



School of Environmental and Forest Sciences

UNIVERSITY of WASHINGTON

College of the Environment

Research Newsletter

Volume IV, Issue 4
September 9, 2013

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NEWS

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

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

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

FINANCIAL DISCLOSURE: Office Sponsored Programs has been requiring completion of the Significant Financial Interest Disclosure before any post-award changes can be processed, including no-cost

extensions, formal rebudgeting, or any changes in personnel. Most of the bugs seem to be worked out of the system, but there are still instances where the notices fail to arrive. When that happens, there is an easy work-around, so it has not been a problem.

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

March Awards

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

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

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

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

Application Number: A83930
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Olympic Resource Management
Period: 1/1/2013 - 12/31/2013
Amount: \$18,595
Supplement and Extension

2013 Membership dues to Stand Management Coop from Olympic Resource Mgmt.

Application Number: A79024
Faculty Member: Jerry Franklin
Role: Principal Investigator

Faculty Member: Van Kane
Role: Co-Investigator

Faculty Member: Jim Lutz
Role: Co-Investigator
Title: **Integrated, observation-based carbon monitoring for wooded ecosystems in Washington, Oregon, and California**
Agency: Boston University
Period: 7/1/2012 - 4/30/2014
Amount: \$157,859
Transfer from Another Institution

The project goal is to develop an integrated satellite, plot, and LiDAR-based system to characterize and monitor the effects of land management and natural processes on carbon fluxes in the wooded ecosystems across large geographic areas. Key characteristics of the system will be explicit, map-based calculation of uncertainties in estimates of both carbon stocks and fluxes yearly from 1990 to present, and a modular structure that will allow rapid inclusion of new data for improving maps and reducing uncertainties as the system matures. Core components of the project are a time-series-based approach to mine the Landsat Thematic Mapper archive to monitor an unprecedented range of change processes on the landscape and to develop temporally-stable data for mapping, a proven nearest-neighbor mapping approach to integrate satellite data, environmental data, and USDA Forest Service Forest Inventory and Analysis (FIA) data, and small-footprint LiDAR data used to assess map error. Processes whose carbon effects will be mapped include all levels of forest harvest and fire, including both mechanical thinning and low-intensity fire, as well insect-related mortality, post-disturbance regrowth and encroachment, and land-use change. The resultant West Coast-wide maps of carbon will be useful for state agencies tasked with carbon monitoring roles, federal land management agencies needing context and guidance for land management decisions, and carbon modelers needing detailed maps of disturbance and growth effects on carbon change to train, calibrate, and validate the process-based models needed for futuring and decision support.

For eight study areas, UW researchers will use established field data gathered within 0-2 years of the acquisition of previously collected airborne LiDAR data to estimate carbon stores for each plot site using allometric biomass algorithms developed for the local forest type. Regressions will be developed to relate LiDAR data gathered over the plot sites to the estimated carbon store. Those regressions will then be used to predict forest carbon stores across the extent of the LiDAR study area. The results of the LiDAR carbon maps will then be compared with the Landsat carbon maps to train the Landsat-based carbon mapping and to estimate error rates for the Landsat carbon maps. UW also will enable use of three of the study areas by collecting accurate plot GPS coordinates and verifying previously collected field data.

March Proposals

Application Number: A83680
Faculty Member: Thomas DeLuca
Role: Principal Investigator
Title: **Conserving the Adaptive Potential of Our Forests Under a Changing Climate: Quantifying range-wide variation and local adaptation across western North America's most widespread conifer, *Pinus contorta***
Agency: USDA
Period: 10/16/2013 - 10/15/2015

Amount: \$150,000

New

Changing climates change habitat for plants, and long-lived trees may be quite vulnerable to rapid climate changes. Species are adapted to local, specific combination of climatic and edaphic conditions, but substantial genetic variation persists in local populations. Subtle changes in climate may leave longlived, immobile tree species especially vulnerable to habitat loss. In this research, we will use *Pinus contorta* (Douglas Ex. Louden) to quantify the role of soil factors in driving local adaptation of tree species. *Pinus contorta* is one of the most widely distributed trees in North America, growing from Baja California to the Yukon Territory. This species' broad distribution is divided into four geographically and morphologically distinct subspecies (*ssp. murrayana*, *latifolia*, *contorta*, and *bolanderi*), with each subspecies growing under and hypothesized to be locally adapted to a unique set of edaphic and climatic conditions. Climate changes may have variable effects for populations across the range of the species, and conservation may require subspecies-level action. Loss of suitable habitat would lead to subsequent disruption of ecosystem functioning and loss of many forest-dependent species. The objectives of this research are to: 1) quantify the extent of variation in local environmental and edaphic conditions across the range of *Pinus contorta*; 2) test for local adaptation across the subspecies of *Pinus contorta*; 3) link subspecies-level success to local and regional environmental properties, and determine the degree to which specific factors are driving local adaptation across the species; and 4) provide land managers with information on appropriate conservation strategies necessary for the maintenance of each subspecies.

Application Number: A83806

Faculty Member: Sharon Doty

Role: Co-Investigator

Title: **FAA Center of Excellence for Alternative Jet Fuels and Environment**

Agency: Florida State University (FSU)

Period: 9/1/2013 - 6/30/2018

Amount: \$2,000,000

New

The FAA has identified a need for a Center of Excellence (COE) to explore ways to meet the energy and environmental and goals for NextGen while also allowing for aviation growth in a sustainable manner. The focus of this COEs efforts include helping FAA develop technologies, strategies, policies and identify solutions for existing and anticipated problems facing aviation in terms of environment and alternative energy.

