Executive Stakeholder Advisory Committee

DRAFT Meeting Agenda

October 19-20, 2016

U.S. Fish and Wildlife Service
911 NE 11th Ave, Portland, OR 97232
3rd floor conference room

Call-in: 855-547-8255; passcode 57166#
Oct. 19 webex: click here
Oct. 20 webex: click here

Meeting Objectives

1. Evaluate and re-envision the role of ESAC as a whole and the roles of individual ESAC members
2. Discuss processes to co-produce actionable science at a scale and level that is meaningful and useful to your organization and the NW region
3. Initiate conversations about future processes and NW CSC activities in 2017-2022

Wednesday, October 19 (all times are Pacific Time)

8:30 Welcome and Introductions
Rich Ferrero, USGS Northwest Regional Director
Gustavo Bisbal, NW CSC Director
• Welcome new members. Each one indicates one climate-related management priority for their organization and one reason for their participation in ESAC
• Introduction of all other ESAC members
• Introduction of new NW CSC staff & other participants
• Introduction of facilitator: Donna Silverberg

8:50 Review meeting objectives, expected outcomes, and structure
Donna Silverberg, Consultant

9:00 Update on the NW CSC’s 5-year review and host re-competition
Robin O’Malley, Policy and Partnership Coordinator, USGS National Climate Change & Wildlife Science Center (NCCWSC)
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<th>Time</th>
<th>Event</th>
<th>Presenter</th>
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<tr>
<td>9:30</td>
<td><strong>The ESAC Questionnaire and Survey</strong></td>
<td>Gustavo Bisbal, NW CSC Director</td>
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<td>• What we discovered – The Big Picture</td>
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<td>• Preview upcoming talks</td>
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<td>9:45</td>
<td><strong>Actionable Science – what is it?</strong></td>
<td>Alison Meadow, University of Arizona</td>
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<td>Tamara Wall, Desert Research Institute</td>
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<td>• Group discussion based on survey results</td>
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<td>10:30</td>
<td><strong>Break – coffee, tea, and refreshments provided</strong></td>
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<td>10:50</td>
<td><strong>Actionable Science at the NW CSC</strong></td>
<td>Nicole DeCrappeo, NW CSC Deputy Director</td>
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<td>• What are the criteria that the NW CSC operates under?</td>
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<td>• Ways we currently ensure science is co-produced and actionable</td>
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<td>• The managers we’ve engaged</td>
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<td>11:20</td>
<td><strong>Is NW CSC-funded science really being used?</strong></td>
<td>Alison Meadow, University of Arizona</td>
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<td></td>
<td>• Proposed framework and process to evaluate NW CSC projects</td>
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<td>12:00</td>
<td><strong>Working Lunch</strong></td>
<td>Lunch is available for purchase at the USFWS cafeteria, first floor.</td>
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<td>12:45</td>
<td><strong>Assessment of the 2011-2016 NW CSC Science Agenda</strong></td>
<td>Nicole DeCrappeo, NW CSC Deputy Director</td>
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<td>1:20</td>
<td><strong>A look into the future: NW CSC Science Agenda 2017-2022</strong></td>
<td>Gustavo Bisbal, NW CSC Director</td>
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<td>2:20</td>
<td><strong>Break – coffee, tea, and refreshments provided</strong></td>
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<td><strong>Introduction of the Science Advisory Panel</strong></td>
<td>Gustavo Bisbal, NW CSC Director</td>
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<td>Amy Snover, Director, Climate Impacts Group, University of Washington</td>
<td>Marty Fitzpatrick, Deputy Director, USGS Forest and Rangeland Ecosystem Science Center</td>
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<td>3:40</td>
<td><strong>Time to talk; reflections on the day</strong></td>
<td>Discussion facilitated by Donna Silverberg</td>
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<td>4:40</td>
<td><strong>Day wrap-up</strong></td>
<td>Rich Ferrero, USGS Northwest Regional Director</td>
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### Thursday, October 20 (all times are Pacific Time)

