June 24-25 Interagency Workshop on Climate Change Impacts on Natural Resource Management in the Columbia Basin

Centre on the Grove, Summit Auditorium, Boise, Idaho

Overview – Executive Summary

Purpose of Workshop: To provide resources and information to natural resource scientists and managers who work to conserve Columbia River Basin ecosystems. To engage scientists and managers in developing conservation strategies that anticipate and respond to a changing climate.

Target Audience: Resource managers, planners, program leads, scientists, information & data specialists from Federal, State and Tribal agencies, and conservation groups.

Foundational Presentations

These presentations provided an overview of observed 20th century global warming, predictions for the 21st century and the associated observed and predicted effects of global warming on natural resources.

We started with an overview of the 2007 reports from the Intergovernmental Panel on Climate Change. This was followed by more specific presentations on the Columbia River Basin from the University of Washington's Climate Impacts Group: What drives the Basin's climate? What is its normal climate variability? What has been the observed 20th century climate change, and what is the predicted climate change for the 21st century?

The IPCC projects an increase in global average annual temperature of 3.2-7.2°F by the end of the 21st century (multiple emissions scenarios are presented and evaluated). This is substantially different than the past 12,000 years. During this period the earth's average temperature has been relatively stable, ranging approximately +/-0.9°F. In the Pacific Northwest, the El Niño/Southern Oscillation and Pacific Decadal Oscillation are important factors for the region's climate due to their influence on atmospheric circulation over the North Pacific and North America.

The University of Washington's Climate Impacts Group presented information on observed 20th century changes in the Pacific Northwest including:

- Average annual temperature increased 1.5°F between 1920 and 2003;
- Decadal variability is the most important feature of precipitation during the 20th century, rather than climate change;
- Snowpack declined at nearly all sites in the Pacific Northwest between 1950 and 2000; and
- Timing of peak runoff has shifted to as much as 20 days earlier in much of the Pacific Northwest between 1948 and 2002.

These findings require us to change our ways of thinking. We have always assumed that the past was a good guide to the future. Management for conservation, subsistence, and resource extraction will need to incorporate change as a fundamental assumption.

Presenters provided information on effects to plants and animals, including a synthesis of the scientific literature on how species react to abrupt climate change. Species have different tolerances of rainfall, temperature, storm and drought frequency, and other features of climate that define their distribution. As warming continues and local climates change in complex ways, species historically found together may no longer co-occur and many are forecast by the IPCC to be threatened with extinction.

There is evidence that some species' ranges have already shifted poleward or toward higher elevations as temperatures rose in the 20th century and these trends are continuing. This includes warm-adapted species whose ranges are expanding, and cold-adapted species whose ranges are contracting. Species with narrow ranges of temperature tolerances and less mobile species will likely have greater difficulty adapting to climate change.

Potential effects to fish and wildlife include: 1) Impacts on a species' physiology; 2) Alteration of habitat characteristics; 3) Alteration of a species' phenology or life cycle; and 4) "De-coupling" of wildlife relationships with key host or food plants, or predator/prey relationships. Species that cannot migrate and/or with slow dispersal rates will suffer the most. For example, plants, amphibians, mollusks, and coral reefs are more vulnerable to changing conditions that may affect their ability to survive, grow and reproduce.

We ended this section of the workshop with a proposed project to assess the impact of global warming on species and ecosystems in the West. The species sensitivity analyses are a joint effort by the University of Washington, the U.S. Geologic Survey, and The Nature Conservancy.

Module 1: Forestry and Rangeland Presentations

These presentations provided an overview of climate change effects to forest and rangeland ecosystems in the Columbia River Basin.

US Forest Service presentations emphasized that disturbances cause significant ecosystem changes in western forests and the two most prevalent natural disturbances have been fire and insects. Both of these disturbance factors have been exacerbated by observed 20th century global warming in the Columbia River Basin, and predictions for the 21st century include a trend towards more fire-prone and insect-prone scenarios.