Under this proposal, we will create world-class consortium of universities, industry, government, research organizations, law, policy and business development stakeholders and other relevant entities that will help meet the environmental and energy challenges confronting aviation over the near and long-term. The proposed Center of Excellence for Alternative Jet Fuels and Environment brings together a team of with the breadth, depth of expertise and resources and an established history of finding solutions to complex and varied problems in Aviation, Alternative Fuels/Energy and the Environment. University of Washington is one of the 10 Universities participating this effort, led by Florida State University.

Application Number: A83930

Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Olympic Resource Management
Period: 1/1/2013 - 12/31/2013
Amount: \$18,595
Supplement and Extension

2013 Membership dues to Stand Management Coop from Olympic Resource Mgmt.

Application Number: A83945
Faculty Member: Richard Gustafson
Role: Principal Investigator
Title: **Production of Aviation Biofuels**
Agency: Washington State University
Period: 9/1/2013 - 8/31/2016
Amount: \$1,044,867
Pre-Application

Aviation fuel is a complex mixture with stringent end-use requirements. The fuel must have sufficient energy content (enhanced by cycloalkanes), low gelation point (enabled by a narrow molecular weight distribution), and proper lubricity (made possible by aromatic compounds). Currently, biofuels must be blended with petroleum fuels to meet these requirements. New processes are required to produce a 100% biomass based aviation fuel that can be used in existing engines and that can meet carbon emission requirements established by the RFS2.

Current processes to create hydrocarbons from biomass cannot produce the correct mixtures of molecules needed for aviation fuel because lignin and carbohydrates require different processing conditions. Fractionation of biomass into lignin and carbohydrate components, converting them into the needed molecules, and then blending the final products in the correct proportions is the only way to produce a 100% biomass based jet fuel with the required properties.

We propose to develop an innovative process that combines biomass fractionation, followed by separate carbohydrate and lignin conversion to hydrocarbons with final blending to produce a 100% biomass based aviation fuel. Biomass will be fractionated by steam pretreatment followed by enzymatic hydrolysis. Sugars may be recovered directly or fermented to ethanol which can then be separated from the lignin. The lignin will then be depolymerized to insoluble lignin-derived fragments that are well suited for further conversion to hydrocarbons. The result will be three distinct feedstocks that can be chemically converted separately and optimally to the hydrocarbons needed for jet fuel.

Conversion of lignin fragments, sugars, and alcohols to hydrocarbons will be accomplished by thermal/catalytic processes. Catalytic fast pyrolysis and hydrogenation can be used to convert lignin into naphthenes; high-energy molecules that constitute 40 % of jet fuels. We will catalytically convert sugars and alcohols into olefins and aromatic hydrocarbons using dehydration and oligomerization as well as zeolite upgrading. These processes together generate the molecules that serve as building blocks for a 100 % biomass based aviation fuel.

Thermal/catalytic conversion will result in relatively homogenous molecular products that must be blended to make the final aviation biofuel. We propose to develop sensors and a model based control system to carry out the blending.

The research proposed here builds on the University of Washington work with ZeaChem to produce jet fuel from cellulosic feedstock. The proposed research will result in a bench scale demonstration of an innovative technology to produce 100% biobased jet fuel. Scale to pilot or commercial scale can happen rapidly because of our ZeaChem connection.

Application Number: A84131
Faculty Member: Joshua Lawler
Role: Co-Investigator
Title: **Climate Change Session**
Agency: WA Department of Fish and Wildlife
Period: 11/26/2012 - 11/30/2012
Amount: \$350
New

Dr. Lawler served as a presenter and discussion facilitator for the annual wildlife program staff meeting.

Application Number: A84184
Faculty Member: Joshua Lawler Faculty Member: L. Monika Moskal
Role: Principal Investigator Role: Co-Investigator
Title: **Assessing Ecological Vulnerability of Wetlands to Climate Change: A Transferable Framework for Washington State**
Agency: Environmental Protection Agency (EPA)
Period: 9/1/2013 - 8/31/2015
Amount: \$307,424
New

Our goal is to incorporate climate change impacts into wetland protection, management and restoration strategies in Washington State. Effective conservation of wetlands may not be possible without accounting for climate change, yet few resources exist for assessing wetland vulnerability to climate impacts. Our objective is to develop a transferable framework for assessing wetland vulnerability to climate change that will make it possible to set conservation priorities in light of climate change. Our approach integrates existing data (wetland maps, hydrologic models) with data to be developed during this project (Ecological Integrity Assessments, hydrologic monitoring results) to conduct a climate change vulnerability assessment of specific wetland types. We will engage key stakeholders through an expert workshop focused on focal wetland types to identify wetland climate adaptation strategies for a range of potential vulnerabilities and to build partnerships. Our project focuses on two contrasting wetland types for which the necessary data are currently available: snow-driven montane wetlands and arid wetlands of the Columbia Plateau. Final products will include: 1) a transferable framework for assessing climate impacts on wetland ecological integrity, integrating climate change into conservation planning, and transferring information, 2) adaptation strategies for focal wetland classes, 3) integration of climate change vulnerability into Washington Natural Heritage Program wetland prioritization methods, 4) an expert workshop, and 5) updated hydrologic models of climate impacts, wetland maps, Ecological Integrity Assessments of focal wetlands, and hydrologic monitoring results. The outcome of

the project is more effective wetland conservation, restoration, and management in light of climate change.