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<tr>
<th>Time</th>
<th>Event</th>
<th>Facilitator(s)</th>
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<tr>
<td>8:30</td>
<td><strong>Review of Day 1 and preparing for Day 2</strong></td>
<td>Donna Silverberg</td>
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<td>8:45</td>
<td><strong>A look into the future: NW CSC Strategic Planning, shared goals &amp; outcomes</strong></td>
<td>Gustavo Bisbal, NW CSC Director</td>
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<td><em>Discussion facilitated by Donna Silverberg</em></td>
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<td>• What do ESAC member agencies need or expect from the NW CSC?</td>
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<td>9:15</td>
<td><strong>The ESAC identity: Who are we and who do we want to be?</strong></td>
<td>ESAC Member Michael Cox, Environmental Protection Agency</td>
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<td><em>Discussion facilitated by ESAC Member Michael Cox, Environmental Protection Agency</em></td>
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<td>• Options for ESAC role and structure</td>
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<td>• Suggestions for revisions to Terms of Reference</td>
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<td>10:15</td>
<td><strong>Break – coffee, tea, and refreshments provided</strong></td>
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<td>10:40</td>
<td><strong>Using climate science to inform climate adaptation strategies</strong></td>
<td>ESAC Member Dave Jepsen, Oregon Department of Fish and Wildlife</td>
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<td><em>Discussion facilitated by ESAC Member Dave Jepsen, Oregon Department of Fish and Wildlife</em></td>
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<td></td>
<td>• Considerations of climate adaptation strategies</td>
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<td>• How can we implement strategies to lower risks?</td>
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<td>11:10</td>
<td><strong>Measures of success over the next 5 years</strong></td>
<td>Robin O’Malley, NCCWSC Policy and Partnership Coordinator</td>
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<td><em>Discussion facilitated by Robin O’Malley, NCCWSC Policy and Partnership Coordinator</em></td>
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<td>• ACCCNRS criteria</td>
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<td>• National Working Group</td>
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<td>11:40</td>
<td><strong>Climate Refugia Research Coalition</strong></td>
<td>Aaron Ramirez, NCEAS Postdoctoral Fellow</td>
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<td>12:00</td>
<td><strong>Lunch</strong></td>
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<td>1:00</td>
<td><strong>Communicating NW CSC information within your organization</strong></td>
<td>ESAC Member Stephen Zylstra, U.S. Fish &amp; Wildlife Service</td>
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<td><em>Discussion facilitated by ESAC Member Stephen Zylstra, U.S. Fish &amp; Wildlife Service</em></td>
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<td></td>
<td>• How do you bring information to ESAC? How do you bring information back from ESAC?</td>
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<td>• What are some of the challenges to transfer information back and forth?</td>
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<td>• Ideas to improve information flow between ESAC and your organization</td>
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<td>1:40</td>
<td><strong>How to improve the NW CSC profile among tribes and states</strong></td>
<td>ESAC Members Lynn Helbrecht, WDFW, and Eliza Ghitis, NWIFC</td>
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<td><em>Discussion facilitated by ESAC Members Lynn Helbrecht, WDFW, and Eliza Ghitis, NWIFC</em></td>
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<td></td>
<td>• NW CSC visibility and perceived service to tribes and states</td>
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<td>• Ideas to improve how the NW CSC may best assist tribes and states</td>
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<td><strong>Break – coffee, tea, and refreshments provided</strong></td>
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<td><strong>Putting the NW CSC’s work into a national context</strong></td>
<td>ESAC Member Bea Van Horne, USDA Northwest Climate Hub</td>
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<td>3:20</td>
<td><strong>Time to talk; reflections on the meeting and future meeting schedules</strong></td>
<td>Donna Silverberg</td>
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<td>4:30</td>
<td><strong>Final thoughts</strong></td>
<td>Rich Ferrero, USGS Northwest Regional Director</td>
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Meeting Notes
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Meeting Objectives

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3. Initiate conversations about future processes and NW CSC activities in 2017-2022

Wednesday, October 19
Welcome and Introductions
Rich Ferrero, USGS Northwest Regional Director
Gustavo Bisbal, NW CSC Director

New ESAC Members were introduced and provided their agencies’ top management priorities:

Linda Anderson Carnahan – EPA Region 10 Office, Seattle
Primary agency concern: Understand impacts of climate change on human health and environment. This is a priority for the EPA Director.

Jennifer Chariarse – Federal Highways Administration, Western Region Federal Lands Division - Environmental Office. Work focuses on transportation projects and includes work with federal partner agencies. Primary agency concern: Infrastructure impacts from climate change.

Louisa Evers BLM – Science and Climate Change Coordinator
Primary agency concern: Potential impacts of drought (sagebrush and forest production in western Oregon) and forest production in western Oregon.
Katherine Smith  U.S. Forest Service –Portland Primary agency concern: Forest planning (upcoming forest plan revision) and completing climate change vulnerability assessments for AK, WA, OR.

