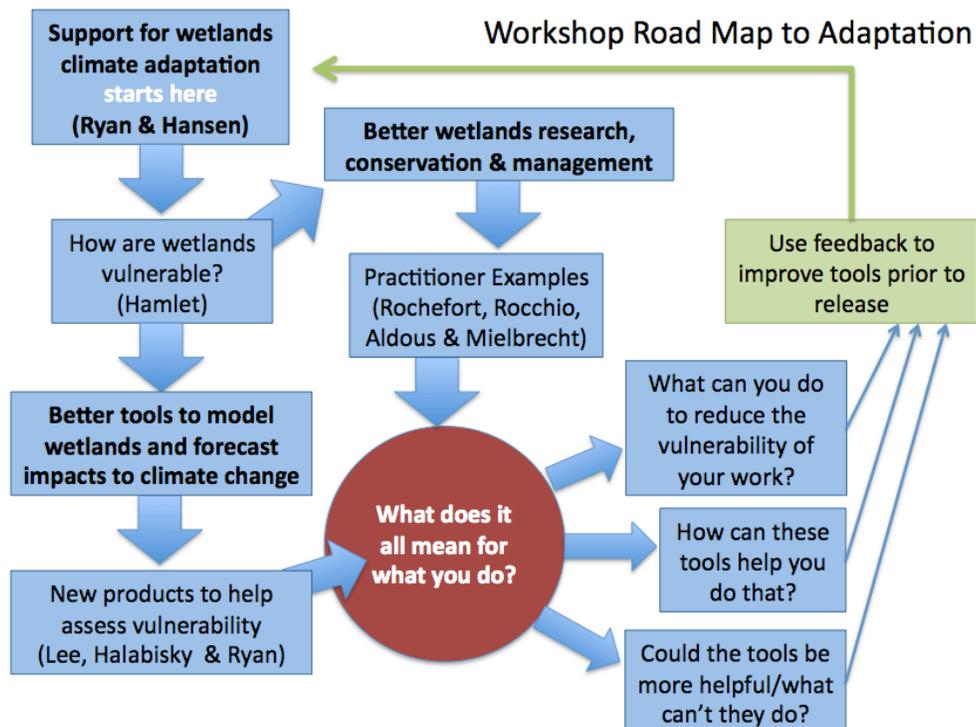

Pacific Northwest Wetlands Symposium

November 8, 2012
Woodland Park Zoo, Seattle, WA



Symposium Agenda

- 9:00 Welcome by Lara Hansen & Maureen Ryan
- 9:30 Introduction to vulnerabilities of wetlands & wetlands management: Alan Hamlet
- 9:45 Introduction to new products and how they can be used
- 9:45 Se-Yeun Lee: Wetlands hydrologic projections
 - 10:00 Meghan Halabisky: Remote sensing, extending the hydromodel
 - 10:15 Maureen Ryan: Field methods & applications of tools for research & management
- 10:30 Open floor for questions
- 10:50 Break
- 11:00 Presentations by practitioners
- 11:00 Maureen Ryan & Regina Rochefort: Overview & federal wetlands management
 - 11:10 Joe Rocchio (Washington DNR): Pacific Northwest Wetlands Classification
 - 11:20 Allison Aldous (The Nature Conservancy): Groundwater & Wetlands Conservation
 - 11:30 Eric Mielbrecht (EcoAdapt): Yale Framework Approach to Climate Adaptation
 - 11:40-12:00 Discussion
- 12:00 Lunch (provided at no cost)
- 1:00 Breakouts
- What is your mission? What are you trying to do?
 - How is your goal likely to be affected by climate change?
 - What can you do about it?
 - How can the tools presented help you make better decisions given climate change?
- 2:15 Break
- 2:30 Breakout continued
- What can none of these tools help you do that you feel is necessary before you take action?
 - Feedback within breakout
- 3:30 Report back from breakouts
- 3:50 Conclusions & evaluations



Welcome to the 2012 Pacific Northwest Wetlands Symposium!

Thank you for being here! We appreciate your participation and the time you are taking to attend the symposium, and look forward to spending the day with you.

This symposium is designed as an opportunity for all of us – managers, researchers, consultants, conservationists, and advocates – to gather, brainstorm, and work to create effective wetlands management and conservation in the face of climate change. The day serves several purposes.

1. It is an opportunity for all of us to **get to know each other and support each other's efforts surrounding freshwater wetlands**. The participants here today represent an enormous amount of collective knowledge and experience about Pacific Northwest wetlands, and we look forward to learning from each other.
2. Today is a **research & development opportunity**. We are developing several new products and tools to support wetlands research and management. We are in the middle stages of developing these tools, and want them to work for you, so are asking for your input and feedback ahead of our project's completion.
3. **We are here to help** you do what you want and need to do in **applying climate savvy thinking to your own work on wetlands**. We hope that by the end of the day you will have made new colleagues, generated new and exciting ideas, and that our work together will continue into the future.

