Workshop on Estuaries, Climate Change, and Conservation Planning
Oregon Coast Aquarium, Newport, Oregon, November 18-19, 2010

Workshop Summary

Introduction

In 2009, the Oregon Department of Fish and Wildlife initiated a process to incorporate information about climate change and its effects on fish, wildlife, and habitats into the Oregon Conservation Strategy. The agency acknowledged that climate change is already affecting Oregon's species and habitats and that future climate change represents one of the most serious long-term challenges to sustaining healthy populations of fish and wildlife.

This workshop brought together representatives of the research, land and resource management, and conservation communities to contribute to the update and implementation of the Oregon Conservation Strategy. Participants were asked to help ODFW identify high-priority climate change adaptation strategies for Oregon's estuaries. A secondary goal of the meeting was to build and strengthen partnerships in the research and management communities.

The objectives of the workshop were to:

- Provide updates and get feedback on on-going Northwest conservation planning processes;
- Hear about recent climate change research relevant to Oregon estuaries and discuss how to better link research with management efforts; and
- Identify and prioritize adaptation strategies for estuaries and describe the steps needed to implement these strategies.

Future workshops will address adaptation in other priority habitats outlined in the Oregon Conservation Strategy.

Workshop Structure

Day 1 of the workshop was held in conjunction with a meeting of the Oregon Habitat Joint Venture (OHJV). Bruce Taylor (Oregon Habitat Joint Venture) and Bob Altman (Pacific Coast Joint Venture/America Bird Conservancy) described the process currently underway to update the PCJV conservation plan, which focuses on developing population-based habitat objectives for focal species. Mark Petrie (PCJV/Ducks Unlimited) placed this process in a climate change context by describing an approach to anticipating and addressing the impacts of sea-level rise in coastal habitats.

On Day 2, the workshop focused on planning for climate change adaptation. In the morning session, Darrin Sharp (Oregon Climate Change Research Institute) and Debbie Reusser (US Geological Survey) gave an overview of projected climate change impacts on Oregon's coastal ecosystems and species. Laura Brophy (Institute for Applied Ecology) described the uses of LiDAR and other new tools for conservation planning, restoration, and monitoring in estuaries. As a lead-in to a larger group discussion, several of the land managers in the room were asked to briefly address how useful the climate change information presented in the morning session was for land management purposes and what researchers might do to better meet land managers' information needs. Finally, Allison Aldous (The Nature

Conservancy) provided a framework for incorporating information on climate change vulnerability into conservation planning and the development of adaptation strategies.

In the afternoon session of day 2, Steve Zack (Wildlife Conservation Society) provided an overview of climate change and conservation planning, focusing on lessons from climate change adaptation efforts elsewhere in the West. He emphasized the idea that existing conservation tools can play an important role in climate change adaptation. Participants then divided into 5 small discussion groups to address the following questions:

- What strategies are available to help estuaries adapt to climate change?
- What 1 or 2 of these strategies should take top priority?
- What will be the first actionable steps to implementing these priority strategies?
- What information or other resources will be needed to get there?

Workshop Outcomes

Key themes from presentations and large-group discussions:

1. **Many familiar conservation tools remain useful and important in a changing climate.**

   Participants provided several examples of familiar tools being used to improve the resilience of estuaries to climate change. For example:

   - Using agricultural easements and land use protections to prevent development on agricultural lands and allow for future landward migration of estuarine wetlands;
   - Protecting existing estuaries through NRCS's Wetlands Reserve Program and other easement programs;
   - Removing dikes and restoring coastal wetlands;
   - Constructing or redesigning infrastructure to allow for estuary function and migration (e.g., Salmon River Estuary Plan);
   - Restoring habitat for specific estuary-dependent species;
   - Managing upland habitats for improved natural water storage ("water catchments" rather than "watersheds");
   - Developing conservation action plans and identifying priority areas for investment.

   Recognizing that these tools are still useful can help us approach climate change adaptation with greater confidence and avoid feeling paralyzed by the continual flow of new information on climate impacts. Research on climate change can be used to inform **which tools** we use, **how** we use them, and **where** we target them, but in many cases the fundamental approaches will remain similar to past conservation.

   Steve Zack and Allison Aldous provided us with a framework for incorporating climate change information into the conservation planning/adaptive management process:

   1) Identify a goal.
   2) Develop a simple conceptual model.
   3) Add climate change (i.e., how does climate change modify your conceptual model?).
   4) Identify potential management actions ("tools in the toolbox").
   5) Evaluate the likely results of the actions relative to your goal.
   6) Implement actions and monitor the results to use in future decision-making.

