Northwest Lichenologists

Network

NorthWest Scientific Association

Science

Communication, Collaboration, and Conservation in a Time of Change

2012 **Program & Abstracts**

March 28-31, 2012
Owyhee Plaza Hotel

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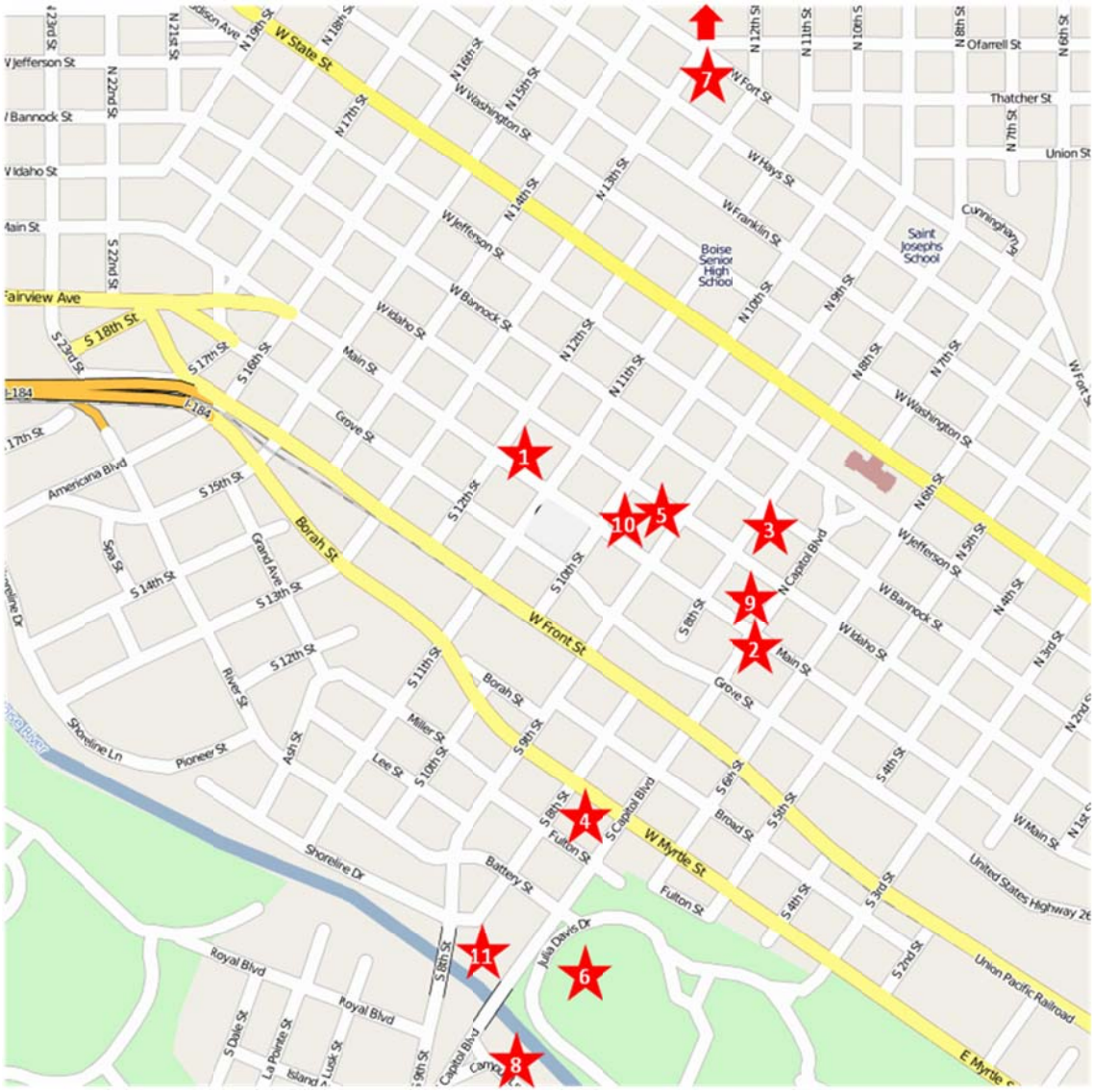
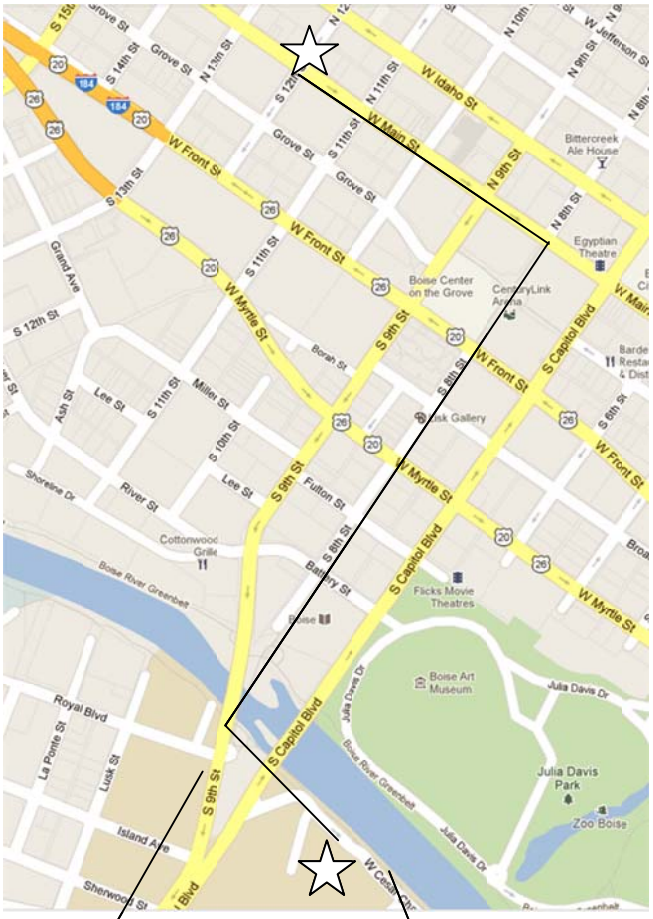
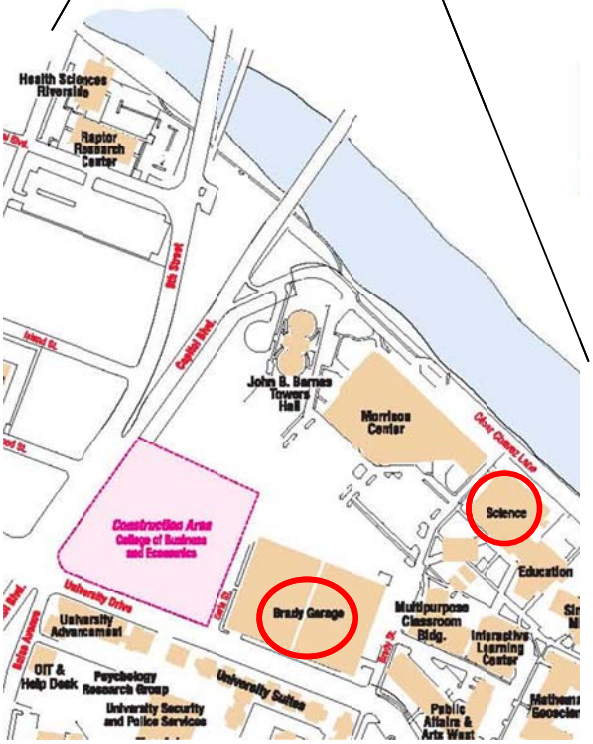
Places to eat and visit in Boise



1. Owyhee Plaza Hotel
2. Goldys Breakfast Bistro (Breakfast and Lunch)
3. Bitter Creek Alehouse
4. Table Rock Brewery and Restaurant
5. Berryhill & Co. Restaurant
6. Boise Art Museum, Historical Museum, Zoo
7. 13th Street/Hyde Park Business Area (more restaurants)
8. Boise State University
9. Tonys Pizza Teatro- Egyptian Theatre
10. La Vie En Rose (Breakfast and Lunch)
11. Anne Frank Human Rights Memorial (entrance to Boise Greenbelt)

Getting to Boise State University (workshops)





Walking (path diagramed in black): Head east on Main, turn right (south) on 8th, follow 8th all the way through the Anne Frank memorial to the river, cross foot bridge, follow loop around to greenbelt, turn right (east) on greenbelt, take greenbelt past Morrison Center, Square, 3-story building on right is Science. Doors on south side of building will be unlocked.

Driving: Head east on Main, turn right on 9th, after crossing river turn left on University, Park in the Brady Garage. Note stall number and pay at machines in the stairwell. Walk north to the Science building. Doors on south side of building will be unlocked.

Workshops will be held in 248 Science building (second floor).

WELCOME FROM THE PRESIDENT

Northwest Scientific Association

promoting scientific research and disseminating scientific knowledge since 1923

http://www.northwestscience.org/

Welcome to the 83rd Annual Meeting of the Northwest Scientific Association (NWSA) and Northwest Lichenologists in Boise, Idaho. Thank you for supporting the association and Pacific Northwest scientific community by attending the annual meeting. This year's meeting reflects the breadth and diversity of scientific research in the Northwest. We have several exciting technical sessions, informative workshops on sagebrush identification and lichens, and innovative symposia including: *Drivers of dynamic fire regimes: past, present and future*, *Citizen science, outreach, volunteerism, and education*, *Geo-Integration: Making sense of the overload of spatial data, portals, and analysis tools*, and *Sagebrush ecosystems: linking biophysical drivers and species change across trophic levels.*

Northwest Scientific Association has been dedicated to serving the scientific community of the northwestern United States and western Canada since 1923. An important part of our mission is to connect people involved in scientific investigations from local institutions and agencies to share their research findings at annual meetings. We also support funding for student research through a small grant competition. The journal, *Northwest Science*, disseminates scientific knowledge through a quarterly publication. NWSA gives honorary awards that recognize excellence and outstanding contributions toward our regional science and service. It is how we acknowledge our scientists, educators, and mentors for their time, effort, and leadership. Northwest Scientific Association is supported entirely by its members who volunteer their time.

Please join us in thanking all those that have served on this year's NWSA Board: Alan Yeakley, Portland State University; Andrea Pipp, Atkins North America, Inc.; Andrea Woodward, USGS Forest and Rangeland Ecosystem Science Center; Bax Barton, University of Washington; Doug Call, Washington State University; Eva Dettweiler-Robinson, University of New Mexico; Heather Root, Bureau of Land Management; Jeffrey Duda, US Geological Survey; Judy Harpel, University of British Columbia; John Villella, Siskiyou BioSurvey; Julie Heath, Boise State University; Katherine Glew, University of Washington; Nancy Grunewald, Washington State University Press; Lana D'Souza, ; Mark Harmon, Oregon State University; Pat Pringle, Centralia College; Robin Lesher, University of Washington; and Trudy A. Kavanagh, University of British Columbia, Okanagan. We will be adding new members to the board for the 2012-13 academic year.

In addition, we thank the NWSA Officers, Editors and members of the NWSA's Program, Awards, Student Grants, Nominating, and Membership committees for their extraordinary work in making NWSA a successful association. If you are not already a member of NWSA, I encourage you to consider joining. We welcome anyone interested in science in the Pacific Northwest, and a diversity of members makes for a stronger association. The NWSA Board is another way to show your support. The above committees and board positions are open to all members of NWSA. If this (or other volunteer opportunities) interests you, contact any member of the current board to find out how to become actively involved in the association.

Our journal, *Northwest Science*, can currently be viewed on-line at the BioOne web site, thanks to our current editor, Jeffrey Duda. This website is a nonprofit publishing collective and is found at: http://www.bioone.org/loi/nwsc. *Northwest Science* is web searchable journal from anywhere in the world, since January 2007. If you are interested in earlier versions of the journal, view: http://www.vetmed.wsu.edu/org_nws/Journal%20reprints.htm. More than 17,000 abstracts and 5,000 full-text articles have been accessed since we have gone online! So there are even better reasons now to publish your work in Northwest Science!

Our new web site, http://www.northwestscience.org/ was developed with the help of Jeffrey Duda and Lana D'Souza. This will make navigating through our association easy for you to do on-line. You can even sign up for membership on the website.

This meeting promises to be an exciting arena for you to connect with other researchers. Our meetings also provide students an opportunity to meet with other researchers and professionals to share their research. I hope you enjoy your time while attending the annual meeting with the other participants, old friends and making new acquaintances.

Sincerely,
Katherine Glew, President
Northwest Scientific Association

Program at a Glance

Wednesday, March 28

1:00- 8:00 pm **Registration table open.** Owyhee Plaza Hotel lobby

2:00- 4:00 pm **Workshop.** Sagebrush identification. (Boise State University, Science 248)

6:00- 8:30 pm **Evening Social.** Owyhee Plaza Hotel, Hors d'oeuvres and no-host bar

Thursday, March 29

8:00 am- 6:00 pm **Registration table open.** Owyhee Plaza Hotel Lobby

8:30- 8:45 am **Welcome.** Patrick Pringle. Owyhee Ballroom

8:45-10:00 am **Plenary Speaker.** J. Michael Scott: *Conservation reliant species: Our new relationship with nature .* Owyhee Ballroom

10:00- 10:20 am **Break**

10:20am- 12:00 pm Contributed Papers: **Lichens and Bryophytes** . Rainer Room

10:20am- 12:00 pm Contributed Papers: **Geosciences**. Regency Room

12:00-1:30 pm **Lunch** (on your own)

1:30- 3:30 pm Contributed Papers: **Forest and Rangeland Ecology**. Rainer Room

1:30- 3:30 pm Symposium: **Sagebrush ecosystems: linking biophysical drivers and species change across trophic levels**. Regency Room

3:30- 3:50 pm **Break**

3:50- 6:00 pm **Poster Session.** Ivory Room. Hors d'oeuvres and a no-host bar

6:00- 9:00 pm **Banquet** (guests invited). Michael Lucid: *Harnessing the enthusiasm of citizen scientists to implement the multi-species baseline initiative.* Owyhee Ballroom

Friday, March 30

8:00-11:00 am **Registration table open.** Owyhee Hotel Lobby

8:00-10:00 am Contributed Papers. **Community Ecology**. Rainer Room

8:00-10:00 am Symposium. **Citizen science: outreach, volunteerism, and education.** Regency Room

10:00-10:20 am **Break**

10:20 am-12 pm Contributed Papers**. Lichens and Bryophytes**, Rainer Room

10:20 am-12 pm Symposium. **Drivers of dynamic fire regimes: past, present and future**, Regency Room

12:00-1:30 pm **NWSA Business lunch**. Owyhee Ballroom.

1:30-3:30 pm Symposium. **Geo-Integration: Making sense of the overload of spatial data, portals, and analysis tools**, Owyhee Ballroom.

1:30-3:50 pm **Workshop.** Lichen and Bryophyte Soil Crust (Boise State Univ., Science 248)

3:30-3:50 pm **Break**

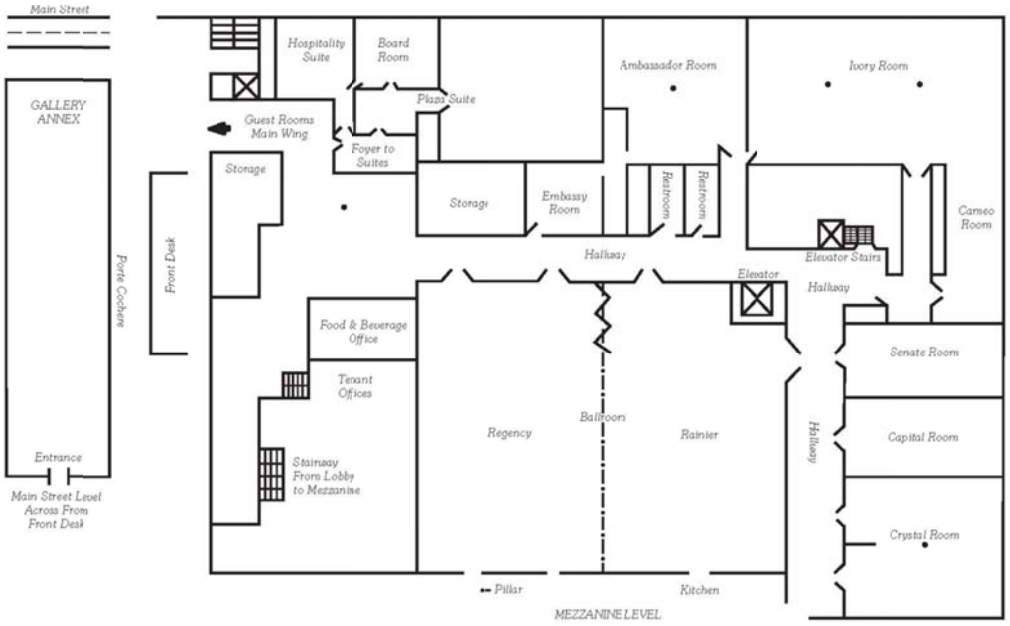
3:50-5:10 pm Symposium. **Geo-Integration: Making sense of the overload of spatial data, portals, and analysis tools (continued)**. Regency Room

3:50-5:10 pm Contributed Papers. **Animal Biology**. Rainer Room

Saturday, March 31

Field trips

Owyhee Plaza Floor Plan



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9/00

Session schedule

Wednesday, March 28

Workshop: Sagebrush Identification and Ecology

Time: 2:00-4:00 pm
Room: Boise State University, Science Building Room 248
Moderator: Roger Rosentreter, State Office Botanist, BLM

Basic Sagebrush morphology and seasonal characteristics will be illustrated with specimens. Key morphological features for the common Sagebrush species and subspecies in Western North America will be illustrated by species. Black light chemistry of the woody sagebrush will be demonstrated. Identified samples of each species and subspecies will be available for review. Ecological preferences for each species and the general wildlife palatability will be discussed. This will be a hands on workshop.

6:00-8:30 pm **SOCIAL.** Ivory Room, Owyhee Plaza Hotel

Thursday, March 29

Plenary

Time: 8:30-10:00 am
Room: Owyhee Ballroom
Moderator: Patrick Pringle

8:30-8:45 WELCOME AND INTRODUCTION. **Patrick Pringle**, NWSA

8:45-10:00 CONSERVATION-RELIANT SPECIES: OUR NEW RELATIONSHIP WITH NATURE. **J. Michael Scott**, University of Idaho, Moscow, Idaho.

Species threatened with extinction are the focus of mounting concern throughout the world. The number of endangered and threatened species in the United States has increased from 78 under the 1966 Endangered Species Preservation Act to more than 1300 today. When the Endangered Species Act was signed in 1973 there was an assumption that under the Act species at risk of extinction would be identified, threats document, needed management responses would be developed and implemented at conservation relevant scales, the species would respond with increased numbers, reproductive success and distributions, recovery goals would be reached and the species delisted no longer needing the special protections afforded it under the Endangered Species Act. Today we know that assumption to be false. Eighty four percent of federally listed species are conservation reliant. That is even after recovery goals have been reached that these conservation reliant species will continue to need species specific management interventions to sustain their numbers and distribution above recovery thresholds. Conservation reliant species are challenging the relevance of long held principals of wildlife managers and policy makers. We have a new relationship with nature. New ways to prioritize conservation actions, implement innovative management approaches and engage a broader spectrum of society are needed if the challenge of maintaining viable populations of conservation reliant species is to be met. Failure to meet these new wildlife management challenges do will leave us with hard choices as to which species to leave behind.

