School of Environmental and Forest Sciences

UNIVERSITY *of* WASHINGTON

College of the Environment

Research Newsletter

**Volume IV, Issue 3
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NEWS

NEW RATES: With the new fiscal year, there are many changes in rates that you need to keep in mind as you prepare proposal budgets. For the first time in a number of years, there are salary increases for most employees. The figures should be known by the middle of the month and most of them will be available through the payroll system at the same time. If there are individual salaries that you need, let Sally know & they will be emailed to you. Student salaries we know now: $5,034/ $5,409/ $5,811 per quarter for premaster/intermediate/candidate (monthly: $1,678/ $1,803/ $1,937). For projects that preclude tuition remission, the Schedule III salary is used (monthly: $3,249/ $3,374/ $3,508). The tuition increase is less than we anticipated, at $4,713/quarter.

Benefit rates have all changed: faculty: 25.0%, students: 16.6%, classified staff: 35.3%, professional staff: 30.9%, and hourly employees: 15.2%.

BUDGET TEMPLATES: If you would like a budget template (Excel), contact Sally with the sponsor, length of project, and whether the project is on- or off-campus, to get the appropriate template, updated with the new rates. Time permitting, these will be posted to the SEFS forms page soon, but in the meantime, they are available directly from her.

FINANCIAL DISCLOSURE: Office Sponsored Programs has been requiring completion of the Significant Financial Interest Disclosure before any post-award changes can be processed, including no-cost extensions, formal rebudgeting, or any changes in personnel. Most of the bugs seem to be worked out

of the system, but there are still instances where the notices fail to arrive. When that happens, there is an easy work-around, so it has not been a problem.

ROYALTY RESEARCH FUND (RRF) DEADLINE: The autumn round deadline is September 30. For instructions, see http://www.washington.edu/research/main.php?page=rrf.

December Awards

Application Number: A81180
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **Alaska Pellets**
Agency: Consortium for Research on Renewable Industrial Materials
Period: 11/1/2012 - 3/1/2014
Amount: $22,000
New

Life-cycle analysis of alternative renewable and non-renewable energy products for residential and commercial heating application in Southeast Alaska.
1) Develop the survey methodology and provide services related to the data collection on pellet feedstocks, cordwood production, and wood chip production for input into the pellet life cycle inventory for SE Alaska.
2) In conjunction with Sitka GSV, conduct surveys for pellet production in potential source areas including the PNW of USA and British Columbia in order to provide input data for the pellet LCA and the economic analysis required as part of understanding the range of residential and commercial heating options in the SE Alaska region.

Application Number: A76427
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **The Western Mountain Initiative: Vulnerability and Adaptation to Climate Change in Western mountain Ecosystems**
Agency: USDI US Geological Survey
Period: 8/1/2012 - 9/14/2013
Amount: $140,000
Supplement and Extension

Climate warming is affecting Western mountain ecosystems, directly through changes in water dynamics and indirectly through altered disturbance regimes. The Western Mountain Initiative team explores the effects of climate change on ecological disturbance, responses of forest vegetation, mountain hydrology, and the coupled hydro-ecological responses that determine vulnerability of Western mountain ecosystems to change. Extensive data sets, empirical studies, surveys, and monitoring programs are linked via models to hindcast and forecast the effects of changing climate on forest dynamics, distribution, and productivity; fire occurrence and insect outbreaks; recovery of vegetation after disturbance; hydrologic changes and glacier dynamics: and the consequences of an altered water cycle for terrestrial and aquatic ecosystems and chemistry. We will address the extent to which climate drivers are mediated by regional- or watershed-scale controls on ecosystem processes, thus quantifying vulnerability to climate change in mountain ecosystems. Region-specific results and emergent West-

wide patterns will be shared with resource managers through workshops and a comprehensive web-based toolkit on climate-change science and adaptation management.

Application Number: A81194
Faculty Member: Richard Gustafson   Faculty Member: Elaine Oneil
Role: Principal Investigator   Role: Co-Investigator
Title: **CORRIM**
Agency: Consortium for Research on Renewable Industrial Materials
Period: 1/10/2009 - 7/31/2014
Amount: $107,295
Supplement and Extension

At both local and national scales, long term forest sustainability and the carbon consequences of biomass removal have emerged as critical issues in our decision matrix for climate change mitigation and energy security. Biomass removal rates for a forest area are sustainable if they can occur while maintaining or enhancing a range of forest conditions and inventory characteristics. Our objective is to identify sustainability criteria for biomass removal to constrain the amounts of biomass to be obtained under different forest treatments and conditions, link them to estimates of available biomass supply on a regional basis, use detailed site specific modeling efforts to begin to assess fragmentation issues and place those results in a carbon impact framework that takes into account the eventual use of the product.

December Proposals

Application Number: A81610
Faculty Member: Stanley Asah
Role: Principal Investigator
Title: **FUTURE WATER - Building Knowledge on the Behavioral and Valuation Aspects of Water Supply and Demand in the Face of Climate-Induced Change and Uncertainty**
Agency: Belmont Forum International Opportunities Fund
Period: 9/1/2013 - 10/31/2016
Amount: $837,717
New

Much work has been done to characterize water resources (Glick, 2011; UNESCO, 2003 & 2006) and some emerging on understanding water resources' variability and uncertainty (IPCC, 2007; UNESCO, 2009 & 2012). The research we propose will add to this understanding by a field data intensive knowledge how people cope with, adapt to and shape social-ecological changes in ways that enhances water security. We will use scenarios to relate biophysical uncertainty to socio-economic options and choices (Claassen et al., 2011). We propose the key innovation of using water use behaviors and practices, and the social-ecological conditions informing such behaviors and practices as the departure point for observations, analyses, and suggestions for the enhancement of water security. This approach will help determine key drivers of existing water use behaviors and practices, parameters for scenarios of water security, resultant changes in goods and services and coping and adaptive options.

Application Number: A81217
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **Sustainable Agriculture using Endophytes**

Agency: Ginkgo BioWorks, Inc
Period: 6/1/2013 - 5/30/2014
Amount: $67,500
New

Endophytic associations with plants have a beneficial effect for many different plant species. Ginkgo BioWorks and the Doty lab are exploring the use of endophytes as a means to improve crop plants on a timescale dictated by bacterial generation times rather than plant generation times. Endophytes are particularly attractive because they can be interfaced with crop varieties that are already known to be successful in the field. Furthermore, the use of specific endophytes may be preferable to the use of chemical fertilizers because of the monetary and environmental costs, contributing to more sustainable agricultural systems.

We propose to characterize and improve bacterial endophytes discovered by the Doty lab, and to test their performance in perennial rye grass. These grasses demonstrated a strong response to endophytes and are a staple crop for livestock feeding.

Application Number: A81265
Faculty Member: Gregory Ettl   Faculty Member: L. Monika Moskal
Role: Principal Investigator   Role: Co-Investigator
Title: **REU: CAFS Supplement I/UCRC Center for Advanced Forest Systems (CAFS)**
Agency: National Science Foundation (NSF)
Period: 1/7/2013 - 12/20/2013
Amount: $8,000
Non-Competing Renewal

The University of Washington is a member of the Center for Advanced Forestry Systems (CAFS), a National Science Foundation Industry/University Cooperative Research Center (NSF I/UCRC), along with North Carolina State University, Virginia Polytech Institute and State University, Purdue University, Oregon State University, the University of Georgia, and the University of Maine. The mission of CAFS is to optimize genetic and silviculture systems to produce high-quality raw materials for existing and developing wood based industries. This Research Experience for Undergraduates (REU) will be used to support the work of an undergraduate student at the University of Washington (UW), to work on a project related to the previously funded CASF research on Remote Sensing for Measuring and Monitoring the Response of Plantations to Intensive Management. Specifically, to update the project data with newly available visualization techniques. Riley Milinovich will utilize point cloud data from the Charles L. Pack Experimental Forest previously collected by researchers at the UW Precision Forestry Cooperative (PFC) and the Remote Sensing and Geospatial Analysis Laboratory (RSGAL), to assess the temporal variability of terrestrial laser scanning (TLS, LiDAR) and its influence on estimating leaf are index (LAI) for biomass assessments of the cites. The student will use Cyclone and Pointools to animate the point clouds so university and industry personnel unfamiliar with LiDAR will be better able to visualize forest plots and utilize the data. Riley Milinovich will specifically explore creating end user tools to better serve the decision making process in regards to natural resource management. The results produced by the undergraduate student will allow a greater understanding of terrestrial LiDAR data as compared to traditional static images.

