UNIVERSITY of WASHINGTON

School of Forest Resources

RESEARCH NEWSLETTER ISSUE TWO, VOLUME 7

AWARDS

Application Number: A65252
Faculty Member: David Briggs
Role: Principal Investigator
Title: **Stand Management Cooperative**
Agency: Oregon Department of Forestry
Period: 1/1/2011 - 12/31/2011
Amount: $27,517
Supplement and Extension

2011 Membership Dues to Stand Management Coop from Oregon Department of Forestry, State of Oregon.

Application Number: A66282
Faculty Member: Ivan Eastin
Role: Principal Investigator

Faculty Member: Elaine Oneil
Role: Co-Investigator

Title: **Life Cycle Assessment of Redwood Decking Lumber**
Agency: Consortium for Research on Renewable Industrial Materials
Period: 5/1/2011 - 4/30/2012
Amount: $23,810
New

Consumers constantly make purchasing decisions among competing products. In recent years, there has been increasing public interest in an ongoing debate about the environmental impacts associated with the manufacture, consumption, disposal, and re-use of products that originate from the forest. Competitors use the uncertainties generated by this debate to promulgate the idea that non-wood alternatives are more environmentally friendly than wood based materials. In order to identify if these claims have any scientific basis, and counteract incorrect claims as necessary, a scientifically sound and defensible assessment of the environmental impacts of wood based materials is needed. This assessment can be used to develop marketing strategies aimed at correcting misperceptions about the environmental impact of wood as a building material.

This project is primarily aimed at identifying the environmental impact of using redwood as a decking material relative to competing materials, in this case wood-plastic composites. The environmental impact will be determined using life cycle inventory (LCI) and life cycle assessment (LCA) techniques conducted to ISO 14040 standards. Conducting the LCI/LCA to these standards provides the added credibility that the results are not only scientifically sound, but have been reviewed by independent experts. This extra level of effort is aimed at meeting current marketing needs and also supports the potential for future endeavors should the California Redwood Association (CRA) choose to pursue environmental product declarations (EPD). In addition to completing the LCA, data from a 2009 market survey will be used to identify key perceptions of deck-builders regarding the strengths and weaknesses of redwood decking relative to these competing products. This module of the study will help identify how best to use the environmental performance data generated by the LCA in a marketing campaign.

Application Number: A65078
Faculty Member: Soo-Hyung Kim
Role: Principal Investigator
Title: **Development of a Process-based Plant Growth Model for Garlic**
Agency: National Center for Agricultural Meteorology
Period: 3/1/2010 - 12/31/2012
Amount: $30,000
Competing Supplement

Process-based crop simulation models have become an important tool for researchers who study crop responses to environmental changes as well as growers who need make economically and environmentally sound crop management decisions. Mechanistic crop models

that are based on solid science can provide critical insights for understanding the linkages among individual components of the complex agroecosystems. These models can play a central role in developing adaptive solutions and strategies to sustain crop productivity while protecting the environment by optimizing resource management in a changing climate. Although numerous models have been developed and utilized for various major field crops, few models exist for specialty crops such as garlic. Garlic is an essential crop in many cultures and countries including Korea, United States, China, and European nations. The primary objective of this project is to develop a process-based crop simulation model for garlic by integrating up-to-date scientific knowledge and compiling experimental data on the physiology and ecology of this widely used, important specialty crop.

Application Number: A59130
Faculty Member: Joshua Lawler
Role: Principal Investigator
Title: **Pests, Predators, and Multiple Stressors in Agroecosystems**
Agency: US Environmental Protection Agency
Period: 1/1/2011 - 12/31/2012
Amount: $100,000
New

We will use concepts and models from spatial ecology to evaluate pest management options. We propose to parameterize a spatially-explicit population model to assess the effect of precipitation extremes (from climate change), land use change, rodent control, and their interactions, on rodents and a sensitive non-target species, the San Joaquin kit fox. We will use our models to evaluate scenarios of pesticide management under current conditions and plausible future climate and land use conditions, to attempt to maximize the combined effect of rodenticide and foxes on squirrel populations, while minimizing fox exposure to rodenticides. These models will be parameterized in the Central Valley of California, an agricultural area with Mediterranean climate. We expect that the modeling approach will be applicable across a range of agricultural systems and spatial scales.
Our model will provide a framework for making decisions about this particular system, but our approach can also be applied by the EPA or other decision makers to better regulate pesticides in cases where their use impacts sensitive non-target wildlife. Our results will also have clear implications for Integrated Pest Management (IPM) methods.

