School of Environmental and Forest Sciences

UNIVERSITY of WASHINGTON

College of the Environment

Research Newsletter

Volume IV, Issue 2
December, 2012

NEWS

Sharing expenses between budgets: A hallmark of good research management is making sure that costs are properly attributed to the correct project or projects and funds are spent in the manner intended. Unfortunately, it is not always possible to predict accurately and a researcher may come to the end of the project period with either an overage or a shortfall. Neither is good, because no one wants to leave money unspent and the University requires that deficits be resolved. The usual approach is to transfer expenditures to achieve as close to a zero balance as possible. However, when there are transfers on a research budget, they are always looked at with a critical eye, and the longer it has been since the expense was generated (or the closer to the end of the budget period), the more apt they are to be singled out by an auditor. As you are no doubt aware, adverse audit findings can not only lead to restrictions on a researcher's capacity to receive awards, but can also impact the entire university's standing.

Unfortunately, the only one who has a sufficiently intimate understanding of the work to be able to identify when an expense should be shared or transferred between projects is generally the PI. The best situation is to know prior to placing an order that the item or service will benefit more than one project. This can make processing the paperwork slightly more complicated, but much less so than doing it after the fact! Please think about the possibility of sharing the expense (calibrating or purchasing lab equipment, for example, or purchasing bulk supplies that are used on more than one project) and let us know right away. Any time you discover that something purchased for one project is also being used on another, the transfer should be done as soon as you realize it to avoid the extra scrutiny that comes at the end of a budget.

Recent changes in SAGE were introduced by OSP in the "Ready to Submit" (RTS) requirements for proposals. GIM 19 specifies when proposals are to be submitted to OSP (7 business days prior to the deadline, with final documents and science 3 business days before the deadline; for more detail, see http://www.washington.edu/research/osp/gim/gim19.html). Now, it will no longer be possible to painlessly adjust little details or upload a new support letter during the last 3 days prior to the deadline. We must mark yes on "Ready to Submit" before OSP will do the pre-submission review and once RTS is marked yes, we will not be able to withdraw it; instead, OSP will have to return it to us. If we request that it be returned anytime within the 3-day deadline window, it will be counted as being submitted late, and a request for a waiver of the GIM 19 3-day deadline will have to be submitted.

Remember: your eGC1 should be routed with final business and administrative sections for institutional review and approval by seven days prior to the sponsor deadline; a draft of the science is allowed. (The Significant Financial Interest disclosure is a required business document and until the disclosure has been done, the proposal can't be marked as RTS.) It must be updated with the final science and marked "RTS" no less than 3 days before the submission deadline.

October Awards

Application Number: A76741
Faculty Member: Stanley Asah
Role: Principal Investigator
Title: **Communicating and Reaching out About Forest Fires and Smoke: A Social Marketing Approach to Attitude Change**
Agency: USDA Forest Service
Period: 5/17/2012 - 12/31/2014
Amount: $40,000
New

This proposal will expand our understanding of public perceptions of the tradeoffs between fuel treatments, smoke, and wildfire risk in diverse community settings. Dr. Stanley Asah of the University of Washington is currently conducting focus groups with managers, Yakima Tribal members, and public stakeholders in communities around the Okanogan-Wenatchee NF. The results will be used to identify how different segments of the public view prescribed fire, wildfire, and smoke, and to develop targeted messages, workshops, and other outreach methods to help improve fire managers' consideration of public perceptions and attitudes. But the social and political acceptability of fire is context dependent (Wigand 2012). This focus area project will replicate the study on the Mt. Hood NF to allow us to identify and compare a broader array of manager and stakeholder perceptions and outreach needs. We propose the Mt. Hood because it is an urban forest that conducts fuel treatments in both wet and dry forest types. This will enable comparisons between urban and rural perceptions of fire and smoke, and expand our design and execution of attitude and behavior change strategies. Comparing results from the Mt. Hood with the Okanagan-Wenatchee presents a unique opportunity to a compare a diverse mosaic of different types of urban, suburban, agricultural, and amenity-based communities. The Mt. Hood also abuts the Warm Springs Indian Reservation, which will enable comparisons with Forest Service managers, and also with Yakima tribal natural resource managers who were interviewed for the Okanogan-Wenatchee focus groups.

