

Seventh Annual
School of Forest Resources



Graduate
Student
Symposium

GRADUATE STUDENT SYMPOSIUM VISION

A forum for graduate students to share their research with fellow School 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 School of Forest Resources.

A time for graduate students to share ideas.

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

Session I

Jason Scullion

The Problem with Panaceas: Payments for Environmental Services and the Question of Fit in the Mountains of Mexico

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The world's tropical forests continue to be lost at breathtaking speed and with them much of the earth's biodiversity. Conservationists and policy makers have attempted a myriad of solutions to arrest tropical deforestation, but generally these attempts have not significantly slowed global trends. Most recently, the idea of using markets to conserve ecosystem services has gained traction as the next best hope to conserve tropical forests. In this study, researchers investigate two Payments for Hydrological Service programs (PHS) in the municipality of Coatepec, Mexico. The investigation was designed to assess the effectiveness of the local PHS programs in their effort to protect the region's endangered cloud forests, as well as generate more understanding of key interactions between the PHS programs and their coupled social and ecological environments. In this study, remote sensing was used to assess forest cover changes before and after program implementation. This data was combined with field surveys of informants and program participants to determine the programs' overall effectiveness in achieving stated social and environmental goals. The results of this research indicate that the PHS programs have not slowed the rate or scale of forest loss in the municipality. Furthermore, informants and program participants' responses indicate that the PHS programs have resulted in a host of unexpected social outcomes, such as loss of trust in government agencies and limited impacts on participant's well being and economic security. Overall, our research indicates the local PHS programs are operating at levels below those required to impact deforestation patterns. Without significant changes in the implementation of the PHS programs, Coatepec's forests will very likely continue to disappear.

Whitney Albright

Examining relationships between tree growth and climate in the Pacific Northwest: an analysis of changing growth environments

Whitney Albright, David L. Peterson

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We are examining the effects of changing climate on the growth environments of Douglas-fir, mountain hemlock, ponderosa pine, and subalpine fir. Previous climate-growth studies are used to determine which

climatic factors are most important to growth throughout each species distribution in Washington and Oregon. Based on the significance of these limiting factors, the current growth environment of each species is represented by a general water or energy limitation; these limitations are defined by specific energy balance variables such as potential evapotranspiration, actual evapotranspiration, precipitation, snowpack depth, snow water equivalent, and growing degree days. Energy variable values are obtained from Variable Infiltration Capacity (VIC) macroscale hydrologic model output for a historical time period. Projected values of energy variables are then used to describe the water or energy limitation environment of each species in 2020, 2040, and 2080. To generate projected values, VIC is driven by three different global climate model and emission scenario pairings, resulting in three growth environment possibilities for each projection year. Expected changes between current and future growth environments include an alleviation of limiting factors at high elevations in energy limited environments, and an increase in water stress at lower elevations, specifically in water limited environments. Results will allow scientists and resource managers to anticipate potential changes in species growth throughout the Pacific Northwest and inform decisions regarding management strategies.

Alina Cansler

Influence of annual climatic variables on annual area burned and burn severity, North Cascades, Washington, USA.

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Ongoing research examines the relationships between annual climate variables and annual area burned and burn severity in the Northern Cascades. The effect of the climate on the summer fire season has been hypothesized to be mediated through the production of vegetation, and drying of vegetation and fuels. The individual climate variables that are most closely associated with fire season characteristics vary by geographic location. Increased fire occurrence and extent have been linked to drought and earlier spring snow melt across the western United States (McKenzie et al. 2004, Westerling et al. 2006, Littell et al. 2009). In the Cascades spring and summer temperature, precipitation, and the Palmer Drought Severity Index (PDSI) have been correlated with larger annual area burned (Littell et al. 2009). This project tests the hypothesis that area burned and burn severity increase with lower spring SWE, higher temperature, and lower precipitation in the Northern Cascades. Progress to date on (1) correlating field-based measurements of burn severity with satellite-based measurements of burn severity, (2) stratifying and determining

representative climate data stations, and (3) analyzing the relationship between annual area burned and snow water equivalent will be presented.

