CPOP
Cascadia Prairie-Oak Partnership

NORTHWEST SCIENTIFIC ASSOCIATION

NORTHWEST LICHENOLOGISTS
Letharia columbiana

84th Annual Meeting of the **Northwest Scientific Association**
with the **Cascadia Prairie-Oak Partnership**
and **Northwest Lichenologists**

The Urban Environment

Photo by Rod Gilbert

Managing Fragmented Prairie-Oak Habitats: Birds, Bugs, and Changing Communities

20-23 March 2013
University Place Hotel, Portland, OR

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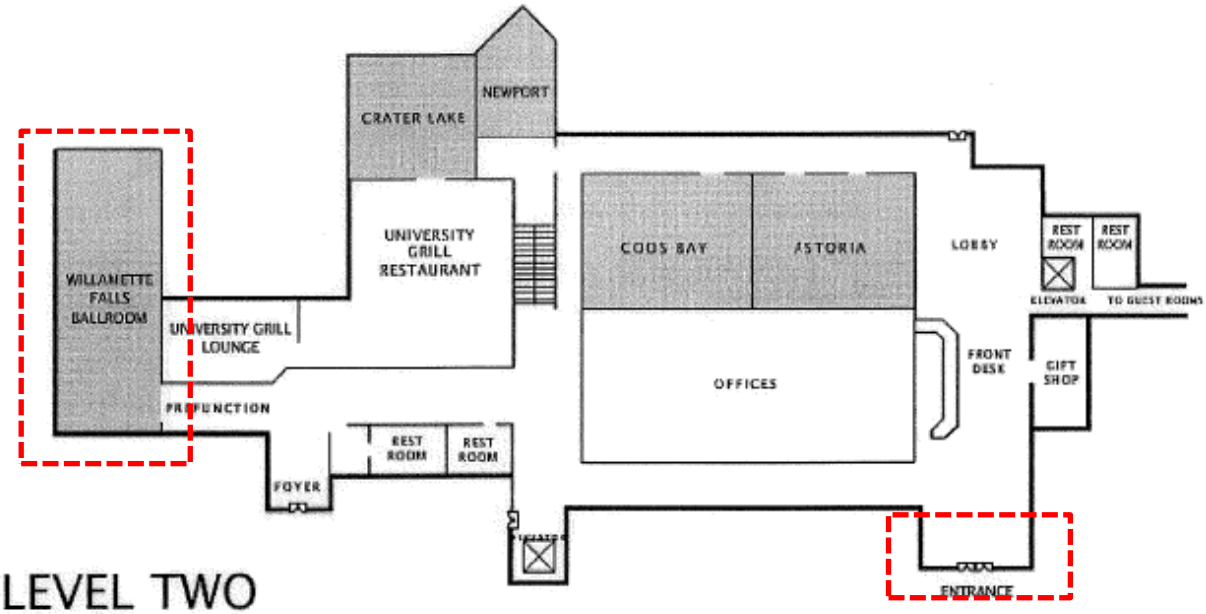

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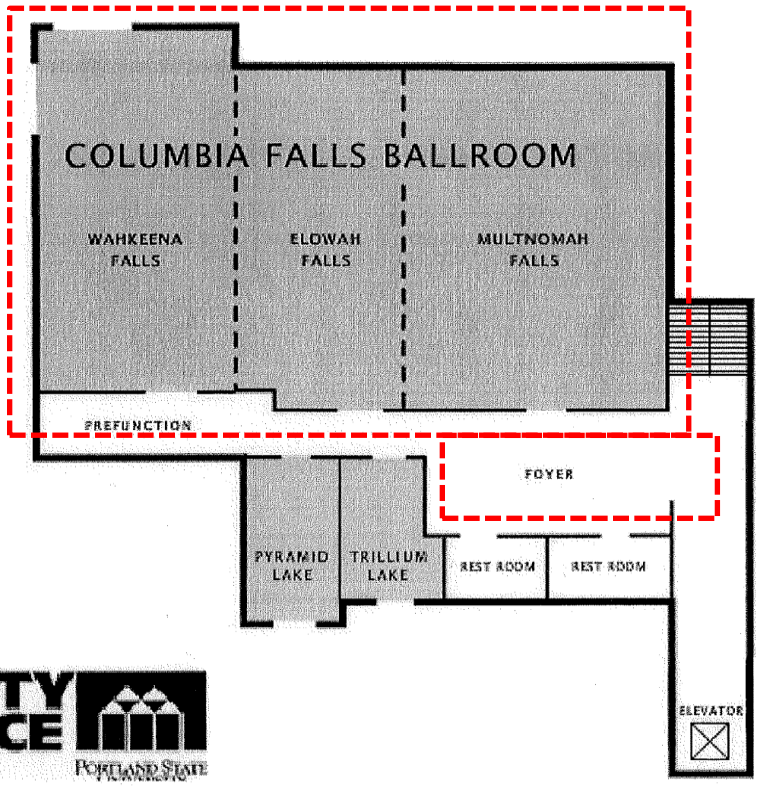

UNIVERSITY PLACE
PORTLAND STATE

WELCOME FROM THE PRESIDENT

Northwest Scientific Association

...promoting scientific research and disseminating scientific knowledge since 1923.

http://www.northwestscience.org/

Welcome to the 84th Annual Meeting of the Northwest Scientific Association (NWSA), Cascadia Prairie-Oak Partnership (CPOP) and Northwest Lichenologists (NWL) in Portland, Oregon. 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 lichens and education, and innovative symposia including: Climate Change, the Urban Ecosystem, prairie-oak land management, geology in the urban setting, lichenology and more. We have two exciting plenary speakers: The Urban Ecosystem - Mike Houck and Geological Features of the Urban Setting - Dr. Anne Chin. This will be a stimulating program for starting the first day of sessions.

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 as directors on this year's NWSA Board: Alan Yeakley, Portland State University; Bax Barton, University of Washington; Eva Dettweiler-Robinson, University of New Mexico; Doug Call, Washington State University; Janelle Downs, Pacific Northwest National Laboratory; Lana D'Souza, botanist; Jeffrey Duda, US Geological Survey; Katherine Glew, University of Washington Herbarium; Nancy Grunewald, Washington State University Press; Mark Harmon, Oregon State University; Trudy Kavanagh, University of British Columbia, Okanagan; Jeremy Littell, U.S. Geological Survey; George Last, Pacific Northwest National Laboratory; Robin Lesher, Burke Museum Research Associate, University of Washington; Clayton Marlow, Montana State University; Launa Morasch, NWSA Technical Editor; Andrea Pipp, Atkins North America, Inc.; Heather Root, Bureau of Land Management; Andrea Woodward, USGS Forest and Rangeland Ecosystem Science Center; Pat Pringle, Centralia College; John Villella, Siskiyou BioSurvey; and Michael Wilson, Douglas College. We will be adding new members to the board for the 2013-14 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 past 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 web site, http://www.northwestscience.org was developed with the help of Jeffrey Duda and Lana D'Souza. This site makes 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

A Note from the Cascadia Oak-Prairie Partnership

We are excited to be co-hosting this conference with the Northwest Scientific Association and Northwest Lichenologists. In addition to the many technical sessions that are planned for Thursday and Friday, we have two exciting symposia on Wednesday that are sure to be a great start to the conference: *Climate Change and Management* and *Prairie Oak Birds*.

You may be wondering what the Cascadia Oak-Prairie Partnership (CPOP) is all about, and we're hoping you will be able to attend the CPOP Business Lunch on Friday (it's free!) where we will be giving an overview of the Partnership and holding a discussion about our vision and plans for the future. Loosely formed in 2010, the partnership has grown from an idea and a listserve to include three range-wide species specific working groups, increased eco-regional coordination and most recently – a steering committee! The mission of CPOP is to bring together the people, entities, and information surrounding prairie-oak conservation in western Cascadia to enable and support efficient and effective conservation and recovery of prairie-oak habitat and species. Already CPOP's working groups have improved the coordinated planning and idea sharing about the steps that need to be taken for the conservation of the Mazama pocket gopher, Taylor's checkerspot butterfly and the streaked-horned lark. CPOP integrated the prairie-oak portions of the Oregon and Washington Wildlife Action Plans - this and the coordination between eleven different entities in the ecoregion culminated in the securing of a $1 million competitive State Wildlife Grant for work to benefit species of greatest conservation need in prairie-oak habitats of OR and WA.

With the momentum of the great work that is being done with the support of CPOP, we have created a guiding document and a steering committee to help formalize the Partnership so it can continue to grow. Thanks again for attending the conference and we hope to see you at lunch on Friday! In the meantime, check out our website (cascadiaprairieoak.org) to find our guiding document, instructions for joining the listserv and a great collection of publications.

Sincerely,

Hannah Anderson
Regional Rare Species Program Manager
Center for Natural Lands Management

Elspeth Hilton
Conservation Coordinator
Center for Natural Lands Management

Program and Abstracts

84th Annual Meeting of the
Northwest Scientific Association
with the
Cascadia Prairie-Oak Partnership
and **Northwest Lichenologists**

20-23 March 2013
University Place Hotel
Portland, OR

NWSA Meeting Theme:

The Urban Environment

CPOP Meeting Theme:

Managing Fragmented Prairie-Oak Habitats:
Birds, Bugs, and Changing Communities

Table of Contents

Program at a Glance **2-3**
Session Schedule **4-23**
Wednesday 20 March 2013 ..... **4-7**
CPOP Symposium: Climate Change and Management 4-5
CPOP Symposium: Prairie-Oak Birds 6-7
Thursday 21 March 2013 ..... **8-15**
Plenary Session 8-9
NWSA Symposium: The Urban Environment 10
CPOP Technical Session: Regulating and Partnering for Rare Species Recovery 11
CPOP Technical Session: Pollinators 12
CPOP Technical Session: Oregon White Oak 13
CPOP Technical Session: Prairie Restoration 14
Banquet 15
Friday 22 March 2013 ..... **16-23**
CPOP Technical Session: Floral Reintroduction 16
Lichenology Technical Session 17
NWSA Technical Session: Geology Aquatic 18
NWSA Technical Session: Forest Ecology 18-19
NWSA Technical Session: Paleontology 19
NWSA Technical Session: Ecosystem Management 19
CPOP Technical Session: Vertebrate Reintroduction 20
CPOP Technical Session: Taylor's Checkerspot Reintroduction 21
CPOP Technical Session: Reintroduction and Outreach 21
NWSA Technical Session: Fire 22
NWSA Technical Session: Plant Ecology 22
NWSA Education Workshop 23
Lichenologists Workshop 23
Field Trips **24-25**
Abstracts **26-87**
Session Overview Table **87-94**

Program at a Glance

Wednesday, March 20

7:30-4:45	**Registration Table Open** - Columbia Falls Foyer
8:00-9:45	**CPOP Symposium**: Climate Change and Management, Part I - Multnomah Room
9:45-10:00	**Break**: Refreshments and Snacks - Columbia Falls Foyer
10:00-12:00	**CPOP Symposium**: Climate Change and Management, Part II - Multnomah Room
12:00-1:00	**Lunch** (on your own)
1:00-2:15	**CPOP Symposium**: Prairie-Oak Birds, Part I **-** Multnomah Room
2:15-2:35	**Break:** Refreshments and Snacks - Columbia Falls Foyer
2:35-4:45	**CPOP Symposium**: Prairie-Oak Birds, Part II - Multnomah Room
3:30-5:00	**NWSA Board Meeting** - Elowah
5:30-7:30	**Joint Reception** – Wahkeena Room

Thursday, March 21

7:30-4:00	**Registration Table Open** - Columbia Falls Foyer
8:30-10:30	**Plenary Session -** Multnomah Room
10:30-11:00	**Break**: Refreshments and Snacks -Columbia Falls Foyer
11:00-12:20	**NWSA Symposium:** The Urban Environment - Multnomah Room
	Concurrent Sessions CPOP Technical Session: Regulating and Partnering for Rare Species Recovery – Elowah Room CPOP Technical Session: Pollinators – Wahkeena Room
12:20-1:20	**Lunch** (on your own)
1:20-4:00	**NWSA Symposium:** The Urban Environment (cont'd) - Multnomah Room
	Concurrent Sessions CPOP Technical Session: Oregon White Oak – Elowah Room CPOP Technical Session: Prairie Restoration – Wahkeena Room
4:00-5:00	**Poster Session** – Refreshments and Snacks, Willamette Room
6:30	**Banquet** – Multnomah Room *($35)*

Friday, March 22

7:30-12:00 **Registration Table Open** - Columbia Falls Foyer

8:00-10:00 **Concurrent Sessions**
CPOP Technical Session: Floral Reintroduction - Multnomah Room
NWSA Technical Session: Lichenology I – Elowah Room
NWSA Technical Session: Geology Aquatic – Wahkeena Room *(8:00-8:40)*
NWSA Technical Session: Forest Ecology I – Wahkeena Room *(8:40-10:00)*

10:00-10:20 **Break**: Refreshments and Snacks, Columbia Falls Foyer

10:20-12:00 **Concurrent Sessions**
CPOP Technical Session: Vertebrate Reintroduction - Multnomah Room
NWSA Technical Session: Lichenology II – Elowah Room *(10:20-11:00)*
NWSA Technical Session: Forest Ecology II – Wahkeena Room

12:00-1:00 **Business Lunches**
NWSA Business Lunch – Elowa Room
CPOP Business Lunch – Willamette Room

1:00-2:40 **Concurrent Sessions**
CPOP Technical Session: Taylor's Checkerspot Reintroduction - Multnomah Room
Northwest Lichenologists Workshop – Elowah Room *(2:00-2:40)*
NWSA Technical Session: Fire – Wahkeena Room

2:40-3:00 **Break**: Refreshments and Snacks - Columbia Falls Foyer

3:00-5:00 **Concurrent Sessions**
CPOP Technical Session: Reintroduction and Outreach - Multnomah Room
Northwest Lichenologists Workshop cont'd – Elowah Room
NWSA Technical Session: Plant Ecology – Wahkeena Room *(3:00-4:00)*
NWSA Education Workshop – Wahkeena Room *(4:00-5:00)*

Saturday, March 23

8:30-5:00 **Field Trip:** Northwest Lichenologists: Forest Creek and Catherine Creek
Led by Hannah Prather and John Villella. *Box lunch included.*

9:00-4:00 **Field Trip:** Oak Habitat Restoration in the Northern Willamette Valley
Led by Elaine Stewart, Brian Vaughn, and Tonia Burns. *Box lunch included.*

7:00-2:00 **Field Trip:** Birds and Prairie-Oak Habitat Restoration in the Willamette Valley: Basket Slough National Wildlife Refuge
Led by Bob Altman, Dave Helzer and Matt Blakely-Smith. *Box lunch included.*

8:30-1:00 **Field Trip:** Urban Portland's Oak-Prairie Habitats
Led by Mary Bushman, Mark Griswold Wilson, Mary Logalbo, and Gaylen Beatty, *Box lunch included.*

Session Schedule

Wednesday, 20 March 2013

CPOP Symposium: Climate Change and Land Management

Time: 8:00-12:00
Room: Multnomah
Moderator: Lynn Helbrecht

8:00-8:15 **INTRODUCTION & WELCOME**
Lynn Helbrecht, Washington Department of Fish and Wildlife

The focus of this half day session will be to explore how to address climate change in restoration project selection and design.

8:15-9:45 PART I: WHAT WE KNOW AND WHAT WE ARE LEARNING

The first part of the session will feature presentations to overview climate impacts generally in the region, and specifically for oak woodland and prairie habitats and related species. We will also highlight some of the current research on climate and prairie systems.

8:15-8:45 **CLIMATE SMART INSIGHTS TO MAINTAIN/RESTORE PACIFIC NORTHWEST PRAIRIE ECOSYSTEMS**. Dominique Bachelet**,** Conservation Biology Institute, Corvallis OR

8:45-9:15 **CLIMATE CHANGE IMPACTS ON BIODIVERSITY IN PACIFIC NORTHWEST PRAIRIES: SHIFTS IN PLANT RANGES AND FUNCTIONAL GROUP COMPOSITION.** Laurel Pfeifer-Meister, University of Oregon, Eugene, OR

9:15-9:45 **CLIMATE CHANGE, OAK SAVANNAS, URBANIZATION AND WILDFIRE: DILEMMAS, TRADEOFFS AND APPROACHES FOR CLIMATE CHANGE ADAPTATION PLANNING.** Bart R. Johnson , University of Oregon, Eugene, OR

9:45-10:00 **Break**: Refreshments and Snacks, Columbia Falls Foyer

Session Schedule

Wednesday, 20 March 2013 (cont'd)

CPOP Symposium: Climate Change and Management (cont'd)

Time: 8:00-12:00
Room: Multnomah
Moderator: Lynn Halbrecht

10:00-12:00	**PART II: APPLYING CLIMATE CONSIDERATIONS AND DATA IN RESTORATION PROJECT DESIGN**
10:00-10:30	**DESIGNING CLIMATE-SMART RESTORATION PROJECTS.** Patty Glick, National Wildlife Federation, Seattle, WA
10:30-11:00	**ASSESSING WILLAMETTE VALLEY GRASSLAND SPECIES USING NATURESERVE'S CLIMATE CHANGE VULNERABILITY INDEX.** Emily Steel, City of Eugene Parks and Open Space Division, Eugene, OR
11:00-11:45	**CASE STUDY**
11:45-12:00	**WRAP UP AND FINAL THOUGHTS**
12:00-1:00	**Lunch** (on your own)

Session Schedule

Wednesday, 20 March 2013 (cont'd)

CPOP Symposium: Prairie-Oak Birds

Time: 1:00-4:45
Room: Multnomah
Moderators: Bob Altman and Hannah Anderson

1:00-1:15 **INTRODUCTION & WELCOME**
Bob Altman, American Bird Conservancy; Hannah Anderson, Center for Natural Lands Management

This session will feature presentations from key conservation players throughout the ecoregion on rare species, population monitoring, habitat restoration, new research and recovery actions, and update briefs on topics relative to prairie-oak bird conservation. Following presentations, an interactive panel discussion will focus on gaps in our knowledge and future opportunities to advance prairie-oak bird conservation. The prairie-oak bird special session is supported by the Pacific Coast Joint Venture.

1:15-2:15 Part I

1:15-1:30 **STATUS AND RECOVERY ACTIONS FOR THE RARE STREAKED HORNED LARK.** Hannah E. Anderson, Center for Natural Lands Management, Olympia, WA

1:30-1:45 **CREATION AND MANAGEMENT OF STREAKED HORNED LARK HABITAT.** Dr. Randy Moore, Oregon State University, Corvallis, OR

1:45-2:00 **MANAGING HABITAT FOR WESTERN MEADOWLARKS IN WESTERN OREGON**. Matt Blakeley-Smith, Greenbelt Land Trust, Corvallis, OR

2:00-2:15 **CONSERVATION OF WILLAMETTE VALLEY GRASSLAND BIRDS - AN UPDATE ON THE OREGON CONSERVATION STRATEGY'S EFFORTS TO RESTORE PRAIRIE HABITAT AND ITS ASSOCIATED SPECIES**. Ann Kreager, Oregon Department of Fish and Wildlife, Corvallis, OR

2:15-2:35 **Break:** Refreshments and Snacks, Columbia Falls Foyer

Session Schedule

Wednesday, 20 March 2013 (cont'd)

CPOP Symposium: Prairie-Oak Birds (cont'd)

Time: 1:00-4:45
Room: Multnomah
Moderators: Bob Altman and Hannah Anderson

2:35-4:45 **Part II**

2:35-2:50 **GRASSLAND AND OAK ASSOCIATED BIRDS IN THE PORTLAND REGION: A DRIVER FOR PROTECTION AND RESTORATION OF HABITAT.** David Helzer, City of Portland Environmental Services, Portland, OR; Katy Weil, Metro Natural Areas, Portland, OR

2:50-3:05 **BIRD CONSERVATION IN PRAIRIE-OAK HABITATS IN THE SOUTH PUGET SOUND REGION.** Adrian Wolf, The Center for Natural Lands Management, Olympia, WA

3:05-3:20 **ASSESING BIRD DIVERSITY AND LAND OWNERSHIP IMPLICATIONS FOR MANAGEMENT PRIORITIZATION IN OAK ECOSYSTEMS OF THE ROGUE BASIN, OREGON**. Katherine Halstead, Oregon State University, Corvallis OR

3:20-3:35 **LANDSCAPE SCALE BIRD AND VEGETATION MONITORING TO ASSESS AND GUIDE OAK RESTORATION.** Jaime L. Stephens, Klamath Bird Observatory, Ashland, OR

3:35-3:50 **SELECTED TOPICS AND ISSUES IN PRAIRIE-OAK BIRD CONSERVATION**. Bob Altman, American Bird Conservancy, Corvallis, OR

3:50-4:45 **PANEL/AUDIENCE DISCUSSION OF SELECTED TOPICS**

5:30-7:30 **Joint Reception –** Wahkeena Room

Session Schedule

Thursday, 21 March 2013

Plenary Session

Time: 8:30-10:30
Room: Multnomah
Moderators: Alan Yeakley and Mark Harmon

8:30-9:00 **WELCOME - NWSA & CPOP**
Katherine Glew, University of Washington; Hannah Anderson, Center for Natural Lands Management

9:00-9:45 **EXPLORING THE INTERTWINE, INTEGRATING THE BUILT ENVIRONMENT AND NATURAL LANDSCAPES IN THE PORTLAND-VANCOUVER METROPOLITAN REGION.** Mike Houck, Urban Greenspaces Institute

This presentation describes the evolution of *The Intertwine*, the Portland-Vancouver region's system of parks, trails, and natural areas and the roles *The Intertwine Alliance* plays in expanding and managing this system. The Alliance is working to protect biodiversity and watershed health, inside and outside the region's urban growth boundaries, across the urban and rural landscapes. *The Intertwine* region encompasses 3,000 square-miles and extends from the north fork of the Lewis River in Clark County, Washington south to the Molalla and Pudding River watersheds and from the foothills of the coast range east to the Cascade Mountains. The presentation will also feature the recently released science-based *Regional Conservation Strategy* and *Biodiversity Guide for the Greater Portland-Vancouver Region*, a collaborative effort between the Alliance and multiple partners including the Institute for Natural Resources. *The Intertwine Alliance* is a coalition of nonprofit organizations, watershed councils, state and federal agencies, cities and counties, local park providers, and local natural resource agencies all of whom are working collaboratively to implementing *The Intertwine* Vision. The Alliance (www.theintertwine.org) is engaged in Conservation Education; Acquisition of Natural Areas and Trail Corridors; Active Transportation; Conservation; and defining the Regional System with local, state and regional park providers.

Mike Houck founded the Urban Greenspaces Institute in 1999 and has served for the past thirty years as Urban Naturalist for the Audubon Society of Portland. He is also co-founder of The Intertwine Alliance. Mike's work over the past forty years has focused on the integration of nature in the city. The Institute's motto, "in livable cities is preservation of the wild" speaks to his philosophy that it will only by creating livable cities that the rural landscape will be protected and restored. And, to be livable urban residents must have access to nature where they live, work and go to school.

Session Schedule

Thursday, 21 March 2013 (cont'd)

Plenary Session (cont'd)

Time: 8:30-10:30
Room: Multnomah
Moderators: Alan Yeakley and Mark Harmon

9:45-10:30 **URBAN TRANSFORMATION OF RIVER LANDSCAPES IN THE "ANTHROPOCENE"** Anne Chin, University of Colorado

The contemporary urban landscape was clearly built by humans; however, humans have also influenced the "natural" landscape throughout history and prehistory by expansion of urban centers, modifying land cover, promoting soil erosion, altering hydrologic and biologic processes, and causing loss of habitat and biodiversity. Dams and levees have provided flood control and water supply, interrupting sediment movement along rivers and causing loss of habitat and biodiversity. Humans have affected Earth's chemical environment through industrial and agricultural practices. Human activity is also linked to our warming climate over the past several decades, which in turn affects many natural processes on Earth. With a growing human population, the scale and magnitude of human impacts on Earth have intensified to the extent that the term "Anthropocene" has entered the scientific literature to signify a new era dominated by human activity. A proposal to formalize Anthropocene as a new geologic epoch within the Geologic Time Scale is currently in development for the International Commission on Stratigraphy. This presentation highlights the need for new research about the future of Earth's surface in light of increasing human interactions. Meeting this challenge suggests a need to account explicitly for human-process interactions in understanding change on Earth's surface. It calls for development of new theories and predictive capacity for human-landscape systems, requiring new conceptual frameworks, methods, and team-based collaborations linking the geosciences, biological sciences, and social sciences. It will use new approaches that focus on feedbacks as well as direct impacts to physical systems that link to past legacies of human effects. A case study of the urbanization of Fountain Hills, Arizona, illustrates how these approaches can be used.

Anne Chin is a professor in the Department of Geography and Environmental Sciences at the University of Colorado, Denver. Anne received a PhD degree from Arizona State University and a BA from the University of California, Los Angeles. Her areas of expertise include physical geography, fluvial geomorphology, and environmental sciences. Recently she was a co-organizer of Geologic Society of America technical session entitled: *Geomorphology of the Anthropocene: The Surficial Legacy of Past and Present Human Activities*.