This will be the first study of this type ever conducted. It meets several fire focus area goals. Results will provide an in-depth understanding of key social and ecological contexts of fire settings found in the

Pacific Northwest, and addresses the need for an “all lands” approach to fire management in complex social-ecological systems. Training and outreach materials will help managers increase collaboration and trust with landowners and communities, and help deliver fire knowledge and tools.

Application Number: A71998
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **Enhanced Endophyte: Poplar System for Remediation of Organic Contaminants (Phase 2)**
Agency: Edenspace Systems Corporation
Period: 7/1/2012 - 6/30/2014
Amount: $299,906
Competing Renewal

This Phase II SBIR proposal seeks to continue development of poplars, well-known to remove and metabolize accumulated TCE, that are enhanced with bacterial endophytes within the the poplar that degrade TCE as well as PAHs, two important environmental pollutants.

Application Number: A74086
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **The Potential of Legal Timber Trade Policies to Expand International Demand for US Wood Products**
Agency: USDA
Period: 9/1/2012 - 8/31/2014
Amount: $98,036
New

Washington is the largest exporter of forest products in the US with a 28% share of US exports. Wood exports provide particular economic benefits to rural, timber-dependent and Native American communities. The recent adoption of timber legality legislation in Japan, the US and the EU (in 2013) requiring that all timber imports be sourced from legally harvested wood provides an opportunity to expand exports of sustainably managed US wood products to China, Thailand and Vietnam. Unfortunately, industry awareness of these regulatory changes and their potential impact on the competitiveness of US forest products is low, particularly among small and medium-sized manufacturers (SME’s) and exporters who often lack the managerial resources and expertise to track and analyze changing market conditions. The Center for International Trade in Forest Products proposes to implement a program of market research and extension activities designed to assist SME’s and native American enterprises understand and adapt to these changing market conditions and identify export opportunities in new and emerging market segments in China, Thailand and Vietnam. Specifically we propose to: 1) analyze timber legality policies and their impact on the competitiveness of US forest products to assist policymakers and industry managers understand and respond to these policies and 2) conduct market research to identify new and emerging markets for US wood products in China, Thailand and Vietnam. This project addresses the main program scope described in the USDA MIS RFP: “applied research that addresses barriers, challenges and opportunities in marketing US agricultural products domestically and internationally”.

Application Number: A78223
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Bureau of Land Management - Stand Mgt Coop**
Agency: USDI Bureau of Land Management
Period: 3/21/2011 - 3/20/2016
Amount: $80,000
Supplement and Extension

This proposal is for year 2 of 5 of the Bureau of Land Management's membership in the UW Stand Management Cooperative. Per Bureau policy, this will be a five year agreement, 2011-2016.

Application Number: A79460
Faculty Member: Soo-Hyung Kim
Role: Principal Investigator
Title: **Modeling Particle Film Effect on Photosynthesis**
Agency: USDA
Period: 8/1/2012 - 9/30/2013
Amount: $10,000
New

Research has demonstrated that the white, reflective particle film used to repel a wide range of insects also reduces plant temperature and heat stress, while reflecting UV radiation and altering the phytochrome-sensitive wavelengths of visible light. Field studies have documented that the reduction of plant temperature results in increased photosynthesis and often, water use efficiency, and the reduction of UV radiation has reduced oxidative stress. Research will identify critical plant growth stages and mechanisms by which the particle film increases photosynthesis, water use efficiency and improved food quality.

This fundamental knowledge will be incorporated with particle film application for insect control in order to effectively time and apply the particle film materials in a commercial setting. The results will enhance the multi-functionality of particle film technology for use in a broad range of crops.

Application Number: A77735
Faculty Member: Fernando Resende
Role: Principal Investigator
Faculty Member: Richard Gustafson
Role: Co-Investigator
Title: **Conversion of Beetle-killed Lodgepole pine into Bio-oil via ablative Pyrolysis**
Agency: USDA
Period: 1/1/2013 - 12/31/2014
Amount: $228,109
New

