

Greetings and welcome to the **February 2014** edition of the **WDFW Climate News Digest**. The purpose of this digest is to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are much appreciated – many *thanks* to those who have sent links and references and please keep them coming. Note that previous editions of the newsletter are now stored on the Habitat Program Sharepoint site -- <http://sharepoint.dis.wa.gov/dfw/habitat/climatechange/default.aspx>, and on the agency [climate change web page](#).

Thanks for contributions this month from Marc Hayes, Bob Vadas, Bill Tweit, Ellie Cohen (Point Blue Conservation), David Patte (USFWS), Hedia Adelsman (Ecology).

## WHAT'S HAPPENING AT WDFW?

### [Predicting Climate Change Effects on Kokanee Habitat Suitability in Lake Sammamish](#)

Kirk Krueger (Habitat Program) contributed to this research project to evaluate whether climate change will exacerbate unsuitable dissolved oxygen and temperature conditions for kokanee in Lake Sammamish – the so-called temperature-dissolved oxygen squeeze. This report documents the ability of lake temperature models developed as part of an earlier King County study to simulate observed temperatures over an 8 year period (1995-2002). The report also documents the application of these models to estimating the potential effect of climate change on lake habitat suitability for kokanee.

## CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

### **BPA Funds Research to Predict Hydrologic Response to Climate Change in the Columbia Basin**

BPA is funding research to increase our ever-growing understanding of how climate change will affect streamflow changes in the Columbia River basin. This project updates and enhances the existing climate change streamflow hydrologic dataset that was developed for use by the Columbia River Basin Management Joint Operating Committee (RMJOC) in 2009-2011 to incorporate recent global and regional model output. It also will incorporate ongoing work in the explicit representation of glacier processes in hydrological models as well as efficient methods for estimating seasonal changes in runoff associated with different climate change projections. (PDF attached)

### [PNW Tribal Climate Change Network](#)

Established in 2009, the Network fosters communication between tribes, agencies, and other entities about climate change policies, programs, and research needs pertaining to tribes and climate change. The Network meets via conference call on the fourth Wednesday of each month. The Network provides regular input into ongoing research, resource development and general efforts of the Tribal Climate Change Project. Participants in the Network have cited a critical need for coordination and collaboration between agencies and organizations to meet the needs tribes have in accessing climate change resources and information. To join the Network email list, email Kathy Lynn at [kathy@uoregon.edu](mailto:kathy@uoregon.edu).

### [White House Announces Network of Climate Hubs](#) to link farmers and ranchers with the latest climate science

Saying it wants to help farmers and ranchers better cope with the effects of climate change, the Obama Administration on Wednesday announced a new network of [regional "climate hubs."](#) The idea is to dispatch a cadre of climate change specialists across the nation to gather the latest science on how climate shifts may affect crops and animals, and to disseminate the information to farmers, ranchers, local officials, and others. The hubs will operate out of U.S. Department of Agriculture offices. The USDA described some of

the impacts it expects from climate shifts in a [February 2013 report](#), saying the agency's scientists expect the trend to have "overall detrimental effects on most crops and livestock" by the mid-21st century.

## LEARNING OPPORTUNITIES

### **February 27<sup>th</sup>, 11:00 Pacific Time, "Rapid evolution of biocontrol insects in response to climate change", Peter McEvoy**

The USDA Forest Service Rocky Mountain Research Station is pleased to announce a new webinar series, *Invasive Plants – Issues, Challenges, and Discoveries*. To participate in the presentations, please log in to Adobe Connect and dial in by

telephone. [http://rmrs.adobeconnect.com/common/help/en/support/meeting\\_test.htm](http://rmrs.adobeconnect.com/common/help/en/support/meeting_test.htm)

To join the webinar click on the following link: <http://rmrs.adobeconnect.com/invasives/> (select "enter as guest", then type your name). No prior registration is necessary for this webinar. For audio, dial: **1-888-844-9904** Access code: **8405053#**. Webinars will be recorded and accessible online as they become available. The webinar website will be available by January 1 at: <http://www.fs.fed.us/rmrs/webinar-series/invasive-species/>

### **Fifth Annual Pacific Northwest Climate Science Conference, Sept 9-10, 2014, Seattle, WA, <http://pnwclimateconference.org/>**

The PNW Climate Science Conference annually brings together more than 250 researchers and practitioners from around the region to discuss scientific results, challenges, and solutions related to the impacts of climate on people, natural resources, and infrastructure in the Pacific Northwest. Emphasis is on talks that are comprehensible to a wide audience on topics of broad interest. Stay tuned for further details regarding abstract submission, registration, and program news. In the meantime, please contact Lara Whitely Binder ([lwb123@uw.edu](mailto:lwb123@uw.edu)) with any questions about the conference.

### **The USA National Phenology Network (USA-NPN;[www.usanpn.org](http://www.usanpn.org) <<http://www.usanpn.org/>> - RECORDED WEBINAR**

The USA National Phenology Network serves science and society by promoting a broad understanding of plant and animal phenology and the relationships among phenological patterns and all aspects of environmental change. This presentation provides an overview of the network structure and operations, describes several types of research and management questions that can be addressed with this observing system and the resultant data, and highlights several ongoing local- to national-scale projects focused on understanding spatial and temporal patterns of phenology for a variety of applications. It also touches upon several ways the USA-NPN connects to the broader scientific community, including the National Climate Change and Wildlife Science Center and the DOI Climate Science Centers.

\*If you cannot attend the webinar, it will be posted on the NCCWSC website:

<https://nccwsc.usgs.gov/webinar/289>

## RESOURCES

### **[The Northwest Climate Science Center \(NW CSC\) is pleased to announce the release of the NW CSC Annual Report](#)**

The Annual Report highlights major accomplishments in FY13 for the NW CSC in each of the five core service areas (Executive, Science, Data, Communications, and Education and Training) described in the NW

CSC Strategic Plan. It also recognizes the hard work of the NW CSC's dedicated staff, academic colleagues, and regional partners.

### **[U.S. Climate Action Report](#)**

2014 opened with the release of the latest [U.S. Climate Action Report](#), including the first ever U.S. Biennial Report and the sixth quadrennial National Communication to the United Nations Framework Convention on Climate Change (UNFCCC). The report laid out steps that the U.S. is taking domestically and internationally to address climate change [**mitigation—reduction of GHG**], particularly highlighting progress in and goals for emissions reductions.

### **NOAA Releases Regional Climate Impacts and Outlooks**

NOAA and its partners have released the regional climate outlooks for the first quarter of 2014. NOAA's Regional Climate Services Directors lead the production of these quarterly syntheses of climate impacts and outlooks for many regions of the United States. The syntheses discuss the major climate events during the past three months and contain historical seasonal assessments as well as future climate outlooks, utilizing NOAA's monitoring and assessment capacity. This effort, which began in 2012, now includes as many as 10 unique regional prototypes, all produced collaboratively with partner organizations. To view the regional climate reports, visit: <http://www.ncdc.noaa.gov/news/latest-regional-climate-impacts-and-outlooks>.

### **U.S. Geological Survey Climate Projection Portal Available for Use**

This interactive viewer shows maps based on future projections of temperature and precipitation from a group of "statistically downscaled" global climate models. Users can generate maps for various periods and scenarios to show the number of days that exceed certain thresholds in the model results (for instance, the number of days over 90 degrees Fahrenheit). The portal can also produce annual time series graphs for regions such as watersheds or counties. To access the portal, visit: <http://cida.usgs.gov/climate/derivative/>.

### **February edition of the Office of the Washington State Climatologist newsletter**

The February edition of the Office of the Washington State Climatologist newsletter is available here: (<http://www.climate.washington.edu/newsletter/>).

Topics include: January climate summary, 2013 in review, Snowpack update, Temperature and precipitation outlook.

## **CLIMATE SCIENCE NEWS**

### **[Could weakening winds threaten Pacific Northwest's mountain water supply?](#)**

Trends in streamflow timing and volume in the Pacific Northwest United States have been attributed to increased temperatures because trends in precipitation at lower elevation stations were negligible. New research demonstrates that observed streamflow declines likely are associated with declines in mountain precipitation, revealing previously unexplored differential trends. Lower-troposphere winter (Nov-Mar) westerlies are strongly correlated to high elevation precipitation but weakly correlated with low elevation precipitation. Decreases in lower-tropospheric winter westerlies across the region from 1950-2012 are hypothesized to have reduced orographic precipitation enhancement, yielding differential trends in precipitation across elevations and contributing to the decline in annual streamflow. Climate projections show weakened lower troposphere zonal flow across the region under enhanced greenhouse forcing, highlighting an additional stressor relevant for climate change impacts on hydrology. (C.H. Luce, J.T. Abatzoglou, and Z.A. Holden, *Science*, 13 December 2013, Vol. 342 no. 6164 pp. 1360-1364, DOI: 10.1126/science.1242335)

## [Solution to Cloud Riddle Reveals Hotter Future: Global Temperatures to Rise at Least 4 Degrees C by 2100](#)

Global average temperatures will rise at least 4°C by 2100 and potentially more than 8°C by 2200 if carbon dioxide emissions are not reduced according to new research published in *Nature*. Scientists found global climate is more sensitive to carbon dioxide than most previous estimates. These findings (a first) rely on a causal physical mechanism for models to better simulate certain cloud-relevant phenomena, show consistent predictive skill across many climate models, and point to processes connecting low-cloud regions to the deep tropics. (Steven C. Sherwood, Sandrine Bony & Jean-Louis Dufresne, *Nature*, Jan 2, 2014, Vol 505, 37, doi:10.1038/nature12829)

## [Converting land to agriculture reduces carbon uptake, study shows](#)

Researchers examined the impact that converting natural land to cropland has on global vegetation growth, as measured by satellite-derived net primary production, or NPP. They found that measures of terrestrial vegetation growth actually decrease with agricultural conversion, which has important implications for terrestrial carbon storage. W. Kolby Smith, Cory C. Cleveland, Sasha C. Reed, Steven W. Running. Agricultural conversion without external water and nutrient inputs reduces terrestrial vegetation productivity. *Geophysical Research Letters*, 2014; DOI: [10.1002/2013GL058857](https://doi.org/10.1002/2013GL058857)

## SPECIES AND HABITATS

### **Preparing For and Managing Change: Climate Adaptation for Biodiversity and Ecosystems**

From the abstract: The emerging field of climate-change adaptation has experienced a dramatic increase in attention as the impacts of climate change on biodiversity and ecosystems have become more evident. Adaptation increasingly is viewed as a way of managing change, rather than just maintaining existing conditions. There is also increasing recognition of the need not only to adjust management strategies in light of climate shifts, but to reassess and, as needed, modify underlying conservation goals. With ecosystems expected to undergo continuing climate-mediated changes for years to come, adaptation can best be thought of as an ongoing process, rather than as a fixed endpoint. (Stein et al, *Frontiers in Ecology and Environment*, November 2013)

### [Warmer winters may be pushing raptors northward](#)

Research shows that several raptor species appear to be responding to warmer winters by shortening their annual migration by as much as seven or eight kilometers (four to five miles) per year. ... > [full story](#)

### [Big, old trees keep growing and capturing carbon, study finds](#)

Excerpt from LA TIMES January 15, 2014

Scientists who gathered decades of measurements from hundreds of thousands of trees all over the world are punching a hole in the common assumption that large, old trees are biologically pretty much over the hill. To the contrary, researchers found that the senior trees have rapid growth rates and keep capturing carbon – lots of it. The findings, published Wednesday in a letter in the journal *Nature*, are based on repeated measurements of 673,046 trees belonging to 403 species across every forested continent. Research suggests that the big guys are not just storing carbon. They are fixing large amounts of it with continued rapid growth, every year adding a little more mass to their trunks, limbs and leaves. At the high end, the authors said a single big tree can in one year add the same amount of carbon to a forest as is stored in an entire mid-sized tree. "

## **[Acidification, Predators Pose Double Threat to Oysters](#)**

The once-booming, now struggling Olympia oyster native to the West Coast could face a double threat from ocean acidification and invasive predators, according to new research from the University of California, Davis' Bodega Marine Laboratory. Invasive snails ate 20 percent more juvenile oysters when both oysters and snails were raised under ocean conditions forecast for the end of this century, the researchers found. The results highlight the dangers of multiple stressors on ecosystems, said Eric Sanford, professor of evolution and ecology at UC Davis and first author on the study. "You might decide to go to work if you had a toothache. But what if you had a toothache, the flu, and a broken leg? At some point, multiple stressors will cause natural systems to break down," he said. Native Olympia oysters were once so common in San Francisco Bay that they were a cheap food during the Gold Rush, commemorated in Hangtown Fry, an omelet of eggs, bacon and oysters. The population collapsed from overfishing in the late 1800s and has never recovered.

*E. Sanford, et al Ocean acidification increases the vulnerability of native oysters to predation by invasive snails. Proceedings of the Royal Society B: Biological Sciences, 2014; 281 (1778): 20132681 DOI: [10.1098/rspb.2013.2681](https://doi.org/10.1098/rspb.2013.2681)*

## **Impacts of long-term snow climate change on a high-elevation cold desert shrubland, California, USA (pdf attached)**

From the abstract: Research compared how increased, decreased, and ambient snow depth affected patterns of vegetation community composition, fire fuel accumulation, and annual tree ring growth. We also tested the effect of snow depth on soil carbon storage based on total C content under the two co-dominant shrub species (*Artemisia tridentata* and *Purshia tridentata*) in comparison with open, intershrub sites. Increased snow depth reduced the cover of the N-fixing shrub (*Loik et al, published online: 4 January 2013, Springer Science+Business Media Dordrecht 2013*)

## **The interacting effects of temperature, ground disturbance, and herbivory on seedling establishment: implications for treeline advance with climate warming (pdf attached)**

From the abstract: This research investigated the ecological dynamics of conifer establishment at treeline in the Mealy Mountains (Labrador, Canada) and the potential for its expansion with climate warming. Available seedbed and tree seedling emergence in the treeline ecotone were monitored, and seeds and seedlings of *Picea mariana* were planted along an elevational gradient from open-canopy forest through tree islands to alpine tundra. Responses in seed germination and seedling growth, damage, and mortality were monitored over two growing seasons, and re-surveyed after 5 years. While temperature enhancement alone had little impact on emergence, even moderate temperature increases had significantly disproportionate effects on emergence of seedlings in the alpine habitat when combined with soil disturbance, indicating that future climate warming could lead to treeline advance if viable seed and suitable substrate for recruitment are available. The positive effect of excluding herbivores suggests that herbivory may be an important filter modifying future species distribution. (*Munier et al, published online: 29 January 2010, Springer Science+Business Media B.V. 2010*)

**[The December issue of The Climate CIRCulator](#)** features eight papers on Forests and climate change including changing fire regimes in the West, insects, invasive plants and meadow invasion, and vegetation phenology. (The Pacific Northwest Climate Impacts Research Consortium ([CIRC](#)) and The Oregon Climate Change Research Institute ([OCCRI](#)))

**[In a new study, megafauna more likely to feel climate impacts than smaller species](#)**

A recent assessment led by University of Colorado Assistant Professor Christy McCain looked at more than 1,000 different scientific studies on North American mammal responses to human-caused climate change. The analysis showed only 52 percent of the mammal species responded as expected to climate change, while 7 percent responded the opposite of expectations and the remaining 41 percent had no detectable response. While body size was by far the best predictor for response to climate change -- almost all of the largest mammals responded negatively -- the new study also showed that mammals active only during the day or only at night were twice as likely to respond to climate change as mammals that had flexible activity times, she said. The ability of mammals to hibernate, burrow and nest was not a good predictor of whether a species responded to climate change or not. One of the most intriguing study findings was that some small mammals may shelter from climate change by using a wider array of "micro-climates" available in the vegetation and soil, she said. McCain compared the findings with the events at the K-T boundary 66 million years ago when an asteroid smacked Earth, drastically changing the climate and killing off the big dinosaurs but sparing many of the small mammals that found suitable shelter underground to protect them from the cataclysmic event. See more at: <http://www.colorado.edu/news/features/mammal-responses-climate-change-some-traits-are-predictors#sthash.NfHcgzx5.p7Kmv8OE.dpuf>

## **POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION**

**Governor Inslee has been appointed to the [State, Local and Tribal Leaders Task Force on Climate Preparedness and Resilience](#)**, which held its first meeting in December, 2013. The purpose of the Task Force is to provide recommendations to President Obama on removing barriers to resilient investments, modernizing Federal grant and loan programs to better support local efforts, and developing the information and tools needed to prepare for climate change. Attached is a letter in which Governor Inslee outlines his aspirations for the Task Force.

### **Split in Washington State Climate Workgroup Recommendations Shows Challenges in Moving Climate Policy Forward** **(from Marten Law Group)**

Washington's Climate Legislative and Executive Workgroup issued majority and minority reports on January 21, 2014, with a party line split on the direction the State should take to reduce its greenhouse gas emissions. The Workgroup, which consists of a majority and a minority member from each house of the state legislature, plus the Governor as a non-voting chair, was created in 2013. It was tasked with developing recommendations for achieving the State's long-term greenhouse gas emission reduction targets, set back in 2008. The Workgroup's majority report indicates that the Governor and the two Democratic members are ready to move forward with a state-wide cap and trade program similar to the one adopted by California, and several other initiatives. The minority report, from the two Republican members, calls for more study of the cost of these programs to the state economy, prior to enactment. The minority also suggests that the State revisit its long-term emission reduction goals, in light of Washington's relatively low greenhouse gas emissions compared to other states, particularly in the electric power generation sector. Workgroup reports are attached.

### **Sea Level Rise Vulnerability Study for Los Angeles Released**

Over the next century, sea level rise in the Los Angeles (L.A.) region is expected to show an increase of 5 to 24 inches from 2000 to 2050 and 17 - 66 inches from 2000 to 2100. Tides, wave-driven run-up and storm surge sometimes cause coastal flooding in Southern California, especially when big wave storms occur at or near peak high tides. Sea level rise will potentially exacerbate the impacts from these events. The City of L.A. owns and maintains coastal infrastructure that includes two power plants, two wastewater treatment plants, and the Port of L.A, all of which are situated about ten feet above sea level. A major component of

L.A.'s economy is dependent upon beach tourism. The City of L.A., along with a team of science and outreach experts, developed a science-based and stakeholder-supported adaptation planning process to begin planning for the impacts of climate change. To access the study, visit:

[http://www.usc.edu/org/seagrant/research/sea\\_level\\_rise\\_vulnerability.html](http://www.usc.edu/org/seagrant/research/sea_level_rise_vulnerability.html).

### **How worldwide climate change news stacks up**

Countries that have committed to reducing greenhouse gas emissions under the Kyoto Protocol tend to have more frequent news coverage of climate change, a new study says. The researchers studied media coverage in 27 countries, ranging from Algeria to Germany to Papua New Guinea. The team searched for articles mentioning climate change in one to... [Read More »](#)

### **EU to cut carbon emissions by 40 percent by 2030**

Europe will cut its greenhouse gas emissions by 40 percent by 2030, compared with 1990 levels, the toughest climate change target of any region in the world, and will produce 27 percent of its energy from renewable sources by the same date.

### **Bloomberg vows to boost cities' efforts to curb climate change**

Former New York Mayor Michael Bloomberg aims to use his new role as U.N. envoy on cities and climate change to help "frustrated" U.N. chief Ban Ki-moon motivate world leaders to cut greenhouse gas emissions by showing them progress made by large cities.

### **Reducing Climate Risks with Natural Infrastructure** (pdf)

This report from The Nature Conservancy draws on experience from nine case studies in California and makes a compelling case for conservation as an effective tool to reduce risks of a changing climate. the main conclusions are that green infrastructure:

1. can provide cost-effective flood and coastal protection.
  2. has been demonstrated successfully in a wide variety of settings.
  3. can be designed to adapt to changing conditions.
  4. provides multiple benefits.
- can inspire strong local support.