



UNIVERSITY *of* WASHINGTON

**School of Forest Resources**

**RESEARCH NEWSLETTER ISSUE ONE, VOLUME 11**

August 28, 2010

**AWARDS Page 1**

**PROPOSALS SUBMITTED Page 10**

**Awards**

Application Number: A58107

Faculty Member: Ernesto Alvarado

Faculty Member: James Agee

Role: Principal Investigator

Role: Co-Investigator

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

Agency: USDA Forest Service

Period: 2009-04-01 - 2014-03-31

Amount: \$528,788

Non-Competing Supplement

The amendment to the Joint Venture Agreement with the USFS proposed will generate, develop, apply and transfer science-based information, strategies and tools for fire management in public lands. This agreement supports USFS PNW FERA's research vision to:

- A. Enhance programmatic fire planning, large fire decision support, hazardous fuel characterization and management, hazard assessment, fire behavior prediction, fire danger rating, and carbon flux assessments.
- B. Promote attainment of desired future conditions and ensure the long-term integrity of ecosystems under a changing climate scenario, reduce air quality impacts and carbon emissions, and contribute to carbon management.

- C. Improve fire management effectiveness and safety of firefighters and communities, and advance national and regional policy goals to reduce management costs.
  - D. Enhance restoration of healthy, resilient, fire-adapted ecosystems through evaluation of integrated fire/fuel management practices.
  - E. Develop a research-management partnership of USFS research stations and national forests to develop the decision support needed by the US Forest Service to incorporate climate change into management and planning of federal lands in the western US.
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Application Number: A60010

Faculty Member: Stanley Asah

Faculty Member: Clare Ryan

Role: Principal Investigator

Role: Co-Investigator

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

Agency: USDA Forest Service

Period: 2009-09-15 - 2013-12-31

Amount: \$45,000

Non-Competing Supplement

The Millennium Ecosystem Assessment (MEA) established the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human wellbeing. (MEA, 2005). The MEA focuses on ecosystem services (ESs) grouped into four broad categories: (i) Supporting services like nutrient cycling, (ii) Provisioning services like timber and food (iii) Regulating services like nutrient cycling/carbon sequestration, and (iv) Cultural services like recreation and aesthetics.

The USDA Forest Service is developing the concept of ecosystem services as a framework for forest stewardship. The concept development will include: (i) identify, define and explain ESs to increase public perception and understanding of the goods and services produced from public lands; (ii) use ESs as a platform for involving partners in forest planning, project design and funding; (iii) help managers integrate ESs into decision making; and (iv) assess the impacts of project-level management activities on identified ESs. With a particular focus on cultural ESs, this study seeks to facilitate the collective identification and definition of ESs by relevant stakeholders.

The original research objectives were:

- (1) Bring together relevant forest sector stakeholders to collectively identify and define ESs particularly, cultural ecosystem services.
- (2) Contribute to problem analysis identifying management challenges that an ESs framework can address.
- (3) Serve as the primary basis for a quantitative assessment of cultural ESs for hypotheses testing, scenario analysis, and decision making.
- (4) Identify knowledge gaps and research needs pertinent to the use of ESs as a framework for forest management.
- (5) Examine potential threats, including fire and fire management actions, to cultural ESs.

As a result of the analysis of the first phase of interviews, the University Cooperators and PNW scientists have decided to add the following new objectives:

- (1) Perform an in depth exploration of emergent constructions (e.g., enhanced sense of place, trust, medium for inter-cultural understanding, venue for self-expression, stewardship opportunities) of cultural Ecosystem Services as nested benefits within a more holistic systems framework.
  - (2) Conduct a more in-depth investigation and analysis of the emergent constraints to the provision of cultural ecosystem services within the Deschutes National Forest.
  - (3) Conduct a survey of the residents of the Deschutes County to assess the prevalence/cultural demand and preferences of Ecosystem Services among this population.
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Application Number: A58882  
Faculty Member: David Briggs  
Role: Principal Investigator  
Title: **Stand Management Coop**  
Agency: Stimson Lumber Company  
Period: 2010-01-01 - 2010-12-31  
Amount: \$14,990  
Supplement and Extension

