School of Environmental and Forest Sciences

UNIVERSITY of WASHINGTON

College of the Environment

Research Newsletter **Volume III, Issue 3**
February 16, 2012

News

First aid certification and wilderness training is now required for students. This is a cost that can properly be charged to research grants. As you prepare your budget, think about how many students you need to have trained/certified. Since the First Aid certificate is only valid for 2 years, this may be a recurring expense over the life of the grant.

ARRA end dates revised. Federal agencies that made awards under ARRA are beginning to send out notices modifying the end dates of each award. In no instance will any ARRA award be extended past September 30, 2013; as needed, modifications to change to that from agreements ending later are being done. Any PI with an ARRA award should look at the projected spending plan and make sure that all funds will be used by September 30, 2013, as any remaining funds will go back to the US Treasury.

Opportunities

As much as possible, new opportunities will be sent directly to those faculty who are most apt to be interested, rather than just listed as a block. To be most effective, you need to make sure that Sally Morgan is aware of the areas that interest you (206-897-1754 or slm@uw.edu). The obvious source of interests is the faculty list on the SEFS website, but any additional guidance you can provide will make the targeting more effective.

Royalty Research Fund: the next deadline is March 5, 2012, with awards to be announced by June 15. The program is set up to allow faculty to do their own SAGE submissions, but in SEFS, faculty are encouraged to take advantage of the services offered in the Financial Services office. Provide a copy of the SEFS Grants Cover Sheet (http://www.cfr.washington.edu/tools/forms/SFRProposalCoverSheet.pdf) and your proposed budget to Sally Morgan.

RRF guidelines are at http://www.washington.edu/research/main.php?page=rrf.

Awards (November, 2011)

Application Number: A69684
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Faculty Member: James Agee
Role: Co-Investigator
Title: **Wildland Fuel and Fire Management in a Changing Climate**
Agency: USDA Forest Service
Period: 4/1/2009 - 3/31/2014
Amount: $503,421
Non-Competing Supplement

The amendment to the Joint Venture Agreement with the USFS proposed here will generate, develop, apply and transfer science-based information, strategies and tools for fire management in public, and Tribal lands. This agreement supports USFS PNW FERA and School of Forest Resource's research vision to:
A. Enhance programmatic fire planning, large fire decision support, hazardous fuel characterization and management, hazard assessment, fire behavior prediction, fire danger rating, and carbon flux assessments.
B. Promote attainment of desired future conditions and ensure the long-term integrity of ecosystems under a changing climate scenario, reduce air quality impacts and carbon emissions, and contribute to carbon management.
C. Improve fire management effectiveness and safety of firefighters and communities, and advance national and regional policy goals to reduce management costs.
D. Enhance restoration of healthy, resilient, fire-adapted ecosystems through evaluation of integrated fire/fuel management practices.
E. Develop a research-management partnership of USFS research stations and national forests to develop the decision support needed by the US Forest Service to incorporate climate change into management and planning of federal lands in the western US.

Specific objectives for this amendment to the joint venture agreement are: To continue a third phase of data collection in the spring and fall of 2011 of live fuel consumption and environmental variables from a series of prescribed fires in federal lands of Florida to improve fuel consumption models for the southern forest region of the United States; To continue a second year study of fuel amount and composition following dormant and growing season prescribed fires for flatwoods pine ecosystems in the Florida Panhandle; To continue the work for integration of the forest vegetation simulator (FVS) and FCCS to generate dynamic fuelbeds derived from stand data collected from FIA and CFI plots, and silvicultural treatments and to recode CONSUME 3.0 into python programming language to make this fire management tool a web application for fuel consumption and smoke emissions from wildfires.

Application Number: A66640
Faculty Member: David Briggs
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Roseburg Resources Company
Period: 1/1/2011 - 12/31/2011
Amount: $21,726
Non-Competing Renewal

2011 Membership Dues payment to Stand Management Coop by Roseburg Forest Products

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Application Number: A61086
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **The Northwest Advanced Renewables Alliance: A new vista for green fuels, chemicals, and environmentally preferred products**
Agency: Washington State University
Period: 1/1/2011 - 12/31/2015
Amount: $4,561,895
New

As part of a larger regional group research study, project goal is to provide a definitive assessment of the technical, economic, environmental, and social impacts of using woody biomass for the production of jet fuel. If forest biomass is to be widely used for jet fuel, it is necessary to understand the consequences of this technology. A life cycle analysis on greenhouse gas emissions is also necessary in order to qualify jet fuel made from forest based biomass under the Energy Independence and Security Act of 2007 and the 2009 EPA guidelines promulgated to meet the new requirements of the act. Project will combine biomass growth/yield models, engineering process models, and life cycle assessment models to develop life cycle environmental profiles for specific woody biomass feedstocks matched with the proposed jet fuel processing technology. These integrated models will be used to develop life cycle analyses for greenhouse gases and other environmental risk indices for comparisons between cellulosic jet fuel and fossil fuels. Energy uses of the feedstock and alternative wood product uses will be compared against their fossil intensive product substitutes. Alternative technologies, with their impacts on the value chain, will be compared for different forest treatments, harvesting and collection equipment and processing alternatives. Feedstock qualities will be matched with processing alternatives and regional feedstock scales of availability matched with efficient scale processing infrastructure. Alternative configurations

and policy assumptions covering a range of scenarios will be used to project potential regional reductions in greenhouse gas emissions and energy dependence as well as rural economic impacts. The impacts of different policies and other alternatives will be characterized as sensitivity scenarios to better inform the adoption of appropriate policies, marketing, and investment strategies to reach energy independence goals with reduced greenhouse emissions while effectively managing cellulosic resources.

Application Number: A67917
Faculty Member: Gregory Ettl
Role: Principal Investigator
Faculty Member: David Peterson
Role: Co-Investigator
Title: **The Western Mountain Initiative: Vulnerability and Adaptation to Climate Change in Western mountain Ecosystems**
Agency: USDI US Geological Survey
Period: 8/1/2010 - 12/31/2013
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: A58877
Faculty Member: Jerry Franklin
Role: Principal Investigator
Faculty Member: Jim Lutz
Role: Co-Investigator
Faculty Member: Van Kane
Role: Co-Investigator
Title: **Integrated, observation-based carbon monitoring for wooded ecosystems in Washington, Oregon, and California Park**
Agency: Oregon State University (OSU)
Period: 1/1/2012 - 12/31/2014
Amount: $203,093
New

The project goal is to develop an integrated satellite, plot, and lidar-based system to characterize and monitor the effects of land management and natural processes on carbon fluxes in the wooded ecosystems across large geographic areas. Key characteristics of the system will be explicit, map-based calculation of uncertainties in estimates of both carbon stocks and fluxes yearly from 1990 to present,

and a modular structure that will allow rapid inclusion of new data for improving maps and reducing uncertainties as the system matures. Core components of the project are a time-series based approach to mine the Landsat Thematic Mapper archive to monitor an unprecedented range of change processes on the landscape and to develop temporally-stable data for mapping, a proven nearest-neighbor mapping approach to integrate satellite data, environmental data, and USDA Forest Service Forest Inventory and Analysis (FIA) data, and small-footprint lidar data used to assess map error. Processes whose carbon effects will be mapped include all levels of forest harvest and fire, including both mechanical thinning and low-intensity fire, as well insect-related mortality, post-disturbance regrowth and encroachment, and land-use change away from forest types. The resultant West Coast-wide maps of carbon will be useful for state agencies tasked with carbon monitoring roles, federal land management agencies needing context and guidance for land management decisions, and carbon modelers needing detailed maps of disturbance and growth effects on carbon change to train, calibrate, and validate the process-based models needed for futuring and decision support. The project addresses both sections 3.1 and 3.4 of the A.5 proposal call by 1) addressing the effects of land management and land use on carbon, and 2) developing the scientific foundations and analytical approaches for monitoring effects or efficacy of management-based carbon mitigation strategies. For this study, University of Washington researchers will use existing field and LiDAR data to estimate forest carbon for several forest types over areas of several tens to ~100 square kilometers for four to six study areas.

