

Greetings and welcome to the **JULY 2014** 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 -- <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 OCCRI newsletter, Joe Buchanan, Mike Schroeder, Dan Siemann (DNR), Kevin Anderson (PSP), Marc Hayes, David Patte (USFWS) and the North Pacific Landscape Conservation Cooperative.

## WHAT'S HAPPENING AT WDFW?

### **White-tailed Ptarmigan and Climate Change**

Mike Schroeder, Upland Bird Research Scientist with the Wildlife Program, recently participated in a climate change symposium at Mt. Rainier National Park, delivering a presentation about climate risks to white-tailed ptarmigan. His talk, as well as others from the symposium, are posted online at the website below. Topics include pollinators and plants, debris flows, bumblebees, subalpine parkland, Cascade Red Fox and others. Worth a look if you get a chance! [http://www.youtube.com/playlist?list=PLR612XierQGev0z9oCZCjCXqyOlGA\\_-uz](http://www.youtube.com/playlist?list=PLR612XierQGev0z9oCZCjCXqyOlGA_-uz)

## CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

### **Directory of Regional Climate Change Adaptation Programs of Federal Natural Resource Agencies**

Federal agencies are implementing diverse actions to help prepare for the impacts of climate change including developing and implementing climate change adaptation plans. Several federal natural resources agencies have also organized multi-state, regional programs or initiatives to deliver climate change adaptation information and assistance at a regional level. The second section of this directory is organized by the eight regions described in the Third National Climate Assessment released May 6th by the U.S. Global Change Research Program.

### **New Report: Response to Extreme Weather Impacts on Transportation Systems**

The Transportation Research Board's National Cooperative Highway Research Program issued a new report in May 2014 that examines eight recent cases of extreme weather in the United States from the perspectives of transportation operations, maintenance, design, construction, planning, communications, interagency coordination, and data and knowledge management.

### **Planning for Climate Change on the National Wildlife Refuge System - A Primer for Planners, Managers, and Biologists**

In response to Conserving the Future Recommendation 2, authors from the Refuge System, other Service programs, and numerous partners completed **Planning for Climate Change on the National Wildlife Refuge System**, which evolved from the "Climate Change Primer" familiar to Refuge System planners.

## LEARNING OPPORTUNITIES

### **Tuesday, July 22nd, 12:00-1:00, Pacific, “Climate Change, Mountain Pine Beetles, and Whitebark Pine Forests of the Greater Yellowstone Ecosystem”**

Speaker, Polly Buotte, University of Idaho

Whitebark pine is an important, high-elevation tree species that provides critical habitat for wildlife and supplies valued ecosystem services. These trees currently face multiple threats, including attack by mountain pine beetles. Join this webinar to hear Polly Buotte from the University of Idaho discuss how she and other researchers have worked to increase the understanding of the causes of the recent mountain pine beetle outbreak, and to estimate future outbreak potential given future climate change. [Read More and Register >>](#)

### **Thursday, August 7<sup>th</sup>, 10:00 am Pacific Time, A Climate-Smart Approach to Adaptive Management of North-central California Coast and Ocean Habitats, Species, and Ecosystem Services**

Speaker, Sara Hutto of the Gulf of the Farallones National Marine Sanctuary.

The Gulf of the Farallones National Marine Sanctuary Climate-Smart Adaptation Project for the North-central California Coast and Ocean is an effort to integrate adaptive management, as well as monitoring, mitigation, and climate change education, into sanctuary management. The project will produce a comprehensive and prioritized adaptation implementation plan based on climate-smart principles. A climate-smart approach seeks nature-based solutions to reduce climate change impacts on wildlife and people, and enhance resilience to sustain vibrant, diverse ecosystems.

**Register for the webinar at <https://www1.gotomeeting.com/register/147107152>.**

### **August 19-20, California Adaptation Forum, Sacramento**

Registration is now open for the first California Adaptation Forum, August 19-20, 2014 in Sacramento. This exciting event includes over 40 plenaries and breakout sessions, and will attract and engage a diverse mix of over 600 policymakers, practitioners, and leaders. Visit the forum website for more information on the program, tours, special events, featured speakers, travel, and hotel information.