We would like to thank our funders – the North Pacific Landscape Conservation Cooperative and Smith Fellows Program, and our institutional collaborators – EcoAdapt, the Climate Impacts Group at University of Washington, and the Earth 2 Ocean Research Group at Simon Fraser University – for their support. We also thank each of our presenters and all the participants who offered to present during the symposium. Most of all we thank each of you for taking the time out of your busy work schedules to be here to advance wetlands research, management, and conservation in the face of climate change.

We look forward to working with you today, and continuing to work with you in the future. Please keep in touch and let us know your ideas and needs as they arise.

Best wishes & thanks again for being here,

Lara Hansen, Eric Mielbrecht, Alex Score (EcoAdapt)

Maureen Ryan (University of Washington & Earth 2 Ocean Research Group, Simon Fraser University)

Meghan Halabisky (University of Washington)

Alan Hamlet, Se-Yeun Lee (Climate Impacts Group, University of Washington)

Regina Rochefort (North Cascades National Park)

Wendy Palen (Earth 2 Ocean Research Group, Simon Fraser University)

Intended Workshop Outcomes

Enhanced awareness of resources to support wetland management & adaptation planning

Increased capacity of participants to use new resources

Increased capacity of participants to incorporate climate adaptation into management

Implementable activities developed by participants to employ new ideas from workshop

New connections to support collaboration in wetlands research & management across institutions

Enhanced awareness of the importance of wetlands

Overview of New Products for Wetlands Conservation, Management, and Climate Adaptation

The challenge: Wetlands provide critical services to both natural communities and human society. They are also among the most sensitive ecosystems to climate change. Despite the importance and vulnerability of wetlands, resources to support their scientific evaluation and management lag behind that of other ecosystem types. Our research aims to develop new approaches and technical tools to better understand, manage, and conserve wetlands in a changing climate. We need your input to do this effectively.

HYDROLOGIC PROJECTIONS FOR PNW WETLANDS *Lead researchers: Lee & Hamlet*

Products

1. **Detailed simulations of wetland response** for focal sites in Olympic, Mount Rainier, and North Cascades National Parks, Puget lowlands, and Columbia Plateau. Products include daily volume and extent of wetlands, drying and refill date of ephemeral wetlands, and daily water temperature for historical and future climate scenarios (Fig 1).
2. Based on detailed studies, **regional maps coding the severity of projected change in hydroperiod** (volume, depth, inundation) for different wetland types (e.g. permanent, ephemeral, riparian) in different PNW climate zones for the 2020s, 2040s, and 2080s (Fig 2).

Uses

1. **Assess impacts to wetland distributions, thermal conditions, and function** over time
2. **Evaluate risk to individual species and species assemblages** using different wetland types
3. **Identify hot spots of climate risk** to wetlands

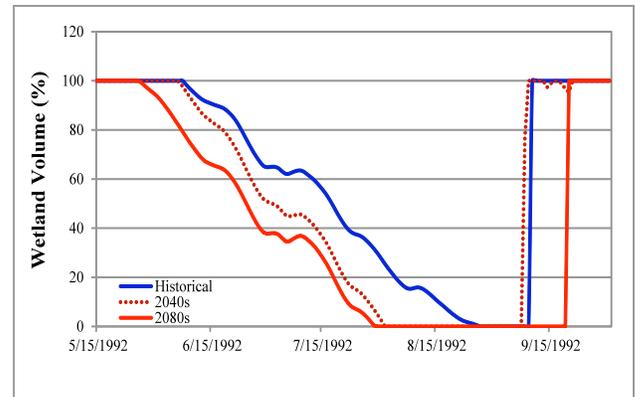


Figure 1. Projections of future change in hydroperiod of an ephemeral drying pond in Mount Rainier National Park (red dotted and solid lines), relative to the observed drying pattern in 1992 (blue line). Note under this scenario (A1B) the earlier drying and extended dry period.

