



UNIVERSITY of WASHINGTON

**School of Forest Resources**

**RESEARCH NEWSLETTER**

**ISSUE ONE, VOLUME 1**

**OCTOBER 13, 2009**

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**OPPORTUNITIES**

**Worldwide Universities Network (WUN)**

**2009 WUN RESEARCH DEVELOPMENT FUND GRANTS—Call for Proposals**

**Deadline: Friday, November 13, 2009**

The Worldwide Universities Network (WUN) is an international partnership of leading public research universities. WUN partners share a commitment to research quality and advancement, developing collaborations in interdisciplinary areas of global concern. University of Washington's partnership in WUN is led by President Mark Emmert, Chair of the WUN Partnership Board, and managed by the Office of Global Affairs under Vice Provost for Global Affairs Stephen E. Hanson.

WUN members:

UK/Europe: **University of Bristol**  
**University of Leeds**  
**University of Sheffield**  
**University of Southampton**  
**University of York**  
**University of Bergen (Norway)**

N. America: **University of Washington**  
**Pennsylvania State University**  
**University of Wisconsin-Madison**  
**University of Alberta**

Australia: **University of Sydney**  
**University of Western Australia**

China: **Nanjing University**  
**Zhejiang University**

For more information on Worldwide Universities Network: <http://www.wun.ac.uk/>

**2010 U.S. Forest Service  
National Urban and Community Forestry  
Challenge Cost-Share Grant Program  
Urban Forest Innovation Grants Funding Opportunity**

**Request for Proposals**

Proposals are due Dec 15, 2009.

They are anticipating dividing \$900,000 into 4 or more awards.

The 4 submittal categories include:

1. Energy Conservation and Urban Forests
2. Climate Change and Urban Forests
3. Public Health and Urban Forests
4. Green Infrastructure Assessment

The RFP is posted on [www.grants.gov](http://www.grants.gov)<<http://www.grants.gov>>

**Responsible Research Seminar – October 21<sup>st</sup>**  
1:00 to 2:15 p.m. in Mary Gates Hall room 389

The Office of Sponsored Programs is We are pleased to have Dr. John Galland, Director, Division of Education and Integrity, Office of Research Integrity, DHHS, join us on October 21<sup>st</sup>, 2009 to give a seminar on the “Importance of Conducting Research Responsibility”. All of us who are involved in conducting research and mentoring of students and fellows, as well as post-doctoral fellows, graduate students, and undergraduates, are encouraged to attend.

## PROPOSALS FUNDED

Application Number: A52079

P.I.: Ernesto Alvarado

Title: **Integration of Fuels, Fires and Vegetation Software Tools to Improve Assessments of Landscape Scale Fire Hazard**

Agency: US Forest Service

Period: 09/03/09 - 07/31/12

Amount: \$500,004

The research conducted under this Joint Venture Agreement (JVA) with the USFS Pacific Northwest Research Station will be supported from the American Reinvestment and Recovery Act (ARRA) funds. The goal of this JVA is to create or retain jobs in King County, WA, by employing and contracting University of Washington faculty, scientists and graduate student with scientific and technical expertise in fuels and fire management. Under this JVA, the School of Forest Resources will support the Fire and Environmental Research Applications Team (FERA) effort to develop management techniques and tools to prioritize fuel reduction treatments in forested landscapes to improve the landscape health. The research will be conducted and applied to federal lands under the administration of the USFS and other federal agencies.

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Application Number: A51470

P.I.: Ernesto Alvarado

Co-P.I.: James Agee  
Title: **Wildland Fuel and Fire Management in a Changing Climate**  
Agency: US Forest Service  
Period: 05/11/09 - 03/31/14  
Amount: \$457,871

Supplement and Extension

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Application Number: A49412  
P.I.: Stanley Asah  
Co-P.I.: Clare Ryan  
Title: **"Kids in the Woods" Leads to Adults in the Woods: The Role of childhood Experiences in enduring Involvement in Nature-Based Activities and Environmental Stewardship**  
Agency: US Forest Service  
Period: 07/31/09 - 03/31/14  
Amount: \$40,000

Transfer from Another Institution

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Application Number: A51695  
P.I.: Jonathan Bakker  
Title: **Compositional analysis along an elevational gradient in the eastern Cascades**  
Agency: Nature Conservancy  
Period: 08/01/09 - 03/31/10  
Amount: \$24,934

The goal of this project is to describe changes in tree and shrub species composition along an elevation gradient in temperate conifer forests on the eastern slopes of the Cascades in Washington, and to determine if observed changes can be attributed to the impacts of climate change. This analysis will be based on field data already collected by The Nature Conservancy. The results will inform the interpretation of future projections of climate change impacts, and are necessary to develop strategies to effectively conserve these systems over the long term.

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Application Number: A36621  
P.I.: Jonathan Bakker  
Title: **Controls on Conifer Regeneration Patterns (1909-2011) and Implications for Future Stand Development (2012-2061) in Southwestern Forests**  
Agency: Northern Arizona University (NAU)  
Period: 08/01/08 - 06/30/11  
Amount: \$62,544

This proposal will examine the effects of past and present land management practices on the long-term sustainability of southwestern forests. Large forested areas in the American Southwest are being treated to reduce fire hazard (no action, thinning at different intensities and patterns, prescribed burning), yet we do not know how these current management activities will affect future stand development. We will examine the factors affecting past and present conifer regeneration, and will forecast how stands will respond to contemporary management practices and to climate change. Specifically, we will consider the relative importance of four general factors (abiotic environment, land-use history, forest overstory, and herbaceous understory). We will collect contemporary data from stands throughout Arizona and New Mexico subject to a range of management actions (e.g., no treatment, thinning, prescribed burning) to validate our conceptual model, and will use our historical dataset spanning ~ 100 years to test this model developed and to assess our ability to forecast stand development. We will then model stand development over the next 50 years and concomitant changes in variables such as tree growth, regeneration patterns, and forage production.

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Application Number: A51696  
P.I.: Jonathan Bakker  
Title: **Prairie Habitat Restoration for Endangered Species**  
Agency: US Fish and Wildlife Service (FWS)  
Period: 07/01/08 - 09/30/11  
Amount: \$62,000

Non-Competing Supplement

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Application Number: A42389

P.I.: David Briggs

Co-P.I.: Robert Harrison, L. Monika Moskal, Sandor Toth, Eric Turnblom

Title: **Proposal for the Univ of Wa to Join the Industry/Univ Coop Research Center (I/UCRC) for the Advanced Forest Systems (CAFS)**

Agency: National Science Foundation (NSF)

Period: 03/01/09 - 02/28/11

Amount: \$70,000

Forests are vital to the world's ecological, social, and economic health. They provide water supplies and quality; diverse habitats for a multitude of organisms; recreation, carbon sequestration, and other services; and timber for energy and material products. Forest lands are also in demand for conversion to agriculture, human living space, and infrastructure. Since the volume of timber harvested for conversion into paper and industrial materials is second only to concrete and exceeds steel, plastic and other materials combined, and the volume harvested for energy is larger than the volume harvested for industrial materials, improving productivity from a shrinking land base is critical. This will allow a larger proportion of the remaining forestland to be reserved to meet other demands. To improve productivity and maintain economically viable, wood-based industries, it is necessary to develop and incorporate technological advances into forest management. A great deal of forestry research has taken place in university-based, industry-supported, cooperative research programs that have been highly successful at providing advances that are relevant to the forest industry. However, many of the problems facing forestry today, and the largest opportunities for breakthrough advances, are in areas that bridge disciplinary boundaries. Four of the top forestry research programs in the US: North Carolina State University (NCSU), Oregon State University (OSU), Purdue University (PU), and Virginia Polytechnic Institute and State University (VPI&SU) succeeded with a proposal to NSF I/UCRC, to create the Center for Advanced Forestry Systems (CAFS) to create a multi-university, truly interdisciplinary center to solve industry-wide problems through multi-faceted approaches. With expertise in biological sciences (biotechnology, genomics, ecology, physiology, and soils) and management and processing (silviculture, bioinformatics, modeling, remote sensing, and spatial analysis) CAFS collaborators approach research questions on multiple scales, including the molecular, cellular, individual-tree, stand, and ecosystem. We propose expanding CAFS by including the University of Washington (UW) as member, adding expertise to create synergies with and a broadening of the capabilities current CAFS members.