Crystal Raymond

Quantifying age-based carbon dynamics in forests of Washington, USA: a multi-scale analysis

Crystal Raymond and Donald McKenzie

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Disturbances affect biomass accumulation and net primary productivity (NPP) across large landscapes by altering the age-class distribution of the landscape. For fire disturbances specifically, a theoretical age-class distribution can be analytically derived from the fire rotation using a negative exponential model. However, to determine the consequences of these ecosystem-specific fire rotations for biomass accumulation and NPP, it is necessary to quantify age-based carbon dynamics at a similar scale. We used chronosequences of Forest Inventory and Analysis (FIA) data to fit empirical models of live and dead biomass carbon (C) accumulation and NPP as a function of stand age. We fit models at both coarse (ecosections) and fine (potential vegetation types) scales for the forested region of Washington, USA. At the ecosection scale, the Western Cascades and the Coast Range had the highest levels of maximum live biomass C (32.6 and 24.4 kg C m⁻² respectively). The fitted maximum live biomass C was lower in the Eastern Cascades (22.4 kg C m⁻²) and lowest in the Okanogan Highlands (12.3 kg C m⁻²). However, the Coast Range accumulated live biomass C more rapidly than the other ecosections. Maximum NPP was highest in the Coast Range (0.91 kg C m⁻²yr⁻¹) and intermediate in the Western Cascades (0.67 kg C m⁻²yr⁻¹). Maximum NPP was lowest and not significantly different in the Eastern Cascades (0.55 kg C m⁻²yr⁻¹) and Okanogan Highlands (0.53 kg C m⁻²yr⁻¹). Dead biomass C was more variable within ecosections and theoretical models of dead biomass as function of stand age fit the data poorly, especially in the Western Cascades and Coast Range. We developed similar empirical models at the scale of potential vegetation types within ecosections. These age-based patterns of carbon dynamics are being combined with landscape age-class distributions to provide an empirical approach for estimating the impact of changes in fire rotations on biomass accumulation and NPP.

Session II

Rick Pringle

U.S. Forest Service Role in Open Space Conservation in Washington State

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The loss of open space was declared one of the “four threats to the health of our national forests” by Forest Service Chief Dale Bosworth in 2003. Since that time, the agency has released the Open Space Conservation Strategy and incorporated the “four threats” into the agency’s Strategic Plan. These two actions would indicate that the issue of open space is on the agency’s agenda; however, little is known about what is happening on the ground resulting from these actions, or how well the Forest Service communicates these messages throughout the agency. Using a qualitative approach, employees at the National Forest level were interviewed using questions based on the priority actions outlined in the Open Space Conservation Strategy. These priority actions include: 1) Convene partners to identify and protect priority open space, 2) Promote national policies and markets to help private landowners conserve open space, 3) Provide resources and tools to help communities expand and connect open spaces, and 4) Participate in community growth planning to reduce ecological impacts and wildfire risks. Respondents described details about the projects and partnerships they were involved with as well as their roles, and what motivates their engagement in these projects and partnerships. The results provide insight into how the agency is currently engaging in open space conservation efforts, describes what employees understand about this agency priority, and identifies barriers to and opportunities for working within the agency’s bureaucratic structure. Where appropriate, recommendations for more effective implementation are suggested.

Laura Blume

Garry Oak Restoration: Seedling Response to Post Planting Treatments in Central Washington

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Garry oaks have been in decline over the past centuries due to urban and agricultural development as well as changes in historical fire regimes associated with European settlement. The only oak native to the Pacific Northwest, Garry oak is a priority restoration species throughout its range. We planted 720 bare root Garry oak seedlings in an old agricultural field in the eastern foothills of the Cascade Mountains. We used a split plot design to test the effects of tree shelters, plastic mulch, first year irrigation, and

seedling age at planting on seedling survivorship and growth over the first two growing seasons. We found that plastic mulch significantly improved survivorship during both years. Irrigation improved survival relative to non-irrigated seedlings in the first year. One-year-old bare root seedlings were more likely to survive than three-year-old bare root seedlings. One-year-old seedlings also showed more diameter growth during the first season and more height growth during the second season than their three-year-old counterparts. In the second season seedlings with tree shelters had more height growth than the unsheltered seedlings. Based on our findings, we recommend selecting one-year-old seedlings for bare root Garry oak plantings east of the Cascades in Washington State. We recommend the use of plastic mulch and regular irrigation to ensure ample moisture availability through hot dry summers in the Cascade rain shadow.