Bark beetles are important components of western forest ecosystems and some level of tree mortality caused by them is normal and desired for proper ecosystem function. High levels of tree mortality, however, have negatively impacted communities and altered wildfire severity and intensity. Fallen trees lead to a heavy surface load on the ground, generating a fire hazard. In case of fire, heat intensity and duration of fire increase on the forest ground. This in turn impacts the soil and the forest’s ability to

produce other services to society. As dead trees decay and fall to the ground, they also pose an additional risk to public and private property.
The use of beetle-killed trees to produce liquid fuels can mitigate these problems and simultaneously add value to the dead trees. Fast pyrolysis converts solid lignocellulosic biomass into a liquid fuel called bio-oil. Bio-oil can be used in applications like heating, power, and production of chemicals. In the presence of catalysts or with proper upgrade, the bio-oil produced from fast pyrolysis could also be used as a transportation fuel.
In this work, we propose the use of a mobile fast pyrolysis unit to carry out the conversion of beetle killed lodgepole pine into a stable bio-oil. A mobile unit would reduce the costs and difficulties associated with harvesting and transportation of dead trees for other applications. Out of the several types of pyrolysis reactors available, an ablative reactor would be effective to carry out the conversion at small scales, because it does not require grinding of the biomass to very small sizes like most fast pyrolysis systems do. A lab-scale ablative pyrolysis reactor will be designed and constructed to carry out the conversion of the killed lodgepole pine into bio-oil. Zeolite catalysts will be used to generate a stable bio-oil.

Application Number: A74895
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Forks GIS Mapping Services 2012**
Agency: City of Forks
Period: 3/1/2012 - 12/31/2012
Amount: $20,000
New

The Olympic Natural Resource Center will provide geographic information system (GIS) support and technical services that address the following priorities defined by the City of Forks:
1. City addressing: finalize the City's addressing overlay utilizing information provided inclusive of water meter databases.
2. Development of data dictionary associated with utilities that will become the basis for future utility overlays.
3. Map requests as needed.

Application Number: A78070
Faculty Member: Stephen West
Role: Principal Investigator
Title: **Eastern Gray Squirrel Ecology and Interactions with Western Gray Squirrels on Joint Base Lewis-McChord**
Agency: WA Department of Fish and Wildlife
Period: 7/1/2011 - 6/25/2012
Amount: $900
Non-Competing Supplement

Introduced eastern gray squirrels are implicated as a cause for the decline of State-threatened western gray squirrels, but little is known about competitive interactions between these species. In conjunction with WDFW's Western Gray Squirrel Augmentation Project on Joint Base Lewis-McChord, we have equipped eastern and western gray squirrels with radio-collars and conducted experimental removals of

eastern gray squirrels to investigate resource use and interactions between these species. Results of this study will aid management and recovery of western gray squirrels. We seek funding for the final six months of this multi-year study.

October Proposals

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: $24,995
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: A79843
Faculty Member: Thomas DeLuca
Role: Principal Investigator
Title: **2013 McIntire Stennis**
Agency: USDA
Period: 10/1/2012 - 9/30/2013
Amount: $550,000
New

The McIntire-Stennis act of 1962 provides the basis for federal funding in forestry research and graduate education programs at state-certified schools of forestry in the United States. The School of Forest Resources, University of Washington, is eligible for McIntire-Stennis funding. This is a long-standing program, formerly administered by the Cooperative State Research, Education and Extension Service (CSREES); effective 10/1/2009, the program has been administered through the National Institute of

Food and Agriculture (NIFA). Funds are used to conduct research in areas such as: (1) ecological restoration, (2) catastrophe management, (3) valuing and trading ecological services, (4) energy conservation, biomass and bio-based materials development; and (5) ways of fostering healthy forests and a globally competitive forest resources sector. At the University of Washington research will focus on: Forest management, coarse woody debris, and soil processes, wildlife use of managed forests, modeling branch dynamics in coastal Douglas-fir and western hemlock plantations as affected by silvicultural treatments, understanding the systematics of commercial ornamental plants, and natural stand development in western coniferous forests. A proportion of the funds will be used for program administration.