Dr. J. Michael Scott has worked with the USFWS and USGS since 1974. He worked on endangered native forest birds in Hawaii (1974-84) and was leader of the Condor Research Center in California (1984-86). In 1986, he became leader of the Idaho Cooperative Fish and Wildlife Research Unit and Professor of Fish and Wildlife Resources at the University of Idaho in Moscow. He pioneered the Gap Analysis Program and served as leader of the National GAP program (1989-97), a major innovation in using GIS to protect important areas for wildlife species. This innovative project is ongoing. He retired in 2011, and is now Distinguished Professor Emeritus at U.I. Dr. Scott has authored and co-authored more than 200 journal articles, chapters, and monographs, and written or edited 9 books, on topics such as endangered species recovery; conservation-reliant species; avian population estimation; reserve identification, selection and design; and landscape approaches to conservation biology. Many have been published with his graduate students. Among his many accomplishments, Dr. Scott has received distinguished achievement awards from the Society for Conservation Biology, the American Ornithologists Union, and the U.S. Department of Interior. He is an elected fellow of the American Association for the Advancement of Science and the American Ornithologist's Union, and has been president of the Cooper Ornithological Society.

10:00-10:20 **BREAK**

Thursday, March 29 (cont.)

Lichens and Bryophytes (Soil Crust Theme)

Time: 10:20-12:00
Room: Rainer Room
Moderator: Heather Root

10:20-10:40 SOIL CRUST LICHENS OF OREGON'S STEPPE. **Heather T. Root**, Bureau of Land Management, Bakersfield, CA; Bruce McCune, Oregon State University Corvallis, OR

10:40-11:00 LAND USE CHANGES HAVE ELIMINATED MUCH SUITABLE HABITAT FOR RARE BIOTIC SOIL CRUSTS IN OREGON. Heather T. Root and **Bruce McCune**, Oregon State University, Corvallis, OR

11:00-11:20 MAPPING LICHENS USING SATELLITE IMAGERY. **Peter R. Nelson**, Bruce McCune, Oregon State University, Corvallis, OR; Carl Roland, Denali National Park and Preserve, Denali Park, AK; Matthew J. Macander, ABR, Inc., Environmental Research & Services, Fairbanks, AK

11:20-11:40 USING EPIPHYTIC LICHENS AS EARLY INDICATORS OF WHITEBARK PINE STAND MORTALITY IN THE EASTERN CENTRAL CASCADES, WASHINGTON. **Katherine Fitch**, Central Washington University, Roslyn, WA

11:40-12:00 DISCUSSION

Geosciences

Time: 10:20-12:00
Room: Regency Room
Moderator: Patrick Pringle

10:20-10:40 HOLOCENE FIRE REGIMES OF THE PACIFIC NORTHWEST RECONSTRUCTED USING CHARCOAL ANALYSIS OF LAKE SEDIMENTS. **Megan K. Walsh**, Central Washington University, Ellensburg, WA; Jennifer R. Marlon, University of Wisconsin, Madison, WI

10:40-11:00 INVESTIGATIONS OF THE GHOST FOREST AT MOUNT HOOD, OREGON USING RADIOCARBON AND DENDROCHRONOLOGY—A TEACHER-RESEARCHER PARTNERSHIP. Chris Hedeen, Oregon City High School, Oregon City OR; **Patrick Pringle**, Centralia College, Centralia WA

11:00-11:20 PRELIMINARY STRATIGRAPHIC CONTEXT OF THE COYOTE CANYON MAMMOTH SITE. **George V. Last**, Pacific Northwest National Laboratory, Richland, WA; Bax R. Barton, University of Washington, Seattle, WA; Gary C. Kleinknecht, Kamiakin High School, Kennewick, WA

11:20-11:40 REASSESSMENT OF THE SILURIAN PROBLEMATICUM RUTGERSELLA AND ITS RELATIONSHIP WITH VENDOBIONTA. **Gregory J. Retallack**, University of Oregon, Eugene, Oregon

11:40-12:00 THE ROLES OF HUMANS AND CLIMATIC VARIATION ON THE FIRE AND VEGETATION HISTORY OF SUBALPINE MEADOWS - MOUNT RAINIER NATIONAL PARK (WASHINGTON). **Michael L Lukens**, Megan K. Walsh, Central Washington University, Ellensburg, WA

Thursday, March 29 (cont.)

12:00-1:30 **LUNCH** (on your own)

Forest and Rangeland Systems

Time: 1:30-3:10
Room: Rainer Room
Moderator: Alan Yeakley

1:30-1:50 ESTIMATING SHRUB COVER IN SEMI-ARID RANGELANDS USING LIDAR AND HYPERSPECTRAL DATA. **Lucas Spaete**, Nancy Glenn, Jessica Mitchell, Temuulen T Sankey, Idaho State University, Boise, ID; Stuart Hardegree, Agricultural Research Service, Boise, ID; Randy Lee, Idaho National Laboratory, Idaho Falls, ID

1:50-2:10 CREATING ECOLOGICALLY-BASED FOREST STAND BOUNDARIES USING REMOTE SENSING, THRESHOLD CLASSIFICATION, AND OBJECT-BASED IMAGE ANALYSIS **David R. Stephens**, Joint Base Lewis-McChord, Lacey, WA

2:10-2:30 RELATIONSHIPS BETWEEN INTENSIVE BIOMASS PRODUCTION AND BIODIVERSITY IN NORTH AMERICAN FORESTS- A LITERATURE REVIEW. **Jake Verschuyl**, NCASI, Anacortes, WA; Sam Riffell, Mississippi State University, Mississippi State, MS; Darren A. Miller, Weyerhaeuser NR Company, Columbus, MS; T. Bently Wigley, National Council for Air and Stream Improvement, Clemson, SC

2:30-2:50 THINNING EFFECTS ON NATURAL REGENERATION IN WESTERN OREGON DOUGLAS-FIR FORESTS**. Erich Kyle Dodson**, Julia I. Burton, and Klaus J. Puettmann, Oregon State University, Corvallis, OR,

2:50-3:10 WHAT IS… THE MATRIX? CONSERVATION IN MULTIPLE-USE FOREST ENVIRONMENTS OF THE 21ST CENTURY. **Mark E. Swanson**, Washington State University, Pullman, WA

3:10-3:30 CONIFER ENCROACHMENT IN PLANTATIONS AND ADJACENT GRASSLANDS OF NORTHERN URUGUAY. **Laura J. Six**, Robert E. Bilby, Weyerhaeuser Global Timberlands Technology, Federal Way, WA; Jonathan D. Bakker, University of Washington, Seattle, WA

Thursday, March 29 (cont.)

Sagebrush ecosystems: linking biophysical drivers and species change across trophic levels

Time: 1:30-3:10
Room: Regency Room
Moderator: Steve Hanser

A large portion of the Pacific NW landscape is upland that is sagebrush steppe, or sagebrush steppe that has been altered by fire and species change due to increase in exotic invaders or loss of native plants and animals. Conservation approaches have either tended to focus on rehabilitation of the biophysical structure of the habitat, such as soil stabilization, or have focused on populations of wildlife. There are considerable opportunities to consider how the unique species' attributes in this ecosystem relate to climate impacts and resistance and resilience. This symposium will promote cross-communication of researchers who focus on linkages of climate, soils, sagebrush and associated plants, insects, and priority wildlife species. The potential audience includes faculty and students interested in sagebrush landscapes, rangeland specialists, restorations, and wildlife specialists.

1:30-1:50 EFFECTS OF LONG-TERM EXPERIMENTAL CHANGES IN PRECIPITATION SEASONALITY ON COVER, ECOPHYSIOLOGY, FOLIAR CROWN PROPERTIES, AND CARBON POOLS IN BIG SAGEBRUSH. **Keith Reinhardt**, Idaho State University, Pocatello, ID; Matt J. Germino, U.S.G.S. Forest and Rangeland Ecosystem Science Center, Boise, ID

1:50-2:10 CHANGES IN SOIL AGGREGATE DYNAMICS AND CARBON STORAGE FOLLOWING 18 YEARS OF EXPERIMENTALLY INCREASED PRECIPITATION IN A COLD DESERT ECOSYSTEM. **Marie-Anne de Graaff**, Boise State University, Boise ID; Jess van der Veen, Matthew Germino U.S.G.S. Forest and Rangeland Ecosystem Science Center, Boise, ID; Jamie Hicks, Boise State University, Boise ID

2:10-2:30 EFFECTS ONF HERBIVORY ON THE GROWTH, REPRODUCTIONG, AND CARBON AND NITROGEN ECONOMY OF THE FOUNDATION SPECIES OF SAGEBRUSH STEPPE (Artemisia tridentata L., BIG SAGEBRUSH) DEPENDING ON CHANGING CLIMATE. **Masaru Takahashi**, Idaho State University, Pocatello, ID; Nancy Huntly, Utah State University, Logan, UT; Bruce Finney, Idaho State University, Pocatello, ID; Matthew Germino; U.S.G.S. Forest and Rangel and Ecosystem Science Center, Boise, ID

2:30-2:50 UNDERSTANDING THE TRADEOFF BETWEEN SAFETY AND FOOD QUALITY BY PYGMY RABBITS. **Jamie Utz**, Jennifer Forbey, Boise State University, Boise ID; Janet Rachlow, University of Idaho, Moscow ID; Lisa Shipley, Washington State University, Pullman, WA

2:50-3:10 THE INFLUENCE OF NON-NATIVE GRASSES AND JUNIPER ON THE SAGEBRUSH-ASSOCIATED BIRD COMMUNITY ALONG AN ELEVATION GRADIENT IN THE OWYHEE UPLANDS. **Steven E. Hanser**, Steven T. Knick, U.S.G.S. Forest and Rangeland Ecosystem Science Center, Boise, ID

3:10-3:30 THE IMPLICATIONS OF CLIMATE CHANGE TO THE ECOLOGY OF GREAT BASIN RATTLESNAKES ON THE EASTERN SNAKE RIVER PLAIN. Charles R. Peterson, Idaho State University, Pocatello, ID; Vincent A. Cobb, Middle Tennessee State University, Murfreesboro, TN; Christopher L. Jenkins, The Orianne Society, Clayton, GA.

Thursday, March 29 (cont.)

3:30-3:50 **BREAK**

Poster Session (no-host bar and hors d'oeuvres)

Time: 3:50-6:00 pm
Room: Ivory Room
* Candidate for student poster award

* A RECONSTRUCTION OF FIRE HISTORY USING MACROSCOPIC CHARCOAL ANALYSIS: FISH LAKE, SINLAHEKIN WILDLIFE AREA, NORTH CENTRAL WASHINGTON, USA. **Haley J. Duke**, Megan K. Walsh, Department of Geography, Central Washington University, Ellensburg, WA

MAMMOTHS IN THE LOESS OF BENTON COUNTY, WASHINGTON. **Bax R. Barton**, University of Washington, Seattle, WA; George V. Last, Pacific Northwest National Laboratory, Richland, WA; Gary C. Kleinknecht, Kamiakin High School, Kennewick, WA

* FROM FIELD TO FRIDGE: FIRST GLIMPSES OF FUNGICIDE-EXPOSED GUT FUNGI. **Emma R. Wilson**, Boise State University, Boise, ID; Kelly L. Smalling, U.S.G.S., California Water Science Center, Sacramento, CA; Timothy J. Reilly, U.S.G.S., New Jersey Water Science Center, West Trenton, NJ; Lance Steele, Prasanna Kandel, Alison B. Chamberlin, Justin W. Gause, and Merlin M. White, Boise State University, Boise, ID

* PAST AND CURRENT WILDFIRE TRENDS IN THE OKANOGAN-WENATCHEE NATIONAL FOREST: AN ANALYSIS USING GIS AND PALEOECOLOGICAL METHODS. **Kevin C. Haydon**, Megan K. Walsh, Department of Geography and Resource Management, Ellensburg, WA

A WEB-AVAILABLE INDIVIDUAL-BASED MODEL FOR EXPLORING LEAST TERN-RIVER MANAGEMENT INTERACTIONS. **Casey A. Lott**, American Bird Conservancy, Boise, ID; Steven F. Railsback, Colin J.R. Sheppard, Lang, Railsback, and Associates, Arcata, CA; Richard A. Fischer, U.S. Army Corps of Engineers, Research and Development Center, Environmental Laboratory, Vicksburg, MS; Stephen R. Crawford, Blake E. Ketchum, Douglas A. Miller, Penn State University, University Park, PA

* VARIATIONS IN MANTLE COMPOSITION INFERRED FROM OLIVINE PHENOCRYST AND XENOCRYST GEOCHEMISTRY FROM THE SOUTHERN RIO GRANDE RIFT, NEW MEXICO. **Spenser P. Scott** and Michael C. Rowe, Washington State University, Pullman, WA

* NATIVE AND NON-NATIVE VEGETATION RESPONSE TO THE 2005 SCHOOL FIRE IN POMEROY, WA. **Maike Holthuijzen**, Utah State University, Logan, UT; Penelope Morgan, University of Idaho, Moscow, ID

Thursday, March 29 (cont.)

Poster Session (cont.)

Time: 4:00-6:00 pm
Room: Ivory Room
* Candidate for student poster award

* THE ROLE OF PINUS LAMBERTIANA CONES AS A SURFACE FUEL IN SIERRA NEVADA MIXED CONIFER FOREST. **Anton T. Gabrielson**, Andrew J. Larson, University of Montana, Missoula, MT; James A. Lutz, University of Washington, Seattle, WA

* IMPROVEMENT IN COLONIZATION AND SEEDLING SURVIVAL OF WYOMING BIG SAGEBRUSH FOLLOWING INOCULATION WITH NATIVE ARBUSCULAR MYCORRHIZAL FUNGI. **Bill Davidson**, Marcelo Serpe, Boise State University, Boise, ID

RESPONSES OF BIOLOGICAL SOIL CRUSTS TO THE PRESENCE OF CHEATGRASS LITTER. Eric Roberts, Russell Holten, **Marcelo Serpe**, Boise State University, Boise, ID

* EVALUATION OF COLOR VARIATION IN THE UMBILICARIA PHAEA COMPLEX (LICHENIZED FUNGI) USING nrDNA SEQUENCES. **Rheannon Arvidson**, Bruce McCune, Oregon State University, Corvallis, OR

* COMPARISON OF BIOMASS ESTIMATION METHODS. **Peter Olsoy**; Nancy Glenn, Idaho State University, Boise, ID 83702; Pat Clark, USDA Agricultural Research Service, Boise, ID; Lucas Spaete, Idaho State University, Boise, ID

* SYNTHESIZING AND VISUALIZING LATE PLEISTOCENE CHANGES IN OLYMPIC PENINSULA FOREST COMPOSITION. **David Fisher**, University of Oregon, Eugene, OR.

* CLIMATE AND VEGETATION IN A PUTATIVE PLEISTOCENE REFUGIUM IN NORTHERN IDAHO INFERRED FROM A 120,000 YEAR SEDIMENT RECORD. **Erin M. Herring**, Daniel G. Gavin, Department of Geography, Eugene, OR

* THE EFFECTS OF HANDLING ON CORTICOSTERONE IN AMERICAN KESTREL NESTLINGS. **Erin Wonder**, Alfred Dufty, Jr., Boise State University, Boise, ID

LC MAP: THE LANDSCAPE CONSERVATION MANAGEMENT AND ANALYSIS PORTAL. **Sean P. Finn**, Great Northern LCC, Boise, ID; Yvette Converse, Rick Sojda, Tom Olliff, Great Northern LCC, Bozeman, MT; Tim Kern, Lei Ann Wilson, U.S.G.S., Fort Collins Science Center, Ft. Collins, CO

Thursday, March 29 (cont.)

Banquet

Time: 6:00-9:00 pm
Room: Owyhee Ballroom

7:30-8:30 HARNESSING THE ENTHUSIASM OF CITIZEN SCIENTISTS TO IMPLEMENT THE MULTI-SPECIES BASELINE INITIATIVE. **Michael Lucid**, Idaho Department of Fish and Game, Coeur d' Alene, Idaho.

The Multi-species Baseline Initiative (MBI) is a diverse collaborative of partners with goals to implement a long term monitoring program for multiple taxa groups across the Idaho Panhandle and adjoining mountain ranges. Conducting standardized surveys across our vast 23,825 km2 study area requires a large amount of equipment and worker hours. Two MBI partners, Friends of Scotchman Peaks Wilderness and Idaho Conservation League, successfully obtained a grant from ZooBoise Conservation Fund which allowed them to play a significant role in the forest carnivore survey portion of the MBI. In 2012 these partners recruited over 100 volunteer Citizen Scientists who donated approximately 1,500 hours to manage 46% (n = 43) of 93 forest carnivore bait stations established by all MBI partners. Field opportunities required a variety of ability levels and our volunteers ranged from high school students to highly skilled ski mountaineers. By enabling community participation the MBI (1) obtains large amounts of equipment and worker hour resources, (2) provides unique opportunities for citizens to experience wildlife, and (3) provides our Citizen Scientists with the tools to further develop their appreciation of local landscapes into an educated conservation ethic for a variety of forest carnivore species.

*Michael Lucid earned a B.Sc. in Wildlife and Fisheries Management from Texas Tech University in 1998. His Master's research focused on population genetics of Keen's Mouse (*Peromyscus keeni*) in southeast Alaska. He graduated with a M.Sc. in Biology from Idaho State University in 2003. He is employed as a Regional Wildlife Biologist for the Idaho Department of Fish and Game's Wildlife Diversity Program.*

Friday, March 30

Community Ecology

Time: 8:00-10:00
Room: Rainer Room
Moderator: Alfred Dufty

8:00-8:20	URBANIZATION AND AVIAN SPECIES RICHNESS AND ABUNDANCE ALONG THE BOISE RIVER CORRIDOR. **Allison Korte** and Alfred Dufty, Boise State University, Boise, ID
8:20-8:40	IMPACTS OF URBAN DEVELOPMENT ON STREAM-ASSOCIATED AMPHIBIAN COMMUNITIES IN FORESTED REFUGIA. **Andrew Dietrich**, Alan Yeakley, and Christa von Behren, Portland State University, Portland OR
8:40-9:00	COMMUNITY COMPOSITION OF URBAN NEAR-STREAM VEGETATION IN THE PORTLAND-VANCOUVER METRO AREA. **Christa von Behren**, Andrew Dietrich, Alan Yeakley, Portland State University, Portland, OR
9:00-9:20	PICTURES OF AN INVASION, PAST, PRESENT, AND FUTURE: ENGLISH HOLLY (*ILEX AQUIFOLIUM*) IN SAINT EDWARD STATE PARK. David Stokes, Caitlin Campbell, **David Cronkright,** Elliott Church, and Rachel Phillips, University of Washington, Bothell WA
9:20-9:40	WINNERS AND LOSERS IN A NITROGEN-RICH BOREAL FOREST UNDERSTORY. **Tess Grainger**; Roy Turkington, University of British Columbia, Vancouver, BC
9:40-10:00	MULTI-SPECIES BASELINE INITIATIVE: GETTING THE MOST BANG FOR THE SURVEY AND MONITORING BUCK. **Michael Lucid**, Idaho Department of Fish and Game, Coeur d' Alene, ID

Friday, March 30 (cont.)

Citizen Science: outreach, volunteerism, and education

Time: 8:00-10:00
Room: Regency Room
Moderator: Greg Kaltenecker

The use of citizen scientists as conservation stewards gives people the chance to learn from experts about local natural resources and efforts to protect them. These citizen scientists not only provide valuable data collection, but also their hours in the field can be converted into dollars to match with important federal grants.