2010 Membership Dues to Stand Management Coop by Stimson Lumber Co.

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Application Number: A60159  
Faculty Member: Sally Brown  
Role: Principal Investigator  
Title: **Biosolids information and education program**  
Agency: Northwest Biosolids Management Association  
Period: 2006-07-01 - 2012-06-30  
Amount: \$172,980  
Non-Competing Supplement

UW staff will continue to provide public information, regulation development, and technical support to the King County Biosolids program. As detailed in the Scope of Work, this will include the following: 1) providing public information through committee support, a community assistance/resource information center, information gathering, and assisting in the BW Biosolids Conference; 2) regulation development, including committee support and regulatory interpretation; 3) research and demonstrations to include W-170 group interaction and projects involving A. the fate of organic compounds in biosolids amended soils, B. Canola growth using biosolids, and C. lead arsenic and compost; 4) continuing special research projects with the King County Biosolids Program on Canola for Biodiesel, gravel pit, biosolids basics, Class A soil mixes, and organic contaminants; 5) attending NBMA general and board meetings.

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Application Number: A57637

Faculty Member: John Calhoun

Role: Principal Investigator

Title: **Clallam County Shoreline Master Program Update: Shoreline Inventory and Characterization Plan, Restoration Plan, and Technical Advisory Committee Management**

Agency: Clallam County

Period: 2010-04-15 - 2011-04-30

Amount: \$50,220

New

ONRC will provide meeting facilitation, consultation and project coordination to Clallam County for the Watershed Resource inventory Area (WRIA) 20 Shoreline Master Program Update.

ONRC will consult with and facilitate input from the WRIA 20 Technical/Policy Advisory Committees--WRIA 20 Watershed Planning Unit, North Pacific Coast Lead Entity, and Coastal Marine Resources Committee—to assist Clallam County in completing the following four WRIA 20 SMP update tasks:

1. Visioning
2. Shoreline Inventory and Characterization
3. Preliminary Restoration Planning
4. Preliminary Shoreline Management Program Elements

ONRC will design and facilitate a WRIA 20 shoreline visioning process with the goal to engage the public in defining the future of Clallam County shorelines. Visioning efforts will gather and compile a broad spectrum of public input using a variety of methods including meeting with and facilitating input from the WRIA 20 Technical/Policy Advisory Committee, designing and facilitating a Regional Visioning Forum, conducting surveys/interviews with WRIA 20 landowners, shoreline users, Treaty Tribes, and Natural Resources Managers.

ONRC will prepare a WRIA 20 Shoreline Inventory and Characterization Report consistent with WAC 173-26-201. The report will include maps that provide an analysis of the inventory data, ecosystem characterization and shoreline functions, shoreline use and public access findings as they relate to development of an effective SMP. The report will present findings and recommendations in a way that is useful for making SMP planning decisions. This report will provide a foundation for establishing shoreline goals, policies, environment designations, policies and implementing regulations designed to achieve no net loss of ecological functions necessary to support shoreline resources and to plan for the restoration of the ecosystem-wide processes and individual ecological functions on a comprehensive basis over time. The report will identify any significant data gaps, focusing on information that would be useful to support shoreline program development and implementation.

This project phase is to evaluate and develop concepts, recommendations, and strategies to guide and support updates to the Clallam County Shoreline Master Program consistent with state shoreline master program guidelines.

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Application Number: A59478



Period: 2010-07-01 - 2011-06-30

Amount: \$184,632

New

The past several years have seen a reversal in most of the macroeconomic factors affecting the US forest products industry, particularly the residential housing sector where housing starts dropped from 2.1 million in 2005 to just 551,000 in 2009. In contrast to the weak domestic market, US exports of wood products increased through 2008 before dropping in 2009, with the weak US dollar helping to improve the international competitiveness of US wood products. With prices low and domestic demand weak, many forest products manufacturers have begun looking to offshore markets again. However, by abandoning their traditional export markets over the past fifteen years, US forest products producers find themselves in the difficult position of reestablishing their presence in export markets. While the high quality and competitive prices of US forest products should help to ease their reentry into these markets, many exporters have lost touch with trends in international markets. In 2009 the US government amended the Lacey Act to require that imported wood products not be manufactured from illegally harvested wood while the Japanese and EU governments have implemented public procurement programs that require legality for imported wood. All of these developments will affect the international competitiveness of US wood exporters. Understanding these measures is critically important in helping guide US wood products exporters determine whether or not to export their products and identify which markets are the best match for their products and marketing capabilities. CINTRAFOR has consistently made the case that exporting broadens a forest products manufacturers' market portfolio, improves their competitiveness and helps offset the market volatility inherent in individual markets since the economies of most countries tend to be countercyclical. This project will provide timely and relevant market information to help manufacturers develop and implement their export strategies. The objectives of this project are: 1) identify changes in the business environment in traditional export markets, 2) identify emerging markets and evaluate potential export opportunities, 3) identify regulatory constraints that adversely impact the competitiveness of US wood products, and 4) broadly disseminate timely and relevant market research to US forest products exporters.