10:30-11:00 **Break:** Refreshments and Snacks, Columbia Falls Foyer

Session Schedule

Thursday, 21 March 2013 (cont'd)

NWSA Symposium: The Urban Environment, Part I

Time: 11:00-12:20
Room: Multnomah
Moderator: Mark Harmon

11:00-11:40 **URBAN MACROINVERTABRATES.** Igor Lacan, Portland State University, Portland, OR

11:40-12:20 **GROUNDWATER RISK ASSOCIATED WITH INFILTRATION OF URBAN STORMWATER**. Torrey Lindbo, City of Gresham, Gresham, OR

12:20-1:20 **Lunch** (on your own)

NWSA Symposium: The Urban Environment, Part II

Time: 1:20-4:00
Room: Multnomah
Moderator: Patrick Pringle

1:20-2:00 **MANAGING MORE STORMWATER WITH GREEN INFRASTRUCTURE: LESSONS LEARNED PLANTING TREES IN PORTLAND, OREGON.** Jennifer Karps, City of Portland Environmental Services, Portland, OR

2:00-2:40 **PEELING BACK URBAN LANDSCAPE COMPLEXITY AND ITS IMPACT ON THE PLANNING AND MANAGEMENT OF A MUNICIPALITY'S INFRASTRUCTURE AND NATURAL RESOURCES.** Mark Liebe, City of Portland, Portland, OR

2:40-3:20 **EARTHQUAKE RESILIENCE IN OREGON CITIES.** Ian P Madin, Oregon Department of Geology, Portland, OR

3:20-4:00 **URBAN LANDSLIDES IN THE PACIFIC NORTHWEST.** Scott Burns, Portland State University, Portland, OR

Session Schedule

Thursday, 21 March 2013 (cont'd)

CPOP Technical Session: Regulating and Partnering for Rare Species Recovery
Time: 11:00-12:20
Room: Elowah
Moderator: Ted Thomas

11:00-11:20 **PROPOSED ENDANGERED SPECIES STATUS FOR THE TAYLOR'S CHECKERSPOT BUTTERLY.** Theodore B. Thomas**,** U.S. Fish and Wildlife Service, Lacey, WA

11:20-11:40 **THE PROPOSED LISTING OF THE STREAKED HORNED LARK: CAN ALLOWING TAKE WITH A 4(d) RULE ADVANCE CONSERVATION OF THE SPECIES?** Cat Brown, US Fish and Wildlife Service, Portland, OR

11:40-12:00 **STREAKED HORNED LARK AND A SPECIAL RULE UNDER ESA §4(d): A CASE STUDY OF FEDERAL EFFORTS TO ADDRESS REGULATORY RISK TO MAINTENANCE-DEPENDENT SPECIES ON PRIVATE LAND.** Adam Novick, University of Oregon, Eugene, OR

12:00-12:20 **PROTECTING RARE ECOSYSTEMS IN OUR COMMUNITIES: WORKING WITH LOCAL, REGIONAL, AND FIRST NATIONS GOVERNMENTS IN CANADA**. Kathryn Martell and Holly Clermont, Garry Oak Ecosystems Recovery Team, Victoria, BC

Session Schedule

Thursday, 21 March 2013 (cont'd)

CPOP Technical Session: Pollinators
Time: 11:00-12:20
Room: Wahkeena
Moderator: Cheryl Fimbel

11:00-11:20 **MORPHOTYPES AS A TOOL TO INVESTIGATE POLLINATOR USE OF BURNED PRAIRIE.** Cheryl Fimbel, Center for Natural Lands Management, Olympia, WA

11:20-11:40 **FENDER'S BLUE BUTTERLFY COLONIZATION OF NEWLY RESTORED HABITAT AT THE NATURE CONSERVANCY'S WILLOW CREEK NATURAL AREA.** Cheryl Schultz, Washington State University, Vancouver, WA

11:40-12:00 **INTEGRATING PRAIRIE HABITAT INTO TRAILS CROSSING URBAN ENVIRONMENTS TO ASSIST DISPERSAL.** Elaine Stewart, Metro Natural Areas Program, Portland, OR

12:00-12:20 **POLLINATOR ON SMALL ISLANDS: IMPLICATIONS FOR HABITAT FRAGMENTATION.** Corey Bunnell, University of British Columbia, Vancouver, BC

12:20 – 1:20 **Lunch** (on your own)

Session Schedule

Thursday, 21 March 2013 (cont'd)

CPOP Technical Session: Oregon White Oak

Time: 1:20-3:40
Room: Elowah
Moderator: Elaine Stewart

1:20-1:40 **DEVELOPING AND IMPLEMENTING AN OREGON WHITE OAK RELEASE PROJECT IN SENSITIVE HABITAT**. Elaine Stewart, Metro Natural Areas Program, Portland, OR

1:40-2:00 **RESTORATION RELEASE OF OVERTOPPED OREGON WHITE OAK: 10-YEAR FINDINGS.** Constance A. Harrington, USDA Forest Service, Olympia, WA

2:00-2:20 **AN OREGON WHITE OAK RESTORATION STRATEGY FOR FOREST SERVICE LANDS EAST OF THE CASCADE RANGE**. Andrew Bower Olympic National Forest, Olympia, WA

2:20-2:40 **DESIGNING AND IMPLEMENTING A LANDSCAPE-SCALE OAK HABITAT RESTORATION INITIATIVE IN SOUTHERN OREGON/NORTHERN CALIFORNIA**. Marko Bey, Lomakatsi Restoration Project, Ashland OR

2:40-3:00 **A LITERATURE REVIEW OF MIGRATORY AND RESIDENT BIRD USE OF ARTHROPODS IN GARRY OAK HABITATS**. David A. Ross, U.S. Fish and Wildlife Service, Klamath Falls, OR

3:00-3:20 **A METHOD FOR RECONSTRUCTING GARRY OAK (*QUERCUS GARRYANA*) FIRE HISTORY USING COARSE WOODY DEBRIS.** David A. Jordan, Trinity Western University, Langley, BC

4:00-5:00 **POSTER SESSION –** Refreshments and Snacks, Willamette Room

Session Schedule

Thursday, 21 March 2013 (cont'd)

CPOP Technical Session: Prairie Restoration

Time: 1:20-4:00
Room: Wahkeena
Moderator: Sarah Hamman

1:20-1:40 **BUTTERFLY MONITORING AND PRAIRIE-OAK RESTORATION: A NEW PROJECT AND APPROACH.** Ann Potter, Washington Department of Fish and Wildlife, Olympia, WA

1:40-2:00 **EVALUATING EFFECTS OF PRAIRIE MANAGEMENT TECHNIQUES ON INTRODUCED WILLAMETTE DAISY POPULATIONS IN THE WILLAMETTE VALLEY, OREGON**. Denise Giles-Johnson, Institute for Applied Ecology, Corvallis, OR

2:00-2:20 **PLANT ESTABLISHMENT VARIES REGIONALLY AND AT SMALL SPATIAL SCALES DURING RESTORATION.** Jonathan D. Bakker, University of Washington, Seattle, WA

2:20-2:40 **WILLAMETTE UNIVERSITY'S ZENA FARM: SUCCESSES AND FAILURES IN RESTORING A HIGH DEGRADED UPLAND PRAIRIE.** Briana Lindh, Willamette University, Salem, OR

2:40-3:00 **A STEP AHEAD OR A FEW STEPS BACK? CAN DIFFERENT IGNITION PATTERNS CHANGE RESTORATION OUTCOMES?** R. Adam Martin, Center for Natural Lands Management, Olympia, WA

3:00-3:20 **IDENTIFYING SEEDING METHODS AND RATES TO MAXIMIZE ESTABLISHMENT OF NATIVE SPECIES IN PACIFIC NORTHWEST PRAIRIES.** Sarah T. Hamman, Center for Natural Lands Management, Olympia, WA

3:20-3:40 **DIRECT SEEDING TO RECOVER GOLDEN PAINTBRUSH**. Eric Delvin, University of Washington & The Nature Conservancy, Olympia, WA

3:40-4:00 **REGIONAL COORDINATION OF PRAIRIE SEED PRODUCTION**. Sierra Smith, Center for Natural Lands Management, Olympia, WA

4:00-5:00 **POSTER SESSION –** Refreshments and Snacks, Willamette Room

Session Schedule

Thursday, 21 March 2013 (cont'd)

Banquet

Time: 6:30-9:30
Room: Multnomah
Moderator: Mark Harmon

7:30-8:30 **EVEN CHANGE IS CHANGING: A MORAL CALL TO SCIENTISTS.** Kathleen Dean Moore, Oregon State University.

Global warming, species extinction, and cascading environmental degradations are driving planetary change at a pace and scale that scientists are only beginning to grasp, with consequences we have scarcely begun to imagine. Does this challenge science to change in response? How can science address the frustrating disconnect between scientific information and public understanding? Between public understanding and political action? Between the facts and their moral consequences in human lives? And now, what is a scientist's work, as the world teeters between the old paradigm that understands science as a tool to dominate Earth and the new paradigm of science as a tool to care for the planet?

Kathleen Dean Moore is a Distinguished Professor of Philosophy at Oregon State University in Corvallis, and a Senior Fellow of the Spring Creek Project. Moore writes about moral, spiritual, and cultural relationships to the natural world. Her recent award-winning edited volume, Moral Ground: Ethical Action for a Planet in Peril, addresses these topics. She is the author of books of nature essays -- Wild Comfort: The Solace of Nature, Holdfast, Riverwalking, and The Pine Island Paradox, winner of the Oregon Book Award. She is also co-editor of How It Is: The Native American Philosophy of V. F. Cordova and Rachel Carson: Legacy and Challenge.

Session Schedule

Friday, 22 March 2013

CPOP Technical Session: Floral Reintroduction

Time: 8:20-10:00
Room: Multnomah
Moderator: Peter Dunwiddie

8:20-8:40 **THE NELSON'S CHECKERMALLOW RECOVERY PROJECT**. Peter Moore, Institute for Applied Ecology, Corvallis, OR

8:40-9:00 **WHERE HAVE ALL THE FLOWERS GONE? MISSING NATIVE ANNUALS FROM SOUTH PUGET SOUND PRAIRIES.** Peter W. Dunwiddie, Center for Natural Lands Management, Olympia, WA

9:00-9:20 **GOLDEN PAINTBRUSH: ON THE ROAD TO RECOVERY**. Joseph L. Arnett, Washington Department of Natural Resources, Olympia, WA

9:20-9:40 **WHERE YOU ARE AND WHO YOU'RE WITH MATTERS: TOPOGRAPHY, PLANT COMMUNITY AND MANAGEMENT INFLUENCE LONG-TERM SUCCESS OF GOLDEN PAINTBRUSH OUTPLANTINGS**. R. Adam Martin, Center for Natural Lands Management, Olympia, WA

9:40-10:00 **MODERATED DISCUSSION**

10:00-10:20 **Break:** Refreshments and Snacks, Columbia Falls Foyer

Session Schedule

Friday, 22 March 2013 (cont'd)

NWSA Technical Session: Lichenology I

Time: 8:00-10:00
Room: Elowah
Moderator: John Villella

8:00-8:20 **CALICIALES SUCCESSIONAL DYNAMICS AND SPECIES DIVERSITY ON CABINS AT THE OPAL CREEK ANCIENT FOREST CENTER, OREGON.** Kate Petersen, Lillian Hynson, Jesse Brown-Clay**,** The Evergreen State College, Olympia, WA

8:20-8:40 **CARBON AND DIVERSITY OF THE GROUND LAYER: THE LEGACY OF MOSSES AND LICHENS**. Juan C. Benavides**,** Oregon State University. Corvallis-OR

8:40-9:00 **LICHEN COMMUNITIES OF QUERCUS GARRYANA IN WASHINGTON STATE.** John Villella, Siskiyou BioSurvey, Ashland, OR

9:00-9:20 **ANTHROPOGENIC INFLUENCES ON EPIPYTIC FUNCTIONAL BIODIVERSITY ACROSS AN URBAN TO RURAL AIRSHED.** Hannah M. Prather, Portland State University, Portland, OR

9:20-9:40 **LICHEN COVER AS AN INDICATOR OF FOREST HEALTH: THE CEDARS OF LEBANON.** Roger Rosentreter, Boise State University, Boise, ID

9:40-10:00 **INVASIVE ALIEN LICHENS IN URBAN ENVIRONMENTS OF THE PACIFIC NORTHWEST**. Bruce McCune, Oregon State University, Corvallis, OR

10:00-10:20 **Break:** Refreshments and Snacks, Columbia Falls Foyer

NWSA Technical Session: Lichenology II

Time: 10:20-11:00
Room: Elowah
Moderator: John Villella

10:20-10:40 **MACROLICHENS PRESENT IN THE PACIFIC NORTHWEST AND FLORIDA: ECOLOGICAL OBSERVATIONS AND NOTES ON BIOGEOGRAPHY.** Barry Kaminsky, Boise State University, Boise, ID

10:40-11:00 **DEVELOPING A NEW SPOT TEST FOR MIRIQUIDIC ACID IN LICHENS.** Elisa Alphandary, Oregon State University, Corvallis, OR

Session Schedule

Friday, 22 March 2013 (cont'd)

NWSA Technical Session: Geology Aquatic

Time: 8:00-8:40
Room: Wahkeena
Moderator: Andrew Larson

8:00-8:20 **IMPACTS OF CLIMATE CHANGE ON DISCHARGE OF THE TUCANNON RIVER, WASHINGTON: HYDROLOGIC MODELING BASED ON TOPOGRAPHICALLY CORRECTED REGIONAL CLIMATE DATA**. Sarah Praskievicz, University of Oregon, Eugene, OR

8:20-8:40 **RELATIONSHIP BETWEEN LAKE WHATCOM ALGAL DENSITIES, WATER QUALITY, AND FILTRATION RATES AT THE BELLINGHAM WATER TREATMENT PLANT, WA.** Bowei He, Western Washington University, Bellingham, WA

NWSA Technical Session: Forest Ecology I

Time: 8:40-10:00
Room: Wahkeena
Moderator: Andrew Larson

8:40-9:00 **THE DECLINE OF A RIPARIAN GALLERY FOREST IN DEVILS TOWER, WYOMING: CAUSATION AND MANAGEMENT TECHNIQUES FOR RESTORATION.** Jacob Anderson, Montana State University, Bozeman, MT

9:00-9:20 **RELATIONSHIPS BETWEEN URBAN LAND USE TYPES AND COMPOSITION OF RIPARIAN VEGETATION COMMUNITIES IN THE PORTLAND-VANCOUVER METRO AREA.** Christa von Behren, Portland State University, Portland, OR

9:20-9:40 **ONE HUNDRED YEARS OF OBSERVING TREE GROWTH AND MORTALITY IN THE WILLAMETTE NATIONAL FOREST, OREGON.** Mark E. Harmon, Oregon State University, Corvallis, OR

9:40-10:00 **REGIONAL BIOMASS ASSESSMENT IN FORESTS OF COASTAL ALASKA.** Mikhail A. Yatskov, Oregon State University, Corvallis, OR

10:00-10:20 **Break:** Refreshments and Snacks, Columbia Falls Foyer

Session Schedule

Friday, 22 March 2013 (cont'd)

NWSA Technical Session: Forest Ecology II

Time: 10:20-12:00
Room: Wahkeena
Moderator: David Wilderman

10:20-10:40 **CANOPY GAP SIZE AND THINNING INTENSITY AFFECT POST-PLANTING PERFORMANCE OF FOUR CONIFER SPECIES.** Timothy B. Harrington, USDA Forest Service, Olympia, WA

10:40-11:00 **CREATING HABITAT FEATURES IN FORMER TREE FARMS: EXAMPLES FROM THREE METRO NATURAL AREAS.** Kathryn T Holleran, Metro, Portland, OR

11:00-11:20 **METALS UPTAKE BY EDIBLE MUSHROOMS IN BIOSOLIDS TREATED FORESTS.** Erica Cline, University of Washington Tacoma, Tacoma WA

NWSA Technical Session: Paleontology

Time: 11:20-11:40
Room: Wahkeena
Moderator: David Wilderman

11:20-11:40 **A DATED PRE-LAST GLACIAL MAMMOTH TOOTH FROM HOOD CANAL, WASHINGTON, AND ITS RELATION TO PUGET LOBE ADVANCE CHRONOLOGY.** Michael C. Wilson**,** Douglas College, New Westminster, BC

NWSA Technical Session: Ecosystem Management

Time: 11:40-12:00
Room: Wahkeena
Moderator: David Wilderman

11:40-12:00 **ENVIRONMENTAL QUALITY AND GOVERANCE IN THE PORTLAND-VANCOUVER METRO AREA**. Alan Yeakley, Portland State University, Portland, OR

12:00-1:00 **BUSINESS LUNCHES**
NWSA Business Lunch – Elowa Room
CPOP Business Lunch – Willamette Room

Session Schedule

Friday, 22 March 2013 (cont'd)

CPOP Technical Session: Vertebrate Reintroduction

Time: 10:20-12:00
Room: Multnomah
Moderator: Gary Slater

10:20-10:40 **TRANSLOCATION OF WESTERN GRAY SQUIRRELS TO SOUTH PUGET SOUND: ADVANCING THE SPECIES RECOVERY EFFORT IN WASHINGTON.** Matthew Vander Haegen, Washington Department of Fish and Wildlife, Olympia WA

10:40-11:00 **TRANSLOCATION OF MAZAMA POCKET GOPHERS IN WESTERN WASHINGTON.** Gail Olson, Washington Department of Fish and Wildlife, Olympia, WA

11:00-11:20 **REINTRODUCING WESTERN BLUEBIRDS TO OAK-PRAIRE HABITAT IN THE PACIFIC NORTHWEST.** Gary Slater, Ecostudies Institute, Mount Vernon, WA

11:20-11:40 **SOUTH PUGET SOUND STREAKED HORNED LARK GENETIC RESCUE PROJECT.** Adrian Wolf, Center for Natural Lands Management, Olympia Washington

11:40-12:00 **MODERATED DISCUSSION**

12:00-1:00 **BUSINESS LUNCHES**
NWSA Business Lunch – Elowa Room
CPOP Business Lunch – Willamette Room

Session Schedule

Friday, 22 March 2013 (cont'd)

CPOP Technical Session: Taylor's Checkerspot Reintroduction

Time: 1:00-2:40
Room: Multnomah
Moderator: Mary Linders

1:00-1:20 **TAYLOR'S CHECKERSPOT REINTRODUCTION: ADVANCES IN THE FACE OF ADVERSITY.** Mary Linders, Washington Department of Fish and Wildlife, Olympia, WA

1:20-1:40 **LESSONS LEARNED IN REARING AND BREEDING TAYLOR'S CHECKERSPOT BUTTERFLY (*EUPHYDRYAS EDITHA TAYLORI*) AT THE OREGON ZOO.** Karen D. Lewis, Oregon Zoo, Portland, OR

1:40-2:00 **HABITAT ENHANCEMENT FOR TAYLOR'S CHECKERSPOT REINTRODUCTION.** Cheryl Fimbel, Center for Natural Lands Management, Olympia, WA

2:00-2:20 **OVIPOSITION PREFERENCE BY TAYLOR'S CHECKERSPOT BUTTERFLY AMONG LANCE-LEAVED PLANTAIN, HARSH PAINTBRUSH, AND GOLDEN PAINTBRUSH**. Dennis Aubrey, The Evergreen State College, Olympia, WA

2:20-2:40 **MODERATED DISCUSSION**

CPOP Technical Session: Reintroduction and Outreach

Time: 3:00-4:20
Room: Multnomah
Moderator: Hannah Anderson

3:00-3:20 **BUILDING BRIDGES: ECOLOGICAL RESTORATION AS A PATHWAY TO INDIVIDUAL REHABILITATION.** Carl W. Elliott, The Sustainability in Prisons Project, The Evergreen State College, Olympia, WA

3:20-3:40 **WHAT ARE THOSE CRAZY CANADIANS UP TO? A WHIRL-WIND TOUR OF CURRENT GARRY OAK AND ASSOCIATED ECOSYSTEMS PROJECTS AND INITIATIVES IN BC.** Kathryn Martell and Chris Junck, Garry Oak Ecosystems Recovery Team, 209 606 Courtney St, Victoria BC,

3:40-4:20 **MODERATED DISCUSSION**

Session Schedule

Friday, 22 March 2013 (cont'd)

NWSA Technical Session: Fire

Time: 1:00-2:40
Room: Wahkeena
Moderator: Mark Harmon

1:00-1:20 **A PALEOPERSPECTIVE ON THE ROLE OF FIRE IN LOW ELEVATION ECOSYSTEMS IN THE PACIFIC NORTHWEST.** Megan K. Walsh, Central Washington University, Ellensburg, WA

1:20-1:40 **LATENT RESILIENCE IN PONDEROSA PINE FOREST: EFFECTS OF REINTRODUCED FREQUENT FIRE.** Andrew J. Larson, The University of Montana, Missoula, MT

1:40-2:00 **POST-WILDFIRE SOIL AND DETRITUS CHANGES RELATED TO PREFIRE FOREST STRUCTURE.** Peter Homann, Western Washington University, Bellingham, WA

2:00-2:20 **FIRE BEHAVIOR AND EARLY SUCCESSION WITHIN THE SCHULTS FIRE AREA.** Susanne Ranseen, Oregon State University, Corvallis, OR

2:20-2:40 **HISTORIC COLONIZATION OF SOUTH PUGET SOUND PRAIRIES BY DOUGLAS-FIR AT JOINT BASE LEWIS-MCCHORD, WASHINGTON.** David H. Peter, USDA Forest Service, Olympia, WA

2:40-3:00 **Break:** Refreshments and Snacks, Columbia Falls Foyer

NWSA Technical Session: Plant Ecology

Time: 3:00-4:00
Room: Wahkeena,
Moderator: Peter Homann

3:00-3:20 **EVIDENCE FOR AN ANCIENT SCENT-BASED "PLANT-POLLINATOR-LIKE RELATIONSHIP BETWEEN MOSSES AND MICROARTHROPODS**. Erin E Shortlidge, Portland State University, Portland, OR

3:20-3:40 **DECLINE IN A RARE COLUMBIA GORGE BUTTERCUP: IS IT TIME TO PANIC YET?** David Wilderman, Washington Dept. of Natural Resources, Olympia, WA

3:40-4:00 ***BROMUS TECTORUM* LITTER ALTERS PHOTOSYNTHETIC CHARACTERISTICS OF BIOLOGICAL SOIL CRUSTS FROM SAGEBRUSH STEPPES.** Eric Roberts, Boise State University, Boise, ID

Session Schedule

Friday, 22 March 2013 (cont'd)

NWSA Education Workshop

Time: 4:00-5:00
Room: Wahkeena
Moderator: Janelle Downs

4:00-4:20 **EVALUATION OF SAMPLING ERROR AND TEMPORAL VARIABILITY ASSOCIATED WITH VOLUNTEER-COLLECTED STREAM BIOASSESSMENT DATA.** Patrick Edwards, Portland State University, Portland, OR

4:20-4:40 **ENGAGING CITIZEN SCIENTISTS WITH OBSERVATIONS OF EVERYDAY BACKYARD ECOLOGY.** Marion Dresner, Portland State University, Portland, OR

4:40-5:00 **BUILDING CAPACITY FOR RESEARCH WITH CITIZEN SCIENTISTS: CLACKAMAS WATERSHED ASSESSMENT—A STUDENT WATERSHED RESEARCH PROJECT.** Mary Ann Schmidt, State University, Portland, OR

Northwest Lichenologists Workshop

Time: 2:00-4:40
Room: Elowah
Moderator: Daphne Stone and Lalita Calabria

2:00-4:40 **EPIPHYTIC MACROLICHENS FOUND ON OREGON WHITE OAK**

The workshop begins with an informal discussion focusing on a recent survey of oak lichen communities in WA (see talk abstract for: Villella, J. et. al.). The effects of poor air quality and fire disturbance on oak lichen communities will be discussed. This will be followed by a hands on educational lab introducing the community of epiphytes found on oaks in Washington. There will be five stations with examples to be shared: 1. Common and widespread macrolichens found on oaks in Washington. 2. Rare species and new state records on oaks found during recent surveys of oaks in Washington. 3. *Usnea*, a conspicuous, diverse and difficult genus. 4. Comparison of WA oak lichen communities east and west of the Cascade Range. 5. Examples of common species displaying pollution-affected morphologies. Oak/prairie land managers, restoration ecologists and anyone interested in learning more about oak lichen communities are encouraged to attend. Microscopes and chemical reagents will be available and participants are encouraged to bring their own specimens to identify during the workshop.

Field Trips

Saturday, 23 March 2013

Birds and Prairie-Oak Habitat Restoration in the Willamette Valley: Basket Slough National Wildlife Refuge

Time:	7:00-2:00
Pick Up Location:	University Place Hotel – front lobby (7:00)
Leader:	Bob Altman, American Bird Conservancy
	Dave Helzer, City of Portland
	Matt Blakely-Smith, Greenbelt Land Trust
Lunch:	Box lunch provided.

We are pleased to offer a Saturday morning birding trip to Basket Slough National Wildlife Refuge and adjacent private land easements where prairie and oak habitat restoration is occurring. Local biologists and ecologists will discuss the restoration which includes conversion of agricultural fields to wetland, wet prairie, and upland prairie along with overstory and understory restoration of the adjacent oak savannah and woodlands. The sites will offer the opportunity to see the recently proposed Threatened species, streaked horned lark, along with a variety of shorebirds and waterbirds in the wetlands.

Urban Portland's Oak-Prairie Habitats

Time:	8:30-1:00
Pick Up Location:	University Place Hotel – front lobby (8:30)
Leader:	Mary Bushman, Bureau of Environmental Services
	Mark Griswold Wilson, Portland Parks and Recreation
	Mary Logalbo, Multnomah Soil and Water Conservation District
	Gaylen Beatty, Columbia Land Trust: Backyard Habitat Program
Lunch:	Box lunch provided.

This field trip will offer opportunities to learn about the many collaborative efforts to protect, restore and create oak woodlands and prairies and enhance pollinator habitats in Portland 's urban core - the Lower Willamette River watershed. The tour will visit oak woodlands and savannahs in urban natural areas and open spaces and residential scale grassland habitats on private lands. Discussion topics will include planning and management challenges, in the urban context, and innovative stewardship partnerships and programming that support habitat enhancement goals Invited presenters include: City of Portland project management staff, Multnomah SWCD the Xerces Society, and the Backyard Habitat Program of the CLT. Attendees will be encouraged to share perspectives and experiences related to the tour topics.

***Please dress for the weather. Binoculars and cameras optional. We will be walking short distances in terrain that is relatively flat. ***

Field Trips

Saturday, 23 March 2013 (cont'd)

Northwest Lichenologists: Forest Creek and Catherine Creek

Time:	8:30-5:00
Pick Up Location:	University Place Hotel – front lobby (8:30)
Leaders:	Hannah Prather, Portland State University
	John Villella, Siskiyou BioSurvey
Lunch:	Box lunch provided.

This field trip will include a look at pollution effected lichens communities in the Portland metro area by visiting Forest Park, the nation's largest urban park. We will visit an area of the park where lichen communities have been monitored for a number of years. Then we will get back in the vehicle and head out to Catherine Creek on the Washington side of the Columbia River Gorge, about 1.5 hours drive from Portland. This area is a Nature Conservancy preserve that has a habitat of mixed conifer forest and white oak woodlands, and a very diverse lichen community including epiphytes and rock dwellers as well as some good displays of spring wildflowers. If the group is so inclined we should be able to walk for some distance on trails. Photography encouraged.

Oak Habitat Restoration in the Northern Willamette Valley

Time:	9:00-4:00
Pick Up Location:	University Place Hotel – front lobby (9:00)
Leader:	Elaine Stewart and Brian Vaughn, Metro
	Tonia Burns, North Clackamas Parks and Recreation Department
Lunch:	Box lunch provided.

Attendees will visit 3-4 Oregon white oak restoration projects in and near Portland. The sites present very different logistical, archaeological and social challenges. They include Peach Cove in the Willamette Narrows complex near West Linn, Canemah Bluff in Oregon City and Mt. Talbert in Happy Valley. At Peach Cove, heavy equipment was used to move hundreds of fir stems out of oak stands into nearby areas for down wood, and climbers created nearly 100 snags. At Canemah Bluff, felled trees were re-used in fish habitat projects. All work was done by hand at Mt. Talbert, where narrow trails precluded use of heavy equipment. Neighbors varied in their interest; however, neighbor relations and archaeological considerations were paramount at Canemah Bluff and required careful project management. Project managers from Metro and North Clackamas Parks and Recreation will offer tips, tricks and lessons learned.

***Dress for the weather, including sturdy hiking or rain boots for walking in mud. Bring binoculars, hand lenses and cameras if desired. We will be walking several miles over the course of the day in terrain that is often steep and uneven. Poison oak is abundant. ***

Abstracts

(Both oral and poster presentations included,
arranged by last name of presenting author)

POSTER

THE DEVELOPMENT OF SUCCESSFUL VOLUNTEER PROGRAMS FOR ENVIRONMENTAL ORGANIZATIONS: A COMPARISON OF THREE GROUPS IN THE SOUTH PUGET SOUND AREA. **Erin Acker**, Center for Natural Lands Management, 120 E Union Ave #220, Olympia, WA 98501; eacker@cnlm.org

The Center for Natural Lands Management (CNLM)'s South Sound Prairies Program works to restore prairie and oak woodlands in the South Puget Sound area of Washington. Volunteers are integral to the success of the program, providing community outreach, citizen science, and thousands of hours of work. The volunteer program at CNLM is very well established, but we are continually looking for ways to expand and improve upon it. In order to gain insight on how to do so, I compared volunteer programs from three different local environmental organizations: Stream Team, the Nisqually Land Trust, and our organization, the Center for Natural Lands Management. I interviewed each group about the development of their volunteer program, recruitment and retention strategies used, and overall success. Success was defined as how well the volunteer program helped each organization meet its goals. I found that each volunteer program began similarly, starting as a way to address the need for work within the organization. The most common recruitment strategies used were online postings, community interaction, and word of mouth, with online postings attracting the most new volunteers. Rewarding volunteer efforts and providing recognition were the most helpful retention strategies. Since each volunteer program was successful, I concluded that we should continue our current actions, while increasing our support for the volunteers and expanding our online presence. These findings can be used by organizations looking to start, improve, or modify their volunteer programs.

ORAL

DEVELOPING A NEW SPOT TEST FOR MIRIQUIDIC ACID IN LICHENS. **Elisa Alphandary**, Bruce McCune, Department of Botany and Plant Pathology, Cordley 2082, Oregon State University, Corvallis, OR 97331-2902; alphande@onid.orst.edu

We sought a chemical spot testing method for detecting miriquidic acid. This will be useful, for example, in distinguishing *Stereocaulon alpinum* and other *Stereocaulon* species from *S. groenlandica*, which contains miriquidic acid. It would also be useful in distinquishing other genera containing miriquidic acid, for example, *Miriquidica*. Detecting miriquidic acid is usually done using thin layer chromatography (TLC), but this is time consuming. By TLC, however, miriquidic acid shows a distinctive peacock blue spot in all solvent systems after treatment with 10% sulfuric acid and charring in an oven. We tested macroscopic spot test methods by comparing *S. alpinum* and *S. groenlandica*, the former containing lobaric acid and atranorin, the latter containing miriquidic and perlatolic acids and atranorin. Seeking a fast way to get the blue reaction, we tested acetone extracts of these species with various acids, with and without pretreatment by toluene, which is in the TLC solutions A and C. We baked the samples at 100ºC for 20 minutes. Surprisingly, *Stereocaulon groenlandica* with 10% sulfuric acid turned a bright pink-red color while *S. alpinum* had no color change. Similar tests using various sulfuric acid concentrations on *Cetrelia cetrarioides* (perlatolic acid and atranorin), *Miriquidica scotopholis* (miriquidic acid only) and the original samples, yielded a yellow/gold color for *C. cetratioides*, a

purple color for *M. scotopholis*, a pink-red color for *S. groenlandica*, and none for *S. alpinum*. This demonstrates the utility of this method for determining the presence of miriquidic acid alone or in combination with other substances in lichens.

