

Greetings and welcome to the **JUNE 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's [climate change web page](#).

Thanks for contributions this month from Dale Gombert, Anne Marshall, Cynthia Wilkerson, Marc Hayes

## WHAT'S HAPPENING AT WDFW?

### **Riparian Climate-Corridors; Identifying Priority Areas for Conservation in a Changing Climate**

John Pierce and Cynthia Wilkerson (Wildlife Program) are sponsoring a talk by Dr. Meade Krosby (June 13<sup>th</sup>, 9-11:00 am), discussing a recent research project to identify riparian areas across the Pacific Northwest resilient to climate change – those that span large temperature gradients, have high canopy cover, low solar insolation, and low levels of human modification. The research team found that riparian climate adaptation potential varies greatly across the region, and is sensitive to scale of analysis. The report therefore describes a multi-scale approach to implementing and interpreting the riparian climate-corridor model. **Space is limited – if interested in attending please contact Cynthia ([Cynthia.wilkerson@dfw.wa.gov](mailto:Cynthia.wilkerson@dfw.wa.gov)).**

### **WDFW staff can help an innovative research effort on Pacific Northwest snowpack and forests**

The Climate Impacts Group is partnering with researchers at the University of Washington, Seattle Public Utilities, Oregon State University, and the University of Idaho to better understand how forest types and management regimes across the PNW affect the timing of snowmelt for the range of climate conditions. The project will use field observations, collected in the form of geo-tagged photos, and predictive models to evaluate the effect of forest management actions on snowmelt timing under current and future conditions. The resulting maps and supporting data will be made publicly available to support forest management.

***On-the-ground observations of snow presence in forested and open areas across the region are an important component of the research.*** If your professional or recreational activities take you into the mountains this spring and summer (or you know people who fit this category), you can help the research by sending geo-tagged photos of snow (or no snow) in adjacent forested and open areas. No special equipment is needed - most smart phones will take geo-tagged photos as long as the GPS for the camera is enabled in phone settings. See the attached PDF or go to <http://depts.washington.edu/mtnhydr/research/citsci.shtml> for more information on the project, including instructions for sending photos. A short training video is also available on the project website. For questions or more information on the project, contact Susan Dickerson-Lange (253-225-9909 or [dickers@uw.edu](mailto:dickers@uw.edu)). And please spread the word!

## CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

**Transportation Research Board Hosts Webinar on Climate Data and Tools for the Development and Implementation of Climate Change Plans by State Departments of Transportation (June 5,**

### **2014, 10:00-11:00 Pacific)**

In this webinar, the Transportation Research Board will explore why and how state departments of transportation and other agencies may improve their data practices in order to enhance their ability to meet and secure federal policies and grants. Adapting to changes brought about by climate in the transportation sector requires that state departments of transportation and other agencies identify the most useful and credible data available. Participants must register in advance of the webinar, and there is a fee for non-TRB Sponsor or non-TRB Sustaining Affiliate employees. For more information and to register, visit: <http://www.trb.org/main/blurbs/170684.aspx>

### **BPA – Predicting the Hydrologic Response of the Columbia River System to Climate Change (see attached)**

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. The project leverages and expands on existing projects within the University of Washington's Land Surface Hydrology Group and its partner Oregon State University that are using multi-model approaches to hydrological prediction, downscaling and bias correction approaches, and regional scale climate and hydrological modeling. We also 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.

## **LEARNING OPPORTUNITIES**

**June 3, 10:00 to 11:30 Pacific, “The National Climate Assessment: Actionable Science for Natural Systems”** - The third National Climate Assessment (NCA) report, released May 6, 2014, is the most comprehensive look at climate change impacts in the United States to date. Based on years of work by hundreds of diverse experts, the NCA (<http://nca2014.globalchange.gov/>) confirms that climate change is affecting us – and the natural resources we rely on – right now. Join authors of National Climate Assessment (NCA) chapters on Ecosystems, Forests, and Adaptation together with representatives from the U.S. Global Change Research Program and the NCA Indicator System to discuss key findings and implications for managers.

To register, go to:

<https://doilearn.webex.com/doilearn/k2/j.php?MTID=t98ad0d0ad02f745021be06828a458828>

THIS WEBINAR WILL BE RECORDED AND POSTED

Approximately 1-2 weeks after the presentation is given a recording will be posted

here: <http://nctc.fws.gov/topic/online-training/webinars/safeguarding-wildlife.html>

### **June 5-23, 2014 -- Webinar Series to Discuss Climate Change Impacts on Tribal Water Resources, and Traditional Foods, Role of Traditional Knowledge, and Communication.**

Offered by the Institute for Tribal Environmental Professionals at Northern Arizona University with support from the U.S. EPA, this webinar series will discuss impacts of climate change on tribal water resources and traditional foods, the role of traditional knowledge in climate change initiatives, and communicating about climate change. The webinars are being held throughout the month of June. Note: webinars will be limited to 100 participants and require registration. Webinars will be recorded and archived at

[http://www4.nau.edu/itep/climatechange/tcc\\_webinars.asp](http://www4.nau.edu/itep/climatechange/tcc_webinars.asp).