Application Number: A80468
Faculty Member: John Marzluff
Role: Co-Investigator
Title: **CNH-RCN: Urban Resilience Science Network (URBANET): An International Transdisciplinary Network of Research on Resilience and Adaptation in Urbanizing Regions**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2018
Amount: $496,094
New

Human's influence on Earth has reached a scale comparable to that of nature. The exponential growth of human activities is placing increasing pressure on critical biophysical systems and producing changes that can trigger regime shifts in ecosystems --- potentially abrupt and irreversible changes in structure and functions---with significant consequences for human well-being (Crutzen 2002, Steffen et al. 2007). Urbanizing regions are major determinants of global and continental scale changes in ecosystem functions through direct and subtle transformation of biophysical and ecological processes (Vitousek et al. 1997, Alberti 2008). Although urbanized areas account only for a relatively limited percentage of the total earth surface, they import ecological services from distant regions and appropriate a far larger share of Earth's carrying capacity (Rees, 1996). It is their high concentration of people that make cities the place where most of the human population faces the greatest challenges for the consequences of irreversible change. Thus it is in cities where action is urgent and opportunities for effective solutions can emerge.
We propose to create a transdisciplinary network to advance scientific understanding of regime shifts, resilience and adaptation in urban ecosystems.URBANET will inspire, generate, and facilitate new modes of interaction and collaboration among diverse members of the scientific communities and practice to achieve four objectives:

- Develop and test frameworks and a shared language to integrate multiple domains of knowledge on regime shifts and resilience in urban ecosystems.
- Produce a new level of synthesis of existing knowledge and identify research priorities to advance understanding of resilience in urban ecosystems
- Identify potential trade-offs of alternative adaptation strategies and practices to support resilience in urbanizing regions
- Define new models of interaction between science and practice and guidelines to translate this knowledge into problem-solving

URBANET will both create an environment that fosters intellectual exchange, communication, and collaboration among diverse members of the urban resilience science communities, and challenge the way research is done and translated in practice. URBANET will facilitate this transformation by providing a neutral arena for collaboration, communication, and learning among a diversity of scientific

communities and knowledge domains and experimenting with modes of co-production of knowledge, and new productive exchanges between the science and practice that focus on effective problem-solving.

Application Number: A79842
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Pacific County Coastal MSP Priorities**
Agency: WA Department of Natural Resources
Period: 11/1/2012 - 6/30/2013
Amount: $75,600
New

The objective of this project is to utilize existing datasets on coastal resources to generate GIS themes defined by the Pacific County MRC as important to coastal marine spatial planning. The datasets identified as crucial include: those related to existing and potential shellfish growing areas; those related to other geographical areas deemed of "beneficial use" as defined by state law; those related to invasive species infestation sites; those related to shoreline mapping and shoreline management designations; and those related to seafloor mapping.

November Awards

Application Number: A78489
Faculty Member: Ernesto Alvarado
Role: Principal Investigator
Title: **Wildland Fuel and Fire Management in a Changing Climate**
Agency: USDA Forest Service
Period: 5/11/2009 - 3/31/2014
Amount: $78,591
Non-Competing Supplement

This Amendment of the Joint Venture Agreement will support the continuation of collaboration with the USFS Fire and Environmental Research Applications Team (FERA) mission to inform management of natural resources through research and development in fuels and combustion science, fire and landscape ecology, climate change, and integration of the physical and ecological sciences. This joint venture agreement supports the research conducted by the FERA Team at the USFS PNW Pacific Wildland Fire Sciences Laboratory in Seattle for the Interagency Joint Fire Sciences Program, the USFS National Fire Plan, and the USFS Region 6. The research will be conducted and applied to public lands under the administration of the USFS and other federal and state agencies. This specific amendment will extend the wildfire sciences research to the wildland urban interface in the southwest and southern United States. Specific objectives for this amendment to the joint venture agreement are:

- To initiate a project to implement in the field strategies to adapt to climate change and wildfires in National Forests of the Pacific Northwest in collaboration with local land and fire managers.
- To assist in data collection an analysis of field research conducted in wildland urban interface fires using the NIST WUI 1 and the NIST WUI 2 GIS-based data collection methodology to provide field validation of the WFDS Model.

- To continue conducting pre-and post fire data collections in fire vulnerable forest and communities in California, Texas, Colorado, and Arizona to improve the fuel bed information for the WFDS fire behavior model.

Application Number: A80983
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **Rose Braden Staff Assignment**
Agency: Evergreen Building Products Association
Period: 1/1/2011 - 12/31/2014
Amount: $151,299
Supplement and Extension

Staff assignment support for Rosemarie Braden for the period, January 1, 2013 to December 31, 2014.