PROPOSALS

Application Number: A66362
Faculty Member: David Briggs
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: WA Department of Natural Resources

Period: 1/1/2011 - 12/31/2011
Amount: $24,581
Non-Competing Renewal

2011 Membership Dues for WA State Dept of Natural Resources to Stand Management Coop.

Application Number: A66495
Faculty Member: David Briggs
Role: Principal Investigator
Title: **Stand Management Coop**
Agency: GMO Renewable Resources, LLC
Period: 1/1/2011 - 12/31/2011
Amount: $8,352
Supplement and Extension

Payment of 2011 Membership dues to Stand Management Coop from GMO Renewable Resources, LLC

Application Number: A66071
Faculty Member: Sharon Doty
Role: Principal Investigator
Title: **Dimensions: Diversity and Functional Roles of Endophytes**
Agency: National Science Foundation
Period: 10/1/2011 - 9/30/2016
Amount: $1,977,607
New

There is currently a major gap in our understanding of how plants adapt to challenging environments. It has long been assumed that plants rely purely on specific genetic traits for successful adaptations. But how do perennial plants respond and adapt to rapid environmental changes such as fire, volcanic activity, shifts in rivers, or glacial retreats? How might they adapt quickly enough to survive rapid global climate changes? Recent evidence points to symbiosis with microbial partners as a critical mechanism for adaptation. The proposed project seeks to fill the substantial gap in knowledge of the microbial biodiversity within plants and how this diversity is critical for the ability of plants to survive in challenging environments.

Intellectual Merit: In only the last decade, there has been a proliferation in research on endophytes, the fungi or bacteria living fully within plants. One branch of the research has focused on nitrogen-fixing endophytes. It is now clear that these diazotrophic endophytes function in a wide range of plants including the tropical grasses, sugarcane, rice, and maize, and in other hardy grasses including kallar grass, dune grass, and Miscanthus. Recently, nitrogen-fixing endophytes were found in pioneer tree species including poplar and lodgepole

pine. All of these discoveries point to a hitherto unexplored rich diversity of microbial life critical to the growth of plants in low-nutrient areas. The majority of these studies were on agriculturally-important food or bioenergy crops. The proposed project seeks to expand our knowledge to include a broader sampling of the natural environments in which endophytes may play a critical role in plant establishment.

Broader Impacts: The project will provide training and learning experiences locally, nationally, and globally. Three graduate students, a postdoctoral fellow, and numerous undergraduates will receive direct training with this project. Outreach to K-12 education will be used to stimulate students with the excitement of discovery. Since the subject is of broad public interest, we propose to publish articles in popular science magazines to reach the general public. As members and leaders of the International Symbiosis Society, the research team will have ample means to broadly disseminate the knowledge gained in this project.

Integration: Through integrating genetic, taxonomic, and functional analyses, the proposed project will lead to a greater understanding of the diversity of microorganisms that are within plants thriving in challenging environments. The microbial population of the plants will be assessed through metagenomic analysis. Taxonomic studies will be conducted to group the endophytes into bacterial, archaeal, and fungal categories and into specific genera. Similarities of taxonomic groups of the endophytes within the plants across the selected environments will be determined. The primary focus of the project is to assess the significance of their presence in the plants, to determine what roles they may play in the nutrient or water status of the host plant, or if they impart the needed stress tolerance to the plant. Through the integration of the genetic, taxonomic, and functional data gathered in this project, we will gain a broader understanding of the importance of microbial diversity within plants. This knowledge may help in the mitigation of climate change impacts on plant diversity by ensuring that plants are not left to go it alone.