Application Number: A68270
Faculty Member: Jim Lutz
Role: Principal Investigator
Title: **Climate Impacts on Burn Severity**
Agency: USDI US Geological Survey
Period: 7/1/2009 - 6/30/2012
Amount: $75,630
Non-Competing Supplement

We will use Landsat TM data from 1984 to 2009 to quantify the fire regime in forested areas in and near Yosemite National Park (one Landsat scene). We will compare the satellite measurements of fire severity with existing ground data related to fire effects, and we will validate the spectral signature of burned areas with field measurements. Measurements of burn severity will be correlated with existing climate data (PRISM, NARR, and RAWS). Finally, climate-fire relationships in Yosemite National Park will be compared with similar relationships examined by other project participants in Glacier National Park and Yukon Charley National Reserve for a synthesis of climate-fire relationships in western North America.

Application Number: A70234
Faculty Member: Jim Lutz
Role: Principal Investigator
Title: **Annually resolved impacts of fire management on carbon stocks in Yosemite and Sequoia & Kings Canyon National Parks**
Agency: USDI National Park Service
Period: 8/5/2010 - 1/29/2013
Amount: $10,000
Non-Competing Supplement

Forest biomass on Sierra Nevada landscapes constitutes one of the largest carbon stocks in the state of California, and the stability of that carbon stock is tightly linked to fire and the ecological factors that drive the fire regime. Recent research suggests that over a century of fire exclusion and fuel accumulation in Western forests have actually reduced the amount of carbon that such suppressed landscapes store, while increasing the likelihood of catastrophic, stand-replacing fire. For over 30 years, fire management at Yosemite (YOSE) and Sequoia and Kings Canyon (SEKI) National Parks has led the nation in restoring fire to park landscapes, however the impacts of that restoration on the stability and magnitude of carbon stocks are not yet known. This work proposes to quantify these effects over a 30 year timescale by leveraging detailed fire history, vegetation, and fuels datasets at YOSE and SEKI to quantify biomass in areas where fire has been suppressed vs. areas where fire has been restored.

Our dynamic approach to quantifying the carbon contained in trees will also involve dendrochronological analyses of recent tree growth. Although the dynamic approach will likely yield the best accounting of carbon pool dynamics over time, both the static and dynamic approaches need to be included in this project for the following reasons: 1) much of the information developed from the static approach (A51771) underpins the dynamic approach; 2) conducting the more complex dynamic approaches will allow us to evaluate how much more information is generated given the greater expenditure of time and funding required for the latter; and most importantly 3) the static approach is very feasible for any land management unit that has archived comprehensive vegetation plot data (e.g. FMH and FIA plots), and by "validating" this approach through the dynamic approach in our proposed study, potential users of these methodologies in other places can better decide which approach is best for their situation.

Application Number: A71141
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Forks SMP Services 2011-2012**
Agency: City of Forks
Period: 7/1/2011 - 6/30/2012
Amount: $13,000
New

The Olympic Natural Resource Center proposes to provide GIS support and professional services to assist with production of remaining required elements of the SMP update process.

Awards (December, 2011)

Application Number: A71728
Faculty Member: Sally Brown
Role: Principal Investigator
Title: **Mountains to Sound Gateway**
Agency: King County Department of Natural Resource and Parks, Water and Land Resources Division
Period: 10/10/2011 - 10/9/2012
Amount: $39,992
New

This agreement is a continuation of a long-standing agreement between the King County Wastewater Treatment Division and the School of Forest resources. Dr. Brown will assist the KCWTD in determining appropriate biosolids application rates for commercial forest plantations. She will assist with questions on benefits and safety of biosolids use in commercial forestry. Biosolids application rate are based on a number of factors including soil nitrate concentrations. The focus of this year's research will be to measure variability in soil nitrate concentrations across application units. This will be carried out by soil sampling in pits as well as across transects in three forest units. Results will be presented to KCWTD and stakeholders as required.

Application Number: A72112
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Hampton Resources, Inc.
Period: 1/1/2012 - 12/31/2012
Amount: $9,455
Supplement and Extension

2012 Stand Management Coop Membership Dues for Hampton Resources Inc.

Application Number: A70106
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **Web-Based Tools for Assessing Climate-Induced Species Range Shifts**
Agency: Environment Canada
Period: 8/1/2011 - 3/31/2012
Amount: $34,996
New

The goal of this project is to make available, on the web, information about projected climate-driven changes in vertebrate fauna for the western hemisphere. More specifically, the work would make available: 1) thirty different range-shift projections for each of 2,954 vertebrate species (birds, mammals, and amphibians) for three different time periods (265,860 maps), 2) projected estimates of species loss, gain, and turnover (as total number of species, percentage of current species, and by taxonomic group) for any user-supplied regions, 3) lists of species whose potential range is projected to move into or out of user-supplied regions, 4) maps of species losses, gains, and turnover for each or all of the three taxonomic groups for user-supplied regions, 5) different methods for ensembling or summarizing range-shift summaries derived from different climate-change projections (general circulation model outputs)

Application Number: A69033
Faculty Member: Eric Turnblom
Role: Principal Investigator
Title: **Data Gathering for Updated Logging Residue Ratios**

Agency: USDA Forest Service
Period: 6/1/2009 - 12/31/2014
Amount: $27,000
Supplement and Extension

The goal of the current study is to gather data directly from harvested sites to produce estimates of actual logging residues obtained from different harvesting techniques used in different timber types. A funding supplement expanded the scope of inference of the current study by, among other things, examining stands in pre-harvest condition to estimate biomass of expected logging residuals from standing trees. The methods and models currently used for this purpose are derived from an extremely small, localized data set that have been shown to be inapplicable to most sub-regions in the Pacific Northwest. Forest stands on the Olympic Peninsula will be examined prior to harvest to gather the data necessary to estimate biomass in, for example, branches + foliage, unmerchantable tops, and stemwood and bark, for individual trees, enabling more complete estimation of the biomass resource. The work proposed herein will expand the scope of that proposed for the previous supplement to two more species.

Proposals (November, 2011)

Application Number: A71802
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Faculty Member: Robert Norheim
Role: Co-Investigator
Faculty Member: David Peterson
Role: Co-Investigator
Title: **Archival of data from JFSP-funded projects conducted by the Fire and Environmental Research Applications Team**
Agency: USDI Bureau of Land Management
Period: 6/1/2012 - 9/30/2013
Amount: $48,728
New

The Fire and Environmental Research Applications Team (USDA Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Lab) (FERA) proposes to document and archive datasets from eleven (11) completed JFSP-funded projects. FERA scientists have received funding for numerous projects since the inception of JFSP, and these eleven in particular have generated high quality datasets that are potentially valuable to other researchers. In addition, the two Co-PIs have a long track record of successful bioinformatics and metadata projects, funded by the Olympic Natural Resources Center, Federal Geographic Data Committee , National Biological Information Infrastructure, National Park Service, and JFSP. These projects have made numerous valuable datasets available online via PNWIN and FIREHouse, and developed over 800 metadata records for geospatial and biological datasets.