### **September 9th, 11:00 am-noon (Pacific Time) Climate Change Adaptation for an at Risk Community - Shaktoolik Alaska**

Speaker: Terry Johnson, Alaska Sea Grant Marine Advisory Program, OneNOAA webinar, [click here for more info](#)

### **September 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.

### **October 28-30<sup>th</sup>, Climate Smart Conservation class, Olympia, WA.**

The North Pacific LCC is sponsoring NCTC Climate-Smart Conservation class in Olympia, WA, Oct 28-30, which is based on the guide, “Climate Smart Conservation: Putting Adaptation Principles into Practice”. The course is designed to provide guidance in how to carry out adaptation with intentionality, how to manage

for change and not just persistence, how to craft climate-informed conservation goals, and how to integrate adaptation into on-going work. Conservation practitioners and natural resource managers will learn to become savvy consumers of climate information, tools, and models. See the course description and logistics on the **NCTC webpage for this class**.

## RESOURCES

### **Recording of the webinar: “The National Climate Assessment: Actionable Science for Natural Systems”**

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

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.

### **The Climate-Aquatics Blog**

The intent of the Climate-Aquatics Blog is to provide a means for the 8,004 (& growing) field biologists, hydrologists, anglers, students, managers, and researchers currently on this mailing list across North America, South America, Europe, and Asia to more broadly and rapidly discuss topical issues associated with aquatic ecosystems and climate change. Messages periodically posted to the blog highlight new peer-reviewed research and science tools that may be useful in addressing this global phenomenon. For those new to the blog, previous posts with embedded graphics can be seen by clicking on the hyperlinks at the bottom or by navigating to the blog archive webpage here: ([http://www.fs.fed.us/rm/boise/AWAE/projects/stream\\_temp/stream\\_temperature\\_climate\\_aquatics\\_blog.html](http://www.fs.fed.us/rm/boise/AWAE/projects/stream_temp/stream_temperature_climate_aquatics_blog.html)).

### **Video: Understanding the Latest Northwest Climate Projections and Scenarios**

The following recorded presentations from the April 17 workshop for the "*Integrated Scenarios of the Future Northwest Environment*" project are available on the C3 YouTube site. The *Integrated Scenarios* project is an effort to understand and predict the effects of climate change on the Northwest's climate, hydrology, and vegetation. The project was funded by the NW Climate Science Center and the Climate Impacts Research Consortium.

- **Future climate, vegetation, and hydrology in the Northwest-- Overview** Dr. Philip Mote, Director, Oregon Climate Change Research Institute.
- **Climate Change Projections for the Northwest**, Dr. David Rupp, Oregon Climate Change Research Institute.
- **Climate Change Projections: Understanding, Using and Accessing the Data**. Dr. John Abatzoglou, University of Idaho.
- **Climate Change & Ecosystems: Simulating vegetation & fire response for the Western US**. Dr. Dominique Bachelet and Tim Sheehan, Conservation Biology Institute.
- **Climate Change & Water Resources/Hydrology in the Northwest**, Dr. Dennis Lettenmaier, University of Washington.
- **Climate Change & Hydrology in the Northwest: Understanding, Using and Accessing the Data**, Dr. Bart Nijssen, University of Washington.

**The June edition of the OWSC newsletter is now available** on Office of the Washington Climatologist website (<http://www.climate.washington.edu/newsletter/>) and attached to this email.

Topics include:

- May climate summary
- Discussion of warm water off our coast and its potential impact on our summer weather
- Snowpack update
- Temperature and precipitation outlook

### **California Climate Commons and Species Distribution Modeling**

The [California Climate Commons](#) houses articles which explain important concepts to support understanding of climate change science. The feature article this month is '[Intro to Species Distribution Modeling](#).' Species distribution modeling (SDM) is often an important part of climate change vulnerability assessment and conservation prioritization. This article provides resources to get you started with SDM techniques.

### **The Climate Inspector**

The Climate Inspector is an interactive web application developed by the National Center for Atmospheric Research, which expands GIS mapping and graphing capabilities to visualize possible temperature and precipitation changes throughout the 21st century. The maps and graphs are generated from a large dataset of climate simulations by the NCAR Community Climate System Model and prepared for the 5th Assessment Report of the IPCC. With Climate Inspector you can explore how temperature and precipitation may change based on different emission trajectories, investigate climate changes around the globe and through time, inspect climate trends, variability and uncertainty, and download maps and data. Visit: <http://gisclimatechange.ucar.edu/inspector>

### **Interactive Tool Lets You Decide How to Reduce Emissions**

What can we do to limit the magnitude of climate change? How would you reduce the nation's greenhouse gas emissions? A new interactive tool from the Koshland Science Museum of the National Academy of Sciences lets you decide. The goal in the tool scenario is to reduce cumulative U.S. greenhouse emissions to 203 gigatons or less by the year 2050. The tool asks you to set priorities among cost-savings, land preservation, oil independence, air quality, or a combination and then to choose a portfolio of renewable energy, carbon capture, land use, and other options to safeguard those priorities while achieving target emission levels.