Application Number: A83854

Faculty Member: Jim Lutz

Role: Principal Investigator

Title: **Disappearing refugia: identifying trends and resilience in unburned islands under climate change**

Agency: University of Idaho

Period: 1/1/2014 - 12/31/2015

Amount: \$55,073

New

This research will 1) identify the climatic factors controlling frequency and distribution of unburned ‘fire-proof’ islands in Pacific Northwest landscapes impacted by wildfire and 2) investigate the hypothesis that a warming climate will significantly reduce or eliminate unburned refugia, resulting in increasingly fragmented habitat and lowered ecosystem resilience. Wildfires are a natural ecological disturbance in Pacific Northwest forests and rangelands, but are widely projected to increase in frequency and magnitude due to climate change. A critical ecological feature of wildfire is its heterogeneous pattern of intensity and severity, which leaves behind patches of unburned vegetation. These ‘fireproof’ unburned islands are often associated with stands of old growth or other critical threatened habitats, serving as refugia for flora and fauna, initializing post-fire regeneration and succession, and buffering post-fire erosion into hydrological systems. Climate variability contributes to changing proportions of high and low severity in some frequent-fire systems, but it is unknown whether it also controls proportion and distribution of unburned islands. Land managers trying to restore fire to ecosystems where it has been excluded through fire suppression desire unburned patches in their treatment mosaic in order to sustain ecosystem resilience and provide habitat refugia, but there is no clear understanding of the environmental attributes or management actions that produce fireproof islands in recently-burned landscapes. Additionally, attempts to mitigate wildfire impacts within the wildland-urban interface benefit from improved understanding of the natural characteristics of fire-proof islands as a template.

Application Number: A83692

Faculty Member: Fernando Resende

Role: Principal Investigator

Title: **Recondensation of Lignin Fragments During Fast Pyrolysis: A Model Compounds Study**

Agency: Royalty Research Fund (RRF)

Period: 9/1/2013 - 8/30/2014

Amount: \$39,295

Resubmission

Fast pyrolysis is a potential method for converting lignin extracted from biomass into liquid fuels for transportation. The major challenge with fast pyrolysis of lignin is the recondensation of its fragments, which forms solid char, leading to problems of reactor clogging and char agglomeration. The problem of recondensation must be properly addressed in order for fast pyrolysis to become technically feasible. The research proposed will investigate the process of char formation at a molecular level. To achieve this goal, the monomers of lignin will be pyrolyzed. The knowledge generated will lead to potential solutions for the problem of char formation during pyrolysis of lignin, and it will also point to feedstocks that are less prone to form char, thereby maximizing the amount of liquid products formed.

Application Number: A83896
Faculty Member: Daniel Vogt
Role: Co-Investigator
Title: **Work Plan for the University of Washington in Managing and Facilitating A Scientific Review Process for CMER by the Independent Scientific Peer Review Program**
Agency: WA Department of Natural Resources
Period: 1/1/2013 - 6/30/2013
Amount: \$44,364
New

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

April Awards

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

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

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

Faculty Member: L. Monika Moskal
Role: Co-Investigator

The University of Washington is a member of the Center for Advanced Forestry Systems (CAFS), a National Science Foundation Industry/University Cooperative Research Center (NSF I/UCRC), along with

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

Application Number: A82109
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: TimberWest - Coast Timberlands
Period: 1/1/2013 - 12/31/2013
Amount: \$37,251
Supplement and Extension

2013 Membership dues to Stand Management Coop from TimberWest-Coast Timberlands.

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

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

Application Number: A81490
Faculty Member: Jerry Franklin
Role: Principal Investigator
Title: **Wind River Field Station**
Agency: USDA Forest Service
Period: 10/1/2011 - 7/31/2016

Faculty Member: Ken Bible
Role: Co-Investigator

Amount: \$67,835
Non-Competing Supplement

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

Application Number: A82724
Faculty Member: Charles Halpern
Role: Principal Investigator
Title: **Meadow Restoration in the Oregon Cascades: Long-term Responses to Tree Removal and Fire**
Agency: USDA Forest Service
Period: 5/21/2012 - 8/31/2016
Amount: \$25,000
Non-Competing Supplement

Woody-plant encroachment threatens the biological diversity of many grassland ecosystems. Positive feedbacks between established and newly establishing shrubs or trees can accelerate the process, with profound consequences for vegetation and soils. We are testing whether large-scale restoration treatments (tree removal with or without fire) can reverse the effects of encroachment by grand fir and lodgepole pine in dry, montane meadows of the Oregon Cascades. Short-term (3-year) observations suggest strong potential to reverse the influences of trees (both with and without fire), even where forests have been present for well over a century. It is not clear, however, whether longer-term patterns of meadow reassembly will be constrained by species' dispersal, interactions with residual forest herbs, use of fire, or the ecological context (age of forests) in which restoration is attempted. The supplemental funding provided by this agreement will allow us to address longer-term (7- to 8-year) responses to treatments. These longer-term assessments are critical, given the equivocal role of fire in short-term responses. Results will offer insights into the ecological vs. operational need for fire and the contexts in which restoration is possible.