For Rangeland ecosystems, the USGS presentation focused on the importance of soil crusts and the overall threats posed by invasive species, changes in water availability, and changes in fire regimes. These threats will continue to be exacerbated by global warming.

This section of the workshop also included a pragmatic example of a National Forest using existing climate change information for planning 'no regrets' adaptation strategies and activities.

Module 2: Aquatic Ecosystems and Hydrology Presentations

As emphasized in the foundational presentations, the University of Washington's Climate Impacts Group finds that the region's precipitation during the 20th century, and modeled into the future, is more influenced by the El Niño/Southern Oscillation and the Pacific Decadal Oscillation rather than climate change. However, the region's hydrology is changing significantly due to climate. This includes the decline of snowpack and glaciers, warmer winter temperatures resulting in more rain-on-snow flood or high-flow events, and earlier peak runoff times. These findings are supported by USGS stream gage data in Idaho. It was noted that additional water gaging stations are needed and that these stations do not include water temperature monitoring.

Other presentations by USGS focused on the importance of groundwater which provides cool water to streams and other surface waters. The threats to groundwater resources were presented including sensitivity to climate related factors. Snowmelt is a major component of groundwater recharge (30-70% of snowmelt provides cold groundwater for later discharge). The decline of the region's snowmelt is therefore an important climate-related threat to this resource.

USGS also presented the effects of such changes on aquatic systems and organisms. This included a prospective analysis of bull trout, and a retrospective multi-species analysis.

Bull trout are associated with cold water habitat, but also bull trout distributions are tied to elevation and air temperature gradients at broad scales. Since air temperature changes do not affect water temperatures very much compared direct solar radiation on a body of water, the changing nature of the Basin's hydrology and disturbances to riparian vegetation are likely to cause more effects to bull trout, but additional research is needed.

This was followed with examples of species in different ecosystems that respond to climate change and provide records of those effects such as tree rings, mussel rings, clam rings and fish rings. This type of research proposes to use biological chronologies to reconstruct environmental histories of aquatic ecosystems.

USGS presented a decision support system that evaluates climate regimes and water temperature changes in the Columbia River through the use of bioenergetic models. The example provided showed that the variation in climate and water temp during the period studied (1933-1996) increased vigor in non-native prey fish. As a result, predation on juvenile salmon has risen sharply and 27.5% of salmonids are found to be consumed due to the increased growth of predators. This is significant for salmonid populations: a 10% reduction in first year mortality is estimated by NOAA to increase population growth rates by 41.5%.

The Nature Conservancy concluded this module with a presentation on how to develop adaptation strategies to mitigate climate change impacts to freshwater species and ecosystems. Climate change information should be considered during the four stages of a project: 1) project definition, scope and design; 2) strategy development (with an analysis of the ecosystem's threats and viabilities) and the development of objectives and actions; 3) work plan development, implementation and monitoring; and 4) the use of results to adapt and improve.

Module 3 General Session

The Nature Conservancy provided a presentation on State and Federal efforts to reduce and mitigate carbon emissions. The key State effort is the Western Climate Initiative (WCI), a collaboration which was launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change. Utah, British Columbia, Manitoba and Quebec have since joined and other U.S. and Mexican states and Canadian provinces have joined as observers. The WCI is identifying, evaluating and implementing collective and cooperative ways to reduce greenhouse gases in the region. The WCI regional greenhouse gas emission reduction goal is an aggregate reduction of 15% below 2005 levels by 2020.

Congress has considered legislation that would reduce total U.S. emissions levels in 2050 to 62 to 66 percent below the 2005 emissions level to reverse the impacts of global climate change while simultaneously preserving robust economic growth. Legislative proposals include funding for natural resources adaptation to States, tribes and Federal agencies. The effort failed this year in the Senate and debate on such measures will likely continue in the next Congress.

We concluded the workshop with a manager's panel. The panel discussed ways to address key challenges such as: developing a natural resources conservation vision and actions for the Columbia Basin with climate change in mind; information gaps; how to keep agencies and decision makers abreast of climate change science; and further information sharing efforts.