8:00-8:40	TWENTY YEARS OF *NATUREMAPPING* USING VOLUNTEERS, CITIZEN SCIENTISTS, AND PUBLIC PARTICIPATION IN SCIENTIFIC RESEARCH. **Karen Dvornich**, NatureMapping Foundation, Federal Way, WA
8:40-9:00	IDAH2O: MASTER WATER STEWARDS SERVING IDAHO THROUGH VOLUNTEER MONITORING. **Kelli Duncan,** University of Idaho Extension, Coeur d'Alene, ID
9:00-9:20	THE IDAHO BIRD OBSERVATORY: USE OF VOLUNTEERS TO CONDUCT LONG-TERM POPULATION MONITORING OF MIGRATORY LANDBIRDS. **Gregory Kaltenecker**, Jay D. Carlisle, Idaho Bird Observatory, Boise State University; Mary Dudley, Idaho Department of Fish and Game, Nampa, ID
9:20-9:40	THE USE OF CHRISTMAS BIRD COUNTS AND CITIZEN SCIENCE TO MONITOR WINTERING RAPTOR POPULATIONS IN IDAHO AND BEYOND. **Neil A. Paprocki**, Julie A. Heath, Boise State University, Boise, ID
9:40-10:00	DISCUSSION

10:00-10:20 **BREAK**

Friday, March 30 (cont.)

Lichens and Bryophytes

Time: 10:20-11:40
Room: Rainer Room
Moderator: Heather Root

10:20-10:40 LICHEN RESPONSES TO DIFFERENT FORMS OF NITROGEN IN THE LOS ANGELES BASIN: IMPLICATIONS FOR CRITICAL LEVELS AND LOADS. **Sarah Jovan**, USDA Forest Service, Portland, OR; Jennifer Riddell, Pamela Padgett, USDA Forest Service, Riverside CA; Thomas H. Nash, University of Wisconsin, Madison, WI

10:40-11:00 RARE INLAND REINDEER LICHENS AT MIMA MOUNDS IN SOUTHWEST WASHINGTON STATE. **Robert J. Smith**, University of Nevada Las Vegas, Las Vegas, Nevada; Elisa Alphandary, Rheannon Arvidson, Gina Bono, Bridget Chipman, Andrew Corkery, Joseph DiMeglio, Kimberly Hansen, Katrina Isch, Jesse McAlpine, Chad Marks-Fife, Brad Mead, Daniel Miller, Nathan Nolte, Ashley Ottombrino, Tamra Prior, Jared Streich, Susan Theis, Stephanie Vandruff, Christina Wesseler, Kim Wesseler, Michele Wiseman, Bruce McCune, Oregon State University, Corvallis, OR

11:00-11:20 NOTES ON HYPERMARITIME FOLLICOLOUS LICHEN COMMUNITIES OF NORTHERN CALIFORNIA. **John Villella** Ashland, OR; Tom Carlberg, Arcata, CA

11:20-11:40 LICHEN DIVERSITY IN A SOUTH FLORIDA FOREST CANOPY. **Barry Kaminsky**, Bureau of Land Management, Boise ID

Friday, March 30 (cont.)

Drivers of Dynamic Fire Regimes: Past, Present, and Future

Time: 10:20-12:00
Room: Regency Room
Moderator: Doug Shinneman

Changing climate and vegetation conditions are key drivers of fire regimes over time and space. Increasingly, human activity plays a pivotal role in the variability of fire regimes, particularly due to fire suppression, land use, and introduction of non-native species. Human-induced climate change is also likely contributing to observed changes in fire regimes, and interactions between climate change and land use are expected to continue to alter fire regimes into the future. Assessing the relative influence of human and natural drivers (and their interactions) on fire regimes is critical to understanding the role of fire in shaping both the historic and future ranges of variability of ecosystems. This session is dedicated to highlighting research that: 1) identifies and quantifies key drivers of fire regimes, from past to present; 2) uses recent or expected trends in climate and land use change to project future fire regimes; or 3) assesses the relative effect of dynamic fire regimes on ecosystem variability (e.g., species composition, stand structure), including rapid or directional change that pushes natural communities beyond ecological thresholds. This session should appeal to scientists and land managers interested in interactions among natural disturbance, human activities, and ecosystem variability, and should provide practical information for developing strategies to restore ecosystems or manage for ecological resiliency in the face of uncertain change.

10:20-10:40 POSTGLACIAL CLIMATE AND FIRE-MEDIATED FOREST DIVERSITY ON THE WESTERN OLYMPIC PENINSULA, WASHINGTON. **Daniel G. Gavin**, University of Oregon, Eugene OR; Linda B. Brubaker, University of Washington, Seattle WA

10:40-11:00 OCCURRENCE OF WILDFIRE REBURNS IN FORESTS OF THE PACIFIC NORTHWEST. **John Campbell**, Oregon State University, Corvallis, OR; Dan Donato, University of Wisconsin, Madison, WI; Alan Kirschbaum, National Park Service Great Lakes Network, Ashland, WI; Garret Meigs, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

11:00-11:20 CLIMATE DRIVERS AND LANDSCAPE RESPONSE: HOLOCENE FIRE, VEGETATION AND EROSION AT CITY OF ROCKS NATIONAL RESERVE, IDAHO. **Kerrie Weppner**, Jen Pierce, Boise State University, Boise, ID 83725; Julio L. Betancourt, USGS, Tucson AZ

11:20-11:40 FINE-SCALE VEGETATION AND FUEL MAPS: SUPPORT FOR FIRE MANAGEMENT PLANNING IN ALTERED FIRE REGIMES. **Eva K. Strand**, University of Idaho, Moscow, ID; Calvin Farris, National Park Service, Klamath Falls, OR; Stephen C. Bunting, University of Idaho, Moscow, ID; Gina Wilson, University of Idaho, Moscow, ID

11:40-12:00 PATTERN AND PROCESS OF PRESCRIBED FIRES INFLUENCE EFFECTIVENESS AT REDUCING WILDFIRE SEVERITY IN DRY CONIFEROUS FORESTS. **Robert S. Arkle**, David S. Pilliod, and Justin L. Welty, U.S.G.S. Forest and Rangeland Ecosystem Science Center, Boise, ID

Friday, March 30 (cont.)

Northwest Scientific Association Business Lunch

Time: 12:00-1:30
Room: Ivory Room, Owyhee Plaza Hotel

Lichen and Bryophyte Soil Crust Workshop

Time: 1:30-3:50
Room: Boise State University, Science Building Room 248
Moderator: Heather Root and Robert Smith

We will discuss overall biotic crust ecology and ecosystem functions and the threats to these communities. We'll cover interpretation of biotic crust development and major functional groups of biotic crust lichens and bryophytes. In teams, participants will work on identification of specimens to functional group and species as an organized game (with prizes!). They will gain practice using simple keys and terminology. They will explore microscopic features through photos and by dissecting and sectioning teaching specimens brought by the instructors. If individuals are interested in bring their own collections, they should contact the organizers. We anticipate that the group-work will allow sharing of knowledge though hands-on identification.

Friday, March 30 (cont.)

Geo-Integration: Making Sense of the Overload of Spatial Data, Portals, and Analysis Tools

Time: 1:30-3:30
Room: Owyhee Ballroom
Moderator: Sean Finn

Way back in the 1990's a common lament of scientists and natural resource managers was that geospatial data and tools were not sufficient or accessible for effective analysis and decision-making over large landscapes. With the maturation of the 'information age' the problem has reversed: there is now an overwhelming amount of spatial data and tools that might help practitioner and analyst do their jobs but understanding what is available and useful requires so much time and effort that effectively using those resources is potentially impractical. During this session we will attempt to unravel the complexities of information assimilation and use by presenting a suite of tools designed to facilitate application of complex spatial data sets over large landscapes. A unique 'speed dating' format will serve to introduce some of these tools and will precede an open-forum discussion covering challenges and opportunities the information age provides natural resource professionals.

Presentations include:

THE COORDINATED BIRD MONITORING DATABASE (CBMD). Jonathan Bart, U.S.G.S., Forest and Rangeland Ecosystem Science Center, Boise, ID; **Leah Dunn**, Great Basin Bird Observatory, Reno, NV

DATA BASIN: SUPPORTING CONSERVATION DATA SHARING AND PROBLEM SOLVING VIA THE WEB. **James R. Strittholt**, Conservation Biology Institute, Corvallis, OR

EXPANDING THE OREGON EXPLORER ACROSS THE WEST: INCREASING THE RANGE OF A DIGITAL NATURAL RESOURCES LIBRARY. **Myrica McCune**, Oregon State University, Corvallis, OR

LC MAP: THE LANDSCAPE CONSERVATION MANAGEMENT AND ANALYSIS PORTAL. **Sean P. Finn**, Great Northern LCC, Boise, ID; Yvette Converse, Rick Sojda, Tom Olliff, Great Northern LCC, Bozeman, MT; Tim Kern, Lei Ann Wilson, U.S.G.S., Fort Collins Science Center, Ft. Collins, CO

THE NORTHWEST CLIMATE SCIENCE CENTER (NW – CSC) CYBERINFRASTRUCTURE PILOT PROJECT AND THE NORTHWEST KNOWLEDGE NETWORK (NKN): A REGIONAL APPROACH FOR RESEARCH DATA LIFECYCLE MANAGEMENT. Greg Gollberg, University of Idaho, Moscow, ID

THE CONSERVATION REGISTRY: TRACKING AND MAPPING WILDLIFE, HABITAT AND CONSERVATION PROJECTS ACROSS THE LANDSCAPE. Kassandra Kelly, Defenders of Wildlife

GIS TOOLS FOR MODELING HABITAT CONNECTIVITY. Andrew Shirk, University of Washington, Seattle, WA; Brad McRae, The Nature Conservancy, Seattle, WA.

3:30-3:50 **BREAK**

Friday, March 30 (cont.)

Geo-Integration: Making sense of the overload of spatial data, portals, and analysis tools (continued)

Time: 3:50-5:10
Room: Regency Room
Moderator: Sean Finn

Animal Biology

Time: 3:50-5:10
Room: Rainer Room
Moderator: Bruce Ackerman

3:50-4:10	DIET SELECTION BY OWYHEE HARVESTER ANTS (POGONOMYRMEX SALINUS) AND ITS CONSEQUENCES FOR SLICKSPOT PEPPERGRASS (LEPIDIUM PAPILLIFERUM), A THREATENED MUSTARD ENDEMIC TO SOUTHWESTERN IDAHO **Matt Schmasow**, Ian Robertson, Boise State University, Boise, ID
4:10-4:30	COMPARISON OF EXTRACTION METHODS USED TO ISOLATE THE CYANOTOXIN MICROCYSTIN FROM FISH MUSCLE. **Ellen P. Preece**, Barry C. Moore, Washington State University, Pullman WA
4:30-4:50	VISCERAL REGENERATION BY THE UPTAKE OF DISSOLVED ORGANIC MATERIAL IN THE SEA CUCUMBER PARASTICHOPUS CALIFORNICUS. **CJ Brothers**, Jim Nestler, Walla Walla University, College Place, WA; Raymond Lee, Washington State University, Pullman, WA
4:50-5:10	FOOD CHAIN DIFFERENCES IN POLYBROMINATED DIPHENYL ETHER (PBDE) LEVELS IN BOISE, IDAHO. **Jessica Sherburne**, Alfred M. Dufty, Jr., Boise State University, Boise, ID

Saturday, March 31

Lichens. Meet in the Owyhee Plaza Lobby at 8:45 am (leaving 9 am), back by ~ 1pm. *Please bring your own lunch.* Transportation will be at least 1 van and carpools. The field trip site will be a Wyoming sagebrush and winterfat habitat type. It is located south of Kuna, ID, on the Swan Falls road, in the Birds of Prey natural conservation area. Lots of common soil crust lichens! We'll have lunch at Dedication point, which overlooks the Snake River. It is lower elevation than Boise, so it should be Spring.

Wetlands and birds of southwest Idaho. Travel to Indian Creek Reservoir, Blacks Creek Reservoir and other wetlands. Meet in the Owyhee Plaza Lobby at 7:30 am, back by 2 pm. *Please bring your own lunch.* Transportation will be at least 1 van and carpools if necessary.

Snake River Canyon. Travel to Snake River Canyon, Dedication Point, Swan Falls Dam, Celebration Park for a full day of birding, history, archaeology, and geology. Meet in the Owyhee Plaza Lobby at 7:30 am, back by 4 pm. *Please bring your own lunch.* Transportation will be at least 1 van and carpools if necessary.

Abstracts

* = Student
# = Poster

PATTERN AND PROCESS OF PRESCRIBED FIRES INFLUENCE EFFECTIVENESS AT REDUCING WILDFIRE SEVERITY IN DRY CONIFEROUS FORESTS. **Robert S. Arkle**, David S. Pilliod, and Justin L. Welty, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Snake River Field Station, 970 Lusk St., Boise, ID 83706, USA. rarkle@usgs.gov

We examined the effects of three early season (spring) prescribed fires on burn severity patterns of summer wildfires that occurred 1-3 years post-treatment in a mixed pine-fir forest in central Idaho. Wildfire and prescribed fire burn severities were estimated as the difference in normalized burn ratio (ΔNBR) using Landsat imagery. We used GIS derived vegetation, topography, and treatment variables to generate models predicting the wildfire burn severity of 1286 – 5500 30-m pixels within and around treated areas using a 1 km buffer. Our preliminary results showed that wildfire severity was significantly lower in treated areas than in untreated areas and significantly lower than the potential wildfire severity of the treated areas had treatments not been implemented. At the pixel level, wildfire severity was best predicted by an interaction between prescribed fire severity, topographic moisture, heat load, and pre-fire vegetation volume. Prescribed fire severity and vegetation volume were the most influential predictors. Prescribed fire severity, and its influence on wildfire severity, was highest in relatively warm and dry locations, which were able to burn under spring conditions. In contrast, wildfire severity peaked in cooler, more mesic locations that dried later in the summer and supported greater vegetation volume. We found considerable evidence that prescribed fires have landscape-level influences within treatment boundaries; most notable was an interaction between distance from the prescribed fire perimeter and distance from treated patch edges, which explained up to 66% of the variation in wildfire severity. Our preliminary findings suggest that early season prescribed fires may not directly target the locations most at risk of high severity wildfire, but proximity of these areas to "well treated" patches and the discontinuity of fuels following treatment may influence wildfire severity. This process may explain how even low severity treatments can be effective management tools, capable of altering contemporary fire regimes in areas previously managed using fire suppression.

#*EVALUATION OF COLOR VARIATION IN THE *UMBILICARIA PHAEA* COMPLEX (LICHENIZED FUNGI) USING nrDNA SEQUENCES. **Rheannon Arvidson**, Bruce McCune, Department of Botany and Plant Pathology, Cordley 2082, Oregon State University, Corvallis, OR 97331-2902; arvidsor@onid.orst.edu

Individuals of *Umbilicaria phaea* collected in SW Oregon, NW California, and Sierra Nevada show high phenotypic variation. Two varieties, *U. phaea* var. *phaea* and *U. phaea* var. *coccinea*, are currently recognized within this species. We identified four distinct phenotypic groupings of *U. phaea* and sequenced the ITS and LSU regions of nrDNA for each phenotype. These four groupings were: brown thallus with black to brown lower surface (*U. phaea* var. *phaea*), brown thallus and gray umbo (GU), red thallus (*U. phaea* var. *coccinea*), and brown thallus with rosy-beige lower surface. Maximum likelihood phylogenetic reconstructions (PhyML in Geneious) and haplotype networks (Network software) were used for analysis of the nrDNA sequences. Our results indicate that GU could

be a distinct species from both *U. phaea* var. *phaea* and *U. phaea* var. *coccinea*. Further observations of GU individuals revealed multiple morphological and anatomical differences that distinguish them from all variations of the *U. phaea* group. Our analysis suggests incomplete speciation between *U. phaea* var. *phaea* and *U. phaea* var. *coccinea*.

THE COORDINATED BIRD MONITORING DATABASE (CBMD). Jonathan Bart, USGS, Forest and Rangeland Ecosystem Science Center, Snake River Field Station, 970 Lusk Street, Boise, ID; **Leah Dunn,** Great Basin Bird Observatory, Reno NV 89502; jon_bart@usgs.gov or ldunn@usgs.gov

The Coordinated Bird Monitoring Database (CBMD) is a "counts database", a secure, long-term storage repository intended to hold data from a variety of surveys. While it was designed for avian survey data, it is flexible enough to be used for other counts. A set of core variables are standardized and defined, but as many additional (user-defined) variables as desired may also be defined. We work with participants on program-specific variables and their sampling plan (if any) or if all the data have been collected then we can help format and upload it into CBMD. We use the same five levels of security (from no access without a password to complete access by anyone) used by the Cornell Laboratory of Ornithology. Each data owner makes all decisions about the data set including what level of security will be attached to the data set. We are also a node of the Avian Knowledge Network (Maintained by Cornell) and can upload data to them if requested and we can help prepare metadata as required. CBMD users can filter the dataset as well as aggregate the data, export filtered results or the entire dataset (as permitted), or use other tools which include a Graph and Map function. Output functions also provide for analysis in TRENDS, a Windows driven software. The TRENDS program will calculate trend and fits a variety of curves to describe trend as well as includes measures of precision for all estimates.

MAMMOTHS IN THE LOESS OF BENTON COUNTY, WASHINGTON. **Bax R. Barton**, Burke Museum of Natural History and Culture and Quaternary Research Center**,** University of Washington, PO Box 351360, Seattle, WA 98195; George V. Last, Pacific Northwest National Laboratory, PO Box 999 MSN K6-81, Richland, WA 99354; Gary C. Kleinknecht, Social Science Department, Kamiakin High School, 600 North Arthur St., Kennewick, WA 99336; baxqrc@u.washington.edu

Sub-fossils of Columbian mammoths are nearly ubiquitous finds in mid-to-late Pleistocene sediments of the Pacific Northwest. In the 1870s early discoveries of mammoths in eastern Washington were made in peat bog and spring deposits. An intermittent flow of mammoth finds have been reported from the Columbia Plateau ever since (Barton 1999). It wasn't until the 1920s that researchers formally noted that mammoth bones also occur in other geologic contexts, such as loess and flood deposits that dominate Quaternary sediments throughout the area. Freeman (1926) first published on mammoth remains in loess from this region in a brief note on the Cheney mammoth (Spokane County). This was quickly followed by a substantial report by Bryan (1927) on mammoth finds in the Palouse loess near Burr Canyon (Franklin County). A recent survey of mammoth localities in Benton County documents some 24 mammoth finds either known to have originated in, or believed to have come from, loess deposits (Barton and Last 2010). These sites represent roughly 53 % of the mammoth finds from the county. Ice Age floods that sculpted much of eastern Washington clearly play a role in the known distribution of such finds as most sites are located at elevations about the 330 m above sea level county-wide Missoula flood maximum, and are situated well above previously flooded major river drainages. Accurate dating of these sites proves to be difficult.

To date none have produced reliable radiocarbon dates as bone recovered from loess is typically leached of any datable organic carbon.

References:

Barton, BR. 1999. "Some notable finds of Columbian mammoths from Washington State." *Washington Geology*, Vol. 27, No. 2/3/4, pp. 23-27.

Barton, BR and GV Last. 2010. "The discovery and distribution of mammoth remains in Benton County, Washington State." *Geological Society of America Abstracts with Programs*, Vol. 42, No. 5, p. 250.

Bryan, K. 1927. "The 'Palouse soil' problem, with an account of elephant remains in windblown soil on the Columbia Plateau of Washington." *US Geological Survey Bulletin* 790-B, pp. 21-45.

Freeman, OW. 1926. "Mammoth found in loess of Washington." *Science* (NS), Vol. 64, No. 1663, p. 477.