2. **Land use planning is a critical part of climate change adaptation in Oregon's estuaries.**

   Land use decisions and land use planning are closely linked with the viability of estuaries in a rapidly changing climate. The ability of many estuaries to migrate inland in response to sea-level rise can make them relatively resilient to climate change, but where this migration process is blocked by either natural topography or developed areas that are likely to be defended, we can expect substantial losses of some habitat types. As a result, the changing pattern of land use along the coast plays a critical role in doing climate-adaptive conservation in estuaries.

   Oregon's land use planning system is an important tool in limiting development inland of current estuaries. In general, protecting agricultural lands from development will help us keep

our future options open. However, even a few structures in the estuary retreat zone are likely to be defended and can prevent migration.

The conservation community needs to connect better with those in the planning community: county and city governments, the Department of State Lands, the Department of Land Conservation and Development, and permitting agencies. We need to work together to identify which areas have development and infrastructure that will definitely be defended and which areas are our highest priorities for protecting land for estuary migration. If we don't look at these two sets of priorities together, they are likely to come into conflict. If we do look at them together, we can see where not to invest our conservation dollars, and permitting agencies can see what areas we would most like to protect from development.

Many of the difficult conversations about coastal development have already been started in the context of tsunami planning. The conservation community can look to agencies involved in tsunami planning for information about infrastructure and community values and ideas about how to engage the public in planning for sea-level rise – a slow-moving tsunami.

3. **Sea-level rise will not be the only climate impact in estuaries.**

Although much of our attention has focused on sea-level rise, other climate trends are likely to be at least as important in shaping how estuaries respond to climate change. In general, these factors are less well understood and few adaptation options have been explored. These trends include:

- Increasing air and water temperatures;
- Increasing storm activity and storm surges;
- Increased wave heights;
- Changes in precipitation patterns and timing of snowmelt, potentially leading to changes in:
    - timing and quantity of freshwater flows;
    - delivery of sediment inputs (both mineral and organic);
    - water chemistry, including salinity and dissolved oxygen concentrations; and
    - estuarine mixing ;
- Acidification of marine waters;
- Possible changes in intensity or timing of coastal upwelling and hypoxic events;
- Possible changes in fog.

4. **We need more information on both climate- and non-climate processes in estuaries.**

Climate research, and in particular climate modeling, has focused on improving the resolution and level of certainty for projections of a few basic trends. Most work has focused around projecting future sea-level rise and annual averages in temperature and precipitation. Recently, significant progress has also been made in exploring seasonal trends in temperature and precipitation and in downscaling projections to the watershed scale.

Workshop participants emphasized the need to develop climate information that is useful for making management decisions. Both time and spatial scales are relevant here. Most planning is done on a scale of 10-20 years, while most climate projections look at 50-100 years. Most

important land use and conservation decisions are done at the scale of a particular site, although climate information at the watershed scale may be helpful in identifying regional priorities for conservation.

Participants also emphasized the importance of continuing to build our knowledge base on non-climate-related processes in estuaries. Some stakeholders place a higher priority on learning more about estuaries function and how best to restore them than on developing improved information on climate change.

In presentations and large-group discussions, participants identified the following climate- and non-climate priorities for research:

- Climate change impacts on:
    - sediment transport;
    - salinity;
    - estuarine mixing;
    - seasonal precipitation patterns and hydrology;
    - ocean chemistry;
    - water temperature;
    - hypoxic events;
    - fog zone;
    - storm surges;
    - biological communities, especially estuary food webs;
- Estuary types that are most at risk;
- Identification of thermal refugia;
- Estuary restoration (e.g., when to use dike breaching vs. removal);
- Futures analysis combining physical climate change information with data on:
    - Patterns of development
    - Estimates of population growth
    - Infrastructure (current and planned);
- Carbon sequestration in west-coast estuaries.

The Oregon Climate Change Research Institute is interested in hearing about what formats they can use to best deliver climate data to users and make sure they know what is available.

5. There is a strong need for science translation and synthesis products.

Participants argued that access to climate data and research results is not enough to provide a climate science foundation for land management decisions. During the conversation on providing climate information for managers, panelists emphasized the importance of developing more products that synthesize the latest climate science and provide information that can be used in planning and decision making. Even when modeling results are made available, it is not always apparent to managers what the implications are for land and resource managers, conservation groups, permitting agencies, and so forth.

Part of the problem is one of scale: Most climate research is not at a fine enough scale to help guide management decisions. Even downscaled data is typically not at the scale where we do land management and planning. Scientists can help managers use modeling results by

translating their work into regionally-specific information and management options that can be used at finer scales. This information could be provided in ways that are value- and policy-neutral, for example, by providing guidance on where to focus conservation efforts to meet different societal goals. In some cases, providing scale-appropriate information products may be a good substitute for downscaled climate data.