## **CLIMATE SCIENCE NEWS**

### **New Report, Video: The Arctic in the Anthropocene**

The Arctic is transitioning to a "new normal" of reduced ice and snow, bringing rapid changes to ecosystems, people, and climate. Arctic societies are also changing rapidly, especially in the political realm as indigenous people achieve greater autonomy in some regions. The Arctic in the Anthropocene: Emerging Research Questions (NRC, 2014) identifies emerging research questions to help us understand how environmental and societal transitions will affect the Arctic and the rest of the world. A video and Report in Brief highlight findings from the report.

### **Understanding the Ocean's Role in Greenland Glacier Melt**

*(From the Woods Hole Oceanographic Institution)*

The Greenland Ice Sheet is a 1.7 million-square-kilometer, 2-mile thick layer of ice that covers Greenland. Its fate is inextricably linked to our global climate system. In the last 40 years, ice loss from the Greenland Ice Sheet increased four-fold contributing to one-quarter of global sea level rise. Some of the increased melting at the surface of the ice sheet is due to a warmer atmosphere, but the ocean's role in driving ice

loss largely remains a mystery. Research by scientists at Woods Hole Oceanographic Institution (WHOI) and the Univ. of Oregon sheds new light on the connection between the ocean and Greenland's outlet glaciers, and provides important data for future estimates of how fast the ice sheet will melt and how much mass will be lost. The study was published in *Nature Geosciences*.

Rebecca H. Jackson, Fiammetta Straneo, David A. Sutherland. "Externally forced fluctuations in ocean temperature at Greenland glaciers in non-summer months". *Nature Geoscience*, 2014; DOI:

10.1038/ngeo2186

## SPECIES AND HABITATS

### Earlier snowmelt prompting earlier breeding of Arctic birds

(Excerpt from *Science Daily*)

Biologists have found that migratory birds that breed in Arctic Alaska are initiating nests earlier in the spring, and that snowmelt occurring earlier in the season is a big reason why. The report, "Phenological advancement in arctic bird species: relative importance of snow melt and ecological factors," appears in the current on-line edition of the journal *Polar Biology*. Lead author Joe Liebezeit and co-author Steve Zack have conducted research on Arctic birds and conservation issues in Alaska for more than a decade. Researchers looked in nearly 2,500 nests of four shorebird species: semi-palmated sandpiper, red phalarope, red-necked phalarope, and pectoral sandpiper, and one songbird, the lapland longspur, and recorded when the first eggs were laid in each nest. The research occurred across four sites that ranged from the oilfields of Prudhoe Bay to the remote National Petroleum Reserve of western Arctic Alaska. Snow melt was assessed in nesting plots at different intervals in the early spring. Other variables, like nest predator abundance (which is thought to affect timing of breeding), and satellite measures of "green-up" (the seasonal flush of new growth of vegetation) in the tundra were also assessed as potential drivers of the change in nest timing, but were found to be less important than snow melt.

J. R. Liebezeit, K. E. B. Gurney, M. Budde, S. Zack, D. Ward. **Phenological advancement in arctic bird species: relative importance of snow melt and ecological factors**. *Polar Biology*, 2014; DOI:

10.1007/s00300-014-1522-x

### Shrinking Ponds Put Amphibians at Risk

(excerpt from the *Climate Impacts Research Consortium Newsletter*)

Northwest amphibians, from frogs to salamanders, have long evaded predation from exotic trout living in the region's rivers by seeking refuge in nearby ponds and other shallow waterways. However, these amphibian safe havens are drying up because of climate change, a recent paper in *Frontiers in Ecology and the Environment* concludes. Conservation tools that could help managers and biologists track the loss of this important amphibian habitat range from hydrologic models used in projecting stream flows to aerial and satellite imagery, which helps map wetlands, especially in remote and as yet un-surveyed areas, according to the authors. The research, funded by U.S. Fish and Wildlife Service and CIRC's sister organization, the Department of the Interior's Northwest Climate Science Center, is investigating how critical amphibian habitat is being affected by climate change. For full review of the research read "Amphibians in a vise: Climate change robs frogs, salamanders of refuge" from the University of Washington's news page, *UW Today*. <http://www.washington.edu/news/2014/05/01/amphibians-in-a-vice-climate-change-robots-frogs-salamanders-of-refuge/>

Ryan, Maureen E. et al. (2014). Amphibians in the Climate Vise: Loss and Restoration of Resilience of Montane Wetland Ecosystems in the Western US. *Frontiers in Ecology and the Environment*, 12, 232–240, <http://dx.doi.org/10.1890/130145>

**Defining and observing climate mediated range shifts in marine systems, Bates et al (attached)**

*(excerpt from the abstract)*

“Climate change is transforming the structure of biological communities through the geographic extension and contraction of species’ ranges. Range edges are naturally dynamic, and shifts in the location of range edges occur at different rates and are driven by different mechanisms. This leads to challenges when seeking to generalize responses among taxa and across systems. We focus on warming-related range shifts in marine systems to describe extensions and contractions as stages. This stage-based framework can be broadly applied to geographic shifts in any species, life-history stage, or population subset. Ideally the probability of transitioning through progressive range shift stages could be estimated from empirical understanding of the various factors influencing range shift rates. We suggest approaches required to increase our capacity to observe and predict geographic range shifts under climate change”.

### **Thermal Carrying Capacity for a Thermally-Sensitive Species at the Warmest Edge of Its Range, Ayllon et al (attached)**

*(excerpt from the abstract)*

“Anthropogenic environmental change is causing unprecedented rates of population extirpation and altering the setting of range limits for many species. Significant population declines may occur however before any reduction in range is observed. Determining and modelling the factors driving population size and trends is consequently critical to predict trajectories of change and future extinction risk. We tracked during 12 years 51 populations of a cold-water fish species (brown trout *Salmo trutta*) living along a temperature gradient at the warmest thermal edge of its range. We developed a carrying capacity model in which maximum population size is limited by physical habitat conditions and regulated through territoriality. Results suggest that limiting temperature effects were progressively stronger with increasing anthropogenic disturbance. We predict that most of our study populations may become extinct by 2100, depicting the gloomy fate of thermally-sensitive species occurring at thermal range margins under limited potential for adaptation and dispersal.”

### **Invasive Species and Climate Change – draft report available for comment (attached)**

Together, the National Invasive Species Council and the national Aquatic Nuisance Species Task Force prepared the attached draft report. They will accept comments through September 5. The report is intended to provide background information on the nexus between climate change and invasive species management; and to identify some context for different approaches to adaptation and mitigation related to invasive species.

### **Body size and activity times mediate mammalian responses to climate change**

*(from the NPLCC newsletter)*

To reliably predict at-risk species we need to know which species are currently responding, which are not, and what traits are mediating the responses. For mammals, we have yet to identify overarching physiological, behavioral, or biogeographic traits determining species' responses to climate change, but they must exist. To date, 73 mammal species in North America and eight additional species worldwide have been assessed for responses to climate change, including local extirpations, range contractions and shifts, decreased abundance, phenological shifts, morphological or genetic changes.

### **Widespread rapid reductions in body size of adult salamanders in response to climate change**

*(from the NPLCC newsletter)*

Researchers compared historic and contemporary size measurements in 15 *Plethodon* species from 102 populations (9450 individuals) and found that six species exhibited significant reductions in body size over 55 years. These rapid reductions in body size over the past few decades have significance for the susceptibility of amphibians to environmental change, and relevance for whether adaptation can keep pace with climate change in the future.

## **The subtle role of climate change on population genetic structure in Canada lynx**

*(from the NPLCC newsletter)*

A new study shows that current genetic variability of Canada lynx (*Lynx canadensis*) is strongly correlated with a winter climate gradient (i.e. increasing snow depth and winter precipitation from west-to-east) across the Pacific-North American (PNO) to North Atlantic Oscillation (NAO) climatic systems. The research team proposes habitat imprinting on snow conditions as one possible explanation for this unusual phenomenon. Results imply that subtle genetic structure can be governed by current climate and that substantive genetic differentiation and related ecological divergence may arise from changing climate patterns.

## **Fisheries/Seafood Industry Affected by Climate Change**

The global fishing industry may lose billions by 2050 due to climate change's effects on the marine environment, according to a new report.

The report, published by the Sustainable Fisheries Partnership and the University of Cambridge, outlines a range of challenges that increasing ocean temperatures and acidification will bring to the seafood industry, based on findings from the IPCC's Fifth Assessment Report.

## **Beyond a warming fingerprint: individualistic biogeographic responses to heterogeneous climate change in California, Rapacciuolo et al (article attached)**

*(Excerpt from the abstract)*

“Understanding recent biogeographic responses to climate change is fundamental for improving our predictions of likely future responses and guiding conservation planning at both local and global scales. Studies of observed biogeographic responses to 20th century climate change have principally examined effects related to ubiquitous increases in temperature – collectively termed a warming fingerprint. Although the importance of changes in other aspects of climate – particularly precipitation and water availability – is widely acknowledged from a theoretical standpoint and supported by paleontological evidence, we lack a practical understanding of how these changes interact with temperature to drive biogeographic responses. Further complicating matters, differences in life history and ecological attributes may lead species to respond differently to the same changes in climate. Here, we examine whether recent biogeographic patterns across California are consistent with a warming fingerprint. Many responses to climate change do not appear to be consistent with a warming fingerprint, with downslope shifts in elevation being as common as upslopeshifts across a number of taxa and many demographic and community responses being inconsistent with upslope shifts.”

## **Natural Infrastructure**

[Key Lessons for Incorporating Natural Infrastructure into Regional Climate Adaptation Planning](#) - A new article in *Ocean & Coastal Management* details a collaborative process in two coastal California counties to account for the role of natural infrastructure in climate adaptation planning.

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

### **The Coming Climate Crash: Lessons for Climate Change in the 2008 Recession**

A recent Op-Ed in the *New York Times* by Henry Paulson, Secretary of the Treasury under George W. Bush lays out the rationale for acting to combat climate change in financial terms and from a risk management framework. Excerpt: “There is a time for weighing evidence and a time for acting. And if there’s one thing I’ve learned throughout my work in finance, government and conservation, it is to act before problems become too big to manage. For too many years, we failed to rein in the excesses building up in the nation’s financial markets. When the credit bubble burst in 2008, the damage was devastating. Millions suffered.

Many still do. We're making the same mistake today with climate change. We're staring down a climate bubble that poses enormous risks to both our environment *and* economy. The warning signs are clear and growing more urgent as the risks go unchecked.....But we must not lose sight of the profound economic risks of doing nothing. The solution can be a fundamentally conservative one that will empower the marketplace to find the most efficient response. We can do this by putting a price on emissions of carbon dioxide — a carbon tax. Few in the United States now pay to emit this potent greenhouse gas into the atmosphere we all share. Putting a price on emissions will create incentives to develop new, cleaner energy technologies.....”

**The U.S. Environmental Protection Agency** has released the **Clean Power Plan proposal** as part of **President Obama's Climate Action Plan** to cut carbon pollution from power plants - the largest source of carbon pollution in the United States - by 30% from 2005 levels by 2030. Following the rollout of the EPA's proposed rule, a number of states provided fact sheets about their own carbon reduction and clean energy programs and Governors across the country have also made statements in support of the rule. Click [here](#) to see Governor Inslee's statement.

### **New York, Rhode Island pass climate change bills to protect against extreme weather**

*(From E and E news, June 23<sup>rd</sup>, 2014)*

New York and Rhode Island passed climate change bills last week to protect both coastal states against extreme weather events, although the fate of legislation in the Empire State is uncertain. The New York bill, called the "Community Risk Reduction and Resiliency Act" and sponsored by Democratic state Sen. Diane Savino and Assemblyman Robert Sweeney, landed on Gov. Andrew Cuomo's desk after passing both chambers of the Legislature. It would force any state-funded project to plan for extreme weather events and the effects of climate change. In Rhode Island, Gov. Lincoln Chafee (D) is expected to sign a bill that moved through the state's Legislature last week establishing a climate change council of government officials. The council is charged with submitting a plan to the governor and Legislature outlining how to cut greenhouse gas emissions more deeply than requirements from U.S. EPA, including a 45 percent reduction in emissions below 1990 levels by 2035.

### **George Mason University Center for Climate Change Communication Releases Report on American Attitudes towards Climate Change**

In spring 2014, George Mason University conducted their latest national survey on Americans' climate change and energy beliefs, attitudes, policy support, and behavior. The report shows that of those Americans who think global warming is happening, nearly two in three (62%) say they are either extremely (30%) or very (32%) sure that it is. Three years ago, in May 2011, fewer (54%) were as sure. Also, Americans continue to be unaware of the extent of the scientific consensus on climate change. Only one in ten Americans (12%) know that 90% or more climate scientists have concluded human-caused global warming is happening. More than twice as many Americans - about three in ten (28%) - think fewer than half of climate scientists have reached this conclusion. The poll also suggests that global warming has much more impact than climate change – when asked if climate change was a good or a bad thing, 63 percent of Americans said it was a bad thing, while 76 percent perceived global warming as a bad thing, a 13-point difference. To access the report, visit: <http://www.climatechangecommunication.org/report/climate-change-american-mind-series-spring-2014>.

### **One-Year Anniversary of President Obama's Climate Action Plan**

Last month marked the one-year anniversary of the launch of President Obama's Climate Action Plan. To mark the anniversary, the White House released a new report detailing our progress toward cutting carbon pollution and protecting our communities and public health.