Application Number: A75470
Faculty Member: Jerry Franklin
Role: Principal Investigator
Faculty Member: Van Kane
Role: Co-Investigator
Title: **Integrated, observation-based carbon ecosystems in integrated into NASA's System**
Agency: Boston University
Period: 7/1/2012 - 12/31/2013
Amount: $60,061
New

The project goal is to integrate methods and data products developed in an on-going carbon monitoring project into the on-going NASA Carbon Monitoring System (NASA ROSES 2011 A.45).

Through USDA-NIFA funded research, our team is developing a system to integrate Landsat satellite imagery, maps of environmental characteristics, Forest Inventory and Analysis (FIA) plot data, small-footprint lidar data, and aerial photos to characterize key carbon dynamics in forested ecosystems across all ownerships in the states of Washington, Oregon, and California from 1985 to 2010. Our system will provide explicit and transparent estimates of uncertainties in carbon stocks and changes.

Our objectives for the NASA Carbon Monitoring System are to: 1) bring our data, methods, and lessons-learned to NASA CMS Science Definition Team, and work closely with other SDT members to link our approaches into those analytical and modeling frameworks to further the overarching goals of the CMS. 2) Relevance at the national scale requires methods that are generalizable to other forest types and to ecosystems where different disturbance agents dominate. A key goal of this project will be to enhance our current methods and tools to provide accurate measurements of forest change, above ground carbon stocks, and error assessment to work with a wider range of forest types. We will use an East Coast site (currently planned to be the NASA Carbon System Maryland study site) to test and enhance our methods and tools as necessary to accurately measure current and past stocks of above ground carbon.

Application Number: A76335
Faculty Member: Jerry Franklin
Faculty Member: Ken Bible

Role: Principal Investigator
Title: **Wind River Field Station**
Agency: USDA Forest Service
Period: 10/1/2011 - 7/31/2016
Amount: $95,000
Non-Competing Supplement

Role: Co-Investigator

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: A79842
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Pacific County Coastal MSP Priorities**
Agency: WA Department of Natural Resources
Period: 11/1/2012 - 6/30/2013
Amount: $75,600
New

The objective of this project is to utilize existing datasets on coastal resources to generate GIS themes defined by the Pacific County MRC as important to coastal marine spatial planning. The datasets identified as crucial include: those related to existing and potential shellfish growing areas; those related to other geographical areas deemed of "beneficial use" as defined by state law; those related to invasive species infestation sites; those related to shoreline mapping and shoreline management designations; and those related to seafloor mapping.

November Proposals

Application Number: A80756
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: 6/16/2013 - 6/15/2015
Amount: $24,564
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: A79982
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Leveraging Land Condition Trend Analysis (LCTA) data to understand vegetation change on military installations**
Agency: US Department of Defense
Period: 9/16/2013 - 9/15/2014
Amount: $99,514
New

DoD training activities are threatened by habitat degradation, the risk of listing at-risk species, climate change, and other factors. The objective of this project is to leverage historical data by applying new analytical techniques to them to better understand how military activities have affected plant communities. This project will have nationwide implications as over 50 installations, spanning multiple Army divisions, have collected data from Land Condition Trend Analysis (LCTA) plots. The Yakima Training Center (YTC) will serve as a pilot installation, having collected LCTA data multiple times from 1989-2002 on 261 permanent plots. The primary products will be a refined model of vegetation change, maps highlighting areas of recovery or degradation, maps prioritizing areas at risk for future degradation or suitable for habitat restoration and enhancement, and identification of opportunities to further leverage historical data by integrating it with other data.

Application Number: A80663
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Faculty Member: Charles Halpern
Role: Co-Investigator
Title: **Monitoring effectiveness of forest restoration treatments: the importance of space and time**
Agency: USDI Bureau of Land Management
Period: 1/1/2014 - 12/31/2016
Amount: $399,469
New

