 – 12:40: Yuzhen Li

12:40 – 1:40: Lunch

1:40 – 3:15: Session III
1:40 – 1:45: Moderator
1:45 – 2:00: Finn Krogstad
2:00 – 2:15: Julia Helen Tracy
2:15 – 2:30: Andrew Hill
2:30 – 2:45: Akira Kato
2:45 – 3:00: Sooyoung Kim
3:00 – 3:15: Hiroo Imaki

3:15 – 3:30: Closing Remarks

4:00 – 4:15: Award Presentations

Reception to follow

Session I

Bethany L. Plewe
Comparison of qualitative and quantitative methods for measuring cobble embeddedness in Pacific Northwest streams

Five methods for measuring cobble embeddedness were compared. Embeddedness or cobble embeddedness describes the percentage of fine sediment in and/or surrounding the surface substrates of streams. The greater the embeddedness of a stream, the more fine sediment is apparent in the substrate. Fine sediment fills interstitial spaces, decreasing water and oxygen flow, detrimentally affecting stream biota such as fish eggs and benthic macroinvertebrates.

The objective of this study was to develop a sediment penetrometer that could be used as an index of embeddedness and to compare the penetrometer to the Wolman pebble count, Platts/Bain visual estimation, Burns-Skille-King hoop, and McNeil sampler methods of measuring embeddedness.

Results and conclusions are currently under review.

Anna E. Hohl
Understanding interactions between federal wildland fire managers and the scientific Community: Ideals versus Reality

To help resource managers address the increasingly complex issues involved in wildland fire management, there has been increased emphasis on improving the flow of information between the wildland fire management and fire research communities. Effective communication between researchers and managers is an essential link in this information transfer process. In order to better understand the interactions between researchers and fire managers, we conducted an internet-based survey of 145 wildland fire managers in federal land management agencies across the western United States, including the U.S. Forest Service, National Park Service, and the Bureau of Land Management. The survey asked managers to describe their view of an ideal interaction with fire scientists, and then to evaluate what kinds of interactions they actually experience. The survey also identified some of the barriers managers may encounter as they attempt to acquire and apply scientific information. In addition, we explored managers'

perceptions of both individual and organizational capacity to generate, communicate, and use research in management decisions.
Our analysis revealed some disparity between what managers consider an ideal research-management interaction and what is actually occurring. For example, 77 % of managers say they agree that managers and researchers should jointly define and design research projects. However, only 5% of managers report doing so often. The survey also revealed that managers face a number of barriers in their interactions with researchers. For example, 90% of managers report that lack of funding to conduct research and hire knowledgeable personnel is a barrier they regularly encounter. However, 66% of managers agree that their agency encourages and supports interactions between researchers and managers.

This study contributes to the development of a framework for understanding information transfer between researchers and managers within federal wildland fire management as well as suggesting several potential approaches for incorporating research into management decisions.

Van R. Kane
Seeking diversity in young forests: a remote sensing and landscape analysis of exurban and rural King County's second-growth forests

The original complex and biologically rich low-land forests of the Pacific Northwest have been largely harvested over the last century. The second-growth forests that have replaced them are generally viewed as ecologically simple and incapable of supporting the community diversity of the forests they replaced. However, researchers have generally ignored these young forests except to contrast them to the rarer fragments of older forests. By doing so, researchers have not explored the possibility that these young forests may exhibit a surprising amount of structural and compositional diversity that would imply a range of resources and a range of biological communities. Young forests are known to follow a multitude of developmental pathways and are subject to a number of disturbance and management regimes, suggesting that they may be more diverse than commonly assumed.

An analysis of second-growth forests across a landscape can establish (1) whether a portion provide the structural complexity that suggests habitat elements commonly associated with older forests, (2) how much diversity exists in second-growth forests in terms of their structural and compositional complexity and their arrangement and whether the types of forests found suggest that particular development paths are more common

than others, and (3) whether particular types of second-growth forests are associated with specific classes of owners.

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Van R. Kane continued
Landscape scale analyses of second-growth forests have not been possible because current widely available remote sensing methods have not demonstrated the needed sensitivity. Spectral mixture analysis (SMA) of Landsat images shows promise, but is sensitive to changes in canopy self-shadowing caused by topography. This has limited the usefulness of SMA for this type of research. The Adaptive Shade Correction (ASC) algorithm being developed as part of this research appears to solve this problem and permit the use of precise SMA analysis. LiDAR data also has been shown to have the sensitivity needed to answer a portion of the research questions posed for this study. Most LiDAR data for forest research, however, has been collected over small areas as part of technology demonstrations. This study will use LiDAR data collected over a region for geological research and develop methodologies for its use in forest studies. The datasets will be analyzed both to answer the research questions directly and to calibrate the SMA analysis. Accuracy of the two methods will be validated using permanent plot data available from the Cedar River Watershed and Pack Forest.

Once the best techniques have been selected, a landscape analysis of second-growth forests across exurban and rural King County, Washington state will be conducted to address the research questions outlined above. A classification scheme that represents the measured diversity of second-growth forests will be developed. The diversity of second-growth forests will be measured by their canopy structural complexity, conifer and deciduous mixture, and patch shape and arrangement complexity. Standard landscape metrics will analyze the arrangement of forest patches and whether that arrangement varies by ownership class, land form, or geographical location within the county.

Aldo Compagnoni
Community properties and plant species invasions during early secondary succession

Scientists have not yet come to a consensus on which are the properties of a plant community, if any, that determine the ability of a new plant to colonize that community. While most of the research done on invasibility has been carried out on stable grasslands, my study will track changes in the role of community properties on species invasions during the time of a succession. I will utilize a 15 year data set collected at the Starrbright site (close to HJ Andrews Experimental Forest, Oregon) to investigate plant

species invasion during an early secondary succession triggered by the harvesting and the slash burning of an old-growth *Pseudotsuga menziesii* forest.

I will address the following questions: (i) What is the effect of community properties like total number of species, total cover, or total biomass, on establishment and success of invasives? (ii) Do individual species have an effect on the invasibility of the community? Invasives are defined as any exotic species observed after the disturbance.

To detect changes in time of the above mentioned relationships, I explore the temporal dynamics of plant invasions by segmenting the analysis into 3 sequential, 5-year periods (years 1-5, 6-10, 11-15).

Patrick Schwartzkopf
Washington Park Arboretum high school botany program

The Washington Park Arboretum currently educates children pre K – 8th and professional horticulturalists. An audience that is not being targeted at the WPA is high school students. Local high school biology teachers have requested more high school programming at the WPA. I will be creating and implementing a high school botany program at the WPA as well as coordinating an outreach program to conduct follow-up visits to local high schools. Key questions looking to be answered are what can attract more high school students to the WPA? Why is this important? And what can we offer to keep them coming back?

One methodology used in this project will be a survey/mailer to local high school biology teachers to find out what they would look for in a botany program at the WPA, interest in an outreach program, and price point. Curriculum will be developed using materials that have been used in past programs and more up-to-date information. One local high school class will be asked to participate in a pilot program in fall '07. Teachers, education staff, and students will be asked to evaluate the program and offer suggestions. The program will then be passed over to the WPA staff; they will develop and send out flyers for spring '08 installation. The next step of this project will be setting up an outreach program through the WPA. Visits to local high schools will be performed as a follow-up to their WPA visit. In the schools, I will work with classes to help build raised garden beds for vegetables, set up composting systems, or lead in a restoration projects at their school. Providing this partnership with local schools will encourage more students to learn about the WPA. This could lead to the development of a Field Guide to the Arboretum written, sketched, and photographed by local high school students.

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Patrick Schwartzkopf continued
Botany programming here, and all over the country, is being cut and left out of curriculums. This program will use the WPA as an outdoor classroom and generate excitement about soil and plants. The outreach program will teach students how they can make a change in their own community and introduce them to a career they may have never thought about. Presenting the programs in a fun and enthusiastic way will show students than a pea pod can be just as interesting as an Ipod.

Session II

Mark E. Swanson
Flora and substrates of anthropogenically burned areas in southwest Tierra del Fuego, Chile: composition and edge effects

Plant communities, tree regeneration, and substrates for plant growth in anthropogenically burned areas and adjacent forest were examined in Tierra del Fuego, Chile. The study was designed to demonstrate differences in parameters between the burned areas and the adjacent forest, and also to identify variation along a distance gradient from the forest interior into the burned area. Burned areas in Tierra del Fuego exhibit greater cover of exotic species, native forbs, and native shrubs than adjacent closed forest. Regeneration of lenga (Nothofagus pumilio) and coigüe de Magallanes (Nothofagus betuloides) occurred on either side of forest edges, but was not observed at distances greater than 50 m into the burned areas, suggesting microclimatic facilitation or seed dispersal are limiting factors in the burned areas. Organic substrates were significantly greater in forest plots, while mineral substrates were significantly greater in burned areas. Non-metric multidimensional scaling reveals distinct clustering of burned vs. forest and coastal vs. interior plant communities. Burned areas in Tierra del Fuego are relatively diverse in terms of composition and some may thus be valuable elements of the landscape mosaic. However, in areas managed for economic or ecological values associated with intact forests, active management may be necessary to accelerate the redevelopment of forest, especially in larger burned areas.

Laura J. Six
Substrate effects on forest understory plant biomass and morphology

information sources for forestry-related topics. Landowners will be identified using county assessor's data for forest parcels enrolled in designated tax classification programs. Findings from this study will have applications for forestry professionals, resource managers, policy makers, extension agencies, and conservation organizations to understand the interests and needs of this new segment of forest landowners and apprise them in the development of programs targeted to new forest landowners, such as educational programs to assist landowners with informed decision making about their forest holdings.

Yuzhen Li
Integrating small footprint LIDAR data into Forest Inventory and Analysis in Kenai Peninsula, Alaska

Current Forest Inventory and Analysis (FIA) is ground-plot based, and it involves labor-intensive field work, intricate sampling schemes, and statistical extrapolation efforts. As national and regional interests in accessing and monitoring ecosystem sustainability increase, FIA is being asked to provide more detailed information with higher accuracy and a shorter inventory cycle. This represents a significant challenge for current FIA, especially in remote areas like Alaska where costs to install and remeasure ground plots are prohibitive. As a new remote sensing technology, airborne laser scanning systems–LIght Detection and Ranging (LIDAR)–offer the potential to capture a detailed three-dimensional forest canopy in very short time. Integrating LIDAR into traditional forest inventory may provide a way to help reduce the high cost and long inventory cycle associated with the current FIA system.

Many small area experiments have demonstrated that forest biophysical structure parameters could be derived from LIDAR measurements at acceptable accuracy and precision. Before adopting LIDAR in practical application, study over large areas is necessary to determine the actual accuracy. Nationwide-distributed FIA ground plots provide a unique opportunity since it collects field data using the same field protocol. However, there are some difficulties on applying LIDAR in current FIA, partly because inaccurate FIA plot locations make it difficult to georegister LIDAR data with field plots. The aim of this study is to develop a methodology that integrates LIDAR data with FIA field measurements when accurate ground plot locations are not available. A procedure of combining stratification of LIDAR metrics with "weighted" regression techniques is proposed to circumvent the ground plot location problem. First the spatial variability of LIDAR-derived structural characteristics is examined. Then each field plot is assigned a weight depending on strata

distribution and field plot location. Finally, relationships between LIDAR and field measurements will be developed by using weight through

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Yuzhen Li continued
regression. The idea is to take advantage of the large sampling area covered by LIDAR data and capture the spatial variability within LIDAR coverage.

Results from this study will provide valuable information regarding the usability of LIDAR for the FIA program given the current FIA field plot design. Recommendations on how to use LIDAR data over large areas in general will also be discussed.

Session III

Finn Krogstad
Does your research support your implications? How would you know?

This discussion identifies a disconnect between science and decision making, develops a range of solutions, and uses them to identify significant problems in the existing literature. The disconnect occurs when scientists have to draw implications about actions well beyond the hypotheses they have been testing. Unfortunately, while there is rigor in the scientific testing of hypotheses, and some rigor in decision making, it is claimed that no similar process exists to evaluate the implications drawn from research. Small modifications to the 'unitary validity' of educational and psychological testing however allow us to specify a 'validity' of research implications. An argument-based evaluation (ABE) of the validity of research implications is presented. ABE involves specifying the claims connecting an implication to the research results on which it is based, and evaluating them for clarity, coherence, and plausibility. A 'graphical' arrow-diagram approach can extend ABE to more complicated arguments with multiple, interconnected parallel- and counter- arguments. Application of these methods to examples in the forestry literature implies that poorly evaluated implication statements can be conclusively rejected by subsequent validity evaluation.

Julia Helen Tracy
Investigating the aquatic ecology of University Slough before and after its connection to Ravenna Creek

This investigation examined periphyton community structure in University Slough before and after connection with Ravenna Creek (RC). Periphyton, including benthic algae, are primary producers, an important foundation of

many stream food webs and useful as biological water quality indicators. The first goal of the investigation was to initiate a monitoring plan for the microorganisms living in the University Slough, particularly the primary producers. The second goal was to examine periphyton community structure as a biological metric of water quality changes when the water from RC was connected to the Slough in early 2006. Preliminary studies began in May of 2004, followed by two complete field seasons carried out mid-February through mid-July in both 2005 and 2006. The 2005 field season was considered a baseline or control while the 2006 field season was the treatment of the RC water. Through the use of artificial substrata placed in a Sampling Station, the investigation measured total organic productivity (TOP) and chlorophyll-a concentration, resulting in a determination of autotrophic index (AI) levels. The AI, a ratio of TOP to chlorophyll-a, is a measure of water quality. The investigation also looked, qualitatively, at taxa present. Results of the treatment period, the ten weeks during the 2006 field season that RC was connected to the Slough, revealed lower AI values, indicating better water quality. Certain taxa changes were also noted that pointed to potentially less-polluted water. Visually, there was a much greater clarity to the water. Results point to the potential for water quality improvements as a result of increased water flow to the Slough.

Andrew D. Hill

Improving short term predictions of Douglas-fir growth in eastern Washington by incorporating weather variability

Growth and yield models are one of the cornerstones of modern forest management. Creating accurate models is an ongoing effort in academic, government, and industrial forestry. Recent efforts have focused on adjusting models in order to account for short-term changes in the weather (Wensel and Turnblom 1998). The purpose of this research is to look at the feasibility of incorporating weather in the model development stage instead of post hoc. Overstory datasets with a five-year measurement interval supplied by the USFS, and monthly weather data on a 2x2 Km grid from OSU were combined to provide site specific climate and weather data. These datasets were combined and then used to model five-year change in diameter for Douglas-fir in eastern Washington. Models incorporating weather were then created using a bootstrapping algorithm with a non-linear model based on the ORGANON model modified for eastern Washington. A gain in precision of the predicted change in diameter up to 113% was found over models without weather incorporated. These results demonstrate that more accurate predictions of changes in diameter in the short-term are possible when weather is used to aid in modeling. Additional

findings indicate orthogonally between equations using only weather data and only standard inventory data. Results indicate that it may be possible to

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Andrew Hill continued

incorporate weather measures into existing and widely used growth models without additional recalibration.

Akira Kato

Wrapping LIDAR points to identify individual trees and tree parameters

Tree crown structure is an important factor in forest fire, plant physiology, and tree competition. Quantifying the tree crown structures is difficult because of their nonparametric shapes. To identify the crown shape, Light Detection and Ranging (LIDAR) data was used. LIDAR has three-dimensional point distribution to ascertain the shape of objects on the ground. In previous studies, the explicit equation such as cone and ellipsoid has been fitted to approximate crown shape. In this study, we use a wrapping technique to reconstruct and display crown shape. There are three main steps to wrap the surface. First, points for a single tree are identified from a group of LIDAR points. Secondly, the points near or on the crown surface are selected and used for the wrapping process. Lastly, using selected points, radial basis function and isosurface are used to reconstruct the wrapped surface. The resulting surface provides more precise information about crown height, crown base height, and crown volume which were difficult to measure from discrete points in conventional studies. This proposed approach improves the spatial precision of tree-level parameters and provides a 3D visual image of crown shape from discrete LIDAR points.

Sooyoung Kim

LIDAR-based species classification using spectral reflectivity and structural characteristics

This study was conducted to address whether various tree species can be identified using spectral reflectivity (in the near infrared wavelength; 1064 nm) and, structural characteristics based on the information provided by LIDAR. Two LIDAR datasets under leaf off and leaf on conditions were examined for a variety of tree species. Spectral reflectivity, defined as the ratio of the strength of reflected light to that of emitted light, is influenced by reflectance characteristics of the reflecting object. Single trees were extracted from laser point clouds in both leaf-on and leaf-off data, and intensity values were computed for whole tree and upper canopy. Structural characteristics can be explained by foliage distributions, canopy openness

and crown shapes. Canopy openness was measured by outer point ratio over the canopy. Crown shapes were measured by the ratio of crown length to the crown diameter and the ratio of top 25% crown length to the crown diameter using laser point clouds.

Conifers and broadleaf species were significantly different for all of the three analyses. Intensity analyses indicated the best separation between species, especially for some deciduous species (big leaf maple and oaks) which had no leaves in leaf-off conditions. Intensity values of upper canopy for all species were significantly higher than those of whole trees because biochemical functions such as photosynthesis are more active at the upper canopy. This study suggests that spectral reflectivity of tree species combined with structural characteristics would better identify species.

Hiroo Imaki

Washington's future timber supply and its impact on wildlife habitat: Comparison of wildlife habitat availability under alternative forest management scenarios

Western Washington's future timber supply scenarios and its impact on wildlife habitat were examined as a part of the Future of Washington's Forests and Forestry Industries Project. Current management regimes from private and public sectors, as well as alternative regimes, were analyzed and six management scenarios (two private industry, one NIPF, two biodiversity path, and one no treatment) were developed for a forest growth simulation. Simulations were used to predict future timber supply and evaluate impacts on wildlife habitat. Future forest structures and compositions were simulated using Landscape Management System (LMS), and soil expectation value (SEV) was calculated to create an economic benchmark. Based on the Jonson & O'Neil (2001) simulated forest conditions were translated into wildlife habitat types using LMS. Four species showing different habitat requirements were selected to evaluate species response to forest treatments. In terms of the economic output, the private industry treatment resulted in the highest SEV (1,996 $/acre) and no treatment was the lowest (-739 $/acre). For the SEV of two biodiversity pathways, the short (clear-cut at 100-yr) and the long track (without clear-cut) were 502 and 477 ($/acre) respectively. The short biodiversity path and no-treatment created old-growth forest structure (< 20 yr), whereas the long biodiversity path did not reach to the old-growth condition defined in this study.

Poster

Phil Monsanto

Management of young stands after stand replacement fire, Entiat Watershed, Okanogan & Wenatchee National Forests

In the past three decades young dry forests are emerging in areas that experienced stand replacing fires. To prevent the likelihood of another stand replacing fire event these forests must be actively managed to at least fragment future fuel loads at landscape levels. Salvage logging, the removal of dead trees after stand replacing fires, is controversial because it may further damage an area already disturbed by wildfire. However, reducing fuel loading by salvage logging could make future management of these stands easier. The study occurred on four stand-replaced fires that burned in 1970, 1988, 1994 and 2004, respectively. Questions addressed included: Is coarse woody debris loading over time higher in areas not salvaged than in areas previously salvaged; Will log loading and percent cover be greater in the 1988 and 1994 fires than the 1970 and 2004 fires due to fall rates and decomposition rates of coarse woody debris, and does the proportion of higher decayed wood increase over time; are experimentally burned logs more flammable in partially decayed states and will they produce higher heat loads into the soil? Modified Brown (1974) transects were used to quantify coarse woody debris (>7.62 cm) by weight and percent cover, and variable plots and fixed plots estimated stand density and seedling counts. Log-burning decks with thermocouples buried down to 15 cm took temperature of logs experimentally burned to map heat loading and determine if lethal temperatures to cambial tissue of roots (60° C) were reached. Knowledge of the surface area covered by coarse woody debris under the two salvage options, when coupled to findings from the experimentally burned logs, can illustrate the possible effective cover range of heat loading to soils, and effects to emerging stands in dry forests, from prescribed or wildland fire.

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Thank you for coming today!

We hope you enjoyed the fourth 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!

This event was made possible with generous support from:

Dean Bare and the College of Forest Resources
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Jeff Aken
Michelle Trudeau

Thank you for your support!

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GRADUATE STUDENT SYMPOSIUM VISION

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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.