ORAL

SELECTED TOPICS AND ISSUES IN PRAIRIE-OAK BIRD CONSERVATION.**Bob Altman**, American Bird Conservancy, 311 NE Mistletoe, Corvallis, OR, 97330. baltman@abcbirds.org

There are a number of resources and issues related to prairie-oak bird species that are important considerations for conservation practitioners planning and implementing activities. Some of these include the recent Oak Bird Guide; the Partners in Flight bird conservation plans; surrogate and focal species; population objective setting within the Pacific Coast Joint Venture; species modeling in the Willamette Valley for setting conservation priorities, climate change, and lidar assessments of habitat; the initiation of a range-wide Oregon vesper sparrow inventory; and the need for standardization of oak habitat type classification. The talk also will serve as an introduction to the group discussion session to follow on topics such as data collection and management, integration of bird conservation objectives with restoration goals, species research needs, and recognition of future conservation scenarios amid an increasing human population and a fragmented landscape.

ORAL

THE DECLINE OF A RIPARIAN GALLERY FOREST IN DEVILS TOWER, WYOMING: CAUSATION AND MANAGEMENT TECHNIQUES FOR RESTORATION. **Jacob Anderson**, Clayton Marlow, Animal Bioscience Building Room 103, Montana State University, Bozeman, MT 59717; jmanderson07@ole.augie.edu

Devils Tower National Monument, Wyoming has experienced a decline in cottonwood recruitment along the Belle Fourche River, leaving the remaining riverine forest in danger of disappearing. The National Park Service has requested information about the mechanisms behind this decline and possible management methods that could be used to restore forests to the Belle Fourche riparian corridor. Previous research has indicated that cottonwood seedlings require flood deposited sediments and high initial groundwater for survival. A dam located 12 miles upstream of Devils Tower could be impacting the recruitment success of cottonwoods because of a decrease in seasonal flooding. If this decline is due to factors that managers have little control over, other methods should be explored to increase the success of future restoration efforts. This case study examined the physical attributes of the Devils Tower riparian area in comparison to a healthy, functioning riparian gallery forest located on the nearby Powder River to learn the complex mechanisms that help support and sustain these healthy riparian ecosystems. Soil testing, vegetation surveys, planting studies, and measurements of local groundwater patterns were used to determine the restoration potential of cottonwood gallery forests at Devils Tower. Planting trials were conducted to provide a methodology for greater seedling survival. At the conclusion of this study, we observed no significant differences among species height or treatment method. Tree health was significantly different among species when groundwater levels at various sites was considered. Management recommendations will be discussed in further detail.

ORAL

STATUS AND RECOVERY ACTIONS FOR THE RARE STREAKED HORNED LARK. **Hannah E. Anderson**, Center for Natural Lands Management, 120 Union Ave SE, Olympia, WA; handerson@cnlm.org

Streaked horned lark *(Eremophila alpestris strigata),* a rare subspecies of horned lark that occurs in western Washington and Oregon, was recently proposed for Threatened status under the federal Endangered Species Act. Once occurring from British Columbia to southern Oregon the lark's range has contracted considerably and the population is now considered quite limited both in size and distribution. Within their range, the lark breeds and winters in habitat types with short, sparse vegetation situated in large, open landscapes. The composition of breeding sites are somewhat unique and include remnant prairie in south Puget Sound, foredune along southern WA coast, dredged material deposition islands in the lower Columbia River, agricultural lands in the Willamette Valley, and airports throughout their range. The rarity of the subspecies, diversity of habitat types, and variety of entities engaged combine to make conservation efforts challenging and exciting. A diverse array of partners are working together to identify priority actions, address threats, and implement a suite of recovery actions. This presentation will touch on many of the on-the-ground actions including monitoring to understand distribution and reproductive success, nest exclosures to improve reproductive success, efforts to increase genetic diversity, understanding if larks respond to conspecific cues, and research to identify nest predators, juvenile survivorship rates, and causes of mortality.

ORAL

GOLDEN PAINTBRUSH: ON THE ROAD TO RECOVERY. **Joseph L. Arnett**, Washington Department of Natural Resources, Natural Heritage Program, 1111 Washington Street SE, P.O. Box 47014, Olympia, WA 98504-7014; joseph.arnett@dnr.wa.gov

Golden paintbrush (*Castilleja levisecta*), federally listed in 1997 as threatened under the Endangered Species Act, was historically known from the Willamette Valley in Oregon to Vancouver Island in British Columbia. Currently, twelve naturally-occurring populations are known in Washington and adjacent British Columbia. I estimate the total naturally-occurring population of the species at between 15,000 and 20,000 flowering individuals. The recovery plan for the species requires the persistence of 20 stable populations of at least 1,000 individuals each throughout its historical range. Currently, only four populations meet these requirements. Accordingly, achieving recovery will require the establishment of numerous new populations, and extensive propagation and outplanting efforts are underway in British Columbia, Washington, and Oregon. In addition to augmentation planting in five natural populations, plantings have been made at multiple new sites, starting in 2001: at least one in British Columbia, 19 in WA, and 7 in Oregon. Experimentation has examined habitat requirements, site preparation effects, propagation by direct seeding, planting plugs, and the effects of host plants. We have cause for optimism: after inconsistent initial success, the golden paintbrush populations at numerous planting sites are increasing rapidly. The count of flowering outplants in 2011 had risen to 5,247; in 2012, this number had more than doubled, and the number of vegetative outplants currently exceeds the naturally-occurring population.

ORAL

OVIPOSITION PREFERENCE BY TAYLOR'S CHECKERSPOT BUTTERFLY (*EUPHYDRYAS EDITHA TAYLORI*) AMONG LANCE-LEAVED PLANTAIN (*PLANTAGO LANCEOLATA*), HARSH PAINTBRUSH (*CATILLEJA HISPIDA*), AND GOLDEN PAINTBRUSH (*CASTILLEJA LEVISECTA*). **Dennis Aubrey**, Sustainability in Prisons Project (The Evergreen State College & Washington Dept. of Corrections), 2700 Evergreen Pkwy NW, Olympia, WA 98505; Carri J. LeRoy, The Evergreen State College, Lab II, 2700 Evergreen Pkwy NW, Olympia, WA 98505; Mary Linders, Washington Dept. of Fish and Wildlife, 1111 Washington St SE, Olympia, WA 98501; Carolina Landa, Mission Creek Corrections Center for Women, 3420 NE Sand Hill Road, Belfair, WA 98528; Lisa Mullen, Mission Creek Corrections Center for Women; Kelli Bush, Sustainability in Prisons Project; aubreyd@evergreen.edu

Extant populations of federally-threatened Taylor's checkerspot butterfly (*Euphydryas editha taylori*) rely mainly on an exotic plant, lance-leaved plantain (*Plantago lanceolata*), as its oviposition host. Because of this, the exotic, *P. lanceolata,* is planted alongside known native hosts such as harsh paintbrush (*Castilleja hispida*) at restoration sites for *E. e. taylori*. It has been speculated that federally-threatened golden paintbrush (*Castilleja levisecta*) may also be a suitable native oviposition host, but its use has not been documented. In order to determine whether E. *e. taylori* would recognize C. *levisecta* as an oviposition host, and if so, determine its preference relative to other known hosts, a manipulative oviposition preference study was conducted. We used protocols that were developed with California populations of *E. editha* (Singer et al. 1991, 1992). Results showed that *C. levisecta* was not only recognized as an oviposition host, it was preferred equally with *C. hispida*, and both were preferred over *P. lanceolata*. Additional work this spring will increase samples sizes to determine if *E. e. taylori* prefer *C. levisecta* over *C. hispida*. This study represents a collaborative project among the Sustainability in Prisons Project, The Evergreen State College, Washington Department of Fish and Wildlife, Oregon Zoo, and Washington Department of Corrections. Research was conducted in cooperation with inmates at Mission Creek Corrections Center for Women, who supported the work and conducted most of the trials.

ORAL

CLIMATE SMART INSIGHTS TO MAINTAIN/RESTORE PACIFIC NORTHWEST PRAIRIE ECOSYSTEMS. **Dominique Bachelet,** Conservation Biology Institute, 136 SW Washington Ave, Suite 202, Corvallis OR 97333; Dominique@consbio.org

The barrage of climate change information from state agencies, federal agencies, and NGOs has become challenging for managers with little funding and limited time to digest the available material, incorporate it into planning documents, and implement it in the field. Climate change projections for the Pacific Northwest are relatively mild compared to those for other US regions such as the Southwest but nonetheless are likely to present challenges that will affect field practices. For example in 2012, the warmest year on record in the USA, prescribed fires on the prairie could not be scheduled since it was feared drought conditions would cause unwanted outcomes. Similarly, the realization that warmer wetter winters are likely to become more common brings forth a revaluation of the timing of herbicide application for maximal

effectiveness to reduce exotic invasive expansion. A group of managers concerned about optimizing prairie restoration and conservation in a highly fragmented landscape where climate change will likely exacerbate on-going stresses gathered recently to discuss options. Novel management strategies were mentioned to help minimize ecosystem exposure to climate stress, take advantage of community diversity to minimize sensitivity and optimize adaptive capacity across a varied landscape. Past climate variability, future climate projections and recent experimental chamber results were used as stepping-stones to address a variety of management strategies and consider how to measure their effectiveness. Results of these discussions will be presented to illustrate the value of bringing relevant scientific information to support decision-making.

ORAL

PLANT ESTABLISHMENT VARIES REGIONALLY AND AT SMALL SPATIAL SCALES DURING RESTORATION. **Jonathan D. Bakker**, School of Environmental and Forest Sciences, University of Washington, Box 354115, Seattle, WA 98195-4115; Eric Delvin, The Nature Conservancy, Olympia, WA; Peter W. Dunwiddie, School of Environmental and Forest Sciences, University of Washington, Box 354115, Seattle, WA 98195-4115; jbakker@u.washington.edu

Natural heterogeneity can affect the effectiveness of restoration actions. We evaluated the importance and magnitude of spatiotemporal variability relating to plant establishment in a prairie restoration experiment in western Washington. Our experiment was conducted in four seeding years (2009-2012) at four sites (two each in North and South Puget Sound) initially dominated by non-native grasses and agricultural weeds. We tested three site preparation treatments (burned, solarized, herbicided) followed by broadcast seeding with three seed mixes (grass-rich, mixed, forb-rich; mean: 24 sown species at 707 seeds m^{-2}). Establishment success (percentages of sown species and seeds) was measured one year after seeding on 1756 quadrats distributed amongst 349 plots. Variance was partitioned to temporal (seeding year) and spatial sources (region, site, plot, quadrat). Region accounted for much of the variation in establishment (42%); counterintuitively, establishment was higher in the drier region (58% vs. 33% of sown species detected). Variation among quadrats, within plots, accounted for a third of the variation in establishment. Seeding year had surprisingly little effect on establishment. Seed mix had little effect on establishment, though it did alter the relative importance of species. Site preparation treatments were similarly effective in the North Sound, whereas herbicide was most effective in the South Sound. Regional-scale variation indicates that context (e.g., climate, species distributions) can control restoration effectiveness. However, quadrat-scale variation is also considerable and directly influences restoration effectiveness. Edaphic or other microsite factors that affect plant establishment require further research. Species-specific responses to treatments also need to be evaluated.

ORAL

CARBON AND DIVERSITY OF THE GROUND LAYER: THE LEGACY OF MOSSES AND LICHENS. **Juan C. Benavides,** Department of Botany and Plant Pathology, Oregon State University. Corvallis-OR 97331-2902; Sarah Jovan, Forest Inventory and Analysis National

Program, US Forest Service. Portland-OR; and Bruce McCune, Department of Botany and Plant Pathology, Oregon State University. Corvallis-OR 97331-2902; benavidj@onid.orst.edu

Bryophyte and lichen ground covers are important components of terrestrial ecosystems around the globe. Bryo-lichen mats provide ecological services including hydrological regulation, soil stabilization, nitrogen fixation, and forage. Understanding the ecological roles of these two groups is limited by reliable data; thus, developing an efficient sampling strategy will help to expand our understanding of the extent and degree of the ecological services offered by the cryptogamic ground layer. We focus here on two main objectives: 1— Investigate the relationships between biomass and cover and thickness from bryophyte and lichen mats; and 2— Compare the accuracy and speed of different sampling protocols (ocular estimates, point intercept and microplots) to estimate cryptogamic ground cover. We collected 182 bryophyte and lichen samples from six biomes of northwest North America. Cover and dry mass were estimated for each sample. Plant density was similar between bryophytes and lichens and growth forms; however, non-parametric multiple regression models (NPMR) showed a significant effect of mat height and volume on plant density. Tall plants have lower density, and plants with low volume are more dense regardless of their growth form. Cover estimation methods were compared using 12, 0.5 ha plots. Ocular cover overestimated cover and offered no information about the variation in cover. Point-intercept sampling was excessively time consuming. Finally, the microplot method compromised speed and accuracy while offering an estimate of the variation in cover. A fourth method, still in development, uses digital photographs in conjunction with the microplot method.

ORAL

DESIGNING AND IMPLEMENTING A LANDSCAPE-SCALE OAK HABITAT RESTORATION INITIATIVE IN SOUTHERN OREGON/NORTHERN CALIFORNIA.

Marko Bey, Lomakatsi Restoration Project, Ashland OR 97520; David A. Ross, U.S. Fish and Wildlife Service, Klamath Falls, OR 97601; CalLee Davenport, U.S. Fish and Wildlife Service, Portland, OR; Dave Johnson, U.S. Fish and Wildlife Service, Yreka, CA; Erin Kurtz, Natural Resources Conservation Service, Medford, OR; John Ketchum, Keno Rural Fire Protection District, Keno, OR. marko@lomakatsi.org

This initiative involves more than 15 project partners in restoring over 2000 acres of oak habitats on private lands by removing encroaching conifers, grass reseeding, and applying prescribed fire. Lomakatsi Restoration Project, with more than 15 partners, was awarded a total of $3 million from the Natural Resources Conservation Service, Cooperative Conservation Partnership Initiative and the U.S. Fish and Wildlife, Partners for Fish and Wildlife Program to implement oak habitat restoration. The key has been designing local initiatives that fit local workforce, strong NGO staffing, flexibility in accomplishing environmental compliance, identifying key partners possessing strong communication skills, and identifying an NGO capable of strong fiscal management. The monitoring effort shows innovation by sharing staff among NGOs and agencies. An interdisciplinary group was assembled to review restoration projects. These communication efforts have led to a solid collaborative community partnership and better on the ground results. This partnership has extended the conservation of oak woodlands, greatly

leveraging its accomplishments. The Klamath-Siskiyou Oak Network (KSON) has formed on the successes of this project. A landowner guide to oak habitat management is being funded by a partnership. LRP has a model partnership with The Klamath Tribe through a workforce initiative providing restoration-based tribal employment. LRP's variable density prescriptions result in a diverse forest stand that is 1) healthy and 2) resilient from fire, and 3) not a "cookie-cutter" approach. Their projects are model reference sites. The strength of this initiative is that a concentrated design towards restoring oak habitats through connected landscapes is established.

ORAL

MANAGING HABITAT FOR WESTERN MEADOWLARKS IN WESTERN OREGON. **Matt Blakeley-Smith**, Greenbelt Land Trust, 101 SW Western, PO Box 1721, Corvallis, OR 97339; Bob Altman, American Bird Conservancy, 311 NE Mistletoe, Corvallis, Oregon 97330; matt@greenbeltlandtrust.org

Western Meadowlarks and their associated plant communities have steadily declined in the Willamette Valley over the past forty years due to land conversion, natural succession and land management practices. This decline has prompted land managers to initiate prairie habitat restoration projects designed to benefit a suite of sensitive species, including the western meadowlark. This project describes key habitat conditions currently utilized by core meadowlark populations at Finley and Baskett Slough National Wildlife Refuges. Territories were identified in the field and nests were located during the breeding season. When nests could not be located, we identified the nest area, which encompassed the 200-square meter area that likely contained the cryptic nest. After the birds fledged we quantified the cover of every plant species in the nest area in four, 50-meter square sub-plots. Later, we compared the vegetation characteristics on four types of nest sites: remnant upland prairie, remnant wet prairie, restored upland prairie, and restored wetland prairie. The results of this analysis were then used to design and implement the creation of approximately 400 acres of new meadowlark habitat on private lands adjacent to the two National Wildlife Refuges. Our findings will also help those managing existing habitat for Oregon's state bird.

ORAL

AN OREGON WHITE OAK RESTORATION STRATEGY FOR FOREST SERVICE LANDS EAST OF THE CASCADE RANGE. Warren Devine, **Andrew Bower,** Jeanne Miller, Carol Aubry; Olympic National Forest, 1835 Black Lake Blvd. SW, Olympia, WA 98512; abower@fs.fed.us

Much work has been undertaken to conserve and restore Oregon white oak habitats in the Willamette Valley – Puget Trough – Georgia Basin ecoregion, but this work has almost entirely focused on lands west of the Cascade Range. The range of Oregon white oak is more limited east of the Cascade range, nonetheless it is an important habitat occurring at the transition between moister, higher elevation conifer forests and drier, lower-elevation shrub-steppe grasslands. Much of the historic eastside Oregon white oak savanna and woodland habitat has been lost, and the combined effects of fire suppression, invasive species, grazing, and development threaten significant portions of the remaining extent. Conservation and preservation of stands that are still

structurally and functionally intact, and restoration of degraded stands, is needed to ensure the longevity of this habitat and the species that rely on it. We have developed a restoration strategy targeting eastside Oregon white oak habitats. This strategy has been written for managers at the Mt. Hood and Gifford Pinchot National Forests and the Columbia River Gorge National Scenic Area, but much of its contents may also be useful to managers in other agencies, conservation organizations, and landowners. Although the focus of the strategy is eastside oak ecosystems, some sections provide information that is also relevant to ecosystems west of the Cascades. The strategy includes a review of the relevant biological and ecological literature, a discussion of restoration issues, tools for prioritizing restoration sites and choosing management actions, and discussion of management activities. Also included are maps, restoration case studies, recommendations for planning and research, and an annotated bibliography of cited literature.

POSTER

USE OF TIME LAPSE CAMERAS TO MONITOR SEED GERMINATION. **Leslie Chandler Brodie**, Constance A. Harrington, US Forest Service, Olympia Forestry Sciences Laboratory, 3625 93rd Ave SW, Olympia, WA 98512; lbrodie@fs.fed.us

To predict the impact that future climate change may have on plant communities, it is important to understand plant responses to weather, and the genetic variation within a given plant species. Regeneration is a key time period in plant life, and changes in environmental conditions could affect flowering, seed set, and germination. The timing and rate of seed germination may be affected by several environmental factors including temperature, moisture, and light. To mimic the complex variation of these factors within a research setting, seed germination trials were placed in a variety of field environments. Seeds were collected from four species of trees -- Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), western redcedar (*Thuja plicata* Donn ex D. Don), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), and western white pine (*Pinus monticola* Douglas ex D. Don) -- from sites in western Washington, across a range of elevations. Seeds were placed at six sites, which ranged in elevation from 60 to 850 m, and from forest understories to open settings. The seeds were buried shallowly in trays and protected from predation. Seed lots were monitored by Wingscapes 7 time-lapse cameras that took several pictures a day to document germination date and rates. These cameras allowed germination to be monitored without frequent field visits, which could be useful for sites with limited access during the likely period of germination; nonetheless, other activities are still required, such as exclusion of seed predators, periodic removal of non-desired germinants from wind-blown seed, and monitoring to verify camera function.

ORAL

THE PROPOSED LISTING OF THE STREAKED HORNED LARK: CAN ALLOWING TAKE WITH A 4(d) RULE ADVANCE CONSERVATION OF THE SPECIES? **Cat Brown**, US Fish and Wildlife Service, Oregon Fish and Wildlife Office, 2600 SE 98th Avenue, Suite 100, Portland, OR 97266; cat_brown@fws.gov.

In October 2012, the US Fish and Wildlife Service proposed to list the streaked horned lark (*Eremophila alpestris strigata*) as a threatened species under the Endangered Species Act. The

lark's natural habitats have virtually disappeared as the natural processes that created early successional prairies and scoured floodplains no longer operate. The lark now occurs mainly in places where habitat is created inadvertently – on airports in Washington and Oregon, in agricultural lands in the Willamette Valley and on dredge spoil islands in the lower Columbia River. Recovery of the species will require developing new sites that have conservation of larks as a management goal, but how do we encourage private landowners to continue to create habitat for larks when the presence of a listed species creates a regulatory burden that could be avoided by discontinuing the activities that create suitable habitat? The Service has proposed a special rule under section 4(d) of the ESA that would allow take for certain activities that create habitat on airports and agricultural lands. Special rules are a tool that have been used successfully elsewhere in the country where agriculture and ranching on private lands have substantial – albeit incidental – benefits to listed species.

ORAL

POLLINATOR ON SMALL ISLANDS: IMPLICATIONS FOR HABITAT FRAGMENTATION. **Corey Bunnell**, Peter Arcese, Centre for Applied Conservation Research, Forest Sciences Department, University of British Columbia, 3041-2424 Main Mall, Vancouver, BC, Canada, V6T-1Z4; Elizabeth Elle, Evolutionary and Behavioural Ecology Research Group, Department of Biological Sciences, Simon Fraser University, Burnaby, BC, Canada, V5A 1S6; eelle@sfu.ca

Island Biogeography theory predicts that species richness will be higher on larger and less isolated islands. We had three objectives: 1) describe pollinator communities on small Gulf Islands, 2) test apparent effects of island size and isolation on pollinators, and 3) describe apparent effects of gull colonies on pollinators. We assessed pollinator communities (bees and flies) on nine small Gulf Islands of British Columbia using pan traps. Pollinator richness increased with the area of habitat within a 450m radius of sampling sites (an index of isolation), mainly due to the influence of a single large site. With this site removed, total pollinator richness and the richness of bees (but not flies) were higher on islands with forest habitat, and total richness increased with island size. A threshold signifying a shift in pollinator community richness and composition appears to exist between island sizes of 2000 m^2 and 6500 m^2. Larger islands more often include both the wildflower-rich coastal meadows we sampled, as well as adjacent conifer forest. Forested islands appeared to provide a greater diversity of nesting resources for cavity and ground-nesting bees. The presence of gull colonies was associated with departures from general trends, including a marked reduction in pollinator species richness, an increased proportion of flies and a near absence of ground-nesting bees. Causal mechanisms appear to be reduced richness and spatial homogeneity of flowering plants and abundant fly breeding habitat on islands with gulls; reduction in ground-nesting bees may be unrelated functions of soil type.

ORAL

URBAN LANDSLIDES IN THE PACIFIC NORTHWEST**.** **Scott Burns**, Department of Geology, Portland State University, P.O. Box 751, Portland, OR 97207; burns@pdx.edu

Each year landslides cause 25-50 deaths and on the average $3.5 billion in damage in the United States. Many of these landslides occur in urban settings. Figuring out what caused these landslides and also how to prevent them can be a challenge to geologists. My talk will focus on lessons learned from Pacific Northwest case histories in urban settings, focusing on homes hit by landslides, homes that moved down the slope on landslides, reactivation of ancient landslides, triggers such as precipitation and earthquakes, and vacant lots. Development of susceptibility maps, especially using LiDAR imagery, will be included. Different mitigation methods including different types of dewatering devices, walls, and freezing of the soil will be mentioned. The importance of lack of insurance for landslides on normal homeowner policies has great significance.

POSTER

ENHANCING PRAIRIE HABITAT ON A WESTERN WASHINGTON GRASSLAND RESERVE PROGRAM (GRP) EASEMENT WITH A GRAZING SYSTEM – HOW'S IT WORKING? **Marty Chaney** USDA-NRCS 1835 Black Lake Blvd SW Suite D, Olympia, WA 98512; marty.chaney@wa.usda.gov

In 2005, USDA NRCS enrolled a large parcel of mixed native prairie and introduced species pastures in the GRP. NRCS has worked closely with the rancher since, helping him develop an intensive grazing system which meets his need of a profitable cattle operation, while enhancing the native prairie. The Management Prescription: Defer grazing or mowing during the critical period for native vegetation (early April until mid-June) by moving livestock to fields seeded to introduced forages. If a field containing native vegetation must be used during this period, limit use to 1 in 3 years. Manage **all** fields with Prescribed Grazing guidelines for target species grazing heights and periods. On native fields, don't apply fertilizers or compost, since they make introduced grasses and forbs more competitive. Don't till these fields. If cattle are wintered here, strictly observe minimum stubble heights. When supplementing with hay on native fields, move feeding areas often and don't reuse sites. Use high quality hay that will leave little waste. Manage by plant phenology, not the calendar. Develop proper infrastructure – fencing and water. Adaptive management is critical – keep track of what was done each year, and what happened. Try new things on a small scale and keep improving the system. What we've learned: It works! Eight years later, native prairie species are increasing, and rarer species are more common. The cattle operation is prospering. The rancher developed a local market in nearby urban communities for cut-and-wrapped beef. A major marketing advantage is his successful native prairie management.

ORAL, PLENARY

URBAN TRANSFORMATION OF RIVER LANDSCAPES IN THE "ANTHROPOCENE" **Anne Chin**, Department of Geography and Environmental Sciences, University of Colorado, Denver, CO 80217; anne.chin@ucdenver.edu

The contemporary urban landscape was clearly built by humans; however, humans have also influenced the "natural" landscape throughout history and prehistory by expansion of urban centers, modifying land cover, promoting soil erosion, altering hydrologic and biologic

processes, and causing loss of habitat and biodiversity. Dams and levees have provided flood control and water supply, interrupting sediment movement along rivers and causing loss of habitat and biodiversity. Humans have affected Earth's chemical environment through industrial and agricultural practices. Human activity is also linked to our warming climate over the past several decades, which in turn affects many natural processes on Earth. With a growing human population, the scale and magnitude of human impacts on Earth have intensified to the extent that the term "Anthropocene" has entered the scientific literature to signify a new era dominated by human activity. A proposal to formalize Anthropocene as a new geologic epoch within the Geologic Time Scale is currently in development for the International Commission on Stratigraphy. This presentation highlights the need for new research about the future of Earth's surface in light of increasing human interactions. Meeting this challenge suggests a need to account explicitly for human-process interactions in understanding change on Earth's surface. It calls for development of new theories and predictive capacity for human-landscape systems, requiring new conceptual frameworks, methods, and team-based collaborations linking the geosciences, biological sciences, and social sciences. It will use new approaches that focus on feedbacks as well as direct impacts to physical systems that link to past legacies of human effects. A case study of the urbanization of Fountain Hills, Arizona, illustrates how these approaches can be used.

POSTER

EVALUATING DAM DECOMMISSIONING AND SEDIMENT RELEASE ON COASTAL HABITATS AND BIOTA IN THE ELWHA RIVER. **Christopher Clark**, Western Washington University, College of the Penninsulas, Port Angeles, WA, 98362; Matt Beirne, Lower Elwha Klallam Tribe, 51 Hatchery Rd, Port Angeles, WA 98363; Ian Miller, Washington Sea Grant, Port Angeles, WA, 98362; Steve Rubin, Nancy Elder, USGS Western Fisheries Research Center, 6505 NE 65th St. Seattle, WA, 98115; Michael McHenry, Lower Elwha Klallam Tribe, 51 Hatchery Rd, Port Angeles, WA 98363; and Jeffrey Duda, USGS Western Fisheries Research Center, 6505 NE 65th St. Seattle, WA, 98115. clark.christoph@gmail.com

Sediment processes resulting from dam removal on the Elwha River are leading to large and continuing changes in downstream coastal habitats and biota. We are evaluating the effects of sediment release on habitat changes and biological responses using various physical and biological sampling strategies in coastal habitats. Our work is focused on three habitat domains: the estuary, coastal beaches, and in the subtidal delta offshore (depths up to 50 feet). Measurement of sediment flux and accumulation in the estuary, using real time kinetics (RTK) GPS, sonar, and sediment elevation tables, allows us to follow changes to the physical habitat template of the estuary through time. Linking changes in assemblages of intertidal invertebrates with physical changes (elevation and grain-size) through transect-quadrat sampling techniques allows us to track changes to beaches to the east and west of the river mouth. Pre-dam removal monitoring showed that these beaches differed in the amount of wave energy and along-shore transport of sediment, which suggests that the biological communities may respond differently during and following dam decommissioning. SCUBA divers conduct transect swath surveys in off-shore habitats across the Elwha delta to assess changes to nearshore habitat and biological communities. Our overarching goal is to document the changes that occur during the transition

from a sediment-deficient to a sediment-rich estuary, intertidal, and nearshore environment. We expect to document a variety of changes in the physical characteristics in each habitat domain, with an eye toward linking biological and physical responses.