Application Number: A78524
Faculty Member: Sarah Reichard
Role: Principal Investigator
Title: **Washington Rare Plant Conservation**
Agency: National Fish and Wildlife Foundation
Period: 1/1/2013 - 12/31/2013
Amount: \$42,000
New

Over 300 of Washington's native plants are considered to be endangered, threatened or sensitive to decline. Habitat loss and degradation, invasive species, and climate change are among the myriad of

threats that interact with one another to cause extirpation of rare plant populations. Declining levels of public funding over the last several decades resulted in a dearth of information on the status of these species. Consequently, the status of these species is poorly documented, which, in the short term, hinders accurate assessments of impacts of threats and in the long-term hinders our ability to understand the conservation needs for preserving plant biodiversity. Rare plant monitoring and seed banking of Washington's rare plants work in concert to achieve their long-term survival by addressing both the short-term threats to natural populations and the long-term need for germplasm to produce plant material for reintroductions and augmentations. Monitoring and seed collecting is carried by a corps of volunteers trained to monitor rare plant populations and collect seeds for storage in the Miller Seed Vault. The project is conducted in partnership with the Natural Heritage Program and state and federal agencies. In 2013, approximately 130 populations will be revisited and reported on by volunteers, seeds will be collected from 15 populations of rare plants, and approximately 40 new volunteers will be trained in monitoring and seed collecting techniques.

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

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

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

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

The North Pacific Coast Marine Resource Committee represents a neutral forum for the coordination of stakeholder interactions in establishing and implementing marine resource management activities on the outer coast. The NPC MRC is responsible for developing ranked lists of restoration and protection

projects that are based on the best available science, community principles, and the integration of environmental and ecological interests. ONRC will coordinate the monthly meetings of the NPC MRC forum including the following:

- 1) Task 1a: Coordinate and facilitate monthly meetings of the North Pacific Coast MRC;
 - 2) Task 1b: Facilitate MRC- approved Ground Rules and By Laws;
 - 3) Task 1c: With the MRC, develop and distribute solicitation of RFPs for FY14 projects; Facilitate project ranking and communications with project applicants. Develop project ranking and draft FY14 project budget; and
 - 4) Task 1d: A brief, draft operational summary that includes prioritized recommendations for future actions and products for MRC development, a description of challenges and growth over the past year, and ideas on new ways to utilize the MRC to implement the Coastal MRC Program Priorities.
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Application Number: A84500
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Forks GIS Mapping Services 2013**
Agency: City of Forks
Period: 1/1/2013 - 12/31/2013
Amount: \$20,000
Supplement and Extension

The City of Forks has requested that the Olympic Natural Resource Center agree to extend the 2012 contract for GIS services to provide geographic information system (GIS) support and technical services that address the following priorities defined by the City of Forks in calendar year 2013. The City will supplement the contract with an additional \$20,000.

The work will consist of:

1. City addressing: finalize the City's addressing overlay utilizing information provided inclusive of water meter databases.
2. Development of data dictionary associated with utilities that will become the basis for future utility overlays.
3. Map requests as needed.

April Proposals

Application Number: A84553
Faculty Member: Stanley Asah
Role: Principal Investigator
Title: **Facilitating the Adoption of Climate Change Coping and Adaptation Strategies and Technologies: An Eco-Social-Psychological Approach**
Agency: USDA
Period: 9/25/2013 - 9/24/2018
Amount: \$997,325
New

Faculty Member: Joshua Lawler
Role: Co-Investigator

Climate change poses an immense challenge to agricultural communities in the form of long-term change punctuated with short-term variability and increasingly frequent extreme events. The USDA FSA spends millions of dollars to help farmers and ranchers cope with this variability and adapt to change. These coping mechanisms and adaptive strategies (e.g., adoption and diffusion of adaptive technologies, crop switching, rotation and diversification, water-use efficiency, etc.) are largely behavioral in nature. Yet, there is little emphasis on understanding human behavior for the purposes of promoting the development and adoption of climate coping and adaptation strategies for agricultural production systems. What strategies and practices do experienced farmers use to cope with and adapt to climate variability and change, how successful are these strategies and how such strategies can be disseminated, are important unanswered questions. Until significant advances are made in this area of behavioral research, and until behavioral change, social marketing, the diffusion of innovations, and other aspects of the social sciences are included in the practice of extension and the curricula of agricultural education programs, the successful adoption of climate-coping and adaptation strategies for agriculture will lag well behind their development. The consequence of this lag to global food supplies and the economies of agricultural communities as well as spin-off industries such as processing and marketing cannot be overemphasized. To this date, studies adopting the approach we propose that combines ecological observations, behavioral change strategies, with education and extension efforts for the purposes of enhancing coping and adaptive strategies within agricultural systems are virtually non-existent. We propose to develop behavioral change blue print plans that extension agents can use to facilitate the adoption of coping and adaptive strategies for various agricultural settings within and beyond the Yakima valley. We will combine climate-impacts forecasting and scenario modeling, social-psychological field studies, including learning from farmers, development of courses and extension practices, and training graduates from agricultural educational and extension programs, using the agricultural systems of the Yakima Valley as case study.

An increased understanding of the social-psychological factors that influence responses of farmers to the behavioral changes needed for coping and adaptive responses to climate variability and change will facilitate the adoption of coping and adaptation strategies and technologies and, in turn, will greatly enhance the ability of farmers to maintain or even augment productivity in the face of climate-induced variability and change. Farm-level coping and adaptive management practices have been shown to augment agricultural productivity despite climate change.