Update on the NW CSC’s 5-year review and host re-competition
Robin O’Malley, Policy and Partnership Coordinator, USGS National Climate Change and Wildlife Science Center

Robin provided a brief overview of the original establishment of the DOI Climate Science Centers, with the Alaska, Northwest, and Southeast CSCs being established first in 2010. Centers in other regions were established in subsequent years. The 5-year cooperative agreements for CSCs established in 2010 were extended two years beyond the end date in the initial agreement. For the NW CSC, the revised cooperative agreement with Oregon State University ends in April 2017.

A 5-year review of the NW, AK, and SE CSCs was conducted by the American Fisheries Society and Cornell University early in 2016. The review process included an external review group with site visits to the CSCs as well as a financial audit. The final report has not yet been released; however, Robin had several summary issues to present, including the following:

1. The University Director position involves a lot more work and a wider range of duties than initially anticipated;
2. The need for engaging communication among resource manager cooperators during and throughout the research process was identified. Important questions that should be addressed early in the project include, “What management-relevant products will be developed through the project?” and “What other managers or management organizations need to be engaged?”
3. The CSCs have a much larger role than just producing research. This involves producing actionable science, convening partners in the region to identify needs and develop research topics, capacity building beyond training graduate students and post docs, and maintaining communication among stakeholders. Uncertainty remains regarding how this suite of activities is best addressed and how it affects staffing.

At some centers, a large portion of the federal investment through the hosting agreement (i.e., indirect cost captured by the host university) goes back to the CSC, while at other CSCs this is not the case. It was also noted that graduate students and post docs supported by CSCs should focus on science needs identified in CSC Science Agendas and address resource management-relevant problems. There was acknowledgement that this is often challenging when students and post docs need to meld this objective with institutional requirements of their universities.

In order to establish new hosting agreements for the next five years, USGS released a request for proposals (RFP) in April 2016, with proposals due in July 2016. Following the evaluation of these proposals by an external review panel, USGS, and DOI, the AK CSC is moving forward with their hosting agreement renewal with the University of Alaska. The proposals submitted to host the SE and NW CSCs were deemed inadequate to move forward with detailed negotiations with the current host universities. A new RFP is currently open to invite new proposals for the SE and NW CSCs. The deadline for proposal submission is January 12, 2017.
The ESAC Questionnaire and Survey

Gustavo Bisbal, NW CSC Director

For presentation slides, see file “1. NWCSC_Overview and ESAC Questionnaire_Bisbal_19Oct16.pdf” on the ESAC meeting webpage.

Gus provided a summary of responses to the questionnaire that ESAC members completed during summer 2016. He noted that everyone responded by email and that he has conducted in-person follow up meetings with 22 of the 25 ESAC members.

One question was: “Do you serve as a nexus for the line managers and the regional executives in your organization?” There was a wide range of responses from ESAC members (yes, no, and everything in-between).

The questionnaire also revealed that “actionable science” looks different to different ESAC members. Several factors that were identified as important components of actionable science included 1) the timeliness of the project, 2) projects developed for an actual problem a manager faces, 3) simple tools that can be easily applied, and 4) peer-reviewed science with a sound data management strategy. Few ESAC members recognized that the definition of actionable science includes both ‘front-end’ and 'back-end' criteria.

ESAC members also responded to a 3-question survey in October 2016 that linked back to the ten priority topics identified by ESAC through the 2014 Lightning Talks. Members were asked to rate their organizations' top management concerns from the list of ten, rate which of the topics should be research priorities for the NW CSC in the future, and assign priority to a number of different science products. Results from the questionnaire and survey were used to confirm ESAC resource management priorities, identify products that ESAC would like the NW CSC to generate, and will ultimately aid in development of the 2017-2022 Science Agenda.

Actionable Science – what is it?

Alison Meadow, University of Arizona
Tamara Wall, Desert Research Institute

For presentation slides, see file “2. NWCSC_Actionable Science Overview_Meadow_19Oct16.pdf” on the ESAC meeting webpage.

Alison and Tamara have been working with the Southwest CSC and NCCWSC to evaluate if and how CSC-generated science is being used by resource managers. They are now working with the NW CSC on a similar endeavor. They engaged ESAC members in a breakout group exercise to clarify what actionable science means to them. The exercise illustrated that actionable science means different things to different stakeholders depending on what management issues need to be addressed. Three separate categories of actionable science were identified that can be useful in consideration of science needs for the NW CSC:

1. Conceptual use – decision makers perceive themselves better informed about an issue or have changed their opinion
2. Justification use – research is used to justify a decision that may have already been made
3. Instrumental use – decision maker perceives a use for the information and the information has contributed to a decision
Nicole DeCrappeo, NW CSC Deputy Director

For presentation slides, see file “3. NWCSC_Actionable Science at NWCSC_DeCrappeo_19Oct16.pdf” on the ESAC meeting webpage.