Application Number: A72023
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Title: **The effects of fire intensity on riparian vegetation composition and structure**
Agency: USDI Bureau of Land Management

Period: 8/1/2012 - 9/1/2013
Amount: $24,850
New

Riparian areas represent critical components of the landscape, connecting aquatic and terrestrial habitats. They are consistently more diverse in both species composition and structure than the adjacent area and this provides crucial habitat to an array of species. On the east slope of the Cascade Range in Washington historical fire return intervals have been shown to be similar between riparian and upland areas. Despite this evidence and the suggested role of fire in maintaining diversity, fire continues to be excluded from the riparian areas. An opportunistic study, sites are based in Naches, WA in areas burned in 2009 and set to be burned in 2012. This study aims to quantify how different intensity fires affect riparian species composition and structure. I hypothesize that mid to high intensity fire with passive torching will result in the greatest increase in species diversity and vegetation complexity.

Application Number: A72016
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Title: **Detailed fuelbed characterization and mapping for Eglin Air Force Base, FL**
Agency: USDI Bureau of Land Management
Period: 6/15/2012 - 6/15/2014
Amount: $24,649
New

Eglin Air Force Base (Eglin) is the largest forested military reservation in the United States and a substantial fraction is comprised of fire-dependent ecosystems. To manage this disturbance regime, the natural resources management section for Eglin operates an ambitious, nationally recognized, prescribed fire program. This proposal seeks to enhance a dissertation project being conducted through the University of Washington, School of Forest Resources that seeks to deliver applied research to prescribed fire managers at Eglin and other land management units in northern Florida. This dissertation has two objectives. To evaluate the relative impacts of growing and dormant season burns on the fuels life cycle in pine flatwoods of the southeast U.S. And to quantify future impacts of a reduced burning schedule at Eglin on fire hazard with a landscape fire-succession model, the Fuelbed Dynamics Model, designed to work with Fuel Characteristic Classification System (FCCS) fuelbeds. This project would fund the development of fuelbed characterization and mapping for Eglin. A product that would both enhance the quality of the FDM analysis of the dissertation and provide a valuable management tool for fire managers are Eglin.

Application Number: A71830
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Title: **Assessing fuel treatment effects on sage grouse habitat in eastern Oregon**
Agency: Oregon State University (OSU)
Period: 10/1/2012 - 9/30/2014
Amount: $54,960
New

Grasslands and shrublands in the Western U.S. are currently undergoing rapid change because of invasive species, grazing, woodland expansion, climate change, and other threats, resulting in habitat degradation, decline of native species, and loss of habitat for wildlife species such as sage grouse. Alteration of fire regimes in sagebrush communities has led to restoration efforts that reintroduce or mimic fire. Several research efforts have investigated the short-term (< five years post-disturbance) effects of sagebrush restoration treatments on vegetation, fuels, wildlife, hydrology and other factors. However, the long-term impacts of these treatments remain poorly understood. Therefore, there is a need for research tools that can help land managers determine what management regimens will reduce fire hazard, maintain or restore native plant communities, and at the same time, improve habitat for threatened and endangered species such as sage grouse over the long-term. We propose to conduct a field study and use resulting data to inform a modeling framework for investigating the long-term effects of prescribed fire and juniper removal fuel treatments on sage grouse habitat and fuels. Field study results will inform management scenarios in a complementary landscape modeling effort with previously developed and vetted state-and-transition models. The modeling effort will help to identify when and where to prioritize fuel treatments by identifying areas with the greatest wildfire hazard, and at greatest risk for cheatgrass and juniper invasion, and thus potential sage grouse habitat loss.

Application Number: A71914
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Title: **Identification of flammability threshold based upon Complex Canopy Structure and Species Composition Conductive to Sustaining a Crown Fire**
Agency: USDI Bureau of Land Management
Period: 5/1/2012 - 9/30/2013
Amount: $24,960
New

Current crown fire behavior prediction and fuel assessment models are great tools that continually evolve, advancing (Cruz and Alexander, 2010) while integrating additional variables within the structure and framework of physics. However, missing from all models is the ecological effect of a trees' influence upon crown fire initiation and spread due to environmental parameters that affect foliar chemistry and bark moisture content. Research has been conducted extensively upon foliage burn characteristics, lacking is the influence of competition, stand stress, environmental conditions and seasonal trends, whereas, bark moisture research has been very limited. Research of bark has been limited to thermal properties, burn characteristics, and thickness with regards to tree mortality, however missing is seasonal moisture trends of live tree bark and its possible influence upon crown fire initiation and spread. Research will be conducted on foliar chemistry and bark components of multi-species, multi-storied stands. Anaylsis will focus upon determining if forest succession influences foliar chemistry resulting in an increased susceptibility to crown fire initiation and spread. In addition to foliar analysis , bark analysis will be conducted to determine if bark is a factor linking surface fires to crown fires.

Application Number: A71820
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Grazing and Afforestation Effects on Understory Community Composition and Diversity in Uruguayan Grasslands**
Agency: Weyerhaeuser Company

Period: 11/5/2011 - 4/30/2012
Amount: $10,000
Supplement and Extension

The landscape of Uruguay is dominated by the South American Campos ecoregion, 85% of which is considered natural grassland and composed primarily of perennial grass and herb species, although shrubs and trees can be sparsely present. The Campos is important for the country's livestock production; currently, it supports 10 million head of cattle and 13 million head of sheep. Although its climate is suitable for forest development, the Campos has not been forested. Grazing is the primary factor maintaining the Campos as grassland, essentially creating an herbaceous pseudoclimax phase. Afforestation efforts began a few decades ago. To date, little research has been conducted on the effects of afforestation or the combined effects of grazing and afforestation on vegetation community dynamics. The objectives of this research are to:

1. Quantify changes in vegetation structure and function associated with afforestation,
2. Examine community composition and response to management over multiple scales and grazing histories: across regions and between similar sites within regions,
3. Determine if grasslands are able to re-establish following tree harvest, and
4. Compare the vegetation responses of Uruguayan and Pacific Northwest grasslands to afforestation and tree harvest.

Application Number: A71810
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Synergistic Recovery of Golden Paintbrush and Taylor's Checkerspot**
Agency: USDI Fish and Wildlife Service
Period: 4/1/2012 - 6/30/2013
Amount: $60,716
New

The prairie ecosystems of Puget Sound contain a disproportionate number of federal and state listed species. Habitat degradation and destruction have been identified in recovery documents and by biologists as key factors contributing to the rarity of these species. These threats are ubiquitous, of high magnitude, and ongoing (imminent). This proposal is for Year 1 (April 1, 2012-JUne 30, 2013) of a four-year interdisciplinary project to synergistically recover populations of these species, particularly golden paintbrush and Taylors' checkerspot. Specifically, we propose to enhance golden paintbrush populations so that they are robust enough to recover the species while supporting usage by Taylor's checkerspot and other butterfly species. The objectives of the project are to: 1) Understand the host plant requirements and population dynamics of golden paintbrush; 2) develop sufficiently large populations of golden paintbrush to meet recovery goals; 3) Understand key elements of the biology of Taylor's checkerspot that are critical to recovering this species; 4) Understand interactions between golden paintbrush and Taylor's checkerspot; and 5) Maintain and enhance habitat for golden paintbrush and several rare butterfly species in Puget Sound. These objectives will be accomplished through a combination of lab and field activities.

Application Number: A72003
Faculty Member: Jonathan Bakker Faculty Member: Ernesto Alvarado

Role: Principal Investigator Role: Co-Investigator
Title: **Fuel succession models for the sagebrush steppe: integrating fuel structure and community dynamics**
Agency: USDI Bureau of Land Management
Period: 1/1/2013 - 12/31/2015
Amount: $493,563
New

Sagebrush steppe ecosystems in the western United States are among the most imperiled in the United States. Fire is an important disturbance in this system. Invasive species may alter fuel structure, including fuel quantity and continuity. Restoration and management actions can further alter fuel structure. The overall goal of this project is to develop and validate models of fuel succession in the sagebrush steppe as a function of edaphic characteristics, disturbance history, and plant community composition. These models will be used to examine the spatial and temporal dynamics of fuels, and to explicitly link changes fuel structure with community dynamics. Products will include the development of predictive models relating fuels to commonly collected plant community data, the application of state-and-transition models to fuels and to communities, and the development of models describing the fuelbeds of communities within the sagebrush steppe. By developing methods and models that directly relate data normally collected as part of studies of plant community ecology we aim to expand the utility of such datasets and allow existing studies vegetation patterns to be related more strongly to fire management issues.

Application Number: A71961
Faculty Member: Gordon Bradley
Role: Principal Investigator
Title: **DNR Snoqualmie Corridor Recreation Planning**
Agency: WA Department of Natural Resources
Period: 1/1/2012 - 3/15/2013
Amount: $49,365
New

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: A71728
Faculty Member: Sally Brown
Role: Principal Investigator
Title: **Mountains to Sound Gateway**
Agency: King County Department of Natural Resource and Parks, Water and Land Resources Division
Period: 10/10/2011 - 10/9/2012
Amount: $35,536
New

This agreement is a continuation of a long-standing agreement between the King County Wastewater Treatment Division and the School of Forest resources. Dr. Brown will assist the KCWTD in determining appropriate biosolids application rates for commercial forest plantations. She will assist with questions on benefits and safety of biosolids use in commercial forestry. Biosolids application rate are based on a number of factors including soil nitrate concentrations. The focus of this year's research will be to measure variability in soil nitrate concentrations across application units. This will be carried out by soil sampling in pits as well as across transects in three forest units. Results will be presented to KCWTD and stakeholders as required.

Application Number: A72112
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Hampton Resources, Inc.
Period: 1/1/2012 - 12/31/2012
Amount: $9,455
Supplement and Extension

2012 Stand Management Coop Membership Dues for Hampton Resources Inc.

Application Number: A71719
Faculty Member: E. David Ford
Role: Principal Investigator
Title: **Selection of plants for reduced density stress**
Agency: Bill and Melinda Gates Foundation
Period: 4/15/2012 - 10/15/2013
Amount: $109,712
Pre-Application

An important contributing factor to increasing agricultural yields in industrialized countries has been increase in planting density. Yield increase has been gradual because plants suffer from density stress. Crop breeding based on group selection from large scale empirical yield trials has produced varieties adapted to increase in planting density. However, this has not been selected for directly and an historic sequence of hybrids shows progress is slow. For tropical crops including rice and beans, rapid increases in productivity are required and a more direct method of selection and change in cultural practice is needed. Our method is for direct selection and testing of plants that exert less competition, show reduced density stress and have greater yield at increased planting density. Our proposal is for a pilot study and, if successful we will transfer this technology to tropical regions to develop locally based, direct selection.

We will work with three species at three locations: maize and groundnut at CLUSA (Cooperative League of the USA) in Mozambique; beans at CIAT (International Center for Tropical Agriculture) Colombia; and rice in West Bengal. We ask three questions for each species and location. (1) What is the biological potential for an improvement through direct selection for reduced competition? (2) What requirements

may restrict planting at increased densities? (3) What are the practical requirements for developing a locally based, crop improvement scheme based on reduced density stress?

Application Number: A71707
Faculty Member: Jerry Franklin
Role: Principal Investigator
Faculty Member: Van Kane
Role: Co-Investigator
Title: **Integrating LiDAR-derived forest structure metrics with process-based simulation models for forest management planning**
Agency: Portland State University
Period: 6/1/2012 - 5/31/2014
Amount: $66,598
New

We will use recently collected Light Detection and Ranging (LiDAR) imagery to generate a suite of forest stand structure metrics across the 77,000 hectare Lake Tahoe Basin Management Unit, including quadratic mean diameter, tree height distribution profiles, canopy surface complexity, and canopy cover of overstory and understory trees. The structural information will be used to refine and attribute the current Tahoe Basin Existing Vegetation Map. We will evaluate the utility of the USFS Forest Inventory and Analysis (FIA) data in the region for training and validating these metrics; additional fieldwork to support both those activities is likely. The forest structure mapping will serve to provide initial conditions for process-based simulation models that will integrate previous and ongoing Tahoe Science Program work, including an updated Forest Vegetation Simulator and landscape models incorporating fire and other natural disturbance rates as well as a range of feasible management scenarios. This modeling context will allow us to assess the trajectory of these spatially-explicit structural metrics through time in response to a range of management strategies superimposed on stand growth and succession in the context of natural disturbance processes. The results of this work will allow other researchers to assess the impacts of these management strategies on forest stand structural restoration goals, fire susceptibility, species habitat, and other areas of concern.

Application Number: A71637
Faculty Member: Charles Halpern
Role: Principal Investigator
Title: **Meadow Restoration in the Oregon Cascades: Assessing Long-term Responses to Tree Removal and Fire**
Agency: USDI Bureau of Land Management
Period: 6/1/2013 - 5/31/2016
Amount: $331,853
New

Forest encroachment threatens the biological diversity of grasslands globally. Positive feedbacks between established and newly establishing trees can accelerate the process, with profound consequences for vegetation and soils. We are testing whether large-scale restoration treatments (tree removal with or without fire) can reverse the ecological effects of encroachment by grand fir and lodgepole pine into dry, montane meadows in the Cascade Range of Oregon. Our short-term (3-yr) observations suggest that there is strong potential for reversing these effects—with or without fire—even in areas in which trees have been present for well over a century. It is not clear, however, whether

future recovery of native meadow systems will be limited by species' dispersal, interactions with residual forest herbs, or ongoing recruitment of conifer seedlings. We will address these questions by re-examining patterns of vegetation recovery 7-8 yr after treatment. Given the equivocal role of fire in short-term responses, longer term assessments appear critical. Managers facing the worldwide phenomenon of tree invasion need to balance the ecological vs. operational need for fire in ecosystem restoration.

Application Number: A71655
Faculty Member: Soo-Hyung Kim
Role: Principal Investigator
Faculty Member: Joshua Lawler
Role: Co-Investigator
Title: **CNH-ex: Human and environmental co-benefits of adaptive solutions to climate change: An interdisciplinary approach for quantitative and qualitative assessments through case studies**
Agency: National Science Foundation
Period: 6/16/2012 - 6/15/2014
Amount: $250,000
New

With the increasing need for developing adaptation strategies to climate change, our ability to identify most effective adaptation options is of fundamental importance for sustaining coupled natural and human systems in a changing climate. Many adaptation options being developed for specific sub-sectors (e.g., food systems, urban ecosystems) are likely to incur concurrent human, economic, and environmental benefits as well as costs through various pathways of interactions within a sub-sector and with other sectors. However, still lacking is a concerted interdisciplinary effort to develop methods and metrics for evaluating the efficacy of adaptation strategies in conjunction with their co-benefits. The broad, long-term goal of this project is to develop and apply a theoretical framework for evaluating climate change adaptation strategies for their short-term and long-term benefits and costs to the environment and human systems. To achieve the overall goal, we set out the following specific aims for this exploratory project: 1) develop conceptual model for assessing co-benefits of adaptive solutions to climate change with the goal of elucidating both the barriers and opportunities for incorporating human-environment co-benefits into climate change adaptation strategies, 2) develop database of co-benefits metrics and parameters with the goal of supporting a meta-analytical investigation of the patterns and determinants (social, political, environmental) of co-benefit outcomes, and 3) perform a field research of an urban ecosystem in Lima, Peru as a case-study to apply the framework and parameters identified in aim 1 and 2 for assessing co-benefits of climate change adaptations. This study will initiate much needed discussions across climate change science and policy communities on the importance of critical appraisal of co-benefits in developing adaptation strategies to climate change. Specific outcomes of this exploratory project will include publications that 1) illustrate the importance of co-benefits of climate change adaptations, 2) lay out the theoretical foundations and definitions of co-benefits of climate change adaptations, 3) review the case studies of co-benefits of climate change adaptations, and 4) summarise the results of a comprehensive meta-analysis on the metrics of co-benefits in climate change mitigation, disaster mitigation, ecosystem services, and health interventions.