Eva Dettweiler-Robinson

Trajectories of community change of sagebrush shrubsteppe following multiple wildfires

Eva Dettweiler-Robinson, G. Matt Davies, Jonathan D. Bakker, Peter W. Dunwiddie, Jim Evans, Sonia A. Hall, Dave Wilderman, & Janelle Downs
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Plant community dynamics may differ in response to repeated disturbances compared to individual disturbances. In the sagebrush shrubsteppe, fires have increased in frequency and size in recent decades. For example, large wildfires burned the Arid Lands Ecology Reserve in eastern Washington in 2000 and 2007. We used two sets of permanent plots to assess how these fires have affected plant community dynamics. The plots were established before the fires at locations selected to represent a range of vegetation types. Data were obtained in 1994, 1996, 2001 through 2004, and 2009. Cover of all plant functional groups declined immediately following the 2000 fire, then began to recover for most functional groups. However, the 2007 fires further reduced cover of native species. Repeated fires accentuated differences in composition between broad elevational groups, though plots within these groups became more similar to one another. Repeated fires have produced fundamental changes in communities. The next step is to investigate the effect of these fires on the soil lichen communities.

Jana Dilley

Increasing Canopy Cover on Single Family Residential Property in Seattle, WA

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Across the country, cities are setting goals to increase canopy cover in order to capture the many environmental, economic and social benefits that urban trees provide. These benefits include making cities more liveable, reducing the people's desire to live elsewhere and create sprawl. Engaging residents to plant trees on single family residential property is critical to meeting canopy cover goals because single family residential property makes up the largest land use in most cities. Seattle is no exception – 56% of the city is single family property. Thus the individual decisions of private landowners have a large influence on urban canopy cover and health. Urban forestry programs in many cities focus on publically owned parks and right of ways – zones which in Seattle make up less than 15% of the city. Local governments and organizations wishing to protect and expand canopy cover need to work closely with homeowners to foster tree planting and retention. Many cities rely on regulation, which can only maintain (not increase) single family canopy cover. Little research has been done on how to best engage homeowners in tree planting and retention through incentive and other non-regulatory approaches.

This research addresses these questions using the community based social marketing framework. By examining the reasons why homeowners make choices both for and against tree planting and retention, we can design programs and policies – such as incentive programs and effective communications strategies – to create and maintain canopy cover on private property. In a collaborative project between the University of Washington and City of Seattle, 2,400 single family homeowners were surveyed. Results show that while homeowners are planting trees, they are planting small trees and not the large trees needed to increase canopy cover and maximize benefits. Homeowners also intend to plant fewer trees in the future than they have in the past. Regional differences can be seen in where homeowners are likely to plant in the future. Further analysis will soon be completed to determine the factors most likely to influence a homeowner's decision to plant or retain a tree.

Session III

Matthew Weintraub

Differences in growing season sap-flow among subalpine conifers in the North Cascades

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Globally, subalpine forest communities are impacted by a variety of stressors that can critically impair ecosystem function and disrupt an existing environmental equilibrium. To project how this forest ecotype could respond to multiple agents of change, we conducted a study aimed at understanding the influence of bioclimatic variables on tree growth and water utilization. The primary vehicle of this examination was the measurement of xylem sap flow in two dominate conifer species, Whitebark pine (*Pinus albicaulis*) and Engleman spruce (*Picea englemannii*), located in the North Cascades in Washington State, USA. Drivers of water use in these systems include solar radiation, temperature and humidity, which can affect drought stress and lead to excessive evapotranspiration. The absence of published literature on sap flux and physiological drought tolerances of these species demands a baseline is developed. The implied hypothesis is that both *P. albicaulis* and *P. englemannii* will exhibit sap-flow levels that are negatively correlated with daily humidity values and positively correlated with both temperature and solar radiation levels. We also will quantify inter-species relationships across varying magnitudes of conductance.