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Application Number: A47092

P.I.: David Briggs

Co-P.I.: L. Monika Moskal

Title: **REU: Terrestrial LiDAR Dynamic Monitoring of Leaf Area Index (LAI) Change in Intensely Managed Forest Types of the Pacific Northwest**

Agency: National Science Foundation (NSF)

Period: 07/24/09 - 02/28/10

Amount: \$7,600

Competing Supplement

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Application Number: A52413

P.I.: David Briggs

Title: **Stand Mgt Coop**

Agency: Pilchuck Tree Farm

Period: 01/01/09 - 12/31/09

Amount: \$6,672

Non-Competing Supplement

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Application Number: A52426

P.I.: David Briggs

Title: **Stand Mgt Coop**

Agency: Stimson Lumber Company

Period: 01/01/09 - 12/31/09

Amount: \$18,738

Non-Competing Supplement

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Application Number: A52352  
P.I.: John Calhoun  
Title: **Building a Web-Based Interface to the Restoration Silviculture Initiative**  
Agency: US Forest Service  
Period: 09/03/09 - 12/31/12  
Amount: \$43,007

Supplement and Extension

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Application Number: A52253  
P.I.: John Calhoun  
Title: **Developing a Management Plan for the Long Island Unit of the Willapa National Wildlife Refuge.**  
Agency: US Forest Service  
Period: 09/03/09 - 12/31/12  
Amount: \$48,018

The Willapa National Wildlife Refuge is developing its Comprehensive Conservation Plan (CCP); a document required for all wildlife refuges. With an estimated completion date of October 2012, The University of Washington's Olympic Natural Resources Center (ONRC) has been invited to develop a proposal to contribute to one or more of the planning elements. This project will develop an online decision-support system for the management of Refuge forestlands: Tools that compile and visually integrate the mostly-offline data about the Refuge will facilitate the most appropriate silvicultural treatment to those stands with the highest probability of success. While the purpose of this project is to provide decision-support for planning purposes, the design and documentation of the effort will be considered for outreach and communication purposes. The final product is expected to be a web-based (HTML/Javascript) portal that coordinates maps (i.e. Google), graphs, charts, and perhaps GIS resources that access an SQL database where Refuge data will be stored.

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Application Number: A52252  
P.I.: John Calhoun  
Title: **Tax Policy alternatives to Promote Forestland (re)Investment**  
Agency: US Forest Service  
Period: 09/03/09 - 12/31/12  
Amount: \$89,527

Effective tax policies have four well-considered dimensions: Efficiency - minimizing the distortion of incentives; intergenerational equity - the tax system should raise enough revenue so current generations do not unduly burden future generations; egalitarianism - the tax system should try to achieve a more equal distribution of after-tax incomes; stabilization - the tax system should help maintain the economy at full employment. This project proposes a tax policy designed to reduce divestment of forestland for other uses by creating a revenue stream for (non-industrial) landowners during years when no harvesting occurs. This project will assert that the financial behavior a real-estate investment (timberland) should be viewed/treated as its analogous financial instrument – the bond. Once the theory is established, the policy is implemented on select counties in Washington State (e.g. Jefferson, Clallam, King) using the Washington State Forestland Database at the University of Washington. This database allows for a precise and accurate calculation of the effect of a proposed policy. This project will facilitate direct comparisons of timberland investments to non-forest uses for the land. Such a system would bring clarity to lawmakers as to what level of subsidy is required in specific localities to maintain a healthy forest base.

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Application Number: A46556  
P.I.: Sharon Doty  
Co-P.I.: Renata Bura, Gregory Ettl, Soo-Hyung Kim  
Title: **Nitrogen Fixation in Poplar: Increased Efficiency of Bioenergy Crop Production**  
Agency: National Science Foundation (NSF)  
Period: 09/15/09 - 08/31/12  
Amount: \$350,000

Microorganisms that live within plants (endophytes) can dramatically enhance plant growth by increasing resistance to pathogens and stress, providing fixed nitrogen, solubilizing phosphate, producing plant hormones, and assisting in detoxification of environmental pollutants. Poplar and willow are fast-growing trees that are used for the production of paper, lumber, and bioenergy, for carbon sequestration, and for phytoremediation of pollutants. We have demonstrated that the endophytic population of these economically-important tree species includes a diverse range of microorganisms, many of which are diazotrophic (nitrogen-fixing). We have demonstrated that some of the isolates from poplar and willow fix nitrogen by studying the nitrogenase genes,  $^{15}\text{N}_2$  incorporation, acetylene reduction

assays, and the vigorous growth in nitrogen-free medium. When some of the endophytes are added to sterile plants or seedlings, the growth of the plants is significantly increased. In this proposal, we aim to test the effectiveness of adding nitrogen-fixing endophytes to poplar grown in greenhouse conditions and on a field site at the UW Center for Sustainable Forestry. If our lab results are repeated in these large-scale experiments, this research could provide the means of increasing the growth of this important bioenergy crop in an inexpensive, environmentally-sustainable manner. Moreover, since the potential for near term commercialization of poplar to bioethanol process is excellent, the low nutrient requirements for plant growth could further improve process economics.

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Application Number: A49916

P.I.: Ivan Eastin

Co-P.I.: John Perez-Garcia

Title: **Competitiveness in International Forest Products**

Agency: Cooperative State Research, Education, and Extension Service (CSREES)

Period: 09/01/09 - 08/31/10

Amount: \$184,954

Over the course of this project, CINTRAFOR will implement a research agenda designed to continue monitoring competitive threats to the US forest products industry while working to identify new and emerging export opportunities for US wood products around the world. The specific objectives of this project include: a) describe new and emerging markets for value-added US wood products, b) evaluate the competitive implications of public procurement policies for US forest products exports, c) assess opportunities for US wood products within the Japanese 2x4 housing industry d) identify new export opportunities for US wood products resulting from the deferred Russian log export tax and e) conduct surveys of wooden furniture manufacturers in China and Vietnam who have acquired chain-of-custody certification to evaluate export opportunities for US certified wood.

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Application Number: A44963

P.I.: Ivan Eastin

Co-P.I.: Sergey Rabotyagov

Title: **Improving the International Competitiveness of Certified Forest Products**

Agency: US Department of Agriculture (USDA)

Period: 09/01/09 - 08/31/11

Amount: \$149,625

The overall objective of this project is to develop an in-depth understanding of how environmental procurement policies in developed countries will impact the demand for certified wood in general and identify strategic market opportunities for US certified wood in particular. The project will accomplish this objective by: 1) conducting in-depth case studies of Chinese furniture and flooring companies with CoC certification to understand how environmental procurement policies in developed countries will affect their material purchasing strategies, 2) conducting an email survey of Chinese wood furniture and flooring manufacturers with and without CoC certification regarding their sourcing and use of wood materials, including certified wood 3) increase students awareness of the international dimensions of environmental policies by incorporating research results into the College curriculum and course discussions, 4) build faculty and student international market research and case study competency within the College of Forest Resources, 5) enhance the international content of the College's curricula by building on existing research collaborations with faculty in the Chinese Academy of Forestry, Beijing Forestry University and the Shanghai Furniture Research Institute, 6) using the results of the survey of CoC companies in China, develop a searchable database that will help US wood products manufacturers identify potential customers in China, and 7) disseminate research results to industry managers and government officials in the US and China through outreach activities, including presentations at industry trade shows and conferences as well as through publication of research results in professional and industry journals.

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Application Number: A45614

P.I.: Ivan Eastin

Title: **Rose Braden Staff Assignment**

Agency: Evergreen Building Products Association (EBPA)

Period: 02/01/10 - 12/31/10

Amount: \$18,433

Supplement and Extension

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Application Number: A51285

P.I.: Robert Edmonds

Title: **Weyerhaeuser Grant - Anna Leon**  
Agency: Weyerhaeuser Company  
Period: 12/16/07 - 12/31/09  
Amount: \$7,967

Non-Competing Supplement

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Application Number: A51565  
P.I.: Gregory Ettl  
Title: **The Western Mountain Initiative: Vulnerability and Adaptation to Climate Change in Western mountain Ecosystems**  
Agency: US Geological Survey (USGS)  
Period: 09/15/09 - 09/14/10  
Amount: \$181,000

Supplement and Extension

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Application Number: A52337  
P.I.: E. David Ford  
Title: **Calculation of Carbon Budgets in Shaded Tsuga Heterophylla and Abies Amabilis**  
Agency: US Forest Service  
Period: 09/03/09 - 12/31/12  
Amount: \$49,446

Supplement and Extension

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Application Number: A47142  
P.I.: E. David Ford  
Title: **Calculation of Carbon Budgets in Shaded Tsuga Heterophylla and Abies Amabilis**  
Agency: US Forest Service  
Period: 07/16/09 - 05/31/10  
Amount: \$42,438

Direct measurements of light received by regenerating *T. heterophylla* and *A. amabilis*, using a BF3 sunshine meter, were combined with preliminary measurements of height growth and some measurements of photosynthesis curves. These suggest diffuse light plays a major role in driving photosynthesis, and so carbon gain, of regenerating seedlings on forest floors on the coastal Olympic Peninsula. Diffuse light is greater on overcast than sunny days. At very low light levels *T. heterophylla* has greater height growth than *A. amabilis*. These results are important for design of a silviculture where thinning would stimulate regeneration and growth of both tree species but not of potentially competing ground vegetation. This work proposes more complete measurements and particularly the calculation of carbon budgets for saplings of both species growing in a range of shaded conditions. A more complete set of light measurements will be taken to investigate if diffuse light really is more important for seedling carbon gain than direct light received as sunflecks. This preliminary result is counter to that found for saplings in tropical forests. A product of this research will be determination of light levels that are sufficient for different amounts of sapling growth.