Application Number: A84048

Faculty Member: Gregory Ettl

Role: Principal Investigator

Title: **Enhanced Drought Tolerance of Forests: Managing Stand Density along Stress Gradients**

Agency: University of Idaho

Period: 9/1/2013 - 8/31/2018

Amount: \$311,246

New

As a consequence of climate change, summer droughts in western forests are expected to become more severe. Available information on forests and drought includes responses to the current range of natural stress, and water stress studies of potted seedlings and small saplings. Little information is available on responses of western conifer forest to future levels of drought stress that are expected to occur within the current range of species distribution. Quantitative and site-specific information is required on management practices that improve the ability of forests to adapt to severe drought. Drought imposed on forests near the limits of species geographic/climatic range are of particular interest because those

forests operate close to physiological limits with little capacity to compensate. Information is needed on specific indicators of impending mortality such as canopy water use, water stress levels, xylem cavitation, leaf area retention, and carbon starvation. Improved drought tolerance and decreased mortality can be achieved through management practices that decrease stem density, limit total stand evapo-transpiration, and increase water available to individual trees. Yet we lack specific recommendations for target densities or growing stock levels to reduce mortality due to drought. Our Goals are to: 1) Determine the capacity of stand density management practices to decrease water use and increase drought tolerance of western forests. 2) Develop density guidelines intended to increase adaptation of western forests to climate change along stress gradients from optimal edaphic and climatic conditions to the limits of species distribution. Rainfall exclusion structures will impose drought in stands of high and low density at locations ranging from mesic to xeric limits. We will characterize drought severity through environmental monitoring and measure water relations at each location. We will determine water relations at tree- and stand-level by measuring growth efficiency (growth per unit leaf area), carbohydrate storage, water stress, water use efficiency, xylem cavitation, transpiration, canopy conductance and intercepted radiation. The data will also provide indicators of impending tree mortality.

Application Number: A82109
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: TimberWest - Coast Timberlands
Period: 1/1/2013 - 12/31/2013
Amount: \$37,251
Supplement and Extension

2013 Membership dues to Stand Management Coop from TimberWest-Coast Timberlands.

Application Number: A82549
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: International Forestry Consultants, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: \$7,615
Supplement and Extension

2013 Membership dues payment to Stand Management Coop from International Forestry Consultants, Inc.

Application Number: A84950
Faculty Member: Robert Lee
Role: Principal Investigator
Title: **Using Common Core State Standards to Enhance Student Learning of Environmental Literacy in Science for Rural School Districts**
Agency: Washington Student Achievement Council (WSAC)

Period: 7/1/2013 - 6/30/2014

Amount: \$150,000

New

The goal of this project is to improve content-area instruction and increase student achievement by building knowledge of the Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects (CCSS-ELA) and related pedagogical content knowledge, aligning these forms of knowledge with instructional contexts and practice.

UW's training activities will build and enrich science teachers' knowledge of CCSS-ELA by integrating these standards into the instruction and exploration of environmental science. Our work with teachers will emphasize academic literacy as a means for improving teaching and learning in both the study of environmental science and science in general. The Literacy Learning in Environmental Science project is a partnership between the University of Washington School of Environmental and Forest Sciences, and the University of Washington Bothell Education Program. Teachers of science in the middle and/or high school in Educational Service District 113 are eligible for this project.

Application Number: A84290

Faculty Member: L. Monika Moskal

Role: Principal Investigator

Title: **Terrestrial LiDAR Scanning (TLS) at Panther Creek Research Plots for Inventory and Tree Species Identification**

Agency: Affiliated Tribes of Northwest Indians Economic Development

Period: 3/1/2013 - 3/1/2015

Amount: \$50,000

Supplement and Extension

Precision forestry leverages advanced sensing technologies and analytical tools to support site-specific economic, environmental, and sustainable decision making for the forestry sector in a timely and effective way. The discipline is highly reliant on accurate, timely and detailed forest inventory characterization and structural information, spanning extensive land holdings. Discrete, high density, LiDAR point clouds derived from aerial and terrestrial laser scanning have become invaluable datasets for precision forestry applications. This project will acquire terrestrial LiDAR scans (TLS) for forest inventory and soil study plots at the Panther Creek research site in the state of Oregon, for the purpose of capturing ground based 3D point clouds and scanner hemispherical camera based photography. The data will be utilized for extraction of inventories and compared to traditional methods of forest inventory and aerial LiDAR based inventories (and calibration). Moreover, the new innovative research proposed in this project will focus on deriving tree species information from TLS. This will serve as the basis for future work to use the TLS data to calibrate other remote sensing approaches as well as explore additional potential of TLS data in conjunction with the wide array of scientific project at the Panther Creek research site.

Application Number: A84835

Faculty Member: Luke Rogers

Role: Co-Investigator

Title: **Forest Biomass Supply Assessment**

Agency: WA Department of Natural Resources

Period: 5/1/2013 - 5/31/2014
Amount: \$10,000
New

The University of Washington, per contract number PSC 11-10 conducted a statewide, all lands forest biomass supply assessment. In addition to the assessment, the University of Washington developed a forest biomass supply calculator that provides information on the volume of residual forest biomass available in a specified geography. The purpose of this agreement is to disseminate the information from the supply study and to teach members of the forest biomass to energy sector how to best utilize the calculator tool.