[Climate Change Impacts on Traditional Foods](#) - June 5, 2014

[Climate Change Impacts on Tribal Water Resources](#) - June 9, 2014

[The Role of Traditional Knowledges in Climate Change Initiatives](#) - June 16, 2014

[Communicating about Climate Change - From Impacts to Solutions](#) - June 23, 2014

### **August 12-14, 2014, Upcoming Training Course: Water Temperature Impacts under Climate Change**

The U.S. Department of Interior's Bureau of Reclamation, the U.S. Army Corps of Engineers, and the University Corporation for Atmospheric Research's COMET Program are offering the first Water Temperature Impacts under Climate Change course under the Professional Development Series they have jointly developed - Assessing Natural Systems Impacts under Climate Change. The course will be held at the University Corporation for Atmospheric Research in Boulder, Colorado from August 12-14, 2014. The course builds on material in three prerequisite COMET modules and is geared towards water resource practitioners and researchers working with current trends and future projections of climate change effects on water temperatures of inland streams and rivers. For more information, visit:

<http://courses.comet.ucar.edu/course/info.php?id=136>.

### **Sept 9-10, 2014, Seattle, WA, Fifth Annual Pacific Northwest Climate Science Conference,**

<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.

## **RESOURCES**

### **NOAA climate and fisheries webpage**

Climate change is already having a profound effect on life in the oceans. Marine species tend to be highly mobile, and many are moving quickly toward the poles to stay cool as average ocean temperatures rise. These shifts can cause ecological disruptions as predators become separated from their prey. They can also cause economic disruptions if a fish population becomes less productive or moves out of range of the fishermen who catch them. In addition to getting warmer, the oceans are also becoming more acidic as they absorb about one-half of the CO<sub>2</sub> we emit into the atmosphere. This increased acidity can make life difficult for organisms that build shells out of calcium carbonate. This includes not only corals and shellfish, but also tiny organisms like pteropods that form the foundation of many marine food webs. NOAA Fisheries scientists are working to understand the effects of climate change and ocean acidification so we can minimize the disruptions they cause, adapt to the changes that are coming, and ensure that future generations can enjoy the benefits of healthy marine ecosystems. This link illustrates some of the projects NOAA staff are working on.

### **New Guide Provides Conservation Guidance in a Changing Climate**

[Climate-Smart Conservation: Putting Adaption Principles into Practice](#) looks at how climate change already is affecting the nation's wildlife and habitats, and addresses how natural resource managers will need to prepare for and adapt to these unprecedented changes. Developed by a broad collaboration of experts from federal, state, and non-governmental institutions, the guide offers practical steps for crafting conservation actions to enhance the resilience of the natural ecosystems on which wildlife and people depend.

If you missed the webinar on "*The Release of the New Climate-Smart Conservation Guide*" held May 14th, a recording will be posted shortly at: <http://nctc.fws.gov/topic/online-training/webinars/safeguarding-wildlife.html>

**New Publication: Vulnerability of Birds to Climate Change in California's Sierra Nevada**

In a rapidly changing climate, effective bird conservation requires not only reliable information about the current vulnerability of species of conservation concern, but also credible projections of their future vulnerability. Read this new publication, by Rodney Siegel et al., to learn more. This work is the result of a project funded by the California Landscape Conservation Collaborative.

**Book on Climate Change and Indigenous Peoples in the United States**

Previously published in the Journal "Climatic Change", (Volume 120, Issue 3, 2013), this book explores climate-related issues for indigenous communities in the United States, including loss of traditional knowledge, forests and ecosystems, food security and traditional foods, as well as water, Arctic sea ice loss, permafrost thaw, and relocation. The book also highlights how tribal communities and programs are responding to the changing environments. Fifty authors from tribal communities, academia, government agencies, and nongovernmental organizations contributed to the book. For more information, visit: <http://www.springer.com/environment/global+change++climate+change/book/978-3-319-05265-6>.

## CLIMATE SCIENCE NEWS

**Collapse of the West Antarctic Ice Sheet**

Two teams of scientists say the long-feared collapse of the West Antarctic Ice Sheet has begun, kicking off what they say will be a centuries-long, "unstoppable" process that could raise sea levels by as much as 15 feet.