Application Number: A81525
Faculty Member: Gregory Ettl
Role: Principal Investigator

Title: **Stand Management Coop**
Agency: Hancock Forest Management
Period: 1/1/2013 - 12/31/2013
Amount: $38,859
Supplement and Extension

2013 Membership Dues from Hancock Forest Mgmt to Stand Mgmt Coop

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Application Number: A81194
Faculty Member: Richard Gustafson   Faculty Member: Elain Oneil
Role: Principal Investigator   Role: Co-Investigator
Title: **CORRIM**
Agency: Consortium for Research on Renewable Industrial Materials
Period: 1/10/2009 - 7/31/2014
Amount: $107,295
Supplement and Extension

At both local and national scales, long term forest sustainability and the carbon consequences of biomass removal have emerged as critical issues in our decision matrix for climate change mitigation and energy security. Biomass removal rates for a forest area are sustainable if they can occur while maintaining or enhancing a range of forest conditions and inventory characteristics. Our objective is to identify sustainability criteria for biomass removal to constrain the amounts of biomass to be obtained under different forest treatments and conditions, link them to estimates of available biomass supply on a regional basis, use detailed site specific modeling efforts to begin to assess fragmentation issues and place those results in a carbon impact framework that takes into account the eventual use of the product.

The University of Washington has developed a decision support tool capable of extracting plot specific data from inventory databases such as the FIA database and simulating a range of treatment options across the entire landscape without the need to aggregate samples. Under the supervision of the Principal Investigator, Elaine Oneil, at the University of Washington, support will be provided to use this tool to develop woody biomass supply information for alternate forest treatments for the NE, and SE regions by owner, forest type, and treatment type constrained by regional sustainability criteria and to characterize the carbon consequences of a range of treatment options and uses for the material including comparisons of different uses for the material in such as way as to be useful input for the USFS climate scorecard process. For those regions where FVS- FFE provides for robust fire impact estimation, a range of assumptions about fire rates will be tested and integrated into carbon assessments.

Application Number: A81532
Faculty Member: John Marzluff
Role: Co-Investigator
Title: **CNH: Ecological Resilience in Urbanizing Regions: Testing Hypotheses Linking Development Patterns to Ecosystem Function**
Agency: National Science Foundation (NSF)
Period: 8/1/2013 - 7/31/2016
Amount: $1,499,033
New

As humans transform Earth ecosystems into highly human-dominated environments, they create new sets of processes and mechanisms governing system dynamics. Emerging studies of coupled human-natural systems reveal new and complex patterns and processes not evident when studied by social or natural scientists separately (Liu et al. 2007). Such systems exhibit great complexity, uncertainties, nonlinearities, thresholds, feedbacks, time lags, vulnerabilities, and surprises. Urbanizing regions are major determinants of global and continental scale changes in ecosystem functions through land transformation and modification of biogeochemical processes (Kaye et al. 2006, Grimm et al. 2008a). The challenge for effective planning and management of coupled human-natural systems is to expand our knowledge of their dynamics, resilience, and capacity for adaptation. During the last three decades we have learned a great deal about the interactions between urban activities and ecosystems (Grimm et al. 2000, Pickett et al. 2001, Alberti et al. 2003, Alberti 2008, Grimm et al. 2008b, Pickett et al. 2011). However, empirical studies of the underlying processes and mechanisms linking urbanization patterns and ecosystem functions are still rare and extremely limited. There is increasing evidence that patterns of urbanization have differential effects on ecosystem functioning, but the emerging evidence shows that patterns may mediate ecosystem response in subtle unexpected ways (Faeth et al. 2005, Bang et al. 2010). The relationships may depend on dynamics and tradeoffs that we do not fully understand, on variable human and environmental conditions, and ultimately by future interactions among uncertain trajectories of key driving forces.

The overarching goal of this project is to study the mechanisms that link urban patterns to ecological resilience by focusing on carbon dynamics and avian diversity in two metropolitan bioregions. We address four overarching questions: 1) What interactions between key slow and fast variables control ecosystem resilience along gradients of urbanization? 2) How do these variables vary with patterns of urbanization? 3) What are key interactions and tradeoffs among different urban patterns? 4) How might these interactions change under alternative future scenarios? By combining field measurements, modeling and scenario analysis, we will test hypotheses about complex interactions in coupled human-natural processes, assess tradeoffs among patterns of urbanization, and simulate how these interactions may influence future environmental change. Our overarching hypothesis is that the diversity of patterns of urbanization that is maintained across regions and within regions control resilience of different urban systems.

Application Number: A81361
Faculty Member: Daniel Vogt
Role: Principal Investigator
Title: **Microbial population structures and functions near concentrated animal feed operations and streams in WA**
Agency: State of Washington Water Research Center
Period: 3/1/2013 - 2/28/2014
Amount: $16,249
New

Microbial population structures and functions near concentrated animal feed operations and streams in the State of Washington There are 434 dairy farms classified as concentrated animal feed operations (CAFOs) in the State of Washington. These facilities maintain over 181,000 dairy cows and both the number of farms and animal density per farm is increasing. The greater Puget Sound drainage basin contains over 50% of these dairies, a total of 231 farms. Almost 60% of these CAFOs are located within 1,000 feet of a named stream or tributary with direct linkages to the Sound. Between 30-80% of the total N and P entering streams can be attributed to CAFOs, but they also contribute a substantial amount of antibiotics to soil and surface waters. Industrial agricultural models utilize antibiotic feed additives as standard practice which is increasing environmental antimicrobial resistance (AMR). Increasing AMR microbe population densities change the normal community structure of soil and

surface water microbiota which in turn results in functional changes in these habitats. Carbon sequestration, nutrient cycling and decomposition are primary ecological processes performed by soil communities and a functional change manifested at this level has much wider implications for all higher tropic levels. Environmental AMR is therefore a threat to ecosystem services, water quality and has major implications for human health. Ten dairies with divergent practices relevant to AMR (5 organic, 5 treatment) will be selected based on specific criteria (proximity to streams, animal density, landscape, watershed) for intensive soil and water sampling for microbial community structure and function at intervals occurring over dry and wet soil conditions. These data will be quantified for relative population densities, biodiversity, and antibiotic resistance.

Application Number: A81582
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **DNR OEFS LTER Script Revision**
Agency: WA Department of Natural Resources
Period: 1/15/2013 - 3/1/2013
Amount: $3,126
New

DNR uses the script to supply long-term hydrological data from and around the Olympic Experimental State Forest (OESF) to the CLIMDB/HYDRODB web harvester monthly. The web harvester is the source of data for a number of ongoing and planned comparative studies and syntheses on questions such as the long-term effects of timber harvest and climate change on the yield and timing of water from forests in different parts of the country. After the data transfer was established, NOAA changed the format of their data. This requires revising the scripts to implement the data retrieval, formatting, and transfer. ONRC will revise harvester scripts to automatically retrieve local site data from 3 stations on a monthly basis; convert the data into a standardized exchange format as specified in the webharvester's User Guide; archive the previous datasets; and trigger the webharvester to harvest the new data file.

Metadata will be reviewed and modified as needed to reflect the new format of the NOAA data and the revised scripts. While revising the script, consider the improvements suggested in the documentation of the original script.

Application Number: A81528
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: **Impact of re-colonizing gray wolves on mule and white-tailed deer in Washington State, USA**
Agency: Pending - OSP to be notified
Period: 9/1/2013 - 12/31/2014
Amount: $49,760
New

The overall goal of our project is to elucidate the impacts of recolonizing gray wolves on deer behavior and plant communities in Washington. The funds for which we are applying here would be used to address one specific facet of this larger effort; namely, the effects of wolves on large-scale adult deer movements year-round and fawn survival. We will explore the former by deploying global positioning system (GPS) collars on adult mule and white-tailed deer in areas of north-central Washington with and without wolves. Movements of these deer will then be tracked rigorously for at least one full year. We will address the latter question by deploying break-away VHF collars of mule and white-tailed deer

fawns; these tags will allow us to track fawn survival and establish cause of death. Our expectation is that, in areas with wolves, coyote numbers will decline and, as a result, coyote predation on fawns will drop and fawn survival should improve.

Application Number: A81106
Faculty Member: Kathy Wolf
Role: Principal Investigator
Title: **Urban Forest Health Benefits Mapping**
Agency: WA Department of Natural Resources
Period: 4/1/2013 - 5/31/2014
Amount: $9,512
New

Urban forests and other urban greening environments provide ecosystem services. This funding will contribute to development of a benefits assessment tool - greenHEAL - that can be used to determine the human health and well-being benefits provided by parks, gardens, open spaces and city trees. A prior project has compiled the research literature, building a collection of more than 2,300 scientific publications. Summaries of nearly 40 years of studies are at www.greenhealth.washington.edu Now underway is a study to translate these health and well-being benefits to economic value. Using both market-based and non-market valuation approaches a team of economists and social scientists are developing theoretical and practical estimations of urban greening contributions to community health. A trio of efforts will be eventually be combined to create greenHEAL: 1) evidence of health and well-being benefits, 2) economic valuation, and 3) spatial and map analysis. This proposal will jumpstart the third component that is needed to create a benefits assessment tool. The funding will support development of the spatially explicit approaches to determine the locations, proximities, and spatial relationships of urban nature, human populations, and benefit levels. The project work will involve a literature review, contacts of key informants about mapping techniques, and preliminary techniques for integrating geocoded data with economic valuation.