Forests throughout much of the western interior United States are widely recognized to be at risk due to a history of fire exclusion. As a result, fuel reduction treatments (thinning and prescribed burning) are occurring throughout this area. These treatments are intended to restore ecosystem structure and function and to enhance resilience to disturbances (fire and insect outbreaks) in the face of climate change. The effectiveness of treatments in meeting these restoration objectives requires that appropriate metrics (or indicators) be identified and assessed at temporal and spatial scales relevant to

management. This project addresses the effects of fuel reduction treatments on overstory and understory vegetation. We have two primary objectives. First, we will assess the range of metrics used by managers and scientists to characterize the effects of fuels treatments on overstory and understory vegetation. Metrics will be identified through a review of the published and unpublished literature supplemented by interviews as needed. Metrics will be assessed in terms of their consistency and sensitivity both to treatments and to spatial scale of observation. We will identify those metrics that yield predictable responses and have broad usability, as these are of primary interest to land managers. Second, we will use long-term experimental data to assess the consistency of conclusions drawn from measurements made 2-3 years after fuels treatments (a factorial design of mechanical thinning and prescribed burning) with those made a decade later (12-13 years after treatments). Analyses will be based on a remeasurement of the overstory and understory vegetation at the Mission Creek Fire and Fire Surrogates site in the eastern Cascade Mountains of Washington, and will capitalize on an existing sampling design that enables hierarchical analyses at spatial scales from 1 m2 to 10 ha.

Application Number: A80978
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **Endophytes for Improved Rooting for Phytoremediation Applications**
Agency: Porter Group, LLC
Period: 11/29/2012 - 6/15/2013
Amount: $4,360
New

The goal of this small pilot project is to test if poplar and willow endophytes known to produce phytohormones can induce enough extra rooting to impact wastewater treatment results. Cuttings will be inoculated with the endophyte cultures and then compared to uninoculated controls in a greenhouse study. Potted plants will be fertilized in excess. Nitrates and phosphates in the effluent will be monitored and compared between the treatment groups. At the end of the study, root mass will be compared between the treatment groups. Another part of the study will determine if endophyte function can be optimized by selecting through a series of inoculations, harvests, and reinoculations.

Application Number: A80983
Faculty Member: Ivan Eastin
Role: Principal Investigator
Title: **Rose Braden Staff Assignment**
Agency: Evergreen Building Products Association
Period: 1/1/2011 - 12/31/2014
Amount: $151,299
Supplement and Extension

Staff assignment support for Rosemarie Braden for the period, January 1, 2013 to December 31, 2014.

Application Number: A81068
Faculty Member: Christian Grue
Role: Principal Investigator

Faculty Member: Sandor Toth
Role: Co-Investigator

Title: **Integer programming techniques (formulating and solving techniques) that will improve forest estate models used in forest land planning for Washington State Department of Natural Resources (DNR)-managed State Lands in the Olympic Experimental State Forest**
Agency: WA Department of Natural Resources
Period: 9/1/2012 - 9/30/2013
Amount: $25,000
New

DNR uses Linear Programming (LP) based forest planning models to optimally allocate silviculture activities and harvest treatments across its forested land base over time in an effort to meet DNR's policy goals and legal commitments in an effective and efficient manner.

DNR manages State Lands according to its 2006 Policy for Sustainable Forests and, specific state and federal laws, as well directives from the Board of Natural Resources. By harvesting timber, DNR provides revenue to the trust beneficiaries to meet its fiduciary obligations. Moreover, DNR is required to meet specific habitat commitments as outlined in its 1997 Habitat Conservation Plan.

While these revenue and conservation outcomes may be achieved at the coarser geographic level without using spatially explicit forest estate modeling techniques, use of integer programming will improve DNR's ability to achieve both revenue generation and habitat conservation objectives in an spatially optimum manner.

Forest modeling helps DNR balance the flows of competing multiple resource values across a forested landscape. DNR aims to achieve this balance by considering the timing and location of future harvest activities. Since DNR managed lands are highly varied in terms of topography, forest cover and soil productivity as well as complex mix of accessibility and operational feasibility, finding an spatially optimum solution through use of integer programming is a timely investment to streamline our harvest planning with operational realities.