Nicole provided an overview of actionable science conducted at NW CSC to highlight what criteria the NW CSC operates under, establish how the NW CSC ensures that science is co-produced and actionable, and show how many resource managers have been engaged with NW CSC-funded projects since FY 2011.

Nicole emphasized that the NW CSC strongly encourages and supports co-production of science throughout the life of the project. Ideally, scientists and managers identify specific management priorities at the proposal stage, and the project is designed to create management-relevant products or tools.

Comment: Suggestion to add an evaluation measure of whether science products generated through NW CSC-funded projects are actually used by resource managers to inform management decisions or actions. Nicole responded that this is exactly what Alison Meadow and Tamara Wall will be examining and helping us with (see next presentation below).

Identification of management significance and engagement is a selection criterion that carries 25% of the weight during the review of proposals. As part of the proposal process and to aid in the development of actionable science, RFPs are now requesting letters of support from managers/stakeholders that contain the following elements:

- Demonstrate the manager’s understanding of the proposed study, including the anticipated outcomes and products
- State how project outcomes will be used to address a specific management priority
- State the manager’s commitment to engaging throughout life of the project

Nicole showed how resource managers have been engaged with NW CSC research projects funded from FY11-14. We examined project documents (including proposals, letters of support, final reports, and workshop attendee lists) from 24 projects and found that we had collectively engaged 445 different managers from 109 unique organizations. The NW CSC acknowledges that not all resource managers are the same with regard to their decision-making responsibilities, their need for climate science information and tools, or their level of participation in CSC projects. Additionally, ESAC members indicated that they don’t yet have a clear understanding about how and if the products or tools developed through NW CSC projects have been used. This particular issue was addressed by Alison and Tamara in the following session.

Is NW CSC-funded science really being used?

Alison Meadow, University of Arizona
Proposed framework and process to evaluate NW CSC projects

For presentation slides, see file “4. NWCSC_Evaluating Co-production_Meadow_19Oct16.pdf” on the ESAC meeting webpage.

Alison identified that in order to determine whether NW CSC-funded science is being used, we first need to identify what makes managers become invested in projects. This includes helping managers understand the
information better and gain a greater sense of ownership, as well as providing information that is more likely to meet their specific needs and fit their organizations’ decision making processes.

She also identified several key components of co-produced science including the following:

- The manager/user works with the researcher to define the management problem and craft the research question. Ideally, this starts before the science proposal is written.
- The manager also works with the scientist to select methods, conduct research, analyze findings and evaluate results.
- Both managers and scientists acknowledge and respect the interplay between “science” and “society” and both are given equal weight and influence in the process.

Comment: There was recognition by ESAC members that collaborative research is a skill that natural and physical scientists haven’t necessarily been trained in, and thus co-production requires developing new skill sets.

Comment: Alison and several ESAC members noted that “stakeholder” is a term that gets over-used in our field. Its imprecise definition can be detrimental to understanding how and why collaborations succeed and fail.

Over the next 24 months, Alison and Tamara will be assessing if and how NW CSC science is being used by resource managers by: 1) identifying the process factors that most influence the outcome of usable science, 2) identifying what outputs, outcomes, and impacts we observe in these projects and how they were achieved, and 3) determining how context and factors outside the control of the researchers and end-users affect project processes, outcomes, and impacts. This work will be conducted using semi-structured interviews with research teams, resource manager participants, and agency representatives, document analysis, and occasional observations of joint meetings of researchers and agency partners. Regular feedback will be provided to NW CSC and ESAC as the work progresses.

Assessment of the 2011-2016 NW CSC Science Agenda
Nicole DeCrappeo, NW CSC Deputy Director

For presentation slides, see file “5. NWCSC_Science Agenda Assessment_DeCrappeo_19Oct16.pdf” on the ESAC meeting webpage.

Nicole reminded ESAC members about the NW CSC 2011-2016 Science Agenda themes and sub-themes. Over the past 6 years, 61 projects (41 completed) have been funded with $7.5M in funding.

Nicole directed ESAC members to the DEPTH web portal for detailed project information for all eight CSCs as well as projects contributed by ESAC member organizations. This database can be searched by principal investigator, keyword, geographic area, fiscal year, NW CSC Science Agenda theme, and other search terms.

It was noted that the 2017-2022 Science Agenda will have a different structure than the 2011-2016 Science Agenda, and thus the framework for assessing accomplishments in future years may have a somewhat different format. However, assessing our progress in satisfying the 2011-2016 Science Agenda will provide a foundation for development of the new agenda. It was noted that we have not yet clearly identified all the relationships between projects collected in the DEPTH database; this is something the NW CSC will work on in the coming months.
Nicole posed a question regarding how much effort should be put into maintaining the DEPTH database. ESAC members expressed a strong desire to maintain and continue to develop this database.