January Awards

Application Number: A82034
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Regional Native Seed Project**
Agency: Center for Natural Lands Management
Period: 8/1/2011 - 12/31/2013
Amount: $9,001
Non-Competing Supplement

This is the third phase of a multi-year project building on more than a decade of habitat restoration in native westside prairies. It specifically supports and improves the burgeoning native seed development efforts to restore habitat for rare plants and butterfly species in these prairies. It has three components: 1) Seeding technique and rate assessment, 2) Seed production, coordination and development, and 3) Planting technique development for golden paintbrush.

Application Number: A79848
Faculty Member: Bruce Bare   Faculty Member: John Perez-Garcia
Role: Principal Investigator   Role: Co-Investigator
Title: **Washington Hardwood Assessment**

Agency: Washington Hardwoods Commission
Period: 11/1/2012 - 4/30/2013
Amount: $25,001
New

Hardwood tree species grown in the Pacific Northwest are an important economic component to mills operating in the region. Hardwood consumption by mills amounted to over 5% of the total logs consumed in the state (WA DNR, 2012). This activity adds value to the economic activity produced by mills in the state since hardwoods increase returns to landowners and operators as they are often an important component of softwood harvest operations. An accepted perception is that the demand for hardwood fiber is greater than its supply. It is also known that various restrictions to harvesting the hardwood resource exist. In addition, there is a sense that a portion of the hardwood growing stock is not being managed efficiently and that the hardwood inventory is decreasing as a percent of the total standing inventory. Given these perceptions, this study aims to answer the following questions: a) how much hardwood growing stock currently exists in Washington State; b) what is the age (or size) class structure and location of the inventory; c) what ownerships currently manage the growing stock; and d) how much volume is under riparian management regulations? The study team will use the Washington State Biomass Assessment (WSBA) database. The database will be revised to estimate the volume of hardwood fiber in Washington State by reexamining the growth and yield modeling and inventory data contained in the WSBA to evaluate the hardwood component.

Application Number: A81034
Faculty Member: Ivan Eastin
Role: Principal Investigator

Faculty Member: Indroneil Ganguly
Role: Co-Investigator

Title: **Glulam LCA Update**
Agency: Consortium for Research on Renewable Industrial Materials
Period: 11/1/2012 - 12/31/2014
Amount: $73,094
New

The objective of this study is to develop a life cycle inventory (LCI) using CORRIM Research Guidelines (CORRIM 2001) for the production of softwood glued laminated (glulam) beams as manufactured in the Pacific Northwest (Oregon and Washington) and the southeast (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and Texas) Unites States. Glulam is an engineered, stress-rated wood product that consists of two or more layers of lumber that are glued together with the grain of all layers parallel to the length. The lumber is joined end-to-end, edge-to-edge, and face-to-face. The size of glulam is limited only by the capabilities of the manufacturing plant and the transportation system. Wood species used for lumber to make glulam in the Pacific Northwest (PNW) include Douglas-fir, western larch and Alaskan yellow cedar. Wood species used to make glulam in the southeast (SE) can be any combination of longleaf, shortleaf, loblolly, and slash pines (referred to as Southern Pine). Glulam plants will be surveyed in these two regions to record all inputs and outputs associated with the production process. Input data will consist of lumber, resin, electricity, and fuel inputs to the glulam manufacturing plant. Output data will consist of emissions to air, water and land and products and co-products produced. This project will also endeavor to undertake the development of an on-line longitudinal survey instrument that will facilitate the continuous updating of life cycle inventory and life cycle assessment data for North American wood products. This on-line tool will be developed for glulam as the example wood product. The tool and survey architecture will be developed so that it can be modified to permit the addition of products and processes over time and to the extent possible be designed to assure usability by survey respondents.

Application Number: A82111
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Plum Creek Timber Company
Period: 1/1/2013 - 12/31/2013
Amount: $26,536
Supplement and Extension

2013 Membership dues to Stand Management Coop from Plum Creek Timber Company.

Application Number: A82112
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Roseburg Resources Company
Period: 1/1/2013 - 12/31/2013
Amount: $22,869
Supplement and Extension

2013 Membership Dues payment to Stand Management Coop by Roseburg Forest Products.

Application Number: A82113
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Port Blakely Tree Farms LP
Period: 1/1/2013 - 12/31/2013
Amount: $17,338
Supplement and Extension

2013 Stand Management Coop Membership Dues for Port Blakely Tree Farms.

Application Number: A82114
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Hampton Resources, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: $9,383
Supplement and Extension

2013 Stand Management Coop Membership Dues for Hampton Resources Inc.

Application Number: A82115
Faculty Member: Gregory Ettl

Role: Principal Investigator
Title: **Stand Management Coop**
Agency: West Fork Timber Company, LLC
Period: 1/1/2013 - 12/31/2013
Amount: $8,006
Supplement and Extension

Membership dues for 2013 from the West Fork Timber Co. to the Stand Management Coop.

Application Number: A82116
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Lone Rock Timber Company
Period: 1/1/2013 - 12/31/2013
Amount: $16,670
Supplement and Extension

2013 Membership dues to Stand Management Coop from Lone Rock Timber Mgmt. Co.

Application Number: A82117
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Weyerhaeuser Company
Period: 1/1/2013 - 12/31/2013
Amount: $71,041
Supplement and Extension

2013 Membership dues from Weyerhaeuser Company NR. CO. to Stand Mgmt CO-OP.

Application Number: A82162
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Cascade Timber Consulting, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: $17,411
Supplement and Extension

2013 Stand Management Coop Membership Dues for Cascade Timber Consulting Inc.

Application Number: A75369
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **Climate Change Vulnerability in the Pacific Northwest: a Comparison of Three Approaches**
Agency: USDI US Geological Survey

Period: 9/1/2012 - 8/31/2014
Amount: $117,538
New

Some species and some ecological systems will be more vulnerable to changes in climate than others. Thus, managing natural resources in the face of climate change will require an understanding of the relative vulnerabilities of species and systems. Although several different approaches have been proposed for assessing relative climate-change vulnerabilities (Dawson et al. 2011, Glick et al. 2011), no systematic comparisons of these approaches have been conducted and thus there is little guidance on how to select an appropriate approach and little understanding of how the outputs of approaches differ. Here, we will compare three approaches to assessing the vulnerability to climate change of species and ecological systems in the PNW.

Application Number: A81854
Faculty Member: Robert Lee
Role: Principal Investigator
Title: **Supporting Teacher Strategies to Prepare Students in Remote Rural Communities for College-Level Mathematics**
Agency: WA Higher Education Coordinating Board
Period: 1/1/2013 - 2/28/2013
Amount: $3,234
Supplement and Extension

This amendment is to allow the data from earlier portion of the project to be uploaded to the sponsor's website.

Application Number: A79158
Faculty Member: Jim Lutz
Role: Principal Investigator
Title: **Yosemite and Wind River Dendrometers**
Agency: Smithsonian Tropical Research Institute
Period: 10/1/2012 - 12/31/2013
Amount: $15,800
New

We will install 200 band dendrometers on trees in the Yosemite Forest Dynamics Plot and 200 band dendrometers on trees in the Wind River Forest Dynamics Plot. Trees will be selected by species and diameter class. Installation protocol will follow that of the CTFS Carbon Project.

January Proposals

Application Number: A82569
Faculty Member: Ernesto Alvarado   Faculty Member: John Perez-Garcia
Role: Principal Investigator   Role: Co-Investigator
Title: **Hazard prediction for ecosystem and communities vulnerable to extreme wildfires using a regional-scale earth system model and economic assessment of rural community impacts from catastrophic wildfires**
Agency: Washington State University
Period: 1/1/2014 - 12/31/2016

Amount: $370,793
New

This is a proposal for a research collaboration project with Washington State University submitted to NSF SEES Program. WSU proposal title is "Hazards SEES Type 2: Advancing local, regional, and national adaptive capacities for wildfire resilience in an altered climate"
Scope of Work
The objectives of this sub-award proposal to WSU are:
• To study the climate, weather and ecosystem conditions conducive to extreme catastrophic fires and potentially multiple fires in the interior Pacific Northwest
• To investigate the ecosystem health and economic thresholds that makes forest ecosystems and human populations vulnerable to catastrophic wildfires in fire-prone ecosystems.
• To study the effect of different approaches to ecosystem management on large and extreme wildfires that move across multiple ownerships, i.e. federal, state, tribal, and private lands in the Pacific Northwest.
• To implement a study case to test BioEarth capability to model future large fire scenarios on the Collaborative Forest Landscape Restoration Projects that exist in the Interior Pacific Northwest. The CFLRPs are consortia of multiple local stakeholders that include the USDA Forest Service, State Lands (e.g. WA DNR), tribes, NGOs, private land and industry owners, and public.
• The research on economic assessment of rural community impacts from catastrophic wildfires would entail two tasks. First, an economic assessment of rural communities with the potential to be impacted by catastrophic wildfires would be conducted to develop a base line of economic activity. Then measure how economic activity changes in the event of a catastrophic wildfire.
• An assessment of the risk of catastrophic wildfire would be conducted by measuring changes in the probabilities that a catastrophic wildfire might occur due to changing stand conditions or weather events, and then policies that reduce risk, i.e., probability, would be compared with the economic changes in the community associated with catastrophic fire.