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Application Number: A60178

Faculty Member: E. David Ford

Role: Principal Investigator

Title: **Calculation of Carbon Budgets in Shaded Tsuga heterophylla and Abies amabilis**

Agency: USDA Forest Service

Period: 2009-09-15 - 2012-12-31

Amount: \$51,427

Non-Competing Supplement

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: A51187

Faculty Member: Richard Gustafson

Role: Principal Investigator

Title: **Development of the University of Washington biofuels and bio-based chemicals process laboratory**

Agency: US Department of Energy

Period: 2008-10-01 - 2010-09-30

Amount: \$475,750

New

Project goal is construction of 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. Project will concentrate on mixed biomass feedstocks that will be used by Washington State and other Pacific Northwest biorefineries, including agriculture and forest residuals, as well as municipal solid waste. A research objective is to develop 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. The laboratory will be available to industry for laboratory scale trials to develop new biorefinery processes.

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Application Number: A57147

Faculty Member: Charles Halpern

Role: Principal Investigator

Title: **Long-Term Responses of Vegetation to Variable-Retention Harvests in the PNW**

Agency: USDA Forest Service

Period: 2008-06-16 - 2012-06-15

Amount: \$171,000

Non-Competing Supplement

In the Pacific Northwestern region of the US, structural or "green-tree" retention has replaced clearcut logging on federal forest lands subjected to timber harvest. The Demonstration of Ecosystem Management Options (DEMO) experiment was established in 1994 to examine the responses of diverse

groups of forest organisms to structural retention harvests in mature forests of the Pacific Northwest. Studies of vegetation response form the foundation of this experiment. Our goals are threefold: (1) to elucidate the 10-yr responses of overstory and understory communities to varying levels and patterns of retention; (2) to provide basic information on changes in forest structure that can aid in understanding the responses of other groups of forest organisms to structural retention; and (3) to assess the need for, and desirability of, future silvicultural treatments based on the distribution and density of regenerating trees.

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Application Number: A48147

Faculty Member: Robert Lee

Role: Principal Investigator

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

Agency: WA Higher Education Coordinating Board

Period: 2009-07-01 - 2012-06-30

Amount: \$938,624

New

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: A59333

Faculty Member: John Perez-Garcia

Role: Principal Investigator  
Title: **Exploring the Economics of Forest Restoration**  
Agency: USDA Forest Service-PNW  
Period: 2010-10-01 - 2011-12-31  
Amount: \$20,000  
New

The PNW Research Station's Urban Wildland Interaction Team (UWI) is developing a new program focusing on forest restoration economics. The purpose of this agreement is to generate, disseminate, and integrate economic analysis techniques into forest restoration activities in the Pacific Northwest region. Specifically, the objectives of this agreement are to investigate the state of economics as an analysis tool for restoration projects, estimate market and non-market impacts of restoration activities in the Pacific Northwest, identify ways to incorporate economics into restoration planning and evaluation, describe barriers to integration, and develop and communicate a baseline understanding of methods and data required to estimate benefits and costs to land owners and managers. Knowledge gaps and research needs of forest managers and landowners conducting restoration activities in the region will also be examined. Washington and Oregon will be the study area.

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Application Number: A60661  
Faculty Member: Sarah Reichard  
Role: Principal Investigator  
Title: **BLM Ex Situ Seed Conservation**  
Agency: USDI Bureau of Land Management  
Period: 2010-06-01 - 2011-12-31  
Amount: \$13,000  
New

Washington Rare Plant Care and Conservation will provide curation services to the Bureau of Land Management for seeds of rare plant species held for BLM in the Miller Seed Vault. Rare Care will also collect seeds from rare plant populations located on BLM land in Washington. Seeds will be stored in Miller Seed Vault for BLM for future use in research and restoration projects.