Comment: There was a suggestion by an ESAC member that there may be business models for evaluating projects that would be useful for assessing NW CSC projects. Other members agreed that these may be useful to investigate in the future.

Comment: Recommendation that information on how NW CSC projects and project products have been used in management applications be included in project summaries.

Comment: Cross-reference the NW CSC project summaries with other agencies’ (climate) databases where possible, particularly with state agencies.

Comment: ESAC members liked the Story Map on the website. It provides a good intro/link for many audiences and can clearly demonstrate actionable science and how products are used to address specific needs.

A look into the future: NW CSC Science Agenda 2017-2022
Gustavo Bisbal, NW CSC Director

For presentation slides, see file “6. NWCSC_Future Science Agenda_Bisbal_19Oct16.pdf” on the ESAC meeting webpage.

Gus introduced the process for development of the 2017-2022 NW CSC Science Agenda, drawing attention to the list of top resource management priorities related to climate change that had been identified by the ESAC through the 2014 Lightning Talks:

1. Accessing downscaled climate data
2. Hydrologic regime shift effects on infrastructure, agriculture, and salmonid habitat
3. Sea-level rise effects on estuaries
4. Landscape connectivity
5. Prioritization of conservation or restoration areas
6. Ecological impacts of drought
7. Ocean acidification effects on shellfish
8. Fire risk
9. Identification of trigger points and ecosystem thresholds
10. Climate change effects on invasive species, diseases, and pests

Because not all of these topics can be fully addressed by the NW CSC with its available resources and funding, this list was subdivided into three tiers. Tier 1 topics were identified as those in which the NW CSC can or should play a leadership role. A second set of topics (Tier 2) included those in which other organizations (e.g., LCCs, NOAA) currently play a leading role (for example, LCCs are highly focused on and organized around addressing landscape connectivity). Finally, Tier 3 consists of topics that have already been addressed to some degree by the NW CSC (e.g., accessing downscaled climate data through the Integrated Scenarios website).
The following topics (from the list above) were placed in Tier 1:

2. Hydrologic regime shift effects on infrastructure, agriculture, and salmonid habitat
6. Ecological impacts of drought
9. Identification of trigger points and ecosystem thresholds
10. Climate change effects on invasive species, diseases, pests

Gus’s presentation included a summary of what ESAC members thought about the above resource management priorities two years ago and what they think now. Some ESAC members acknowledged feeling constrained by this list when they received the questionnaire this summer/fall. Gus presented a list of proposed pillars of the NW CSC Science Agenda for 2017-2022 that developed out of the experience with implementation of the 2011-2016 Science Agenda.

**Comment:** A number of ESAC members noted the need for synthesis papers as agencies use these to conduct management planning and implementation.

**Comment:** We need to know what management decisions are pending that require climate information and/or knowledge. These management decisions are likely to change on a relatively short time scale.

**Comment:** It was acknowledged that acquiring new knowledge takes the most work and needs co-development, while synthesizing and generalizing current knowledge often requires somewhat less investment.

**Comment:** Clarifying the management question/problem is the starting point for actionable science. These questions/problems may encompass a number of science topics.

**Comment:** The USDA Northwest Climate Hub is funding three synthesis papers this year, which will be published in a special issue of *Climatic Change*.

Ecological Impacts of Drought
Aaron Ramirez, NCEAS postdoctoral fellow

For presentation slides, see file “7. NWCSC_Ecological Drought_Ramirez_19Oct16.pdf” on the ESAC meeting webpage.

Aaron is a postdoc with the National Center for Ecological Analysis and Synthesis and is working with the NW CSC part-time on a few projects. He provided a brief summary of his current work with the Science for Nature and People Partnership (SNAPP) Working Group on Ecological Drought to illustrate the complexity and extent of just one of the issues that ESAC has identified as a Tier 1 item. Ecological drought, defined as an episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and human systems, affects many stakeholders in the NW CSC geographic region. Aaron noted that a literature review on this topic has been synthesized and submitted to a peer-reviewed journal for publication.

SNAPP will synthesize available information on ecological drought under current and future climates and compile examples of ecosystem-based approaches for managing drought impacts. This synthesis, including maps and thresholds for ecosystems at risk of “transitional drought,” will provide the foundation for expert- and stakeholder-based assessments of the current state of knowledge and enable the group to identify information gaps. The complexity of this topic helped illustrate why a Science Advisory Panel (described in the presentation...
below) is necessary. The Scientific Advisory Panel will be able to work with ESAC to iterate and refine the management priorities related to Tier 1 items (such as ecological drought) and craft an appropriate scientific response to those management priorities.