Application Number: A84500
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **Forks GIS Mapping Services 2013**
Agency: City of Forks
Period: 1/1/2013 - 12/31/2013
Amount: \$20,000
Supplement and Extension

The City of Forks has requested that the Olympic Natural Resource Center agree to extend the 2012 contract for GIS services to provide geographic information system (GIS) support and technical services that address the following priorities defined by the City of Forks in calendar year 2013. The City will supplement the contract with an additional \$20,000.

The work will consist of:

1. City addressing: finalize the City's addressing overlay utilizing information provided inclusive of water meter databases.
2. Development of data dictionary associated with utilities that will become the basis for future utility overlays.
3. Map requests as needed.

May Awards

Application Number: A85060
Faculty Member: Jonathan Bakker
Role: Principal Investigator
Title: **Coordination of Protocol Reviews for Long-Term Monitoring in the Pacific West Region of the National Park Service**
Agency: USDI National Park Service
Period: 3/15/2012 - 12/31/2015
Amount: \$25,320
Supplement and Extension

The Pacific West Region (PWR) of the National Park Service seeks expert assistance from Professor Jon Bakker at the University of Washington to function as the Protocol Review Coordinator (PRC) and accomplish the coordination, tracking, oversight, and synthesis of blind peer reviews for protocols

associated with PWR Inventory and Monitoring (I&M) network monitoring plans over a period of several years. The Protocol Review Coordinator will contact and negotiate with academic reviewers, arrange for appropriate 'honoraria' to be paid, and synthesize review comments. The PRC in collaboration with the PWR I&M Program Manager (RPM) will make final decisions as to the adequacy of the submitted protocols according to their scientific merit and ability to meet management needs. Ensuring that scientifically credible long-term monitoring protocols are used on public lands is a core service from which the public benefits by gaining an understanding of the status of natural resources at any given time, and the long-term dynamics of species and communities as they vary with biological, climate, and human stressors over time.

Application Number: A82549
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: International Forestry Consultants, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: \$7,615
Supplement and Extension

2013 Membership dues payment to Stand Management Coop from International Forestry Consultants, Inc.

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

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

Application Number: A81582
Faculty Member: Miranda Wecker
Role: Principal Investigator
Title: **DNR OEFS LTER Script Revision**
Agency: WA Department of Natural Resources

Period: 1/15/2013 - 6/30/2013

Amount: \$3,147

New

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

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

May Proposals

Application Number: A85163

Faculty Member: Ivan Eastin

Role: Principal Investigator

Title: **The Northwest Advanced Renewables Alliance (NARA): A New Vista for Green Fuels, Chemicals and Environmentally Preferred Products (EPP)**

Agency: Washington State University

Period: 8/1/2013 - 7/31/2014

Amount: \$314,935

Non-Competing Supplement

Faculty Member: Indroneil Ganguly

Role: Co-Investigator

This research module is part of a larger regional group research project. It will provide a definitive assessment of the technical, economic, environmental, and social impacts of using woody biomass for the production of jet fuel. Understanding the consequences of this technology is necessary if forest biomass is to be widely used for jet fuel. In addition, an LCA on greenhouse gas emissions will be necessary to qualify jet fuel made from forest based biomass under the Energy Independence and Security Act (EISA) of 2007 and the EPA guidelines promulgated to meet the new requirements of the act (EPA 2009). To meet this objective we will combine biomass growth/yield models, engineering process models and Life Cycle Assessment (LCA) models to develop life cycle environmental profiles for specific woody biomass feedstocks matched with the proposed jet fuel processing technology. These integrated models will be used to develop LCAs for green house gases (GHG) and other environmental risk indices for comparisons between cellulosic jet fuel and fossil fuels. We will also compare energy uses of the feedstock and alternative wood product uses against their fossil intensive product substitutes. Alternative technologies, with their impacts on the value chain, will be compared for different forest treatments, harvesting and collection equipment and processing alternatives. Feedstock qualities will be matched with processing alternatives and regional feedstock scales of availability matched with efficient scale processing infrastructure. Alternative configurations and policy assumptions covering a range of scenarios will be used to project potential regional reductions in GHG

emissions and energy dependence as well as rural economic impacts. The impacts of different policies and other alternatives will be characterized as sensitivity scenarios to better inform the adoption of appropriate policies, marketing, and investment strategies to reach energy independence goals with reduced GHG emissions while effectively managing cellulosic resources.

Application Number: A85125

Faculty Member: Ivan Eastin

Role: Principal Investigator

Title: **Assessing the Impact of Japan Domestic Wood Programs on the Trade of Wood Products**