ORAL

METALS UPTAKE BY EDIBLE MUSHROOMS IN BIOSOLIDS TREATED FORESTS.
Erica Cline, Mary Clouse. Environmental Sciences, Interdisciplinary Arts and Sciences, University of Washington Tacoma, Box 358436, 1900 Commerce St, Tacoma WA 98402; ecline@uw.edu

The objective of this project was to study the uptake of metals by edible mushrooms in forests treated with biosolids at the University of Washington Pack Experimental Forest near Eatonville, Washington. Sampling occurred from 2010 to 2011 within six sites; four treated with biosolids and two non-treated controls. We collected and analyzed metals concentrations from a total of 113 samples representing 16 species of edible mushrooms, as well as organic and mineral soil substrates. Silver, arsenic, cadmium, copper, lead, and zinc remained significantly elevated in mineral and organic horizons in soils that had been treated with biosolids in 1982 or earlier. Overall, mushrooms from biosolids-treated sites had significantly elevated silver and cadmium. Metals uptake showed a strong species-specific relationship, with the metal concentrations in some mushrooms much lower than the substrate in which they were growing, while other species showed strong patterns of active uptake. In particular, two species of edible coral fungus, *Clavulina cinerea* and *C. cristata*, accumulated copper and silver at levels ten to twenty-fold above substrate levels, and *Gomphidius subroseus* accumulated silver at more than sixty-fold above substrate levels. As a result, wild mushroom foragers may be exposed to unhealthy levels of these metals if they consume large quantities of these particular species, especially in forests that were treated with biosolids previous to implementation of tighter regulatory standards.

ORAL

DIRECT SEEDING TO RECOVER GOLDEN PAINTBRUSH (*CASTILLEJA LEVISECTA)*.
Eric Delvin, University of Washington & The Nature Conservancy, 120 Union Ave SE, Olympia, WA, 98501; Jonathan D. Bakker, Peter Dunwiddie, School of Environmental and Forest Sciences, University of Washington, Box 354115, Seattle, WA 98195-4115**;** edelvin@tnc.org

Castilleja levisecta is a federally threatened hemiparasite associated with one of the most endangered ecosystems, the prairies of western Washington. Effective recovery of this species requires understanding how to efficiently establish large numbers of individuals at a site. The current USFWS reintroduction plan (2004) does not recommend using seeds as founders for a recovery population, likely due to the limited seed availability at the time of writing. However, recent restoration actions have increased the amount and availability of *C. levisecta* seeds for recovery. We have been successful in establishing *C. levisecta* plants at a large scale through direct seeding as part of our Prairie Habitat Restoration Experiment. We compared several restoration strategies in a rigorous experimental design, which included preparing sites for seeding using prescribed fire, solarization, and herbicide. Three different mixtures of 24 native

forbs and grasses were sown, including *C. levisecta* at densities of 75, 110, and 150 seeds per square meter. Strategies were replicated over three years (2009, 2010, 2011) and four sites to understand when and where they are most effective. Successful strategies were applied to increasingly larger areas in subsequent years. The cumulative result of this research is the restoration of significant areas of prairie habitat and populations of *C. levisecta*. Results demonstrate establishment of *C. levisecta* at all sites, and suggests that prescribed fire is a promising site preparation treatment across all sites. Further research should investigate whether differences in establishment relate to germination conditions or to the presence and abundance of host plants.

ORAL

ENGAGING CITIZEN SCIENTISTS WITH OBSERVATIONS OF EVERYDAY BACKYARD ECOLOGY. **Marion Dresner**, Portland State University, Portland, OR, 97207; dresnem@pdx.edu

A new program raises scientific literacy about conservation ecology by engaging adult volunteers in urban restoration on public and private lands. Research projects are investigating the spillover effects of backyard habitats (BYH) using a local neighborhood-based approach and conveying the results via small-scale neighborhood events. Residential areas offer an opportunity to impact private landscaping practices that improve ecological integrity and provide a mostly untapped volunteer monitoring force. Backyard habitats, a form of landscaping, may affect overall environmental quality, but their actual ecological value has not been studied. Our pilot study began during the summer of 2012. We studied the differences in species richness of invertebrates and birds in 16 backyards containing at least 25% native plants as compared with yards having few or no native plants. We also examined how proximity to naturally maintained green spaces influenced species richness in yards. Proximity of restored yards to green spaces does make a difference. We engaged non-BYH homeowners for comparative purposes. BYH owners received training and participated in spring bird point counts in their yards. We also engaged with Portland Audubon Society, neighborhood associations, the local Master Gardeners, and the Ecological Society of America in a trial Bioblitz/yard tour event where BYH owners showcased their yards to neighbors and comparative moth diversity data was examined.

ORAL

WHERE HAVE ALL THE FLOWERS GONE? MISSING NATIVE ANNUALS FROM SOUTH PUGET SOUND PRAIRIES. **Peter W. Dunwiddie,** R. Adam Martin, Sarah Hamman, Center for Natural Lands Management, 120 Union Ave. SE, Olympia, WA 98501; Ed Alverson, 501 Irving Rd., Eugene, OR 97404; Joe Arnett, David Wilderman, Washington Dept. of Natural Resources, PO Box 47014, Olympia, WA 98504; Rod Gilbert, Fish and Wildlife Program, Joint-Base Lewis-McChord, Tacoma, WA 98433; pdunwidd@u.washington.edu

Although it is well documented that the vast majority of native prairies in western Washington have disappeared, it is less clear to what extent the remaining fragments have been modified by the loss of native taxa. In this study, we begin to provide insight by focusing on one group of

plants – native annuals – that are notably lacking in prairies today. Based on current and historical records, we compiled a list of 306 native herbaceous species from upland prairies in South Puget Sound. Ninety-four (31%) of these were annuals, a proportion that is considerably higher than what occurs in these prairies today, where an average of 13% of the native species are annuals. In addition, virtually all (90) the native annual species were forbs. These data suggest that in the past, native annuals may have represented a significantly greater proportion of the diversity in the prairies. Although it is impossible to determine how widespread these species were historically, several measures suggest significant declines have occurred. Twenty-percent of the native annuals have no recent records from any prairies in the region, and half are known from only one or two current occurrences. A tabulation of species from 15 of the major prairies recorded only 55 native annuals. The historical abundance of annuals is also difficult to reconstruct. However, we suggest that large increases in both cover and species richness of non-native annuals following prescribed burns likely mirror how native annuals once responded to frequent burning by Native Americans.

ORAL

EVALUATION OF SAMPLING ERROR AND TEMPORAL VARIABILITY ASSOCIATED WITH VOLUNTEER-COLLECTED STREAM BIOASSESSMENT DATA. **Patrick Edwards**, Environmental Science and Management, Portland State University, PSU-ESM Box 751, Portland, OR 97207-0751; patrick.edwards@pdx.edu

Aquatic invertebrate bioassessment is a widely-used method for volunteer stream monitoring and is advocated as a potential source of citizen science data for natural resource management. This paper evaluates the error and variability associated with volunteer bioassessment data by comparing volunteer and professional subsampling techniques and examining long-term biomonitoring data collected by volunteers. At two streams with different land use intensities, six groups of volunteers collected data which was subsequently re-subsampled in the lab using the professional technique. Data were analyzed by comparing the error associated with relative abundance data, ordinations and biologic measures generated by each technique. Temporal variability of volunteer biomonitoring data was also evaluated by examining six years of biannual data (n=13) collected by volunteers using the randomized field technique to biomonitor a small forested stream. Temporal data were evaluated by correlating volunteer data to broad-scale climate conditions and examining annual and seasonal patterns in the data. The volunteer and professional techniques generally showed strong agreement. Relative abundance generated by the volunteer field technique was more variable than the professional technique, but the ordinations generated by each technique were statistically concordant (M2 =0.94, p=0.001) and the biological measures were similar. Temporal biomonitoring data showed expected seasonal patterns were significantly correlated with the El Nino Southern Oscillation Index (R^2 =0.43, p=0.01). The results of this investigation suggest that volunteer data, when collected using a randomized subsampling technique, may provide useful baseline information to stream managers or augment existing data collection efforts.

ORAL

BUILDING BRIDGES: ECOLOGICAL RESTORATION AS A PATHWAY TO INDIVIDUAL REHABILITATION. **Carl W. Elliott**, The Sustainability in Prisons Project, The Evergreen State College, Lab 2, Environmental Studies Lab II, 2700 Evergreen Parkway NW, Olympia, Washington 98505; elliottc@evergreen.edu

Plant and animal translocation conducted in coordination with habitat restoration on south Puget Sound prairies rely heavily on community labor and participation. The Sustainability in Prisons Project (SPP) has cooperated with the scientific community and regional land managers to provide trained technicians to raise target organisms since 2009. Technicians at three Washington Department of Corrections (DOC) facilities raise prairie plants, Oregon spotted frogs (*Rana pretiosa*) and Taylor's checkerspot butterflies *(Euphydryas editha taylori)*. We present an overview of the process leading to this unique relationship between the restoration community and the Washington DOC. The SPP has formulated techniques to integrate the goals of all the institutions involved and meet those goals within the structural limitations of the institutions. The SPP seeks to combine training in tangible job skills for the incarcerated with regional ecological restoration. The SPP goal is to create an exchange of resources and ideas between the DOC and the restoration community that is mutually beneficial. In addition to raising the target organisms, the DOC technicians have assisted in studies on seed germination response to plant-derived smoke water, predator evasion response by Oregon spotted frogs and oviposition preference of Taylor's checkerspot butterflies. We present established protocols to conduct such studies and curricula that provide both meaningful training to incarcerated individuals and achieve the objectives of the restoration community. This model of linking rehabilitation and change in individuals with ecological restoration has the potential to be successfully replicated across institutions and environments.

POSTER

GROUNDWATER CONTAMINATION AND ARCHAEOLOGICAL RESOURCES AT HANFORD NUCLEAR RESERVATION, WASHINGTON. **Serafina Ferri,** Central Washington University, 400 E. University Way, Ellensburg, Wa. 98926; Ferris@cwu.edu

This research provides a historical overview and documents the environmental impacts of the production and disposal of nuclear waste at the Hanford Nuclear Reservation. The K-basin within Hanford held two nuclear reactors for plutonium production. When production ended in the 1980s there were more than 100,000 uranium fuel rods on site. Multiple methods were used to store nuclear waste and hazardous chemicals including holding ponds, unlined pits, trenches, landfills, reverse wells and underground storage tanks. Even so, fuel rods near the K-East Basin started to deteriorate and waste leached into the groundwater. As a result, nuclear contamination has caused major environmental damage. It is also likely that the waste has contaminated pre-contact archaeological sites, including graves, cemeteries, pre-contact pit houses, hunting and kills sites. In 1994, the remediation process began to extract the contaminated water and sediment, but the degree to which these cultural sites have been compromised is unknown. This research evaluates the major environmental issues associated with the contamination and the subsequent clean-up procedures in an attempt to fully understand the adverse effects it has had on the environment as well as any local cultural resources.

ORAL

HABITAT ENHANCEMENT FOR TAYLOR'S CHECKERSPOT REINTRODUCTION.
Cheryl Fimbel, Peter Dunwiddie, Center for Natural Lands Management, 120 E. Union #215, Olympia, WA 98501; Dave Hays, Mary Linders, Ann Potter, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501; Dave Wilderman Washington Department of Natural Resources, PO Box 47014, Olympia, WA 98504; cfimbel@cnlm.org

Conservation partners in the South Puget Sound are preparing a network of reintroduction sites for Taylor's checkerspot butterflies. Partners have been collaborating as a multi-disciplinary team since 2007 to: 1) assess potential receiving sites and delineate butterfly management units, 2) develop habitat enhancement targets, 3) identify, implement, and refine strategies to achieve those targets, and 4) monitor habitat condition. Habitat enhancement actions emphasize the use of prescribed fire, weed control, and additions of diverse larval and adult foodplants across a variety of microsites to promote wide windows of plant resource availability. These efforts are supported by native plant and seed nurseries managed by partners. To date, eight sites have received treatments to improve habitat conditions for Taylor's checkerspots, including the addition of 325,000 seedling plugs and 150kg of native seed. One site supports a reintroduced population of checkerspots, with evidence of reproduction, and a second site is in the early phase of reintroduction. Primary challenges for the team include: 1) enhancing sites while checkerspot reintroduction is underway; 2) development of sufficient seed and plug resources for enhancement plantings; 3) unpredictable trajectories of habitat enhancement treatments; and 4) the ability to adequately characterize or define habitat that is ready for reintroduction. We also address controversies surrounding: 1) plug and seed additions of the non-native hostplant lance-leaf plantain (*Plantago lanceolata*) into native prairies; and 2) single species management for checkerspot butterflies vs. ecosystem prairie management.

ORAL

MORPHOTYPES AS A TOOL TO INVESTIGATE POLLINATOR USE OF BURNED PRAIRIE.
Cheryl Fimbel, Center for Natural Lands Management, 120 E. Union #215, Olympia, WA 98501; cfimbel@cnlm.org

Prescribed fire is an important and frequently used tool for managing Puget lowland prairies. There is increasing attention to the impacts of land management practices on pollinator populations. I conducted a pilot investigation to: 1) assess the indirect effect of fire on native pollinators, and 2) explore the utility of non-destructive surveys based on pollinator morphotypes, instead of more traditional approaches involving identification of collected specimens. I compared the abundance of bees, butterflies, and flower-visiting insects, collectively referred to as pollinators, in paired burn and control (unburned) plots the first year following late summer prescribed fire treatments on two Puget lowland prairies. Pollinators were indentified to species, genera, or morphotype categories, depending on ease of identification of live insects in the field. Results varied by site. Greater abundance of floral resources appeared to influence higher use of burned prairie compared to unburned prairie by select taxa. Mixed results suggest that pollinator response to burned prairie habitat varies by taxon and site. Results from this study suggest that surveys including morphotypes can provide a non-invasive approach to providing insights into the effects of land management actions on pollinators by citizen scientist level trained observers.

ORAL

EVALUATING EFFECTS OF PRAIRIE MANAGEMENT TECHNIQUES ON INTRODUCED WILLAMETTE DAISY POPULATIONS IN THE WILLAMETTE VALLEY, OREGON. **Denise Giles-Johnson**, Thomas N. Kaye, Institute for Applied Ecology, P.O. Box 2855, Corvallis, OR 97339; denise@appliedeco.org

Willamette daisy (*Erigeron decumbens*) is endemic to the Willamette Valley and is currently listed as endangered. Threats to the species include invasive species and improper prairie management. Existing populations of Willamette daisy often occur in degraded habitats, and appropriate prairie management may be essential to the success of the species. The Institute for Applied Ecology, funded by USFWS and in partnership with the Army Corps of Engineers and the City of Eugene, have implemented a four year study testing seven prairie management techniques including grazing, carbon addition, mowing, application of grass specific herbicide, fire + glyphosate, glyphosate alone, and control (no management) on the establishment and reproductive success of re-introduced populations of Willamette daisy. In 2011, two sites at Finley Wildlife Refuge and two sites at Fern Ridge Reservoir were outplanted into treatment blocks. In 2013 an additional four sites will be outplanted and treatments will occur at all outplanted sites. Preliminary results indicate burning followed by glyphosate application resulted in more flowers per individual than the control (3.4 vs.1.9 flowers/individual). Plants from the Eugene West Recovery Zone were consistently smaller than those from Corvallis West and had lower reproductive effort. Effects of the remaining treatments on the survival of Willamette daisy do not initially appear to be different than controls. Community and plant data collected through 2014 will allow us to make recommendations for prairie management in areas occupied by Willamette daisy and assess the effects of treatments on both the Willamette daisy and the associated vegetation.

ORAL

DESIGNING CLIMATE-SMART RESTORATION PROJECTS. **Patty Glick**, National Wildlife Federation, 2100 Westlake Avenue North, Suite 107, Seattle, WA 98109; glick@nwf.org

Climate change has become the defining conservation issue of this century. As current trends suggest, the environment in which the planet's living resources – humans, plants, and animals alike – will exist in the future will be vastly different from the one we have experienced over the past several centuries during which our conservation traditions evolved. Given this reality, state and federal agencies, non-governmental organizations, and others concerned with conservation are challenged with designing and implementing projects that will maximize the effectiveness of restoration and acquisition investments under both current and expected future climate conditions (i.e., projects that are "climate-smart"). This presentation will highlight overarching principles and a generalized planning framework for designing climate-smart restoration projects, based on guidance developed by the National Wildlife Federation and EcoAdapt. It will provide examples of how the framework is being applied in the Great Lakes and Chesapeake Bay regions and will suggest ways in which it could be used to address issues relevant to the Pacific Northwest.

ORAL

ASSESING BIRD DIVERSITY AND LAND OWNERSHIP IMPLICATIONS FOR MANAGEMENT PRIORITIZATION IN OAK ECOSYSTEMS OF THE ROGUE BASIN, OREGON **Katherine Halstead**, Dept. of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis OR 97331; katherine.halstead@gmail.com

Oak ecosystems of the Pacific Northwest (PNW) support high levels of bird diversity, and are critical targets of conservation and restoration efforts. In the Rogue Basin of southwest Oregon, managers are challenged by site prioritization within structurally and compositionally diverse oak vegetation types across a complex patchwork of ownership. Site selection for inherent biological value and likelihood of management success is key for effective coordination of management efforts, but is limited by accurate assessment of these parameters at landscape scales. Selection parameters may be dependent on stand- and landscape-level ownership patterns due to correlation of land ownership with vegetation composition. Investigating avian responses to landscape-scale vegetation composition and ownership patterns may help to clarify these issues. In prior work, species distribution models (SDMs) using landscape-level vegetation composition to predict local species occurrence were highly accurate for a selection of oak-associated avian species of the Rogue Basin, suggesting that landscape composition within 2000m may be influential to site-level species occupancy. I use remote sensing data (Landsat TM) in landscape-based SDMs for oak-associated bird species across the Rogue Basin, with the goal of identifying potential "hot-spots" and "cold-spots" of regional avian diversity. I examine implications of local and landscape-level ownership on oak-associated bird diversity by assessing distribution of hot- and cold-spots among ownership types (e.g. private, federal, industrial forest). The results will inform selection and prioritization of oak management sites across ownership types in the Rogue Basin, with a focus on retaining avian diversity.

ORAL

IDENTIFYING SEEDING METHODS AND RATES TO MAXIMIZE ESTABLISHMENT OF NATIVE SPECIES IN PACIFIC NORTHWEST PRAIRIES. **Sarah T. Hamman**, Center for Natural Lands Management, 120 E. Union Ave. #215, Olympia, WA 98501; Peter Dunwiddie, Jonathan D. Bakker, School of Environment and Forest Sciences, University of Washington, Box 354115, Seattle, WA 98195; shamman@cnlm.org

Restoration efforts and native seed production have increased greatly in Pacific Northwest prairies during the past decade, and there is a clear need to identify seeding methodologies and seeding rates that can be applied efficiently at large scales. We evaluated effects of three seeding methods (seed drill, broadcast seeder, hydroseeder) and five seeding rates (0, 350, 700, 1050, 1400 seeds/m^2) on the germination and establishment of four prairie species (*Festuca roemeri*, *Eriophyllum lanatum*, *Erigeron speciosus* and *Potentilla gracilis* sown in a 1:1 grass:forb ratio). These seeding rates were used to determine the seed saturation level (rate at which no additional germination occurs due to lack of available space or resources) for each species. The experiment was replicated at three sites and in two seeding years. We measured germination and establishment as the density of each species during the first and second growing seasons post-

seeding. Additionally, we correlated habitat variables (bare ground, native richness, non-native richness) with germination and establishment rates to determine conditions that best predicted establishment. Restoration site and seeding year were significant for all species, while seeding method was not significant for most species and sites. Germination increased with increasing seeding rate, however seed saturation level was species- and site-specific. Germination was positively correlated with bare ground and native species richness. These results suggest that seeding methods may not alter establishment, but optimal seeding rates vary by species and site. Additionally, sufficient bare ground must exist at restoration sites prior to seeding to ensure successful native establishment.

ORAL

RESTORATION RELEASE OF OVERTOPPED OREGON WHITE OAK: 10-YEAR FINDINGS. **Constance A. Harrington**, USDA Forest Service Pacific Northwest Research Station, 3625 93rd Ave. SW, Olympia, WA 98512; Warren D. Devine, Engineering and Environment, Inc., Fort Lewis, WA 98433; charrington@fs.fed.us

Restoration of Oregon white oak savanna and woodland ecosystems that have been encroached upon by Douglas-fir begins with removal of the conifers from the overstory. Our objective was to evaluate the response of oak trees on four sites in western Washington to three release treatments relative to overtopping Douglas-fir. Treatments were: full release (remove all Douglas-fir within a radius equal to the oak's height), half release (remove Douglas-fir within a half-height radius), and thin only (stand-level commercial thinning of the Douglas-fir overstory; oaks not specifically targeted for release). Periodic diameter growth of oak trees in the full-release treatment was significantly greater (as much as 243%) than that in the other treatments and increased with time since treatment. Oak height and crown width growth rates were not influenced by treatment, but larger pre-treatment crown size was associated with greater post-treatment diameter growth and acorn production. Full release increased acorn production compared to thin only in years when region-wide production was moderate to high (5 of 9 years); half release increased production relative to thin only in fewer years (2 of 9) and to a lesser degree. Height growth of residual Douglas-fir trees was greater than that of oak in all treatments. Results indicate that long-suppressed Oregon white oak retain the capacity to rapidly recover following complete removal of a conifer overstory. A single-entry, complete release from overtopping conifers was effective in restoring overstory structure and composition, which is an initial step in restoring oak woodland or savanna systems invaded by conifers.

POSTER

SPATIOTEMPORAL ENCROACHMENT PATTERNS OF CONIFERS INTO SHRUB-STEPPE AREAS IN THE SINLAHEKIN WILDLIFE AREA, WASHINGTON STATE. **Emily Haeuser,** Mark E. Swanson, School of the Environment, Box 646410, Washington State University, Pullman, WA 99164-6410; emily.haeuser@email.wsu.edu

A century of fire suppression in the Pacific Northwest has caused notable shifts in the structure of conifer forests previously maintained by frequent, low-intensity fires. Ponderosa pine forests,

historically maintained by such fires as a shifting mosaic of mixed age, open understory, low-to-moderate-density stands interspersed with shrub-steppe areas, are just such a system. Without frequent fire, conifer encroachment into shrub-steppe habitat will occur. This study examines spatiotemporal patterns of conifer encroachment, and which landscape factors might influence establishment events in space and time. The study area is the Sinlahekin Wildlife Area (SWA) in a north-to-south running valley in north-central Washington. Four sampling areas were selected where significant encroachment events could be seen when comparing current and historic aerial imagery. Within each site, sampling plots were established at intervals along transects perpendicular to the perceived encroachment front. Tree age cores, tree diameters and stem counts were taken at each plot. Slope, aspect, profile, soil composition, distance along the encroachment wave, and Pacific Decadal Oscillation (PDO) indices were all investigated as potential factors influencing conifer encroachment and establishment. Preliminary results do not suggest a waveform encroachment sequence; rather, there is a signal of long-distance dispersal events, followed by infilling. These establishment events may be mediated by climate anomalies with long-term periodicity, such PDO. Managers of the SWA have recently begun to employ prescribed burn and thinning techniques. An objective of this study is to inform their efforts so as to maximize effectiveness of restoration activities.

ORAL

ONE HUNDRED YEARS OF OBSERVING TREE GROWTH AND MORTALITY IN THE WILLAMETTE NATIONAL FOREST, OREGON. **Mark E. Harmon**, Robert Pabst, Department of Forest Ecosystems and Ecology, 321 Richardson Hall, Oregon State University, Corvallis, OR 97331; mark.harmon@oregonstate.edu

Growth and mortality of forests are critical processes in controlling the mass of carbon and volume of wood in forests; however, these have rarely been observed for long periods of time, as most of our knowledge of forest growth comes from chronosequences of multiple stand ages. In 1910, three permanent plots (0.4 ha each) were established by T. T. Munger in a 56-year-old Douglas-fir dominated forest stand. The diameter at breast height (DBH) and occurrence of mortality was assessed on tagged trees at 5- to 10-year intervals for the last 100 years. The number of tree stems has generally declined over this period, although in the last 30 years there has been a small increase associated with regeneration and growth of shade-tolerant species such as western hemlock and western red cedar. Over time, diameter distributions have shifted from normal to uniform to a reverse-J shape in 2010. Annualized mortality, expressed as a percentage of stems, has declined 3-fold with occasional large increases. Biomass has increased linearly since 1910, which is at odds with theoretical predictions of a gradually slowing rate of biomass accumulation caused by increasing mortality and decreasing primary production. This unexpected pattern likely is due to the relatively low rates of tree mortality this stand is experiencing and suggests that live carbon accumulation in live trees has been underestimated by some modeling efforts. This study illustrates the value of long-term time-series observations as checks on both growth models and predictions from chronosequences of stand ages.

ORAL

CANOPY GAP SIZE AND THINNING INTENSITY AFFECT POST-PLANTING PERFORMANCE OF FOUR CONIFER SPECIES. **Timothy B. Harrington**, USDA Forest Service, PNW Research Station, Olympia, WA 98512; Warren D. Devine, Engineering and Environment, Inc., Fort Lewis, WA 98433; tharrington@fs.fed.us

The prairie colonization forests of Joint Base Lewis-McChord (JBLM) began to develop in the mid-1800s with suspension of Native American burning practices. These sites have been difficult to reforest after timber harvesting or natural disturbances because their coarse-textured, glacial-outwash soils dry out quickly early in the growing season. To meet a diversity of management objectives on dry sites such as these, variable-density thinning guidelines are needed that appropriately combine thinning of forest matrix with creation of canopy gaps. In 2009, a study was initiated on six sites at JBLM to compare three-year regeneration performance of four conifer species. Seedlings of each species were planted within circular canopy gaps of five sizes embedded within forest matrix thinned at two intensities. In the first year after treatment, light intensity (% of full sun) varied as follows: forest matrix (34%) < 0.1 ha gaps (59%) < 0.2-0.4 ha gaps (77-85%). Third-year survival of Douglas-fir and western redcedar did not vary consistently among gap sizes (70-85%), whereas survival of grand fir and western hemlock was lowest in 0.4-ha gaps (35 and 14%, respectively). For each species, the smallest and greatest values of stem diameter occurred in forest matrix and 0.3 ha gaps, respectively. Results indicate that regeneration of Douglas-fir and cedar was adequate within the full range of gap sizes, whereas regeneration of grand fir and hemlock was best in 0.1-0.3 ha and 0.1-0.2 ha gaps, respectively. Thinning intensity did not have a significant influence on species' responses to gap size.

ORAL

RELATIONSHIP BETWEEN LAKE WHATCOM ALGAL DENSITIES, WATER QUALITY, AND FILTRATION RATES AT THE BELLINGHAM WATER TREATMENT PLANT, WA. **Bowei He**, Robin Matthews, Huxley College of the Environment, Western Washington University, 516 High St., Bellingham, WA 98225; heb@students.wwu.edu

During the summer of 2009, the City of Bellingham experienced severe reductions in filtration rates at the City's water treatment plant (WTP), resulting in mandatory water conservation measures. Since then, summer filtration rates continue to approach critical levels. The slow filtration appeared to be associated with specific types of algae in the source water. In 2011 we conducted a study to identify the types of algae associated with filter clogging and to determine whether there were water quality indicators that could be used to predict slow filtration rates. Water and algae samples were collected 3x/week at the WTP screen house from June through November, 2011. Temperature and dissolved oxygen were measured at the site; alkalinity, conductivity, pH, turbidity, nutrients (total phosphorus, soluble phosphate, total nitrogen, nitrite/nitrate, and ammonium) and chlorophyll were measured in the laboratory. Algae were settled in counting chambers, then identified and enumerated. *Aphanocapsa/Aphanothece* (cyanobacteria), *Synedra*, and *Aulacoseira* (diatoms) were negatively correlated with filtration rates (p-values<0.05). Conductivity, alkalinity and total phosphorus were significantly negatively correlated with filtration rates, while turbidity, nitrite/nitrate and total nitrogen were

positively correlated with filtration rates. Alkalinity had the strongest correlation with filtration rate (Kendall's tau = -0.403, p-value<0.0001). Algae counts required approximately 3-4 days to process, whereas alkalinity measurements required less than 1 hour, which makes alkalinity a potential early warning indicator for filter clogging events.

ORAL

GRASSLAND AND OAK ASSOCIATED BIRDS IN THE PORTLAND REGION: A DRIVER FOR PROTECTION AND RESTORATION OF HABITAT. **David Helzer**, City of Portland Environmental Services, 1120 SW 5th Ave, Room 1000, Portland, OR 97204-1912; david.helzer@portlandoregon.gov. **Katy Weil**, Metro Natural Areas 600 NE Grand Ave., Portland, OR 97219-2736; Katy.Weil@oregonmetro.gov.