Introduction of the Science Advisory Panel
Gustavo Bisbal, NW CSC Director
Amy Snover, Director, Climate Impacts Group, University of Washington
Marty Fitzpatrick, Deputy Director, USGS Forest and Rangeland Ecosystem Science Center

For presentation slides, see file “8. NWCSC_Science Advisory Panel_Bisbal_19Oct16.pdf” on the ESAC meeting webpage.

Gus introduced the concept of establishing a Science Advisory Panel (SAP) for the NW CSC. The purpose of the SAP will be to converse with ESAC and provide more refinement on science responses to regional resource management priorities. This will provide the basis for the NW CSC 2017-2022 Science Agenda. The SAP would function as “super-PIs” and be comprised of 6-10 core people, but scientific experts will be engaged as necessary to address specific topics. The Pacific Islands CSC has also taken a SAP approach (reminder that Rich Ferrero is the chair of both the NW and PI CSC Stakeholder Advisory Committees and is overseeing this process in both regions). The following table distinguishes the roles of the ESAC and SAP:

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<th>Executive Stakeholder Advisory Committee (ESAC)</th>
<th>Science Advisory Panel (SAP)</th>
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<tbody>
<tr>
<td><strong>WHO?</strong> Resource Managers, Cultural Stewards, Regulators, Decision Makers, and Climate partners</td>
<td>NW CSC Science Providers - USGS - NW academic partners</td>
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<td><strong>WHAT?</strong> Focus on how changing climate will impact resources and the management priorities in a climate context</td>
<td>Focus on identifying the science products and tools needed to address ESAC management questions</td>
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<td><strong>HOW?</strong> SAC members integrate mgmt. perspectives and urgencies of the programs they represent</td>
<td>SAP members tap into and integrate scientific expertise within their institutions</td>
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**Comment:** In discussing the concept of a SAP, an ESAC member noted that pinpointing the management priorities of states, tribes, and federal agencies will require identifying data and tools related to climate science that are not currently available.

**Comment:** Another ESAC member noted that identifying management priorities that are common among different agencies/tribes/constituents is important. Some examples might include endangered species recovery planning and planning for fire management and drought.
**Comment:** One ESAC member asked whether there is potential for conflict of interest if SAP members may also be scientists who would be submitting proposals. This member was not sure what the motivation for a scientist to be a member of the SAP would be.

Gus noted that the authority to allocate funding belongs to the CSC Director alone and that we need people with expertise in NW issues to populate the SAP and achieve our mutual goals. SAP members would not be authors of the next Science Agenda, but rather would provide input for the development of the Science Agenda. Gus noted that many scientists are genuinely interested in processes such as ours that are examining scientific research and management topics at a regional scale. It was also noted that ESAC will serve as the ultimate filter for SAP members who may try to promote their own particular scientific interests over others.

**Comment:** There was concern that a fairly large number of people (ESAC = 25 members, SAP = 6-10 people) will be involved with the two groups, which may make scheduling meetings for each group and establishing communication between the ESAC and SAP challenging. ESAC acknowledged that time and resource constrains need to be considered when moving forward with SAP development.

**Comment:** Part of the reason ESAC has a hard time expressing management priorities is because most ESAC members have more of a science background than management background. It would benefit the NW CSC to have input from more on-the-ground managers (rather than execs) for the development of the next Science Agenda.

**Day wrap-up**
Rich Ferrero, USGS Northwest Regional Director

Rich noted that today’s discussions have highlighted difficulties in identifying management priorities with enough specificity to develop science products that addresses specific management priorities.

SAP Co-lead Amy Snover noted that the avoidance of conflicts of interests for scientists who are members of the SAP is a necessary element for the orderly development of the group. She also referred to the need to manage time commitments carefully, particularly for SAP members who are on soft money and need to charge their time to a grant. Amy noted that an effort that may provide a useful example for the SAP is the Ocean Acidification Blue Ribbon Panel, a group that involved both scientists and policy makers/managers working towards a common goal.

SAP Co-lead Marty Fitzpatrick commented on the importance of considering the scale of science when developing actionable science. Science that addresses some of the more complex and essential problems presented by climate change doesn’t necessarily provide a readily available tool or product.
Thursday, October 20

A look into the future: NW CSC Strategic Planning, shared goals & outcomes
Gustavo Bisbal, NW CSC Director

For presentation slides, see file “9. NWCSC_ESAC Homework_Bisbal_20Oct16.pdf” on the ESAC meeting webpage.