<http://www.nbcnews.com/science/environment/west-antarctic-ice-sheets-collapse-triggers-sea-level-warning-n103221>

[http://www.nytimes.com/2014/05/13/science/earth/collapse-of-parts-of-west-antarctica-ice-sheet-has-begun-scientists-say.html?hp&\\_r=1](http://www.nytimes.com/2014/05/13/science/earth/collapse-of-parts-of-west-antarctica-ice-sheet-has-begun-scientists-say.html?hp&_r=1)

**Ocean winds keep Antarctica cold, Australia dry**

*(from Science Daily)*

New research has explained why Antarctica is not warming as much as other continents, and why southern Australia is recording more droughts. Researchers have found rising levels of carbon dioxide in the atmosphere are strengthening the stormy Southern Ocean winds which deliver rain to southern Australia, but pushing them further south towards Antarctica. [full story](#)

**Long-term warming likely to be significant despite recent slowdown**

*(from Science Daily)*

A new study shows Earth's climate likely will continue to warm during this century on track with previous estimates, despite the recent slowdown in the rate of global warming. The research hinges on a new and more detailed calculation of the sensitivity of Earth's climate to the factors that cause it to change, such as greenhouse gas emissions. The study found Earth is likely to experience roughly 20 percent more warming than estimates that were largely based on surface temperature observations during the past 150 years. One reason for the disproportionate influence of the Northern Hemisphere, particularly as it pertains to the impact of aerosols, is that most human-made aerosols are released from the more industrialized regions north of the equator. Also, the vast majority of Earth's landmasses are in the

Northern Hemisphere. This furthers the effect of the Northern Hemisphere because land, snow and ice adjust to atmospheric changes more quickly than the oceans of the world. [full story](#)

Drew T. Shindell. **Inhomogeneous forcing and transient climate sensitivity**. *Nature Climate Change*, 2014; DOI: [10.1038/nclimate2136](https://doi.org/10.1038/nclimate2136)

### **How do oceans absorb carbon dioxide?**

*(excerpt from the Christian Science Monitor)*

The ocean's biological pump exports organic carbon from the upper part of the ocean into the deeper layers below, "through sinking particulate matter, largely from zooplankton feces and aggregates of algae," say researchers, who published their findings in a paper titled "[Global assessment of ocean carbon export by combining satellite observations and food-web models](#)" in the journal *Global Biogeochemical Cycles*. The color of ocean waters is an indicator of the type of phytoplankton biomass and its composition. For example – green ocean water means the particular area probably contains a lot of phytoplankton. Blue water could mean that portion of the ocean has less phytoplankton. Using satellite images, the team of researchers examined the color of ocean waters which helped them to zero in on the different types of phytoplankton present in oceans. Among other things, the images also helped them to determine the size and pigmentation of the phytoplankton.

D. A. Siegel, K. O. Buesseler, S. C. Doney, S. F. Sailley, M. J. Behrenfeld, P. W. Boyd. **Global assessment of ocean carbon export by combining satellite observations and food-web models**. *Global Biogeochemical Cycles*, 2014; DOI: [10.1002/2013GB004743](https://doi.org/10.1002/2013GB004743)

## **SPECIES AND HABITATS**

**Invasive hybridization in a threatened species is accelerated by climate change**, Clint C. Muhlfeld et al, article attached.

*(from the abstract)*

Climate change will decrease worldwide biodiversity through a number of potential pathways, including invasive hybridization (cross-breeding between invasive and native species). How climate warming influences the spread of hybridization and loss of native genomes poses difficult ecological and evolutionary questions with little empirical information to guide conservation management decisions. Here we combine long-term genetic monitoring data with high-resolution climate and stream temperature predictions to evaluate how recent climate warming has influenced the spatio-temporal spread of human-mediated hybridization between threatened native westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) and non-native rainbow trout (*Oncorhynchus mykiss*), the world's most widely introduced invasive fish. This study shows that rapid climate warming can exacerbate interactions between native and non-native species through invasive hybridization, which could spell genomic extinction for many species.

**The interactive effects of climate change, riparian management, and a non-native predator on stream-rearing salmon**, David J. Lawrence et al,

*(from the abstract)*

Predicting how climate change is likely to interact with myriad other stressors that threaten species of conservation concern is an essential challenge in aquatic ecosystems. This study provides a framework to accomplish this task in salmon-bearing streams of the northwestern United States, where land-use related reductions in riparian shading have caused changes in stream thermal regimes, and additional warming from projected climate change may result in significant losses of coldwater fish habitat over the next century. The goal of this work was to forecast the interactive effects of climate change, riparian management, and non-native species on stream-rearing salmon, and to evaluate the capacity of restoration to mitigate these effects.

**Sensitivity of summer stream temperatures to climate variability in the Pacific Northwest**, Luce et al, attached.

*(from the abstract)*

Estimating the thermal response of streams to a warming climate is important for prioritizing native fish conservation efforts. While there are plentiful estimates of air temperature responses to climate change, the sensitivity of streams, particularly small headwater streams, to warming temperatures is less well understood. We analyzed summer stream temperature records from forested streams in the Pacific Northwest for interannual correlations to air temperature and standardized annual streamflow departures. A significant pattern emerged where cold streams always had lower sensitivities to air temperature variation, while warm streams could be insensitive or sensitive depending on geological or vegetation context. A pattern where cold streams are less sensitive to direct temperature increases is important for conservation planning, although substantial questions may yet remain for secondary effects related to flow or vegetation changes induced by climate change.

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

Stay tuned for more climate change policy news next month!