Two approaches will be discussed. 1) Few regulatory programs exist to address the loss of grasslands, oaks, and associated wildlife. Within the City of Portland, grassland bird communities endure despite the total loss of native prairies. The City uses documented presence of grassland-associated birds to map grassland habitat; species include western meadowlark, streaked horned lark, northern harrier, American kestrel, and short-eared owl. Although occupied sites are often dominated by non-native vegetation, important wildlife habitat functions are provided if key attributes are present: suitable size, open landscape context, low vegetation structure, and/or bare ground. In some cases, the City may require mitigation for impacts to these grassland habitats. The recently completed Airport Futures Land Use Update is an example project that concluded with a proactive outcome for grassland conservation. 2) Metro's Natural Areas program acquires, protects, and restores land within the Portland region -- approximately 16,000 acres to date. Bird use of these natural areas serves as a crucial performance measure to inform the scientists who manage the land and plan restoration. Thanks to vital information available on focal species, and recommendations for habitat management to benefit those species, land managers now have important tools for restoration planning within priority habitats. Use of bird monitoring in project planning will be discussed in the context of two natural areas. We will also discuss what next steps, including regional collaboration and recommendations from the scientific community, are necessary to improve conservation success for these species, and their associated habitats.

ORAL

CREATING HABITAT FEATURES IN FORMER TREE FARMS: EXAMPLES FROM THREE METRO NATURAL AREAS. **Kathryn T Holleran**, Metro, 600 NE Grand Ave, Portland, OR, 97232; kate.holleran@oregonmetro.gov

Metro has acquired thousands of acres of commercial tree farms to conserve wildlife habitat and water quality in the Multnomah, Clackamas, and Washington Counties of Oregon as part of two natural areas acquisition bonds (1995, 2006). We are investigating and implementing a range of habitat enhancements in these former commercial tree farms to introduce diversity and resilience to structurally simplistic forest stands. Created habitat features include snags, down wood structures, canopy gaps, and early seral patches. Recommendations for practices such as treatment timing, patch size and distribution, snag density, and underplanting will be presented. Examples will be drawn from forests in the Tualatin and Chehalem mountain ranges.

POSTER

PHYSIOLOGICAL RESPONSE OF INVASIVE IVY (*HEDERA* SPP.) TO THE SEASONAL LIGHT CYCLE: TAKING PHOTOSYNTHETIC ADVANTAGE OF WINTER CANOPY LOSS. **Laura Holloway**, Todd Rosenstiel, Department of Biology, Portland State University, PO Box 751, Portland, OR 97207; earual@gmail.com

Ivy (*Hedera* spp.) presents a management challenge in natural areas in the Pacific NW. Understanding seasonal patterns of physiology in this invasive species may be key to informing and improving current management strategies. In this study, we examined the seasonal patterns of vine growth, leaf photosynthetic capacity, leaf chlorophyll content, and specific leaf mass in populations of ivy growing in Marquam Nature Park (Portland, OR) under two canopy types that differed in seasonal light regimes: mixed coniferous-deciduous, and primarily coniferous. Growth rate of ground ivy was measured over one year at four plots; results from this study suggest that ivy takes advantage of increased light levels under mixed coniferous-deciduous forest in winter to fuel high spring growth rates. Ivy populations under mixed coniferous-deciduous canopies experienced increased winter light intensities and showed increases in specific leaf mass and greater vine growth rates following spring-time canopy closure, compared to ivy populations experiencing year-round low light levels under coniferous canopies. These results suggest that ivy likely takes advantage of increased winter light intensities, which contributes to the invasive success of ivy in mixed coniferous-deciduous woodlands. Work is currently underway to determine if hyperaccumulation of leaf nitrogen, a key factor influencing leaf photosynthetic rates, contributes to the invasive success of ivy. Understanding seasonal growth strategy of ivy can help improve management efforts and inform our ability to predict patterns of future expansion of this vigorous Pacific Northwest invasive species.

ORAL

POST-WILDFIRE SOIL AND DETRITUS CHANGES RELATED TO PREFIRE FOREST STRUCTURE. **Peter Homann**, Department of Environmental Sciences, Western Washington University, Bellingham, WA 98225-9181; Bernard Bormann, Ecosystem Processes Program, U.S. Forest Service, Pacific Northwest Forest Research Station, Corvallis, OR 97331; Robyn Darbyshire, Wallowa-Whitman National Forest, Baker City, OR 97814; Brett Morrissette, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR 97331; Peter.Homann@wwu.edu

We examined how prefire forest structure influences soil and detrital responses during the first decade following wildfire. Prior to wildfire, forest structure was experimentally altered by thinning and clearcutting in a southwestern Oregon forest dominated by mature Douglas-fir [*Pseudotsuga menziesii* var. *menziesii* (Mirb.) Franco]. Prefire fine woody debris (1−10 cm diameter) loads ranked clearcut > thinned > control. In the clearcut treatment, wildfire decreased fine woody debris to near zero, and there was no recovery in the following decade. In the thinned treatment, wildfire decreased fine woody debris to near zero, but it regained 20% of its prefire mass in the following decade, consistent with input from overstory trees, which suffered 94% mortality from wildfire. In the control, wildfire decreased fine woody debris by 70%, but it increased to its prefire mass during the following decade, consistent with input from overstory

trees, which averaged 47% mortality from wildfire. In the clearcut treatment, the O horizon was nearly totally consumed during the wildfire, but regained 30% of its prefire mass in the following decade via inputs from herbs, shrubs and small deciduous trees. In the thinned and control treatments, the O horizon decreased to near zero during wildfire, then increased substantially the following year as heat-killed needles from the overstory canopy were deposited on the surface. These results indicate the importance of different sources of detritus following wildfire in stands of varying structure. Projecting detrital and soil responses to wildfire requires this understanding of how prefire forest structure influences post-wildfire dynamics.

ORAL, PLENARY

EXPLORING THE INTERTWINE, INTEGRATING THE BUILT AND NATURAL LANDSCAPES IN THE PORTLAND-VANCOUVER METROPOLITAN REGION. **Mike Houck**, Executive Director, Urban Greenspaces Institute, P O Box 6903, Portland, OR 97228-6903; mikehouck@urbangreenspaces.org

This presentation describes the evolution of *The Intertwine*, the Portland-Vancouver region's system of parks, trails, and natural areas and the roles *The Intertwine Alliance* plays in expanding and managing this system. The Alliance is working to protect biodiversity and watershed health, inside and outside the region's urban growth boundaries, across the urban and rural landscapes. *The Intertwine* region encompasses 3,000 square-miles and extends from the north fork of the Lewis River in Clark County, Washington south to the Molalla and Pudding River watersheds and from the foothills of the coast range east to the Cascade Mountains. The presentation will also feature the recently released science-based *Regional Conservation Strategy* and *Biodiversity Guide for the Greater Portland-Vancouver Region*, a collaborative effort between the Alliance and multiple partners including the Institute for Natural Resources. *The Intertwine Alliance* is a coalition of nonprofit organizations, watershed councils, state and federal agencies, cities and counties, local park providers, and local natural resource agencies all of whom are working collaboratively to implementing *The Intertwine* Vision. The Alliance (www.theintertwine.org) is engaged in Conservation Education; Acquisition of Natural Areas and Trail Corridors; Active Transportation; Conservation; and defining the Regional System with local, state and regional park providers.

ORAL

CLIMATE CHANGE, OAK SAVANNAS, URBANIZATION AND WILDFIRE: DILEMMAS, TRADEOFFS AND APPROACHES FOR CLIMATE CHANGE ADAPTATION PLANNING. **Bart R. Johnson**, David W. Hulse, Department of Landscape Architecture, University of Oregon, Eugene, OR 97403; Max Neilsen-Pincus, Cody Evers, Institute for Sustainable Environment, University of Oregon, Eugene, OR 97403; Alan A. Ager, USDA Forest Service, Prineville, OR 97754; John P. Bolte, Department of Biological and Ecological Engineering, Oregon State University, Corvallis, OR 97331; bartj@uoregon.edu

Rapid environmental change poses challenges and opportunities for oak savanna conservation. Oak ecosystems require active management to prevent forest succession, which, in turn, requires

ongoing financial investment. Linking such investments to the provision of multiple societal benefits provides a more compelling case that they are justified. But actual outcomes are intrinsically bound up in uncertainties about what the future holds. To this end we developed a spatially explicit modeling system to explore potential synergies between oak restoration and fire hazard mitigation in the wildland urban interface of Oregon's Willamette Valley. We integrated an agent-based model of landowner decisions with models of forest succession and wildfire under projected climate change. We tested the model for the 50-year future under eight alternative scenarios comprised of two climate change models that bracket lower and higher impacts on vegetation and wildfire; two contrasting land use scenarios that accommodate a projected doubling of human populations; and two approaches to fire hazard management, one based on conventional fuels reduction treatments versus a mixed fuels reduction/oak restoration approach. Our results illustrate the uncertainties and tradeoffs society may face. Under lower climate impacts, future wildfire may be similar to that of the recent past; large investments in conventional fuels treatments have limited benefits. Under higher climate impacts, oak restoration better protects homes where it was applied than conventional treatments. However under the most extreme fire weather, it also may lead to larger fires that extend into untreated stands, increasing the risk to homes in those areas.

ORAL

A METHOD FOR RECONSTRUCTING GARRY OAK (*QUERCUS GARRYANA*) FIRE HISTORY USING COARSE WOODY DEBRIS. **David A. Jordan**, Geography Department, Trinity Western University, Langley, BC V2Y 1Y1; davidj@twu.ca

To improve the understanding of Garry oak savannah and woodland fire history, while building upon existing Garry oak tree-ring chronologies for southwestern British Columbia, a pilot project involving the dendrochronological assessment of coarse woody debris was conducted. The primary objective of this project was to determine if an accurately crossdated fire scar chronology could be reconstructed from Garry oak coarse woody debris. A fire scar chronology was constructed from full and partial Garry oak cross-sections that were opportunistically sampled from three locations, including the southern Gulf Islands, the east coast and southern tip of Vancouver Island. Thirty-nine fire scars were identified on 13 visually and statistically crossdated ($p < 0.01$) sections recording fire events from 1572 to 1907, representing 32 distinct fire years. Two sections from Saltspring Island were successfully crossdated with an existing master ring-width chronology extending the existing living tree-ring chronology backward in time by 17 years. Ten sections were used to create a new master ring-width chronology for southern Vancouver Island spanning the period 1562-2011, with an overall series intercorrelation of 0.458. Seasonality of historic fire events was determined by analyzing the intra-annual position of fire scars. All fire scars analyzed were classified as forming in either the late or dormant season. Fire return intervals were not calculated owing to the low sample number and the preliminary nature of the findings. This pilot project demonstrated the successful creation of a crossdated fire scar chronology from Garry oak coarse woody debris, extending tree-ring chronologies backward in time and gaining valuable dendroecological data.

ORAL

MACROLICHENS PRESENT IN THE PACIFIC NORTHWEST AND FLORIDA: ECOLOGICAL OBSERVATIONS AND NOTES ON BIOGEOGRAPHY. **Barry Kaminsky**, Lichen Curator, Boise State University, Dept. of Biological Sciences MS1515, 1910 University Dr., Boise, ID 83725-1515; barrykaminsky@boisestate.edu

In this presentation, the macrolichen flora of the Pacific Northwest and Florida is compared. Lichen flora was compared using the Consortium of North American Lichen Herbaria online portal and the book "Macrolichens of the Pacific Northwest." Twenty-two macrolichens are present in both regions. A few species such as *Leptogium cyanescens* (Rabenh.) Körber, *Coccocarpia erythroxyli* (Sprengel) Swinscow & Krog, and *Parmotrema crinitum* (Ach.) M. Choisy are common in Florida but not in the Pacific Northwest. However, most species present in the PNW and Florida are uncommon to rare in both locations (*Heterodermia leucomela* (L.) Poelt, *Candelaria concolor* (Dickson) Stein, and *Leptogium tenuissimum* (Dickson) Körber. One species, *Cladonia chlorophaea* (Flörke ex Sommerf.) Sprengel is common in the Pacific Northwest, but rare in Florida. While further study is needed to pinpoint precisely which abiotic and biotic variables control where these macrolichens grow in both regions, these observations suggest that a moderate climate (such as proximity to the ocean or in a dense forest with water) limits where some macrolichens grow in the Pacific Northwest. Studying abiotic and biotic variables of different ecosystems at opposite corners of the United States may provide additional information on habitat preference for some macrolichens throughout the United States and help locate additional populations.

ORAL

MANAGING MORE STORMWATER WITH GREEN INFRASTRUCTURE: LESSONS LEARNED PLANTING TREES IN PORTLAND, OREGON. **Jennifer Karps**, City of Portland Environmental Services, 1120 SW 5th Ave., Suite 1000, Portland, OR 97204; Jennifer.karps@ portlandoregon.gov

Each year the 37 inches of rain that falls in the city of Portland generates 10 billion gallons of stormwater, contributing to water quality and quantity issues and burdening the grey infrastructure. Green infrastructure elements reduce stormwater runoff by intercepting and infiltrating rainwater where it falls. Rising population and infill development increase the need for additional green infrastructure to help meet healthy watershed and clean river goals. In 2008, Portland's five-year, $55 million Grey to Green initiative heralded an unprecedented investment in green stormwater management: natural area improvement via land acquisition and restoration, and built environment improvement through culvert rehabilitation, ecoroof and Green Street construction, and tree planting. Grey to Green is the largest tree planting effort in the city since the Seed the Future campaign (1996-2001), and the largest city-funded urban tree planting effort to date. Five years in, the Urban Canopy Program (UCP) led by Environmental Services has invested in planting partnerships, community education, and data collection while helping plant more than 44,000 trees. Within the context of regulatory, policy, and socioeconomic constraints, the UCP works to enhance both the urban forest ecosystem and the services it provides. This presentation outlines strategies, achievements and lessons learned developing and implementing a city tree planting effort.

POSTER

MODELING RESTORATION TRAJECTORIES OF OLIGOHALINE TIDAL WETLAND ECOSYSTEM SERVICES IN THE PACIFIC NORTHWEST: A STUDY OF YOUNG'S BAY TIDAL RECONNECTION PROJECTS. **Sarah Kidd**, Alan Yeakley, Portland State University, School of the Environment, P.O. Box 751, Portland, OR 97207; sarah.kidd@pdx.edu

The objective of this study was to identify the rate of ecosystem service recovery in tidally reconnected oligohaline (salinity 0.5-5 ppt) wetlands on historically diked agricultural lands in the Columbia River Estuary. Global tidal wetland loss has resulted in severe declines in ecosystem functions and services including water quality regulation, climate regulation, fish and wildlife habitat, and cultural heritage. In the Pacific Northwest, reconnection and restoration of tidal wetlands is fundamental for restoring endangered salmonid habitat. However, the rates of ecosystem service recovery in these reconnected wetlands remains unclear. To identify rates of ecosystem recovery, a 53 year chronosequence of tidal wetland restoration sites will be evaluated to create functional restoration trajectory models. Evaluated projects will include sites hydrologically reconnected in 1959, 2002, 2005, 2006, 2008, 2010, 2012, 2013, and one site slated for restoration in 2014 all within the Young's Bay Watershed. These sites will be monitored for two years in conjunction with two diked pastures and two natural reference wetlands. Site monitoring will focus on evaluating plant community, carbon sequestration, soil development, and water quality. Regression and multivariate analysis will be conducted to evaluate if restoration trajectories toward reference levels can be observed. This research will provide insight into the major drivers and limiting factors of long-term tidal wetland ecosystem recovery. This information can be used directly by restoration practitioners, land managers, and tribes to identify if restoration outcomes are being achieved and provide insight to how projects can be adaptively managed to improve rates of ecosystem recovery.

POSTER

EXCAVATION OF A LATE PLEISTOCENE PROBOSCIDEAN TUSK BY HIGH SCHOOL STUDENTS AT FOUR MILE CANYON, BENTON COUNTY, WASHINGTON. **Gary Kleinknecht**, Kamiakin High School, Kennewick, WA 99336; Jim Dishon, Tri-Cities Prep, Pasco, WA 99301; Bill A. Mauldin, MCBONES Foundation, Kennewick, WA 99337; George Last, Pacific Northwest National Laboratory, Richland, WA 99354; Bax R. Barton, Burke Museum of Natural History and Culture and Quaternary Research Center, Seattle, WA 98195; gary.kleinknecht@ksd.org

The Mid-Columbia Basin Old Natural Education Sciences Foundation Research Center (MCBONES) sponsors community-based paleontological research in south central Washington, including funding major on-going excavations at the Coyote Canyon Mammoth Site, Kennewick, Washington. As part of the MCBONES educational outreach program, a proboscidean (cf. mammoth) tusk from a road cut in Four Mile Canyon (Benton Co., WA) was excavated by students from Tri-Cities Prep (TCP) under the supervision of instructor Jim Dishon (TCP), assisted by MCBONES staff. The tusk was discovered by MCBONES volunteer Mauldin in 2011. The tusk was a partial, highly fragmented, extensively leached and weathered proximal portion of proboscidean tusk, and was excavated (Spring 2012) as a learning exercise for the TCP students. The overall deteriorated condition of the tusk, coupled with its stratigraphic location on the hillside, suggest a relative age for this find of somewhere between the regional

L1 and L2 loess deposits. Studies by Richardson (1998) indicate that the terminal date for the accretion of L2 loess in eastern Washington occurs by roughly 35,000 ybp (years before present). In conjunction with this excavation, Dishon assigned 29 biology students to prepare end of semester projects on various topics related to paleontology in eastern Washington. These project reports were presented in class in May of 2012. Excavation of the tusk introduced the students to archaeological/paleontological methods and techniques, as well as local/regional theories of biogeography, paleo-climate and environmental change, evolution and extinctions. This poster documents the TCP excavations of the Four Mile Canyon tusk site.

ORAL

CONSERVATION OF WILLAMETTE VALLEY GRASSLAND BIRDS - AN UPDATE ON THE OREGON CONSERVATION STRATEGY'S EFFORTS TO RESTORE PRAIRIE HABITAT AND ITS ASSOCIATED SPECIES. **Ann Kreager**, Oregon Department of Fish and Wildlife, 7118 NE Vandenberg Avenue, Corvallis, OR 97330; ann.kreager@state.or.us

The dramatic decline in grassland bird species in the Willamette Valley resulted in the Oregon Legislature establishing a program that focused on restoring native prairie habitats and their associated species. With the emphasis primarily on sensitive grassland birds, the intent of the program has been to support implementation of the Oregon Conservation Strategy, a State Wildlife Action Plan dedicated to proactively conserving declining species and habitats throughout Oregon. Since its implementation in 2009, the Willamette Valley Grasslands Program (WVGP) has provided significant funding and ground support to individual landowners, Soil and Water Conservation Districts, and Watershed Councils, restored or enhanced over one thousand acres of habitat, and helped secure properties with conservation easements that will provide long-term benefit to native wildlife and plant species. Critical to the success of the program is knowledge of population trends and distribution of grassland birds, and cooperative partnerships able to implement complex and often costly projects. Efforts have ranged from conducting Valley wide grassland bird surveys to on-the-ground restoration. This presentation begins with a brief review of the WVGP's past accomplishments, describes the approaches taken to implement conservation actions, and follows with a discussion of current challenges and goals.

POSTER

NATIVE PLANT PROPAGATION PROTOCOLS FOR TEN PRAIRIE SPECIES. **Sarah Krock,** Center for Natural Lands Management, South Puget Sound Program, 120 Union Ave. SE #220 Olympia WA 98501; skrock@cnlm.org

Native plant propagation has emerged as a vital aspect in the conservation of endangered ecosystems such as the South Puget Sound Prairies. Research has shown that effective restoration must involve seeding or planting of native species once non-natives have been removed. As the capacity for land management agencies to work at larger scales has improved, the availability of native plant materials has become the primary limiting factor in the restoration process. Propagation methodologies need to be scientifically sound, but also cost effective and easy to replicate for both small and large producers. This study helps to establish effective

propagation protocols for ten important and challenging prairie species. Our study investigates four key aspects of plant propagation: imbibe time length, effects of smoke water on percent germination, stratification time length, and mychorrhizal inoculation post germination. Ideal imbibe time lengths have been determined for all ten species, varying between eight and twenty-four hours. Research into the effects of smoke water and stratification time on germination is on-going. Mychorrhizal inoculation trials will begin winter 2013. This poster presents our research methodologies and preliminary findings. At the conclusion of the experiment full propagation protocols will be disseminated throughout the scientific and management communities.

POSTER

TOP-DOWN CONTROL BY INSECTIVOROUS BIRDS DURING PRIMARY SUCCESSION ON MOUNT ST. HELENS. **Angela Kroon**, School of the Environment, John Bishop, School of Biological Sciences, Washington State University, 14204 Salmon Creek Avenue, Vancouver, WA 98686; angela.kroon@email.wsu.edu

Sitka willow (*Salix sitchensis*) is a foundation species on regions of Mount St. Helens undergoing primary succession, where it provides the only significant source of vertical structure. On the Pumice Plain, *S. sitchensis* is frequently suppressed by insect herbivores, particularly in upland areas, which in turn limits colonization by birds and small mammals. Through an exclusion experiment, we assessed the effects of top-down control by birds on *S. sitchensis* herbivore damage and biomass in plots of high and low willow density. One high- and one low-density plot were chosen from each of 2 sites on the Pumice Plain. Within each plot, 16 *S. sitchensis* plants were selected and assigned at random as bird exclosures, shade controls, open controls, or pesticide treatments. After 8 weeks, the probability of leaf damage by insect herbivores was greater in low-density plots. Further, this effect was strongly increased with exclusion of birds. However, for attacked leaves, no significant effects of density or bird exclusion were seen in the magnitude of leaf damage. This suggests that birds decreased the likelihood that an herbivore would feed on a given leaf but did not affect the amount of damage to the leaf once feeding had commenced. Arthropod surveys revealed that herbivores, particularly sapfeeders, were more common on plants in high-density plots from which birds were excluded. These patterns may be explained, in part, by bird abundance and diversity, which differed only in the western low-density plot.

POSTER

DEVELOPING A REGIONAL MAP OF OAK HABITAT: INTERTWINE ALLIANCE OAK MAPPING WORK GROUP. **Ted Labbe,** Kingfisher Ecological Services LLC, 6325 N Albina Ave #7, Portland OR 97217; Lori Hennings and Jonathan Soll, Oregon Metro, 600 NE Grand Ave, Portland OR 97232; Eric Nielsen, PSU Institute for Natural Resources, 2112 SW 5th Ave, Portland OR 97201-4908; ted.labbe@gmail.com

The Intertwine Alliance Oak Mapping Work Group (OMWG) is a multi-partner effort to develop a comprehensive map of Oregon white oak (*Quercus garryanna*) habitats for the greater Portland metro region. Although several oak mapping efforts have been conducted in or near the region,

they address various geographies, at varying levels of precision and accuracy. Owing to high biodiversity and imperilment of oak habitats, the Intertwine Alliance's new Portland-Vancouver *Regional Conservation Strategy* has prioritized development of region-wide maps to better guide future conservation efforts, including habitat connectivity. The OMWG has compiled existing data sets, is conducting field- and aerial photo-based mapping, and is investigating the feasibility of using remote sensing to map oak. We present preliminary oak distribution maps, summarize our progress to date, and illustrate potential applications for the data.

ORAL

URBAN MACROINVERTABRATES. Igor Lacan, Portland State University, University Honors Program, PO Box751, Portland, OR, 97207; ilacan@pdx.edu

Basic ecological principles, such as the interaction between plants and herbivores, remain applicable in urban areas, although these principles are frequently ignored, leading to outbreaks of pest insects. Using past and present insect outbreak examples, I discuss the importance of ecology to the management of urban forests and trees, and will demonstrate the use of host-insect relationships in creating a simple model that allows for an assessment of pest vulnerability. I also discuss the model-testing results from 50 California cities. Finally, I show a couple of "complications" to the urban ecological relationships: one a specific example involving aquatic insects and non-native trees (eucalyptus) and the other a more general example of the landscape patterns and urban tree mortality.

POSTER

MOUNT RAINIER GLACIAL MELTWATER HYDROCHEMISTRY AND MICROBIAL COMMUNITIES. **Kristiana Lapo**, Claire Todd, Amanda Harris, Matthew Hegland, Amy Siegesmund, Pacific Lutheran University, Tacoma, WA 98447; toddce@plu.edu

Mount Rainier is a geothermally active, glaciated peak. In this study, we analyze glacial meltwater hydrochemistry and microbial life as one way to evaluate geologic hazard potential and to characterize subglacial environments. We measured major ion concentrations in meltwater samples collected from streams at or near glacier termini in Mount Rainier National Park. Preliminary data show constant sulfate levels during the diurnal cycle, and low C-ratios (bicarbonate/[bicarbonate + sulfate]) at the Tahoma and Emmons Glaciers, which suggests a subglacial source of sulfate at both locations. Carbon Glacier meltwater contains relatively low levels of sulfate, with a significant decrease between the diurnal maximum and minimum, and a high C-ratio, which indicates a supraglacial source of sulfate. Tentative conclusions include that Tahoma Glacier meltwater is in contact with the mountain's hydrothermal system, which confirms findings from previous work. Our work also suggests a subglacial source of sulfate at the Emmons Glacier; if confirmed, this result may identify a connection between the subglacial environment and the hydrothermal system. Since microbes are reliant on the chemistry of the water in which they reside, it is likely that a link between hydrochemistry, geothermal activity, and microbial life exists. Thus, we also collected microbial samples at glacial meltwater sampling sites. Sequenced DNA of microbes found in glacial meltwater will provide additional insight into these complex environments.

ORAL

LATENT RESILIENCE IN PONDEROSA PINE FOREST: EFFECTS OF REINTRODUCED FREQUENT FIRE. **Andrew J. Larson**, Department of Forest Management, College of Forestry and Conservation, 32 Campus Drive, The University of Montana, Missoula, MT, 59812; a.larson@umontana.edu

Ecological systems often exhibit resilient states that are maintained through negative feedbacks. In ponderosa pine forests, fire historically represented the negative feedback mechanism that maintained ecosystem resilience; fire-exclusion reduced that resilience, thereby predisposing transition to a novel ecosystem state upon reintroduction of fire. We evaluated the effects of reintroduced frequent wildfire in unlogged, fire-excluded ponderosa pine forest in the Bob Marshall Wilderness, Montana, USA. Initial reintroduction of fire in 2003 reduced tree density and consumed surface fuels, but also stimulated establishment of a dense cohort of lodgepole pine, which maintained a trajectory towards a novel state. Resumption of a frequent fire regime by a second fire in 2011 restored a low-density forest dominated by large-diameter ponderosa pine by eliminating many regenerating lodgepole pines, and by continuing to remove surface fuels and small-diameter lodgepole pine and Douglas-fir that established during the fire suppression era. Our data demonstrate that some unlogged, fire-excluded ponderosa pine forests possess latent resilience to reintroduced fire. A passive model of simply allowing lightning-ignited fires to burn appears to be a viable approach to the restoration of such forests.

ORAL

LESSONS LEARNED IN REARING AND BREEDING TAYLOR'S CHECKERSPOT BUTTERFLY (*EUPHYDRYAS EDITHA TAYLORI*) AT THE OREGON ZOO. **Karen D. Lewis**, MaryJo Andersen, Oregon Zoo, 4001 SW Canyon Road, Portland, OR 97221-9704; Karen.Lewis@OregonZoo.org.

A captive rearing program for Taylor's checkerspot butterfly (*Euphydryas editha taylori*) was established at the Oregon Zoo in 2004. This paper reviews obstacles, lessons learned, and next steps in husbandry, rearing, mating, oviposition, and population management. Initial focus centered on scaling the project from a 1 person, "proof-of-concept" to a staffed facility producing thousands of animals. Once early hurdles were cleared, the bar was raised so captive reared individuals would more closely approximate wild individuals in size and phenology. The captive breeding program started in 2008; the first year we tested the feasibility of breeding and the following year there would not have been larvae to release without captive breeding. However, individuals can produce thousands of eggs (more than we can manage), which forced further refinement of our husbandry protocols. With assistance from the Population Management Center at Lincoln Park Zoo we developed a framework for managing the captive population. We share our existing strategies and our efforts to develop more proactive and balanced approaches to maintaining genetic diversity. Each year, we produce approximately 5,000 eggs to meet postdiapause larvae release goals and maintain the captive breeding colony. Habitat recovery efforts have led to expanded release opportunities and demand for additional animals. In 2011, under the Sustainability in Prisons Project, a second captive rearing facility was established, providing additional rearing capacity and associated challenges. Since inception, over 12,000 animals have been released to field sites and survival during most life stages averages in the 90th percentile.

ORAL

PEELING BACK URBAN LANDSCAPE COMPLEXITY AND ITS IMPACT ON THE PLANNING AND MANAGEMENT OF A MUNICIPALITY'S INFRASTRUCTURE AND NATURAL RESOURCES. **Mark Liebe**, Bureau of Environmental Services – Asset Systems Management, 1120 SW 5th Avenue, Room 1100, City of Portland, Portland, OR 97204; mark.liebe@portlandoregon.gov

As urban centers grow, densify, and develop more intricate and interrelated infrastructures, the characteristics of their original landscapes grow more obscure. What was once perhaps common knowledge becomes lost to some degree, leaving modern urban planners and engineers with less and less understanding of that original landscape, and the possible impacts that their activities may have on local hydrology, hydrogeology, and geomorphology. The purpose of this study was to develop methods to increase the general awareness of both vestigial landscape factors and the impacts of future urban development in a municipal planning and engineering setting using various presentation methods of advanced imagery, including LiDAR and other analytically-derived raster data. The results of these methods have met with some success in informing and redirecting development and management decisions. This paper will present the findings of that study and its resultant methods and tools, and will show specific examples where significant yet hidden landform features and geologic complexity would have otherwise been overlooked.