Agency: USDA

Period: 1/1/2014 - 12/31/2015

Amount: \$439,223

New

Faculty Member: Indroneil Ganguly

Role: Co-Investigator

Over the years, the Japanese government and the forest products industry have tried a number of strategies to improve the competitiveness of the forestry and sawmill sectors. Despite the closure of more than 13,000 sawmills over the past twenty five years, the Japanese sawmill industry remains uncompetitive. The most recent regulatory initiative, the Wood Use Points Program, will expand the current system of programs, policies and subsidies designed to double the volume of domestic wood used in the construction of both public buildings and residential homes. This complex combination of regulations and subsidies could have a serious impact on the forest products industry in the US, particularly in the Pacific Northwest. Japan is the third largest destination for US wood exports. Clearly any program designed to raise the market share of domestic wood in Japan will adversely impact the competitiveness of imported wood would have serious implications for forest products manufacturers in the Pacific Northwest, many of whom are located in rural, timber-dependent communities who have been particularly hard hit by the recent economic crisis in the US. This research project was designed to gain a better understanding of how the combination of domestic wood use programs would impact the overall demand for wood products in Japan in general and the competitiveness of US wood products specifically. The main objectives of the proposed research include the following: 1) describe the forest resource in Japan and assess the factors that influence the supply and demand of domestic wood products in Japan; 2) provide an overview of the major wood industries in Japan (lumber, plywood and glue laminated lumber); 3) provide an overview of the housing sector; 4) describe the broad range of forestry and wood subsidies and support programs in Japan and 5) assess the potential impact of the domestic wood policies and programs on wood use in Japan and the demand for imported wood products.

Application Number: A84241

Faculty Member: Gregory Ettl

Role: Principal Investigator

Title: **Stand Management Cooperative**

Agency: Sierra Pacific Industries

Period: 1/1/2013 - 12/31/2013

Amount: \$20,009

New

2013 Membership Dues to Stand Management Coop from Sierra Pacific Industries, Mt Vernon, WA.

Application Number: A85406
Faculty Member: Gregory Ettl
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: Campbell Group, Inc.
Period: 1/1/2013 - 12/31/2013
Amount: \$27,494
Supplement and Extension

2013 Membership dues to Stand Management Coop from Campbell Group.

Application Number: A85435
Faculty Member: Indroneil Ganguly
Role: Principal Investigator
Faculty Member: John Perez-Garcia
Role: Co-Investigator
Title: **Residual Woody Biomass: Addressing the Market Failure**
Agency: USDA
Period: 9/1/2013 - 8/31/2015
Amount: \$497,678
New

Faculty Member: Ivan Eastin
Role: Co-Investigator
Faculty Member: Ernesto Alvarado
Role: Co-Investigator

In absence of a steady market for the forest thinning residues and non-merchantable trees in the US, a number of incentive programs are introduced to promote forest management and offset the associated costs. Despite these programs there has been an increase in the number of catastrophic forest fire incidents in the US over the last decade, especially in the western part of the country. The environmental implication associated with this market failure of woody biomass is multipronged. The failure to establish a routine fire management results in frequent catastrophic forest fires. Forest fires release large quantities of CO₂ to the atmosphere and are estimated to contribute 10-20% of annual global emissions of methane and nitrogen oxide, both potent greenhouse gases. Moreover, these catastrophic fires sterilize the forest soils and inhibit forest regeneration, slowing down the carbon sequestration and further contributing to global climate change.

At present, the primary economic use of residual woody biomass, from forest harvest and thinning operations, is hog fuel. However, given the logistical challenges associated with residual biomass collection and transport, economic viability of transporting the material to an energy generation facility is limited to forests located close to highways. The proposed project identifies the feasibility of low-cost technologies that add economic value and marketability of woody biomass and address the address the market. The regional focus of the project will be the forested communities in the Pacific Northwest region. Specifically, the project will investigate forests managed by tribes, non-tribal private land owners and industrial plantations, and state governmental managed forests.

Application Number: A85160
Faculty Member: Richard Gustafson
Role: Principal Investigator
Faculty Member: Luke Rogers

Faculty Member: Renata Bura
Role: Co-Investigator
Faculty Member: Stanley Asah

Role: Co-Investigator
Faculty Member: Sharon Doty
Role: Co-Investigator
Title: **System for Advanced Biofuels Production from Woody Biomass in the Pacific Northwest**
Agency: USDA
Period: 9/1/2013 - 8/31/2014
Amount: \$8,000,000
Non-Competing Supplement

Role: Co-Investigator

The goal of the Advanced Hardwood Biofuels Northwest (AHB) consortium is to prepare the Pacific Northwest for a 2016 introduction of a 100% infrastructure compatible biofuels industry that meets the region's pro-rata share of Renewable Fuel Standard (RFS2) targets using sustainable and regionally appropriate woody energy crops. This will revitalize the region's forestry industry with establishment of a sustainable advanced biofuels industry that supports large and small growers and brings jobs to rural communities.

The AHB program is on track to realize this goal. Much of the work in years 1 and 2 has been to lay the foundation for the research, extension, and education programs but we have already obtained exciting results and learned insights about the challenges in building out a full commercial scale enterprise to produce drop in fuels from plantation grown poplar wood. The project is divided into five major program areas: Feedstock, Conversion, Sustainability, Extension, and Education.