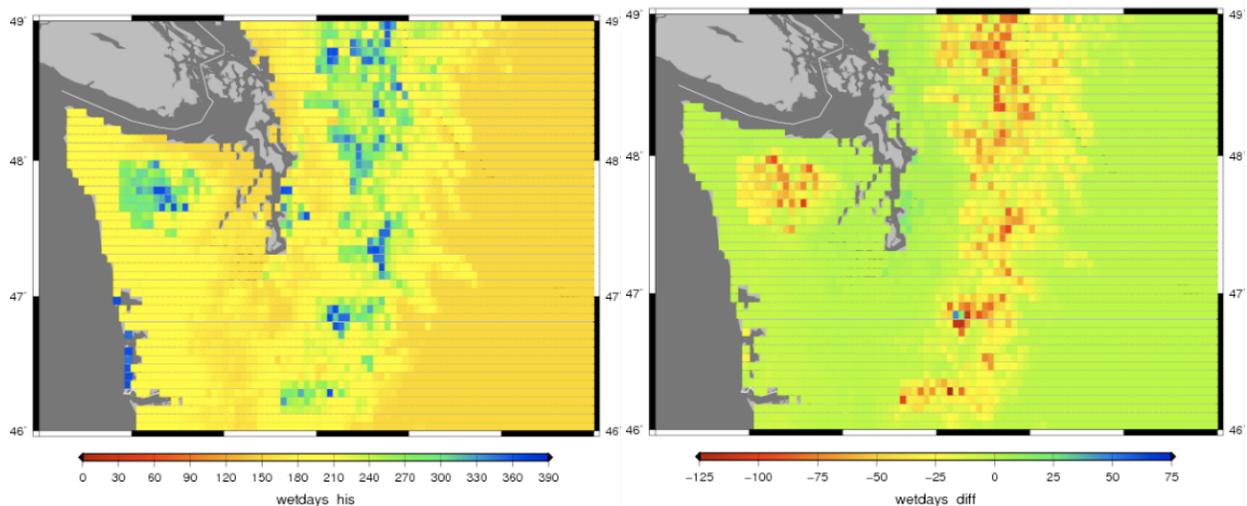


Figure 2. Historical number of wet days with 40% saturated soil moisture (left), and difference in wet days for the 2080s (right), based on climate projections from the ECHAM5 general circulation model, for the A1B scenario.

Primary findings: Simulations of future wetland response show that warmer and drier summers are likely to cause **earlier wetland drawdown**, a **more rapid water recession rate**, **reduced water levels overall**, and a **longer summer dry season**.

How it was created: The Variable Infiltration Capacity (VIC) hydrologic model is a physically based, fully distributed hydrologic model implemented at 1/16th degree resolution (~5km x 6km). VIC simulates water movement through 3 layers in the top 2m of soil. Using a model calibrated with historical data, we characterize wetland response to climate change using future VIC projections based on climate scenarios.

NEW WETLANDS MAPS & HISTORICAL WETLAND DATASETS *Lead researcher: Halabisky*

Products

1. **Updated wetland inventory maps** for North Cascades and Olympic National Parks & Columbia Plateau
2. **Remote sensing algorithms** that can be used to map wetlands throughout the PNW (Fig 3)
3. Spatially explicit data products detailing **historic and current hydroperiods** for focal regions in the **Columbia Plateau**
4. **Summary maps coding severity & types of projected change in wetland dynamics** in focal regions

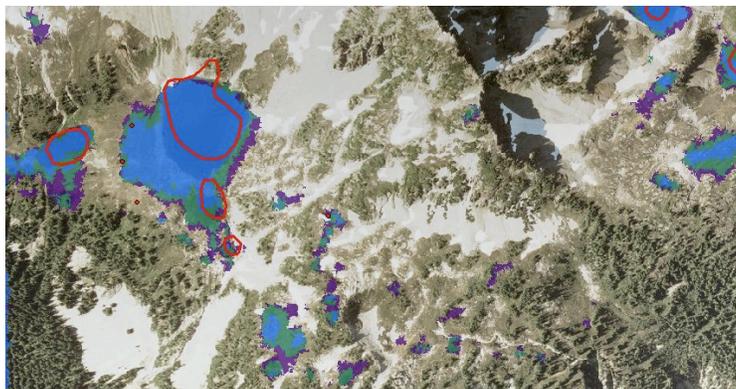


Figure 3. Wetlands identified through OBIA in North Cascades National Park. Blue is wetland surface area, green is emergent wet meadow, and purple is low-slope overflow region. Note that the National Wetlands Inventory (red polygons), the current best resource for wetland mapping, misses virtually all small wetlands.

Uses

1. **Identify wetlands** (including wetlands <0.005 ha) and **generate new wetlands maps**
2. **Reconstruct historical data** to aid understanding of long-run dynamics in different wetland types
3. **Identify hot spots of risk** to wetlands based on hydroperiod and landscape context

How it was created: Object-based image analysis (OBIA) combines the ability of the human eye to interpret images (recognizing distinctions of color, form, texture, etc) with computer processing power. This enables the remote-sensor to classify parts of the landscape and build these features into an algorithm that can be processed across large geographic regions. This approach improves the accuracy of classification using aerial photo and satellite imagery and dramatically enhances our ability to detect small wetlands that are missed by virtually all other methods (Fig 3). A combination of OBIA classification using aerial images, Landsat imagery, and harmonic analysis can be used to extract historical hydroperiod data from satellite imagery.