ORAL

GROUNDWATER RISK ASSOCIATED WITH INFILTRATION OF URBAN STORMWATER. **Torrey Lindbo**, Department of Environmental Services, City of Gresham, 133 NW Eastman Pkwy, Gresham, OR 97030; Matt Kohlbecker, GSI Water Solutions, Inc., 55 SW Yamhill Street, Suite 300, Portland, OR 97204; torrey.lindbo@greshamoregon.gov

Stormwater quality and volume have been identified as two of the biggest threats to the health of urban watersheds. While green infrastructure is becoming the favored method that stormwater management agencies use to control stormwater quality and quantity, some subsurface infiltration methods have been in use for the past 40-50 years. Stormwater piped to underground facilities, such as drywells and soakage trenches, are regulated as Underground Injection Control (UIC) devices under the Safe Drinking Water Act. The City of Gresham owns and operates 1,100 UICs. Stormwater data from around the State of Oregon, as well as data collected in the Portland/Gresham area shows that stormwater quality for many constituents meets SDWA drinking water standards. Fate and transport modeling was performed for some key pollutants, including lead, pentachlorophenol, phthalates and 2, 4-D (the most environmentally mobile and persistant of the common stormwater pollutants), to determine whether they might pose a risk to groundwater. Under vadose zone conditions specific to Gresham, the modeling results indicate all pollutants are attenuated to levels below detection within 5 feet. Further modeling demonstrated that stormwater injected directly into groundwater would be below background concentrations within 330 feet of a UIC. The findings from this data-driven model are currently being used to upgrade stormwater management devices within the city to protect groundwater, while also reducing the volume of water that would otherwise be discharged to sensitive streams which reduces flooding and erosion risks.

ORAL

TAYLOR'S CHECKERSPOT REINTRODUCTION: ADVANCES IN THE FACE OF ADVERSITY. **Mary Linders** and Gail Olson, Washington Department of Fish and Wildlife, 600 Capitol Way N. Olympia, WA 98501; lindemjl@dfw.wa.gov

State-endangered in Washington and proposed for federal listing as endangered, Taylor's checkerspot is one of many species at-risk in western Cascadia grasslands. Reduced to one population, Taylor's checkerspot butterfly (*Euphydryas editha taylori*) was nearly extirpated in the Puget lowlands, a region that remains the stronghold for native Westside grasslands of the Georgia Basin, Puget Trough, and Willamette Valley ecoregions. A female captured as a voucher specimen in 2003 laid eggs and launched a world of new potential. Yet hundreds of butterfly (re)introductions in the past century shed little light on a successful path (Oates and Warren 1990, Thomas 1989, Schultz et al. 2008). Similarly, the region's only extant site had limited resemblance to occupied sites elsewhere in the species' range. Undeterred, conservation partners joined forces and developed habitat restoration, captive rearing, and reintroduction programs to reduce the likelihood of extirpation. The reintroduction project objective is to establish at least three new checkerspot populations at three Puget lowland sites over the next decade. Since 2008, releases have resulted in juvenile and adult butterflies with apparently normal foraging, basking, mating and ovipositioning behaviors. Two years of release at one site produced peak single day abundance estimates comparable to the extant site when adjusted for site size. Releases were discontinued and numbers continue to rise. In contrast, while releases at a second site have produced and retained adult butterflies since 2008, that population has not increased so far. Long-term monitoring and population goals have been developed and will be discussed.

ORAL

WILLAMETTE UNIVERSITY'S ZENA FARM: SUCCESSES AND FAILURES IN RESTORING A HIGH DEGRADED UPLAND PRAIRIE. **Briana Lindh**, Erin Banks Rusby, Department of Biology, Willamette University, 900 State St., Salem, OR 97301. blindh@willamette.edu

Willamette University has undertaken restoration of 40 acres of university-owned upland prairie and oak savanna. The site was highly degraded, with slopes that had been terraced to facilitate plantings of *Pseudotsuga menzieii* and *Pinus ponderosa*, extensive cover of non-native *Cytisus scoparius* and *Rubus armeniacus*, dominance of open areas by *Agrostis* species, and a near total absence of native species. After cutting and herbiciding of woody species, a May broadcast application of glyphosate created fuels for July "spring" burns, followed by drill-seeding of *Festuca idahoensis* ssp. *roemeri* in November. Two-year post-burn monitoring in 60 1m square plots revealed patchy establishment of drill-seeded Roemer's fescue, with 6.5 clumps per m2, only 70% of plots occupied. *Agrostis* cover was 45% pre-treatment, 3 and 13% in the two prairie units a year after treatment, and 23% at the two-year point. However, a November follow-up application of Poast grass-specific herbicide appeared almost 100% successful at eliminating *Agrostis*. Most forb restoration has been done with plugs propagated on-site; December survival of plugs planted in March was 97% for Roemer's fescue and *Eriophyllum*

lanatum, 87% for *Potentilla gracilis*, and 60% for *Prunella vulgaris* and *Sidalcea malviflora*. November plantings yielded survival rates above 75% for the latter three species, while *Eriophyllum* and *Achillea* did poorly. *Cytisus scoparius* re-established extensively, reaching 15% cover (range 0-60%) two years after treatment. We recommend that in highly degraded upland sites, restoration budgets should explicitly contain money for follow-up applications of both grass specific and broadleaf herbicides.

ORAL

EARTHQUAKE RESILIENCE IN OREGON CITIES. **Ian P Madin,** Oregon Department of Geology, 800 NE Oregon St. #28, Portland, OR 97232; ian.madin@dogami.state.or.us

Decades of research on the Cascadia Subduction Zone confirm that Oregon faces a 10% chance of experiencing a magnitude 9 earthquake in the next 50 years. Most of the buildings in Oregon cities and most of the lifelines serving those cities were built with no knowledge of this earthquake threat; consequently, Oregon cities are highly vulnerable to severe damage and disruption when the next event occurs. Strong shaking and widespread ground failure, coupled with inherently weak structures and interdependencies between damaged systems mean that recovery of normal urban support functions will take many weeks at best, and more likely many months. These vulnerabilities are a function of geologic site conditions and the condition of the structure itself, and so can be readily evaluated in order to assess overall vulnerability and prioritize upgrades. A decades-long effort to strengthen our cities will greatly reduce the impact of the future earthquake.

ORAL

WHAT ARE THOSE CRAZY CANADIANS UP TO? A WHIRL-WIND TOUR OF CURRENT GARRY OAK AND ASSOCIATED ECOSYSTEMS PROJECTS AND INITIATIVES IN BC. **Kathryn Martell** and **Chris Junck**, Garry Oak Ecosystems Recovery Team, 209 606 Courtney St, Victoria BC, Canada, V8W 1B6; Kathryn.martell@goert.ca

The Garry Oak Ecosystems Recovery Team (GOERT) is a comprehensive partnership of experts from all levels of government, non-governmental organizations, academic institutions, First Nations, volunteers, and consultants, and has been implementing species recovery under an ecosystem-based recovery strategy for more than 10 years. With more than 100 species at risk (SAR), only fragments of the historical landscape remaining, and much of it on private lands (where there is no legislative protection for SAR), our approach has been to engage broad stakeholder involvement in managing for individual species at risk as well as the broader landscape. Some of the projects underway include 1) differentiated outreach products and approaches: stewardship work with private landowners; building partnerships with First Nations and local government; propagation and native plant workshops with nurseries, land managers, and landscape architects; and sharing targeted resources and approaches with land managers, including Model Bylaws, Best Management Practices, SAR training workshops, invasive species management case studies, and our Restoration Guide; 2) on-the-ground at-risk species protection projects, including several with "non-traditional" audiences such as golf courses and airports; translocations and reintroductions of Golden Paintbrush, Scouler's Catch-fly, White-top Aster,

Western Bluebird, and a proposed Taylor's Checkerspot captive rearing and reintroduction project; restoration projects that target key SAR (Coastal Vesper Sparrow, White-top Aster, Bear's-foot Sanicle); and 3) the partnerships that make this all possible. We will profile several of these initiatives and outline some of our nascent project ideas designed to build on them and fill critical knowledge gaps.

ORAL

PROTECTING RARE ECOSYSTEMS IN OUR COMMUNITIES: WORKING WITH LOCAL, REGIONAL, AND FIRST NATIONS GOVERNMENTS IN CANADA. **Kathryn Martell** and **Holly Clermont**, Garry Oak Ecosystems Recovery Team, 209 606 Courtney St, Victoria BC, Canada, V8W 1B6; Kathryn.martell@goert.ca

Garry Oak and associated ecosystems are among the most at-risk in Canada: less than 5% remain in near-natural condition, and there are more than 100 provincially or federally at-risk species dependent on them. Canada's federal *Species at Risk Act* does not automatically provide protection on provincial, local government, or private lands, making it critical to work with governments, developers, and private landowners to protect remaining sites. Over the past two years, GOERT's new Local Government / First Nations Liaison has been building partnerships, and we've created a suite of new resources targeted at stakeholders who directly influence development and land use in our communities. Our Priority Site Records Catalogue, a long-term GOERT project, fully describes remaining Garry Oak ecosystem sites, which are mapped according to ecological (not cadastral) boundaries. NatureServe methodologies are used to assess and rank each site based on representativeness, biodiversity, connectivity, and other criteria, which determine its priority for acquisition and stewardship. These site records are linked to our new Connectivity Conservation project, which has two main themes 1) identify critical networks for structural and functional connectivity at multiple scales, and 2) work with our local government and First Nations partners to address capacity constraints and initiate cross-jurisdictional connectivity planning. Through these two initiatives, we plan to provide local government staff and elected representatives, land managers, and community groups with a practical framework to identify key ecosystem patches and connections, and target their resources most effectively for protecting Garry Oak ecosystems and species.

ORAL

WHERE YOU ARE AND WHO YOU'RE WITH MATTERS: TOPOGRAPHY, PLANT COMMUNITY AND MANAGEMENT INFLUENCE LONG-TERM SUCCESS OF GOLDEN PAINTBRUSH OUTPLANTINGS. **R. Adam Martin**, Peter W. Dunwiddie, Center for Natural Lands Management, 120 Union Ave. SE, Olympia, WA 98501; randall.a.martin@gmail.com

Re-establishment of golden paintbrush (*Castilleja levisecta*) is a major restoration objective at many sites in the Pacific Northwest. In this study we assessed performance of outplanted plugs over five years at six sites in South Puget Sound. Specifically, we identified factors associated with increased survival, flowering, and new plant recruitment. Of the plugs planted in 2007, between 5 and 25% remain alive at the six sites. Three major factors influenced outplanting

success: topographic position within a prairie, the species growing in close proximity, and burn history. In the diverse topography of mounded prairies, deep-soiled swales and mounds had the highest rates of survival (59 and 44% respectively) compared to flat shallow-soiled topography (20%). We identified a suite of 14 species highly associated with long-term survival. Though survival and flowering varied between sites, in general these two traits were highest when plugs grew in close proximity to at least 5 of these associated species. Burning had variable effects on both stimulating new plant recruitment and plug survival. Fall burning immediately before planting increased long-term recruitment of new individuals, and tended to increase long-term plug survival. Survival of plugs post-fire varied with time since planting, plant life stage at time of fire, and site. These findings suggest recovery of golden paintbrush may be most successful in deep-soiled microsites, planted in association with a diverse suite of native species, and in sites burned within a year or two before planting.

ORAL

A STEP AHEAD OR A FEW STEPS BACK? CAN DIFFERENT IGNITION PATTERNS CHANGE RESTORATION OUTCOMES? **R. Adam Martin**, Sarah T Hamman, Center for Natural Lands Management, 120 Union Ave. SE, Olympia, WA 98501; randall.a.martin@gmail.com

Prescribed fire has become a foundational method for prairie restoration. In the prairies of the Willamette Valley-Puget Trough-Georgia Basin Ecoregion fire has been reintroduced as a tool for reducing non-native, invasive plant cover and to promote the growth and establishment of native plants and associated butterflies. Head or backing fires are the two primary methods used to complete prescribed burns, and the relative effectiveness of these two ignition patterns on invasive removal and native plant enhancement is unknown. We used observations from one prairie fire to see how ignition patterns affected fire intensity, severity, and post-fire plant communities, and if these changes helped to achieve the desired restoration objectives. We also evaluated how pre-burn vegetation composition influenced fire intensity and severity. We found the application of backing fires led to higher fire severity, which favored increases in cover of individual problem non-native forbs, while head fires promoted an increase in native species richness. Plant communities had a small influence on fire severity, but only during backing fire. Finally, we found specific plant species were associated with the different application methods. While both methods were successful at reducing the cover of invasive and introduced grasses, total non-native cover still increased across the burn unit, due to an increase in non-native forbs. If these patterns are repeatable across burns, using head fires may be more desirable than backing fires for managing invasive species and enhancing native species.

ORAL

INVASIVE ALIEN LICHENS IN URBAN ENVIRONMENTS OF THE PACIFIC NORTHWEST. **Bruce McCune**, Dept. of Botany & Plant Pathology, Oregon State University, Corvallis, Oregon 97331; Bruce.McCune@science.oregonstate.edu

Old herbarium records are so few for lichens in the Pacific Northwest that knowing which lichen species are aliens and which are native is not easy. Based on this limited herbarium data and

personal observations, several lichens appear to be of recent introduction and expanding in our area. *Lecanora conizaeoides*, one of the lichens most tolerant of SO_2 and acidification, is abundant in Europe, but sporadic in urban areas of Vancouver, Seattle, and Portland. Because of the limited distribution and absence of old records, this species appears to be non-native. This crustose, sorediate species has distinctive characteristics making field identification possible in many cases. *Xanthoria parietina*, a conspicuous yellow to orange species restricted to eutrophic (high nitrogen) habitats, has rapidly expanded in the last two decades in the Willamette Valley and also occurs sporadically in nitrogen-enriched habitats on the immediate Oregon coast. It is the only lichen I know that has dramatically increased in abundance in the Pacific Northwest in the last two decades. *Punctelia jeckeri* is known in Oregon only from urban, suburban and agricultural areas, but does not seem to be rapidly expanding nor can we be sure that it is non-native. Other widespread, pollution-tolerant species, such as *Physcia millegrana*, have apparently not yet arrived in Oregon and Washington.

ORAL

CREATION AND MANAGEMENT OF STREAKED HORNED LARK HABITAT. **Dr. Randy Moore**, Dept. of Fisheries and Wildlife, Oregon State University, Oak Creek Laboratory of Biology, 8840 NW Oak Creek Drive, Corvallis, OR, 97330. randy.moore@oregonstate.edu

Streaked horned larks (*Eremophila alpestris strigata*) require open landscapes containing relatively flat parcels of habitat with variable proportions of bare ground and vegetation of low stature. Where these basic requirements are met, larks occupy a variety of habitat types in western Oregon and Washington that include agricultural land (mostly OR), remnant glacial outwash prairie (WA), ocean foredune and accretion flat (WA), dredge spoil deposition sites, airports, construction sites (OR), and vernal wetlands (OR). Generally, lark habitat is created and maintained at perennially occupied sites by operational disturbance (e.g., plowing, airport mowing, etc.). Assuming that there are parcels available in a suitably open landscape, intentionally creating and maintaining streaked horned lark habitat will require very different strategies for introducing appropriate disturbance regimes for each of the occupied habitat types. This presentation will focus on discussion of basic requirements for creation and maintenance of lark habitat in each occupied habitat, projects that have resulted in the creation of such habitat either intentionally or serendipitously, and geographic prospects for new habitat management projects.

ORAL

THE NELSON'S CHECKERMALLOW RECOVERY PROJECT. Melanie Gisler and **Peter Moore**, Institute for Applied Ecology, P.O. Box 2855, Corvallis, OR 97339-2855; peter@appliedeco.org

Nelson's checkermallow (*Sidalcea nelsoniana*) is a threatened plant found in prairie habitats of the Willamette Valley. Since 2008, we have been developing a recovery model for this species involving large scale plant materials production and introduction on public and protected private lands. Our objectives are 1) to meet recovery criteria in the Corvallis West and Salem West zones (20,000 plants each), 2) determine the most successful propagules for introduction – seed,

plugs, or rhizomes, and 3) expand availability of introduction sites by including private lands enrolled in conservation easement programs. First, seed was collected from wild populations in both recovery zones and used to plant two production fields. More than 300 pounds of seed from these fields, and 29,000 plugs and rhizomes, were then planted at fourteen sites. Site preparation included herbicide treatments, mowing, prescribed fire, and companion plantings of native prairie species. Experimental plots were established at six sites to compare relative survival and cost effectiveness of the three propagule types. Results indicate recovery objectives have been exceeded for the number of checkermallows in both zones, though work is still needed to improve overall habitat quality at some sites. Preliminary data suggest, overall, seeds achieved the highest number of plants, but not at all sites; plugs had the most consistent establishment rates. We have demonstrated Nelson's checkermallow has excellent potential for delisting using a model that includes genetically-diverse plant material, large production fields, public and private introduction sites, and adequate funding for site management.

ORAL

STREAKED HORNED LARK AND A SPECIAL RULE UNDER ESA §4(d): A CASE STUDY OF FEDERAL EFFORTS TO ADDRESS REGULATORY RISK TO MAINTENANCE-DEPENDENT SPECIES ON PRIVATE LAND. **Adam Novick**, Environmental Studies Program, University of Oregon, Eugene, OR 97403; anovick@uoregon.edu

At various times, in various ways, and to various degrees, the US Fish and Wildlife Service has recognized and attempted to address risk to maintenance-dependent species from species-based land-use regulation. Citing currently proposed rulemaking for streaked horned lark as a case study, I argue that the Service might have found an effective and efficient mechanism to address this risk under federal law and might have an opportunity to improve the survival of such species by more fully considering its use.

ORAL

TRANSLOCATION OF MAZAMA POCKET GOPHERS IN WESTERN WASHINGTON. **Gail Olson**, Washington Department of Fish and Wildlife, Olympia, WA 98501; Tammy Schmidt, Washington Department of Fish and Wildlife, Lakewood, WA 98498. gail.olson@dfw.wa.gov

The Mazama pocket gopher (*Thomomy mazama*) was listed as threatened by the state of Washington in 2006, and has been a Federal candidate for listing since 2001. In 2009, we initiated a study to determine the feasibility and effectiveness of using translocations to create new populations of Mazama pocket gophers in western Washington. Over 3 years, we moved 565 pocket gophers from the Olympia Airport to West Rocky Wildlife Area, an unoccupied site less than 10 miles away. We used radio-telemetry to determine immediate post-release survival and fidelity, and mark-recapture to estimate survival to the spring breeding season and beyond. First year translocations initially had high post-release mortality rates but changes in release methods significantly improved survival in that year and subsequently. In 2011, nearly 50% of translocated animals survived from their fall release to the 2012 spring breeding season. In general, survival of released animals after the first breeding season at the new site was high

(approximately 65%), as was survival of animals produced on site (48%). Productivity, defined as the ratio of new animals to females from the previous year, was low in 2010 (1.3 recruits/female) but more than doubled in 2011 (2.8 recruits/female). The spring breeding population was estimated at 22 individuals in 2010, and increased each year to about 110 in 2011 and 267 in 2012. We discontinued translocations after 2011 but will continue to monitor the new population through 2014 to document its growth.

ORAL

HISTORIC COLONIZATION OF SOUTH PUGET SOUND PRAIRIES BY DOUGLAS-FIR AT JOINT BASE LEWIS-MCCHORD, WASHINGTON. **David H. Peter**; Timothy B. Harrington, USDA Forest Service, PNW Research Station, Olympia, WA 98512; dpeter@fs.fed.us

Native Americans used fire to maintain extensive prairies in the Puget Lowlands of western Washington, but few of these prairies remain partly due to forest encroachment. We used tree species, density and diameter data from 1800's General Land Office Surveys to describe the historical condition of prairies and associated timbered areas at six sites at Joint Base Lewis McChord. Modern stands were described with stem density, Reineke stand density index (SDI), and site index calculated from pre-harvest plot data. After harvest we measured decadal tree ring increments on 242 stumps to reconstruct stand development. We plotted individual breast high diameter (dbh) growth curves to illustrate patterns of regeneration among the sites. The principal successional trend was increasing Douglas-fir density although it was the dominant tree throughout succession. Much tree establishment occurred in waves from 1878-1938. The cause of these regeneration waves is obscure, but because climate varies little over these sites, a lack of wave synchronicity among the sites argues against a climatic explanation. Tree ring scars may implicate wildfires with some waves. We found 2 patterns of tree invasion: "episodic" (distinct waves) and "continuous" (indistinct waves). Sites with continuous regeneration had higher crown heights, site indexes, SDI, lower dbh growth rates and a weaker relationship of dbh growth to age and SDI than sites with episodic regeneration. Our successional reconstruction shows how Douglas-fir forests developed from prairies and open woodlands in response to cessation of anthropogenic burning and how they are likely to respond to subsequent silvicultural treatments.

POSTER

CATALOGING AND VISUALIZING COMPLEX FOREST STANDS USING LIDAR DATA **Fox Peterson**, 3119 ALS Hall, Oregon State University, Corvallis, OR 97321; Judy Cushing, Evan Hayduk, The Evergreen State College, 2700 Evergreen Pkwy, Olympia, WA 98505. Fox.Peterson@oregonstate.edu

Aerial LiDAR data have been used extensively for describing and quantifying canopy cover and forest structure because they provide a scale-invariant estimation of forest biomass. Additionally, LiDAR visualizations can help illustrate forest structure and composition. However, validating remotely-sensed LiDAR metrics against ground-truthed measurements and developing analytical tools and visualizations is critical for both research and management. We analyzed tree height and stand composition on long-term remeasurement plots on a small watershed in Oregon's

Cascades. We identified individual trees and inventoried tree heights using a LiDAR tree-delineation approach (*TreeVaW*), comparing our results with field catalogued individual trees. *TreeVaW* identified 2,810 of 3,407 trees observed in surveys (82.48%). Since landscape simulations can help assess the potential impact of land-use decisions, e.g., forest harvest or mitigation, we also visualized the LiDAR returns as a simulated landscape. Using individual tree measurements from *TreeVaw*, we created conical models of trees with the *Processing* computer graphics language and visualized stand composition, stem position, and canopy gaps at a plot scale. We observed that *TreeVaw* identified more trees and predicted heights more accurately where the overstory was homogeneous and where canopy gaps were present than where stand composition was complex. Researchers might use these findings to refine analysis software such as *TreeVaW* and visualizations such as ours might improve communication between researchers and decision-makers. We conclude that LiDAR data with tools such as *TreeVaW* and *Processing* produce simple 3D visualizations that could sometimes replace expensive stand-level surveys, but that further refinement is needed for complex stands or topography.

PAPER

CALICIALES SUCCESSIONAL DYNAMICS AND SPECIES DIVERSITY ON CABINS AT THE OPAL CREEK ANCIENT FOREST CENTER, OREGON. **Kate Petersen, Lillian Hynson, Jesse Brown-Clay,** Lalita M. Calabria, The Evergreen State College, 2700 Evergreen Pkwy, Olympia, WA 98505; Kelli Johnston, Erol Chandler, Amanda Ulbrich, Environmental Science and Management Department, Portland State University, Portland, OR; John Villella, Siskiyou BioSurvey 324 Avery St., Ashland, OR 97520**;** petkat19@evergreen.edu

Our study aims to evaluate Caliciales colonization rates and species diversity on cabins at the Opal Creek Ancient Forest Center located in the Opal Creek Wilderness, Oregon. Caliciales, or "pin lichens," can be used as bioindicators of forest health and continuity because their distribution is limited to old-growth legacy features such as old trees and snags. Little is known about their habits of substrate colonization. We surveyed lignicolous pin lichen diversity on 17 cabins that were built between 1930 and 2009. All the cabins were constructed with untreated conifer wood that was cut and milled on-site. This gives us an unprecedented opportunity to evaluate Caliciales species on a chronosequence of conifer substrate within a larger old-growth forest habitat. Our results indicate a positive correlation between pin lichen diversity and age of substrate and provide insight into the successional dynamics of Caliciales in Pacific Northwest forests.

ORAL

CLIMATE CHANGE IMPACTS ON BIODIVERSITY IN PACIFIC NORTHWEST PRAIRIES: SHIFTS IN PLANT RANGES AND FUNCTIONAL GROUP COMPOSITION**.** **Laurel Pfeifer-Meister**, Scott D. Bridgham, Timothy Tomaszewski, Lorien L. Reynolds, Maya E. Goklany, Chelsea J. Little, Hannah E. Wilson, Institute of Ecology and Evolution, University of Oregon, Eugene, OR 97403; Bart R. Johnson, Department of Landscape Architecture, University of Oregon, Eugene, OR 97403; lpfeife1@uoregon.edu

Climate change is a leading threat to global biodiversity, and is further exacerbated by other changes such as invasive species. As species' shift their distributions in response to changing climate, protected areas may no longer support some of the species they were designed to conserve. Successful management must consider these changing distributions and how they may result in novel community assemblages, particularly when considering the impact of introduced species. We used a manipulative climate change experiment (increased temperature and precipitation) embedded within a natural climate gradient to examine (1) the demographic responses of 12 prairie species with range limits within the PNW and (2) shifts in plant community composition at three restored upland prairies. For the 12 species, warming decreased recruitment even at the coolest edge of their current ranges, but this effect disappeared when they were moved poleward beyond their current ranges. These results are consistent with predictions that many species will need to expand their ranges poleward to successfully maintain viable populations. Over two years, warming also resulted in significant shifts of functional groups. Warmed plots had higher abundance of annuals and introduced species, and became more similar to their southern counterparts over time. Increased precipitation had minimal effects on range-limits or community composition. Our results highlight the need for conservation planners to (1) consider shifting species distributions and the potential need for assisted migration with future climate change, and (2) rethink the intensity of management needed to maintain native species and/or reassess feasible targets for restoration quality.

ORAL

BUTTERFLY MONITORING AND PRAIRIE-OAK RESTORATION: A NEW PROJECT AND APPROACH. **Ann Potter**, Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501; ann.potter@dfw.wa.gov

Prairies and oak woodlands in western Oregon and Washington support over 60 species of butterflies, including regional endemics, proposed and listed endangered species, and 11 species identified in their respective state's Wildlife Action Plans as Species of Greatest Conservation Need (SGCN). Much of the remaining prairie and oak woodland is the focus of intensive habitat restoration and enhancement activities. In many cases, butterflies are the target species intended to benefit from restoration. Management actions are often necessary to support prairie-oak systems; however, those actions can directly harm butterflies extant in treatment areas. Few prairie-oak restoration projects assess the response of butterflies to restoration. In one element of the recently initiated prairie-oak restoration project, *Conserving State Strategy Species in Pacific Northwest Prairie and Oak Habitat*, we will be monitoring the suite of SGCN prairie-oak butterflies to assess the effects and effectiveness of butterfly targeted habitat treatments. Our objective is to determine if butterfly occurrence, abundance, or use, change in association with restoration activities. Using a variety of methods, including area search and larval counts we will monitor SGCN butterflies known or suspected to occur in or near restoration units and a common grassland dependent butterfly for 1-2 years prior to treatment and 2 years post-treatment. This project funds restoration efforts and corresponding butterfly surveys on 26 sites located in the Willamette Valley and throughout the Puget Trough. Restoration treatments are scheduled for 2013, and butterfly monitoring will continue through 2015.

POSTER

BUTTERFLY ABUNDANCE AND DIVERSITY AMONG UPLAND PRAIRIE, OAK SAVANNA, AND OAK WOODLANDS IN THE WILLAMETTE VALLEY, OREGON. **Breanna F. Powers**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331-3830; breanna.powers@oregonstate.edu

In the Willamette Valley, prairie-oak butterfly species are rapidly declining as a result of loss and degradation of prairie-oak ecosystems upon which obligate prairie-oak species rely. Butterflies are important for ecosystem integrity because they provide services such as pollination, prey species, and decomposition. The objectives of my research are to examine butterfly species richness and abundance across three different stand types of prairie, oak savanna, and oak woodlands and with measured environmental variables. I established a minimum of 20 circular variable plots (8 m^2) along line-transects 12 study sites and collected data on butterfly abundance and species diversity. Butterfly density and species richness was highest at prairie sites and lowest in the oak woodland sites. Preliminary results show that stand types differ in butterfly community structure significantly (MRPP; p=0.046) but this difference is small (A=0.07). A Bray-Curtis ordination was used to determine correlations in butterfly community composition relative to stand type and environmental variables. The three most important variables explaining variation in butterfly structure are canopy cover (r= -0.727), elevation (r= -0.527), and bare ground (r=-0.544). These finding should guide long term management efforts for the restoration or conservation of remnant prairies, oak savannas, and oak woodlands in the Willamette Valley.