Application Number: A80856
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **CNH: Economic development, land-use change, and conservation policy: Modeling local-scale feedbacks in a coupled natural human system**
Agency: University of Minnesota, Twin Cities
Period: 9/1/2013 - 8/31/2016
Amount: $226,471
New

The great acceleration in economic activity in the last half of the 20th century vastly improved standards of living for many people around the world. Human population more than doubled between 1950 and 2000 but the value of economic activity increased by over 400% (Delong 2003). The expansion of agriculture, timber, energy production, mining, and urban development, however, had the unintended consequence of greatly reducing natural habitat with the consequent large-scale decline of biodiversity (MA 2005). Globally, about half of habitable land is already devoted to agricultural crop production or grazing (Tilman et al. 2001). Increased demands for food, fiber, and fuel in the future will likely further intensify land use pressure. How to conserve biodiversity, while at the same time meeting human needs, is a "central environmental challenge of our time"(Levin 1999). Biodiversity conservation provides a

prime example of the critical need for effective policy. Policy initiatives to conserve biodiversity include both national laws (e.g., Endangered Species Act) and international treaties (The Convention on Biological Diversity). But effective conservation often requires local actions to promote the conservation of specific habitats. At local levels, individual landowners do not have much incentive to sacrifice their own economic returns to provide habitat for species; the landowner shoulders the entire burden of the sacrifice but gets only a small fraction of the public good that conservation provides. However, if all landowners act in their own self-interest, biodiversity will decline and society as a whole will be worse off, leading to the infamous "the tragedy of the commons" (Gordon 1954, Hardin 1968). Here, we will explore the complexities of the intended and unintended consequences of conservation actions in the coupled human-natural landscapes of the Willamette Basin in western Oregon and in a five county region in Wisconsin. The Willamette Basin is a broad valley stretching from the Columbia River and the city of Portland to the North to the city of Eugene in the south. The Basin is a mixture of urban, rural, agricultural, and forested lands. In Wisconsin, we will focus on the five counties around the city of Green Bay. These two landscapes have different land-use histories, different conservation cultures, and both provide rich spatial data sets for detailed spatial analysis and modeling.

Application Number: A80867
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **An investigation into how current and future disturbances may affect forest resilience and endangered species sustainability in fire-prone forests, and what we can do about it**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2016
Amount: $317,469
New

Potential changes in disturbance regimes and characteristics, such as larger fires, will likely impact forest and habitat sustainability throughout the western US. The ability of forests to recover post-disturbance (their resilience) may be threatened by larger fires resulting from increasingly severe fire weather. Larger fires mean larger distances required for seed dispersal and post-fire recovery. But forests are more than trees, and the various species that depend on those forests for habitat may also be threatened. Maintenance of sustainable forests and species populations in a dynamic environment requires resilience, as disturbances are inevitable. Research is needed on what aspects of the landscape provide resilience, how sensitive landscapes are to potential disturbance events, and how habitat will respond to any given potential disturbances. This study will explore the implications of climate change, via both climate and tree growth, on forest fire behavior in the western US. It focuses on forest resilience to potential fire events using a unique spatial approach, highlighting resilience mechanisms, and investigating what those fires, and the resilience of the forest to those fires, means to conservation efforts for an endangered species, the northern spotted owl. Special consideration is given to exploring how management actions may increase the sustainability of the forest landscape. This project draws on several different agencies, skill sets, data sources, and perspectives, enabling a comprehensive and synoptic view the problem of changing disturbance regimes and changing climates poses for forests and conservation. The interdisciplinary approach provides a strong background to attack this problem from different angles, both theoretical and practical, which will provide immediate, localized results as well as guidance to similar projects and questions for disturbance-prone forests throughout the world.

Application Number: A80738

Faculty Member: John Marzluff
Role: Co-Investigator
Faculty Member: Joshua Lawler
Role: Co-Investigator
Title: **Ecology and Evolution of Infectious Diseases**
Agency: National Science Foundation (NSF)
Period: 9/1/2013 - 8/31/2017
Amount: $1,972,025
New

Human activity increases the juxtaposition of once separate land covers, simplifies biotic communities, intersperses domestic species with native wildlife, and introduces invasives and pollutants. All of these factors can facilitate the acquisition and transmission of pathogens among wildlife species and the subsequent spread to human populations and may explain why over the last 20 years, novel zoonotic infectious diseases have emerged, and diseases once under control in both man and animals have resurged. Crows provide a useful model system to test the hypothesis that wild birds represent a significant reservoir for pathogenic bacteria and important antibiotic resistance genes and the prevalence of Campylobacter and Salmonella are directly related to dissemination, transmission and persistence between crows, their environment and human communities. We will test whether in areas with long term high levels of Campylobacter and Salmonella human disease, crows have higher levels of carriage of these bacteria then in a region with traditionally lower levels of human disease due to these pathogens. The project will be conducted in Seattle and Yakima in core and surrounding agricultural areas which have traditionally had 2-6 fold differences in rates of Campylobacter and Salmonella disease in man. We will quantify the distribution, spatial and temporal occurrence of the crows, pathogens and resistance genes and determine whether differences in carriage rates in bird and the environment occur between sites and to what degree they are due to dissemination, persistence and transmission within and between crows, the environment and humans.