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Application Number: A51865  
P.I.: Jerry Franklin  
Title: **Ecosystem Management 6**  
Agency: US Forest Service  
Period: 07/01/08 - 06/30/13  
Amount: \$424,971

Non-Competing Supplement

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Application Number: A52066  
P.I.: Jerry Franklin  
Title: **Ecosystem Management 6**  
Agency: US Forest Service  
Period: 07/01/08 - 06/30/13  
Amount: \$216,994

#### Non-Competing Supplement

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Application Number: A46726

P.I.: Jerry Franklin

Title: **Spectral Mixture Analysis of ASTER Images to Estimate Forest Biomass and Habitat**

Agency: National Aeronautics and Space Administration (NASA)

Period: 09/01/07 - 08/31/10

Amount: \$30,000

#### Non-Competing Renewal

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Application Number: A50510

P.I.: Fritzi Grevstad

Title: **Biological Control of Invasive Knotweeds in North America**

Agency: US Forest Service

Period: 07/01/09 - 06/30/11

Amount: \$50,721

We propose research to develop a biological control program for invasive knotweeds, including giant knotweed (*Fallopia sachalinensis*), Japanese knotweed (*F. japonica*), the hybrid between these two (*F. x bohemica*). For 2009 and beyond will we carry out the following objectives: (1) Complete host specificity testing of the psyllid *Aphalara itadori* and the moth *Ostrinia ovalipennis*; (2) Prepare and submit a petition for release of *Aphalara itadori* and (if appropriate) *Ostrinia ovalipennis*; (3) Develop release and monitoring protocols for the Northwest and Northeastern regions; (4) Share information about the knotweed project with landowners, land managers, and the scientific community, including the writing a technology transfer publication on the biology and biological control of knotweeds; (5) If release permits are issued for either insect, we will coordinate and monitor releases.

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Application Number: A51139

P.I.: Fritzi Grevstad

Title: **Determining the Suitability of Candidate Biological Control Agents for Gorse**

Agency: US Forest Service

Period: 07/15/09 - 09/30/11

Amount: \$25,000

#### Supplement and Extension

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Application Number: A51106

P.I.: Fritzi Grevstad

Title: **WSDA Knotweed Biocontrol Project**

Agency: Washington State Department of Agriculture (WSDA)

Period: 07/01/09 - 06/30/10

Amount: \$28,955

Two introduced knotweed species, *Fallopia japonica* (Japanese knotweed) and *F. sachalinensis* (giant knotweed), and hybrid between the two, *F. x bohemica* (Bohemian knotweed) are invasive throughout most of the United States. These weeds displace native plants, destroy critical fish and wildlife habitat, and reduce recreational opportunities. The plant is fast spreading and difficult to control, especially in riparian zones. We propose to develop a classical biological control program against Japanese knotweed using natural enemies introduced from Asia. The overall goal is to determine suitability of several insects as biological control agents. Biological control is a cost effective, ecologically sound, and sustainable approach to managing widespread weeds.

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Application Number: A50501

P.I.: Charles Halpern

Co-P.I.: Jim Lutz

Title: **Climate Impacts on Burn Severity**

Agency: US Geological Survey (USGS)

Period: 07/01/09 - 06/30/10

Amount: \$57,000

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.

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Application Number: A45708

P.I.: Charles Halpern

Title: **Consequences of Conifer Encroachment for Mountain Meadows: A Long-Term, Landscape-scale Analysis of Vegetation Change in the Three Sisters Wilderness, Oregon**

Agency: Mazamas Research Committee

Period: 05/14/09 - 05/26/12

Amount: \$2,000

Meadows are small, but ecologically important components of mountain landscapes in the Pacific Northwest. Within the last century, mountain meadows have undergone widespread encroachment by coniferous trees. Loss or degradation of these open habitats may have profound consequences for local and regional diversity and other ecosystem services. Predicting, managing, or adapting to these changes requires an understanding of the landscape contexts in which tree invasion is likely to occur and of its ecological consequences. I will sample for the third time a series of permanent transects established in 1983 to quantify long-term (26-year) changes in vegetation composition and structure across forest-meadow ecotones in the Three Sisters Wilderness Area, Oregon- ecotones that span a broad range of mountain environments and vegetation types. I will address the following questions: How have vegetation structure and composition changed across forest-meadow ecotones over the past 26 years? How do the magnitude and direction of vegetation change vary among forest, ecotonal, and meadow habitats? Which plant functional groups have shown the greatest changes in these habitats? To what extent are changes driven by the dynamics of tree invasion? How do rates and patterns of change vary at larger spatial scales as a function of physical environment and landform? Understanding variation in the dynamics of forest-meadow ecotones at broad spatial and temporal scales is critical to predicting, managing, or adapting to future changes in vegetation in mountain landscapes. Long-term studies in the Three Sisters Wilderness Area offer an unparalleled opportunity to document these changes.

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Application Number: A51493

P.I.: Thomas Hinckley

Title: **Eastside Forest Health Forum**

Agency: US Forest Service

Period: 08/21/09 - 12/31/09

Amount: \$30,000

The purpose of this funding is to support the planning, management, facilitation, and recording of the Eastside Forest Health Forum to be held in Yakima, Washington, on November 11 - 13, 2009.

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Application Number: A51771

P.I.: Thomas Hinckley

Co-P.I.: Jim Lutz

Title: **Effects of Fire Management on Carbon Sequestration in Sequoia Kings Canyon and Yosemite National Parks**

Agency: National Park Service (NPS)

Period: 08/15/09 - 08/01/12

Amount: \$56,400

Fires release carbon to the atmosphere through the combustion of organic material. Some of these greenhouse gases are returned to the landscape as biomass grows back subsequent to fires. The net change of carbon contained in vegetation on the landscape relative to pre-fire levels depends on the time since burning and the type of vegetation that grows back. However, the rates of above-ground carbon accumulation and the effects of fire on decadal carbon cycling in Yosemite and Kings Canyon National Parks are unknown. The time for a forest to develop following a high severity wildfire can be several centuries, but fires that burn at lower severities may be able to replace biomass lost to fire in decadal timescales. The differing productivities of forests and their attendant regrowth rates, coupled with the characteristic fire return interval of each forest type make it difficult to determine whether fires actually cause a net emission or sequestration of carbon at multi-decadal timescales. At broad scales and over the course of many decades, frequent fire appears to select for forest stands with less dense larger diameter trees that store a greater volume of carbon per unit land area than the stands of more dense but smaller trees that they replace. In addition, forests with larger diameter trees of fire resistant species have complex structure which often includes a high height-

to-live-crown, making them less susceptible to catastrophic stand-replacing crown fires, and thus promoting long-term carbon storage. Are such broad-scale results applicable at the smaller scales of time and space relevant to individual fires and the people who manage them? Do changes in fire management strategies that return Sierra Nevada forests to more frequent and lower intensity fire regimes have the co-benefit of increasing the carbon sequestration capacity of these forests? Are the broad-scale results applicable to every forest type in Sierra Nevada?

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Application Number: A51997

P.I.: Joshua Lawler

Co-P.I.: Christian Torgersen

Title: **Develop a Climate-Sensitivity Database for Species in the North Coast and Cascades Network**

Agency: National Park Service (NPS)

Period: 09/30/09 - 12/01/11

Amount: \$99,649

Natural resource managers face an unprecedented challenge – how to plan and manage for the local and regional effects of climate change. In the Pacific Northwest, temperatures and precipitation changes are affecting snowpack levels, hydrology, and disturbance regimes such as fire. These changes will affect species' distributions and phenologies, creating cascading effects on ecological systems that will greatly alter many of the resources of our national parks. To address these impacts, managers need detailed information on which species and systems are most susceptible to climate change and how projected changes in climate are likely to affect them. This project will answer the critical research question of which species are inherently most sensitive to climate change. We will develop a digital database of climate-change sensitivities for species of concern in the national parks of the North Coast and Cascades Network. Assessment of individual species sensitivities will be based on physiology, habitat requirements, interspecific dependencies, dispersal ability, population growth rates, location, and disturbance regime effects. Species sensitivities will be determined using expert review panels, published scientific literature, and pertinent data sets. The database will provide natural resource managers with critical information that can be combined with the management tools already in their toolbox to address climate change. This project could serve as a pilot for a national database serving multiple agencies and organizations. Multi-Park Project This project includes all of the parks in the North Coast and Cascades Network (Table 1). Olympic National Park will be the lead park in facilitating the project between the parks and cooperators at the USGS, the University of Washington, and The Nature Conservancy. A multi-park approach is the most powerful way to address the primary objective of developing a database of climate-sensitivities that can be used by managers at park, network, and regional levels.

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Application Number: A48147

P.I.: Robert Lee

Title: **Supporting Teacher Strategies to Prepare Students in Remote Rural Communities for College-level Mathematics**

Agency: Washington State Higher Education Coordinating Board

Period: 07/01/09 - 06/30/10

Amount: \$290,471

Thirty-five 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.