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Application Number: A60097  
Faculty Member: Sandor Toth  
Role: Principal Investigator  
Title: **Integrating Carbon and Other Ecosystem Services into a Framework for Forest Management**  
Agency: USDA Forest Service  
Period: 2010-09-01 - 2012-08-31  
Amount: \$30,000  
New

Faculty Member: Gregory Ettl  
Role: Co-Investigator

The overall objective of the FY2010 grant is to develop a research proposal that will allow the Deschutes National Forest to analyze the tradeoffs that exist behind different forest ecosystem services at certain project sites that yet are to be identified. The objectives of this scoping proposal are to determine a range of potential ecosystem services and their potential to be optimally provided, setting the stage for a larger project. Here we propose to: 1) identify a range of potential sites, 2) determine the spatial and temporal scale associated with native forest types and unique pilot sites, 3) identify key ecosystem services that are most important for each set of sites, 4) conduct a literature review of key ecosystem services identified, 4) develop a sampling scheme and rationale for a ground-based and modeled estimate of C for the Deschutes National Forest, and 5) draft an initial model for optimization based on potential combinations of ecosystem services. The deliverables will include a literature review of ecosystem services associated with vegetation types and unique habitats in the Deschutes NF and a proposal to evaluate optimal provision of those ecosystems in the future.

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## Proposals

Application Number: A60009

Faculty Member: Ernesto Alvarado

Faculty Member: James Agee

Role: Principal Investigator

Role: Co-Investigator

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

Agency: USDA Forest Service

Period: 2009-04-01 - 2014-03-31

Amount: \$404,209

Non-Competing Supplement

This amendment to the Joint Venture Agreement (JVA) will continue the support of the research conducted by the Fire and Environmental Research Team (FERA) at the USFS Pacific Wildland Fire Sciences Laboratory for the Interagency Joint Fire Sciences Program. The research will be conducted and applied to national forests under the administration of the USFS and other federal agencies, and throughout North America.

Specific objectives for this amendment to the cooperative research are:

- To continue collecting fuel consumption data and environmental variables from a series of prescribed fires in National Forests of the SE United States to improve fuel consumption models for southern and north central forest regions of the United States.
  - To continue a study of fuel amount and composition following dormant and growing season prescribed fires for flatwoods pine ecosystems in the southern United States.
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Application Number: A60096

Faculty Member: Ernesto Alvarado

Role: Principal Investigator

**Title: Fire, Climate, and Smoke Research**

Agency: USDA Forest Service-PNW

Period: 2010-09-01 - 2015-08-31

Amount: \$82,500

New

This Joint Venture Agreement will support the USFS Atmosphere and Fire Interactions Research Team (AIRFire) research to improve understanding of the role of weather and climate in fire and other ecological disturbances and to develop decision support tools for ecosystem management, fire operations, planning, and smoke management based on meteorology, air quality engineering, and climate dynamics. The purpose of this agreement is to advance climate, fire, and smoke science in support of building a better understanding of how fire is affected by and affects the atmosphere, including weather and climate, and how this knowledge can be used to develop scenarios and tools to better inform land managers.

Specific objectives for this joint venture agreement are:

Specific Tasks for this agreement:

- To participate the development of the next generation of a Fire Scenario Builder.
  - Support the growth, development, and research of graduate students and undergraduates at the School of Forest Resources as their research pertains to fire, climate, and smoke research.
  - Support high-end computer modeling and analysis of large data sets of fire, climate and smoke at the Pacific Wildland Fire Sciences Laboratory.
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Application Number: A60137

Faculty Member: Ernesto Alvarado

Role: Principal Investigator

**Title: Fuel & Fire Hazard Assessment at the USFS Savannah River**

Agency: USDA Forest Service

Period: 2011-01-01 - 2011-12-31

Amount: \$14,992

Supplement and Extension

The purpose of this amendment to the Challenge Cost Share Agreement is to work cooperatively to continue development of a fuel and fire hazard assessment for the USFS Savannah River Site using the Fuel Characteristic Classification System, and to complete the development and analysis of a matrix of FCCS fuelbeds and fire potential predictions that represent the range of prescribed fire conditions. Under this new funding agreement, the SRS, the USFS PWFSL, and the University of Washington teams propose to expand the capacity of FCCS to the evaluate the effectiveness of fuel treatments conducted in the spring of 2010. The results of this study will allow us to: (1) improve the spatial resolution and accuracy of fire hazard assessments at SRS in order to evaluate different fuel treatment options, (2) expand the capacity of FCCS to be applied to landscape-level fire hazard assessment, (3) refine the FCCS fuelbeds that have been developed during the initial phase of this agreement to reflect the changes on fuelbeds caused by treatments of hazardous fuels.

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Application Number: A59617

Faculty Member: Jonathan Bakker

Role: Principal Investigator

Faculty Member: Matt Davies

Role: Co-Investigator

Title: **Forecasting the effects of climate change on species distribution in shrub steppe**

Agency: National Aeronautics and Space Administration

Period: 2011-04-01 - 2014-03-31

Amount: \$722,697

New

Our ability to predict the effects of climate change clearly requires that we understand the relationship between plant species distributions and climate. However, climate is not the only factor affecting species distributions – they are also affected by disturbances, fragmentation, etc. We will focus on the shrub steppe of south-central Washington, particularly the Hanford Reach National Monument and surrounding lands. We will build a geospatial database (~800 m pixel) containing predictor variables related to climate (temperature, precipitation, carbon dioxide), edaphic factors (soil type, elevation, aspect, slope), disturbance history (fire severity, years since last fire, EVI, NDVI, land use change). Predictor variables will be obtained from remotely sensed sources, regional climatological data, and local land management agencies. Species presence/absence will be obtained from permanent plots, herbarium records, and other sources. We will classify plant species by functional type (e.g., grass vs. shrub), size of current range (e.g., endemic vs. throughout Intermountain West), and nativity (i.e., native or introduced to North America). For select species spanning this classification, we will use ensemble distribution models to construct a series of three models: i) historical fundamental niche (based on climate and edaphic characteristics along with species presence data from relatively undisturbed areas/times), ii) realized niche (based on climate and edaphic characteristics, species presence/absence data, and disturbance history), iii) future fundamental niche (application of climate relationships from historical fundamental niche to predicted future climate in 2035 as determined from ensemble global circulation models). The resulting distribution models will increase our understanding of which groups of species have the strongest associations between their distributions and climate. These models will also provide management tools to prioritize management activities. For example, areas that are within the future fundamental niche but outside of the current realized niche would be a high priority for restoration, while those that are outside of the future fundamental niche would be a low priority.

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Application Number: A59667

Faculty Member: Jonathan Bakker

Role: Principal Investigator

Title: **Using plant traits to predict community dynamics and ecosystem functions**

Agency: National Science Foundation

Period: 2011-03-16 - 2014-03-15

Amount: \$693,697

New

Ecology has long focused on interactions between groups defined by taxonomic status and/or life form, but the predictive capabilities of this ‘taxonomic ecology’ are limited by context dependency and stochasticity. An alternate conceptual framework focuses on plant functional traits. These traits strongly influence community dynamics and ecosystem functions, though our predictive capabilities are limited at present. In part, this is because we have surprisingly little data about the traits of most species. The overall goal of this research program is to develop predictive trait-based models of community dynamics and ecosystem functions. The specific objectives of this project are to: A) quantify inter- and intra-specific variation in functional traits, B) determine the effects of functional diversity on community dynamics and ecosystem functions by creating a ‘trait library’ for the regional species pool and applying it to several extant experiments, and C) experimentally assess the effects of functional diversity by assembling communities that differ in functional diversity and quantifying community dynamics and ecosystem functions within them. We will address these objectives through a combination of observational studies, value-added analyses of extant experiments, and an experiment that uses a novel method to assemble experimental communities. The prairies of western Washington are our study system. The regional species pool for this ecosystem includes ~ 300 species, ranging from endemic native species to globally distributed exotic species.