Application Number: A81973
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Preliminary Proposal: Trait-based community assembly and dynamics**
Agency: National Science Foundation (NSF)
Period: 7/1/2014 - 6/30/2017
Amount: $
Pre-Application

Ecology has long focused on interactions between groups defined by taxonomic status and/or life form, but species within genera or life forms can exhibit strong variation in traits. The goal of this research project is to experimentally test the hypothesis that a trait-based approach improves our understanding of community assembly and dynamics. This goal will be addressed through a novel community assembly experiment, through large-scale, spatially and temporally replicated field experiments, and through modeling. The prairies of western Washington will serve as the study system.

Intellectual Merit: Plant community ecology is one of the oldest and most widely investigated areas in ecology, yet our ability to predict plant compositional change in response to perturbations remains low. This is unfortunate, given the increasing importance of anthropogenic stressors such as nutrient deposition and invasive species. Moreover, ecologists are increasingly asked to help decide whether or how to mitigate the effects of these stressors – something that is impossible without a fundamental understanding of community dynamics. This project tests whether a trait-based approach enhances the

predictive capacity of community ecology. Two research hypotheses are proposed: i) Priority effects are context dependent, and ii) the relationship between priority effects and niche differentiation vary with context. These hypotheses will be experimentally tested in large-scale, long-term spatially and temporally replicated field experiment. Plots were sown with varying combinations of species such that they did not differ in sown diversity but differed in priority (higher proportion = higher priority). Community dynamics have been followed annually since 2009. Niche differentiation will be quantified by calculating the community-weighted trait distribution. The knowledge produced through this project may be particularly helpful when conceptualizing and predicting the consequences of climate change on plant communities and the ecosystem functions they provide. This research will increase our understanding of the processes that regulate community assembly along with the insights provided by and limitations of a trait-based approach. Ultimately, the goal of this research is to improve the predictive capacity of ecological theory.

Broader Impacts: This research will enhance our ability to use a trait-based approach to improve the predictive capacity of ecology. The trait data generated through this project will be made accessible to the public by publication in global plant trait databases such as TraitNet, LEDA, and TRY. This research will directly inform the management of the prairies of western Washington, an ecosystem that is a significant conservation priority and supports numerous endangered species. The infrastructure that is developed will enhance future research in the region. This project will provide valuable training for a post-doctoral researcher (post-doc), Ph.D. student, and up to nine undergraduate students. Results will be incorporated into curricula, published in peer-reviewed journals, and presented at professional meetings and to land managers. A project website will be established to enhance communication. Annual and final reports will be prepared for NSF, along with a project outcomes report for the general public.

Application Number: A82034
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Regional Native Seed Project**
Agency: Center for Natural Lands Management
Period: 8/1/2011 - 12/31/2013
Amount: $9,001
Non-Competing Supplement

This is the third phase of a multi-year project building on more than a decade of habitat restoration in native westside prairies. It specifically supports and improves the burgeoning native seed development efforts to restore habitat for rare plants and butterfly species in these prairies. It has three components: 1) Seeding technique and rate assessment, 2) Seed production, coordination and development, and 3) Planting technique development for golden paintbrush.

Application Number: A82108
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Preliminary Proposal: SG: Hemiparasites as Mediators Between Other Plants and Insects**
Agency: National Science Foundation (NSF)
Period: 3/16/2014 - 3/15/2016
Amount: $
Pre-Application

The goal of this small grant research project is to quantify the strength of the interactions between hemiparastic plants and their hosts, and between butterflies and the hemiparasitic plants that serve as their hosts. This goal will be addressed through several experiments under controlled conditions.

Intellectual Merit: Indirect interactions among taxa are often difficult to observe but are particularly fascinating elements of ecology. Hemiparasitic plants can alter the relative balance of species in plant communities, but recent work has also shown that the identity of the plants that they parasitize can strongly affect their survival, reproduction, growth, and defensive chemistry. Furthermore, hemiparasitic plants can themselves serve as hosts for other taxa, such as butterflies that oviposit on them. Together, these observations suggest that hemiparasitic plants may serve as mediators through which other plant species indirectly affect butterfly populations even though the butterflies do not oviposit on them or feed on them as larvae. Two research questions will be addressed: i) how does host plant identity affect the performance of hemiparasitic plants? and ii) Do hemiparasitic plants with different host plants differ in their effects on butterfly oviposition and larval survival? These questions will be addressed through experiments under controlled conditions. The knowledge produced through this project will increase our understanding of the complex interactions among taxa.

Broader Impacts: This research will directly inform the recovery of two listed species, Castilleja levisecta (golden paintbrush; plant) and Euphydryas editha taylori (Taylor's checkerspot; butterfly), as well as the management of the prairies of western Washington where these species occur. This project will provide valuable training for two graduate students and up to six undergraduate students. Results will be incorporated into curricula, published in peer-reviewed journals, and presented at professional meetings and to land managers. A project website will be established to enhance communication. Annual and final reports will be prepared for NSF, along with a project outcomes report for the general public.

Application Number: A82022
Faculty Member: Sharon Doty
Role: Co-Investigator
Title: **Effects-Related Biomarkers of Environmental Neurotoxic Exposures**
Agency: National Institute of Environmental Health and Science
Period: 4/1/2013 - 3/31/2014
Amount: $2,299,293
Non-Competing Renewal

The theme of this Program Project is that biomarkers measured in accessible tissues are predictive of: a) toxicant exposures; b) early indicators of damage; and/or c) unusual susceptibility to toxic agents that commonly occur at hazardous waste sites. The proposed UW Program includes 5 research projects (3 biomedical, 2 ecological/bioremediation), an Administrative Core, a Research Translation Core, a Functional Genomics and Bioinformatics Core, and an Outreach Core. The Program will focus most intensively on biomarker applications for investigations of adverse effects to human health and the environment from neurotoxic chemicals, primarily metals and pesticides. Collectively, these projects will develop and validate biomarkers for elucidating underlying neurotoxicity mechanisms, characterizing risks to humans, animals, and the environment, identifying host susceptibility traits that modify exposure/risk relations, and for implementing phytoremediation techniques. The research projects include studies of: 1) a mouse model of susceptibility to the neurodevelopmental toxicity of methyl mercury; 2) investigations of genetically-determined susceptibility factors predictive of mercury-related neurobehavioral impairment in children and adults; 3) animal models of susceptibility to organophosphate pesticides, with applications to human Parkinson's disease; 4) environmental and genetic determinants of Parkinson's disease; 5) sub-lethal neurotoxic effects of metals and pesticides in

free-living Coho salmon; 6) phytoremediation methods for organic solvents and pesticides. The Functional Genomics and Bioinformatics Core will provide extensive molecular biology laboratory and data analysis support to all research projects. Multi-disciplinary collaborations among scientists specializing in neurotoxicology, epidemiology, molecular genetics, and bioinformatics will be emphasized as an essential feature of this highly integrated research program. The Administrative Core, directed by the Program Director, will oversee all major budgetary and personnel aspects of the program project, and will coordinate multidisciplinary interactions among research projects and cores. An External Science Advisory Board, composed of scientists from academia and government agencies, and an Internal Executive Committee that includes the Program Director, the Deputy Director, and selected Program investigators, will provide scientific advice and oversight. The Research Translation Core will be responsible for communicating our research findings to community, government, and private sector stakeholders. This Core will also supervise technology transfer activities. The Outreach Core will coordinate efforts with the Research Translation Core to ensure appropriately tailored dissemination of research findings to community groups, government agencies, health professionals, and the broader scientific community.