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Application Number: A51303

P.I.: L. Monika Moskal

Title: **Spatial Analysis of Recreational Impacts in Mount Rainier National Park**

Agency: National Park Service (NPS)  
Period: 08/05/09 - 06/01/10  
Amount: \$7,000

Recreational use of national parks presents a complex challenge for park managers and resource specialists. Parks are directed to regulate the use of national parks while preserving natural processes and ecosystems for future generations in such a manner that leaves them unimpaired. The goal of this project is to investigate the use of spatial statistics to evaluate the geospatial influence of social trails and campsites on ecosystems within Mount Rainier National Park (MORA). By evaluating these indicators within the context of the ecological landscape, resource managers at MORA will be able to develop a more cost-effective index of ecological integrity as "early warning" signs of unacceptable ecosystem change.

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Application Number: A51395  
P.I.: L. Monika Moskal  
Title: **Urban Natural Resources Stewardship: Geospatial Data Assessment and Management**  
Agency: US Department of Agriculture (USDA)  
Period: 08/31/09 - 12/31/10  
Amount: \$30,000

The purpose of this JVA is to launch a partnership for identifying, assessing, and organizing social and biophysical data that can be used to help support the urban natural resources research initiative being developed in Seattle. The project will include basic analysis work including geospatial and statistical analysis and joint work on research questions of interest and research reports and publications

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Application Number: A51145  
P.I.: John Perez-Garcia  
Title: **Report on Threats to Western Private Forests**  
Agency: US Forest Service  
Period: 08/03/09 - 06/30/10  
Amount: \$14,976

The Forest Service is participating in a process sponsored by the Western Forest Leadership Coalition (WFLC) to identify threats to private landownership in the Western United States. As part of this process interdisciplinary teams consisting of public, private and Native American interests produced detailed outlines of threats to private forests for the Central and Northern Rockies, Interior Alaska, Central Plains and the Pacific Northwest regions. The next step in this process is for a group of technical experts and others knowledgeable about private land management to draft a report that summarizes the results from all five workshops. The Forest Service needs assistance of an expert with extensive knowledge in private forest threats to participate in the drafting group.

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Application Number: A45020  
P.I.: Sarah Reichard  
Title: **Rare Plant Monitoring**  
Agency: US Fish and Wildlife Service (FWS)  
Period: 08/24/09 - 12/31/10  
Amount: \$44,396

Under the proposed project, Rare Care recruits, trains and coordinates a corps of volunteers who carry out the monitoring and coordinates this work with WNHP and with land agencies. Volunteer recruitment and training are key components of the project to ensure consistent, high quality data are collected. Minimum qualifications for volunteer monitors include: a basic knowledge of Washington flora, two years of post-high school education in biology or science, and a desire to play an active role in the conservation of our native flora. Volunteers are recruited from the University of Washington College of Forest Resources and biology department, and local and statewide conservation organizations such as the Washington Native Plant Society, Master Gardeners, the Audubon Society, and The Mountaineers. Volunteers are required to submit an application and references are checked for each participant.

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Application Number: A52024  
P.I.: Joseph Roos  
Title: **Asian Markets for Renewable Wood Pellet and Biomass Energy**  
Agency: US Forest Service  
Period: 09/01/09 - 12/31/12  
Amount: \$35,000

The global wood pellet market for 2006 was estimated at 7 million tons and this is a growing market (Wood Pellet Association of Canada). Furthermore, Asia is expected to become the largest energy market, surpassing North America, by 2030. Wood pellets offer a way for sawmills to efficiently utilize their residual product and also offer an alternative to fossil fuels for heating purposes. Asian markets are aggressively seeking out renewable energy sources. China's energy policy calls for 10% of energy to come from renewable resources by 2020. Japan has also been increasing their consumption of fossil fuel alternatives as they strive to meet their Kyoto Protocol requirements. Korea is a leader in biomass power plants and has a plant that utilizes 145 tons of wood chips and pellets daily to generate 50 kW of electricity an hour (Peksa-Blanchard et.al. 2007). The biomass and wood chip markets are developing rapidly in Asia and it is important to examine potential markets for wood chips produced in Alaska.

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Application Number: A51977

P.I.: Clare Ryan

Title: **Communication in NEPA Decision-Making: Writing an Effective Environmental Document**

Agency: US Forest Service

Period: 08/25/09 - 06/20/13

Amount: \$74,300

Dramatic changes in demographics and population growth, the structure of international markets, technology trends, and processes of new governance and public decision-making shape the contemporary reality in which public resource management agencies such as the U.S. Forest Service must operate. Over the past couple of decades environmental documents have become very voluminous collections of data aimed largely at trying to withstand legal challenges. In many cases these documents are not clearly written, are poorly organized, and are presented in a format that is difficult to follow and have become incomprehensible to not only the general public but have not aided in decisionmaking. Understanding effective ways to communicate NEPA decisions may lead to quicker implementation of decisions, fewer conflicts and challenges to agency decisions, and ultimately improved management of public lands and natural resources; this is the goal of the proposal.

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Application Number: A52257

P.I.: Sandor Toth

Title: **Dynamic Reserve Selection: Modeling the Land Price Feedback Effect in Strategic Land Retentions in Western Washington**

Agency: US Forest Service

Period: 09/06/07 - 10/01/11

Amount: \$29,993

Supplement and Extension

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Application Number: A47145

P.I.: Eric Turnblom

Title: **Data Gathering for Updated Logging Residue Ratios**

Agency: US Forest Service

Period: 06/22/09 - 05/31/10

Amount: \$62,595

Biomass from forestry residues has been identified as a significant potential source of renewable energy. An inventory of biomass resources available for energy production in Washington was conducted by scientists at Washington State University (J.D. Kerstetter and J.K. Lyons. 2001. "Logging and Agricultural Residue Supply Curves for the Pacific Northwest"). Study results identified wood residuals from forestry operations and products manufacture as the largest source of in-state-produced biomass that could be used for energy conversions. The magnitude of the forest resource was found to be equal to the volume of other resources (e.g. agricultural residues, municipal waste) combined. Biomass supply curves illustrate the cost of delivering a specific quantity of biomass to a specific location. In general, the marginal cost increases as the quantity needed increases. The basic task is to determine where available material is located and how much it costs to collect and transport to a specific location. The amount of available woody biomass in a region is a product of the type and frequency of forest operations in that region. This quantity may be reduced by environmental constraints, market competition, and willingness of the resource owners to supply the material. The purpose of this report is to update the data - according to established methods - upon which more accurate supply curves may be developed.

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Application Number: A51149

P.I.: Stephen West

Title: **Eastern Gray Squirrel Ecology and Interactions with Western Gray Squirrels on Ft. Lewis, WA**

Agency: Washington State Department of Fish and Wildlife

Period: 07/01/09 - 06/30/11

Amount: \$58,097

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 Fort Lewis, we have equipped eastern and western gray squirrels with radio-collars to investigate resource use and interactions between these species. Results of this study will aid management and recovery of western gray squirrels.

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Application Number: A34241

P.I.: Stephen West

Title: **Western gray squirrel (*sciurus griseus*): measure distribution, abundance and habitat use in Lake Chelan National Recreation Area, Washington**

Agency: US Geological Survey (USGS)

Period: 07/01/07 - 09/30/10

Amount: \$63,490

This research will describe status of the western gray squirrel, a state-listed threatened species, in the lake Chelan National Recreation Area. It will also provide information to assess the possible adverse effects of woodland management practices in the Stehekin area of Lake Chelan National Recreation Area and to identify changes in management practices that would provide greater protection for western gray squirrels in the area. The objective of this project is to determine the population status of the western gray squirrel in the vicinity of Lake Chelan and determine what NPS management actions are needed to maintain a viable western gray squirrel population in the park.

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Application Number: A51616

P.I.: Kathy Wolf

Title: **Human Well-Being Benefits of Urban Forests: Completion of a Research Assessment & Summary**

Agency: US Forest Service

Period: 09/30/09 - 12/31/10

Amount: \$25,000

Scientific studies demonstrate the broad array of benefits provided by urban forests. Such benefits are generally grouped as environmental, economic and social, a framework that aligns closely with definitions of urban sustainability. Social benefits are the focus of this project. "Human well-being" is used here to describe the human need for nearby nature in the everyday settings where people live, work, play, and learn. Scientific studies on urban nature experience and human well-being were assessed and summarized in an earlier project to present the scientific work in a format that is accessible to public and professional audiences. A framework of benefits themes was created and a subset of five topics was developed into full literature summaries. In this project seven additional benefits summaries will be completed, and web based delivery of the content will be finalized. The products of this work will inform: 1) more effective communications about well-being benefits of urban nature, 2) goals for geospatial modeling of benefits, and 3) goals for economic valuation of benefits.