COMMUNITY COMPOSITION OF URBAN NEAR-STREAM VEGETATION IN THE PORTLAND-VANCOUVER METRO AREA. **Christa von Behren**, Andrew Dietrich, Alan Yeakley, Environmental Science and Management Department, Portland State University, P.O. Box 751, Portland, OR 97207; christav@pdx.edu

The purpose of this study is to identify relationships between urban development and community composition of riparian vegetation. Riparian vegetation plays an important role in processes occurring within the stream channel and on the bank. Bank stabilization, stream shading, and nutrient buffering are all influenced by vegetation composition. Urban structures and processes can dramatically change riparian areas, altering the vegetation communities and resulting riparian processes. While general trends in the vegetation response to urbanization have been suggested, it is unclear how specific features, both proximal to and at a distance from a stream, contribute to those changes. Vegetation was surveyed at 31 randomly-selected sites on both public and private property in the Portland-Vancouver metro area during the summer of 2011. Species were categorized by native status and USDA wetland indicator status. Urban features, including riparian buffer width, forest connectivity, and surrounding impervious surface area will be quantified at different spatial scales using GIS. Ordination will be used to determine relationships between local and landscape features and vegetation composition. A total of 82 species were identified, including 65 native and 17 non-native species. Preliminary results show that within the first 5 meters of streams, the most developed sites had on average about half the native cover and 10 times the non-native cover of the least developed sites. The most developed sites also had fewer upland and facultative species, and more wetland obligates. These results suggest that intense development can alter both riparian hydrology and community susceptibility to invasion.

VISCERAL REGENERATION BY THE UPTAKE OF DISSOLVED ORGANIC MATERIAL IN THE SEA CUCUMBER *PARASTICHOPUS CALIFORNICUS*. **CJ Brothers**, Jim Nestler, Department of Biology, Walla Walla University, 204 S. College Ave., College Place, WA 99324; Raymond Lee, School of Biological Sciences, Washington State University, PO Box 644236, Pullman, WA 99164-4236; cecilia.brothers@wallawalla.edu

Regeneration allows living organisms to repair or replace body tissues in response to sub-lethal predation or stressful abiotic conditions. The sea cucumber *Parastichopus californicus* is a unique model for studying regeneration as every year the visceral organs atrophy between October and November and regenerate between January and March. Previous research has suggested that during the regeneration period no movement or feeding occurs, however the metabolic rate is doubled when compared to the period during which regeneration does not occur. The uptake of dissolved organic material from the aqueous environment could provide an external source of biosynthetic materials for regeneration of the visceral organs. In April, July-August and November, *P. californicus* were incubated in ^{15}N-labeled dissolved amino

acids (Isogro®) for between 48 and 72 h and the uptake of ^{15}N by the epithelial (dorsal and ventral), buccal tentacles, tube feet, longitudinal muscle strips, digestive tract, gonads, Cuvierian tubules and respiratory tree tissues was measured. During April, all tissues except dorsal and ventral epithelial assimilated amino acids at significantly higher rates than controls, and during July-August, all tissues showed significant assimilation of amino acids. In addition, uptake by the respiratory trees was significantly higher than uptake by any other tissue type, and the uptake during April ($\delta^{15}N$ 74.4 ± 26.8/day) was more than three times the uptake in July-August ($\delta^{15}N$ 20.2 ±10.3/day). These results suggest that certain tissues, especially the respiratory trees, of *P. californicus* assimilate dissolved amino acids from the sea water that could be used as biosynthetic materials for regeneration.

OCCURRENCE OF WILDFIRE REBURNS IN FORESTS OF THE PACIFIC NORTHWEST. **John Campbell**, Department of Forest Ecosystems and Society, 3180 SW Jefferson Way, Oregon State University, Corvallis, OR 97331; Dan Donato, Department of Zoology, 430 Lincoln Dr., University of Wisconsin, Madison, WI 53706; Alan Kirschbaum, National Park Service Great Lakes Network, Ashland, WI 54806; Garret Meigs, Department of Forest Ecosystems and Society, 3180 SW Jefferson Way, Oregon State University, Corvallis, OR 97331; john.campbell@oregonstate.edu

Forest reburn (when a stand has recently undergone a high-severity fire and has burned a second time) is distinct from single high-severity fires and repeated low-severity fires both with respect to ecological processes and resource conservation. However, little is known about the occurrence of these compound disturbances in the Pacific Northwest, or in what manner high-severity fire influences a site's propensity to reburn. We used a spatially-explicit, 25-year fire history map covering the states of Oregon, Washington, and California, to answer two simple questions regarding reburn. First, how common have reburns been over the past 25 years relative to once-burned fires? Secondly, over the past quarter century, were fires more or less likely to burn in areas recently subject to high-severity fire, and if so, did reburn probability vary with time since the initial fire? Our results indicate that reburn is a very rare phenomena (especially in mesic forests), large rare events account for a majority of reburned area, and the realized probability of fire returning to a particular site is neither increased or decreased by a prior fire at any lag interval. While the fuel structure that develops following a high-severity fire necessarily influences the combustion potential in the event that flame reaches the site, burn events appear too rare and stochastic for these propensities to manifest themselves over space and time. These conclusions bring into question any attempt to manage for reburn risk.

#*IMPROVEMENT IN COLONIZATION AND SEEDLING SURVIVAL OF WYOMING BIG SAGEBRUSH FOLLOWING INOCULATION WITH NATIVE ARBUSCULAR MYCORRHIZAL FUNGI. **Bill Davidson**, Marcelo Serpe, Department of Biological Sciences, Boise State University, 1910 University Drive, Boise, ID 83725-1515; billdavidson@u.boisestate.edu

Inoculation of seedlings with arbuscular mycorrhizal fungi (AMF) is a common practice aimed at improving seedling establishment. The success of this practice largely depends on the ability of the inoculum to colonize the growing root system after transplanting. These events were investigated in Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) seedlings inoculated with native AMF. Seedlings were first grown in a greenhouse in 50 ml containers containing sterilized pot cultures (control seedlings) or pot cultures having a mixture of seven mycorrhizal phylotypes (inoculated seedlings). In early spring, three-month

old seedlings were transplanted to 24 L pots filled with soil collected from a sagebrush habitat and grown under natural climatic conditions. At the time of transplanting the percent colonization was 0.3 and 57% for control and inoculated seedlings, respectively. Two and a half and five months after transplanting, the percent colonization remained higher in inoculated than in control seedlings with values of about 48 and 20%, respectively. These differences in colonization were associated with differences in seedling survival, which was 24% higher in inoculated than control seedlings. In contrast, biomass per plant and the shoot over root ratio were similar for both treatments. Overall, our results indicate that the inoculum contributed to the colonization of the roots that developed after transplanting resulting in higher levels of colonization than those naturally occurring in the soil. This may have led to an increase in seedling survival.

THINNING EFFECTS ON NATURAL REGENERATION IN WESTERN OREGON DOUGLAS-FIR FORESTS**.** **Erich Kyle Dodson**, Julia I. Burton, and Klaus J. Puettmann Department of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis, OR, 97331; 541-737-6558; erich.dodson@oregonstate.edu

Creating multi-layered canopies in younger even-aged stands via thinning necessitates tree regeneration and subsequent recruitment into taller strata. Thinning can increase resources, creating a favorable environment for seedlings while also increasing the productivity of potential competitors in the understory. We investigated effects of thinning on natural regeneration 11 years following thinning in seven Douglas-fir stands in western Oregon using a randomized block design of operational-scale treatments. Additionally, we examined the relationships among seedling and sapling density, basal area (BA), and cover of understory vegetation at fine spatial scales (0.002 ha) within stands. Treatments included high density retention with 300 trees/ha, moderate density retention with 200 trees/ha, variable density retention with areas of 300, 200 and 100 trees/ha and an untreated control with 565 trees/ha. The density and frequency of tree seedlings and saplings was greater in thinning treatments than in the untreated control. Seedling density did not differ among thinning treatments; however, sapling density was higher at the lowest thinning level (100 trees/ha) than other thinning levels. Within treatments, natural regeneration was negatively related to BA. Furthermore, the probability of regeneration decreased with increasing understory cover, particularly at low BA. These results suggest that thinning can increase natural regeneration likely through increased availability of light and soil water and nutrients, although strong understory responses may limit the response of tree regeneration. While all thinning treatments increased seedling density, heavy thinning and creation of canopy gaps appeared especially beneficial for recruitment of saplings into the lower canopy in the short-term.

#*A RECONSTRUCTION OF FIRE HISTORY USING MACROSCOPIC CHARCOAL ANALYSIS: FISH LAKE, SINLAHEKIN WILDLIFE AREA, NORTH CENTRAL WASHINGTON, USA. **Haley J. Duke**, Megan K. Walsh, Department of Geography, Central Washington University, 400 E. University Way, Ellensburg, WA 98926; dukeh@cwu.edu

The Sinlahekin Wildlife Area is a 14,000 acre reserve located in the Okanogan Valley of north central Washington. Sitting in the rain shadow of the Cascade Mountains, its forests consist primarily of ponderosa pine (*Pinus ponderosa*), which are adapted to frequent low-severity fires. However, because of fire suppression over the past approximately 100 years, fire has all but disappeared from this ecosystem. As a consequence, excess biomass has accumulated on the forest floor, leading to catastrophic forest fires. To better understand the current dilemma, a long-term perspective on fire history is needed. Lakes hold much

information on fire history in the form of fossilized charcoal. Identifying changes in charcoal accumulation in lake sediments allows for a calculation of past fire frequency. This information can then be used as a guideline for prescribed burning and managing forest health. In summer 2011, a 3 meter long sediment core was retrieved from Fish Lake in the Sinlahekin Wildlife Area. Macroscopic charcoal analysis was used to reconstruct fire history for the last 2500 years. Loss on ignition and magnetic susceptibility were also used to characterize the lithology of the core and to investigate the relationship between fire and erosional events. Results show that fire activity was high at the site prior to the last century. Fires burned mainly herbaceous material (i.e. grass), indicating that fires were low-severity. Further analysis of the core, including pollen analysis, will highlight the relationship between fire and vegetation change, human activity, and regional climate change.

IDAH$_2$O: MASTER WATER STEWARDS SERVING IDAHO THROUGH VOLUNTEER MONITORING. **Kelli Duncan,** Area Extension Educator, University of Idaho Extension, Coeur d'Alene, ID 83814

Maintaining water quality integrity in the state of Idaho is necessary to ensure a safe water source for drinking, recreating and to support fisheries and wildlife. Through education and outreach, citizens gain a better understanding of their interaction with the land and learn how to best preserve resources. The primary goals of the IDAH$_2$O program are: (1) Increasing citizen knowledge on water quality issues, (2) Promote volunteer monitoring on Idaho streams and (3) Enhance watershed stewardship. IDAH$_2$O was developed into a 'Master' program to make use of a highly successful Extension model. IDAH$_2$O volunteers receive training and in return, conduct monitoring in Idaho watersheds. Collected data is published and used to inform citizens and agencies about watershed conditions. These data can be used to make arguments to grantors for watershed improvement projects. Furthermore, agencies such as Idaho DEQ may someday be able to utilize the data to assist in the TMDL process. Since the program launch in fall 2010, nearly seventy-five volunteers have been certified, monitoring twenty different watersheds. Program evaluations show that 75% of certified volunteers plan to register and conduct regular monitoring. Over half of certified volunteers stated they would become more involved in watershed activities and restoration. The success of IDAH$_2$O will lead to better coordination within citizens and agencies on water resource matters and in turn promote stewardship within Idaho watersheds which will ultimately lead to improved water quality.

TWENTY YEARS OF *NATUREMAPPING* USING VOLUNTEERS, CITIZEN SCIENTISTS, AND PUBLIC PARTICIPATION IN SCIENTIFIC RESEARCH. **Karen Dvornich**, NatureMapping Foundation, Box 26962, Federal Way, WA 98093; vicon@uw.edu

The *NatureMapping* Program began in 1992 as part of the Washington Gap Analysis Project (WAGAP). Its goal is to facilitate the exchange of information between natural resource agencies, academia, land-use planners, local communities, and schools through public education and participation in data acquisition. Involving each entity was and has been a project in itself. *NatureMapping's* first volunteers were retired natural resource professionals that groundtruthed WAGAP's land cover map. With the help of Washington Department of Fish and Wildlife's Project WILD coordinator the Program started working with schools. Data acquisition was the reason *NatureMapping* began. The development of standard reporting attributes for all partners was based on the lessons learned from WAGAP's efforts to merge multiple agencies' databases. A network of like-minded individuals and

organizations grew across the US, sharing training techniques, materials, and developing emerging technologies for data collection and assessment. The materials and other content were put on *NatureMapping*'s website that receives 1 million hits per month and continues to grow in usage. The Program began long-term projects involving communities, schools, natural resource agencies, and academia such as the Adopt-a-Farmer Project, Project CAT, Mule Deer Project, Pierce County Biodiversity Network, and the Ohop Creek Restoration Project. Recent projects and bioblitzes now utilize *NatureMapping*'s data collection software, NatureTracker, that allows users to record invertebrates, plants, and fish, as well as, vertebrates and display their work immediately. An evaluation of *NatureMapping*'s data, use of data, technological advances with online interactive mapping, android apps, and the pitfalls and successes will be discussed.

LC MAP: THE LANDSCAPE CONSERVATION MANAGEMENT AND ANALYSIS PORTAL. **Sean P. Finn**, Great Northern LCC, Boise, ID; Yvette Converse, Rick Sojda, Tom Olliff, Great Northern LCC, Bozeman, MT; Tim Kern, Lei Ann Wilson, U.S.G.S., Fort Collins Science Center, Ft. Collins, CO

The path to effective collaboration over large geographic areas depends on successful transcendence of boundaries – political, jurisdictional, disciplinary, social, and technical. The Great Northern Landscape Conservation Cooperative (GNLCC) and partners are working to soften each of these boundaries while respecting the vision, mandates, and security concerns of the broad array of LCC partners. GNLCC has developed a state-of-the-art geospatial data discovery, management, and analysis tool which supports inter-organization collaboration and coordination: The Landscape Conservation Management and Analysis Portal or LC MAP. LC MAP combines modules built off DOIs open source developed ScienceBase, which provides efficient data search, catalog and management tools, with the ArcGIS 10 spatial data editing, analysis, and modeling environment to provide a powerful, fully functional project management and decision process portal. Interaction with the spatial data employs a suite of web services allowing dispersed, inter-organizational teams to access and analyze common datasets in near real-time and provides automated metadata and versioning functions to closely document project progress and product development. A robust security infrastructure is built in front of all components giving project managers fine-tune controls over accessibility and data publication. Design tradeoffs were biased toward reaching the widest possible audience while relying on established, stable platforms with in-place user support. This demonstration will present example applications of the data discovery, documentation, security, and analysis functions.

LC MAP: THE LANDSCAPE CONSERVATION MANAGEMENT AND ANALYSIS PORTAL. **Sean P. Finn**, Great Northern LCC, Boise, ID; Yvette Converse, Rick Sojda, Tom Olliff, Great Northern LCC, Bozeman, MT; Tim Kern, Lei Ann Wilson, U.S.G.S., Fort Collins Science Center, Ft. Collins, CO

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USING EPIPHYTIC LICHENS AS EARLY INDICATORS OF WHITEBARK PINE STAND MORTALITY IN THE EASTERN CENTRAL CASCADES, WASHINGTON. **Katherine Fitch**, Central Washington University, Resource Management Program, PO Box 471, Roslyn, WA 98941; fitchka@cwu.edu

Data were collected to evaluate the association between epiphytic lichen communities and whitebark pine (*Pinus albicaulis*) mortality in the east-central Washington Cascades. Fifteen circular units of 0.4 ha (34.7 m radius) were sampled at an average elevation of 1918 m. Macrolichens were collected from boles and branches of each tree within the sampled unit. Each whitebark pine tree was then evaluated for percent crown kill. From these data, lichen richness and diversity were calculated for each sampled unit, and each unit was assigned a percent overall mortality. Blister rust was observed in every sampled unit and a mean crown kill of 32% was measured. Scatter plots, regression, column charts, clustered hierarchical analysis, ANOVA, and indicator species analysis were used to determine how lichen communities may correlate to mortality in stands of whitebark pine. Twenty-four species comprising nine families were found to make up the Cascade whitebark pine lichen community. Lichen richness varied from site to site with a mean species richness of eight. Richness and diversity were greater in stands with advanced crown kill. Three indicator species were differentiated in grouped stands of the highest percentage of overall mortality: *Alectoria sarmentosa, Platismatia glauca,* and *Parmeliopsis hyperopta.* Epiphytic lichens such as these can be used in management protocols to monitor both spatial and temporal trends in forest change with emphasis on high alpine whitebark pine communities.

#*SYNTHESIZING AND VISUALIZING LATE PLEISTOCENE CHANGES IN OLYMPIC PENINSULA FOREST COMPOSITION. **David Fisher**, Department of Geography, 1251 University of Oregon, Eugene, OR 97403-1251; dmf@uoregon.edu

Scientists and concerned citizens are increasingly interested in understanding the response of forests to a changing climate. Complex statistical models can be employed to describe this relationship; however, data exploration is a critical first step that should precede modeling. Data visualization is one method of exploration that has the potential to make large environmental datasets accessible and interpretable to a broader community. This poster visualizes the changing forest communities and climate of northwestern Washington and southwestern British Columbia since the Last Glacial Maximum. This region underwent dramatic environmental change during the Late Pleistocene, after the most recent retreat of the Cordilleran Ice Sheet and associated mountain and valley glaciers. An empirical record of vegetation change exists as a geographic network of pollen records from lake sediment cores.

In the greater Olympic Peninsula region, this network is fairly robust in spatial and temporal coverage. Presented here is a synthesis of the raw data from 20 pollen records in the region. The pollen records were made comparable by limiting data to arboreal taxa and applying new calibrated age scales. Change in the relative abundance of pollen of each taxon is visualized by a time-series of maps. Plotted continuously, on the same temporal scale, are climate variables extracted from the nearest gridcell of a transient global circulation model. The result is a detailed picture of the observed changes in forest composition alongside a model of climate, the most important driver of these changes. All graphics were generated using the R computing environment.

#*THE ROLE OF *PINUS LAMBERTIANA* CONES AS A SURFACE FUEL IN SIERRA NEVADA MIXED CONIFER FOREST. **Anton T. Gabrielson**, College of Forestry and Conservation, Missoula, MT 59801; Andrew J. Larson, College of Forestry and Conservation, University of Montana, Missoula, MT 59812; James A. Lutz, College of the Environment, University of Washington Box 352100, Seattle, WA 98195; anton.gabrielson@umontana.edu

We investigated the role of sugar pine (*Pinus lambertiana*) cones as a woody surface fuel. We developed a six category classification system to describe sugar pine cones of different sizes and conditions, and hypothesized that condition classes differed in terms of mean biomass, burning characteristics, and relative contribution to surface fuel loads. Field sampling was conducted at the Yosemite Forest Dynamics Plot (YFDP), a 25.6 ha mapped study plot in Yosemite National Park. We randomly located 90, 9 m^2 quadrats within the YFDP and counted the number of cones by condition class in each quadrat. Cones were returned to the laboratory where we determined the mean biomass and burning characteristics by condition class. Mean cone biomass differed significantly between cone condition classes (one-way ANOVA, $F = 99.0$, $P<0.001$). Sugar pine cones comprise 601 kg ha^{-1} of surface fuels in YFDP. Aborted juvenile cones (5-25 cm long) accounted for 44% of cone biomass ha^{-1} in the YFDP while mature cones (>25 cm long) comprised 54% of biomass ha^{-1}. Initial observations suggest large and significant differences in burning characteristics between cone condition classes: flame lengths for juvenile cones ranged from 9 to 12 cm while flame lengths for mature cones ranged from 84 to 122 cm. Managers can use the cone classification presented here to improve accuracy of surface fuel estimates. The developmental stage at which sugar pine cones become surface fuels may influence behavior of surface fires in Sierra Nevada mixed-conifer forests.