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Faculty Member: Ivan Eastin Faculty Member: Elaine Oneil
Role: Principal Investigator Role: Co-Investigator
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Application Number: A65305
Faculty Member: Robert Edmonds
Role: Principal Investigator
Title: **Biocontrol & fungicide Efficacy/Cylindrocarpon spps in containerized Douglas Fire seedlings**
Agency: WA State Commission on Pesticide Registration
Period: 1/1/2011 - 12/31/2011
Amount: $11,000
New

We wish to determine the efficacy of soil drenches (Mancozeb, Chipco 26019, Cleary's and Heritage)and biocontrol agents (Root Shield, Root Guard, Actinovite, and Companion) in protecting bareroot and containerized Douglas-fir seedlings from infection by Cyclindrocarpon spp. We will also conduct phytotoxicty and Root Growth Potential tests. Co-applied fungicide and biological control agents could have the potential for decreasing fungicide use, reducing the fears of fungicide tolerance build up, and improving seedling yield and performance. We will use Cylindrocarpon isolates from representative PNW forest nurseries (Weyerhaeuser - Aurora (OR), Mima and Rochester (WA), WADNR Webster (WA), and IFA Canby (OR). We have formed a strong partnership with Weyerhaeuser and other seedling growers and the data we obtain will be shared by all.

Application Number: A65888
Faculty Member: John Marzluff

Role: Principal Investigator
Title: **Neuroecology of American Crow Recognition of People**
Agency: UW Royalty Research Fund
Period: 6/16/2011 - 6/15/2012
Amount: $34,200
New

This proposal is a major, collaborative addition to the PI's research focus that will move from observing the behavior of wild animals to a coupled understanding of their behavior and the neural bases enabling behavior. The proposal will build a research base sufficient to support competitive proposals in an area for which he currently has little professional standing. A number of field studies have been conducted on American Crows aimed at understanding their population and social ecology. Most recently, those efforts have demonstrated that these animals recognize individual humans who have wronged them in the past and retain this information for over 5 years. They demonstrate individual learning of this information and infer social learning by observation as well. Recent advances in the ability to peer within the brains of small animals as they behave suggested an opportunity to further understand the neural bases of recognition in the crow. Then a collaboration with Dr. Donna Cross and Dr. Robert Miyaoka in the Department of Radiology tested the feasibility of PET scanning for crows. In the past two months a small pilot study was completed that shows this technique works on crows and that crows activate several regions in their forebrain (olfactory bulb, hippocampus, and other areas of the hyperpallium) differentially when they view a known dangerous person relative to a known, harmless person. While exciting and likely to produce a unique publication, these results are insufficient to couch future proposals to NSF or NIH. In addition, upgrades to existing facilities are needed to support more of this research; such a place would increase chances of subsequent funding. This project is to conduct 30 more PET scans of crows that will demonstrate the activation of their brain regions when viewing 1) no person, 2) a person, but not a face, 3) a familiar crow, 4) a crow predator, the red-tailed hawk, 5) a never before seen person perceived as dangerous because they will be holding a taxidermy mounted crow that appears to be dead. A crow holding facility will be built atop Guthrie Hall and improvements will be made to the experimental chamber.

Application Number: A65441
Faculty Member: Stephen West
Role: Principal Investigator
Title: **Eastern Gray Squirrel Ecology and Interactions with Western Gray Squirrels on Joint Base Lewis-McChord**
Agency: WA Department of Fish and Wildlife
Period: 7/1/2011 - 6/30/2012
Amount: $11,860
New

Introduced eastern gray squirrels are implicated as a cause for the decline of State-threatened western gray squirrels, but little is known about competitive interactions between these species. In conjunction with WDFW's Western Gray Squirrel Augmentation Project on Joint Base Lewis-McChord, we have equipped eastern and western gray squirrels with radio-collars and conducted experimental removals of eastern gray squirrels to investigate resource use and interactions between these species. Results of this study will aid management and recovery of western gray squirrels. We seek funding for the final six months of this multi-year study.