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Application Number: A60159

Faculty Member: Sally Brown

Role: Principal Investigator

Title: **Biosolids information and education program**

Agency: Northwest Biosolids Management Association

Period: 2006-07-01 - 2012-06-30

Amount: \$172,980

Non-Competing Supplement

UW staff will continue to provide public information, regulation development, and technical support to the King County Biosolids program. As detailed in the Scope of Work, this will include the following: 1) providing public information through committee support, a community assistance/resource information center, information gathering, and assisting in the BW Biosolids Conference; 2) regulation development, including committee support and regulatory interpretation; 3) research and demonstrations to include W-170 group interaction and projects involving A. the fate of organic compounds in biosolids amended soils, B. Canola growth using biosolids, and C. lead arsenic and compost; 4) continuing special research projects with the King County Biosolids Program on Canola for Biodiesel, gravel pit, biosolids basics, Class A soil mixes, and organic contaminants; 5) attending NBMA general and board meetings.

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Application Number: A60177

Faculty Member: John Calhoun

Role: Principal Investigator

Title: **Building a Web-Based Interface to the Restoration Silviculture Initiative**

Agency: USDA Forest Service

Period: 2009-09-15 - 2012-12-31

Amount: \$83,213

Non-Competing Supplement

Decision-making may properly be regarded as a problem solving activity which is terminated when a satisfactory solution is found. Therefore, decision making is a reasoning or emotional process which can be rational or irrational, can be based on explicit assumptions or tacit assumptions. The rational-iterative approach is one such decision-making process that is particularly suitable for management of forest ecosystems. Repeated iterations of feedback between analysts and decision-makers lead to the development of an understanding of the tradeoffs among objectives for the decision-makers.

Many small, non-industrial land owners now face the important decision of continuing to invest in forestry in the face decreasing revenue potential, or to divest. This is particularly true where riparian regulations are in effect; this project will continue to develop management models and coordinate their online deployment. Of particular emphasis is content directed at riparian management decision-making.

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Application Number: A60650

Faculty Member: Douglas Deur

Role: Principal Investigator

Title: **A Study of Traditional Activities in the Exit Glacier Area of Kenai Fjords National Park**

Agency: USDI National Park Service

Period: 2010-08-01 - 2013-11-23

Amount: \$15,627

New

This project is a collaborative effort between the National Park Service (NPS) and the University of Washington to use detailed oral histories already compiled among individuals from the Seward area, along with secondary sources, to research and write a report entitled "Traditional Activities in the Exit Glacier Area of Kenai Fjords National Park." The central portion of the park contains the Harding Icefield, one of the largest ice fields in the United States, from which no fewer than 38 active glaciers exit into valleys and tidewater locations surrounding the park. Of these glaciers, Exit Glacier is the most publicly accessible, with road access from the town of Seward. The life histories and other information presented in this report will provide insights into the history of Seward that will be of value to NPS interpreters. This information will also describe Seward residents' traditional activities, as defined by Title XI of the Alaska National Interest Lands Conservation Act (ANILCA), in and around Seward with special emphasis on the Exit Glacier area.

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Application Number: A60178

Faculty Member: E. David Ford

Role: Principal Investigator

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

Agency: USDA Forest Service

Period: 2009-09-15 - 2012-12-31

Amount: \$51,427

Non-Competing Supplement

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: A59986

Faculty Member: Jerry Franklin

Role: Principal Investigator

Title: **Reassessing the Universality of Trophic Cascades: Context Dependence by Setting and Sere in Pacific Northwest Forest Ecosystems**

Agency: Washington State University

Period: 2011-03-01 - 2014-03-01

Amount: \$55,682

New

The impact of predators on herbivory and consequent trophic effects will be assessed in early- and late-successional forests in the South Cascades of Washington State using a diversity of ecological measurements and observations, including vegetation plots, exclosures, tracking transects, and bird/small mammal surveys.

Dr. Jerry F. Franklin will be involved as an advisor and research collaborator. He will not mentor graduate students or conduct fieldwork in connection with this research; his involvement is purely related to research design, data analysis, and production of peer-reviewed publications.

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Application Number: A60338

Faculty Member: Jerry Franklin

Role: Principal Investigator

Title: **Ecosystem Management 6**

Agency: USDA Forest Service

Period: 2010-10-01 - 2011-03-31

Amount: \$224,970

Non-Competing Supplement

This funding request is proposed for the continued support and operations of the Wind River Canopy Crane Research Facility (WRCCRF), located in SW Washington, and is based on the Memorandum of Understanding between PNW Station and UW regarding operations at the canopy crane.