Many participants also said they need more synthesis products that summarize the most recent research on climate change impacts. Land managers and planners often don't have time to keep up with research, synthesize the results, and use that information to make plans. The fast pace of climate research makes it difficult to stay current, and many managers need to synthesize research from across several disciplines to inform their decision making.

6. **Adaptation work should be – and is – already in progress on Oregon's coast.**

   A common theme among many of the presentations was that uncertainty about future climate impacts and the need for more downscaled data should not prevent us from starting work now on climate change adaptation with the information and tools we already have. Several speakers encouraged the group to look for strategies and projects that are robust to uncertainty because they are likely to support healthy ecosystems and communities regardless of future climate conditions. We can also avoid being paralyzed by over-analysis if we choose to overbuild the network of protected lands to ensure that we're left with sufficient amounts of different types of estuarine habitat even if some of our assumptions about the impacts of sea-level rise in different areas turn out to be wrong.

   Many of the groups and individuals at the workshop are already involved in projects that will help Oregon's estuaries cope with climate change. Land conservation, land and resource management, education, and research all play important roles.

Key themes from workgroup discussions

Below is a summary of the workgroups' responses to our four questions about climate change adaptation strategies. Unedited notes from the groups are also available at http://www.dfw.state.or.us/conservationstrategy/events.asp

1. **What strategies are available to help estuaries adapt to climate change?**

- Avoid development in potential migration zone:
  - Land use planning and permitting – incorporate climate change considerations
  - Strategic land conservation (easements and purchase to maintain connectivity, room for migration)
  - Incentives (NRCS programs, ecosystem services)
  - Disincentives (changes in insurance policy, federal flood insurance program, discourage rebuilding after flooding)
  - Direct funding to estuaries with highest ecological functions
- Restore estuaries to maintain or regain natural processes
  - Controlling invasive species
  - Hydrological modification and restoration
  - Dike removal

    - Upland, riparian restoration (e.g., beavers)
- Best management practices for development, infrastructure
- Engineering solutions to maintain desired estuarine functions (e.g., dredge spoils to raise land level)

2. What 1 or 2 of these strategies should take top priority?

Use a mix of strategies (land use planning, permitting, incentives, and strategic conservation) to protect opportunities to allow estuary migration and preserve connectivity, especially in high-functioning estuaries.

3. What will be the first actionable steps to implementing these priority strategies?

- Map zones of risk and opportunity: Which areas are vulnerable? Which areas are free of obstacles to migration? Which estuaries are highest functioning now?
- Identify priorities for conservation and developed areas that are very likely to be protected from sea-level rise (e.g., critical infrastructure)
- Incorporate information on climate change, conservation priorities into permit evaluation processes and infrastructure planning; give agency and local government staff tools to do this.
- Continue strategic conservation of lands that are vulnerable, don't have obstacles to migration:
    - Incentives
    - Easement (incl. rolling)
    - Acquisitions
- Improve education and outreach, possibly building on existing tsunami work.

4. What information or other resources will be needed to get there?

Better information on:

- Response of different estuaries/types to sea level rise
- Salinity regimes
- Sediment regimes
- How forest/upland changes with climate will change inputs to estuaries
- How ocean changes with climate will change inputs to estuaries
- Accretion process
- Distribution of ecological habitats and at-risk species
- Bathymetry
- Actual economic costs of development decisions
- Futures modeling (demographics, projected growth)
- Important existing/planned infrastructure

Final Agenda

November 18: 1 pm – 5 pm
November 19: 9 am – 3 pm
Oregon Coast Aquarium, Newport, Oregon

Goal: Contribute to update and implementation of the Oregon Conservation Strategy by developing priority climate change adaptation strategies for estuaries and strengthening partnerships in the research and management communities.

Objectives:

- Provide updates and hear feedback on on-going Northwest conservation planning processes.
- Hear about recent climate change research relevant to Oregon estuaries and discuss how to better link research with management efforts.
- Identify and prioritize adaptation strategies that can help reduce climate change impacts on estuaries. Describe the steps needed to implement these strategies.

Outcomes:
Based on results of the working groups, the organizers will develop and distribute a summary document describing:

- Priority climate change adaptation strategies for Oregon estuaries;
- Actionable steps toward implementing those strategies; and
- Information needs and other barriers preventing implementation.