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Application Number: A50055

P.I.: Kathy Wolf

Title: **K Wolf/USFS-Interagency Personnel Agreement**

Agency: US Forest Service

Period: 10/01/09 - 09/30/11

Amount: \$79,954

Supplement and Extension

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Application Number: A45455

P.I.: Darlene Zabowski

Co-P.I.: Robert Harrison

Title: **Development of a Modified Forest Reclamation Approach to Establish Coniferous Forest Plantations in the Pacific Northwest**

Agency: US Department of the Interior

Period: 07/01/09 - 06/30/11

Amount: \$184,233

The research proposed here will test a modified version of the Forest Reclamation Approach (FRA) that has been successfully used in the Appalachian region for reforestation following surface coal mining operations. The overall objective of the project is to reestablish Douglas-fir plantations on reclaimed land that would approach productivity of the original forested lands. The original FRA has five basic steps: 1) create a suitable rooting medium for good tree growth that is no less than 4 feet deep and comprised of topsoil, weathered sandstone or best available material, 2) loosely grade the topsoil or topsoil substitute established in Step 1 to create a non-compacted growth medium, 3) use ground covers that are compatible with growing trees, 4) plant two types of trees – nurse trees and commercial crop trees, and 5) use proper tree planting techniques. Modifications to the FRA that will be investigated are intended to adapt it to western Washington's climate and coniferous ecosystem. Steps 1 and 2 will take place, but must be altered due to the larger dump trucks used at the western site. Step 4 will involve only planting Douglas-fir rather than a mixture of species. A paired plot method will also be used to compare results of using larger seedlings with typical plantings for their ability to withstand droughty conditions that are common during the summer months in western Washington. Additionally, a treatment applying residual ash from the TransAlta Centralia power plant will be tested relative to no amendments. All site reclamation plots will have soil, ground surface and seedling properties monitored. This research will help meet primary OSM objectives by demonstrating the effectiveness of the FRA in different ecosystems, thus building on the established body of remediation science. The project is designed to assess the first year and a half after treatment but could be extended to develop longer-term information. This project will also provide valuable information regarding use of powerplant ash applications as a soil amendment.

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## PROPOSALS SUBMITTED

Application Number: A51684

P.I.: James Agee

Title: **Coordination of Protocol Reviews for Inventory and Monitoring Long-term Monitoring in the Pacific West Region**

Agency: National Park Service (NPS)

Period: 07/15/04 - 07/15/11

Amount: \$132,075

Supplement and Extension

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Application Number: A52079

P.I.: Ernesto Alvarado

Title: **Integration of Fuels, Fires and Vegetation Software Tools to Improve Assessments of Landscape Scale Fire Hazard**

Agency: US Forest Service

Period: 08/01/09 - 07/31/12

Amount: \$500,004

The research conducted under this Joint Venture Agreement (JVA) with the USFS Pacific Northwest Research Station will be supported from the American Reinvestment and Recovery Act (ARRA) funds. The goal of this JVA is to create or retain jobs in King County, WA, by employing and contracting University of Washington faculty, scientists and graduate student with scientific and technical expertise in fuels and fire management. Under this JVA, the School of Forest Resources will support the Fire and Environmental Research Applications Team (FERA) effort to develop management techniques and tools to prioritize fuel reduction treatments in forested landscapes to improve the landscape health. The research will be conducted and applied to federal lands under the administration of the USFS and other federal agencies.

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Application Number: A51470

P.I.: Ernesto Alvarado

Co-P.I.: James Agee

Title: **Wildland Fuel and Fire Management in a Changing Climate**

Agency: US Forest Service

Period: 04/01/09 - 03/31/14

Amount: \$283,951

Supplement and Extension

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Application Number: A49412

P.I.: Stanley Asah

Co-P.I.: Clare Ryan

Title: **"Kids in the Woods" Leads to Adults in the Woods: The Role of childhood Experiences in enduring Involvement in Nature-Based Activities and Environmental Stewardship**

Agency: US Forest Service

Period: 08/01/09 - 03/31/14

Amount: \$40,000

Transfer from Another Institution

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Application Number: A51484

P.I.: Stanley Asah

Co-P.I.: Clare Ryan

Title: **Exploring Cultural Forest Ecosystem Services within a Framework for Forest Stewardship**

Agency: US Forest Service

Period: 10/01/09 - 12/31/10

Amount: \$30,000

The purpose of this agreement is to conduct a preliminary study of cultural ecosystem services (values) currently provided by National Forest lands, contribute to the problem analysis of identifying management challenges that an Ecosystem Services framework can address, and help identify knowledge gaps and research needs pertinent to Ecosystem Services provided by the forest. The Deschutes National Forest will be the study site.

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Application Number: A51695

P.I.: Jonathan Bakker

Title: **Compositional analysis along an elevational gradient in the eastern Cascades**

Agency: Nature Conservancy

Period: 08/01/09 - 03/31/10

Amount: \$24,934

The goal of this project is to describe changes in tree and shrub species composition along an elevation gradient in temperate conifer forests on the eastern slopes of the Cascades in Washington, and to determine if observed changes can be attributed to the impacts of climate change. This analysis will be based on field data already collected by The Nature Conservancy. The results will inform the interpretation of future projections of climate change impacts, and are necessary to develop strategies to effectively conserve these systems over the long term.

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Application Number: A51696

P.I.: Jonathan Bakker

Title: **Prairie Habitat Restoration for Endangered Species**

Agency: US Fish and Wildlife Service (FWS)

Period: 07/01/08 - 09/30/11

Amount: \$62,000

Non-Competing Supplement

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Application Number: A52876

P.I.: Gordon Bradley

Title: **PNW-CESU Amendment**

Agency: National Park Service (NPS)

Period: 10/01/09 - 09/30/10

Amount: \$10,000

Membership fee for National oceanic and Atmospheric Administration to the PNW-CESU, cooperative agreement #CA9088A0008.

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Application Number: A52784

P.I.: Gordon Bradley

Title: **Reasonable Person Model: A Path Toward More Effective Participation**

Agency: Royalty Research Fund (RRF)

Period: 03/16/10 - 03/15/11  
Amount: \$39,216

The management of forest lands throughout the western United States has always been the subject of considerable debate. As more demands are placed on forest lands, and as we gain greater insight into the wide range of benefits they provide, more people would like a say in the planning and management of both wild land and urban forest landscapes. Recent issues focus on all aspects of forest ecosystem services including physical, biological, economic and social. The focus of this research is to explore more meaningful ways of engaging people in the development of effective natural resource management policies and programs. The Reasonable Person Model offers a perspective for achieving that goal. Presumably public involvement efforts should result in greater information exchange between managers and people who will be affected by natural resource programs, as well as to increase the likelihood of successfully implementing important natural resource programs. Alternative strategies for communicating information about emerging natural resource programs will be tested. One program is centered in Seattle and involves encouraging private land owners to increase tree canopy on their property. The other program is in rural Chelan County and involves the development of a native gray squirrel habitat conservation strategy. In both cases, alternative methods of communication will be tested for their effectiveness in creating an understanding of the programs purpose and intent, and people's interest in modifying land use practices on their private property to achieve natural resource program objectives.

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Application Number: A52413  
P.I.: David Briggs  
Title: **Stand Mgt Coop**  
Agency: Pilchuck Tree Farm  
Period: 01/01/09 - 12/31/09  
Amount: \$6,672

Non-Competing Supplement

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Application Number: A52426  
P.I.: David Briggs  
Title: **Stand Mgt Coop**  
Agency: Stimson Lumber Company  
Period: 01/01/09 - 12/31/09  
Amount: \$18,738

Non-Competing Supplement

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Application Number: A52352  
P.I.: John Calhoun  
Title: **Building a Web-Based Interface to the Restoration Silviculture Initiative**  
Agency: US Forest Service  
Period: 09/15/09 - 12/31/12  
Amount: \$43,007

Supplement and Extension

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Application Number: A52253  
P.I.: John Calhoun  
Title: **Developing a Management Plan for the Long Island Unit of the Willapa National Wildlife Refuge.**  
Agency: US Forest Service  
Period: 09/15/09 - 12/31/12  
Amount: \$48,018

The Willapa National Wildlife Refuge is developing its Comprehensive Conservation Plan (CCP); a document required for all wildlife refuges. With an estimated completion date of October 2012, The University of Washington's Olympic Natural Resources Center (ONRC) has been invited to develop a proposal to contribute to one or more of the planning elements. This project will develop an online decision-support system for the management of Refuge forestlands: Tools that compile and visually integrate the mostly-offline data about the Refuge will facilitate the most appropriate silvicultural treatment to those stands with the highest probability of success. While the purpose of this project is to provide decision-support for planning purposes, the design and documentation of the effort will be considered for outreach and communication purposes. The final product is expected to be a web-

based(HTML/Javascript) portal that coordinates maps (i.e. Google), graphs, charts, and perhaps GIS resources that access an SQL database where Refuge data will be stored.

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Application Number: A52252

P.I.: John Calhoun

Title: **Tax Policy alternatives to Promote Forestland (re)Investment**

Agency: US Forest Service

Period: 09/15/09 - 12/31/12

Amount: \$89,527

Effective tax policies have four well-considered dimensions: Efficiency - minimizing the distortion of incentives; intergenerational equity - the tax system should raise enough revenue so current generations do not unduly burden future generations; egalitarianism - the tax system should try to achieve a more equal distribution of after-tax incomes; stabilization - the tax system should help maintain the economy at full employment. This project proposes a tax policy designed to reduce divestment of forestland for other uses by creating a revenue stream for (non-industrial) landowners during years when no harvesting occurs. This project will assert that the financial behavior a real-estate investment (timberland) should be viewed/treated as its analogous financial instrument – the bond. Once the theory is established, the policy is implemented on select counties in Washington State (e.g. Jefferson, Clallam, King) using the Washington State Forestland Database at the University of Washington. This database allows for a precise and accurate calculation of the effect of a proposed policy. This project will facilitate direct comparisons of timberland investments to non-forest uses for the land. Such a system would bring clarity to lawmakers as to what level of subsidy is required in specific localities to maintain a healthy forest base.