Application Number: A72116
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **DOD Environmental Postdoc**

Agency: Stanford University
Period: 1/1/2012 - 4/30/2013
Amount: $228,118
New

This project is for a post-doctoral associate to join a collaborative team including the Natural Capital Project, The Nature Conservancy, Industrial Economics, Stanford University, and two labs at the University of Washington, focused on mapping the quantity and value of the ecosystem services flowing from three demonstration DoD installations and surrounding landscapes, and illuminating the tradeoffs and broader implications of land-management decisions in a novel, practical, and powerful way that can be subsequently applied to additional installations. This collaborative project will estimate the relative benefits, measured in ecological or financial terms, of alternative future patterns of land use and land cover (including restoration and land purchases) on and around demonstration DoD installations.

Application Number: A71806
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **CNH-Intended and unintended consequences of payments for ecosystem service: modeling feedbacks in coupled natural and human systems**
Agency: National Science Foundation
Period: 6/16/2012 - 6/15/2016
Amount: $118,277
New

Land-use change has caused significant alterations of ecosystems around the world. At present the most rapid land use changes are happening in tropical developing countries. Conversion of ecosystems from native forest, grasslands and wetlands into developed areas, croplands and managed forests has led to vast increases in manufactured goods, food production, and timber production, but has come at a significant cost in terms of environmental degradation and declining biodiversity. These unintended consequences threaten to undermine the life support system on which human wellbeing, and that of much of the rest of biodiversity on the planet, depends. Managing human actions to provide for human needs while minimizing environmental harm requires both scientific understanding and an appropriate set of institutions. A major reason for the rapid progress in the production of material goods and rapid deterioration in the provision of many aspects of environmental quality is that the dominant market economic system rewards the former but does not penalize the latter. Until this imbalance is addressed it is unlikely that we will see fundamental change leading to improvements in environmental quality, ecosystem services or sustainability.
This multi-institution project will address three key questions. First, we ask by using linked biophysical and economic models to make projections, do incentive-based policies fulfill the intended consequences of the policies, and what are some of the unintended consequences that result? Second, how can policies create an optimal value, across a given landscape, of ecosystem service provision and economic returns from different land uses? And third, what factors affect the achievement of the goals of incentive-based programs in developed nations compared to developing nations?
Dr. Lawler will be responsible for modeling the effects of changes in land-cover and land-use on the biodiversity-related ecosystem services. He will advise a graduate student who will apply, and modify when necessary, several existing models to investigate the provisioning of hunting, birding, pollination, and biodiversity in general.

Application Number: A71702
Faculty Member: John Marzluff
Role: Co-Investigator
Title: **URBAN RESILIENCE SCIENCE NETWORK (URBANET): An International Transdisciplinary Network of Research on Resilience and Adaptation in Urbanizing Regions**
Agency: National Science Foundation
Period: 8/1/2012 - 7/31/2017
Amount: $499,997
New

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. Despite the remarkable progress made in studying the ecological effects of human activities, the interactions between human processes and ecosystem dynamics in urbanizing regions are still poorly understood, as empirical studies of the underlying processes and mechanisms linking urban systems and patterns to ecosystem function are extremely limited. Although individual projects have generated important insights, developing theories of urban resilience and formulating practical approaches to sustainability will require cross-site comparisons and trans-disciplinary synthesis.
Currently, there are several barriers to advance our understanding of urban ecosystems, development of theories of urban resilience, and implementation of policy-relevant insights. Disciplinary isolation largely persists, despite the exemplary success of several interdisciplinary programs. Place-based research, while important and well-developed in many cities, has dominated the focus of many research programs, and the gap between academia and practice continues to limit effective translation of new scientific understanding in practice. To address the current and future challenges in urban resilience and sustainability, we need to transform research settings, educational training, and communication.
URBANET will both create an environment that fosters communication and collaboration among current members of the urban resilience science communities, and challenge current approaches to research design, educational training, and the division of research and practice.
URBANET will foster this transformation by creating and facilitating interaction and collaboration among members of the scientific communities and practice. Specifically we will:
- Produce a new level of synthesis and understanding of resilience of coupled human-natural systems in urbanizing regions;
- Develop new approaches for transdisciplinary research, education, and practice in the resilience science of urbanizing regions;
- Provide a neutral arena for interaction, communication, and learning among a diversity of scientific communities
- Develop new models of interactions between science and practice that focus on effective problem-solving.

Application Number: A71709
Faculty Member: John Marzluff
Role: Co-Investigator
Title: **Ecological Resilience in Urbanizing Regions: Emerging Hypotheses Linking Development Patterns to Ecosystem Function**
Agency: National Science Foundation

Period: 8/1/2012 - 7/31/2014
Amount: $1,492,838
New

During the last three decades we have learned a great deal about the interactions between urban activities and ecosystems. However, empirical studies of the underlying processes and mechanisms linking urbanization patterns and ecosystem functions are still rare and extremely limited. There are very few data available to systematically evaluate how alternative patterns of urban development (e.g., centralized versus sprawling) interact with ecosystem processes across multiple scales in different biomes. Only with more mechanistic and comprehensive understanding of such interactions can we begin to evaluate the resilience of nested hierarchical natural-human systems. Empirical data, evidence of mechanisms linking urban patterns and ecosystem function, and evaluation of system resilience across spatial and temporal scales are critical to informing urban planning and public policy decisions. The overarching goal of this project is to study the mechanisms that link urban patterns to ecological resilience by focusing on ecosystem function in two metropolitan bioregions. We will explore how alternative development patterns produce different landscape signatures (spatial and temporal changes in ecosystem functions) and how these signatures may in turn influence patterns of urbanization. We propose to study two aspects of ecosystem function that couple urban patterns to ecological resilience: carbon dynamics and avian diversity. We will study these coupled processes in two metro regions: Seattle (moist temperate) and Phoenix (arid). We will focus on understanding how slow and fast variables affecting the key mechanisms governing carbon and avian diversity vary across alternative patterns of development along an urban-to-rural gradient. We will test hypotheses about complex interactions in coupled human-natural processes, assess tradeoffs between slow and fast variables with patterns of urbanization, and explore how these interactions may influence future environmental change. By applying scenario analysis, we will evaluate how alternative urban growth management and planning strategies might affect ecological resilience in the metropolitan regions. The Seattle and Phoenix areas present ideal case studies for examining causes and consequences of sprawl due to the regions' high population growth rates, contrasting biogeophysical constraints (e.g. water availability, climate, available land for urban expansion) and varied strategies for constraining development. Cross-regional comparisons are critical for understanding coupled human-natural systems, especially in urbanizing areas.

Application Number: A71678
Faculty Member: John Marzluff
Role: Co-Investigator
Title: **Where human enterprise affects occurrence, risk, and transmission of infectious disease**
Agency: National Science Foundation
Period: 7/1/2012 - 6/30/2016
Amount: $937,844
New

Over the last 20 years new infectious diseases have emerged and diseases once under control in both man and animals have resurged. The reasons for emergence and reemergence of these diseases are myriad, involving changes in human actions and often the actions of wild birds. Birds have been recognized as both potential reservoirs and for their ability to spread infectious diseases of public health importance. Documenting pathogenic bacteria in wild bird populations that interact with human-impacted environments compared with avian populations that do not, will yield vital information on

transmission and spread of pathogens within the avian and human communities. The specific aims are: 1) Survey urban, agricultural, and wildland environments to determine the occurrence, risk of exposure and transmission of selected infectious disease bacteria from human activity to wild birds by measuring the difference in the level of carriage of bacterial pathogens [Campylobacter, E. coli O157:H7, vancomycin resistant Enterococcus spp. (VRE), Salmonella, methicillin-resistant Staphylococcus aureus (MRSA)] in birds from human-impacted and non-impacted environments; 2) We will determine the population and community level responses of birds to the bacterial pathogens and will relate the relative occurrence of disease to the survivorship of individual birds, the relative abundance of species, and the composition of the avian community establish study sites along a gradient of disease occurrence, after the first year of the study; 3) Compare the dynamics of bacterial disease transmission from humans to birds in urban versus agricultural environments; 4) Develop education modules which can be downloaded, printed flyers, and websites which will inform the public of the potential risks for transmission of these diseases in specific environments and at a non-scientific level of understanding.