Application Number: A65785
Faculty Member: Stephen West
Role: Principal Investigator
Title: **Ecology and Conservation of the Western Gray Squirrel (Sciurus griseus) in the North Cascades**
Agency: Seattle City Light
Period: 4/1/2011 - 3/31/2012
Amount: $31,420
New

The Western Gray Squirrel (Sciurus griseus) – listed as a Washington State threatened species in 1993 – is confined to three geographically isolated areas: the southern Puget Trough of Pierce County, southern Washington in Klickitat, Yakima and Skamania counties, and north-central Washington in Chelan and Okanogan counties. Recovery of the species has become a priority, however, distributional and life history data on the western gray squirrel, particularly for the North Cascades population, is limited. This population is genetically isolated from others in Washington and ecologically unique as it exists in a mixed-conifer forest habitat composed primarily of Douglas-fir (Pseudotsuga menziesii) and ponderosa pine (Pinus ponderosa) that lacks oak (Quercus spp.), an important source of forage and maternal nests elsewhere in the range. The North Cascades are also distinguished by high average annual snowfall, frequent wildfire, and dynamic forest management. A history of logging and fire suppression has created dense, diseased, and fire-prone forest stands, leading to several catastrophic wildfires in recent years and intensive fire fuel reduction plans with potentially adverse effects on western gray squirrels. The parent study began in 2008 to investigate the distribution, life history, and response of squirrels to fire management treatments in the North Cascades using radio-telemetry. Preliminary results indicate high use of fire fuel treated areas by squirrels. We also conducted a small experiment on the effectiveness of alternate educational presentations to stakeholders. All educational strategies significantly increased understanding and support for research; differences between strategies were less transparent. This funding request will complete the overall project by extending fieldwork another season and allowing for data analyses and writing.

Application Number: A65873
Faculty Member: Aaron Wirsing

Role: Principal Investigator
Title: **Seattle City Light: Patterns of lynx predation on snowshoe hares in north-central Washington**
Agency: Seattle City Light
Period: 7/1/2011 - 6/30/2012
Amount: $25,354
New

Numbers of Canada lynx (Lynx canadensis) in the continental United States have dwindled over the past several decades, leading this carnivore to be listed as Threatened under the federal Endangered Species Act in 2000. In Washington State, this decline has been driven largely by loss of boreal forest habitat where lynx are able to hunt efficiently for their principal prey species, the snowshoe hare (Lepus americanus). By implication, the current lynx population trend in Washington could be mitigated or even reversed following the implementation of a management strategy that promotes boreal forest habitats where lynx are able to forage successfully for hares. Indeed, both the 2000 Canada Lynx Conservation Assessment and Strategy and the State of Washington Lynx Recovery Plan emphasize projects that identify key drivers of snowshoe hare availability to lynx as critical to lynx population recovery in the northwest. To date, however, we know little about the boreal forest features that are associated with high rates of hare predation by lynx, hindering the development of such a plan. Accordingly, we are asking for funds to help complete the second year of a comprehensive study of the boreal forest features that drive patterns of lynx predation on hares in north-central Washington (the Loomis State Forest and the Okanogan National Forest). Our specific objectives for this study are to: (1) contrast lynx predation rates on hares characterizing the two main boreal forest stand types where hares are abundant – dense, regenerating stands and mature stands with an understory – and (2) identify any forest features in each stand type that are consistently associated with lynx kill sites.

This project provides partial support of the student working on this project.

Application Number: A65996
Faculty Member: Sandy Wyllie-Echeverria
Role: Principal Investigator
Title: **Relationship Between Temperature and Ovule Development in the Seagrass, Zostera Marina**
Agency: UW Royalty Research Fund
Period: 6/15/2011 - 12/31/2011
Amount: $16,788
New

Through the combined strategies of vegetative growth and seed dispersal, Zostera marina, a marine angiosperm, can form contiguous meadows in the shallow sub-tidal region of the Pacific Northwest. These meadows increase biodiversity and productivity in coastal and estuarine

environments in this region, however an increase of environmental stress from human-induced sources threatens meadow survival. Recent research demonstrates that genetic variation within extant populations buffers these populations from particular stresses such as increased temperature. Because seed production and dispersal strongly contributes to genetic diversity within populations, it is important to identify stressors that reduce seed development and viability. Evidence from ongoing studies in the San Juan Archipelago suggests that higher than normal temperature during the flowering season could retard ovule development and hence negatively effect the amount of viable seed. Because temperature increase is a predicted element of climate change in the Pacific Northwest region, seed stocks of Z. marina could be reduced. The objective of this proposed research is to investigate the influence of higher than normal temperatures on ovule and seed development.