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Application Number: A51565

P.I.: Gregory Ettl

Title: **The Western Mountain Initiative: Vulnerability and Adaptation to Climate Change in Western mountain Ecosystems**

Agency: US Geological Survey (USGS)

Period: 07/15/09 - 12/31/13

Amount: \$181,000

Supplement and Extension

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Application Number: A52337

P.I.: E. David Ford

Title: **Calculation of Carbon Budgets in Shaded Tsuga Heterophylla and Abies Amabilis**

Agency: US Forest Service

Period: 09/15/09 - 12/31/12

Amount: \$49,446

Supplement and Extension

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Application Number: A52066

P.I.: Jerry Franklin

Title: **Ecosystem Management 6**

Agency: US Forest Service

Period: 04/01/09 - 10/31/09

Amount: \$216,994

Non-Competing Supplement

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Application Number: A51865

P.I.: Jerry Franklin

Title: **Ecosystem Management 6**

Agency: US Forest Service

Period: 10/01/09 - 09/30/10

Amount: \$424,971

Non-Competing Supplement

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Application Number: A50510

P.I.: Fritzi Grevstad  
Title: **Biological Control of Invasive Knotweeds in North America**  
Agency: US Forest Service  
Period: 06/01/09 - 05/31/11  
Amount: \$50,721

We propose research to develop a biological control program for invasive knotweeds, including giant knotweed (*Fallopia sachalinensis*), Japanese knotweed (*F. japonica*), the hybrid between these two (*F. x bohemica*). For 2009 and beyond we will carry out the following objectives: (1) Complete host specificity testing of the psyllid *Aphalara itadori* and the moth *Ostrinia ovalipennis*; (2) Prepare and submit a petition for release of *Aphalara itadori* and (if appropriate) *Ostrinia ovalipennis*; (3) Develop release and monitoring protocols for the Northwest and Northeastern regions; (4) Share information about the knotweed project with landowners, land managers, and the scientific community, including the writing a technology transfer publication on the biology and biological control of knotweeds; (5) If release permits are issued for either insect, we will coordinate and monitor releases.

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Application Number: A51139  
P.I.: Fritzi Grevstad  
Title: **Determining the Suitability of Candidate Biological Control Agents for Gorse**  
Agency: US Forest Service  
Period: 07/16/07 - 07/15/11  
Amount: \$25,000

Supplement and Extension

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Application Number: A51106  
P.I.: Fritzi Grevstad  
Title: **WSDA Knotweed Biocontrol Project**  
Agency: Washington State Department of Agriculture (WSDA)  
Period: 07/01/09 - 06/30/10  
Amount: \$28,955

Two introduced knotweed species, *Fallopia japonica* (Japanese knotweed) and *F. sachalinensis* (giant knotweed), and hybrid between the two, *F. x bohemica* (Bohemian knotweed) are invasive throughout most of the United States. These weeds displace native plants, destroy critical fish and wildlife habitat, and reduce recreational opportunities. The plant is fast spreading and difficult to control, especially in riparian zones. We propose to develop a classical biological control program against Japanese knotweed using natural enemies introduced from Asia. The overall goal is to determine suitability of several insects as biological control agents. Biological control is a cost effective, ecologically sound, and sustainable approach to managing widespread weeds.

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Application Number: A51187  
P.I.: Richard Gustafson  
Co-P.I.: Renata Bura  
Title: **Development of the University of Washington biofuels and bio-based chemicals process laboratory**  
Agency: US Department of Energy (DOE)  
Period: 10/01/08 - 09/30/10  
Amount: \$475,750

We will construct a process laboratory to conduct research on pretreatment of cellulosic biomass for the production of fuels and chemicals. The laboratory will be used to develop optimal pretreatment methods for a range of feedstocks and for production of a wide variety of biorefinery products. Our research will concentrate on mixed biomass feedstocks that will be used by Washington State, and other Pacific Northwest, biorefineries. These feedstocks include agriculture and forest residuals, as well as municipal solid waste. A feature of the research will be development of processes that work well with recalcitrant biomass, such as softwood forest residuals, but that can rapidly change processing conditions to accommodate more easily pretreated biomass, such as agriculture waste (e.g. wheat straw) without production of significant degradation products. This laboratory will also be available to industry for laboratory scale trials to develop new biorefinery processes.

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Application Number: A51493  
P.I.: Thomas Hinckley  
Title: **Eastside Forest Health Forum**  
Agency: US Forest Service

Period: 08/01/09 - 12/31/09  
Amount: \$30,000

The purpose of this funding is to support the planning, management, facilitation, and recording of the Eastside Forest Health Forum to be held in Yakima, Washington, on November 11 - 13, 2009.

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Application Number: A51771  
P.I.: Thomas Hinckley  
Co-P.I.: Jim Lutz  
Title: **Effects of Fire Management on Carbon Sequestration in Sequoia Kings Canyon and Yosemite National Parks**  
Agency: National Park Service (NPS)  
Period: 08/15/09 - 08/01/12  
Amount: \$56,400

Fires release carbon to the atmosphere through the combustion of organic material. Some of these greenhouse gases are returned to the landscape as biomass grows back subsequent to fires. The net change of carbon contained in vegetation on the landscape relative to pre-fire levels depends on the time since burning and the type of vegetation that grows back. However, the rates of above-ground carbon accumulation and the effects of fire on decadal carbon cycling in Yosemite and Kings Canyon National Parks are unknown. The time for a forest to develop following a high severity wildfire can be several centuries, but fires that burn at lower severities may be able to replace biomass lost to fire in decadal timescales. The differing productivities of forests and their attendant regrowth rates, coupled with the characteristic fire return interval of each forest type make it difficult to determine whether fires actually cause a net emission or sequestration of carbon at multi-decadal timescales. At broad scales and over the course of many decades, frequent fire appears to select for forest stands with less dense larger diameter trees that store a greater volume of carbon per unit land area than the stands of more dense but smaller trees that they replace. In addition, forests with larger diameter trees of fire resistant species have complex structure which often includes a high height-to-live-crown, making them less susceptible to catastrophic stand-replacing crown fires, and thus promoting long-term carbon storage. Are such broad-scale results applicable at the smaller scales of time and space relevant to individual fires and the people who manage them? Do changes in fire management strategies that return Sierra Nevada forests to more frequent and lower intensity fire regimes have the co-benefit of increasing the carbon sequestration capacity of these forests? Are the broad-scale results applicable to every forest type in Sierra Nevada?

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Application Number: A51637  
P.I.: Soo-Hyung Kim  
Title: **Plant Urban Response Network (PURN): A Global Network of Plant Research in Response to Urbanization and Climate Change**  
Agency: National Science Foundation (NSF)  
Period: 03/16/10 - 03/15/14  
Amount: \$400,000

Accumulating evidences suggest that urbanization is not only a leading cause of global change but cities themselves can act as surrogates for the future climate and can provide means to look for solutions to global environmental changes. Plant communities in cities, in particular, can offer valuable insights on how plants and associated organisms in highly managed ecosystems respond to the urban climate and consequently global climate change. The broad, long-term goal of this proposed work is to establish a global research network to study physiological, ecological and evolutionary responses of plants, animals, and human interactions to urban climate and global climate change. We propose to establish the Plant Urban Response Network (PURN) as a global-scale observational/experimental platform to gain critical knowledge on plants and associated organisms in their responses to urbanization and global climate change. This network will have strong potential to grow into a large, extensive global network with minimal requirements of physical infrastructures and resources to study the impacts of urbanization and climate change on plants and animals in association with human interactions. As an international research network, it also bears prospects to attract external funding from participating countries, draw international public interests and become an effective educational and outreach means for disseminating research findings.

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Application Number: A51997  
P.I.: Joshua Lawler  
Co-P.I.: Christian Torgersen  
Title: **Develop a Climate-Sensitivity Database for Species in the North Coast and Cascades Network**  
Agency: National Park Service (NPS)  
Period: 09/30/09 - 09/30/11  
Amount: \$99,648

Natural resource managers face an unprecedented challenge – how to plan and manage for the local and regional effects of climate change. In the Pacific Northwest, temperatures and precipitation changes are affecting snowpack levels, hydrology, and disturbance regimes such as fire. These changes will affect species' distributions and phenologies, creating cascading effects on ecological systems that will greatly alter many of the resources of our national parks. To address these impacts, managers need detailed information on which species and systems are most susceptible to climate change and how projected changes in climate are likely to affect them. This project will answer the critical research question of which species are inherently most sensitive to climate change. We will develop a digital database of climate-change sensitivities for species of concern in the national parks of the North Coast and Cascades Network. Assessment of individual species sensitivities will be based on physiology, habitat requirements, interspecific dependencies, dispersal ability, population growth rates, location, and disturbance regime effects. Species sensitivities will be determined using expert review panels, published scientific literature, and pertinent data sets. The database will provide natural resource managers with critical information that can be combined with the management tools already in their toolbox to address climate change. This project could serve as a pilot for a national database serving multiple agencies and organizations. Multi-Park Project This project includes all of the parks in the North Coast and Cascades Network (Table 1). Olympic National Park will be the lead park in facilitating the project between the parks and cooperators at the USGS, the University of Washington, and The Nature Conservancy. A multi-park approach is the most powerful way to address the primary objective of developing a database of climate-sensitivities that can be used by managers at park, network, and regional levels.