Application Number: A71936
Faculty Member: John Perez-Garcia
Role: Principal Investigator
Title: **Feedstock Feasibility and Market Assessment**
Agency: Pending - OSP to be notified
Period: 7/1/2012 - 6/30/2014
Amount: $149,401
New

The bio-chemical catalyst (BCC) approach that harvests biogas from hog fuel while maintaining its heat value is a promising improvement in efficiency. The successful establishment and maintenance of regional bioenergy supply systems that utilize hog fuel will require a broad understanding of potential benefits and impacts. Sustainable production systems are part of the new forestry paradigm in the Pacific Northwest, and an understanding of the effect of new market uses for hog fuel and potentially forest biomass is central to developing a forest-based resource for the developing bioenergy market. The University of Washington, School of Forest Resources would like to contribute to this understanding by studying the feedstock logistics and market dynamics of hog fuel in the area surrounding Simpson's Shelton plant.

Application Number: A71667
Faculty Member: Sarah Reichard
Role: Principal Investigator
Title: **Habitat Characterization of Copablepharon fuscum**
Agency: USDI Fish and Wildlife Service
Period: 4/1/2012 - 3/31/2013
Amount: $
New

The sand verbena moth (Copablepharon fuscum) (SVM) is known from only nine sites: four in Canada and five in the northern Puget Sound in Washington State. Yellow sand verbena (Abronia latifolia) (YSV) is the only known larval food plant for SVM. The plant is not uncommon in Washington, but its

distribution is patchy. In 2011, Washington Rare Plant Care and Conservation (Rare Care) surveyed a number of known and potential sites for yellow sand verbena, focusing primarily on the outer coast and the Strait of Juan de Fuca. Surveys for the moth were done at Deception Pass State Park, where SVM was found, and on the Long Beach Peninsula, where no SVM were found. Under the current effort, Rare Care and the Washington Natural Heritage Program will survey remaining sites along the Strait of Juan de Fuca and Puget Sound for yellow sand verbena, sample sites for the sand verbena moth, and characterize the habitat of known sand verbena moth sites. Yellow sand verbena surveys will be conducted primarily by Rare Care volunteers. Volunteers will be asked to locate patches of yellow sand verbena using maps and GPS units and provide information on the size of the patches and the plant phenology. Information will be collected on the potential for SVM at each site. Sites that look appropriate for SVM will then be surveyed for the moth. Where the moth is found, data will be collected to characterize the site, vegetation, and potential threats.

Application Number: A71784
Faculty Member: Daniel Vogt
Role: Co-Investigator
Title: **Work Plan for the University of Washington in Managing and Facilitating A Scientific Review Process for CMER by the Independent Scientific Peer Review Program**
Agency: WA Department of Natural Resources
Period: 7/1/2011 - 6/30/2012
Amount: $26,660
New

The Forest Practices Adaptive Management Program's Cooperative Monitoring, Evaluation and Research Committee (CMER) needs to have an independent review process for evaluating research designs and research and monitoring reports that may be used in support of future forest practices rule changes or the creation of new rules. This agreement is for the continuation of an Independent Scientific Peer Review program that will manage and facilitate scientific review for CMER.

Application Number: A71738
Faculty Member: Daniel Vogt
Role: Principal Investigator
Title: **Improving Urban Stream Health through Better Understanding of Urban Development Patterns and Their Effects on Streams**
Agency: Environmental Protection Agency (EPA)
Period: 9/1/2012 - 8/31/2014
Amount: $84,000
New

In the past few years the world's population has gone from majority rural to majority urban (United Nations 2009). The UN predicts this trend to continue, with 69% of people living in urban areas by 2050. Within the United States, 82% of the population already lives in urbanized/suburbanized areas. Understanding the impacts of urban development on ecosystem functions is more important than ever. I am interested in looking specifically at stream ecosystems as these may be good indicators for the environmental health of their watersheds. The effects of increasing urbanization on stream health are

well-documented and negative (Paul and Meyer 2001, Walsh et al. 2005), but less is known about how different patterns of urban development are related to stream health. Possibly some patterns of development impact streams less than others. I propose to use Geographic Information Systems (GIS) to measure patterns of urbanization in watersheds in the Puget Sound region and then to compare these to indicators of stream health, in particular the benthic index of biologic integrity. The results of this research will inform decisions about how to allow future development so that it has less impact on local ecosystems.

Proposals (December, 2011)

Application Number: A72558
Faculty Member: Susan Bolton
Role: Co-Investigator
Title: **SQWater: Atmospheric Water Resources in Lima, Peru**
Agency: Environmental Protection Agency (EPA)
Period: 8/15/2012 - 4/30/2013
Amount: $14,423
New

Objective: More than 1 billion people, close to 20% of the world's population, live in urban squatter communities (slums). By the year 2050, this number will approach 3 billion. In Lima, Peru more than a third of the city's 9 million occupants live in slums, many without reliable access to clean water, adequate nutrition and public green space. Within as little as a decade, the city's primary water supply, Andean glaciers below 5500 meters, will melt as a result of climate change and the city's already inadequate water networks will become increasingly dysfunctional. Although Lima receives only 10mm of rain, it is shrouded in a blanket of moist fog from June until December. Our project, SQWater focuses on the design, development and evaluation of fog water harvesting technologies that provide water at point of use (POU), help Lima's slum communities adapt to increasing water scarcity, preserve the integrity the city's remaining water resources and reduce air and water pollution related to water production, distribution and use.

Description: The project will be based both in Lomas de Zapallal (LdZ), a slum in Northern Lima and the University of Washington (UW). It will leverage existing UW service learning courses and build upon a long standing relationship between the UW, the Universidad Nacional Mayor de San Marcos (UNMSM) and the community of LdZ. Following an initial period of research and participatory design in LdZ, students will return to the UW to design, build, test and refine prototypes for a fog harvesting system optimized for Lima's winter climate. They will explore fog collector materials and forms and pioneer acoustic fog precipitation as a means of increasing fog collection yields. They will then integrate their fog harvesting system into the design of public green spaces and vegetable gardens that provide LdZ residents with a place to relax and play, augment habitat for local species, help clean Lima's pollution laden air, serve as source of nutrition and generate income. As part of their designs, students will detail how fog water collected can be utilized on site for household gardens and they will examine water quality to assess feasibility of POU consumption. . Following the completion of prototypes and design development, students will conduct quantitative and qualitative evaluations of their system's water collection capacity, costs and ease of use and assess its limitations and advantages relative to existing fog collection technologies. They will also compile a manual and companion website with detailed graphic and written documentation of their system that will empower community members as experts

on its design, construction, installation, use and maintenance. This manual/website will supplement on-site training workshops and serve as a blueprint for the implementation of an on-site fog harvesting system and public green spaces during Phase 2 of the project (if funded).