Application Number: A80619
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: 9/1/2013 - 8/31/2016
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: A79293
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: 9/1/2013 - 9/30/2015
Amount: $116,350
New

The San Joaquin kit fox (Vulpes macrotis mutica, here after kit fox) is an endangered subspecies of the kit fox that lives in the southern end of the Central Valley. Although the kit fox faces many, potentially interacting threats, like many endangered species, habitat loss is a major factor contributing to the subspecies' decline. Therefore, habitat protection plays a critical role in the conservation of the kit fox and prioritizing lands for protection is necessary to ensure optimal use of limited funds. Such prioritization is complicated by the fact that threats to the kit fox, and the landscapes they inhabit, are dynamic. Both climate change and land-use change have the potential to alter the distribution of kit fox habitat as well as the distribution of the predators, competitors, and prey. We propose to evaluate the relative effectiveness of different land-acquisition strategies and rank proposed conservation sites in terms of effects on kit fox population size in the face of both climate and land-use changes. We will use a spatially explicit, individual-based population model to examine the relative effectiveness of different land-acquisition strategies including 1) expanding existing reserves for core populations; 2) creating new reserves for unprotected populations; 3) enhancing connectivity between populations, and 4) combinations of these strategies. To explore the performance of these strategies in the face of climate change, we will model climate-induced changes in kit fox habitat as well as the effects of climate change on interactions with predators and exposure to pesticides. Similarly, to explore how robust the different strategies are to land-use change, we will investigate the potential effects of projected land-use changes on habitat and dispersal.

Application Number: A80715
Faculty Member: John Perez-Garcia
Role: Principal Investigator
Faculty Member: Ernesto Alvarado
Role: Co-Investigator
Title: **Land Rents Associated with Fuels Reduction Management Alternatives**
Agency: USDI Bureau of Land Management
Period: 9/1/2013 - 8/31/2014
Amount: $131,023
New

The proposal seeks to link decision-making tools used to prioritize areas for fuels reduction treatments and restoration projects with economic returns associated with fuels treatment and other accompanying harvests activities in the TAPASH Sustainable Forest Collaborative area in eastern Washington. The project goal is to calculate the economic returns to land (land rent) associated with forest activities and link them to decision criteria used to determine treatment regimens and their timeline. Landscape management decisions consider the state of the ecological system and what should be done to create conditions of resiliency. Ecological systems are embedded in social systems that impact decision making. The Okanogan-Wenatchee National Forest restoration strategy (USDA FS 2011) examines landscape patterns collecting information on attributes such as habitat, fire conditions, insect/disease and others to consider the current state of each resource, and then uses the Ecosystem Management Decision Support (EMDS) (Gartner et. al., 2008) system by integrating multiple resources and creating landscape treatment priorities to create priority management areas. The study would overlay the landscape priorities with economic values derived from the assessment of land rent to assess the economic returns associated with the selected priorities and how knowledge of these economic values may improve restoration management priorities.
We will expand an existing database on residual values in Washington state so that project managers can overlay land rent values in watersheds where fuel reduction management priorities are identified. Planners can use the database to rank areas in terms of viability to impact catastrophic wildfire occurrence with associated economic land rent. A web-based tool will be developed to access data based on characteristics found in the watershed relating landscape metrics such as departure from baseline and risk of fire to economic returns based on land rent and actual and reasonable markets for materials removed from the watershed. An assessment examining existing mills and prospective new mills will be completed to identify infrastructural needs that create economic value for restoration projects. The calculator tool and assessment will allow managers to increase cost efficiency and locate treatments strategically, while “improving ecosystem health and natural functions of the landscape through active restoration projects backed by best science, community input and adaptive management” (Tapash Mission Statement, 2010).