ORAL

IMPACTS OF CLIMATE CHANGE ON DISCHARGE OF THE TUCANNON RIVER, WASHINGTON: HYDROLOGIC MODELING BASED ON TOPOGRAPHICALLY CORRECTED REGIONAL CLIMATE DATA. **Sarah Praskievicz**, Department of Geography, University of Oregon, Eugene, OR 97403; praskiev@uoregon.edu

Anthropogenic climate change significantly affects river flow, particularly in snowmelt-dominated basins in which warmer temperatures result in more winter rainfall and the accumulation of a smaller snowpack, leading to higher winter and lower summer discharge. In these mountainous basins, local topography strongly affects temperature and precipitation, and these orographic effects are not resolved by the smooth topography of general circulation models (GCMs) that are used to simulate future climate change, or even by the regional climate models (RCMs) often used to dynamically downscale GCM output for impact analysis. Here I develop and apply a method for topographically correcting RCM data for use in hydrologic modeling of a mountainous basin. I calculate local topographic lapse rates from the Parameter-elevation Regressions on Independent Slopes Model (PRISM), an 800-m monthly dataset based on regressions of observed climate against topographic variables. I then use these lapse rates to topographically correct two types of regional climate data: the North American Regional Reanalysis (NARR) and the North American Regional Climate Change Assessment Program (NARCCAP). Comparison of the topographically corrected NARR data with station data indicates that the method has positive skill. I run the calibrated and validated Soil and Water

Assessment Tool (SWAT) hydrologic model for the Tucannon River Basin in Washington using observed, NARR, and baseline and future NARCCAP data. Comparison of modeling results allows for determination of the sensitivity of the hydrologic model to the driving climate data and the likely response of Tucannon River discharge to future climate change.

ORAL

ANTHROPOGENIC INFLUENCES ON EPIPYTIC FUNCTIONAL BIODIVERSITY ACROSS AN URBAN TO RURAL AIRSHED. **Hannah M. Prather**, Todd N. Rosenstiel, Sarah M. Eppley, Department of Biology, Portland State University, Portland, OR 97201; Nancy E. Broshot, Environmental Studies Department, Linfield College, McMinnville, OR 97128; pratherh@pdx.edu

Epiphytic lichens are exceptionally sensitive to regional changes in air quality and are often used as indicators of regional ecosystem degradation. Because epiphytic lichen communities contribute to a wide range of ecosystem services, air pollution induced shifts in epiphytic community composition could have significant impact on the ecology and function of Pacific Northwest forests. Here we examine the shift in epiphytic community composition across an urban to rural air quality gradient in Portland, Oregon. Three research sites with varying distance (0km, 74km, and 109km) from urban center were sampled and epiphytic community composition was quantified. As predicted, ground-based surveys showed a pronounced shift in epiphytic community composition with distance from urban center. Eutrophic lichen species increased with proximity to urban center, while oligotrophic and cyanolichen species both decreased with proximity to urban center. The results observed here are similar to observations made in other regional bioindication studies. However, the pronounced shift in epiphytic community we observed downwind of the Portland metro region suggests that urbanization and urban air pollution may have significant and surprisingly far-reaching impacts on rural forested ecosystems in the Pacific Northwest. The impact of an altered arboreal epiphytic community on regional ecosystem services will be discussed.

POSTER

WHAT GEOLOGIC EVENT(S) KILLED THE CIRCA 2,300 YR B.P. SUBMERGED OR BURIED SUBFOSSIL TREES AT MULTIPLE SITES IN AND NEAR THE PUGET LOWLAND, WASHINGTON USA? **Patrick T. Pringle,** Christina A. Williams, Centralia College Science Dept., 600 Centralia College Blvd., Centralia WA 98531; ppringle@centralia.edu.

Buried or submerged subfossil trees can record the timing of prehistoric earthquakes, landslides, or volcanic eruptions. Eight km northeast of Olympia, Washington, a subfossil tree in Woodland Creek in the intertidal zone of southernmost Henderson Inlet yielded a radiocarbon age of 2,260 ±70 yr B.P. on wood ~60 rings in from bark. Using skeleton plots and measurements, we compare the tree rings of the Woodland Creek tree with those of subfossil trees having similar radiocarbon ages from the intertidal zone at Point Wilson near Port Townsend (2,280 ±40 yr B.P.), buried in the Skagit River floodplain ~10 km north-northeast of Mount Vernon, Washington (2,200 ±60 and 2,260 ±40 yr B.P.), and in a debris avalanche deposit ~2 km southeast of Glacier, Washington (2,340 ±60 yr B.P.). Do these radiocarbon ages permit

correlation with megathrust event N, a great earthquake on the Cascadia Subduction Zone note by Atwater and others (2004)? More evidence of possible tectonic disturbances at this time include coseismic subsidence at Serpentine Fen southeast of Vancouver B.C. (Mathewes and Clague, 1994), paleoliquefaction in the Fraser River delta (Clague, 1992), and a possible turbidite event in Lake Washington between 2,200–2,400 yr B.P. (Karlin and Abdella, 1992). Additionally, large volcanic eruptions at Mount Rainier (WA) and Meager Mountain (BC) have similar ages. There is a great deal of evidence for significant geologic events ~2,300 yr B.P. in Cascadia. Calibration of the radiocarbon ages, tree-ring studies, and further investigations at each site should help reveal more details about these events.

POSTER

MIMA CREEK PRESERVE: BECOMING A POTENTIAL RELEASE SITE FOR OREGON SPOTTED FROGS. **Maureen Puffer**, Center for Natural Lands Management, 120 E. Union Ave #220, Olympia, WA 98501; mpuffer@cnlm.org

Mima Creek Preserve, a property owned by The Nature Conservancy and managed by the Center for Natural Lands Management (CNLM), is 150 acres of wet meadow, emergent vegetation, open water, and woody riparian vegetation along the Black River in the South Puget Sound Region of Washington State. This site was historically used for agricultural and grazing, and today is being restored for wildlife. The Black River has small populations of the state threatened and federal candidate, Oregon Spotted frog (OSF) (*Rana pretiosa*), and a goal for the site is reintroduction of this species. Oregon spotted frog populations have decreased along with the wetland habitat they require. The Black River sustains one of three populations of OSF found in Washington. CNLM in partnership with Cedar Creek Correction Center, Oregon Zoo, Woodland Park Zoo, Washington Department of Fish and Wildlife, and others are working toward developing protocols for captive rearing and recovery of the species. Current reintroduction efforts are focused on Joint Base Lewis-McChord, although Mima Creek Preserve is a candidate site for future reintroduction. In preparation, CNLM has been monitoring the three different wetland habitats for the last four years to reveal the native species assemblages and identify any invasive and predatory species present. Thirty to sixty funnel traps were placed in the different habitats during amphibian breeding intervals. No OSF have been captured during the monitoring; however, five species of native amphibians and five native fish species were found. In October 2011, five acres of several shallow ponds were sculpted and are being enhanced by the planting of emergent vegetation, providing OSF oviposition habitat. Additional efforts include the control of invasive species such as reed canary grass. Efforts continue to obtain captive reared OSF for reintroduction to Mima Creek.

ORAL

FIRE BEHAVIOR AND EARLY SUCCESSION WITHIN THE SCHULTS FIRE AREA. **Susanne Ranseen,** Oregon State University, Corvallis, OR 97331; susanne.ranseen@ oregonstate.edu

Fire is an integral part of Ponderosa pine forest in the American southwest. These ecosystems are influenced by frequent low-severity surface fires, but the exclusion of fire has changed fire regimes in these forests to infrequent high-severity crown fires. By examining the Schultz Fire as a case study, I hoped to gain further understanding of how management practices have affected fire severity levels and how the forest structure was affected by such a disturbance. The

main objectives of this study were to determine: (1) the driving factor(s) behind the Schultz Fire: topography, fuels, or weather; (2) whether tree density was correlated with severity; and (3) whether post-fire species richness two years after the Schultz Fire was related to severity. There was no statistically significant relationship between tree density and fire severity levels found in this study. The main factors that influenced the rapid spread and high severity of the Shultz Fire, based on modeling, were high winds combined with the presence of high surface fuel loads. There was a statistically significant relationship between species richness and severity level. The Schultz Fire demonstrates that the combination of high fuel loads and high winds can create high severity crown fires that have an impact on ecosystems and communities.

ORAL

BROMUS TECTORUM LITTER ALTERS PHOTOSYNTHETIC CHARACTERISTICS OF BIOLOGICAL SOIL CRUSTS FROM SAGEBRUSH STEPPES**. Eric Roberts**; Marcelo Serpe; Roger Rosentreter, Department of Biological Sciences, Boise State University, Boise, ID 83725-1515; mserpe@boisestate.edu

Invasion of sagebrush steppes by the grass *Bromus tectorum* has increased the amount of vegetation litter covering biological soil crusts, which could affect their metabolism and growth. To investigate this possible phenomenon, crusts dominated by the moss *Bryum argenteum* or the lichen *Diploschistes muscorum* were covered with *B. tectorum* litter (litter treatment) or left uncovered (control treatment) and exposed to natural field conditions. After periods of five and ten months, we removed the litter and compared photosynthetic characteristics of crusts from the two treatments. In both *B. argenteum* and *D. muscorum*, crusts that had been covered with litter for ten months had lower rates of gross photosynthesis and lower chlorophyll content than control samples. Similarly in both crust types, litter reduced the rate of dark respiration. For *D. muscorum*, this reduction fully compensated for the decrease in gross photosynthesis, resulting in similar net photosynthesis rates in the two treatments. In contrast, for *B. argenteum*, net photosynthesis was four-times greater in the control than the litter treatment. Also under litter cover, *D. muscorum* showed two adaptations to shade conditions: a decrease in the light compensation point and in the chlorophyll *a*/*b* ratio. These changes were not apparent in *B. argenteum*. Our results indicate that photosynthetic responses to litter cover vary among species of the crust biota and that the litter can reduce the photosynthetic capacity of biological soil crusts. These results help to explain field observations of decreases in crust cover and changes in crust composition with increases in litter cover.

POSTER

KIN RECOGNITION IN A DIOECIOUS GRASS. **Sally R. Rogers**, Sarah M. Eppley, Center for Life in Extreme Environments and Department of Biology, Portland State University, P.O. Box 751, Portland, OR 97207-0751; srrogers@pdx.edu

It has been shown that organisms have the ability to identify neighbors based on relatedness and alter their interactions with neighbors accordingly. Recently it has been shown that plants have the ability to recognize neighboring roots as self/non-self or kin/stranger via volatile compounds and root exudates. This recognition allows roots to compete or cooperate with neighboring roots potentially resulting in an allocation shift of resources within a plant. In this study, we used

Distichlis spicata, a perennial saltmarsh grass that exhibits extreme Spatial Segregation of the Sexes (SSS) in which males and females occupy different patches of nearly 100% males or 100% females, to determine the response of plant roots when exposed to liquid media previously occupied by another plant. Plants were grown in sterile liquid media for one week and then exposed to liquid media from a self, kin or stranger plant for a week. We were also able to determine root responses to plants subjected to media from a same sex or opposite sex competitor. Overall, we found that relatedness of plants affected root morphology. The type of competitor (intra-sexual vs. inter-sexual) plants were subjected to had a significant effect on overall fitness. These data suggest that not only can *D. spicata* recognize differences in relatedness via root interactions, but is also able to determine and respond to sexual competition through interactions within the rhizosphere.

POSTER

BROMUS TECTORUM LITTER ALTERS PHOTOSYNTHETIC CHARACTERISTICS OF BIOLOGICAL SOIL CRUSTS FROM SAGEBRUSH STEPPES. Eric Roberts; Marcelo Serpe; **Roger Rosentreter**, Department of Biological Sciences, Boise State University, Boise, ID 83725-1515; mserpe@boisestate.edu

Invasion of sagebrush steppes by the grass *Bromus tectorum* has increased the amount of vegetation litter covering biological soil crusts, which could affect their metabolism and growth. To investigate this possible phenomenon, crusts dominated by the moss *Bryum argenteum* or the lichen *Diploschistes muscorum* were covered with *B. tectorum* litter (litter treatment) or left uncovered (control treatment) and exposed to natural field conditions. After periods of five and ten months, we removed the litter and compared photosynthetic characteristics of crusts from the two treatments. In both *B. argenteum* and *D. muscorum*, crusts that had been covered with litter for ten months had lower rates of gross photosynthesis and lower chlorophyll content than control samples. Similarly in both crust types, litter reduced the rate of dark respiration. For *D. muscorum*, this reduction fully compensated for the decrease in gross photosynthesis, resulting in similar net photosynthesis rates in the two treatments. In contrast, for *B. argenteum*, net photosynthesis was four-times greater in the control than the litter treatment. Also under litter cover, *D. muscorum* showed two adaptations to shade conditions: a decrease in the light compensation point and in the chlorophyll *a*/*b* ratio. These changes were not apparent in *B. argenteum*. Our results indicate that photosynthetic responses to litter cover vary among species of the crust biota and that the litter can reduce the photosynthetic capacity of biological soil crusts. These results help to explain field observations of decreases in crust cover and changes in crust composition with increases in litter cover.

ORAL

LICHEN COVER AS AN INDICATOR OF FOREST HEALTH: THE CEDARS OF LEBANON. **Roger Rosentreter**, 1910 University Drive, Department of Biological Sciences, Boise State University, Boise, ID 83725-1515; roger.rosentreter0@gmail.com

Lebanon is well known for their cedar trees (*Cedrus*), which are a symbol of the country and appear on the national flag. The cedar forests occur on calcareous soils at higher elevations,

where seven nature reserves have been established for forest protection. Outside of the reserves, the cedar forests are overgrazed and have been converted to perennial, invasive forb communities. The cedar forest habitats have experienced a warming climate, which has changed abiotic conditions to favor growth of some lichen species. Some of the individual cedar trees in the Ehden Reserve are growing poorly. The cedar trees with impaired health and slow growth are limited to specific ecological sites. They become a stable substrate for lichens, so lichen cover greatly increases on these particular trees. This indicates poor forest health for the evergreen cedar trees.

ORAL

A LITERATURE REVIEW OF MIGRATORY AND RESIDENT BIRD USE OF ARTHROPODS IN GARRY OAK HABITATS. **David A. Ross**, Partners for Fish and Wildlife Program, U.S. Fish and Wildlife Service, 1936 California Ave., Klamath Falls, OR 97601; dave_ross@fws.gov

A literature search was conducted to determine the trophic relationships between arthropod and avian populations in Garry oak (*Quercus garryana*) habitats. The literature search revealed no peer-reviewed papers documenting the relationship between arthropod populations and avian diversity in Garry oak habitats. I did locate six papers revealing high bird diversity or other high bird connectivity to Garry oak habitats. I did not locate any publications documenting arthropod populations of Garry oak. I located 14 peer-reviewed papers documenting an association between bird diversity or high bird occupancy of other western oak species (primarily *Q. gambelii* and evergreen *Quercus)*. I located two peer-reviewed papers that discussed high diversity or numbers of arthropods on western oak habitats. I located one paper that documented a relationship between bird densities and insect availability as prey in western oak woodlands. I documented 11 papers documenting trophic relationships between arthropod and bird populations in oak (*Quercus* spp.) habitats in Eastern North America and Western Europe. Examples of *Quercus* habitats where trophic relationships between arthropod and avian populations have been documented will be briefly discussed. The results of this literature search suggest that further investigation into arthropod populations and their trophic relationship to migratory and resident bird populations in Garry oak habitats may be warranted.

ORAL

BUILDING CAPACITY FOR RESEARCH WITH CITIZEN SCIENTISTS: CLACKAMAS WATERSHED ASSESSMENT—A STUDENT WATERSHED RESEARCH PROJECT. **Mary Ann Schmidt**, Environmental Sciences and Management, Portland State University, Portland, OR, 97207; maryanns@pdx.edu

The purpose of the Portland State University (PSU) Clackamas Watershed Assessment was to obtain and test samples from various streams of the Clackamas watershed to answer questions about water quality. The ongoing monitoring project, which is in its fifth year of data collection, is composed of qualitative and quantitative tests to examine the physical and chemical properties of the watershed. In addition, macroinvertebrate analysis has been conducted to provide further insight into stream health. The quality assurance team for this project, PSU

Senior Capstone students, was trained using the Riparian and Aquatic Ecosystem Monitoring: A Manual for Lab and Field Procedures. This publication was developed by local water resource management agencies, Clean Water Services, DEQ, US Geological Survey as well as PSU faculty and local educators. The Student Watershed Research Project has been providing opportunities for student led research for over 20 years.

ORAL

FENDER'S BLUE BUTTERLFY COLONIZATION OF NEWLY RESTORED HABITAT AT THE NATURE CONSERVANCY'S WILLOW CREEK NATURAL AREA. **Cheryl Schultz**, Rhiannon Thomas, and Joey Smokey, Washington State University, 14204 NE Salmon Creek Ave, Vancouver, WA 98686; Matt Benotsch, The Nature Conservancy, 87200 Rathbone Rd., Eugene, OR 97402, Elizabeth Crone, Harvard Forest, Harvard University, Petersham, MA 01366; schultzc@vancouver.wsu.edu,

Habitat restoration is central to recovery planning for Fender's blue butterfly (*Plebejus icarioides fenderi*), an endangered butterfly restricted to Oregon's Willamette Valley. The Nature Conservancy has been vigorously pursuing *de novo* restoration of abandoned agricultural areas adjacent to extant Fender's blue butterfly populations at their Willow Creek Natural Area Preserve in Eugene, Oregon. Since 1999, restoration has been initiated across 46 acres of habitat, including 37 acres of a large 42 acre field known as "the Hayfield" in the central part of the preserve. Restoration efforts at the Hayfield include patchy plantings of Kincaid's lupine (*Lupinus oreganus*), hostplant for Fender's blue, and a diversity of native nectar species. By systematically searching all lupines for Fender's blue butterfly eggs for the past 5 years, we document exponential growth of the Fender's blue population in this field since restoration expanded to the field-scale in 2007, and colonization of the lupine patches farthest from the source population by 2012. Lessons learned from this project will be helpful in guiding future restoration efforts for Fender's blue.

ORAL

EVIDENCE FOR AN ANCIENT SCENT-BASED "PLANT-POLLINATOR-LIKE RELATIONSHIP BETWEEN MOSSES AND MICROARTHROPODS. **Erin E Shortlidge**, Todd N Rosenstiel, Sarah M Eppley, Department of Biology and Center for Life in Extreme Environments, Portland State University, 1719 SW 10th Ave, SRTC rm 246, Portland, OR 97201; eshort@pdx.edu

In non-vascular plants, sexual reproduction requires that unicellular free-motile sperm travel across the terrestrial landscape from male to female reproductive structure. In moss species with separate sexes, this may seem a difficult task, yet the majority of mosses retain separate sexes (unlike angiosperms) and still sexually reproduce. Recent data suggest that microarthropods can disperse sperm in mosses. However, little is known about what drives this relationship, including what chemical communication, if any, is involved in the interaction. Also unknown is the relative importance of microarthropod sperm dispersal as compared to abiotic dispersal agents in mosses. Here we show that tissues of the cosmopolitan moss *Ceratodon purpureus* emit complex volatile scents, similar in chemical diversity to those described in pollination

mutualisms between flowering plants and insects, and that the volatile metabolomes of *C. purpureus* are sex-specific. Interestingly, we found that common moss-dwelling microarthropods (Collembola) are differentially attracted to these sex-specific moss volatile cues. Furthermore, using experimental microcosms, we discovered that microarthropods significantly increase moss fertilization rates, as evidenced by sporophyte production, even when in the presence of water spray, thus highlighting the important role of microarthropod dispersal in contributing to moss mating success. Taken together, our results indicate the presence of a scent-based "plant–pollinator-like" relationship between two of Earth's most ancient terrestrial lineages, mosses and microarthropods. These data lay the groundwork for future study on the factors influencing and sustaining this transport-mutualism, a relationship likely occurring among moss systems worldwide.

ORAL

REINTRODUCING WESTERN BLUEBIRDS TO OAK-PRAIRE HABITAT IN THE PACIFIC NORTHWEST. **Gary Slater**, Ecostudies Institute, PO Box 703, Mount Vernon, WA 98273; Bob Altman, American Bird Conservancy, 311 NE Mistletoe, Corvallis, OR 97330; Kathleen Foley, San Juan Preservation Trust, Friday Harbor, WA; Kathryn Martell, Garry Oak Ecosystems Recovery Team, 209–606 Courtney Street, Victoria, BC V8W 1B6; glslater@ecoinst.org.

Since 2007, we have worked to restore a regional population of Western Bluebirds (*Sialia mexicana*) to their former range in western Washington and southwestern British Columbia. This secondary cavity-nesting and migratory species was considered common in the region in oak-prairie habitats during the early 1900's, but populations began disappearing in the mid-1900s due to habitat loss and fragmentation and competition for nest cavities. On San Juan Island, a five-year reintroduction program released 125 individuals, 99 adults and 35 juveniles, from 2007 to 2011. Birds were placed in outdoor aviaries in appropriate habitat and held for one to three weeks. We conducted demographic monitoring to evaluate reintroduction success. During the translocation period, population size increased annually and reproduction and survival estimates were similar between the reintroduced population and high-quality reference populations, indicating support for reintroduction success. In 2012, the first post-translocation year, population size declined and reproduction output was low, presumably due to cold and wet weather conditions during the breeding season. On Vancouver Island in the Cowichan Valley, a pilot study in 2012 released 8 adults and 9 young. At least two pairs initiated nest-building and one pair successfully fledged young. Partners intend to release > 80 adults to this region in the next 4 years. Overall, demographic monitoring indicates success in the establishment of bluebirds on San Juan Island, but also highlights the vulnerability of this small population. Reintroduction on Vancouver Island will expand and strengthen the viability of the regional population.

ORAL

REGIONAL COORDINATION OF PRAIRIE SEED PRODUCTION. **Sierra Smith,** Center for Natural Lands Management,120 Union Ave. SE #207, Olympia, WA 98501; ssmith@cnlm.org

The South Puget Sound area boasts on-going collaborative successes in the conservation and restoration of rare prairie habitat and several associated federal and state-listed endangered species. Regional restoration and conservation goals blur political boundaries and allow for greater impact, but require active coordination and compromise between conservation partners. South Puget Sound prairie restoration is occurring over a dozen sites owned and managed by 10 different entities, including local, state and federal agencies, non-profits and private citizens, while seed production for this regional restoration is conducted by the Center for Natural Lands Management. This requires that conservation partners come together regularly to identify desired species and production targets. Seed is then grown, processed and stored in jointly funded facilities. Allocation of the seed is determined by a committee of partners and local experts based upon need and mutually developed priorities. Coordination of these priorities, needs and expectations requires diligence and communication, and sharing of resources necessitates compromise and requires partners to embrace regional goals. The joint nature of this effort allows pooling of resources and an economy of scale not available to any individual partner, which results in greater conservation gains for all.

ORAL

ASSESSING WILLAMETTE VALLEY GRASSLAND SPECIES USING NATURESERVE'S CLIMATE CHANGE VULNERABILITY INDEX. Tom Kaye and Ian Pfingsten, Institute for Applied Ecology, P.O. Box 2855, Corvallis, OR 97339; Trevor Taylor and **Emily Steel**, City of Eugene Parks and Open Space Division, 1820 Roosevelt Boulevard, Eugene, OR 97402; tom@appliedeco.org

To preserve rare grassland species, manage and restore grassland habitat, and maintain communities resilient to climate change, land managers and restoration practitioners in the Willamette Valley (WV) should proactively incorporate climate change considerations into both planning and management actions. We utilized NatureServe's Climate Change Vulnerability Index (CCVI) to investigate the climate change vulnerabilities of 31 native species including rare plants and butterflies, nectar plants significant to butterfly conservation, and prairie species commonly used in restoration. Six federally-listed and four federal species of concern (USFWS 2010) were assessed at Willamette Valley and range-wide scales. The CCVI combines downscaled climate data, landscape setting, and abiotic factors of a geographic area (WV) with a suite of factors pertaining to species' biology to derive climate vulnerability. We modeled vulnerabilities under three climate change scenarios representing optimistic conditions (B1), moderate climate change (A1B), and severe climate change (A2) to understand the range of potential future effects by 2050 as predicted by the CCVI. The CCVI model returns categorical, qualitative vulnerability rankings for each species. Under moderate to severe climate change scenarios, butterflies ranged from "presumed stable" to "highly vulnerable," listed plants generally ranged from "presumed stable" to "moderately vulnerable," and western pond turtle was "presumed stable." Nectar plants and prairie restoration species ranged from "presumed stable" to "highly vulnerable." The CCVI is a rapid assessment method which incorporates several factors while also requiring many assumptions, but allows land managers to obtain a broad sense of species' climate vulnerability.

ORAL

LANDSCAPE SCALE BIRD AND VEGETATION MONITORING TO ASSESS AND GUIDE OAK RESTORATION. **Jaime L. Stephens**, Klamath Bird Observatory, P.O. Box 758, Ashland, OR 97520; jlh@klamathbird.org

Ecological monitoring is a critical component of evaluating current restoration and guiding future projects. In addition to measuring changes to composition and structure of vegetation, birds provide an excellent monitoring tool. To add value to individual restoration projects, restoration and associated monitoring should incorporate a landscape level approach. Monitoring projects should include collecting data both before and after restoration and the use of spatial controls. Survey points should be established to maximize statistical rigor while minimizing confounding factors (i.e. edges, roads). Designs should strive for adequate sample size which will differ based on the variance in your system. Data management is a critical component of monitoring and a sound system will add value to monitoring data making them available for broad scale meta-analyses. Current oak/bird habitat relationships were incorporated into the restoration guidelines for the Central Umpqua Mid-Klamath Oak Habitat Conservation Project and monitoring was designed to evaluate restoration success and inform future planning. We established a Before-After-Control-Impact (BACI) design to monitor changes in the bird community in response to oak restoration in southern Oregon and northern California. This study is designed to determine whether 1) relative abundance of common species and/or oak woodland focal species and 2) community composition differed before and after treatments or differed on treated and untreated oak woodlands. Results from monitoring will aid future actions at the study sites and in combination, will inform future restoration efforts.

ORAL

DEVELOPING AND IMPLEMENTING AN OREGON WHITE OAK RELEASE PROJECT IN SENSITIVE HABITAT. **Elaine Stewart**, Chris Hagel, Adam Stellmacher, Metro Natural Areas Program, 600 NE Grand Avenue, Portland, OR 97232; Elaine.stewart@oregonmetro.gov

More than 95 percent of the Willamette Valley's Oregon white oak (*Quercus garryana*) woodlands, savannas and upland prairies have been lost and remaining stands are threatened by land conversion and neglect. Fire suppression during the last 150 years facilitated invasion by Douglas-fir and other trees that shade and kill oaks. Fuel loading often exceeds historic conditions and without treatment the risk of a stand-replacement fire is high, even for oak woodlands. The Willamette Narrows complex has some of the largest remaining stands of Oregon white oaks in the north Willamette Valley and about 40 species of rare native plants occur there. We sought to remove competing trees to release oaks, improve stand health, reduce fire risk and improve habitat for associated plants and wildlife. We used literature on locally occurring oak-associated wildlife, metrics developed by The Nature Conservancy for Oregon white oak woodlands, personal knowledge of the site and experience with other oak release work to develop the project plan. Formal surveys of breeding birds and herbaceous vegetation documented pre-treatment conditions. Treatments were conducted in fall 2012 on more than 90 acres of oak woodland. More than 650 trees over eight inches dbh were treated as well as hundreds of smaller trees that were not measured. About 100 fir trees greater than 20 inches dbh were retained as snags, and more than 200 trees were placed in other habitats nearby for down wood. Wildlife and vegetation monitoring will resume in spring 2013.

ORAL

INTEGRATING PRAIRIE HABITAT INTO TRAILS CROSSING URBAN ENVIRONMENTS TO ASSIST DISPERSAL. **Elaine Stewart,** Robert Spurlock, Metro Natural Areas Program, 600 NE Grand Avenue, Portland, OR 97232; Elaine.stewart@oregonmetro.gov.