Application Number: A72294
Faculty Member: Renata Bura
Role: Principal Investigator
Title: **The effects of preprocessing of switchgrass, corn stover and sugarcane bagasse on the overall butanol yield**
Agency: USDA
Period: 9/15/2012 - 9/15/2014
Amount: $149,961
New

The long-term goal of this project is to integrate our understanding of feedstock logistics with biomass requirements for biofuels and biochemicals production via biological conversion to develop a commercially feasible process that will enable sustainable feedstock assembly and processing. The specific objectives of this project are (1) to assess the effects of substrate particle size diminution on hydrolysability and fermentability of switchgrass, corn stover and sugarcane bagasse (2) to determine whether increasing the moisture content of biomass by pre-steaming prior to pretreatment would have a positive effect on butanol yield. Objective 1 will be achieved by investigating the particle size of biomass that would result in the highest biomass to butanol conversion yield. Objective 2 will be achieved by developing pre-steaming technology which, by increasing the moisture content of biomass, would allow the maximum biobutanol yield to be obtained. Successful completion of this project will result in a definition of technology and optimized particle size and pre-steaming conditions for the production of butanol. The results from this study will: provide the guidelines for biomass preprocessing; fill in the gap between biomass supply and conversion; stimulate interdisciplinary research; and show the need for development of preprocessing equipment based on the biomass conversion. This research primarily addresses “Development and Sustainable Production of Regionally-appropriate Biomass Feedstocks–sustainable feedstock delivery and preprocessing”. The long term goal of this project addresses the AFRI program of “sustainable agriculture” by achieving the long term goals of “satisfying fiber needs and sustaining the economic viability of farm operations”.

Application Number: A72245
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **The Use Of Fungal And Diazotrophic Endophytes As A Means For Climate Change Mitigation And Adaptation In Agroeco**
Agency: USDA
Period: 6/16/2012 - 6/15/2016
Amount: $750,000
New

By utilizing beneficial microbial plant symbionts to increase water use efficiency, provide essential nutrients, and improve plant growth and stress tolerance, the overall goal of this project is to develop tangible options to mitigate climate change impacts on agriculture and forestry more quickly than could

be reached by relying solely on crop improvement approaches via breeding or transgenics. Using corn, rice, and Douglas-fir as model systems, we will 1) develop the most effective nitrogen-fixing endophytes for improved growth with minimal need for chemical fertilizers; 2) screen fungal endophytes to impart stress tolerance and increased water use efficiency; 3) assess the significance of endophytic symbiosis in mitigating the impacts of climate change; and 4) develop outreach programs and educational opportunities to insure that the knowledge gained in this research is widely disseminated. Through this study, we will develop optimized inoculum and methods for improved plant growth, stress tolerance, biomass, and yield of grain crops and timber forests with limited inputs of nutrients and water. Elevated CO2 stimulates crop growth most when N and water are not limiting. Thus, plants with symbiotic N fixation are most likely to capitalize on the benefits of increasing atmospheric CO2. We will evaluate the physiological benefits of the endophytic symbionts identified from Aim 1 and 2 under current and elevated CO2 conditions. Utilizing process-based crop physiology models and life cycle assessments, we will then evaluate agro-ecological and economic benefits of the use of endophytic symbionts. Outreach and dissemination of the research findings will also be a priority, through our teaching both at the university level and to K-12 groups and teachers, training graduate students and postdoctoral fellows, speaking frequently at international conferences, participation in key roles in the International Symbiosis Society, and engaging the agricultural community directly.

Application Number: A72234
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **Reduced Biofuels Processing Costs Through Use of Crop Endophytes**
Agency: Edenspace Systems Corporation
Period: 5/1/2012 - 4/30/2014
Amount: $150,000
Competing Renewal

In Phase 1 of this project, we successfully developed new protocols for transforming maize fungal endophytes with the Edenspace constructs. We confirmed that the inoculated plants did not suffer any apparent harm from the transgenic endophytes producing cell wall degrading enzymes. This phase 2 proposal will continue our collaboration with Edenspace by using our developed protocols for introducing Edenspace's 4-enzyme construct into the endophytes, adding fluorescent markers for tracking the colonization within the plants, and introducing the endophytes to a new host, sorghum. We will assess plant health and send Edenspace the effectively colonized plants for the digestibility assays. Through this continued study, we look forward to further establishing this proof-of-concept for the use of endophytes in aiding in more efficient biofuel production.

Application Number: A72055
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **Understanding Stakeholder Perceptions of Using Woody Biomass to Produce Biofuel**
Agency: USDA
Period: 7/1/2012 - 6/30/2013
Amount: $49,993
New

Using woody biomass to produce biofuel, while widely viewed by many scientists and environmental groups as being a win-win proposition for both the environment and forest health, nonetheless has its critics. Given the wide array of disparate stakeholders in the Pacific Northwest region, the varying perceptions about the benefits of using woody biomass for biofuels, and the critical importance of engaging stakeholders early in the process, we propose to conduct two Forums on producing biofuel from woody biomass derived from forest thinnings, forest residuals and urban waste streams. The goals of the Forums will be to: 1) engage the key stakeholders in a constructive dialogue regarding the general environmental impacts associated with the production of biofuel from woody biomass, 2) assess the perceptions of each stakeholder group regarding the environmental impacts associated with producing biofuel from woody biomass, 3) identify what sources of information have influenced their perceptions, 4) identify those issues which are perceived as having the greatest positive and negative impacts on support for using woody biomass to produce biofuel, 5) develop a methodology for evaluating the relationship between perceptions, information sources and attitudes towards using woody biomass for biofuel, 6) assess differences in perception, attitudes and concerns of using woody biomass for biofuel between stakeholders located on the eastside and the westside of the Cascades and 7) work to develop consensus on a program designed to gain the greatest level of support by all stakeholders for producing biofuel from woody biomass. The successful development of a competitive bio-based fuels and chemical industry requires a multifaceted social science approach designed to understand and address the environmental and economic perceptions of key stakeholders. From this understanding, effective communication strategies will be developed, to ensure market acceptance and support the successful production of biofuel derived from woody biomass. The proposed Forums will develop a better understanding of the factors that affect key stakeholder, perceptions, attitudes and concerns about the economic and other social benefits from biofuel derived from woody biomass, and help us to differentiate perceived customer value and better understand how to inform public choices.

Application Number: A72828
Faculty Member: Gregory Ettl
Role: Principal Investigator
Faculty Member: Elaine Oneil
Role: Co-Investigator
Title: **Western Conifer Climate Change Consortium**
Agency: Oregon State University (OSU)
Period: 6/1/2012 - 5/31/2017
Amount: $1,525,634
New

The proposed research is a broad, integrated project involving multiple organizations including 4 Co-PIs from the University of Washington. The long-term goal is to synthesize existing knowledge and develop new knowledge on the impacts of climate change on western forest production systems, and then design, convey, and implement management strategies that maximize forest health, forest productivity, and greenhouse gas mitigation under changing climates.

Application Number: A72102
Faculty Member: Joshua Lawler
Role: Principal Investigator
Faculty Member: Theresa Nogeire
Role: Co-Investigator
Title: **Prioritizing land acquisition for the San Joaquin kit fox: Efficient planning in the face of land-use and climate change**
Agency: Bureau of Reclamation

Period: 9/1/2012 - 9/1/2014
Amount: $217,126
New

The San Joaquin kit fox (SJKF) is an endangered species that suffers primarily from loss of habitat, but also from intraguild predation and competition. Prioritizing lands for conservation of kit foxes is critical to ensure optimal use of limited conservation funds, but this prioritization is confounded by climate change, land-use change, and the differential effects that both have on the kit fox versus its competitors. The biggest threat to the SJKF is loss of habitat, but different methods for preserving habitat could produce vastly different results. We propose to evaluate the relative efficacy of different land preservation strategies for kit fox preservation: 1) add habitat to existing reserves for core populations; 2) create additional reserves for unprotected populations, or 3) enhance connectivity between populations.
We will use a spatially explicit, individual-based population model to examine the relative effectiveness of these three different conservation strategies. We will examine the relative effectiveness under both current conditions and future projected land-use and climate change scenarios. The model is currently being parameterized for a related project based on the published literature: the result of extensive field work conducted to understand kit fox vital rates, movement patterns, and resource use over the past decades. This work will build from an existing project, and will synthesize the efforts of many researchers to help understand which lands are the highest priority to conserve for the persistence of the kit fox. In addition to new information on prioritization, we will produce a powerful modeling tool which we will share with stakeholders so that they can continue to use it to answer questions critical to kit fox conservation.