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Application Number: A51218

P.I.: John Marzluff

Title: **LTREB: Population and Community Dynamics of Birds Along a Gradient of Urbanization**

Agency: National Science Foundation (NSF)

Period: 03/01/10 - 12/31/14

Amount: \$449,997

The long-term study of animal populations along steep environmental gradients in dynamic settings enables one to determine the relative influence of density-dependent and density-independent factors in the regulation of populations and test a variety of theories concerning the assembly of communities. I propose to build on a 10-year-long study of breeding birds along a gradient of urbanization in the Seattle, WA metropolitan region. By extending the annual estimation of survivorship, reproduction, and population growth of 11 species (varying in life history strategies, but common in the lower strata of suburban, upland forests), and the enumeration of a complex web of interacting breeding birds (including facilitators, predators, and possible competitors), I will test general hypotheses of population regulation, community organization, and the relative influences of climatic variation and anthropogenic disturbance, and contribute specifically to our growing understanding of urban ecology.

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Application Number: A51357

P.I.: Larry Mason

Co-P.I.: Ernesto Alvarado

Title: **A Nationwide Program to Improve Integration and Application of Wildland Fire Science and Traditional Ecological Knowledge in Tribal Communities**

Agency: Bureau of Land Management (BLM)

Period: 09/01/09 - 01/15/10

Amount: \$37,536

This project will promote information exchange between tribes, agencies, research organizations, and institutions of higher learning to explore the feasibility, interest, and utility of developing a nation-wide program to improve information and technology transfer between Indian Tribes and the fire science community. Phone/email contacts and visits to regions (canvassing and meeting with candidates among tribes, agencies, academic institutions and researchers) would identify the level of interest in attending and becoming partners for convening regional workshops. Regional workshops would be designed to exchange information with opportunities for field application of modern fire science and traditional ecological knowledge. Tribal elders, councils, and resource managers will be consulted to develop workshop agendas and focus on topics of local importance. Regional cooperators from the educational community will be sought to provide situational expertise, with special preference given to Indian Colleges. By establishing formal ties between larger universities and tribal colleges, Native American students would have increased exposure to the broader fire science community and could benefit from mentoring programs. Workshops tailored for regional circumstances would provide forums for knowledge transfer and development of interpersonal relationships among tribes, agencies, and academia. Methods to disseminate information would involve contemporary web media, newsletters, alerts, and networks for interpersonal communication. The commitment and expertise of Tribes to national and regional forest health should be recognized as a unique forest stewardship human resource worthy of investment.

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Application Number: A52408

P.I.: L. Monika Moskal

Title: **Dynamic spatiotemporal multi-resolution remote sensing monitoring for sustainable forest health and ecosystem services**

Agency: National Aeronautics and Space Administration (NASA)

Period: 06/16/10 - 06/15/13

Amount: \$351,877

Sustainable forest health is the primary factor enabling forest ecosystems to deliver a broad range of ecosystem services. These services benefit society in a number of ways, include: carbon sequestration, water quality mediation, air quality, biodiversity and cellulosic production for biofuels, such as ethanol. Forestry has a long history of relying on remote sensing and geospatial analysis as a management decision support tool. Traditionally, only one or a narrow and limiting range of remote sensing data have been utilized to address forest ecosystems. For example, aerial photography for stand level analysis, or satellite imagery for landscape level investigation. The scale of forest ecosystem analysis is interlinked, thus, processes occurring at a local scale are impacted by phenomena occurring at the regional and global scales. This is fundamentally true for forest health. For instance, global climate change has implications on local forest health conditions such as susceptibility to insect attacks and fire. This project is built on the hypothesis that to understand and thus sustainably manage for forest health and ecosystem services, a monitoring approach needs to link, harmonize and integrate a multi-scale and multi-resolution array of remote sensing platforms capable of assessing the spatiotemporal and spectral conditions of the landscape. The main goal of the proposed research is to develop such an approach. More detailed research objectives include: (1) developing a dynamic framework for unifying multi-resolution remotely sensed data; (2) calibrating the framework through spatiotemporal analysis; and (3) applying the framework to monitoring of forest health and ecosystem services. Objective 1 derives from the widely successful sensor fusion for ecosystem applications. The proposed approach will utilize an object-based feature segmentation to delineate forest stands. The segmentation at the stand level is the most desirable theme for management decision making and will be used as the unifying theme integrating finer grain detail (aerial and field data) and coarser grain landscape context (satellite data). The detail and context information will be extracted using a dynamic and modular hierarchical approach from terrestrial, aerial and satellite sources. Objective 2 will focus on understanding the optimal sampling strategies needed to calibrate and validate the framework approach, and the uncertainties to be expected. Specifically, the spatiotemporal approach will utilize spatial statistics and time series analysis. Objective 3 will be addressed through forest health and ecosystem services themed case studies involving Pacific Northwest Indian Tribes. The project integrates a multiphase interlinked educational and public outreach (EP/O) plan focused on academics, public outreach and technology transfer. The main goal of the EP/O plan is to disseminate the tools and technology for sustainable forest ecosystem management by adhering to the following objectives: (1) engage students in remote sensing and geospatial technology application to understand forest ecosystems; (2) provide continuity by the dissemination of research project products to the forestry community and to the public including K12 students; and (3) forge new and sustainable partnerships with local and international entities involved in ecosystem management. Both research and EP/O plans' objectives strongly support the NASA Education Strategic Coordination Framework and the NASA Earth Science research Strategic Sub-goal to expand and accelerate the realization of societal benefits from Earth systems science. Knowledge drawn from this research will define a path for integrating future NASA systems to monitor terrestrial ecosystems. The strides made in the application of this approach to forestry will demonstrate the potential of the same technique for other environmental monitoring applications at local, regional and global scales.

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Application Number: A51303

P.I.: L. Monika Moskal

Title: **Spatial Analysis of Recreational Impacts in Mount Rainier National Park**

Agency: National Park Service (NPS)

Period: 08/05/09 - 06/01/10

Amount: \$7,000

Recreational use of national parks presents a complex challenge for park managers and resource specialists. Parks are directed to regulate the use of national parks while preserving natural processes and ecosystems for future generations in such a manner that leaves them unimpaired. The goal of this project is to investigate the use of spatial statistics to evaluate the geospatial influence of social trails and campsites on ecosystems within Mount Rainier National Park (MORA). By evaluating these indicators within the context of the ecological landscape, resource managers at MORA will be able to develop a more cost-effective index of ecological integrity as "early warning" signs of unacceptable ecosystem change.

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Application Number: A51395

P.I.: L. Monika Moskal

Title: **Urban Natural Resources Stewardship: Geospatial Data Assessment and Management**

Agency: US Department of Agriculture (USDA)

Period: 10/01/09 - 08/20/10

Amount: \$30,000

The purpose of this JVA is to launch a partnership for identifying, assessing, and organizing social and biophysical data that can be used to help support the urban natural resources research initiative being developed in Seattle. The project will include basic analysis work including geospatial and statistical analysis and joint work on research questions of interest and research reports and publications

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Application Number: A52024

P.I.: Joseph Roos

Title: **Asian Markets for Renewable Wood Pellet and Biomass Energy**

Agency: US Forest Service

Period: 01/01/10 - 12/31/12

Amount: \$35,000

The global wood pellet market for 2006 was estimated at 7 million tons and this is a growing market (Wood Pellet Association of Canada). Furthermore, Asia is expected to become the largest energy market, surpassing North America, by 2030. Wood pellets offer a way for sawmills to efficiently utilize their residual product and also offer an alternative to fossil fuels for heating purposes. Asian markets are aggressively seeking out renewable energy sources. China's energy policy calls for 10% of energy to come from renewable resources by 2020. Japan has also been increasing their consumption of fossil fuel alternatives as they strive to meet their Kyoto Protocol requirements. Korea is a leader in biomass power plants and has a plant that utilizes 145 tons of wood chips and pellets daily to generate 50 kW of electricity an hour (Peksa-Blanchard et.al. 2007). The biomass and wood chip markets are developing rapidly in Asia and it is important to examine potential markets for wood chips produced in Alaska.