POSTGLACIAL CLIMATE AND FIRE-MEDIATED FOREST DIVERSITY ON THE WESTERN OLYMPIC PENINSULA, WASHINGTON. **Daniel G. Gavin**, Department of Geography, University of Oregon, Eugene OR 97403-1251; Linda B. Brubaker, School of Forest Resources, University of Washington, Seattle WA 98195; dgavin@uoregon.edu

The mode and tempo of forest compositional change during periods of rapid climate change is a long-standing theme of forest ecological research, especially with respect to the role of fire to produce non-linear relationships between climate change and vegetation. In the dense and old conifer forests of the coastal Pacific Northwest, fire disturbances are sufficiently rare that their ecological role is poorly understood. We used a high-resolution sediment record of vegetation and fire from the Olympic Peninsula in conjunction with independent records of climate to examine the co-varying trends in climate, fire, and tree species turnover. We found two modes of forest dynamics during the past 14,700 years. First, before 8000 years ago, rapid species turnover was driven by climate changes and mediated by fire events.

Several large fires resulted in nearly complete turnover of the local tree species with successional trajectories dependent on climate changes preceding the fire events. Second, during the last 8000 years, forest composition changed slowly as fires were smaller or less severe and much less frequent than before. However, brief periods of fire did not cause compositional changes, possibly because fires were only of moderate severity and climate changes were not large enough to favor less-common species. In summary, this record provides examples of a dynamic forest marked by rapid switching between alternative states followed by a long period marked by high resilience to less frequent and less severe disturbance.

CHANGES IN SOIL AGGREGATE DYNAMICS AND CARBON STORAGE FOLLOWING 18 YEARS OF EXPERIMENTALLY INCREASED PRECIPITATION IN A COLD DESERT ECOSYSTEM. **Marie-Anne de Graaff,** Department of Biological Sciences, Boise State University, Boise ID 38725; Jess van der Veen, USGS Forest and Rangeland Ecosystem Science Center, Boise, ID 83706; Matthew Germino, USGS Forest and Rangeland Ecosystem Science Center, Boise, ID 83706; Jamie Hicks, Department of Biological Sciences, Boise State University, Boise ID 387251. marie-annedegraaff@boisestate.edu

Climate change is expected to alter the amount and timing of precipitation in semi-arid ecosystems of the Intermountain West, and the net effect of these changes on soil C sequestration is not well understood. Soil C sequestration is regulated by the incorporation of C into soil aggregates, where they are physically protected from microbial degradation. With this study we assessed: (1) how precipitation shifts affect soil aggregate formation and associated soil organic carbon (SOC) contents in semi arid ecosystems, and (2) how plants mediate precipitation impacts on soil C sequestration. Soil was collected from an ecohydrology study situated at INL. The experimental field site consists of subplots planted with either sagebrush (*Artemisia tridentata*) or crested wheatgrass (*Agropyron cristatum*) and has been exposed to three precipitation treatments: ambient (i.e. control), winter (200 mm) or summer (4x50 mm) for 18 years. Soils were collected from directly beneath plants and from plant-interspaces, after which they were fractionated into macroaggregates, free microaggregates and free silt and clay fractions. Further, macroaggregates were separated into particulate organic matter (POM), microaggregates and silt and clay fractions. We measured the relative abundance of soil fractions, and SOC within the fractions. Results showed that increased precipitation decreased SOC in all treatments, but not in soils underneath sagebrush, where SOC incorporation into more stable soil fractions was enhanced. Our data suggest that precipitation in semi arid ecosystems deplete SOC contents, and that plant species mediate the impact of precipitation on soil C dynamics.

WINNERS AND LOSERS IN A NITROGEN-RICH BOREAL FOREST UNDERSTORY. **Tess Grainger**; Roy Turkington; Department of Botany, University of British Columbia, 3529-6270 University Blvd. Vancouver, BC, V6T 1Z4; tessng@interchange.ubc.ca.

Higher temperatures associated with global climate change are predicted to cause an increase in soil nutrients such as nitrogen. This will have pronounced effects on plants at northern latitudes that are adapted to low nutrient conditions. I used long-term experimental plots near Kluane, Yukon, to investigate the effects of 22 years of annual fertilizer application on the growth and morphology of four species of Boreal forest understory plants. Previous research in this area has shown that some species increase in abundance when fertilized (e.g.

Epilobium angustifolium and *Mertensia paniculata*), others decline (e.g. *Festuca altaica*) and some show little change (e.g. *Achillea millefolium*). I asked a) whether functional traits such as height and SLA can predict abundance in fertilized conditions and b) whether the most phenotypically responsive species to fertilizer also become the most abundant in fertilized conditions. In the summer of 2011 I measured morphological traits on four target species in fertilized and control plots. Plant height in unfertilized conditions is a better predictor of success than SLA, but neither was entirely predictive. Multivariate analysis revealed that *Epilobium, Mertensia* and *Achillea* tended to get larger when fertilized, whereas *Festuca* got smaller. However, the ratio of tissue types (stem and leaf) did not change for any species. It was concluded that while some morphological characteristics (e.g. size) were associated with abundance in fertilized plots, others (e.g. SLA) had a consistent response across all species, and yet others (e.g. tissue ratios) showed no response for any species.

THE INFLUENCE OF NON-NATIVE GRASSES AND JUNIPER ON THE SAGEBRUSH-ASSOCIATED BIRD COMMUNITY ALONG AN ELEVATION GRADIENT IN THE OWYHEE UPLANDS. **Steven E. Hanser,** Steven T. Knick, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Boise, ID 83712; shanser@usgs.gov

The extent of sagebrush habitats throughout the Intermountain West is declining due to numerous factors, including invasion by non-native grasses and encroachment by native conifers. Non-native grasses lead to a loss of sagebrush due to increased frequency and extent of wildland fire in lower elevations; while at higher elevations, native conifer encroachment converts shrublands to woodlands. The loss of sagebrush habitat can influence the occurrence of associated wildlife, most notably the greater sage-grouse. We studied the bird community along an elevation gradient within the Owyhee Uplands region of southwest Idaho and southeast Oregon within non-native grasslands, sagebrush shrublands, and western juniper woodlands to provide information on how the community is influenced by vegetation and environmental factors. We identified the environmental gradients underlying the bird community using canonical correspondence analysis. Our preliminary results suggest that the bird community is organized along a primary gradient from Wyoming big sagebrush to western juniper and a secondary gradient from Wyoming big sagebrush to increased gap sizes between perennial trees and shrub canopies. Sagebrush obligate species were strongly associated with the Wyoming big sagebrush region of the environmental gradients, while the majority of species assessed were associated with the woodlands and only a single species, horned lark, was associated with increased canopy gap size. Two fires during the study shifted the bird community at those sites toward a community indicative of large canopy gaps. This study increases our understanding of the environmental factors important in structuring the bird community within sagebrush and associated habitats.

*# PAST AND CURRENT WILDFIRE TRENDS IN THE OKANOGAN-WENATCHEE NATIONAL FOREST: AN ANALYSIS USING GIS AND PALEOECOLOGICAL METHODS. **Kevin C. Haydon**, Megan K. Walsh, Department of Geography and Resource Management, Central Washington University, Ellensburg, WA, 98926; haydonk@cwu.edu

Environmental change and human activity have been the driving forces of fire activity in Pacific Northwest forests throughout the Holocene. Fire exclusion policy following the fires of 1910 was intended to remove fire from federally-managed forest ecosystems. To evaluate the effectiveness of fire suppression over the last century, we examined area burned by wildfires in the Okanogan-Wenatchee National Forest in decadal intervals using GIS. Analyses of these data indicate that for the better part of the 20th century, fire exclusion

efforts were very successful. However, despite technological advancements in wildfire suppression the data demonstrate that area burned in recent decades has greatly increased. It is understood that the removal of fire from eastern Cascade forests has increased their susceptibility to high-severity wildfires. In order to more effectively manage these forests it is important to understand how fire regimes have varied in longer timescales. To address this, we retrieved Holocene-length sediment cores from Blue Lake and Doheney Lake in the Sinlahekin Wildlife Area, Okanogan County, WA. Through the use of macroscopic charcoal and pollen analysis we will reconstruct the vegetation and fire history for the Sinlahekin study sites. Preliminary results indicate major shifts in fire activity prior to and after Euro-American settlement. Further analysis of these records will establish a Holocene fire record and determine its linkages with vegetation change, climate variability, and human activities. The results of this research will aid in management decisions regarding fire in eastern Cascade forests.

#*CLIMATE AND VEGETATION IN A PUTATIVE PLEISTOCENE REFUGIUM IN NORTHERN IDAHO INFERRED FROM A 120,000 YEAR SEDIMENT RECORD. **Erin M. Herring**, Daniel G. Gavin, Department of Geography, 1251 University of Oregon, Eugene, OR 97403-1251; eherring@uoregon.edu

The mesic forests of northern Idaho's Rocky Mountains are unique because they support over one hundred vascular plant species disjunct from their main distribution along the Pacific Northwest coast. The uplift of the Cascade Mountains during the Miocene led to the development of a pronounced rain shadow to the east and the development of a separate interior mesic climate, but it is less clear when and how the associated disjunctions were established. Specifically, it is unclear whether most species with an inland disjunction, including *Thuja*, survived the glacial periods of the Pleistocene in their present locations or whether they more recently dispersed from coastal areas. Recent phylogeography and modern distribution studies suggest that a refugium may have existed in the Lochsa watershed of northern Idaho. There are currently no climate or vegetation records that extend back to the glacial maximum or earlier in this region. A ca. 120,000 year sediment record was recovered from Star Meadows, a paleomeander of the Lochsa River, located within the proposed refugium. Pollen recovered from this sediment record provides evidence for changes in forest composition that occurred in conjunction with changing climatic conditions since the last interglacial. Preliminary results from pollen analysis indicate a mid-Holocene arrival of *Thuja* to the region. Since there are so few continuous records of climate and vegetation that date back to the last interglacial this sediment record is indispensible in our understanding of Pleistocene climates in western North America.

#*NATIVE AND NON-NATIVE VEGETATION RESPONSE TO THE 2005 SCHOOL FIRE IN POMEROY, WA. **Maike Holthuijzen**, Utah State University, Department of Wildland Resources, 5230 Old Main Hill, Logan, UT 84322-5280; Penelope Morgan, University of Idaho, Department of Forest Resources, PO Box 441133, Moscow, ID, 83844-1133; mholthuijzen@vandals.uidaho.edu

The University of Idaho and US Forest Service began a long-term vegetation monitoring project in the Umatilla National Forest after the 2005 School Fire. Their goals were to determine if burn severity was a factor in non-native invasions after fires and where post-fire rehabilitation projects should be focused. My main objectives were to 1) determine whether presence and percent canopy cover of non-native and native herbaceous species differed in low, medium, and high severity burns, and 2) contrast regeneration and life span traits (seed-

dispersed vs. resprout and annual vs. perennial) of native and non-native plant species responding to three levels of burn severity. Sampling sites were designated as low, medium, or high severity based on satellite imagery pre and post fire. The following vegetation data were collected at sampling plots: 1) species-level vegetation cover and composition, 2) percent cover of ash, mineral soil, and litter, and 3) litter and duff depth. My results showed that, compared to medium and low burn severity areas, high severity burn areas contained more non-native plant species. Non-native plant species were absent in control plots. Approximately half the common species in fire-affected areas originated from seed and half were resprouts. Although annuals appeared in all levels of fire severity, perennials were more abundant than annuals, even in high severity burns. The invasive species present in high severity burn areas could increase in the future due to their presence in the seedbank and continue to persist in other disturbed locations.

LICHEN RESPONSES TO DIFFERENT FORMS OF NITROGEN IN THE LOS ANGELES BASIN: IMPLICATIONS FOR CRITICAL LEVELS AND LOADS. **Sarah Jovan**, PNW Research Station, USDA Forest Service, Portland, OR 97205; Jennifer Riddell, Pamela Padgett, Southwest Research Station, USDA Forest Service, Riverside CA 92507; Thomas H. Nash, Dept. of Botany, University of Wisconsin, Madison, WI 53706; sjovan@fs.fed.us

Nitrogen (N) causes the replacement of native lichen floras by "weedy" eutrophic species. This shift is commonly used to develop empirical critical levels (CLE) for ammonia (NH_3) and critical loads (CLO) for N. To be most effective in conserving sensitive species, empirical CLE/CLO must firmly link lichen response to causal pollutant(s), which is difficult to accomplish in field studies because the high cost of N measurements limits their use. We synthesized an unprecedented array of N measurements across 22 long-term monitoring sites in the L.A. Basin, California: NH_3, nitric acid (HNO_3), nitrogen dioxide, ozone, N in throughfall, modeled estimates of eight different forms of N, and nitrate accumulated on oak twigs. We sampled lichens on *Quercus kelloggii* and scored plots using two indices of eutroph abundance. Our results contradict two common misconceptions: 1) that eutrophs respond specifically to NH_3, and 2) that that response necessarily depends upon increased substrate pH. Nitrogen deposition in canopy throughfall was by far the best predictor (r^2 = 0.94), indicating that eutrophs respond to multiple forms of N. Most N variables had significant correlations to eutroph abundance (r^2 = 0.36 – 0.62) as well as to each other (r^2 = 0.61 – 0.98), demonstrating the risk of mistaking correlation for causality in CLE/CLO field studies. Our also data show eutroph abundance is driven by N inputs, not pH. The counterintuitive negative correlation of eutrophs and trunk pH (r^2 = 0.43) probably results because HNO_3 dominates N deposition in our study region.

THE IDAHO BIRD OBSERVATORY: USE OF VOLUNTEERS TO CONDUCT LONG-TERM POPULATION MONITORING OF MIGRATORY LANDBIRDS. **Gregory Kaltenecker,** Jay D. Carlisle, Idaho Bird Observatory, Department of Biological Sciences, Boise State University, 1910 University Dr., Boise, ID 83725; Mary Dudley, Idaho Department of Fish and Game, Southwest Region, Nampa, ID 83686. gregorykaltenecker@boisestate.edu

Since 1995, a standardized hawk migration count has been conducted annually at Lucky Peak, located on the Boise Ridge. Counts are conducted daily from 25 August through 31 October. Diurnal raptors are also trapped and banded during this same time period. Since 1997, we have maintained a passerine mist-netting effort daily from 16 July through 15

October to document species composition, migration timing, and stopover biology of over 60 species of western migratory landbirds. A forest owl banding program, targeting Northern Saw-whet and Flammulated Owls, was initiated in 1999, and is operated daily from 28 August through 28 October. The majority of these projects are accomplished with volunteer labor. Each fall, more than 30 volunteers contribute over 5000 hours and thousands of miles driven in personal vehicles. These volunteer contributions are valued at over $200,000 annually. We recruit three types of volunteers: full-time volunteer crew, part-time community volunteers, and undergraduate and graduate students. Full-time volunteers may receive a per diem, but all other volunteers are unpaid. Volunteer labor is well-documented by a third party: Idaho Department of Fish and Game's Regional Volunteer/Reservist Program. This third-party partner calculates the value of volunteer time based on standard rates. Volunteer labor has resulted in continuation of long-term monitoring and research projects for 18 years, has resulted in numerous contributions to peer-reviewed scientific literature, has trained hundreds of young biologists and students in bird capture, handling and other research techniques, and has provided opportunities for research to dozens of undergraduate and graduate students.

LICHEN DIVERSITY IN A SOUTH FLORIDA FOREST CANOPY. **Barry Kaminsky**, Bureau of Land Management, 1387 S. Vinnell Way, Boise ID 83709; barryk39@yahoo.com

Two lichen studies were conducted in Myakka River State Park, in southwest Florida. The first experiment measured the vertical distribution of lichen diversity in oak hammocks. Three trees were climbed using a modified single rope technique and the percent cover of foliose, fruticose, and crustose lichens was measured. Crustose lichens composed 85% of all cover while foliose composed 15%. Additionally, foliose cover may increase with height in tree. There was no correlation between total lichen cover and height in tree. There was no correlation between cardinal directions. However, this survey raises questions pertaining to how lichen diversity changes with height in trees in subtropical forests, and how to incorporate forest structure into measuring percent cover. In the second experiment, lichen diversity was compared between Ocala National Forest and Myakka River State Park. While lichen diversity was very similar between parks, Myakka may have a higher diversity of tropical lichens due to its southern proximity. Future directions for lichenological research in subtropical Florida include a more in-depth biodiversity sampling and the use of *Ramalina* taxa as an indicator of wetlands and good water quality.

URBANIZATION AND AVIAN SPECIES RICHNESS AND ABUNDANCE ALONG THE BOISE RIVER CORRIDOR. **Allison Korte** and Alfred Dufty, Department of Biological Sciences, Boise State University, Boise, ID 83725; Allikort26@hotmail.com

Riparian corridors have an interesting paradigm: they are a valuable habitat for breeding, migration, and dispersal activities for birds and urban development along their banks brings wildlife closer to city-dwellers. To maintain the riparian corridor, Boise mandated a 70-ft buffer between all buildings and the river's edge. However, with increasing population there are added anthropogenic pressures. We examined if urbanization was associated with decreased avian richness and abundance along the Boise River during the breeding season. We also surveyed vegetation and habitat variables to determine percent coverage of riparian area, urban structures, and vegetation types. We then determined the level of tolerance to anthropogenic habitat disturbance of the avian species living in the riparian corridor. Over 80 species were identified and separated into guilds to show effects of human disturbances on species composition. Using an Akaike Information Criterion corrected modeling we found that birds in the cavity-nesting guild were best described by the presence of live grass,

suggesting a need to preserve open habitat. We also analyzed several individual species. For example, the top model for the Yellow Warbler was characterized by the presence of riparian habitat and people, suggesting that this species is tolerant of people, as long as riparian habitat is maintained. This study improves our basic understanding of the effects of urban development on avian species along riparian corridors. Additionally, it will help in developing local conservation plans to preserve the attractiveness of riparian areas while minimizing the impacts on the avian community.

PRELIMINARY STRATIGRAPHIC CONTEXT OF THE COYOTE CANYON MAMMOTH SITE. **George V. Last**, Pacific Northwest National Laboratory, P. O. Box 999 MSN K6-81, Richland, WA 99354; Bax R. Barton, Burke Museum of Natural History and Culture and Quaternary Research Center**,** University of Washington, P.O. Box 351360, Seattle, WA 98195-1360; Gary C. Kleinknecht, Kamiakin High School, 600 North Arthur St., Kennewick, WA 99336; george.last@pnnl.gov

The Coyote Canyon Mammoth Site is located on private land approximately 4 km south of Kennewick, Washington. It is one of at least 45 mammoth sites found in Benton County, and one of at least 12 interpreted to be hosted in Pleistocene outburst flood deposits (Barton and Last 2010). A non-profit 501(c)(3) organization, the Mid-Columbia Basin Old Natural Education Sciences (MCBONES) Research Center Foundation was created to engage students and teachers in detailed paleoecologic research at the site. Excavation of the site began in September 2010. Preliminary interpretation of the site stratigraphy indicates that the bone bed is located within fine-grained Pleistocene outburst flood deposits along the southern shoreline of temporary Lake Lewis (max. elev. = 385 m). Located at an elevation of 293 m MSL, this is one of the highest known mammoth finds in flood deposits in southeastern Washington, and has been associated with one of the largest floods (Last and Bjornstad 2009). At least four graded beds associated with different Pleistocene flood events have been interpreted to overlie the bone bed (Guettinger *et al*. 2010). An overprint of pedogenic calcium carbonate in the lower most flood deposits suggests a period of weathering and subaerial exposure prior to deposition of approximately one meter of loess, followed by a 0.75 m thick sequence of colluvial slopewash.

References:

Barton, BR and GV Last. 2010. "The Discovery And Distribution Of Mammoth Remains In Benton County, Washington State." 2010 Annual Meeting & Exposition, Denver, Colorado, 31 October – 3 November. *Geological Society of America Abstracts with Programs*, Vol. 42, No. 5, p. 250.

Guettinger, MW, GV Last and BR Barton. 2010. "Geology Of The Coyote Canyon Mammoth Site, Benton County, Washington State." 2010 Annual Meeting & Exposition, Denver, Colorado, 31 October – 3 November. *Geological Society of America Abstracts with Programs*, Vol. 42, No. 5, p. 119.

Last GV, and BN Bjornstad. 2009. "Distribution of *Mammuthus* and Erratic Finds Relative to the Size of Ice Age Floods in Southeast Washington." 2009 Annual Meeting & Exposition, Portland, Oregon. *Geological Society of America Abstracts with Programs*, Vol. 41, No. 7, p. 16

A WEB-AVAILABLE INDIVIDUAL-BASED MODEL FOR EXPLORING LEAST TERN-RIVER MANAGEMENT INTERACTIONS. **Casey A. Lott**, 223 N. 6th St. #410, Boise, ID, 83702; Steven F. Railsback and Colin J.R. Sheppard, Lang, Railsback, and Associates, 250 California Ave., Arcata, CA, 95521; Richard A. Fischer, US Army Corps of Engineers, Research and Development Center, Environmental Laboratory, 3909 Halls Ferry Road, Vicksburg, MS, 39180; Stephen R. Crawford, Blake E. Ketchum, and Douglas A. Miller, Penn State University, Center for Environmental Informatics, 2217 Earth-Engineering Sciences Building, University Park, PA 16802; clott@abcbirds.org.

We developed an individual-based model of Least Tern reproduction that simulates tern population response to alternative habitat conditions, flow regimes, or management scenarios. A web-based version of the model, with an intuitive graphical user interface, allows non-expert users to investigate alternative management practices. Target users include: river managers, biologists, ornithologists, and stakeholders; anyone with interest in developing their understanding of Least Tern-management interactions on engineered rivers. Users build simulation experiments in which they vary initial conditions (e.g., habitat or flow inputs, predator intensities, tern population size) and compare model outputs (e.g., reproductive success, causes of mortality) among simulations. The model has complete observability (rather than the partial or biased observability that typifies most tern-river study systems). Similarly, experimental conditions are not limited to the observed habitat or flow conditions that typify short term research studies. Consequently, this model provides tremendous opportunities for learning via repetitive experimentation and strong inference. Our poster will illustrate the major properties of the model (nesting sandbars, flow inputs, virtual birds and predators) and provide background on how we have developed, tested, and applied a first version of the model to learn about a specific tern-river-management system: the population of Least Terns nesting below Keystone Dam on the Arkansas River. We believe that the development of individual-based models to explore bird-management interactions, as well as web-based user interfaces that encourage widespread model exploration is a major potential growth area in ornithology. We will run live demonstrations of the model on laptops during the poster session.

(BANQUET) HARNESSING THE ENTHUSIASM OF CITIZEN SCIENTISTS TO IMPLEMENT THE MULTI-SPECIES BASELINE INITIATIVE. **Michael Lucid**, Idaho Department of Fish and Game, Coeur d' Alene, ID, 83805; michael.lucid@idfg.idaho.gov

The Multi-species Baseline Initiative (MBI) is a diverse collaborative of partners with goals to implement a long term monitoring program for multiple taxa groups across the Idaho Panhandle and adjoining mountain ranges. Conducting standardized surveys across our vast 23,825 km^2 study area requires a large amount of equipment and worker hours. Two MBI partners, Friends of Scotchman Peaks Wilderness and Idaho Conservation League, successfully obtained a grant from ZooBoise Conservation Fund which allowed them to play a significant role in the forest carnivore survey portion of the MBI. In 2012 these partners recruited over 100 volunteer Citizen Scientists who donated approximately 1,500 hours to manage 46% (n = 43) of 93 forest carnivore bait stations established by all MBI partners. Field opportunities required a variety of ability levels and our volunteers ranged from high school students to highly skilled ski mountaineers. By enabling community participation the MBI (1) obtains large amounts of equipment and worker hour resources, (2) provides unique opportunities for citizens to experience wildlife, and (3) provides our Citizen Scientists with the tools to further develop their appreciation of local landscapes into an educated conservation ethic for a variety of forest carnivore species.

MULTI-SPECIES BASELINE INITIATIVE: GETTING THE MOST BANG FOR THE SURVEY AND MONITORING BUCK. **Michael Lucid**, Idaho Department of Fish and Game, Coeur d' Alene, ID, 83805; michael.lucid@idfg.idaho.gov

There is much interest in how land managers can increase species resiliency to human caused landscape and climate change. However, conservation action requires a fundamental baseline of knowledge that does not exist for many species. The Multi-species Baseline Initiative (MBI) is a collaborative of not-for-profit groups, universities, tribes, state, and federal

agencies with goals to (1) describe the occurrence and distribution of multiple species in the Idaho Panhandle and adjoining mountain ranges, (2) collect baseline micro-climate data at survey sites, and (3) implement a single long term monitoring program for these species. During the MBI's pilot years (2010-2011) we divided our 23,825 km^2 survey area into 953 5x5 km survey cells and co-located temperature data loggers with surveys for beetles, terrestrial gastropods, and forest carnivores at 476 (50%) of these cells. Results from 2010 demonstrate how a single multi-species survey can dramatically improve baseline knowledge of species range and distribution. For example, we obtained the first verifiable Idaho detection of magnum mantleslugs (*Magnipelta mycophaga*) in 68 years (17 specimens from 11 sites), the first verifiable lynx (*Lynx canadensis*) detection in the U.S. portion of that range in 18 years, and a higher than expected detection rate of the Idaho state imperiled (S2) fir pinwheel snail (*Radiodiscus abietum*) (105 specimens from 45 sites). By conducting biological and climate surveys in a single field effort, the MBI provides the most bang for the survey and monitoring buck.

THE ROLES OF HUMANS AND CLIMATIC VARIATION ON THE FIRE AND VEGETATION HISTORY OF SUBALPINE MEADOWS - MOUNT RAINIER NATIONAL PARK (WASHINGTON). **Michael L Lukens**, Megan K. Walsh, Department of Geography and Resource Management Program, Central Washington University, Ellensburg, WA 98926; lukensm@cwu.edu

Subalpine meadows of Mount Rainier National Park (MORA) are among the most highly valued ecosystems in the National Park System, but tree encroachment from lower-elevation forests currently threatens their existence. The underlying cause for this is still unclear. Past research and oral histories suggest that these meadow systems were maintained through natural and human-set fires, and that the cessations of these burning practices along with fire suppression activities are to blame. Others contend that recent climatic shifts have played a larger if not complete role in overall meadow demise. To address this debate, analysis of macroscopic charcoal and pollen preserved in lake sediments was used to reconstruct the fire and vegetation history of three sites along the Sunrise Ridge of MORA. Preliminary results suggest a combination of natural and human influences on fire regimes during the Holocene. In general, fire activity was highest between the Mt St Helens-YN tephra layer through Mt Rainer P tephra layer (~3500 to 2400 cal yr BP). This coincides with an increase in cultural artifacts found at the nearby Sunrise Ridge Borrow Pit Site. Climatic data from MORA and the Cascades suggest that this time period was marked by a change to cooler, moister conditions as compared to earlier in the Holocene. Fire records for other parts of the Cascades reflect this shift in climate with a general decrease in fire frequency. Overall, our records appear to suggest that anthropogenic burning played at least a partial role in the fire history of our study sites.

EXPANDING THE OREGON EXPLORER ACROSS THE WEST: INCREASING THE RANGE OF A DIGITAL NATURAL RESOURCES LIBRARY. **Myrica McCune,** Institute For Natural Resources, 210 Strand Agricultural Hall, Oregon State University, Corvallis, OR 97331-2208; myrica.mccune@oregonstate.edu

Oregon Explorer was formed through a partnership between the Institute For Natural Resources at Oregon State University and OSU libraries, and has been further developed through a wide range of partnerships in state and local agencies. There are three components of Oregon Explorer. First, data portals provide access to imagery and spatial data through The Oregon Spatial Data Library, a searchable list of datasets for extraction and download, and

the Oregon Imagery Explorer, a mapping tool which facilitates display and download of statewide areal imagery. Second, topic portals provide tools, data, articles, and links to inform users about topics such as wildfire risk, land use, and rural communities. Finally, location portals contain information about natural resources issues in five plan basins within Oregon. The new Western Landscapes Explorer, which will launch in May of 2012, will be an amalgamation of a data portal, topic portal, and location portal. The site will feature articles, information, and photos about landscapes in the west; links to other relevant sites, tools and data repositories; and a mapping and visualization tool that will provides access to selected western datasets. The "Western Landscapes Trend Reporter" will allow viewing, extraction, and download of spatial data, as well as allowing users to add their own data to maps they create. The Western Landscape Explorer seeks to facilitate knowledge acquisition about landscapes in the West through articles, links to additional resources, and visualization and download of spatial data.

MAPPING LICHENS USING SATELLITE IMAGERY. **Peter R. Nelson**, Bruce McCune, Department of Botany and Plant Pathology, 2082 Cordley Hall, Oregon State University, Corvallis, OR 97331-2902; Carl Roland, Denali National Park and Preserve, P.O. Box 9, Denali Park, AK 99755; Matthew J. Macander, ABR, Inc., Environmental Research & Services, P.O. Box 80410, Fairbanks, AK 99709. nelsopet@science.oregonstate.edu

Lichens cover large areas across the high latitudes of the northern hemisphere. In this region, they compose much of the diversity within vegetation communities and serve as important winter food for caribou. Mapping lichens is useful because access is limited relative to the large physical areas involved. Mapping lichens is possible using satellite imagery because they are spectrally distinct from other co-occurring surfaces. We modeled the cover of 4 different lichens groups (total lichen, usnic lichens, usnic and light colored lichens together and dark lichens) to see which were the most detectable. Our models were built using non-parametric multiplicative regression to capture the non-linear relationships between lichen cover and spectral and environmental data. Lichen cover data came from 722 plots in the vegetation monitoring system of Denali National Park and Preserve, Alaska. We used a pool of 25 possible independent variables, including reflectance from the Landsat 7 ETM+ sensor and other environmental variables associated with each plot. Usnic lichens had the best fitting model (xR^2=0.37), with elevation, blue and mid-infrared light as predictors. Elevation had a non-linear, double humped shaped relationship with usnic lichen cover, while blue and mid-infrared light were positively related to usnic lichen cover. Maps of lichen cover in Denali were generated using our models. These maps and models could be used for assessing caribou food resources and describing patterns lichen communities across vast inaccessible landscapes.

#*COMPARISON OF BIOMASS ESTIMATION METHODS. **Peter Olsoy**; Nancy Glenn, Boise Center Aerospace Laboratory, Idaho State University, 322 E. Front St., Suite 240, Boise, ID 83702; Pat Clark, USDA Agricultural Research Service, 800 Park Blvd, Boise, ID, 83712-7716; Lucas Spaete, Boise Center Aerospace Laboratory, Idaho State University, 322 E. Front St., Suite 240, Boise, ID 83702; olsopete@isu.edu

Management of sage-steppe rangelands typically requires an inventory or assessment of the health of sagebrush. One important parameter in this assessment is biomass. Most techniques to measure biomass are destructive, expensive, and time consuming. One non-destructive method is the use of point framing, which takes a gridded approach to estimating 'hits' on woody and green plant matter. This method has shown high correlation between

point-intercept and plant characteristics such as cover and biomass, but is also quite time consuming. Three-dimensional LiDAR scans provide a similar point-based approach as point framing, but are much more rapid to collect in the field. Additionally, with terrestrial LiDAR, complete coverage of one sagebrush in excess of 100,000 3-D points is common. This work seeks to compare point framing and LiDAR scanning techniques for estimation of biomass using data from 30 sagebrush at 6 sites within Reynolds Creek Experimental Watershed (RCEW). We explore the perspective in which the data is collected, along with techniques to quantify biomass with an excess amount of 3-D points.

THE USE OF CHRISTMAS BIRD COUNTS AND CITIZEN SCIENCE TO MONITOR WINTERING RAPTOR POPULATIONS IN IDAHO AND BEYOND. **Neil A. Paprocki**, Julie A. Heath, Department of Biological Sciences and Raptor Research Center, Boise State University, Boise, ID 83725; neilpaprocki@u.boisestate.edu

For over 110 years citizen volunteers have conducted Christmas Bird Counts (CBC) across North America, making it potentially the longest running ornithological dataset in existence. Starting in 1900 a total of 25 CBC circles were surveyed. Presently, over 2,000 circles are surveyed creating a large and complex resource for scientists to explore. We used CBC data to supplement wintering raptor point counts conducted over a 20-year span in the Morley Nelson Snake River Birds of Prey National Conservation Area (NCA). Western United States CBC data was obtained for several wintering raptor species over the last 50 years, and compared to trends seen from variable-radius point counts conducted in the NCA. Species' trends in the NCA were either increasing or constant over the last 20 years. Some of these trends are consistent with CBC data for the state of Idaho as American Kestrels ($F_{1,49}$=12.49, P<0.001) and Rough-Legged Hawks ($F_{1,38}$=8.972, P=0.005) have shown significant increases. However, other species show inconsistent trends with CBC data, and the possible causes for this vary between species and reflect sampling issues within the CBC that should be considered. CBC data also indicates several raptor species may be significantly shifting their wintering distribution across the western United States. The main factor driving these distribution shifts may be climate change, as warming winters are facilitating increased winter residency in some species, and decreased migration distances in others. Long term datasets like CBC will become increasingly valuable as we begin to assess the impacts of global change.

THE IMPLICATIONS OF CLIMATE CHANGE TO THE ECOLOGY OF GREAT BASIN RATTLESNAKES ON THE EASTERN SNAKE RIVER PLAIN. **Charles R. Peterson**, Department of Biological Sciences, Idaho State University, Pocatello, ID 83209; Vincent A. Cobb, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132; Christopher L. Jenkins, The Orianne Society, Clayton, GA 30525; petechar@isu.edu.

The objective of this presentation is to examine the implications of some of the potential direct and indirect effects of climate change on Great Basin Rattlesnakes on the eastern Snake River Plain. Our approach is to combine the results of ecological studies of rattlesnakes on the Idaho National Laboratory with possible changes in temperature and fire. The ecological studies include (1) field telemetry of activity, habitat selection, body temperatures, and movements; (2) laboratory studies of the effects of temperature on development and overwinter survival; (3) mark-recapture studies of rattlesnake population characteristics; (4) field studies of the effects of disturbance on rattlesnake populations; and (5) GIS habitat and distribution modeling. The direct effects of increased temperatures may include shorter hibernation periods, extended activity and gestation times, enhanced growth rates (assuming

adequate food), more frequent reproduction (i.e., shorter durations than 4 years between pregnancies), shorter life-spans, and expanded distribution. The indirect effects of climate change on disturbance due to fire may counter some of the direct effects by decreasing prey availability.

COMPARISON OF EXTRACTION METHODS USED TO ISOLATE THE CYANOTOXIN MICROCYSTIN FROM FISH MUSCLE. **Ellen P. Preece**, Barry C. Moore, School of the Environment, PO Box 646410, Washington State University, Pullman WA 99164-6410; eppreece@wsu.edu

Toxic cyanobacteria (CB) are recognized as a worldwide environmental and human health threat, and are an increasing problem in the US. Currently, a fundamental gap exists in understanding trophic transfer of microcystin (MC), a hepatotoxin produced by CB, through aquatic food webs to humans. Although it is understood that fish can accumulate MC, the significance of this potential pathway to humans is unclear. A number of extraction methods, clean up steps and analytical tests have been developed to isolate MC from fish muscle. These different procedures have resulted in various degrees of MC recovery, making it difficult to determine the true accumulation potential of MC within fish muscle. My study spiked rainbow trout tissue with the commercially available MC standard, then tested four extraction methods and three analytical tests to determine the method that produced the best recovery rates. Preliminary results indicate that each method produced a different recovery rate. This suggests that previous studies may have either underestimated or overestimated the true MC content in fish muscle. To produce statistically significant results, each method will be retested a minimum of five times. Once the best method is determined I will quantify MC in fish collected from Washington lakes. These results will be used to inform communities reliant on fish for a food source, such as local Indian tribes, if they are consuming contaminated fish. Positive MC detection can then be transformed into a dietary exposure assessment to identify the degree of risk being posed to tribal members.

INVESTIGATIONS OF THE GHOST FOREST AT MOUNT HOOD, OREGON USING RADIOCARBON AND DENDROCHRONOLOGY—A TEACHER-RESEARCHER PARTNERSHIP. Chris Hedeen, Oregon City High School, Oregon City OR 97045; **Patrick Pringle**, Centralia College, 600 Centralia College Blvd, Centralia WA 98531; c*hscience@gmail.com*

A “ghost forest” of standing dead snags at timberline on the flanks of Mount Hood volcano, Oregon has intrigued mountaineers and scientists for more than 60 years. One noteworthy stand of snags, largely whitebark pines, is along the east and west sides of the upper White River canyon between 1550 and 1950 m elevation as first described by Lawrence (1948). Clues to demise of the ghost forest trees will shed more light on the eruptive history of Mount Hood and(or) possible environmental or climatic disturbances. Previous cross dating of subfossil trees buried by lahars in the Sandy and Zigzag River valleys shows they died near the end of the 1781 CE growing season or by the earliest part of the 1782 growing season (Pringle and others, 2010; Pierson and others, 2011). However, precise timing of volcanic events of the “Old Maid” eruptive period (or of earlier Holocene lahars) in the upper White River basin on the southern flanks of the edifice is unknown. Our research plan is to:

- Identify, sample, and map the location of ghost forest snags in the White River drainage.
- Locate and sample living old-growth “survivor” trees in proximity to ghost forest snags.

- Compare tree-ring patterns in ghost snags and living trees with those of neighboring subfossil trees buried in dune, lahar, and pyroclastic flow deposits.
- Evaluate the potential role of volcanism, disease, climate, and/or environmental factors in the death of the ghost forest trees.

Thus far we have found at least two age-defined cohorts of trees.

EFFECTS OF LONG-TERM EXPERIMENTAL CHANGES IN PRECIPITATION SEASONALITY ON COVER, ECOPHYSIOLOGY, FOLIAR CROWN PROPERTIES, AND CARBON POOLS IN BIG SAGEBRUSH. **Keith Reinhardt**, Department of Biological Sciences, Idaho State University, Pocatello, ID 8320p; Matt J. Germino, United States Geological Survey, Forest and Rangeland Ecosystem Science Center, Boise, ID 83706; reinkeit@isu.edu

In semi-arid shrublands, shrubs are the dominant plant species and account for about 50% of aboveground biomass. Changes in precipitation due to climate change are predicted to alter shrub abundance in these water-limited ecosystems, with consequent impacts ecosystem structure and function. We quantified changes in shrub cover, crown parameters, biomass, and carbon pools in *Artemisia tridentata* following 17 years of experimental changes in precipitation seasonality. Shrub cover and crown size nearly doubled in plots receiving supplemental winter irrigation relative to summer-irrigated and control plots. Correspondingly, above- and below-ground biomass and carbon pools nearly doubled in shrubs in winter-irrigated plots. Increases at plot scales were due to changes in total-shrub crown size and leaf area, and not due to alterations in shrub abundance, plant area index (PAI), specific leaf area, photosynthetic gas exchange, or plant water status. The ratio of total-plant surface area to basal sapwood area (A_{TPSA}:A_b) also nearly doubled in winter-irrigated plots compared to control and summer-irrigated plots, indicating changes that balance maximum water-use for growth with hydraulic-transport constraints. While many current studies use variation in PAI to quantify changes in evapotranspiration across the landscape, our results show that A_{TPSA}:A_b may be more suitable than PAI for monitoring changes in evapotranspiration, at least for communities dominated by *A. tridentata*. Our study shows that the timing of precipitation is as important as the amount of precipitation to sagebrush productivity and carbon-storage potential, as these parameters increased only in shrubs in winter-irrigated, not summer-irrigated, plots relative to shrubs in control plots.