Application Number: A81874
Faculty Member: Sharon Doty　　　　　　　　Faculty Member: Soo-Hyung Kim
Role: Principal Investigator　　　　　　　　Role: Co-Investigator
Title: **Diazotrophic endophytes for increasing crop yields and reducing chemical inputs**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2016
Amount: $853,437
New

This program is entitled "Improving on Nature" and has the aim to increase nitrogen availability to crop plants while increasing yield and decreasing the need for chemical fertilizer. We have demonstrated that inoculation of crop plants with nitrogen-fixing endophytes of wild poplar and willow results in increased growth, yields, and health of the host plants in low-nutrient soils. We propose to return to the original riparian site and isolate the most active nitrogen-fixing endophytes using metagenomics tools. Techniques will be developed to isolate these specific species from the host. The strains will be characterized and their impacts on plant growth and physiology will be quantified. In parallel, Ginkgo Bioworks will work with our current diazotrophic endophytes, engineering them for increased nitrogen fixation. The overall aim of the project is to develop the most effective endosymbiont inoculum for increasing crop yields with reduced chemical fertilizer requirements.

Application Number: A82113
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Port Blakely Tree Farms LP
Period: 1/1/2013 - 12/31/2013
Amount: $17,338
Supplement and Extension

2013 Stand Management Coop Membership Dues for Port Blakely Tree Farms.

Application Number: A82114

Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Hampton Resources, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: $9,383
Supplement and Extension

2013 Stand Management Coop Membership Dues for Hampton Resources Inc.

Application Number: A82115
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: West Fork Timber Company, LLC
Period: 1/1/2013 - 12/31/2013
Amount: $8,006
Supplement and Extension

Membership dues for 2013 from the West Fork Timber Co. to the Stand Management Coop.

Application Number: A82116
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Lone Rock Timber Company
Period: 1/1/2013 - 12/31/2013
Amount: $16,670
Supplement and Extension

2013 Membership dues to Stand Management Coop from Lone Rock Timber Mgmt. Co.

Application Number: A82111
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Plum Creek Timber Company
Period: 1/1/2013 - 12/31/2013
Amount: $26,536
Supplement and Extension

2013 Membership dues to Stand Management Coop from Plum Creek Timber Company.

Application Number: A82117
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**

Agency: Weyerhaeuser Company
Period: 1/1/2013 - 12/31/2013
Amount: $71,041
Supplement and Extension

2013 Membership dues from Weyerhaeuser Company NR. CO. to Stand Mgmt CO-OP.

Application Number: A82158
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Rayonier Timberlands Operating Company
Period: 1/1/2013 - 12/31/2013
Amount: $24,582
Supplement and Extension

2013 Membership dues from Rayonier Forest Resources L.P. to Stand Mgmt Coop.

Application Number: A82162
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Cascade Timber Consulting, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: $17,411
Supplement and Extension

2013 Stand Management Coop Membership Dues for Cascade Timber Consulting Inc.

Application Number: A82161
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Green Diamond Resource Company
Period: 1/1/2013 - 12/31/2013
Amount: $22,727
Supplement and Extension

2013 Stand Management Coop Membership Dues for Green Diamond Resource Co.

Application Number: A82110
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Quinault Indian Nation
Period: 1/1/2013 - 12/31/2013
Amount: $8,387

Supplement and Extension

2013 membership dues to Stand Management Coop from Quinault Indian Nation.

Application Number: A82112
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Roseburg Resources Company
Period: 1/1/2013 - 12/31/2013
Amount: $22,869
Supplement and Extension

2013 Membership Dues payment to Stand Management Coop by Roseburg Forest Products.

Application Number: A81490
Faculty Member: Jerry Franklin   Faculty Member: Ken Bible
Role: Principal Investigator   Role: Co-Investigator
Title: **Wind River Field Station**
Agency: USDA Forest Service
Period: 10/1/2011 - 7/31/2016
Amount: $67,835
Non-Competing Supplement

This Joint Venture Agreement (JVA) between the UW and the USFS PNW Research Station is to conduct research and educational outreach activities at the Wind River Field Station (WRFS), formerly the Wind River Canopy Crane Research Facility. The purpose of the WRFS is to monitor key ecosystem processes and climate variables, develop new monitoring capabilities, provide management and oversight for ongoing projects and promote new research and educational/outreach activities. This project is to continue support of the UW's long-term monitoring of key ecosystem processes and climate variables, development of new monitoring capabilities utilizing the potential of the Climate Tower Network and to allow oversight of ongoing research and education activities in the Wind River Experimental Forest (WREF), and the promotion of new research, education and outreach activities in the WREF.

Application Number: A82139
Faculty Member: Christian Grue   Faculty Member: Kathy Wolf
Role: Principal Investigator   Role: Co-Investigator
Title: **Veterans, Urban Forest Stewardship, and Nature Therapy**
Agency: WA Department of Natural Resources
Period: 1/21/2013 - 6/30/2015
Amount: $77,000
New

In recent years veterans have served our nation in ways that differ from the past. They have been active in non-traditional battle situations, such as urban settings and fighting against insurgents (rather than military personnel). Many service men and women have also been deployed multiple times. The general experiences of war and these special circumstances contribute to residual emotional and/or physical disorders after return from duty. Recent news headlines have raised public awareness that vets may be

at risk for various emotional stresses and disorders. Meanwhile, extensive scientific evidence indicates that human experiences of nature improve mental and physical health of individuals, and consequently, of communities. Both nature-based activity (such as stewardship) and passive encounters (such as nature views from one's home) can provide benefit. This project will evaluate the healing potential of nature as veterans participate in urban forest stewardship in the Pacific Northwest region. Stewardship is but one way that people can interact with nature and ecology. The context for this study will be urban forest stewardship work that is associated with employment or community service. A research overlay on such programs will study the effects of working in nature and explore the personal benefits of stress and anxiety reduction, and other psychosocial benefits that may emerge through stewardship activity.

Application Number: A82093

Faculty Member: Charles Halpern   Faculty Member: Thomas DeLuca

Role: Principal Investigator   Role: Co-Investigator

Title: **Preliminary Proposal: Constraints on grassland reassembly following a regime shift to forest: tests using large- and small-scale experiments**

Agency: National Science Foundation (NSF)

Period: 6/1/2014 - 5/31/2018

Amount: $

Pre-Application

Ecological systems can undergo abrupt transitions in state, or regime shifts, that challenge our understanding of the processes that structure natural communities. Despite substantial development of theory, the processes that contribute to changes in state and the approaches needed to reverse them remain poorly understood for most systems. Woody plant encroachment of grasslands constitutes a regime shift of global relevance, with profound consequences for biological diversity, ecosystem function, and societal values. Encroachment also poses challenges to restoration, in the form of positive feedbacks that confer resilience on the woody state, or changes in biotic and abiotic conditions that hinder reassembly of the grassland state. Experiments to reverse woody-plant dominance using mechanical removal or fire provide critical tests of system resilience and ideal settings in which to examine the processes that regulate community reassembly (grassland restoration).

The proposed research will explore community assembly processes through a novel combination of experiments in a mosaic of conifer-invaded grasslands at Bunchgrass Ridge in the Oregon Cascades – a system for which the history and consequences of encroachment are documented at fine spatial and temporal resolution. The project will combine large- and small-scale experiments to explore the relative importance of processes that operate at varying spatial and temporal scales. Remeasurements from a large-scale restoration experiment will facilitate long-term, spatially explicit analyses of community assembly following tree removal (with or without fire). These analyses will explore the relative importance for community assembly of landscape context (e.g., distance or connectivity to remnant grasslands), species' dispersal traits, and local biotic or abiotic conditions (e.g., community composition or burn severity). Small-scale mechanistic experiments, placed within the larger tree-removal plots, will test the relative importance of three biological processes: dispersal limitation (tested with seed addition), space or resource preemption by residual forest species or initial colonists (tested with species removal), and tree-induced changes in soils (tested with meadow-soil addition to introduce potentially beneficial symbionts). By design, both sets of experiments will assess the dependence of assembly processes on fire – assumed to be critical to the maintenance of open grasslands – and site history (duration of tree influence, quantified through dendrochronological analyses).

The combination of large-scale, long-term spatially explicit analyses and small-scale mechanistic experiments will provide critical tests of ecological theory and yield practical guidance on the

approaches and contexts in which it is possible to effect reversal of this regionally, indeed globally, relevant ecosystem transformation.

Application Number: A81845
Faculty Member: Soo-Hyung Kim
Role: Principal Investigator
Title: **Geospatial optimization tools for efficient design, water management, and phenotyping strategies for United States agricultural systems**
Agency: USDA
Period: 9/16/2013 - 9/15/2015
Amount: $250,001
New

Agriculture accounts for approximately 80-90% of annual water use in the United States, the majority related to irrigation. Methods to improve water use efficiency are critical in light of increasing demands among various commercial and public sectors, requirements of water-related environmental policies, and potential climate change effects. Agricultural water use is closely associated with the value of the irrigated commodity, existing irrigation technology and local practices, regional differences in climate, soils, and management, and crop biology. Methods to evaluate and identify the most efficient irrigation strategies have yet to be explored in the context of regional specific spatio-temporal variability in major U.S. cropping systems. Optimum regional-specific phenotypes must also be identified in order to improve water use efficiency in a changing climate. A two-pronged approach combining irrigation technology and crop genetics is thus an effective way to improve water management for long-term U.S. agriculture viability. The major goal of this proposal is to develop a spatially-referenced decision support tool that identifies most efficient location-specific irrigation technologies and management strategies, and associated crop ideotypes that optimize yield and water use efficiency. Using existing explanatory crop models for maize, soybean, and potato and a geospatial simulation tool, the project will (1) characterize regional differences for Pacific Northwest, Southeast, and Great Plains production systems, (2) identify optimal combination of irrigation type, in-season practice, and crop, (3) evaluate sensitivity to climate change, (4) determine region-specific optimal crop ideotypes, and (5) develop a web-based data repository and search tool for regional recommendations.

Application Number: A81767
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **To invest in restoring habitat or improving connectivity? Identifying priority sites to enhance Washington ground squirrel populations**
Agency: USDI Fish and Wildlife Service
Period: 5/1/2013 - 4/30/2015
Amount: $76,504
New

This project will prioritize areas for shrub-steppe restoration that will benefit the Washington ground squirrel and other shrub-steppe species in the Columbia Plateau. Specifically, we will determine 1) whether populations of Washington ground squirrels will benefit more from shrub-steppe restoration projects aimed at increasing connectivity among habitat patches or restoration projects aimed at increasing the quality, size, or number of existing habitat patches; and 2) whether restoring priority areas for increasing connectivity and habitat in general for the Washington ground squirrel will benefit other shrub-steppe species. The project will cover much of the Washington ground squirrel's range,

centering on Douglas, Grant, and Adams counties, and including areas currently being monitored for occupancy by the Washington Department of Fish and Wildlife.

Application Number: A81750

Faculty Member: Joshua Lawler	Faculty Member: Sergey Rabotyagov
Role: Principal Investigator	Role: Co-Investigator

Title: **Collaborative Research: Putting the Gulf of Mexico Coast in Context: Targeting upland and coastal investments for sustainable delivery of ecosystem services**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2017
Amount: $732,175
New

Here, we propose to apply an ecosystem-modeling framework for exploring the response of coastal and marine ecosystems and services they provide to different types of watershed and coastal management decisions in the Mississippi River Basin and the Gulf of Mexico. The conceptual model we use is based on existing constructs illustrating how human actions produce changes in ecosystem processes, which in turn affect ecosystem services and thus change the value of natural systems to humans (NRC 2004). This whole system approach is based explicitly on 2 premises: (1) natural and human system functions are linked and their connections can be quantitatively evaluated using ecosystem services as currencies, and (2) effects of human actions on watershed, coastal, and marine ecosystem processes can be assessed in an integrated manner to illuminate how the inclusion of cross-system connections can contribute to better policy design on land and in the water.

Application Number: A81854
Faculty Member: Robert Lee
Role: Principal Investigator
Title: **Supporting Teacher Strategies to Prepare Students in Remote Rural Communities for College-Level Mathematics**
Agency: WA Higher Education Coordinating Board
Period: 1/1/2013 - 2/28/2013
Amount: $3,234
Supplement and Extension

This amendment is to allow the data from earlier portion of the project to be uploaded to the sponsor's website.

Application Number: A82511
Faculty Member: Jim Lutz
Role: Principal Investigator
Title: **Effects of fire on forest structure and development: Fusing Landsat and airborne LiDAR to understand the impacts of fire severity on carbon stability over time**
Agency: National Aeronautics and Space Administration
Period: 9/1/2013 - 8/31/2016
Amount: $90,000
New

Climate change predictions indicate that drought and fire severity will increase with warmer global temperatures. This poses a challenge for land managers in the western United States, where nearly a century of fire suppression has increased tree density in dry mixed-conifer forests. In these densely packed conditions competition for water makes trees more vulnerable to drought and allows fire to spread more easily from one tree to the next. I propose to combine data from Landsat satellites and data from airborne light detection and ranging (LiDAR) instruments with tree cores that show annual growth patterns and on-the-ground measurements of spatial locations of trees to quantify the effects of fire severity, climate, and spatial arrangement of trees on post-fire tree growth (i.e. carbon accumulation) and structural resistance to fire (i.e. stability of forest carbon) over time. Twenty-eight 0.25 ha plots will represent four dry mixed-conifer forest types. Within each forest type, comparisons between growth patterns in one unburned control plot and six burned experimental plots will isolate growth variation due to fire severity and growth variation due to annual variation in climate. Analysis of spatial arrangement of trees between plots will reveal potential synergistic effects on post-fire carbon accumulation of competition for resources, fire severity, and annual variation in climate. These descriptions of post-fire forest development will calibrate Landsat time series to better predict post-fire carbon accumulation rates based on forest type, fire severity, and annual variation in climate. Airborne LiDAR will describe canopy structure at different times since fire and further calibrate Landsat images to better predict changes in stability of forest carbon over time based on forest type, fire severity, and annual variation in climate. This research employs both LiDAR and field data to increase the utility of Landsat imagery in modeling and predicting the effects of fire on carbon cycling, ecosystem processes, and wildlife habitat in future climate scenarios across the western United States.

Application Number: A81733
Faculty Member: John Marzluff
Role: Principal Investigator
Title: **Comparative neuroecology of crows and pigeons**
Agency: National Science Foundation (NSF)
Period: 1/1/2014 - 12/31/2017
Amount: $
Pre-Application

One of neurobiology's grand challenges is to understand how the brain integrates diverse sensory information into commands that produce complex behaviors. While it is clear that multiple brain regions integrate sensation, context, history, and emotion into muscular response, very little is known about how this is accomplished by birds outside of song learning. The proposed 4-year project will use (f-18) flurodeoxyglucose positron emission tomography (FDG-PET) to image the brains of American crows (Corvus brachyrhynchos) and rock pigeons (Columba livia) as they acquire and recall ecologically relevant knowledge about new dangers and foods. Both of these birds are successful residents of an increasingly human-dominated world, in part because they quickly associate their personal experiences and observations with the rewards and punishments of urban life. For example, the faces of particularly threatening humans are learned by crows after a single dangerous encounter, remembered for years, and over time come to be known by an increasing proportion of a social group. The proposal aims to understand the brain regions that provide the neural bases of these abilities. Brain images of over 200 conscious crows and pigeons will be used to identify the regions consistently activated during individual and social learning. By contrasting brain activity during the acquisition and recall of individual and social knowledge the research will demonstrate how the brain of a bird acquires and integrates sensory information, stores ecologically important associations, and shapes learning and memory of a cognitively complex discrimination task with emotion.

Application Number: A82472
Faculty Member: Eric Turnblom
Role: Principal Investigator
Title: **Understanding and Modeling Competition Effects on Tree Growth and Stand Development Across Varying Forest Types and Management Intensities**
Agency: National Science Foundation (NSF)
Period: 7/15/2013 - 7/14/2015
Amount: $66,542
New

Forests sequester carbon, provide clean water and oxygen, promote biodiversity, provide recreational opportunities, and produce a host of wood products. Wood is a major economic commodity, serving as the raw material for the paper and building products industries and it is becoming increasingly important as a feedstock for the emerging biomaterials and bioenergy sectors. Managing forests for a myriad of wood products and ecosystems services requires reliable models of tree growth and stand dynamics that incorporate a full range of silvicultural and utilization options.

Forest stand dynamics are a function of the species present, the site quality, the degree to which the site is occupied, stand age in the case of even-aged stands or elapsed time from a specified initial condition for uneven-aged stands, and management treatments. Quantification of site occupancy is central to developing reliable models for predicting forest growth and yield. Because of the importance of quantitatively describing site occupancy and competition for growth resources, much attention has been devoted to the problem of developing stand- and point-density measures, but it remains an elusive and vexing component of forest growth and yield forecasting for multiple reasons.

Relating resource availability and competition intensity to growth is central to understanding and projecting forest stand dynamics. Understanding competition dynamics is paramount for evaluating management activities such as deploying genetic material, prescribing site preparation treatments and planting density, predicting response to control of inter-and intra-specific competition via vegetation control and thinning, and ameliorating nutrient deficiencies through fertilizer applications. Increased understanding of competition processes and formulation of improved models for quantifying competition effects, the aim of this research, will enhance evaluation of a wide array of forest management options ranging from intensively-managed even-aged stands of single species to extensively-managed uneven-aged, mixed-species systems.

Application Number: A81813
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **North Pacific Coast Lead Entity Neutral Forum**
Agency: Washington State Recreation and Conservation Office
Period: 7/1/2012 - 6/30/2013
Amount: $52,646
Non-Competing Supplement

The University of Washington's Olympic Natural Resources Center proposes to facilitate two neutral forums for development of salmon habitat restoration plans on the western side of the Olympic Peninsula. One neutral forum called the "North Pacific Coast Lead Entity" (NCPLE) is responsible for the development of ranked lists of restoration and protection projects in western Clallam and Jefferson counties. The other forum operates in the Quinault region. Both must be based on the best available science, community principles, and the integration of environmental and ecological interests.