Gus asked the ESAC members to take the Tier 1 list presented yesterday afternoon back to their management agencies to gain some specificity on the list items. To facilitate this process, ESAC members will provide answers to the following 4 questions in no more than 1 page per Tier 1 list item:

ESAC Homework (due Nov 15, 2016 – to Betsy Glenn, eglenn@usgs.gov):
1. What are your organization’s specific resource management decisions or planning efforts that require new/newly available climate-related information? What concrete decisions will be made or actions taken?
2. What is the timescale associated with the need for scientific information and products (i.e., when is the information needed, and for which future time period)?
3. What is the scope (geographic, financial, jurisdictional, social, etc.) of this particular management topic?
4. What other dimensions associated with this issue does the Science Advisory Panel need to know about? (e.g., which form(s) of information delivery -- peer-reviewed study, software, synthesis reports, short-term training/webinar -- would best facilitate effective uptake of new climate-related information in this specific management context?)

Marty and Amy will refine the 4 questions (if needed), develop a template for responses, and send out to ESAC members at the conclusion of this meeting. (NOTE: THESE WERE SENT TO SAC MEMBERS ON OCTOBER 25).

The ESAC identity: Who are we and who do we want to be?
Discussion facilitated by ESAC Member Michael Cox, Environmental Protection Agency

For presentation slides, see file “10. NWCSC_Who is ESAC_Cox_20Oct16.pdf” on the ESAC meeting webpage.

While the ESAC has been an integral component of the NW CSC since its inception, it became apparent during the NW CSC’s 5-year review that ESAC members were still unclear about their roles as individuals and the role of ESAC as a collective. Likewise, the NW CSC was unclear about the responsibilities and functions of many ESAC members within their home organizations, their expertise in climate science issues, or their decision-making responsibilities. The questionnaire that was distributed to members over the summer helped the NW CSC gain insight into who ESAC members are and what they do, but a conversation was still necessary to clarify the purpose and responsibilities of ESAC as an advisory body to the NW CSC.

Michael led a discussion to clarify the purpose of ESAC, which, according to the CSC Terms of Reference, is to assist the CSC Director in identification of regional natural and cultural resource management priorities and science needs. Specifically, the responsibilities are to:

- Provide counsel for the development and periodic updating of the regional science agenda for the CSC
- Provide counsel on the development of CSC planning and implementation documents, including short-term science plans and strategic solicitation documents for funding;
• Provide and facilitate feedback concerning how effectively CSC products meet the needs of stakeholders.

Only government entities are formal members of ESAC, and while executive level participation is highly encouraged, other agency staff can and often do represent agency executives at ESAC meetings. The group noted that executives are not necessarily the appropriate participants in the ESAC, as they may not have intimate knowledge of specific management actions or decisions that could benefit from climate science or tools. People that work at the interface between executives and on-the-ground managers may be a better fit to provide advice to the NW CSC. It was also noted that the NW CSC is the only CSC in the network that has an ESAC (all other CSCs have SACs – Stakeholder Advisory Committees). **There was general consensus in favor of dropping the “Executive” element of ESAC and calling the group the Stakeholder Advisory Committee (SAC).**

A key ESAC role is identifying where the NW CSC can make the most effective difference in providing climate science and tools that effectively address the management priorities of stakeholders. Convening people at ESAC meetings provides an opportunity to understand what projects are being implemented, learn who is doing the work, and identify gaps in knowledge. ESAC meetings provide an opportunity to talk across agencies about how common climate-related issues are being addressed.

**Group input:** Based on this meeting, there was general agreement that ESAC is has become clearer on its purpose and this meeting is leading to more focused direction.

**Putting the NW CSC’s work into a national context**

*Discussion facilitated by ESAC Member Bea Van Horne, USDA Northwest Climate Hub*

For presentation slides, see file “11. NWCSC_National Context_Van Horne_20Oct16.pdf” on the [ESAC meeting webpage](#).

Bea introduced this topic by noting that interest in climate change is very high across the globe; however, Federal agencies aren’t very good at addressing global-scale issues.

The Northwest region has very strong climate science, but federal agency engagement is often not very good. Several factors influence this including the fact that landscapes are often defined by political jurisdictions rather than by boundaries that are more meaningful for climate-related issues (it was noted that LCC boundaries are more ecologically based).