Agenda

Day 1: 1 – 5 pm
Pacific Coast Joint Venture Conservation Planning

1 – 2 pm
Welcome, introductions
Joint venture update
Partner updates

2 – 3 pm
Purposes of PCJV plan update
Bruce Taylor, Oregon Habitat Joint Venture

Biological Objectives for Riparian and Upland Habitats: PCJV Planning for the Coast Range Ecoregion of Oregon
Bob Altman, American Bird Conservancy
Discussion, Q&A

3 – 3:15 pm: break

3:15– 4:30 pm

Mitigating for sea level rise in the Northwest

Mark Petrie, Ducks Unlimited

Discussion, Q&A

4:30 – 5 pm

Wrap-up, intro to day two

5 pm

Happy hour at Rogue Brewery boardroom

Day 2: 9 am – 3 pm
Climate Change Adaptation Strategies for Oregon Estuaries

9 – 10:30 am:

Welcome, introductions

Purpose of the workshop and review of day one

Climate change and the coast: impacts on Oregon estuaries

Darrin Sharp, Oregon Climate Change Research Institute, and Debbie Reusser, USGS

Discussion, Q&A

10:30 – 10:45 am: Break

10:45 am – 12 pm:

Tidal wetland hydrology in Oregon: New tools for defining reference conditions, mapping resources, prioritizing actions, and evaluating project results

Laura Brophy, Green Point Consulting/Institute for Applied Ecology

Panel discussion: Using climate information in land management decision-making

Estuaries and Climate Change: Updating the Conservation Planning Framework

Allison Aldous, The Nature Conservancy

Discussion, Q&A

12 – 1 pm: Working lunch

Climate Change and Conservation Planning Elsewhere in the West: Starting Points and Pretty Pictures

Steve Zack, Wildlife Conservation Society

1 – 2:30 pm: Small group discussions

1. What strategies are available to help estuaries adapt to climate change?
2. What 1 or 2 of these strategies should take top priority?
3. What will be the first actionable steps to implementing these priority strategies?
4. What information or other resources will be needed to get there?

2:30 – 3 pm: Closing thoughts

List of participants

Justin Ainsworth, Oregon Department of Fish and Wildlife
Allison Aldous, The Nature Conservancy
Dan Avery, Oregon Department of Fish and Wildlife
Scott Bailey, Tillamook Estuaries Partnership
John Bauer, The Wetlands Conservancy
Bill Bridgeland, US Fish and Wildlife Service, Bandon Marsh National Wildlife Refuge
Laura Brophy, Estuary Technical Group, Institute for Applied Ecology
Cheryl Brown, EPA
Anna Buckley, Oregon Department of State Lands
Bob Buckman, Oregon Department of Fish and Wildlife
John Christy, The Wetlands Conservancy and Institute for Natural Resources
Catherine Corbett, Lower Colorado River Estuaries Partnership
Craig Cornu, South Slough NERR
Celeste Coulter, North Coast Land Conservancy
Tony D'Andrea, Oregon Department of Fish and Wildlife
Steve Denney, The Nature Conservancy
Amielle DeWan, Defenders of Wildlife
Ted DeWitt, US EPA
Gareth Ferdun, Lower Nehalem Community Trust
Georgenne Ferdun, Lower Nehalem Community Trust
Lisa Gaines, Institute for Natural Resources
Stacy Galleher, Oregon Department of Fish and Wildlife
Nadia Gardner, Columbia Land Trust
Mike Gray, Oregon Department of Fish and Wildlife
Cheryl Hummon
Chris Janousek, US EPA
Jimmy Kagan, Institute for Natural Resources
Jason Kirchner, Oregon Department of Fish and Wildlife
Henry Lee, US EPA
Esther Lev, The Wetlands Conservancy
Roy Lowe, US Fish and Wildlife Service
Laura Mattison, Oregon Coastal Management Program
Heather Medina Sauceda, NRCS
Holly Michael, Oregon Department of Fish and Wildlife
Aileen Miller, Portland State University
Jim Morgan, Oregon State Parks
Sara O'Brien, Defenders of Wildlife
Mark Petrie, Ducks Unlimited
Dave Plawman, Oregon Department of Fish and Wildlife
Fran Recht, Pacific States Marine Fisheries Commission
Debbie Reusser, US Geological Survey
Justin Saarinen, US Geological Survey, Newport
Shawn Stephensen, US Fish and Wildlife Service
Dan Shively, US Fish and Wildlife Service
Erin Stockenberg, US Fish and Wildlife Service
Heather Stout, NOAA Fisheries

Bruce Taylor, Oregon Habitat Joint Venture
Madeleine Vander Heyden, US Fish and Wildlife Service, Coastal Program
Stan van de Wetering, Siletz Tribes
Mary Wahl, Wahl Ranches
Jeff Weber, Oregon Coastal Management Program
Jon Wickersham, North Coast Land Conservancy
Steve Zack, Wildlife Conservation Society