Ian Bell

Stakeholder Constructs of Cultural Ecosystem Services within a Framework for Forest Stewardship

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Management decisions about ecosystem services (ESs) are unavoidably socio-political, and embedded within specific cultural value systems. Thus, effective decision making and sustainable management necessitates understanding of how stakeholders “see” and “know” ESs. The Millennium Ecosystem Assessment groups ESs into four categories of benefits to human well being: Supporting services, Provisioning services, Regulating services, and Cultural services. The ongoing debate surrounding the typology of cultural ESs leaves the current state of the ESs framework with an unresolved complexity. Though use of the framework is currently minimal, interest in using the ESs framework in natural resource

management and decision making has increased significantly over the past decade. Using the Deschutes National Forest (DNF) as case study, the Pacific Northwest Research Station of U.S. Forest Service seeks to explore and demonstrate how an ESs Framework can be developed and used for forest stewardship and decision making. As part of that effort, this study will explore cultural ESs provided by the DNF. We will examine how stakeholders "see" and "understand" benefits from DNF. We will use focus groups and key informant interviews, of both "local" and "extra local" stakeholders of the DNF, to enable the collective identification and classification of intangible ESs. Interviews will be tape recorded, transcribed, coded and thematic analysis conducted. We will compare the results with the classification suggested by Millennium Ecosystem Assessment. Knowledge gaps of forestland managers regarding use of this framework will be identified, resulting in suggestions for more effective use in management and decision making. The fundamental nature of place-specificity and cultural context in the effective use of ESs as a framework for stewardship, decision making, and sustainable management will be discussed.

Eric Delvin

Restoring highly degraded habitats for rare species in Puget Sound prairies

Eric Delvin, Jonathan Bakker, Peter Dunwiddie
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Restoration of highly endangered Puget Sound prairies has primarily focused on enhancing remnant areas by controlling invasive species and increasing native diversity. However, effective conservation requires increasing the total acreage of prairie. A multi-year research project is developing treatments for restoring native communities in abandoned agricultural fields. We are using a novel experimental approach that is adaptive and iterative. Treatments are replicated spatially and temporally to understand when and where they are most effective. The most successful strategies are retested in increasingly larger areas each year. The cumulative result is restoration of significant areas of prairie habitat for endangered wildlife.

Sonja Lin

Willingness of small forest landowners to participate in working forest conservation easements in Washington

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The role that small forest landowners (SFLO) play in maintaining forest cover and the ecosystem services provided has become increasingly recognized. As development pressures continue to convert forests to non-forest uses, strategies to enhance SFLO participation in conservation efforts have been quickly gaining momentum. The popularity of conservation easements has greatly increased over the last years; however, the extent to which they can be used to protect forests in the future will depend on landowners' willingness to participate. My research will investigate how contract attributes, landowner characteristics and forest parcel characteristics affect landowner decisions to participate in a working forest conservation easement program in Washington State. Policy implications will also be examined, exploring how different contract scenarios impact the extent of participation as well as the cost of the program. A mail survey was sent to over 7000 SFLOs throughout the state, asking them to choose between hypothetical contract alternatives.

Preliminary results show that contract length and duration significantly contribute to landowner decision-making, and while landowners are generally averse to long-term commitments, increasing payment amounts greatly improves the probability of enrollment in a permanent easement program. While an annual per acre payment of only \$50 can achieve a participation level of 60% for a 10-year contract, the same level of participation could be achieved for a permanent easement contract by increasing the payment level to \$175 per acre per year. Based on the goals and resources available for implementing a working forest conservation easement program, this model could be used to determine what levels contract attributes should be set at, which landowners should be targeted, and the extent to which easement programs can be used to retain forest cover in Washington.

Session IV

Jenny Knoth

Nitrogen Fixation in Poplar: Increased Efficiency of Bioenergy Crop Production

An introduction to the diazotrophic endophytes of *Populus trichocarpa*.

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Ethanol is a main component to the bioenergy push in the United States. It is an effective additive to gasoline, cutting the overall consumption of fossil fuels while reducing the greenhouse gas emissions. Nearly half of the cost of bioethanol production comes from the expense of growing the biomass. Current production of ethanol relies on agricultural crops that require the input of fertilizer and intensive agricultural practices. Endophytic bacteria capable of fixing nitrogen have been identified and studied in a number of non-leguminous species including rice and sugarcane. The exploitation of these endophytes has resulted in higher yielding crops with little or no input of fossil fuel derived fertilizer. Diazotrophic endophytes have recently been isolated from *Populus trichocarpa* sp. (Doty, et al. 2005, Doty, et al. 2009, Xin, et al. 2009). Poplar provides a regionally responsible and sustainable resource of lignocellulosic material that has the potential to be a more efficient feedstock in the production of bioethanol. The aims of our study are focused on further demonstrating the benefits of these naturally occurring endophytes within the poplar system and their potential to benefit additional bioenergy crops species.

Lauren Urgenson

Multi-Stakeholder Assessment of Alien Invasive Plant Clearing on Private Land in the Western Cape, South Africa

Lauren Urgenson, Heidi Prozesky, Karen J. Esler

There is growing recognition that conservation paradigms focused solely on land preservation are insufficient to halt the loss of earth's biodiversity and natural resources. In recent years, ecosystem services concepts have been embraced by conservation organizations worldwide. Ecosystem services programmes focus on the incorporation of conservation into production landscapes through creation of novel incentives and disincentives that align conservation and economic goals. Despite increased prevalence, there is limited evidence demonstrating the effectiveness of these programmes.

South Africa's Working for Water (WfW) is globally recognized for combining alien invasive plant management (IAP) with job creation in previously disadvantaged communities. Private land-user involvement has been identified as a limiting factor in the long-term success of this program. WfW has developed a new policy combining social and economic incentives and disincentives to promote private land-user clearing of IAP. This policy requires a major shift in the rights and roles of land-users and the agencies working with them. Success will depend on its ability to address the perceptions and constraints facing these stakeholders.

We use a combination of personal interviews, focus group interviews, and e-mail surveys to assess the perceptions of landowners, WfW managers, and conservation professionals regarding the greatest barriers to IAP clearing on private land in the Western Cape. We compare perceptions across stakeholder groups to identify potential strengths and limitations of WfW's new approach. We use a combination of personal interviews, focus group interviews, and e-mail surveys.

The results our study will provide WfW with monitoring information to feed into future policy implementation and contribute to the international literature evaluating the potential effectiveness of an ecosystem service approach to off-reserve conservation.

Rachel Mitchell

Carbon amendments as a restoration tool

Rachel M. Mitchell, Jonathan D. Bakker

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In 2008, we began to investigate whether soil carbon amendments could alter plant abundance and composition. We tested the effects of two types of carbon (C), sugar and activated carbon (AC), which have been suggested as prairie restoration tools. Sugar stimulates the microbial community, changes the soil osmotic potential, and can temporarily reduce plant available nitrogen (N), whereas AC adsorbs plant available N and organic compounds. Our study site is a grassland dominated by non-native species in central Whidbey Island. We used experimental plots that received three different pretreatments (mowed, tilled, or planted with *Festuca roemerii*) to assess the generality of the results. Sugar (42% C; 1000 g/m²; equivalent to 420 g/m² of C) and AC (420 g/m²) were applied in early spring of 2008; control plots did not receive any application. Plots were monitored for two years with respect to spring and summer community composition, biomass, and species richness. Neither sugar nor AC had a significant effect on

community composition in Spring 2008, but sugar did affect Summer 2008 composition. The effects of sugar and AC on composition were not significant in Spring or Summer 2009. Sugar reduced the biomass of forbs in 2008, but did not affect grass or legume biomass. Sugar also significantly reduced species richness in Spring 2009 but not in Summer. These results suggest that sugar has significant effects on the plant community, particularly within the first year of application, and may be a useful tool for temporarily reducing the prevalence of exotic species during restoration treatments. Activated carbon (AC), conversely, did not reduce exotic species richness, exotic biomass or alter community composition.

Poster Session

Brooke K. Sullivan

Implementing an eelgrass restoration project in the nearshore Elwha River environment following dam removal: strategies for success
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The nearshore conditions of the Elwha River delta are expected to undergo a significant change following the removal of two dams in 2011 or 2012. This change will occur when long held sediments are released into the delta for the first time since the dams were constructed near the turn of the last century. The dams were originally constructed to provide power to the town of Port Angeles. Through completion of the FERC relicensing process it was determined that the dams should be removed and restored to protect federally listed salmon species. The main goal of the removal project is ecological restoration of the Elwha River watershed, particularly as a viable salmon bearing stream, as it had been prior to development of the dam. Currently, there is no plan to assist the nearshore, submerged vegetation in the establishment of vegetation on the newly laid sediments. Eelgrass is important habitat for a wide variety of fish and wildlife. I plan to demonstrate whether a plan for eelgrass restoration should be developed based on suitability of future conditions (predicted substrate conditions, available seed and propagule sources, reference sites, prior restoration efforts and predicted water quality) and 2) if a plan for restoration shows promising chances of survival what should be included in the plan to ensure the best possible chance of long-term success?

Keum Young Lee

The Three Approaches to Enhancing Phytoremediation of Chlorpyrifos

Keum Young Lee, Sharon L. Doty & Stuart E. Strand

Chlorpyrifos is one of the commonly used organophosphorus insecticides and causes serious environmental and human health problems. Our hypothesis was that these problems may be partially or thoroughly solved by the emerging phytoremediation technology. To evaluate plant potential for degradation of chlorpyrifos, several selected plant species such as aspen, cottonwood, and willow were investigated. Analysis of the percent removal of chlorpyrifos from solution showed that chlorpyrifos can be taken up by roots and significant amounts of chlorpyrifos were accumulated in plant tissues. To our knowledge, this work represents the first report for

phytoremediation of chlorpyrifos using plants. Further study of plant metabolism of chlorpyrifos is in progress.

Expression of genes involved in the metabolism of chlorpyrifos will lead to increased tolerance and removal rates of chlorpyrifos by the transgenic plants. Human cytochrome P450 2B6 and recombinant rabbit paraoxonase (PON1) have been cloned into plant expression vector using 35S promoter separately. Engineering plants by insertion of two vectors using *Agrobacterium*-mediated transformation method is in progress. Uptake and degradation assay of chlorpyrifos for the transgenic plants will be investigated.

In order to develop plants more capable of tolerating the stressful environment of contaminated sites, we introduced a construct to overexpress a chaperone protein that confers general stress tolerance including salt, heat, cold, and drought. The poplar hybrid clone 'INRA' 717-1B4 (*Populus tremula* x *P. alba*) was transformed with *Agrobacterium tumefaciens*, and the best two lines were selected for salt and drought stress experiments. The results showed that transgenics were tolerant of 500 mM of NaCl, while wild types died at 200 mM within 10 days. Cold, heat, and metal toxicity test for the transgenic plants will be investigated.

Through the introduction of overexpression of genes involved in pollutant degradation and stress tolerance, we hope to develop superior plant lines for effective phytoremediation.

Rachel Miller

Enhancing Phytoremediation Using Endophytes

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More than 50% of SuperFund sites in the United States are contaminated with trichloroethylene, or TCE. TCE, a halogenated hydrocarbon, is one of the most common environmental pollutants and can persist in the environment for decades. It has been used extensively in industry and in the military primarily as a degreaser. TCE exposure can result in liver and kidney toxicity, and depression of the central nervous system. TCE is also a suspected human carcinogen. For these reasons, there is great interest in developing effective yet inexpensive methods for removal of this pollutant from the environment. Phytoremediation is the use of plants for the removal of contamination. This method of contamination removal is gaining significant attention as a more benign method than some of the current engineering practices. One of the major problems with

phytoremediation is that even plants that are tolerant to the presence of these contaminants often remain relatively small, due to the toxicity of the pollutants that they are accumulating. This toxicity can be reduced using microorganism-assisted phytoremediation. Endophytic bacteria has only recently been considered in relation to degradative capacity as part of phytoremediation strategy. My research involves screening thirteen different willow species and three poplar species for TCE degradative capacity, and identifying the most effective species. I am propagating internally sterile plants of the same species for future comparison. My current research aims to discover that fast-growing willow and poplar could be more effective at removing TCE contamination if appropriate endophytes are present.

Katherine Murray

Spatial and temporal analysis of Chinook salmon redds from historical and current aerial surveys on the Cowlitz River, Washington

Katherine Murray, Christian Torgersen, Julie Henning, Christopher Murray, kjcm22@u.washington.edu

Using a unique set of fine- and large-scale temporal and spatial data, we investigated the spawning patterns of fall and spring Chinook salmon *Oncorhynchus tshawytscha* on the Cowlitz River, Washington. Coarse-scale spatial data had been collected from 1991-2007, and fine-scale spatial data (resolution of 100-500 m) were collected in 2008 and 2009 from bi-weekly helicopter flights on the lower Cowlitz River by Washington Department of Fish and Wildlife. We examined Chinook salmon redd reoccupation among and within years, and explored whether (1) redds were distributed randomly and (2) the spatial distribution of redds was related to large-scale geomorphic features. Five years (1993, 1998, 2000, 2002, and 2009) were compared for reoccupation, and the minimum correlation coefficient for reoccupation was 0.90 (adjusted p-value of 0.002). These preliminary results demonstrate that Chinook spawn in the same sections each year with little variation among years. These results also indicate that redds are distributed in clusters and that redd distribution varies at different spatial scales, ostensibly related to channel geomorphology and availability of spawning habitat.

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Endophytes-assist phytoremediation

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Most plants associate with various microbes which live around the plant's root or intercellular spaces of the aerial part of the plant. The term endophyte refers to microorganisms, bacteria or fungi, living with plant tissue without causing disease. Plants can harbor dozens of different endophytes within the stems and roots. These endophytes can assist phytoremediation. Recently, we have shown that plant endophytes might be responsible for the degradation of environmental toxins.

The goal of this study is to optimize remediation of trichloroethylene (TCE) using specific species of fast-growing trees such as poplar and willow, and appropriate endophytes. It will help us to provide an inexpensive, widely-applicable method for the effective removal of common pollutants from our natural environment. My current research is isolating and characterizing a variety of endophytes having the ability to degrade TCE and then test the best-performing plant/endophyte partnerships in assays with TCE.

GSS Organizing Committee

Eva Dettweiler-Robinson
Jenny Knoth
Gabrielle Roesch
Mary Ann Rozance
Brooke Sullivan
Chad Wilsey

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Bob Edmonds
Michelle Trudeau and Amanda Davis

Thank you for coming today!

We hope you enjoyed the seventh annual School 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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February 19, 2010

Schedule of Events

9:50 – 10:00: Dr. Tom Hinckley, Interim Director, School of Forest Resources

10:00 – 10:50: Keynote Speech

Jeremy Littell, Research Scientist at the Climate Impacts Group

11:00 – 12:00: Session I

11:00 – 11:15 Jason Scullion

11:15 – 11:30 Whitney Albright

11:30 – 11:45 Alina Cansler

11:45 – 12:00 Crystal Raymond

12:00 – 1:00: Lunch

1:00 – 2:00: Session II

1:00 – 1:15 Rick Pringle

1:15 – 1:30 Laura Blume

1:30 – 1:45 Eva Dettweiler-Robinson

1:45 – 2:00 Jana Dilley

2:00 – 2:30 Poster Session

Brooke K. Sullivan, Keum Young Lee, Katherine Murray, Rachel Miller,

Jun-won Kang

2:30 – 3:30: Session III

2:30 – 2:45 Matt Weintraub

2:45 – 3:00 Ian Bell

3:00 – 3:15 Eric Delvin

3:15 – 3:30 Sonja Lin

3:30 – 3:45: Break

3:45 – 4:45: Session IV

3:45 – 4:00 Jenny Knoth

4:00 – 4:15 Lauren Urgenson

4:14 – 4:30 Rachel Mitchell

Dead Elk to follow