Urbanization may block dispersal of native wildlife and plants at a time when climate change may require organisms to shift their ranges. Development in the northern Willamette Valley is becoming contiguous from the Coast Range to Cascade Range. The network of riparian corridors, parks and natural areas within the urban area is essential for many species to begin needed movements and range shifts. However, organisms requiring open habitat will not be served by wooded corridors and patches. For them, urbanization's east-west extent may be a barrier. Improvements in open habitats such as power line corridors may increase permeability for open country wildlife and plants. Metro and partners are taking this approach with the Westside Trail, which follows a north-south power line corridor for approximately 19 km from the Tualatin River to the Willamette River near Sauvie Island. A master plan for resolving gaps in the trail is near completion and includes a habitat restoration toolbox. For example, pollinator and prairie plant recommendations include native plant lists, guidance for providing food throughout the season, size and spacing of planted areas, and designing plantings to be seen by pollinators. Other subjects include modifying switchbacks on steep terrain to accommodate small animals and designing crossings (including bridges) to enable safer movement for wildlife. Incorporating conservation information at the master plan level presents an opportunity to apply the tools and provide habitat along the full length of the trail corridor regardless of the jurisdiction that ultimately develops and maintains a given trail segment.

POSTER

NEW ENVIRONMENTAL AND RADIOCARBON EVIDENCE FOR THE AGES OF TWO HOLOCENE LANDSLIDE-DAMMED LAKES IN THE SOUTHERN WASHINGTON CASCADE RANGE, USA. **Colleen Suter**, Patrick T. Pringle, Centralia College Science Dept., 600 Centralia College Blvd., Centralia WA 98531; Robert L. Schuster, U.S. Geological Survey, retired, Golden, CO 80401; colleen.suter@student.centralia.edu

We investigated two landslide-dammed lakes in the southern Washington Cascade Range. Glacier Lake, 9 km southeast of Packwood, Washington, is dammed by a rockslide-debris avalanche from Angry Mountain. Pringle and others (1998) reported a radiocarbon age of 660 ±60 yr B.P. (cal 1185–1440 yr CE; 2σ, k=1.6) on a snag rooted in the lakebed ~11 m below highest lake level. This is a maximum age because the snag lacked bark. To estimate the rockslide's minimum age, we cored seven well-established Douglas-firs (*Pseudotsuga menziesii*) growing on the deposit and evaluated surficial ash layers. Ash from Mount St. Helens (CE late 1479) lies atop the rockslide deposit. The oldest tree had ~543 rings; however we adjusted for the time needed for seedlings to germinate and reach the height of the core samples (colonization time gap or CTG). Previous work on CTGs for disturbed areas at Mounts Rainier, St. Helens, and Hood by Pierson (2006) indicated an ecesis time of at least 14 years; thus, a probable minimum age for the Glacier Lake rockslide is ~CE 1455 ± 20 years. Knupenberg Lake, 2.5 km west of White Pass, Washington, is dammed by a rockslide-debris avalanche from Hogback

Ridge. Our new radiocarbon age on a submerged snag in the lake is 1503 ±24 yr B.P. (cal 434–492, 507–519, 528–642 yr CE; 2σ, k=1.6). Dating of landscape disturbances such as landslides is crucial to understanding the environmental and geologic history of a region, particularly that of past earthquakes.

ORAL

PROPOSED ENDANGERED SPECIES STATUS FOR THE TAYLOR'S CHECKERSPOT BUTTERLY. **Theodore B. Thomas,** U.S. Fish and Wildlife Service, 510 Desmond Drive SE, Lacey, WA 98503. ted_thomas@fws.gov.

In October 2012, the U.S. Fish and Wildlife Service published a proposal to list as endangered the Taylor's checkerspot butterfly (*Euphydryas editha taylori*) and to designate critical habitat for this rare, endemic subspecies. Historically, the butterfly was known to occur on outwash prairies of Puget Sound, shallow-soil balds, coastal grassland bluffs, and grassland openings within a forested matrix in Oregon, Washington and British Columbia. The subspecies' distribution has been reduced rangewide from 80 locations to its present distribution of 13. I will present the factors that threaten the species leading to this proposal to list the subspecies under the Endangered Species Act. Conservation efforts have involved numerous county, state, federal, and non-governmental organizations who have partnered to improve landscape conditions for the subspecies. We work with our conservation partners to reduce threats, acquire property, conserve and improve habitat through restoration treatments that are designed to sustain low stature grassland and forb-dominated landscapes. We have targeted restoration of several potential and historically occupied locations to enable translocation of captive bred larvae. Given the fragmented arrangement of remnant grassland patches, we consider captive breeding and translocation efforts as the primary method available to assist with migration of this subspecies onto new suitable habitat within its historic range. At present, we are in the process of reviewing comments to the proposal, producing the economic analysis for the proposed designated critical habitat, and developing the final rule for publication in October 2013.

ORAL

TRANSLOCATION OF WESTERN GRAY SQUIRRELS TO SOUTH PUGET SOUND: ADVANCING THE SPECIES RECOVERY EFFORT IN WASHINGTON. **Matthew Vander Haegen**, Gene Orth, Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia WA 98501; matt.vanderhaegen@dfw.wa.gov

The western gray squirrel (*Sciurus griseus*) is listed as threatened in Washington and currently exists in 3 disjunct populations. Of these, the Puget Trough population faces the greatest extinction risk as a result of declining numbers and altered habitat. The recovery plan for western gray squirrels in Washington lists augmentation of the Puget Trough population as a high priority both to increase the genetic diversity of the population and to expand the area of occupied habitat to provide a buffer against catastrophic loss. From 2007-2012 we translocated 93 western gray squirrels from other populations in Washington and from Oregon to Joint Base Lewis-McChord, a 35,000 ha military reservation that contains some of the last oak-prairie and ponderosa pine

woodlands in western Washington. We monitored squirrels with radio-telemetry to assess movements, survival, and reproduction. Most (>90%) radio-marked animals remained on the Base, with many females settling in the general area of release. Survival of radio-marked animals was high (0.64 annual survival; n = 49) and was comparable to survival of resident western gray squirrels monitored on the Base. All radio-marked females that survived to the spring following their release showed indications of reproduction and produced an estimated 35 young from 2009 to 2011. Recent advances in forest management on the Base and focused habitat improvements such as scotch broom control and prescribed burning should continue to expand habitat suitable for western gray squirrels. Continued occupancy by squirrels and expansion into nearby habitat will be monitored in future years.

POSTER

STRONTIUM ISOTOPIC SIGNATURES IN MAMMOTH MOLARS FROM SOUTHEASTERN WASHINGTON. **Brenda Villasenor**, University of Washington, 42409 Haggett Hall, Seattle, WA 98195-0042; George V. Last, Eirik Krogstad, Pacific Northwest National Laboratory, P.O. Box 999, MSN K6-81, Richland, WA 99354; Bax R. Barton, University of Washington, Box 351360, Seattle, WA 98195-1360; george.last@pnnl.gov

Strontium isotopic analyses were conducted on an upper right 5th molar (T-66) from a Columbian mammoth found in 1966 in loess deposits in the Horse Heaven Hills south of Kennewick, Washington, and a modern bovine molar found on scabland north of Basin City, Washington. Various spot analyses of $^{87}Sr/^{86}Sr$ were measured on the mammoth tooth enamel using laser ablation single and multi-collector inductively coupled plasma mass spectrometry (ICP-MS). *In situ* Sr measurements yielded $^{87}Sr/^{86}Sr$ ratios of 0.7119±0.0001 and 0.7113±0.0001 for root enamel from growth plates #3 and #6, respectively. This compares with a $^{87}Sr/^{86}Sr$ ratio of 0.71106±0.00001 measured in the modern bovine enamel. All three results are relatively high compared to $^{87}Sr/^{86}Sr$ ratios from the Columbia River basalt bedrock (ca. 0.704 to 0.707). Clearley reported a lower $^{87}Sr/^{86}Sr$ ratio (0.709634±0.000011) in mammoth molar enamel from a peat bog near Salem, Oregon. The elevated ratios are reflective of values reported for glacial outburst flood deposits (ca. 0.7095 to 0.) and what might be expected in older crystalline rocks (granites, gneisses and schists) of northeastern Washington, Idaho and Montana. These glacial outburst flood deposits have also given rise to the thick loess deposits that blanket eastern Washington. Thus, the bioavailable Sr in flood deposits and loess of eastern Washington may be similar, and it may be difficult to differentiate mammoths indigenous to southeastern Washington from those washed in from northern Washington, Idaho, and Montana.

ORAL

LICHEN COMMUNITIES OF QUERCUS GARRYANA IN WASHINGTON STATE. **John Villella**, Siskiyou BioSurvey, 324 Avery St. Ashland, OR 97520; Daphne Stone, Stone Ecosurveys, 30567 LeBleu Rd. Eugene OR; Lalita Calabria, Greg Eide, The Evergreen State College, 2700 Evergreen Parkway NW, Lab I 1065, Olympia, Washington 98505; Katherine Glew, Lichen Collection, Herbarium, Box 355320, University of Washington, Seattle, WA 98195; jvillella@siskiyoubiosurvey.com

Macrolichen diversity on *Quercus garryana* (Garry oak) was investigated to establish a baseline of lichen occurrence for the substrate in Washington. We compiled records from our fieldwork, herbaria collections and other Washington oak lichen studies to evaluate the rarity of observed species and potentially rare species. The known ranges of some oak-associated species are expanded within Washington and occurrences of several species new to the state are reported. We identified 102 lichen taxa, 24 of which occurred at only one site and three species, *Fuscopannaria pulveracea*, *Placidium* sp. and *Collema quadrifidum*, which are reported for the first time for Washington. We report three additional species *Bryoria furcellata*, *Dendriscocaulon intricatulum* and *Waynea californica* that are known from oaks on two or fewer sites from Washington prior to this study. We conclude that several species are likely rare or uncommon in our study area and we recommend that land managers and state agencies consider the effects of habitat restoration activities on the persistence of these lichen species. We discuss the effects of management practices on lichen diversity and abundance at specific sites and suggest species of interest for future conservation efforts. We also collected data on lichen species diversity and abundance in air quality monitoring plots in order to assess the threat level from increasing air pollution to lichens at these sites.

ORAL

RELATIONSHIPS BETWEEN URBAN LAND USE TYPES AND COMPOSITION OF RIPARIAN VEGETATION COMMUNITIES 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

Community composition of riparian vegetation adjacent to small streams can differ substantially in urban and rural areas. While urbanization in general is known to affect riparian communities, the relationships between specific types of urban land use in a watershed and riparian vegetation is still not clear. The purpose of this study was to determine relationships between urban land use types within a watershed and the vegetation composition of riparian communities. Thirty-one riparian areas of small streams were studied in the Portland-Vancouver metro area. Streams were randomly selected and vegetation was surveyed during summer of 2011. Land use within each watershed was determined using ArcGIS and data provided by city and regional governments in the study area. Landscape metrics were calculated at three scales: within the watershed delineated from the study site, within 200 meters of the study site, and within 500 meters of the study site. Linear regression and ordination were used to determine relationships between land use metrics at different scales and cover by different vegetation types in the riparian area. Results show relationships between land use type at different scales and vegetation cover. Non-native vegetation was strongly associated with low-density development at all landscape levels measured. Herbaceous cover in the near-stream area was positively associated with forest cover in the landscape, and negatively with high-density development and impervious surface cover. These results suggest that surrounding forest cover is important for the maintenance of native riparian vegetation, particularly sensitive herbaceous species, in urban riparian areas of small streams.

POSTER

PRELIMINARY ANALYSIS OF RODENT AND LAGOMORPH GNAW MARKS ON MAMMOTH RIBS FROM THE COYOTE CANYON MAMMOTH SITE, BENTON COUNTY, WASHINGTON. **Samuel A. Wahl,** Prosser High School, Prosser, WA 99350; Bax R. Barton, Burke Museum of Natural History and Culture and Quaternary Research Center, University of Washington, Seattle, WA 98195; wahlsamwahl@yahoo.com

Columbian mammoth (*Mammuthus columbi*) sub-fossils are common to Central Washington, but their taphonomy has not been studied in depth. Such taphonomy includes weathering, post-mortem utilization, and fracturing. The Coyote Canyon mammoth was discovered in the Horse Heaven Hills in 1999 and dates to roughly 17,449 cal yr BP. At the Coyote Canyon Mammoth Site, we have recorded the widths of animal gnaw marks on mammoth ribs and compared them to known incisor widths of paleo- and modern rodent and lagomorph species from the Columbia Plateau. We examined eleven ribs, ten of which bore gnaw marks producing a total of 148 measurable marks. At this site, rodents and lagomorphs generally gnawed on the tubercles and exterior portions of the shafts of the ribs. Typically, rodents utilize such bones for nutrition and to sharpen and erode their incisors. Our studies revealed that the gnaw mark assemblage is dominated by three different incisor widths: 0.3 mm, 0.5 mm, 2.1 mm. Our research suggests that at least two rodents and at most two lagomorph species produced the gnaw marks found on the mammoth ribs. The 0.3 mm and 0.5 mm gnaw marks were carved by incisors that lacked central grooves. However, the 2.1 mm gnaw marks were carved by incisors with central grooves suggesting that they were produced by lagomorphs. The 0.3 mm and 0.5 mm gnaw marks were produced by rodents rather than lagomorphs. Here, we document the gnaw marks located on the ribs and discuss the species that most likely produced them.

ORAL

A PALEOPERSPECTIVE ON THE ROLE OF FIRE IN LOW ELEVATION ECOSYSTEMS IN THE PACIFIC NORTHWEST. **Megan K. Walsh**, Department of Geography, Central Washington University, 400 E. University Way, Ellensburg, WA 98926. walshme@cwu.edu

The goal of this study was to evaluate the role of fire in low-elevation ecosystems of the Pacific Northwest (PNW) during the Holocene. Charcoal and pollen records derived from lake sediments in the Willamette Valley, Portland Basin, Puget Lowland, and Okanogan Valley were examined to determine past shifts in fire regimes and their associated impacts on the landscape. Results vary from site to site, but many sites show an increase in fire activity during the late Holocene (the past approximately 3500 years). This increase is somewhat counterintuitive given the climate at that time, which is generally thought to be cooler and wetter compared to earlier. Nonetheless, fire remained an important component of many environments up until the time of Euro-American settlement (ca. AD 1830-1870), both on the west and east side of the Cascades. This study presents the first high-resolution late Holocene fire history record from the east side of the Cascades Mountains. Fish Lake (Okanogan County, WA) exists in an area dominated by dry ponderosa pine forest. This record clearly shows that frequent, low-severity fires burned until the start of 20th century fire suppression. Increased fire activity at Fish Lake and other sites in the

PNW during the late Holocene, and the ecological changes that resulted, are likely related to increased human use of fire due to higher populations and shifts in subsistence strategies. The fire records discussed here, as well as others from the PNW, are helping to develop a baseline for assessing current and future fire activity.

ORAL

DECLINE IN A RARE COLUMBIA GORGE BUTTERCUP: IS IT TIME TO PANIC YET?
David Wilderman, Natural Areas Program, Washington Dept. of Natural Resources, PO Box 47014, Olympia, WA 98504; david.wilderman@dnr.wa.gov.

Obscure buttercup (*Ranunculus triternatus*) is a rare plant species found in the eastern Columbia Gorge of Washington and Oregon, as well as a small number of locations in Nevada and Idaho. It is classified by the WNHP as Threatened in Washington State. The largest known Columbia Gorge population occurs within the Columbia Hills Natural Area Preserve and the adjacent Columbia Hills State Park. Various monitoring efforts have been conducted for this population, beginning in the mid-1980s. While some of the original monitoring locations and methods have been maintained, others have been conducted at different time periods as well, resulting in a combination of methods and time periods over which the population has been monitored. Beginning in the early 2000's, substantial declines were observed in portions of the population, with some areas falling by 80% over just eight years. Declines have continued to be observed in these and other portions of the population through 2012. While these numbers suggest a dramatic decline at the site, it is unclear if they are representative of the entire population or are limited to specific areas. In addition, anecdotal observations and mapping on the site do not indicate an obvious, site-wide decline. In the face of this uncertainty, site management responses could include additional research into potential causal factors of any observed declines, experimental habitat manipulation to address suspected causes, and/or expanded monitoring to provide a more thorough assessment of overall population trends.

ORAL

A DATED PRE-LAST GLACIAL MAMMOTH TOOTH FROM HOOD CANAL, WASHINGTON, AND ITS RELATION TO PUGET LOBE ADVANCE CHRONOLOGY.
Michael C. Wilson, Dept. of Earth & Environmental Sciences, Douglas College, P.O. Box 2503, New Westminster, BC V3L 5B2, Canada; Stephen M. Kenady, Cultural Resource Management, 5319 Cedar Ridge Place, Sedro-Woolley, WA 98284; wilsonmi@douglascollege.ca

A mammoth molar (lower M6) was collected in 1956 by Roy and Margaret Allison from clayey deposits on the east side of Hood Canal ~1.5 km south of Hood Canal Bridge, Kitsap Co., Washington, in the northern Puget Lowland. The locality was exposed only at low tide and the *in situ*, partially exposed specimen had wave-washed roots. Dental plate spacing and overall morphology are consistent with *Mammuthus columbi*, Columbian mammoth. Observations in nearby areas indicate a sedimentary sequence including advance outwash of the Puget Lobe, Last Glacial Maximum (LGM), though the precise find spot cannot be pinpointed. A dentine and enamel sample drilled from deep in the tooth yielded a radiocarbon date of ~16,960 ^{14}C yr BP (20,230 to 19,940 Cal BP). This is consistent with the contexts of other Puget Lowland

mammoths, all thus far apparently pre-LGM, and agrees with limiting dates for ice advance into the Puget Lowland area. Compared with available dates for areas to the north and south (Stephen Porter, 2004, in *Quaternary Glaciations – Extent and Chronology*), this date precedes local arrival of glaciers by ~2000 years. The date is nearly identical to that of a mammoth humerus from southern Vancouver Island. The coastal mammoth range extended north to the Fraser lowland of southwest British Columbia *ca.* 25,000 Cal yr BP; but these populations, like those of Puget Lowland, were extirpated by Fraser Glaciation ice advance. Mammoths likely occupied a sandur (outwash plain) built ahead of the advancing ice.

POSTER

HARVESTING AND PROCESSING OF NATIVE SEED. **Angela Winter,** Center for Natural Lands Management, 120 Union Ave SE #215, Olympia, WA 98501. awinter@cnlm.org

The Center for Natural Lands Management operates a native prairie seed farm and seed processing facility that grows 70 plus species that require specialized and innovative harvesting and seed cleaning equipment. I will discuss facilities and equipment necessary to grow from small-scale production to large-scale production. Included will be harvesting methods, seed cleaning equipment, seed drying techniques, and modifications we have made to make our equipment work with our diverse seeds.

POSTER

TEMPERATURE AND MOISTURE EFFECTS ON NITROGEN AND CARBON DYNAMICS IN ORGANIC FOREST SOILS IN THE PACIFIC NORTHWEST. **Hanna Winter**, Peter Homann, Western Washington University, Huxley College of the Environment, 516 E College Way, Bellingham, WA 98225; winterh2@students.wwu.edu

The objective of the study was to determine how soil respiration (CO_2 efflux) and inorganic nitrogen are influenced by temperature and moisture in organic forest soils in the Pacific Northwest. Upper and lower organic soil layers from a mature conifer forest on the Olympic Peninsula were incubated at four temperatures (5−20 °C). Soil moisture was maintained at 200, 300, 400, or 500% throughout the first 30-day incubation period, and soils were allowed to dry during the second follow-up incubation period. Total carbon and nitrogen concentration of the soils was determined at the beginning of the study, soil respiration was measured throughout the incubation periods, and inorganic nitrogen concentration in the soil water was measured at the end of the first incubation period. Respiration per g C was higher for the upper layer than for the lower layer for all moistures and temperatures. For both incubation periods, temperature had a significant effect on respiration, with 20 > 15 > 10 = 5°C. For the first incubation period, respiration at 200% moisture was lower than at 400% moisture. During the second incubation period, respiration rates generally declined as the soils dried. Nitrate was below detection limits for all samples. Temperature, moisture and layer had a significant effect on ammonia concentrations, but no interactions were significant. This study indicates that layer and temperature can affect the respiration rate of organic layer forest soils. This study also indicates that moisture can affect the respiration rate of organic forest soils, particularly below 200% moisture.

ORAL

SOUTH PUGET SOUND STREAKED HORNED LARK GENETIC RESCUE PROJECT. **Adrian Wolf** and Hannah Anderson, Center for Natural Lands Management, 120 Union Avenue S.E. #208, Olympia Washington 98501, Scott Pearson, Washington Department of Fish and Wildlife, 1111 Washington St. SE, 5th Floor Olympia, WA 98501-2283; awolf@cnlm.org

Hatchability of streaked horned lark (*Eremophila alpestris strigata*) eggs in the Puget Lowlands of Washington State is extremely low relative to other grassland nesting birds at the same site and generally. Because genetic factors (inbreeding depression) appear to be a likely explanation, an effort to increase genetic diversity was initiated. In 2011, four three-egg-clutches were translocated to Puget Sound nests, from Corvallis, Oregon. Eleven of the twelve translocated eggs hatched, were color banded as nestlings, and a minimum of five fledglings survived and were observed foraging independently. In 2012, one Oregon translocated nestling returned to its natal site as an adult male, but this male was not observed breeding successfully with a female in 2012. Assuming that the male survives its second winter, returns to the site and successfully reproduces in 2013, the local population of streaked horned lark could be rescued, which can lead to improved fitness and reduced extinction risk. Subsequent monitoring will determine whether the male or other translocated birds return to breed. If this experiment is successful and we can document the mechanism responsible for the success, the method used here could have broader implications to the conservation of birds with small populations throughout the world.

ORAL

BIRD CONSERVATION IN PRAIRIE-OAK HABITATS IN THE SOUTH PUGET SOUND REGION. **Adrian Wolf**, The Center for Natural Lands Management, 120 Union Avenue S.E. #208, Olympia Washington 98501, awolf@cnlm.org.

Bird monitoring efforts associated with restoration and non-restoration prairie oak habitats in the south Puget Sound region were initiated as early as 1985. Monitoring methods have included transects, nest box monitoring, winter bird surveys, and breeding bird surveys, although the vast majority of these monitoring efforts were point count data that attempted to characterize the avian community rather than use birds as a metric to measure specific restoration objectives. Only one of six Breeding Bird Survey routes in the South Sound incorporates prairie-oak habitats. Strategies to protect and restore prairie-oak birds that have been identified and implemented include nest box monitoring, and up to 250 Western Bluebirds boxes per year since 1985 have been monitored at Joint Base Lewis-McChord, and several locations in Thurston County. One restoration effort was initiated to create and increase cavity availability for the White-breasted Nuthatch by limbing and topping Douglas firs to release Garry Oak. I found only one study that used birds (non-lark) to measure responses to a specific prairie restoration activity, namely Scotch broom mowing. The talk will provide "snippets" of past, current and future prairie-oak bird conservation efforts in the South Puget Sound from locations such as Glacial Heritage Preserve, Wolf Haven, West Rocky Prairie, Scatter Creek Wildlife Area, Tenalquot Prairie and Joint Base Lewis-McChord.

POSTER

PHYTOPLANKTON ECOLOGY IN FOUR HIGH-ELEVATION LAKES OF THE NORTH CASCADES, WA. **Siana Wong**, Dr. Robin Matthews, Department of Environmental Sciences, Western Washington University, Bellingham, WA 98225; wongs3@students.wwu.edu

The main objective of this project is to describe the ecology of phytoplankton communities in four high elevation lakes in the same watershed near Mt. Baker, WA (USA). We used exploratory statistical approaches to uncover patterns among phytoplankton and water chemistry variables. Each week from ice-out in August to freeze-up in October 2012, we collected and analyzed lake surface samples for phytoplankton and water chemistry. Phytoplankton samples were analyzed by Nostoca Algae Laboratory, Bainbridge Island, WA, and water chemistry samples by the Institute for Watershed Studies at Western Washington University. Chlorophyll levels were low in all four lakes, and were not significantly correlated with most water quality variables. Despite low chlorophyll levels, all lakes exhibited diversity and seasonality in phytoplankton during the short ice-free period. Non-parametric cluster analysis revealed that the four lakes significantly associated into two groups based on both water chemistry variables and phytoplankton abundances. The first group (Upper and Lower Bagley Lakes), could be characterized by lower water temperatures and total nitrogen concentrations, and higher dissolved nutrient concentrations, pH, and dissolved oxygen concentrations. This group exhibited lower total phytoplankton abundances and was dominated by diatoms. The second group (Picture and Highwood Lakes) was dominated by cyanobacteria, chlorophytes, and ochrophytes, and exhibited strong seasonal succession in the major phyla. Results from this project overall provide basic ecological understanding of phytoplankton in the harsh mountain environment of the North Cascades.

ORAL

REGIONAL BIOMASS ASSESSMENT IN FORESTS OF COASTAL ALASKA. **Mikhail A. Yatskov,** Mark E. Harmon, Olga N. Krankina, Oregon State University, FES Department, 321 Richardson Hall, Corvallis, OR 97331; Tara M. Barrett, USDA Forest Service, Wenatchee Forestry Sciences Lab, 1133 N. Western Ave., Wenatchee, WA 98801; Kevin R. Dobelbower, USDA Forest Service, PNW Research Station, Anchorage Forestry Sciences Lab, 161 East 1st Ave., Door 8, Anchorage, AK 99501; Andrew N. Gray, USDA Forest Service, PNW Research Station, Corvallis Forestry Sciences Lab, 3200 SW Jefferson Way, Corvallis, OR 97331; mikhail.yatskov@oregonstate.edu

Coastal Alaska is a vast forested region (6.2 million ha) with the potential to store large amounts of carbon in live and dead biomass thus influencing continental and global carbon dynamics. The main objectives of this study were to assess regional biomass stores, examine the biomass partitioning between live and dead pools, and the effect of disturbance on biomass pools. Data collected by the Forest Inventory and Analysis program between 1995 and 2003 across all ownerships in Coastal Alaska were used to estimate live tree, snag, and log biomass pools in forest types, and ecoregion (Boreal versus Temperate). The regional average combined (live and dead) biomass was 76.7±3.8 Mg/ha in the Boreal ecoregion and 277.5±5.4 Mg/ha in the Temperate ecoregion. Biomass of snags and logs comprising Coarse Woody Debris (CWD) pool

was 35.1±3.1 Mg/ha in the Boreal ecoregion and 58.6±2.1 Mg/ha in the Temperate ecoregion. Total regional biomass was 45.4±3.0 Tg and 1001.9±20.6 Tg, whereas CWD biomass was 20.8±2.1 Tg and 211.4±7.7 Tg for the Boreal and the Temperate ecoregions, respectively. In the Boreal ecoregion, the recent spruce bark beetle outbreaks greatly increased CWD stores, with damaged stands containing 82% of total CWD biomass. In the Temperate ecoregion, undisturbed stands contained 76% of total CWD, indicating disturbance had less impact on CWD stores. In Coastal Alaska, average live biomass (194.0±4.1 Mg/ha) was 4-23 percent higher and average snag biomass (29.5±1.0 Mg/ha) was approximately twice as high as that found in Washington and Oregon, states considered to have high biomass stores.

ORAL

ENVIRONMENTAL QUALITY AND GOVERANCE IN THE PORTLAND-VANCOUVER METRO AREA. **Alan Yeakley**, School of the Environment, Portland State University, Portland, OR 97207; Heejun Chang, Department of Geography, Portland State University, Portland, OR 97207; John Harrison, School of the Environment, Washington State University, Vancouver, WA 98686; Jeffrey Kline, Pacific Northwest Research Station, USDA Forest Service, Corvallis, OR 97331; Anita Morzillo, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR 97331; Noelwah Netusil, Department of Economics, Reed College, Portland, OR 97202; Connie Ozawa, Toulan School of Urban Studies and Planning, Portland State University, Portland, OR 97207; Na'ama Schweitzer, Pomona College, Claremont, CA 91711; Vivek Shandas, Toulan School of Urban Studies and Planning, Portland State University, Portland, OR 97207; Paul Thiers, Department of Political Science, Washington State University, Vancouver, WA 98686; yeakley@pdx.edu

In the Portland-Vancouver ULTRA-Ex project, we are examining the role of governance in urban ecosystem sustainability in cities in our bi-state metropolitan region. We are assessing multiple pathways through which human actions, governance systems, and the built and social infrastructure affect ecosystem functions and services provided by landscape vegetation pattern and regional water quality. Our findings suggest that local land use, rather than regional governance, is the primary determinant of water quality in streams. Hedonic analyses show that water quality is correlated with property values in residential areas. Our findings also suggest that while green infrastructure strategies (e.g. bioswales) provide environmental benefits, the perception of their value by local citizens is mixed. We have also found that heavy metal accumulations (i.e. Cu, Pb, Zn, Cd) have not reached toxic levels in bioswale soils; yet, bioswales were found to retain these metals effectively during storms. For urban greenspace conservation, while the rates of riparian area losses have continued over the past two decades, those rates are slowing in our six study cities; in Portland, gains in riparian areas due to restoration efforts have even begun to outpace riparian losses. Overall, our preliminary findings indicate variations in levels of civic engagement among municipalities, but general social and ecological differences among municipalities and between states are not yet clear.