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Application Number: A52279

P.I.: Joseph Roos

Title: **Korean Niche Market for Alaska Forest Products**

Agency: University of Alaska, Fairbanks

Period: 01/01/10 - 12/31/12

Amount: \$40,000

The reduced harvest volume has forced Alaska forest products manufacturers to seek out higher value added niche market. Korea is a growing market that has the potential to be a strong part of Alaska's international forest products industry. However, little research exists regarding how forest products exported to Korea are being used. The purpose of this research project is to research the potential Korean market for Alaska logs and lumber.

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Application Number: A51977

P.I.: Clare Ryan

Title: **Communication in NEPA Decision-Making: Writing an Effective Environmental Document**

Agency: US Forest Service

Period: 08/15/09 - 06/30/13

Amount: \$74,300

Dramatic changes in demographics and population growth, the structure of international markets, technology trends, and processes of new governance and public decision-making shape the contemporary reality in which public resource management agencies such as the U.S. Forest Service must operate. Over the past couple of decades environmental documents have become very voluminous collections of data aimed largely at trying to withstand legal challenges. In many cases these documents are not clearly written, are poorly organized, and are presented in a format that is difficult to follow and have become incomprehensible to not only the general public but have not aided in decisionmaking. Understanding effective ways to communicate NEPA decisions may lead to quicker implementation of decisions, fewer conflicts and challenges to agency decisions, and ultimately improved management of public lands and natural resources; this is the goal of the proposal.

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Application Number: A52257

P.I.: Sandor Toth

Title: **Dynamic Reserve Selection: Modeling the Land Price Feedback Effect in Strategic Land Retentions in Western Washington**

Agency: US Forest Service

Period: 09/06/07 - 12/31/12  
Amount: \$29,993

Supplement and Extension

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Application Number: A52015  
P.I.: Sandor Toth  
Co-P.I.: Gregory Ettl, Sergey Rabotyagov  
Title: **ECOSEL – An Auction Mechanism for Forest Ecosystem Services**  
Agency: National Science Foundation (NSF)  
Period: 04/01/10 - 03/31/13  
Amount: \$1,147,281

We propose to build, test and deploy a novel auction mechanism, called ECOSEL that was designed to provide forest ecosystem services to the public in an efficient, fair and profitable way. The concept combines multi-attribute decision theory with a unique auction mechanism in an attempt to match willing sellers of forest ecosystem services with willing buyers. ECOSEL uses multi-objective mathematical programming to identify forest management plans that lead to Pareto-optimal bundles of eco-services and solicits bids for these bundles. The costs of implementing the plans serve as reserve prices and the plan with bids whose combined value most exceeds the reserve price at the end of the auction is implemented. We seek funding to (1) build a fully functional web-based implementation of the ECOSEL concept, (2) test and fine-tune the design variables of the auction mechanism both theoretically and empirically, (3) run a real auction for the University of Washington's Pack Forest, and (4) study the participants' bidding behavior as well as the winning management scenario to better understand people's monetary preferences with respect to forest ecosystem services. We also request dollars to expand the use of ECOSEL as an educational tool in natural resource management and environmental economics classes, and as laboratory equipment for economists to study voluntary public goods contribution games. Intellectual Merit: People's monetary values with respect to forest ecosystem services are poorly understood. While stated preferences are clearly in favor of environmental benefits, revealed consumption patterns for wood products or real estate indicate otherwise. To what extent are people willing to make monetary sacrifices to promote the healthy, integral forest ecosystems that they demand? We propose a tool that has the potential to provide a tangible, quantitative answer to this question. ECOSEL is fundamentally different from cap-and-trade and other regulatory schemes in that it bypasses a complex and often expensive valuation exercise and derives dollar values directly for eco-services based on monetary transactions. The novelty of the approach is not limited to utilizing an efficient frontier of management plans as an auction platform for public goods. The auction mechanism itself is entirely new. In the initial, open phase of the bidding process, each participant can assess the other players' anonymous bids and build, or even dynamically revise their own strategy. This not only allows groups who demand different but compatible ecosystem services to bid collectively on management plans that bundle multiple benefits, but it also forces them to learn about the resource, its tradeoffs, and about the values of other constituents. The second, final phase of the auction is sealed to minimize free riding. Broader Impact: Forest-dependent communities in the United States suffer greatly from volatile timber prices, housing downturns, regulatory restrictions and the nation's increasing reliance on import wood. Conversion to non-forest land uses such as real estate is often the landowner's most profitable option. As a result, hundreds of thousands of hectares of non-federal forestland are lost each year due to urban sprawl (Alig et al. 2003). Market-based methods that can offset the costs incurred by owners who preserve their forests and provide ecosystem services such as wildlife habitat could mitigate conversion risk. The development of these methods, however, has been largely unsuccessful because the public nature of most forest goods renders conventional equilibrium-driven pricing mechanisms to fail. ECOSEL was specifically designed to overcome these technical difficulties. A successful deployment of this research product would have a tremendous positive impact on rural communities who depend on forest revenues. Society would also benefit greatly by gaining access, through competitive bidding, to land management decisions on private lands that provide public goods.

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Application Number: A51149  
P.I.: Stephen West  
Title: **Eastern Gray Squirrel Ecology and Interactions with Western Gray Squirrels on Ft. Lewis, WA**  
Agency: Washington State Department of Fish and Wildlife  
Period: 07/01/09 - 06/30/11  
Amount: \$58,097

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 Fort Lewis, we have equipped eastern and western gray squirrels with radio-collars to investigate resource use and interactions between these species. Results of this study will aid management and recovery of western gray squirrels.

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Application Number: A52873

P.I.: Aaron Wirsing

Title: **Using snowshoe hare responses to forest stand structure and fragmentation to guide lynx recovery in Washington**

Agency: Royalty Research Fund (RRF)

Period: 05/01/10 - 05/01/11

Amount: \$39,073

In Washington, the Canada lynx (*Lynx canadensis*) has been reduced to a few small populations occupying the montane forests of the North Cascades east to the Columbia plateau. This decline owes largely to loss of habitat supporting snowshoe hares (*Lepus americanus*), on which the lynx specializes, stemming from stand replacing fires, insect outbreaks, and timber harvest. Thus, lynx recovery in Washington will require active management for forests that promote hare availability. At present, however, information that might be used to guide such management is lacking. Accordingly, I am asking for funds to explore the relationship between two key forest features that can be manipulated by managers – stand understory structure and the amount of fragmentation (stand size) – and the availability of hares to lynx in the Loomis State Forest, which is one of the last lynx sanctuaries in this state. Forest features associated with heavy hare use and lynx hunting success, or in other words high hare availability, will be determined from movement tracks and fates of hares equipped with mortality-sensitive global positioning system (GPS) collars. We will then use these features to both inform the development of a forest management strategy that promotes lynx recovery in Washington and more reliably predict how future forest alteration resulting from climate change and human activity will affect the predator-prey relationship between this imperiled carnivore and its principal prey species.

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Application Number: A51616

P.I.: Kathy Wolf

Title: **Human Well-Being Benefits of Urban Forests: Completion of a Research Assessment & Summary**

Agency: US Forest Service

Period: 09/30/09 - 12/31/10

Amount: \$25,000

Scientific studies demonstrate the broad array of benefits provided by urban forests. Such benefits are generally grouped as environmental, economic and social, a framework that aligns closely with definitions of urban sustainability. Social benefits are the focus of this project. “Human well-being” is used here to describe the human need for nearby nature in the everyday settings where people live, work, play, and learn. Scientific studies on urban nature experience and human well-being were assessed and summarized in an earlier project to present the scientific work in a format that is accessible to public and professional audiences. A framework of benefits themes was created and a subset of five topics was developed into full literature summaries. In this project seven additional benefits summaries will be completed, and web based delivery of the content will be finalized. The products of this work will inform: 1) more effective communications about well-being benefits of urban nature, 2) goals for geospatial modeling of benefits, and 3) goals for economic valuation of benefits.

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Application Number: A51190

P.I.: Kathy Wolf

Co-P.I.: L. Monika Moskal, Clare Ryan

Title: **Urban Ecosystems in the Seattle Metro Region: Linking Policy and Stewardship at Multiple Scales**

Agency: National Science Foundation (NSF)

Period: 10/01/09 - 09/30/11

Amount: \$286,579

The ULTRA-Ex grant program is a precursor to the establishment of a national network of long-term urban ecology study sites. This proposal builds on the needs and opportunities for urban ecosystem studies in the Seattle metro region, with eventual expansion across the landscape gradient (from white cap to snow cap) throughout the Puget Sound basin. This initial research will investigate the extent, dynamics, and outcomes of urban natural resources stewardship. Ecological and planning based policies are typically implemented across large-scale geographies, and over extended time frames. Associated with such programs are often expansive outcomes indicators. This project will instead investigate the potential of near term, iterative outcomes indicators as an adaptive approach to understanding ecosystem condition. In addition, stewardship programs will be investigated, as the extent of stewardship activity is now little understood, as well as resulting landscape changes and co-benefits or ecosystem services. This research program will generate fundamental knowledge about reconciliation ecology that integrates human communities and social systems. It will also provide practical recommendations for agency or NGO stewardship programs. The resulting integrated, coupled human/natural system investigations will be the foundation for the ULTRA: Seattle study

site.

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