The WRCCRF is a cooperative scientific endeavor among the University of Washington, USDA PNW Research Station, and the Gifford Pinchot NF. The mission of this program is to provide a facility, canopy access, data information and education for those wishing to better understand the forest canopy within the context of forest science and management in its broadest sense. The centerpiece of the research facility is a 250 ft. freestanding construction tower crane. The crane is located in a 500-yr old-growth patch within the T. T. Munger, Research Natural Area, and is used as an access tool for scientists and educators to accomplish research and gain knowledge of forest ecosystems. The WRCCRF was established in 1994 as the only tower crane operating in North America within the context of canopy research, and is currently a focal point of environmental research for many Universities and government agencies.

Major research projects supported by the crane operations include productivity and carbon cycling in forest ecosystems, relations between habitat and biological diversity, and ecology of forest diseases and insects.

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Application Number: A59328

Faculty Member: John Marzluff

Role: Principal Investigator

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

Agency: National Science Foundation

Period: 2011-01-01 - 2015-12-31

Amount: \$449,997

New

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: A59395

Faculty Member: John Marzluff

Role: Principal Investigator

Title: **OPUS: Synthesizing the Response of Birds to Urbanization**

Agency: National Science Foundation

Period: 2011-01-01 - 2012-12-31

Amount: \$192,320

New

When I began studying the ecology of birds in the urbanizing forests around Seattle, WA, USA, I assumed I would be chronicling the demise of a vibrant native avifauna. Studies elsewhere in the world warned what the cats and crows did not eat would surely be outcompeted by the invasive human commensals, shot by kids, or run over by cars. After 12 years of intensive breeding season surveys ( $N > 10,000$ ), monitoring of productivity and nest predation ( $N > 800$  nests,  $>4300$  territories), and following the movements and survival of individual birds ( $N = 11$  species,  $>2700$  individuals), little of the urban dogma seems to fit the temperate, conifer forests of western Washington. By conducting extensive research at 139 field sites and intensive research at 20-30 of these sites, my students and colleagues have documented high species richness in suburbs, typical levels of reproduction, few non-native predators, reduced survival in some species but generally adaptive adjustments by birds to native predators, successful dispersal of young birds, extensive use of human subsidies by native species, and typical adult survival and fidelity to breeding territory. This core literature is mostly correlative and ripe for synthesis and integration with on-going, long-term monitoring of bird responses to active development at 13 study sites (established as a before-after-control experiment). Such synthesis will result in three products: 1) a comparison of ecological function among urban ecosystems and between urban and less anthropogenic ecosystems including a test of the applicability of general ecological theory to urban systems; 2) an appraisal of intensive and extensive research techniques; and 3) prescriptions for practitioners interested in conserving birds in urban areas.

Scientific Merit: I will test the application of ecological theory to the peculiarity of urban ecosystems assessing the (1) role of niche characteristics to extinction and colonization, (2) strength of connections in a diverse web of ecological interactions, (3) empirical strength of density (in)dependence in reproduction, survival, and population fluctuation, and (4) magnitude of demographic and environmental stochasticity. Such fundamental ecological knowledge is lacking in urban systems.

Broader Impact: I propose to synthesize the breeding biology of birds in an urbanizing landscape to describe how one of the most significant human impacts on earth affects the population viability and community composition of animals. The practical aspects of this work will be of use to urban planners, developers, landscape architects, policy makers, and homeowners. Synthesis will be accomplished in collaboration with training of a postdoc.

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Application Number: A60542

Faculty Member: Sarah Reichard

Role: Principal Investigator

Title: **Center for Plant Conservation Ex Situ Review 2010**

Agency: Center for Plant Conservation

Period: 2010-06-01 - 2010-12-31

Amount: \$625

New

Under this project, University of Washington Botanic Gardens will assist the Center for Plant Conservation with compiling information on ex situ collections of sensitive plant species held in the Miller Seed Vault. We will focus on collections of high priority species from populations on US Forest Service lands as well as ex situ material of these species that originated from lands of other ownership. The information will be used to plan for priority ex-situ work to ensure recovery and restoration potential for sensitive species and their habitats.