Application Number: A85124
Faculty Member: John Perez-Garcia
Role: Principal Investigator
Faculty Member: Sergey Rabotyagov
Role: Co-Investigator

Faculty Member: Stanley Asah
Role: Co-Investigator

Title: **Expanding Certified Wood Markets for Small Forest Owners in the Northwest**
Agency: USDA
Period: 1/1/2014 - 12/31/2017
Amount: \$499,451
New

Many small- to medium-sized forestland owners have a long tradition of significant participation in the state, regional and international economies, and perhaps more importantly, a diversified vision for their woodlots for social and environmental benefits. Yet today, these forestland owners face daunting challenges as the demand of modern society—whether for environmental conservation, wood products for home construction, or municipal water supplies—clash with the legacy of land stewardship and ownership in a rapidly changing social, economic and environmental climate. In Washington State alone, 1.8 million acres of family forestland parcels are at high risk of conversion to other uses (Bradley, 2009). There is thought a similar but undocumented threat in Oregon. The land ownership patterns that have dominated the landscape across the country and in the Pacific Northwest over the past 100 years have shifted significantly. Timber companies that have been “vertically integrated” in the past – with ownership over land for timber production, milling infrastructure, and distribution channels – have changed their business strategies and restructured as real estate investment trusts (citation). Pressures of real estate values, uncertain regulations, structural changes in the industry, and population growth have led many companies to divest of timberlands in areas closer to metropolitan centers, thereby distributing these larger holdings into smaller ownerships (citation). Once these parcels are in individual ownership, they can be vulnerable to further fragmentation. Studies show that small and medium forest

landowners struggle to compete with larger industrial owners and receive financial recognition for their valuable contributions of ecosystem services in current markets; a generation of new owners and managers inheriting properties face new economic pressures and will be making decisions within this shifting economic context that increases pressure toward conversion; and costs of health care for aging owners can be a significant driver for selling land, and if there are other revenue opportunities, these lands won't convert. We wish to understand the factors that limit participation in certified marketing cooperatives for small- and medium-sized forestland owners, the marketing constraints architects and intermediate users of certified wood face, and then seek to empower the small- and medium-sized forestland owners with the tools and information necessary to plan and undertake management actions on their property that will generate an economic return while also contributing to the provision of environmental services like clean water, carbon storage, and habitat.

Application Number: A85533
Faculty Member: Sarah Reichard
Role: Principal Investigator
Title: **Sisyrinchium Sarmentosum Common Garden Study**
Agency: USDI Bureau of Land Management
Period: 6/1/2013 - 12/31/2014
Amount: \$36,000
Non-Competing Supplement

UW Botanic Garden's Rare Plant Care and Conservation will perform a common garden study and complete a morphological analysis on Pale blue eyed grass (*Sisyrinchium sarmentosum*), a member of the Iris family, to determine the extent of hybridization with the more common Idaho blued eyed grass (*S. idahoense*). The project is necessary for the conservation of pale blue eyed grass (*Sisyrinchium sarmentosum*), a species tracked by the US Fish and Wildlife as proposed for federal listing, is a State of Washington Threatened species, and a USFS and BLM as sensitive and special status species. Hybridization is suspected to be occurring at several occurrences with the more common Idaho blued eyed grass (*S. idahoense*). Hybridization poses a potential risk to the long-term survival of the species and needs to be understood in order to develop an effective management strategy for conservation. The work will be conducted in collaboration with the USFS R6 Forest Genetics group, who will conduct genetic analyses of plant material developed during the common garden study. Analysis and interpretation of the data will be conducted jointly between the Genetics Group and the UW Botanic Gardens.

Application Number: A85619
Faculty Member: Sarah Reichard
Role: Principal Investigator
Title: **2013 Seattle reLeaf Project**
Agency: Seattle Public Utilities
Period: 6/1/2013 - 12/31/2016
Amount: \$36,000
New

The University of Washington Botanic Gardens will work with the City of Seattle to support the Trees for Neighborhoods program. The Trees for Neighborhoods program is a City of Seattle initiative to meet their goal to reach 30% canopy cover by 2037, as outlined in the Urban Forest Management Plan

(UFMP). This project most directly meets the goals of the UFMP's community framework. The planting and maintenance of trees in urban areas provides important environmental, social, economic, and public health benefits including the reduction of stormwater runoff and the consequent pollution of nearby waterways such as Puget Sound. UWBG will provide outreach to the public; organize and host planting training and tree distribution events for the public; provide nursery and workshop space; and find appropriate homes for all unclaimed trees. Supporting the Trees for Neighborhoods program will further the University of Washington Botanic Gardens' mission by engaging residents in tree planting and care and by educating the public on both the proper care of trees on residential property and the larger concept of the benefits trees provide, particularly in urban environments.

Application Number: A84414

Faculty Member: Clare Ryan

Role: Principal Investigator

Title: **Toward Sustainable Geoduck Aquaculture Management in Puget Sound: Assessing Policy and Social Dimensions**

Agency: US Department of Commerce, National Oceanic and Atmospheric Administration

Period: 2/1/2014 - 1/31/2016

Amount: \$89,238

Pre-Application

Intertidal aquaculture of geoduck clams (*Panopea generosa*) poses an economically lucrative, yet scientifically, socially, and politically challenging resource management issue in the Puget Sound region (WA). Rapid expansion of intertidal geoduck aquaculture operations in habitats of Puget Sound in the past decade has raised concern among managers, conservation organizations, and the public regarding practices that may directly or indirectly alter nearshore ecosystems. In Washington State, a legislatively mandated Geoduck Aquaculture Research (GAR) program addresses some of the ecological aspects of geoduck aquaculture, but does not explicitly consider broader policy and social dimensions of the issue. The objectives of this project are to: 1) conduct a policy analysis of the aquaculture issue; 2) conduct a situation assessment in order to identify stakeholder interests and concerns, examine areas of consensus and dissent, and provide information necessary for developing a conflict resolution framework useful to managers and decision makers; and 3) integrate results of this study with available ecological studies to provide a more holistic understanding of the geoduck aquaculture management issue in Washington State.