ECOLOGICAL MONITORING & APPLICATIONS *Lead researchers: Ryan & Palen*

We are conducting surveys and collecting new data on wetland dynamics using dataloggers and physical monitoring in North Cascades, Olympic, and Mount Rainier National Parks, with plans to expand to the Puget lowlands and Columbia Plateau. We are currently using the products above and survey data to assess vulnerability and evaluate climate impacts on montane amphibians in the WA National Parks.

Where you can find resources: Products will be revised based on this meeting's interactions and posted online upon completion. Visit the Symposium web page for links: <http://ecoadapt.org/workshops/detail/11>

Additional Resources

Links to Symposium Presentations: <http://ecoadapt.org/workshops/detail/11>

Literature

Climate Adaptation

- Brodie, J.F., E. Post, D. Doak, eds. Wildlife Conservation in a Changing Climate. Chicago: University of Chicago Press.
- Glick, P., B.A. Stein, N.A. Edelson, eds. 2011. *Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment*. National Wildlife Federation, Washington, D.C.
- Hansen, L.J. and J.R. Hoffman. 2011. *Climate Savvy*. Island Press, Washington DC.
- Hansen, L., J. Hoffman, C. Drews, E. Mielbrecht. 2009. Designing climate-smart conservation: guidance and case studies. *Conservation Biology* 24: 63-69.

Regional Climate Impacts

- Elsner, M.M., L. Cuo, N. Voisin, J.S. Deems, A.F. Hamlet, J.A. Vano, K.E.B. Mickelson, S.Y. Lee, D.P. Lettenmaier. 2010. Implications of 21st century climate change for the hydrology of Washington State, *Climatic Change*. doi: 10.1007/s10584-010-9855

Regional wetlands

- Crawford, R.C., C.B. Chappell, C.C. Thompson, F.J. Rocchio. 2009. Vegetation classification of Mount Rainier, North Cascades, and Olympic National Parks Plant Association Descriptions and Identification Keys. Natural Resource Technical Report NPS/NCCN/NRTR-2009/D-586. National Park Service, Fort Collins, Colorado.

Freshwater systems

- Bates B.C., Z.W. Kundzewicz, S. Wu, J.P. Palutikof, Eds. 2008. Climate change and water. Intergovernmental Panel on Climate Change Secretariat, Geneva.
- Burkett, V., J. Kusler. 2000. Climate change: potential impacts and interactions in wetlands of the United States. *Journal American Water Resources Assoc* 36: 313-320.
- Carpenter, S.R., S.G. Fisher, N.B. Grimm. 1992. Global change and freshwater ecosystems. *Annual Review of Ecology and Systematics* 23:119-139.
- Erwin, K.L. 2009. Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands Ecology and Management* 17:71-84.
- Winter, T.C. 2000. The vulnerability of wetlands to climate change: a hydrologic landscape perspective. *Journal American Water Resources Assoc* 36: 305-311.

Web links to relevant information

- EcoAdapt Workshop Support Page: <http://ecoadapt.org/workshops/detail/11>
- Climate Impacts Group, University of Washington: ces.washington.edu/cig/
- Climate Adaptation Knowledge Exchange (CAKE): cakex.org
- North Pacific Landscape Conservation Cooperative: <http://www.fws.gov/pacific/Climatechange/nplcc/>

Pacific Northwest Wetlands Symposium
Final Evaluation Form

1. Overall, how would you rate this symposium?

Circle one: 1 (poor) 2 3 4 5 (excellent)

Comments:

2. What are your thoughts on the tools presented?

Tool/data product	Comprehend how it would be useful	Would it be useful to you?	Do you expect to use it?	Could it be more useful? If so, how?
Wetlands Hydrologic Projections Se-Yeun Lee				
Remote Sensing to extend the hydromodel Meghan Halabisky				
Ecological applications Maureen Ryan				
PNW Wetland Classification Joe Rocchio				
Groundwater and Wetlands Conservation Allison Aldous				
Yale Framework Spatial Prioritization for Adaptation Eric Mielbrecht				

3. Will you incorporate learning from the symposium in your *thinking*?

Yes No Please explain:

4. Will you incorporate learning from the symposium in your *work*?

Yes No Please explain:

5. How would you rate the components of the workshop?

Presentations

Circle one: 1 (poor) 2 3 4 5 (excellent)

What was particularly memorable/useful:

Breakouts

Circle one: 1 (poor) 2 3 4 5 (excellent)

What was particularly memorable/useful:

Supporting Materials (packet, workshop support page)

Circle one: 1 (poor) 2 3 4 5 (excellent)

Comments:

7. Can you offer any other suggestions for improving the symposium?

Comments:

8. Other comments or feedback:

9. If you would like someone from the symposium to contact you in regard to a specific tool or concept please provide:

Your Name:

Issue of Interest: