Greetings and welcome to the **JULY 2015** edition of the WDFW Climate News Digest. Our purpose 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 and on the agency's climate change web page.

Thanks for contributions this month from Joe Buchanan, Wendy Connally, Jason Wettstein and Dan Siemann (DNR)

*Sources for news items include the following (please contact Lynn if you want to subscribe to any directly): EPA and Climate Change and Water News, NPLCC and NWCSC News Digests, Ellie Cohen's Point Blue Conservation News, Weekly digest from climate.gov.*

## WHAT'S HAPPENING AT WDFW?

### Habitat Program hosts technical workshop on climate change and culverts

WDFW received a grant in 2014 from the NPLCC (North Pacific Landscape Conservation Cooperative) for a project to evaluate if, when and how to consider changes in culvert size and/or design guidance because of projected climate change impacts. See attached for a one page description of the project and a list of project participants. The WDFW team hosted a technical workshop in early June to share methodology and preliminary findings for the project. Draft products include a statewide map which translates projected changes to streamflows across the state to percent change in bankfull width, a critical design factor for culvert sizing. Products also include a proposed framework for considering the relative risk of failure under different scenarios. Workshop participants offered helpful feedback and indicated support for the project approach and methodology. A final project report will be available in late fall 2015. For more information or copies of draft material, please contact Lynn Helbrecht.

## CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

### Comparison of 2014 Federal Agency Adaptation Plans

This comparison of 2014 Federal Adaptation Plans was undertaken to provide US Army Corps of Engineers staff with information about other agency climate preparedness and resilience actions to facilitate partnering and information sharing, identify actions taken by agencies with aligned missions and operations that could be useful to us, and support a gap analysis to guide future actions. It is not intended to be a comprehensive comparison, rather an information resource to combine with other more detailed data. This report has two components: a compilation of individual agency adaptation plan highlights and a crosswalk between the USACE 2014 Adaptation Plan and the 37 other Adaptation Plans submitted in 2014.

## LEARNING OPPORTUNITIES

### July 14th, 11:00-12:00 PDT, Webinar: National Phenology Network Data Visualization Tool

The USA-National Phenology Network will demonstrate how to use their new data visualization tool to explore patterns from their data collection network. Users can compare between years, regions, and determine if timing of phenological events in their region seem to be driven by temperature, precipitation, daylength, or elevation.
Click here for more information.

**July 15th, 12:00-1:00 PDT, EPA Climate Change Speaker Series: *Carbon Offsets: A Perfect Substitute for Directly Reducing Emissions?***

Carrie Lee, Stockholm Environment Institute. Call-in: 1-866-299-3188, Code: 206-553-1597#
Adobe Connect: https://epa.connectsolutions.com/r3y572rrhby/
Carrie is a staff scientist for the Stockholm Environment Institute, where her research focuses on climate change mitigation strategies in forestry and agriculture; carbon offsets; bioenergy production; ecosystem ecology and management. She will be discussing the pros and cons of using carbon offsets both individually and in regional, national, and international emissions trading systems. **Information:** Michael Cox (206-553-1597).

**July 21, 2:00-3:00 PDT, NPLCC Webinar: Prioritizing restoration and enhancement of passage at stream-road crossings for fish**

This NPLCC-funded project with U.S. Geological Survey evaluated how to best prioritize culvert replacements. Please join us for a presentation on this project from Rachel Reagan and Jason Dunham of USGS. **REGISTER HERE**
More about the project.

**July 22, 11:00-12:00 PDT, Communicating the Connection between Climate Change and Heat Health**

Climate change, the heat island effect, and public health are strongly connected. As temperatures rise due to climate change, the heat island effect (which causes built-up areas to be hotter than surrounding areas) is exacerbated, leading to increases in heat-related illnesses, deaths, and other health issues. This webcast will explore how public health and environmental professionals can effectively communicate and leverage these connections to raise awareness among the public and to promote progress on these issues. Register here.

**August 21, 8:00 – 12:00, Beaver Restoration Workshop - Portland OR**

Portland State University, Environmental Professional Program, is excited to announce a Beaver Restoration Workshop on Friday, August 21st, that will be held in conjunction with the American Fisheries Society National Meeting the week of August 16th in Portland, Oregon. The focus will be the new state of the science "Beaver Restoration Guidebook". **Sign up here f**or only $25 for course #EPP 726-007.

**November 4-5, 2015, Sixth Annual Northwest Climate Conference,** Coeur d'Alene, Idaho
http://pnwclimateconference.org/
The NW Climate Conference (formerly known as the Pacific Northwest Climate Science Conference) annually brings together more than 250 researchers and practitioners from around the region to discuss scientific findings, challenges, and solutions related to the impacts of climate on people, natural resources, and infrastructure in the northwestern United States and southwestern Canada

## RESOURCES

**The Climate Commons: "Get Started: Quick-Reference Articles"**

The California Climate Commons presents "Get Started: Quick-Reference Articles", a collection of short pieces to help you launch into the world of climate change science so you can move forward quickly with climate-smart conservation. "Get Started" articles include brief explanations of climate change concepts, literature reviews summarizing the latest science, guidelines for analysis and planning techniques, and examples of climate-smart conservation in action in California.

**The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains**

The North Pacific LCC worked with the guidebook's authors to develop this resource for anyone involved in using beaver to restore streams, floodplains, wetlands, and riparian areas. It provides a practical synthesis of the best available science, an overview of management techniques, and case studies from throughout the western U.S. This information will be useful for landowners, biologists, engineers, scientists, foresters, farmers, ranchers, the regulatory and funding communities, and others interested in how beaver activity can be effectively used to restore and improve water quality.
Click here for more information. See August 21st workshop notice in "Learning Opportunities" above.

**Northwest Climate Magazine 2015**

This new annual publication is a joint effort of the Northwest Climate Science Center, the Climate Impacts Research Consortium and the North Pacific Landscape Conservation Cooperative. The magazine is intended to share stories about climate research and improve coordination and collaboration among federal, state, tribal, university and non-governmental groups across the Northwest. Read More >>

**Webinar recording: Predicting Climate Change Impacts on Aquatic Ecosystems across the Pacific Northwest**

*Clint Muhlfeld*

Trout and salmon populations, which play a critical role in many ecosystems and economies, have dramatically declined in the Pacific Northwest (PNW) due to habitat degradation and fragmentation and introductions of invasive species, and are expected to be further impacted by future climate change. Understanding how climate change will influence the abundance, distribution, genetic diversity, and value of these native fish species is crucial for their management and recovery. This project used modeling techniques to study how climate change might affect freshwater habitats of key trout and salmon species throughout the PNW. The goal of the study was to develop and provide novel tools that will help managers predict and respond to potential climate change induced impacts on habitats, populations, and economies.

**Animated Map: Wind Map: Explore prevailing surface wind direction and strength across the U.S.** (from Climate.gov).

**Climate Resilience Toolkit: Climate Registry for the Assessment of Vulnerability (CRAVe)**

Search this registry to locate vulnerability assessments by geographic area, assessment target, sponsoring agency, and other factors. Registered users can also enter basic information about a vulnerability assessment, enabling colleagues, partners, and others to learn and benefit from their work.

## CLIMATE SCIENCE NEWS

***Science* publishes new NOAA analysis: Data show no recent slowdown in global warming**

A **new study** published online in the journal *Science* finds that the rate of global warming during the last 15 years has been as fast as or faster than that seen during the latter half of the 20th Century. The study refutes the notion that there has been a slowdown or "hiatus" in the rate of global warming in recent years. The study is the work of a team of scientists from the National Oceanic and Atmospheric Administration's (**NOAA**) National Centers for Environmental Information* (**NCEI**) using the latest global surface temperature data. The new analysis suggests that the apparent hiatus may have been largely the result of limitations in past datasets, and that the rate of warming over the first 15 years of this century has, in fact, been as fast or faster than that seen over the last half of the 20th century.

**Greenhouse effect from fossil fuels felt almost immediately**

(from Science News)

When a fossil fuel burns, it radiates heat and releases carbon dioxide. Once in the atmosphere, some of that $CO_2$ can linger for thousands of years and trap heat that would otherwise leak into space. Over the lifetime of the released $CO_2$, the trapped heat exceeds the heat released during combustion by a factor of more than 100,000, researchers report online June 2 in *Geophysical Research Letters*.

**July newsletter from the Office of the Washington Climatologist (attached)**

The July edition of OWSC's newsletter is now available on our website:
http://www.climate.washington.edu/newsletter/ and attached to this email.
Topics include a review of the hot June temperatures and little precipitation, a drought update, a review of July 1985, and the temperature and precipitation outlook from the Climate Prediction Center.

## SPECIES AND HABITATS

**Tree mortality from drought, insects, and their interactions in a changing climate**

*(excerpt from the abstract)*

Climate change is expected to drive increased tree mortality through drought, heat stress, and insect attacks, with manifold impacts on forest ecosystems. Yet, climate-induced tree mortality and biotic disturbance agents are largely absent from process-based ecosystem models. Using data sets from the western USA and associated studies, we present a framework for determining the relative contribution of drought stress, insect attack, and their interactions, which is critical for modeling mortality in future climates.

- USGS Western Ecological Research Center

**USGS Changing Arctic Ecosystems – New Publication Provides Synthesis, Overview of Wildlife Response, and Forecasting Framework**

The USGS Changing Arctic Ecosystems initiative began in 2010 to provide accurate, timely forecasting of wildlife response to the rapid warming occurring in the Arctic. USGS research efforts in the Arctic include the marine, freshwater and terrestrial landscapes of Arctic Alaska, and focus on delivering information for proactive decision-making**.** A new paper to be published in the journal *BioScience* by scientists from the USGS Alaska Science Center describes the primary physical drivers affecting Arctic wildlife habitats and synthesizes early results from USGS research. The authors provide a conceptual model that integrates physical drivers, community-level interactions, and anthropogenic influences. The utility of this modeling approach is explained using examples from recent resource management decisions. The article is available online from *BioScience*: http://bioscience.oxfordjournals.org/content/early/2015/06/19/biosci.biv069.
Van Hemert, C., P.L. Flint, M.S. Udevitz, J.C. Koch, T.C. Atwood, K.L. Oakley, and J.M. Pearce. 2015. Forecasting wildlife response to rapid warming in the Alaskan Arctic. BioScience. In press.

*From the Climate Resilience Toolkit:*

**Taking Action in the Navajo Nation: Hotter, Drier Climate Puts Sand Dunes on the Move**

Sand dunes cover roughly one-third of the Navajo Reservation in northeastern Arizona. Higher temperatures and lower precipitation totals projected for the region have researchers monitoring dune motion and considering solutions.

**Animals that are cold-blooded or unable to regulate their internal body temperature may find it hard adjusting to global warming change**

For their study published in the *Proceedings of the Royal Society B.*, biologists from the University of California, Berkeley and San Francisco State University completed a meta-analysis in which they analyzed 112 published studies on plasticity — the ability of individual animals to change their thermal tolerance when they experience new environmental temperatures. They found that cold-blooded animals have an especially difficult time adjusting to temperatures, and that on average most ectotherms aren't flexible to global warming changes. http://rspb.royalsocietypublishing.org/content/282/1808/20150401

**New study shows Arctic Ocean rapidly becoming more corrosive to marine species: Chukchi and Beaufort Seas could become less hospitable to shelled animals by 2030**

New research by NOAA, University of Alaska, and Woods Hole Oceanographic Institution in the journal *Oceanography* shows that surface waters of the Chukchi and Beaufort seas could reach levels of acidity that threaten the ability of animals to build and maintain their shells by 2030, with the Bering Sea reaching this level of acidity by 2044.

**New Synthesis Study Shows the Importance of Incorporating Climate Change Projections into Riparian Restoration**

A new study by U.S. Geological Survey, National Oceanic and Atmospheric Administration (NOAA), and Colorado State University scientists published in the journal *Ecohydrology,* highlights the many ways that climate change can and should be incorporated into riparian restoration planning. Riparian restoration by land managers around the globe is used to protect water quality, endangered species, wildlife habitat, and human infrastructure. However, climate change can complicate restoration efforts since it can alter which restoration sites are most promising, which restoration methods are most effective, and which restoration goals are achievable. This new study describes ways to predict climate change effects, adjust restoration methods, and address future uncertainty to increase the chances of effective, long-term riparian restoration. The article is available early online at http://onlinelibrary.wiley.com/doi/10.1002/eco.1645/abstract.

## POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION

**Contrasting futures for ocean and society from different emissions scenarios**

(From Tom Banse, Northwest Public Radio)

A recent paper in the journal *Science* asserts that the window of opportunity to prevent grave ecological damage to our oceans from climate change is closing. The co-authors include researchers from the University of Washington and University of British Columbia. Most scientists tend to shy away from politics. But it's a short leap from science to policy when it comes to climate change. In this case, 22 marine science researchers from nine countries collaborated to analyze scenarios for future life in the ocean in clear, stark terms. They published in a science journal, but University of Washington Professor Ryan Kelly, one of the co-authors of the paper, said the ultimate target audience is political decision makers and climate treaty negotiators.

**EPA publishes study on the costs of inaction on climate change (attached)**

Yesterday EPA released the first comprehensive study for the USA of the benefits of climate action compared to the costs of inaction (attached). Notably the report has some level of regional results as well. The summary brochure also has some nice PNW bullet points worth using (pasted below).

NORTHWEST

• In the Pacific Northwest, unmitigated climate change is projected result in $120-340 million in damages due to decreased water quality in 2100. Global action on climate change would avoid approximately $100-260 million of these damages.

• In the Pacific Northwest, approximately 56% (8,300) of inland bridges are projected to become vulnerable in the second half of the century due to unmitigated climate change. Global action on climate change would reduce this number to 25% or approximately 3,700.
• Throughout the Northwest, unmitigated climate change is projected to result in the loss of a substantial amount of the habitat currently suitable for coldwater fisheries, which supports valuable species such as trout. Global action on climate change is projected to preserve nearly all of this habitat.
• In the Northwest, unmitigated climate change is projected to increase area burned by wildfire annually by approximately 95% by the end of the century.
• In the national market, ocean acidification is projected to result in a 32-48% decline in the harvest of select shellfish by the end of the century. Global action on climate change could prevent most of the decreases in supply, therefore avoiding an estimated $380 million in consumer losses in 2100.