UW-ONRC will assist the forum members in scientifically-grounded and objective monitoring of the implementation of the selected projects. UW-ONRC will also prepare a compilation of restoration project outcomes in the state-wide Habitat Work Schedule data base; and coordinate with other relevant forums in the region that are addressing endangered salmon recovery efforts.

February Awards

Application Number: A81525
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Hancock Forest Management
Period: 1/1/2013 - 12/31/2013
Amount: $38,859
Supplement and Extension

2013 Membership Dues from Hancock Forest Mgmt to Stand Mgmt Coop

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Application Number: A82191
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Longview Timberlands, LLC
Period: 1/1/2013 - 12/31/2013
Amount: $35,406
Supplement and Extension

Stand Management Coop Membership Dues for Longview Timberlands for 2013.

Application Number: A82343
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Stimson Lumber Company
Period: 1/1/2013 - 12/31/2013
Amount: $18,445
Supplement and Extension

2013 Membership Dues to Stand Management Coop by Stimson Lumber Co.

Application Number: A83128
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: **Patterns of predation on snowshoe hares in north-central Washington**
Agency: USDA Forest Service
Period: 9/1/2011 - 6/30/2013

Amount: $1,000
Non-Competing Supplement

The funds deriving from this University of Washington / Forest Service agreement will be used to provide one quarter of graduate student support as part of a larger study of snowshoe hare-predator interactions in north-central Washington. The goals of this project are to (1) determine the impact of forest stand composition on hare vulnerability to predation, (2) contrast patterns of hare predation by Canada lynx (Lynx canadensis) and competing mesocarnivores such as coyotes (Canis latrans) and bobcats (Lynx rufus), and (3) identify forest features that are associated with lynx-induced hare mortality. This project has important conservation implications, for it will increase our understanding of the relationship between forest features and lynx hunting success and, as a result, improve out ability to manage forests in a manner that benefits this imperilled carnivore.

February Proposals

Application Number: A83330
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Interactions Between Hemiparasites, Hosts, and Herbivores**
Agency: Royalty Research Fund (RRF)
Period: 1/1/2014 - 12/31/2014
Amount: $39,622
New

Hemiparasitic plants occupy a unique niche interacting with the host plants that they parasitize and with the herbivores that feed upon them. For example, Castilleja species are 'generalist' hemiparasites that can parasitize many different host plants, although their performance is directly affected by the identity of the host plant. However, herbivores such as Euphydryas editha are specialists that preferentially oviposit and feed upon a small number of related plant species, including Castilleja species. Thus, the host plants that are being parasitized may indirectly affect the performance of specialist herbivores that feed on the parasite but not on them. The objective of this project is to experimentally determine the mechanisms that mediate these tritrophic interactions. Two phases are proposed. The first phase examines the mechanisms that underlie differences in performance depending on the host. Castilleja levisecta (golden paintbrush), a hemiparasite, has been experimentally planted alone or with one of 12 potential host plants. Leaf tissues will be sampled from C. levisecta growing in each host treatment. Tissues will be analyzed to identify differences in nitrogen concentration and in secondary compounds. The second phase examines the importance of tritrophic interactions. Hemiparasites will be grown with individual hosts and then exposed to a specialist herbivore that feeds upon it. The performance of the specialist herbivore that feeds upon the hemiparasite will be measured and related to the identity of the host plant with which C. levisecta grew. This research will inform our understanding of the importance of tritrophic interactions in ecology.

Application Number: A83336
Faculty Member: Gordon Bradley
Role: Principal Investigator
Title: **DNR Snoqualmie Corridor Recreation Planning**
Agency: WA Department of Natural Resources
Period: 1/1/2012 - 6/30/2013
Amount: $13,578

Supplement and Extension

The Department of Natural Resources (DNR) is seeking assistance with the Snoqualmie MTS Greenway Corridor Recreation Planning project. This project will determine the recreation management direction and priorities for the next 10-15 years. It will include establishing a citizen-based recreation planning committee who will work with the agency throughout plan development. The plan will be based on a broad scale land suitability analysis and will include establishing recreation management goals, objectives and strategies for the planning area.

Application Number: A82905
Faculty Member: Sharon Doty   Faculty Member: Soo-Hyung Kim
Role: Principal Investigator   Role: Co-Investigator
Title: **Improving Plant Growth via Engineered Plant-Microbe Interactions**
Agency: Ginkgo BioWorks, Inc
Period: 9/1/2013 - 8/31/2016
Amount: $149,997
New

Previous work in the Doty lab and elsewhere has demonstrated that colonization of plants by endophytic strains is cultivar-specific. The basis on which endophyte strains colonize some cultivars but not others remains unknown. An improved understanding of factors influencing colonization would allow us to redesign the host range of key endophytic strains and to enhance plant colonization thereby improving biological nitrogen fixation by inoculated plant. Together, these results would advance our long-term goal of developing endophytic bacteria capable of serving as a fertilizer replacement (bio-fertilizer) in U.S. agricultural crops.

Application Number: A83323
Faculty Member: Robert Harrison
Role: Principal Investigator
Title: **Effects of Organic Matter Retention & Management on Long-Term Productivity of Pacific Northwest Coastal Douglas-Fir Plantations**
Agency: National Council for Air and Stream Improvement
Period: 12/18/1998 - 3/31/2014
Amount: $20,000
Non-Competing Supplement

The goal of this project is to gain a better understanding of the long-term consequences of various levels of organic removals, nutrient allocation, and soil compaction, as well as the appropriate ameliorative or growth enhancement treatments that can be used to sustain productivity through multiple rotations on the Pacific Northwest's most productive soils. Although N fertilization is commonly used in Pacific Northwest Douglas-fir stands for enhancing, it is not known to what extent organic matter will be enhanced by N fertilization through successive applications, or how it compensates for the nitrogen removed from the system through harvest. This study will begin to fill this critical data gap in the Pacific Northwest Region.

This amendment is to extend the MOA and supplement this project.

Application Number: A83091

Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **Restoration of habitat and connectivity on the Columbia Plateau**
Agency: The Nature Conservancy
Period: 3/1/2013 - 6/30/2013
Amount: $13,277
New

The arid lands of eastern Washington are fragmented by agriculture, roads, and development. The few remnant patches of sagebrush and prairie are relatively isolated from one another, posing a significant challenge to the management of species of concern in this region. We will (a) develop a set of priority restoration sites for enhancing habitat and connectivity for focal species on the Columbia Plateau in eastern Washington, (b) determine the impact of restoring those priority sites on population of Washington ground squirrels, using these priorities to develop scenarios as inputs to a species-specific population model and (c) to gauge whether restoring sites for the Washington ground squirrel will benefit other species of concern in the region.

Application Number: A82640
Faculty Member: Fernando Resende
Role: Principal Investigator
Title: **Improving Carbon and Hydrogen Efficiences**
Agency: Washington State University
Period: 1/1/2014 - 12/31/2016
Amount: $302,204
New

The overarching goal of this project is to improve carbon and hydrogen efficiencies in the production of bio-oil from fast pyrolysis. As one of the steps to accomplish this goal, supercritical water gasification of the bio-oil aqueous phase (C1-C4 molecules) will be performed and evaluated to produce hydrogen gas and therefore improve hydrogen efficiency. The effect of variables will be studied and catalysts will be screened to maximize the hydrogen yields. Based on the experimental results, a kinetic model will be developed to describe the conversion of C1-C4 molecules in supercritical water. Model compounds (C1-C4 molecules in the aqueous phase) will also be used to aid the model development. The model will include the main reactions leading to the formation of products, and will be validated by comparisons with thermodynamic calculations as well as prediction of data not used in the model development.

Application Number: A83095
Faculty Member: Fernando Resende
Role: Principal Investigator
Title: **Understanding Ablative Pyrolysis for the Conversion of Beetle-Killed Trees into Fuels**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2016
Amount: $311,204
New

The goal of the work proposed here is to generate fundamental knowledge about ablative pyrolysis as a technology for the conversion of beetle-killed trees into biofuels. Based on techno-economic reasons, we propose that ablative pyrolysis in mobile units is a viable option for the disposal of trees affected by the mountain pine beetle and production of liquid fuels. Beetle-killed trees lose moisture over time,

which makes them an excellent feedstock for fast pyrolysis. Ablative pyrolysis can be used for this conversion because, unlike more conventional pyrolysis methods, it does not require the grinding of wood chips to very small particle sizes, and it can possibly convert up to 81 wt % of the wood into liquid fuels. The recent bark beetle epidemic have affected more than 4 million acres of west forest, generating hundreds of thousands of woody biomass that do not have a direct application in the wood industry sector. The work in this proposal has the potential to generate a novel application for lodgepole pine trees killed by bark beetles. Specifically, we will: 1) develop kinetic models coupled with heat and mass transfer models to provide an accurate description of the ablative process; 2) investigate how the structure and composition of beetle-killed trees affects pyrolysis and its products. Once fully developed, this technology can be used in mobile pyrolysis units for converting beetle-killed trees into fuels. The results of this proposal will be used to seek additional funding for the construction of a mobile pyrolysis unit to demonstrate the technology proposed.