Application Number: A72507
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: 7/1/2011 - 6/30/2012
Amount: $149,425
Non-Competing Revision

Thirty middle and high school teachers from the following cluster of Lewis County school districts, together with their principals, will be assembled to form sustainable mathematics learning communities: Adna, Centralia, Chehalis, Morton, Mossyrock, Napavine, Toledo, White Pass, and Winlock plus two high-need districts, Onalaska (partner) and Boistfort. This project will address seven objectives:
1) Increase participant mathematics content knowledge
2) Increase participant instructional skill, including ability to use State standards
3) Foster the sustainability of professional development by forming professional learning communities, including administrators
4) Involve parents and the community to gain support for more effective methods of learning mathematics
5) Improve student achievement, morale, performance, and college readiness for all students
6) Provide teachers and administrators with useful methods for monitoring and evaluating student performance

7) Extend and deepen the capacity of the University of Washington to effectively prepare teachers of mathematics.
These objectives will be accomplished by three summer institutes, coupled with classroom studios, observations, and coaching to prepare teachers for adopting practices utilizing group-based learning focused on inquiry-based problem solving. Activities are designed to prepare students for meeting Revised Mathematics Standards and improving college readiness, particularly for students in isolated rural communities where the learning of advanced mathematics is not highly valued. Workshops for principals will be held to familiarize them with new classroom practices and elicit their support of teachers who adopt these practices. Community Math Nights will be held to coach parents interested in supporting their children in learning mathematics.

Application Number: A72381
Faculty Member: John Marzluff
Role: Principal Investigator
Faculty Member: John Perez-Garcia
Role: Co-Investigator
Faculty Member: Stephen West
Role: Co-Investigator
Title: **Wildlife Responses to Varying Levels of Slash for Bioenergy**
Agency: USDA
Period: 7/1/2012 - 6/30/2016
Amount: $499,891
New

The successful establishment and maintenance of regional bioenergy supply systems that utilize slash from forest operations will require a broad base of understanding of potential benefits and impacts. Down wood retention for wildlife habitat is part of the new forestry paradigm in the Pacific Northwest, and an understanding of the effect varying levels of slash left for wildlife is central to developing best management practices. Slash retained on site is a function of the amount produced from forest operations and the market conditions for bioenergy. As this market develops and companies invest in facilities and technology that utilize forest slash, demand for the forest biomass will rise. Reliable supply, necessary for a sustainable bioenergy market, will occur only if management practices are developed that retain slash levels necessary to sustain wildlife and other forest ecosystem functions. These practices require a determination of the slash levels required to sustain wildlife. We aim to measure wildlife responses and their economic impact to altering levels of forest-based biomass that has the potential to be used in producing bioenergy. Our primary research question is how a broad community of wildlife (birds, small mammals, forest carnivores, reptiles and amphibians) respond to a range of economically realistic downed-wood management strategies, especially removal and retention of logging slash. More specifically: (1) What proportion of various types of forests would be affected by economically viable harvest of downed material? (2) Which species may be at risk of disturbance from economically viable harvest of downed material? (3) How much of an effect does economically viable removal of downed woody material have on susceptible species? (4) How do vertebrates of the Pacific Northwest respond to removal of slash? (5) What is the economic impact of varying the levels of biomass retained for maintaining wildlife habitat?

Application Number: A71693
Faculty Member: Luke Rogers
Role: Principal Investigator

Title: **2012 Washington State Parcel Database**
Agency: WA Department of Health
Period: 1/1/2012 - 3/31/2013
Amount: $100,000
New

The Washington State Department of Health (DOH) needs a spatially explicit database of land ownership in the state of Washington to use in drinking water protection efforts. The database assists DOH in the identification of potential sources of contamination near drinking water sources. Three previous efforts have led to the creation of integrated Washington State Parcel Databases in 2007, 2009, and 2010. This contract will contribute funds towards the development of a 2012 Washington State Parcel Database.

Application Number: A68318
Faculty Member: Christian Torgersen
Role: Principal Investigator
Title: **Imprinting salmon to targeted spawning waters**
Agency: Grant County Public Utility District
Period: 1/1/2012 - 7/31/2012
Amount: $24,996
New

The need to rear salmon at large centralized hatcheries and then release them offsite to supplement specific populations or fisheries is a practical reality of artificial production in the Pacific Northwest. However, this practice can dramatically increase stray rates. Homing is governed by the olfactory discrimination of home-stream water and exposure to the home stream during appropriate juvenile stages is critical for olfactory learning (imprinting) and successful completion of the adult homing migration. Smolt acclimation and imprinting facilities have been developed or proposed as part of most hatchery supplementation programs in the Pacific Northwest and hundreds of millions of dollars have been spent or proposed for construction, operation and maintenance of these facilities. However, several recent studies of the efficacy of these facilities have indicated that physical and logistical constraints on where these facilities must be sited relative to appropriate spawning habitat (typically downstream of target sites) can result in a large percentage of fish spawning in non-target or inappropriate locations. In this proposal, we plan to develop and test a novel, cost-effective, approach for achieving successful imprinting and homing fidelity to target spawning locations without moving fish from their central rearing hatchery prior to release. We hypothesize that if salmon are exposed as embryos to water derived from a targeted location upstream of their release site, they will ultimately migrate past the release site to the target areas to spawn. We believe that if successful, this approach could be used to facilitate re-establishment of sustainable natural populations of upper Columbia River spring and summer Chinook, steelhead, coho and sockeye salmon spawning without the need for expensive and logistically challenging acclimation facilities. For the first phase of this project, we will assess different strategies for collecting, storing and concentrating imprinting waters to retain chemical properties that are critical for olfactory discrimination.

Application Number: A72689
Faculty Member: Miranda Wecker
Role: Principal Investigator

Title: **Data Entry and Committee Facilitation Support**
Agency: Clallam County
Period: 1/1/2012 - 6/30/2012
Amount: $8,435
Non-Competing Supplement

The North Pacific Coast Lead Entity (NPCLE) requires technical assistance for entering new and historical project information into the Habitat Work Schedule (HWS) program it utilizes as a monitoring and public access portal for its contracted activities with the Salmon Recovery Funding Board. The North Pacific Coast Marine Resources Committee (NPC MRC) requires public meeting facilitation support for researching and preparing meeting materials and documenting and preparing meeting records. Olympic Natural Resources Center (ONRC) will provide NPCLE with professional services necessary to compile historical watershed and salmon restoration project records undertaken in WRIA 20 and to enter this information into the HWS on-line data portal. They will also provide meeting facilitation support in the form of researching and compiling meeting documents and assisting in documentation of meeting proceedings for the North Pacific Coast Marine Resources Committee.

Application Number: A72809
Faculty Member: Aaron Wirsing
Role: Co-Investigator
Title: **Preliminary Proposal: Effects of Wolf Recolonization on Mesopredator Interaction**
Agency: National Science Foundation
Period: 5/1/2013 - 4/30/2018
Amount: $3
Pre-Application

We will compare impacts of wolf recovery in Washington on the interactions among the mesopredators: coyote, bobcat and lynx. We will measure abundance, physiological health, resource selection and diet of these carnivores using scat samples collected by detection dogs in summer and winter in two areas where wolves have returned and two areas where wolves are still absent. All areas are in Okanogan Country, WA.