REASSESSMENT OF THE SILURIAN PROBLEMATICUM *RUTGERSELLA* AND ITS RELATIONSHIP WITH VENDOBIONTA. **Gregory J. Retallack**, Department of Geological Sciences, University of Oregon Eugene, Oregon 97403; gregr@uoregon.edu

Rutgersella is a problematic fossil from the Early Silurian (Llandoverian) Shawangunk Formation of New Jersey, initially interpreted as jellyfish comparable with Ediacaran fossils such as *Dickinsonia*. Three proposed species of *Rutgersella* from the same locality are now regarded as growth or reproductive variants of a single species, *R. truexi*. Sedimentology and ichnology of their occurrence shows that they were sessile organisms of intertidal mudflats. These fossils have been dismissed as pyrite suns, but new petrographic studies show that they were weakly pyritized, hollow, organic structures, with a quilted internal structure, comparable with the Adolf Seilacher's taxonomic concept of Vendobionta. As for *Dickinsonia* and other vendobionts, the biological affinities of *Rutgersella* remain uncertain. Plausible biological models for *Rutgersella* include coenocytic green algae, cellular slime molds, puffball-like fungal fruiting bodies, or foliose lichens. These varied

paleoenvironmental constraints and the structure of *Rutgersella truexi* are most compatible with interpretation as a foliose intertidal lichen.

RESPONSES OF BIOLOGICAL SOIL CRUSTS TO THE PRESENCE OF CHEATGRASS LITTER. Eric Roberts, Russell Holten, **Marcelo Serpe**, Department of Biological Sciences, Boise State University, 1910 University Drive, Boise, ID 83725-1515; mserpe@boisestate.edu

Invasion by exotic annual grasses has resulted in an increase in plant litter in sagebrush habitats. This litter tends to cover biological soil crusts (BSCs), which may affect their metabolism and growth. To investigate these possibilities, BSC samples dominated by the moss *Bryum argenteum* were covered with cheatgrass litter (litter treatment) or left uncovered (control) and exposed to natural conditions during the summer and fall. At the end of the fall, we removed the litter and compared morphological and photosynthetic characteristics of these samples. The presence of litter led to the development of a taller but less dense BSC. Average moss height was 0.8 and 1.5 mm for the control and litter treatment, respectively. In contrast, no differences were observed in chlorophyll content or dry weight per area. The photosynthetic parameter Fv/Fm was higher for the litter than the control, while the opposite was observed for the electron transport rate, which at a light intensity of 700 μmol m^{-2} s^{-1} was 25% higher in the control than the litter treatment. This was attributed to higher non-photochemical quenching in the litter treatment. The amount of litter used (25 mg cm^{-2}) severely reduced photosynthesis. However, after litter removal net photosynthesis was somewhat higher in litter than control samples. This was caused by differences in respiration, which was 25% lower in the litter treatment. Overall, the results indicate that BSCs partly adjust to the presence of litter by changing morphology, altering light transfer and dissipation, and decreasing respiration.

LAND USE CHANGES HAVE ELIMINATED MUCH SUITABLE HABITAT FOR RARE BIOTIC SOIL CRUSTS IN OREGON. Heather T. Root and **Bruce McCune**, Department of Botany and Plant Pathology, 2082 Cordley Hall, Oregon State University, Corvallis, OR 97331; mccuneb@onid.orst.edu

We modeled species occurrences in relation to climate and soil variables for four uncommon lichens that are found in the biotic soil crusts of central and eastern Oregon: *Acarospora schleicheri*, *Fuscopannaria cyanolepra*, *Rhizocarpon diploschistidina*, and *Texosporium sancti-jacobi*. We used nonparametric multiplicative regression (NPMR) with the software HyperNiche. This modeling approach assumes no particular shape for a response surface and automatically incorporates interactions among predictors. We estimated probability of occurrence, based on climate and soils, to map regions of Oregon that may support new populations of these species. We then overlaid habitats unsuitable for biotic crusts due to development and agriculture. *Acarospora schleicheri*, *R. diploschistidina*, and *T. sancti-jacobi* were strongly associated with fine soils along the Columbia River and Treasure Valley. Because most of these areas are currently used for agriculture, much of these species' potential habitat has been eliminated. Our models predict, however, that the residual public lands in these areas are likely to support additional populations. Wind farms are now numerous on the benches above the Columbia River, at and beyond the east end of the Gorge, prime habitat for three of these species. Wind farms might be a compatible use for soil crusts because they are less disruptive than farming and still allow people to make an income from the land. Careful site selection aided by species modeling is needed, along with monitoring.

We suggest that negative effects of wind farms on biotic soil crusts on public grazing lands could be mitigated by co-locating large grazing exclosures with wind turbines.

SOIL CRUST LICHENS OF OREGON'S STEPPE. **Heather T. Root**, Bureau of Land Management 3801 Pegasus Dr. Bakersfield, CA, 93308 & Bruce McCune, Department of Botany & Plant Pathology Cordley 2082 Oregon State University Corvallis, OR 97331-2909 U.S.A.; ericarhiza@gmail.com.

Biological soil crusts are ecosystem engineers in arid and semi-arid habitats; they affect soil chemistry, stability, and vegetation. Little is known about regional variation in biotic crust communities of North America. We explored how biotic crust lichen community composition and richness are related to vascular plant, soil and climate characteristics in Oregon. In 59 0.4-ha plots, we found 99 biotic crust lichen species, one-third of which were observed only once. Biotic crust lichen communities rich in cyanolichens characterized *Juniperus* stands whereas warm grasslands were home to regionally uncommon species including *Texosporium sancti-jacobi* and *Rhizocarpon diploschistidina*. We discerned biotic crust communities in sandy *Artemisia tridentata* ssp. *wyomingensis* sites from those loamy *A. arbuscula* sites. Hotspots of biotic crust lichen species richness were geographically scattered, weakly negatively associated with abundance of shrubs of disturbed sites, *Gutierrezia* and *Chrysothamnus*. The sites with lowest biotic crust lichen richness were heavily grazed, burned plots with *Gutierrezia* in the grassy north; unstable steep talus slopes at the center of the study area; and sandy, grazed sites with *Chrysothamnus* in the southern portion of our region. Overall, regional patterns in biotic crust lichen communities were strongly associated with vegetation, soils, and climate.

DIET SELECTION BY OWYHEE HARVESTER ANTS (POGONOMYRMEX SALINUS) AND ITS CONSEQUENCES FOR SLICKSPOT PEPPERGRASS (LEPIDIUM PAPILLIFERUM), A THREATENED MUSTARD ENDEMIC TO SOUTHWESTERN IDAHO **Matt Schmasow**, Ian Robertson, Department of Biological Sciences, Boise State University, 1910 University Dr., Boise, ID 83725; mattschmasow@u.boisestate.edu

Owyhee harvester ants (*Pogonomyrmex salinus*) are generalist granivores native to sagebrush steppe habitat throughout the Pacific Northwest, including areas occupied by slickspot peppergrass (*Lepidium papilliferum*), a threatened mustard endemic to southwestern Idaho. Recent studies have shown that *P. salinus* is a voracious seed predator of slickspot peppergrass in areas where their habitats overlap, and suggest that these ants may pose a threat to the long term viability of the species (White & Robertson 2009). To better understand the importance of *L. papilliferum* in the diet of *P. salinus*, we compared the diet of *P. salinus* relative to the availability of major seed types (i.e., *Bromus tectorum*, *Poa secunda*, *Sisymbrium altissimum* and *L. papilliferum*) located within 20 m of ant colonies. We found that harvester ants exhibited distinct seasonal patterns in resource use. In 2010 *Poa secunda* seeds were overrepresented in the diet of ants early in the season. However, although *Poa* remained available throughout the season, ants shifted to smaller seed types (e.g., *Sisymbrium*, *Lepidium*) once these seeds became available. By contrast, in 2011 *Lepidium* seeds appeared in the diet, albeit rarely, consistent with their availability whereas *Poa* seeds were consumed in large numbers throughout the season. *Bromus* seeds, despite being abundant throughout both seasons, comprised a small component of the ant's diet. Our results further suggest that the reduced handling time of smaller seed types and the greater energy and protein content of *L. papilliferum* relative to other seed types may play a role in its selection by *P. salinus*.

(KEYNOTE) CONSERVATION-RELIANT SPECIES: OUR NEW RELATIONSHIP WITH NATURE. **J. Michael Scott**, University of Idaho, Moscow, Idaho.

Species threatened with extinction are the focus of mounting concern throughout the world. The number of endangered and threatened species in the United States has increased from 78 under the 1966 Endangered Species Preservation Act to more than 1300 today. When the Endangered Species Act was signed in 1973 there was a assumption that under the Act species at risk of extinction would be identified, threats document, needed management responses would be developed and implemented at conservation relevant scales, the species would respond with increased numbers, reproductive success and distributions, recovery goals would be reached and the species delisted no longer needing the special protections afforded it under the Endangered Species Act. Today we know that assumption to be false. Eighty four percent of federally listed species are conservation reliant. That is even after recovery goals have been reached that these conservation reliant species will continue to need species specific management interventions to sustain their numbers and distribution above recovery thresholds. Conservation reliant species are challenging the relevance of long held principals of wildlife managers and policy makers. We have a new relationship with nature. New ways to prioritize conservation actions, implement innovative management approaches and engage a broader spectrum of society are needed if the challenge of maintaining viable populations of conservation reliant species is to be met. Failure to meet these new wildlife management challenges do will leave us with hard choices as to which species to leave behind.

*# VARIATIONS IN MANTLE COMPOSITION INFERRED FROM OLIVINE PHENOCRYST AND XENOCRYST GEOCHEMISTRY FROM THE SOUTHERN RIO GRANDE RIFT, NEW MEXICO. **Spenser P. Scott** and Michael C. Rowe, School of the Environment, Washington State University, Pullman, WA 99164; spscott@wsu.edu

The composition of the mantle beneath an active rift zone may have a significant impact on the amount and rate of crustal extension and deformation within the region. The Rio Grande Rift in central New Mexico is a unique locality where both factors have played a key role in forming the land. Considering this, volcanic material can be analyzed geochemically and be key to determining the composition of the lithospheric mantle and further infer the processes promoting extension therein. Olivine xenocrysts and phenocrysts within basalts spanning the southern portion of the rift were measured by electron microprobe analysis and laser ablation ICPMS while oxygen isotope data was compiled by laser fluorination. The trace element and isotope data gathered allows for characterization of the lithospheric mantle into two possible components: peridotite or pyroxenite, giving an indication of the composition of the mantle source. Olivine trace element concentrations and ratios suggest that the lithospheric mantle beneath the Rio Grande Rift consists of a mixture of these two components. By categorizing the olivine into these two components, the composition of the lithospheric mantle beneath the rift can be extrapolated. It has been hypothesized that metasomatism within the mantle occurred during the subduction of the Farrallon Plate concurrent with the Laramide orogeny (ca. 80-40 Ma). We hope to demonstrate that erupted basalts can record evidence for this change in mantle chemistry beneath the Rio Grande Rift, forming a modified lithospheric mantle that is much more susceptible to extension, deformation, and volcanism.

FOOD CHAIN DIFFERENCES IN POLYBROMINATED DIPHENYL ETHER (PBDE) LEVELS IN BOISE, IDAHO. **Jessica Sherburne**, Alfred M. Dufty, Jr., Department of Biological Sciences, Boise State University, Boise, ID, 83725; jessicasherburne@u.boisestate.edu

A major goal in toxicology is determining the effects of potentially harmful and persistent environmental pollutants, such as polybrominated diphenyl ethers (PBDEs), on biota and the environment. One potential mechanism for introduction of PBDEs in the environment is the disposal of sewage sludge or biosolids through land application. To assess contaminant levels, we studied American kestrel (*Falco sparverius*) and European starling (*Sturnus vulgaris*) eggs. All clutches were laid in artificial nest boxes placed on telephone poles near Boise, ID. The experimental eggs were from nest boxes adjacent to land where biosolids have been applied as fertilizer for five years. Control eggs were collected from similar boxes located at least 5 km from the experimental site, in areas where biosolids were not applied. We examined differences in egg size and eggshell thickness between species and sites. If PBDE accumulation affects egg size or eggshell thickness, we expect the effect to be more evident in kestrel eggs than in starling eggs. In the future, spatial and interspecific differences in PBDE levels will be determined in egg yolk from both species. We hypothesize that PBDE levels will be highest in the kestrel and starling eggs collected where biosolids were applied. Additionally, we expect higher PBDE levels in the kestrel (secondary consumers) than in the starling (primary consumers) eggs because of bioaccumulation of pollutants at higher trophic levels. Through this research we hope to better understand how exposure to PBDEs through land-applied biosolids affects the eggs of birds at different trophic levels.

CONIFER ENCROACHMENT IN PLANTATIONS AND ADJACENT GRASSLANDS OF NORTHERN URUGUAY. **Laura J. Six**, Robert E. Bilby, Weyerhaeuser Global Timberlands Technology, WTC 1A5, Box 9777, Federal Way, WA 98063; Jonathan D. Bakker, School of Environmental and Forest Sciences, University of Washington, Box 354115, Seattle, WA 98195; laura.six@weyerhaeuser.com

Afforestation, the practice of planting trees where none existed in recent history, is a common practice around the globe. In the Campos ecoregion of South America, grasslands are planted with monocultures of fast growing woody species that are harvested in < 20 years. Livestock grazing was widespread before afforestation and continues in these plantations. Exotic species are used for these plantations and potential spread of these trees into remaining grassland area is a growing concern. We quantified rates of encroachment by loblolly pine (*Pinus taeda*) in and adjacent to 5 plantations in northern Uruguay. Belt transects extended 25 m into each plantation and 25 m into adjacent grassland within grazed areas and grazing exclosures. Areas were sampled semi-annually (spring and fall) for two years. Seedling density was greater in spring than autumn and in forests than grasslands. There was a significant interaction between habitat (forest or grassland), management (grazed or ungrazed) and sampling month (spring or fall): density was highest in forest habitats in spring, regardless of grazing, and forests in fall still had higher seedling density than grasslands in any season or grazing regime. Seedlings were common in forests, especially in spring before experiencing high mortality by fall, but almost completely absent from grasslands. Our results suggest that conifer encroachment into adjacent grasslands is unlikely. The mechanisms controlling encroachment differ: in ungrazed grasslands, the dense cover of herbaceous species prevents establishment whereas in grazed grasslands, the intensive livestock grazing prevents tree establishment.

RARE INLAND REINDEER LICHENS AT MIMA MOUNDS IN SOUTHWEST WASHINGTON STATE. **Robert J. Smith**, School of Life Sciences, University of Nevada Las Vegas, Las Vegas, Nevada 89154; Elisa Alphandary, Rheannon Arvidson, Gina Bono, Bridget Chipman, Andrew Corkery, Joseph DiMeglio, Kimberly Hansen, Katrina Isch, Jesse McAlpine, Chad Marks-Fife, Brad Mead, Daniel Miller, Nathan Nolte, Ashley Ottombrino, Tamra Prior, Jared Streich, Susan Theis, Stephanie Vandruff, Christina Wesseler, Kim Wesseler, Michele Wiseman and Bruce McCune, Department of Botany and Plant Pathology, Oregon State University, Corvallis, Oregon 97331; smithr2@unlv.nevada.edu

Reindeer lichens (*Cladonia* subgenus *Cladina*) are rare to uncommon in inland valleys of the Pacific Northwest. Therefore, the occurrence of 4 reindeer lichens in a unique relict prairie habitat in the Puget Trough raises questions about their ecological and evolutionary relationships. Conservation of rare lichens at Mima Prairie Natural Area Preserve has been complicated by difficulties in identification and by a lack of knowledge regarding responses to environmental perturbations. Our primary objective was to establish baseline information on the distribution, ecology, and systematics of reindeer lichens at Mima Prairie. We measured lichen occurrence in relation to factors including topography, invasive species and time since fire. We also quantified local air quality, and compared DNA sequences and secondary chemistry products among taxa. We found that other factors were not as important as recent fire history in explaining reindeer lichen occurrence at Mima Prairie. DNA sequencing supported previous phylogenetic concepts, and we documented 6 chemical variants, including two rare chemotypes. Based on these findings, we provided a key for distinguishing the reindeer lichens of Mima Prairie. We concluded that air pollution stress, prescribed fire, and land use changes may interact with dispersal limitation to impact reindeer lichens in the near future. Prescribed fire is likely to benefit reindeer lichens so long as it is small in scale, preserves pockets of refugia as propagule sources, and is supplemented with propagule addition in disturbed areas. Continued monitoring and designation as state sensitive species are recommended steps toward conserving rare inland reindeer lichens.

ESTIMATING SHRUB COVER IN SEMI-ARID RANGELANDS USING LIDAR AND HYPERSPECTRAL DATA. **Lucas Spaete**, Nancy Glenn, Jessica Mitchell, Temuulen T Sankey, Boise Center Aerospace Laboratory, 322 E. Front St, Suite 240, Idaho State University, Boise, ID 83702; Stuart Hardegree, Agricultural Research Service, 800 Park Blvd, Suite 105
Boise, ID, 83712; Randy Lee, Idaho National Laboratory, 2525 Fremont Ave, Idaho Falls, ID 83415; spaeluca@isu.edu

This study investigated the applicability of LiDAR and hyperspectral data to estimate percent shrub cover in semi-arid rangelands in southern Idaho, USA. To this end, vegetation characteristics were collected at 90 plots from 3 study areas: Southwestern Idaho: Reynolds Creek Experimental Watershed, South Central Idaho: Hollister, ID, and Southeastern Idaho: Idaho National Laboratory. Preliminary results show relationships between LiDAR derived percent shrub cover and field collected cover (R^2= 0.72), hyperspectral vegetation indexes and field collected cover (R^2= 0.62), and when multiple regression is employed on LiDAR derived percent shrub cover and hyperspectral vegetation indexes with field collected cover (R^2=0.78).

CREATING ECOLOGICALLY-BASED FOREST STAND BOUNDARIES USING REMOTE SENSING, THRESHOLD CLASSIFICATION, AND OBJECT-BASED IMAGE ANALYSIS **David R. Stephens,** Joint Base Lewis-McChord, 1032 Skyridge St SE, Lacey, WA 98503, lidar@uw.edu

This study develops methodologies for establishing ecologically-based forest stand boundaries across 57,000 acres of predominately western coniferous forest on Joint Base Lewis-McChord (JBLM) near Tacoma, Washington. In accordance with Forest Stewardship Council certification as a sustainable forestry program, forest managers at JBLM intend these new stand boundaries to facilitate ecologically-based management goals. Object-based image analysis and threshold-based classification techniques were used to discern ecological patterns present in small-footprint aerial LiDAR and multispectral aerial imagery. A new soil survey map of JBLM was used to classify the ecological forest type historically associated with a given soil series. Using LiDAR data, the forested landscape was classified by the three-dimensional characteristics of structural complexity, canopy cover and height. Next, using NDVI values calculated from high-resolution multispectral aerial imagery, the relative abundance of deciduous canopy trees present at the object level was determined. An iterative process of object merging and smoothing generated six vector layers that were combined to produce roughly 500 forest management stands with an average stand area of 80 acres. Finally each stand was classified into one of several ecological management classes to guide the type and timing of future forest treatments. Subjective and objective validation techniques will be used to produce overall accuracies for stand classification and boundary placement.