Application Number: A83278
Faculty Member: Luke Rogers
Role: Principal Investigator
Title: **Kitsap Community Forest Management Plan**
Agency: Great Peninsula Conservancy
Period: 4/1/2013 - 3/31/2014
Amount: $22,500
New

The Great Peninsula Conservancy and other conservation organizations propose to nominate Pope Resources 6,900 acres of forestland on the Kitsap Peninsula for inclusion in the State's Community Forest Trust. The Conservancy seeks to work with the University of Washington's School of Forest Resources to develop alternative management plans that demonstrate the range of social, ecological and economic products the forest can provide and to quantify those outputs over time. Desired outcomes are:

1. A range of FSC management options will be explored to demonstrate different strategies for managing the proposed community forest and to consider a range of revenue generation scenarios:

FSC Certification: maximum revenue stream allowable under FSC guidelines.
FSC Certification: revenue neutral harvest. A FSC forest certification plan that seeks to generate revenue necessary to support forest administration and management by DNR and land stewardship costs incurred by Kitsap County and local partners.

Management framework and revenue generation projections are requirements for DNR nomination of Kitsap Community Forest as a pilot community forest under the DNR Community Forest Trust program recently passed by the Washington State legislature. This information will inform DNR and Kitsap County of potential revenue generation to offset management costs of the community forest and may also provide a revenue source to underpin a local open space ballot measure within Kitsap County. This project will greatly enhance Kitsap County's ability, as a potential future landowner, to conserve and manage this regionally-unique community forest.

Application Number: A83389
Faculty Member: Luke Rogers
Role: Principal Investigator
Title: **Alaska Riparian Inventory**

Agency: Martin Environmental Services, Inc.
Period: 4/1/2013 - 12/31/2013
Amount: $7,072
New

To quantify and characterize riparian stand conditions along all streams (approx. 1000 miles) on Sealaska lands (approx. 290,000 ac). These data would be used along with results from the habitat trend study to assess the overall cumulative effects of timber harvest on riparian potential to maintain ecological functions and salmonid habitat on Sealaska lands. The data should be attributed in a GIS data base and suitable for queries (e.g., determine proportion of streams with buffer strips and quantify riparian functional status for supplying large wood and shade) and development of map products.

Application Number: A82834
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **North Pacific Coast MRC Neutral Forum**
Agency: Jefferson County
Period: 7/1/2012 - 6/30/2013
Amount: $19,659
New

The North Pacific Coast Marine Resource Committee represents a neutral forum for the coordination of stakeholder interactions in establishing and implementing marine resource management activities on the outer coast. The NPC MRC is responsible for developing ranked lists of restoration and protection projects that are based on the best available science, community principles, and the integration of environmental and ecological interests. ONRC will coordinate the monthly meetings of the NPC MRC forum including the following:

1) Task 1a: Coordinate and facilitate monthly meetings of the North Pacific Coast MRC;
2) Task 1b: Facilitate MRC- approved Ground Rules and By Laws;
3) Task 1c: With the MRC, develop and distribute solicitation of RFPs for FY14 projects; Facilitate project ranking and communications with project applicants. Develop project ranking and draft FY14 project budget; and
4) Task 1d: A brief, draft operational summary that includes prioritized recommendations for future actions and products for MRC development, a description of challenges and growth over the past year, and ideas on new ways to utilize the MRC to implement the Coastal MRC Program Priorities.

Application Number: A81745
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: **Impact of Wolves on Mule and White-Tailed Deer**
Agency: WA Department of Fish and Wildlife
Period: 7/1/2013 - 6/30/2014
Amount: $11,280
New

The goal of the project is to understand how recolonizing gray wolves might impact mule and white-tailed deer via non-consumptive (i.e., predation-risk induced shifts in habitat use, foraging behavior, herding, etc.) and consumptive (i.e., direct killing of deer causing changes in adult or fawn survival,

population growth, etc.) effects. Impacts of wolves on deer will be assessed by deploying animal-borne cameras, to monitor behavior, in areas of north-central Washington with and without recolonizing wolves. We also plan to investigate how wolves can potentially influence range conditions by impacting either deer behavior, abundance, or both, in effect potentially reducing deer herbivory and impacting range biomass and plant composition. Furthermore, wolves in our study areas are already radio-collared, and our project partners (WDFW and the Colville Tribe) have plans to radio-collar more packs and members within already radio-collared packs. Thus, there is great scope for research into wolf habitat use, food requirements, and overall behavior within a managed landscape as part of the proposed project.

Application Number: A83128
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: **Patterns of predation on snowshoe hares in north-central Washington**
Agency: USDA Forest Service
Period: 9/1/2011 - 6/30/2013
Amount: $1,000
Non-Competing Supplement

The funds deriving from this University of Washington / Forest Service agreement will be used to provide one quarter of graduate student support as part of a larger study of snowshoe hare-predator interactions in north-central Washington. The goals of this project are to (1) determine the impact of forest stand composition on hare vulnerability to predation, (2) contrast patterns of hare predation by Canada lynx (Lynx canadensis) and competing mesocarnivores such as coyotes (Canis latrans) and bobcats (Lynx rufus), and (3) identify forest features that are associated with lynx-induced hare mortality. This project has important conservation implications, for it will increase our understanding of the relationship between forest features and lynx hunting success and, as a result, improve out ability to manage forests in a manner that benefits this imperilled carnivore.

Application Number: A83116
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: Will a warming climate affect mesocarnivore interactions in Washington's southern boreal forests?
Agency: Seattle City Light
Period: 6/16/2013 - 6/15/2014
Amount: $24,052
New

There is growing concern that climate change will affect ecosystems by altering species interactions. Yet, to date, there has been little empirical effort to understand how species interactions might change in the face of anticipated climatic shifts. Given that landscape-level manipulations of climate are intractable, one of the best ways we have to forecast the nature of future biotic relationships at ecologically relevant temporal and spatial scales is to explore species interactions across current climatic gradients. Accordingly, in an effort to better understand how Canada lynx (Lynx canadensis) populations in Washington might respond to climate change, we are proposing to examine the relationship between variation in winter snow conditions and competition for snowshoe hares (Lepus americanus) between this threatened carnivore and two other medium-sized predators – coyotes (Canis latrans) and bobcats (Lynx rufus).

Application Number: A83380
Faculty Member: Aaron Wirsing
Role: Principal Investigator
Title: Do the effects of recolonizing gray wolves on deer in Washington vary seasonally?
Agency: National Geographic Society (NGS)
Period: 12/1/2013 - 1/1/2015
Amount: $20,024
New

Gray wolves are currently recolonizing the State of Washington, presenting an opportunity explore the consequences of restored wolf predation risk for prey populations and native ecosystems. We propose to exploit this opportunity with a natural experiment that entails monitoring responses of two prey species - mule and white-tailed deer - in areas with and without resident wolf packs. Deer and wolves in each area will be equipped with GPS collars and tracked for up to three years. We will then use tracking data to ask if deer exposed to wolves respond with chronic shifts to safe habitat (rugged terrain for mule deer, gentle terrain for white-tailed deer) or temporary habitat shifts that occur only when hunting wolves are close by. Our work is important because it will improve (i) our understanding of wolf-prey relationships, (ii) our ability to predict how prey distributions may shift in the face of wolf recolonization of the Pacific Northwest, and (iii) the capacity of managers to predict how the return of wolves will affect game populations.

Application Number: A83210
Faculty Member: Darlene Zabowski
Role: Principal Investigator
Title: Reservoir Sediment Carbon along the Elwha River after Removal of Dams
Agency: Royalty Research Fund (RRF)
Period: 6/1/2013 - 5/31/2014
Amount: $32,125
New

The recent removal of two dams on Elwha River provides a unique opportunity to assess the sediments remaining after the dam removal. Worldwide, numerous dams are aging and will either need to be replaced or removed with the next few decades. However, little is understood about the fate of the carbon stored in the sediment carbon when a dam is removed. The proposal would assess the pool of carbon in the sediments of the former Lake Mills and Lake Aldwell. Estimates of carbon storage would be mapped spatially and by depth. Additionally, gaseous carbon fluxes to the atmosphere would measured to provide a preliminary estimate of respiration losses. This research will use this dam removal project, the largest-known of its kind, to establish important information regarding carbon pools and fluxes when reservoir sediments become soil.