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Application Number: A60642

Faculty Member: Sarah Reichard

Role: Principal Investigator

Title: **National Arboretum Collections**

Agency: USDA

Period: 2010-11-01 - 2013-10-31

Amount: \$7,000

New

Planning for a Cultivated Flora of the United States is underway, with leadership from the National Arboretum. The Hyde Herbarium at the University of Washington Botanic Gardens will collect specimens of horticulturally significant plants in the Pacific Northwest and provide at least one specimen of each collection to the herbarium at the National Arboretum to assist with completion of the Flora. Specimens will be prepared in the standard manner, with detailed information provided on archival quality labels. When possible duplicates will be provided to the National Arboretum for exchange with other herbaria.

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Application Number: A60661

Faculty Member: Sarah Reichard

Role: Principal Investigator

Title: **BLM Ex Situ Seed Conservation**

Agency: USDI Bureau of Land Management

Period: 2010-06-01 - 2011-12-31

Amount: \$13,000

New

Washington Rare Plant Care and Conservation will provide curation services to the Bureau of Land Management for seeds of rare plant species held for BLM in the Miller Seed Vault. Rare Care will also collect seeds from rare plant populations located on BLM land in Washington. Seeds will be stored in Miller Seed Vault for BLM for future use in research and restoration projects.

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Application Number: A59853  
Faculty Member: Luke Rogers  
Role: Principal Investigator  
Title: **GIS-Based LiDAR Ground Plot Selection Protocol**  
Agency: USDA Forest Service  
Period: 2010-04-01 - 2013-03-31  
Amount: \$70,000  
Supplement and Extension

Airborne laser scanning (LiDAR) data can be used to map forest inventory and structure across large areas when appropriate ground sample plots are carefully located and measured. This project will develop Geographic Information System (GIS) protocols for stratifying forest lands using LiDAR derived canopy structure metrics.

The primary purpose of the proposed collaboration is to develop a GIS-based protocol for ground plot selection in areas with high-density LIDAR coverage. The study area is approximately 250,000 acres of USDI Bureau of Land Management (BLM) and Coquille tribal forests in the south Oregon coastal forests embedded in a 1.6 million acre area over which LIDAR data were collected in 2005 and 2009. The BLM plans to measure approximately 1,200 ground plots (1/8th -acre, circular) within the BLM and Coquille ownership in 2010. However, the BLM lacks a statistically sound protocol for selecting field plot positions across the range of forest conditions present on these lands.

The PNW and RTI scientists will develop a LIDAR-optimized sampling protocol built on earlier work by Hawbaker et al. (2009).

With the proliferation of LIDAR data collection in heavily forested areas, new methods for selecting field ground plots need to be developed. Prior methods of photographic interpretation were cumbersome and labor intensive. The primary products will be: a GIS protocol for stratifying forests with LIDAR coverage using LIDAR metrics; and, a GIS protocol for then selecting plot locations in each stratum.

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Application Number: A60049  
Faculty Member: Aaron Wirsing  
Role: Principal Investigator  
Title: **Does Matrix Quality in Fragmented Forests Influence the Dynamics of Snowshoe Hare Populations?**  
Agency: National Science Foundation  
Period: 2011-10-01 - 2016-09-30  
Amount: \$752,675  
New

Prey species in fragmented landscapes typically are assumed to occupy suitable patches, or 'islands', set amidst an inhospitable matrix. As a result, most studies of the effects of fragmentation on animal populations have focused on the quality of island patches while ignoring their surroundings. Yet, matrix

rarely is uniform in quality, and poor quality matrix could influence the demography and extinction risk of island residents. Few studies to date have tested this possibility. Accordingly, I propose to explore the effects of matrix quality on snowshoe hare (*Lepus americanus*) abundance, vulnerability to predation, and behavior in a fragmented boreal forest in north-central Washington. Specifically, I will weigh support for two competing hypotheses: the refugium model, which posits that the creation of low quality (open) matrix only leads to heavy predation on hares that leave the protective confines of densely vegetated forest islands, and the concentration model, which holds that hares using forest islands imbedded in low quality matrix experience enhanced predation, and therefore must invest heavily in antipredator behavior, despite the presence of protective cover because of predator swamping (i.e., concentrated use of islands by predators). The results of this study will unravel the mechanism by which variation in matrix quality influences hare mortality in patches of suitable habitat and, consequently, help to explain why hare populations in Washington do not cycle and inform forest management strategies aimed at promoting hare abundance and, in turn, lynx persistence.