PICTURES OF AN INVASION, PAST, PRESENT, AND FUTURE: ENGLISH HOLLY (*ILEX AQUIFOLIUM*) IN SAINT EDWARD STATE PARK. David Stokes, Caitlin Campbell, **David Cronkright**, Elliott Church, and Rachel Phillips, University of Washington, Bothell, Bothell WA 98011; cronkd2@u.washington.edu

English holly (*Ilex aquifolium*) is an increasingly prominent invader of forests in western Washington, but little site-scale information exists about the pattern and processes of this invasion. We mapped, aged, and removed all English holly in a 15.9 acre area of invaded native forest at St. Edward State Park in the greater Seattle metropolitan area. The 215 holly trees in our sample ranged from 1 to 42 years of age. The oldest trees exceeded 10 m in height and 20 cm basal stem diameter. Trees in the older age-range (> 20 years) were growing rapidly, as reflected by steepening height-age and stem diameter-age curves. Mapping of holly establishment through time indicates that spread is occurring at two scales: contiguous, primarily vegetative, expansion of clumps of trees, and long distance dispersal, probably via animal-dispersed seed. The invasion appears to be concentrated near forest edges. The age of the oldest trees in our sample suggests that the original source of the invasion may have been ornamental holly planted by early residents of nearby neighborhoods. Our preliminary data indicate that English holly is increasing exponentially at St. Edward Park, and has the potential to become a dominant species both in number of individuals and canopy cover within a few decades. This dominance would likely come at the expense of native plant diversity and forest structure. We are currently expanding our sample and pursuing additional research to investigate the effects of holly on native species and factors that control the pattern of holly invasion.

FINE-SCALE VEGETATION AND FUEL MAPS: SUPPORT FOR FIRE MANAGEMENT PLANNING IN ALTERED FIRE REGIMES. **Eva K. Strand**, Department of Forest, Rangeland, and Fire Sciences, University of Idaho, Moscow, ID, 83844-1135; Calvin Farris, National Park Service, Klamath-South Cascade Network, Klamath Falls, OR, 97601; Stephen C. Bunting, Department of Forest, Rangeland, and Fire Sciences, University of Idaho, Moscow, ID, 83844-1135; Gina Wilson, Department of Fish and Wildlife Sciences, Moscow, ID, 83844; evas@uidaho.edu

Lava Beds National Monument (LABE) recently initiated a pilot project to develop a comprehensive long-term vegetation management plan to be integrated with short-term fire and resource planning. LABE is an ideal setting for such an approach because: (a) it contains a complex mix of intact and degraded sagebrush steppe with differential response to fire, (b) juniper woodlands are expanding into sagebrush and other vegetation types, (c) exotic species, mainly cheatgrass, are present in the park with potential to spread, and (d) the park has experienced a relatively high rate of 20th century burning. Thus, the decision to burn in LABE requires careful consideration of many factors due to these dynamic and altered fuels and expected response to fire. The purpose of this research is to develop state-of-the-art remote sensing techniques and high resolution spatial data layers needed to complete and implement an integrated management plan at LABE. We investigated three different remote sensing methods: Classification of 1-m scale aerial imagery, spectral unmixing of time-series satellite images, and object extraction using wavelet analysis. Combining these remote sensing methods with field data from the park we produced high thematic resolution layers essential for vegetation and fuels management. Specifically, we developed maps of sagebrush steppe including cover of shrub, annual, and perennial grass; juniper woodland maps differentiating between four phases of woodland development and maps of lava cover. Fuel loading maps were developed via regression of vegetation cover and fuel types with correlation coefficients ranging from 0.5 to 0.7 for different fuel types.

DATA BASIN: SUPPORTING CONSERVATION DATA SHARING AND PROBLEM SOLVING VIA THE WEB. **James R. Strittholt**, Conservation Biology Institute, 136 SW Washington, Suite 202, Corvallis, OR 97333; stritt@consbio.org

Data Basin (www.databasin.org) is an innovative, web-based conservation data sharing system publicly launched in July 2010. With over 8,100 spatial datasets and nearly 3,600 registered users, Data Basin offers a powerful system that connects users with conservation datasets, mapping and spatial analysis tools, and expertise. Individuals can explore and download from a vast library of spatial datasets, upload their own datasets, connect to other external map services, and produce customized maps that can be saved and easily shared with others. Data Basin currently supports Esri layer packages (shapefiles, grids, and geodatabases) as well as native NetCDF – the most popular format for climate change research. Data Basin is not just a data warehouse. Rather, it is a fully functional system that supports users to do meaningful work. Each user is provided with a private workspace so all of their Data Basin activities can be easily organized and saved. User-defined working groups can be established within minutes (public or private) to facilitate collaboration, peer review, or negotiation. Review and commenting tools provide maps to be truly interactive. New advances underway will enhance Data Basin's ability to further empower its users with high quality technical functionality that supports natural workflows and conservation decision making.

WHAT IS… THE MATRIX? CONSERVATION IN MULTIPLE-USE FOREST ENVIRONMENTS OF THE 21ST CENTURY. **Mark E. Swanson**, School of the Environment (SoE), Box 646410, Washington State University, Pullman, WA 99164-6410; markswanson@wsu.edu, 206-947-5323

The "matrix" is often defined as the unreserved (managed or developed) portion of a landscape or planning region. The creation and maintenance of comprehensive reserve systems sufficient for conservation of a majority of forest biota and processes is unlikely or impossible throughout the forested regions of the world; therefore, the future of many organisms and forest-related ecosystem values and functions lies partly in management methods outside of reserves. Opportunities certainly exist to conserve forest-related values in managed forestlands, but also in urban or residential areas, agricultural lands, and other types of area not traditionally considered in forest conservation frameworks. Conservation strategies may be implemented at all spatial scales, from the level of the individual street tree to broad landscapes, enhancing a host of values from maintenance of native biota to aesthetics. Participation must come from a broad range of individuals, including foresters, landscape architects, developers, policy makers, and many more, due to the spatially and socially comprehensive nature of management in the matrix.

EFFECTS OF HERBIVORY ON THE GROWTH, REPRODUCTION, AND CARBON AND NITROGEN ECONOMY OF THE FOUNDATION SPECIES OF SAGEBRUSH STEPPE (*ARTEMISIA TRIDENTATA* L., BIG SAGEBRUSH) DEPEND ON CHANGING CLIMATE. **Masaru Takahashi**, Department of Biological Sciences, Idaho State University, Pocatello, ID 83209; Nancy Huntly, Ecology Center and Department of Biology, Utah State University, Logan, UT 84322; Bruce Finney, Departments of Biological Sciences and Geosciences, Idaho State University, Pocatello, ID 83209; Matthew Germino; U.S. Department of Interior, U.S. Geological Survey, Forest and Rangel and Ecosystem Science Center, Boise, ID 83706; mailto:takamasa@isu.edu

One of the most pressing goals in Sagebrush Steppe research is to understand the potential change in species interactions due to climate change. Arthropod species associated with big sagebrush are highly diverse, can form complex interactions, and are likely vital components of food webs in Sagebrush Steppe. Past studies also suggest herbivorous insects greatly reduce growth and seed production of big sagebrush. However, little is known about whether climate variation drives changes in arthropod-sagebrush interactions, and how climate change will affect the impact of herbivorous insects on big sagebrush in the future. In this study, we conducted a long-term herbivore removal experiment under natural variation in climate conditions (especially precipitation) to help evaluate the potential effects of climate change on sagebrush-insect interactions. We measured the effects of herbivorous insects on growth, carbon and nitrogen isotope fractionation, and seed production of big sagebrush over a four-year period (2008-2011) in southeastern Idaho during which winter and spring precipitation varied greatly. Herbivorous insects significantly lowered seed production in all years. In years with dry conditions, big sagebrush increased water use efficiency, which was countered by the effects of herbivorous insect activity. Moreover, the effect of herbivorous insects on water use efficiency disappeared in years with wet conditions. We conclude that the effects of herbivorous insects on big sagebrush can change significantly depending on precipitation patterns.

UNDERSTANDING THE TRADEOFF BETWEEN SAFETY AND FOOD QUALITY BY PYGMY RABBITS**. Jamie Utz,** Jennifer Forbey**,** Boise State University, Boise ID 83725; Janet Rachlow, University of Idaho, Moscow ID 83844; Lisa Shipley, Washington State University, Pullman, WA 99163; jamieutz@u.boisestate.edu

Conserving an animal species requires understanding the simultaneous tradeoffs between shelter and food within a landscape, but most management approaches consider these factors independently. Quantifying interactions between cover and food quality at a scale relevant to a foraging animal could reveal the forces that shape habitat use. We investigated tradeoffs between predation risk and diet quality for the pygmy rabbit (*Brachylagus idahoensis*), a specialist herbivore reliant on sagebrush for cover and for 50-99% of its diet. We hypothesized that pygmy rabbits would forage in areas with low predation risk and high quality food but would trade off lower predation risk for higher quality food. We compared food intake by captive pygmy rabbits during trials designed to elicit tradeoffs through varying levels of predation risk (cover) and food quality (toxicity). Rabbits ate more under cover and preferred non-toxic food. However, interaction results suggested that the value of cover decreased when food quality was low, and the value of quality food decreased when cover was poor. Furthermore, foraging decisions by rabbits suggested marked individual variation in tolerance of toxins or predation risk. Follow-up field studies showed that heterogeneity of diet and cover quality exists in the sagebrush landscape and could influence habitat use by pygmy rabbits. Tradeoffs between cover and diet quality can influence foraging behavior and shape patterns of habitat use by pygmy rabbits, and these tradeoffs should be considered in habitat management for this and other specialist herbivores.

RELATIONSHIPS BETWEEN INTENSIVE BIOMASS PRODUCTION AND BIODIVERSITY IN NORTH AMERICAN FORESTS- A LITERATURE REVIEW. **Jake Verschuyl**, NCASI, P.O. Box 1259, Anacortes, WA 98221; Sam Riffell, Department of Wildlife, Fisheries,& Aquaculture Box 9690 Mississippi State University Mississippi State, MS 39762; Darren A. Miller, Weyerhaeuser NR Company, P.O. Box 2288, Columbus, MS 39704; T. Bently Wigley, National Council for Air and Stream Improvement, Inc. PO Box 340317, Clemson, SC 29634-0317; jverschuyl@ncasi.org

Energy policy in the United States and Canada has increasingly promoted development of plant-based biofuels to complement, and potentially provide alternatives to, fossil fuels. Large scale adoption of intensive biomass production in forests, however, has the potential to alter management, species composition, physical structure and landscape configuration of forests in some regions of North America. Because forest lands support a large proportion of biodiversity in many regions, it is important to understand what is known about forest biodiversity response to practices associated with biomass production systems. We summarized documented relationships between intensive production of forest biomass and forest biodiversity in North America and identify knowledge gaps. We searched the literature for papers that characterized biodiversity responses and used meta-analysis to summarize response to at least one of four treatments related to biomass harvesting: removal of forest harvest residues (coarse woody debris [CWD] manipulations), thinning, intercropping and short-rotation woody crops. We found that removal of snags and CWD may have more significance for birds than for other taxa. A decrease in abundance of invertebrates in CWD or snag removal plots is a possible mechanistic explanation for the reported lower bird abundance and diversity. Forest thinning treatments had generally positive effects on diversity and abundance across all taxa. We found biodiversity response to biomass harvest

at least somewhat dependent on harvest intensity. More research is needed to determine effects of short rotation woody crops, intercropping, CWD removal as well as geographic variation of results.

NOTES ON HYPERMARITIME FOLLICOLOUS LICHEN COMMUNITIES OF NORTHERN CALIFORNIA. **John Villella** 324 Avery St. Ashland, OR 97520; Tom Carlberg, 1959 Peninsula Drive , Arcata, CA 95521; jvillella@siskiyoubiosurvey.com

Hypermaritime foliicolous lichen communities were investigated at several locations in Northern California. The composition of foliicolous lichen community was found to be species depauperate when compared to tropical foliicole communities but resembling them in several ways. Observations of species rarely encountered in California are given and their known distribution in coastal California and the Pacific Northwest is discussed. Novel substrates for some species are discussed and several lichens are recorded as new to California.

HOLOCENE FIRE REGIMES OF THE PACIFIC NORTHWEST RECONSTRUCTED USING CHARCOAL ANALYSIS OF LAKE SEDIMENTS. **Megan K. Walsh**, Department of Geography, Central Washington University, 400 E. University Way, Ellensburg, WA 98926; Jennifer R. Marlon, Department of Geography, University of Wisconsin, 550 North Park Street, Madison, WI 53706; walshme@cwu.edu

The goal of this study was to determine the dominant influences on the fire history of the Pacific Northwest during the Holocene. Twenty six lake sediment-based charcoal records were extracted from the Global Charcoal Database and used to develop a composite biomass burning curve. This curve shows that prior to the Holocene (ca. 12-11,000 calendar years before present [cal yr BP]) biomass burning was low when climatic conditions were cool and dry. Burning then increased sharply and peaked ca. 10,000 cal yr BP when insolation anomaly was greatest and summer drought was higher than present. Biomass burning then decreased until ca. 6000 cal yr BP as a result of decreased insolation anomaly leading to cooler, wetter conditions. Following this, however, instead of continuing to decrease, biomass burning increased from ca. 6000-750 cal yr BP. After that, biomass burning decreased sharply until present.
Given the oddity of the trend in biomass burning over the past 6000 years, the study sites were separated into different categories and analyzed again to determine whether climate or other influences, such as human activities, were responsible for the patterns seen. The results showed very different burning trends for high vs. low elevation and forest vs. woodland study sites. Several of the categories showed the influence of the Medieval Climatic Anomaly and the Little Ice Age on the burning curves. Additionally, the burning trend at woodland sites suggests that human use of fire over the last several thousand years has had the greatest influence in this environment.

CLIMATE DRIVERS AND LANDSCAPE RESPONSE: HOLOCENE FIRE, VEGETATION AND EROSION AT CITY OF ROCKS NATIONAL RESERVE, IDAHO. **Kerrie Weppner**, Jen Pierce, Department of Geosciences, 1910 University Drive, Boise, ID 83725; Julio L. Betancourt, USGS, 1955 E 6th St., Tucson AZ 85719; kerrieweppner@u.boisestate.edu

In semiarid ecosystems, past fire regimes are poorly understood due to limited fire scars and few lakes containing charcoal sediments. Past fire and fire-related sedimentation can be

reconstructed using charcoal preserved in alluvial and fluvial sediments, which we compare with woodrat midden reconstructions of vegetation at the migration front for single-leaf pinyon and Utah juniper at City of Rocks National Reserve (CIRO), Idaho. Radiocarbon ages from 37 charcoal samples indicate five episodes of increased fire activity. Frequent fires burned following deglaciation (10,700-9500 cal yr BP), and later during prolonged drought (7200-6700 cal yr BP). A moderate fire interval (2400-2000 cal yr BP) followed arrivals of Utah juniper (~3800 cal yr BP) and single-leaf pinyon (~2800 cal yr BP). Frequent fires burned as pinyon-juniper expanded (850-700 and 500-400 cal yr BP) and correspond to decadal droughts. No fires were recorded during extended wetter climate (9500-7200 cal yr BP) and fires were infrequent during dry but relatively stable climate (6700-4700 cal yr BP). Fire-related erosion also changed during the Holocene at CIRO. Debris flows were common during early and late Holocene, but infrequent ~6500-2500 cal yr BP, when only ~4% of measured alluvium deposited. This suggests prolonged minimal erosion, when drier, warmer mid-Holocene climate and low vegetation densities suppressed fire and colluvial storage for debris flow development. After ~4000 cal yr BP, higher vegetation densities (inferred from midden radiocarbon ages) re-stabilized hillslopes and increased colluvial storage. This, combined with frequent fires of expanding pinyon-juniper woodlands, likely triggered episodic post-wildfire debris flows.

*# FROM FIELD TO FRIDGE: FIRST GLIMPSES OF FUNGICIDE-EXPOSED GUT FUNGI. **Emma R. Wilson**, Boise State University, Department of Biological Sciences, Boise, ID, 83725; Kelly L. Smalling, US Geological Survey, California Water Science Center, Sacramento, CA, 95819; Timothy J. Reilly, US Geological Survey, New Jersey Water Science Center, West Trenton, NJ, 08628; Lance Steele, Prasanna Kandel, Alison B. Chamberlin, Justin W. Gause, and Merlin M. White, Boise State University, Department of Biological Sciences, Boise, Idaho, 83725; emmawilson@u.boisestate.edu

Fungicides have long been used to control fungal diseases and play an important role in modern agriculture. However, they tend to be understudied and are not typically included in water quality monitoring programs. Fungicides are moderately hydrophobic and their persistence has been documented in water and sediment, leading to concerns that fungicides may have a detrimental effect on non-target fungi, which play a vital role in stream ecosystem functioning. Non-target fungi may exist as independent free-living organisms or within an intimate association of symbiosis, such as trichomycetes, or gut fungi, which associate with black fly larvae (Diptera, Simuliidae). To determine effects of fungicides on non-target gut fungi, four surface water sites (two agricultural, two reference) were sampled for black fly larvae in 2010. Pesticide concentration was measured for all water samples, gut fungi were assessed and enumerated, and black fly larval tissue was tested for pesticides. Gut fungi were observed to have lower prevalence, density, and spore production in agriculture sites compared to reference sites. Experimental microcosms have been initiated to determine more precise effects. Lab reared *Simulium vittatum* were hatched, inoculated with gut fungi and dosed with field-relevant concentrations of fungicides (750, 200, and 5 ng/L). A significant decrease in fungal biomass was observed at fungicide concentrations of 200 and 750 ng/L. We believe that the preliminary results indicate that fungicides have the potential to affect non-target fungal communities in surface water systems and are relevant toxins even at low levels in the environment.

*# THE EFFECTS OF HANDLING ON CORTICOSTERONE IN AMERICAN KESTREL NESTLINGS. **Erin Wonder**, Alfred Dufty, Jr., Department of Biological Sciences, Boise State University, 1910 University Drive, Boise, ID 83725; erinwonder@u.boisestate.edu

Wildlife biologists routinely handle nestling birds to monitor their development, with the general assumption that these activities themselves are benign. However, this has rarely been tested. We studied the effects of investigator handling on the development of stress responsiveness because the ability to mount appropriate physiological responses to stressors can affect survival and reproductive success. Studies have shown that exposing birds to stressors during the nestling stage can alter their stress responsiveness later in life, perhaps due to stress-induced changes in the development of the hypothalamic-pituitary-adrenal (HPA) axis. To test this hypothesis, American kestrel (Falco sparverius) nestlings were subjected to three different handling protocols. An "early-handled" group was gently held for 15 minutes daily from day 0 (day of hatching) through day 7, a "late-handled" group was handled from day 18 through day 24, and a control group was not handled. On day 25 or 26, just prior to fledging, all birds were exposed to a novel noise stressor in the form of 10 minutes of continuous white noise played at 100 decibels, after which blood was obtained and levels of the stress hormone corticosterone (CORT) were analyzed via EIA. Preliminary data shows a trend toward lower CORT levels in early-handled nestlings to late-handled and control nestlings. This suggests that investigator handling during the early nestling period can induce changes in HPA function and stress responsiveness that last at least throughout the end of the nestling period.