The USDA Climate Hubs were developed to provide location-specific online tools at the right scale to facilitate agency use. Bea noted that interaction and dissemination of climate info remains an essential (and still unmet) need, and that the short time scale of budgets and planning is not well-suited for addressing climate change issues as the expected life of land use plans is generally 10-20 years.

There is a need to show to larger audiences what different climate groups are doing and how projects done by different groups/collaborations are related to one another and to be able speak with clear voice across agencies, stakeholder groups, politicians, etc. about what different groups do, how they work together, what is produced/learned. Bea provided an overview of some of the Climate Hub products and the following table illustrating the roles of a number of different national efforts to address climate change:
Measures of success over the next 5 years
Robin O’Malley, NCCWSC Policy and Partnership Coordinator

Robin provided an overview of procedures for assessing the success of the NW CSC over the next 5 years. There are a number of components that need to be considered when assessing the success of the program, including measures of institutional development (staff, space, admin support), capacity building (including graduate students and training for managers), development of partnerships to link management and science, and determining whether the actionable science products meet the needs of stakeholders (determine if the science is both used and useful). Another important component is assessing whether the process of developing the science is conducive to making it actionable. Robin also posed the question, “What is the science role for CSCs at the national level? In particular, are there projects that span multiple CSCs?” It was noted that metrics to assess success are expensive to gather and they need to be useful and effective for implementing changes that may be needed.

Climate Refugia Research Coalition
Aaron Ramirez, NCEAS Postdoctoral Fellow

For presentation slides, see file “12. NWCSC_Refugia Research Coalition_Ramirez_20Oct16.pdf” on the ESAC meeting webpage.

Aaron provided an overview of his ongoing work with the Refugia Research Coalition. This work fits somewhere between the individual project-scale and program-scale efforts, but is focused on the Northwest. Additionally, this project encompasses both aquatic and terrestrial systems (but not marine for this effort), and the work is split fairly evenly between these two areas.

Refugia are areas relatively buffered from contemporary climate change over time that enable persistence of valued physical, ecological, and socio-cultural resources, and can involve many different areas of particular landscapes.
The goals of this working group include identification of regional management priorities related to refugia, synthesizing science related to refugia and making it available to managers, and developing additional science products specific to management priorities. A recent publication by Morelli et al. (2016) in PLoS One provides the framework that will be used for this effort.

The working group is composed of NW CSC funded PIs working on projects related to climate, fire, and drought refugia; other refugia experts; and managers interested in refugia. The group will meet in-person in Portland in November 2016 and will also hold remotely-attended meetings. It will host a workshop to roll out actionable science and synthesis products to broader research/management communities at the end of the project.

Comment: ESAC requested email updates on this effort.

Communicating NW CSC information within your organization
Discussion facilitated by ESAC Member Stephen Zylstra, U.S. Fish & Wildlife Service

Stephen led a discussion on methods for communicating information produced by the NW CSC to the organizations represented by ESAC members. One of the first topics brought up was whether this duty (communication of science findings) should be listed in the official duties of the ESAC (it’s not currently listed).

It was also noted that actionable communication – or getting info from the NW CSC to the agency - is often easier than gathering information from agencies to provide to NW CSC.

Comment: Most ESAC members in the room are not social scientists – there was acknowledgement that someone with this expertise would be useful in fine-tuning the NW CSC Communication Strategy.

Comment: We need to make sure that NW CSC projects, products, and tools comes up near the top of a google search because that’s how most people find things.

In summary, most ESAC members indicated that they would like to see a revised Communication Strategy for the NW CSC.

How to improve the NW CSC profile among tribes and states
Discussion facilitated by ESAC Members Lynn Helbrecht, WDFW, and Eliza Ghitis, NWIFC

For presentation slides, see file “13. NWCSC_Working with States and Tribes_Helbrecht and Ghitis_20Oct16.pdf” on the ESAC meeting webpage.

Lynn and Eliza provided a summary of ways to improve visibility and service provided by the NW CSC to states and tribes. As with other presentations at this meeting, defining what success looks like is the key first step. For states and tribes, maximizing NW CSC services, leveraging products across organizations, and responding effectively to management priorities are all key components.
Currently, dissemination of NW CSC information to state and tribal entities is very haphazard. In addition, ESAC members from one agency or tribe can’t represent the needs of all state agencies or regional tribes. Consequently, NW CSC may be missing opportunities to identify needs and share information.

One area in need of improvement is to enhance awareness about NW CSC products and services so that tribes and states can understand how to apply them to their work. This can be improved by having the NW CSC provide regular updates to groups like the Washington Interagency Climate Adaptation Network and Regional Adaptation Practitioners.

Tribes and states can be involved at a deeper level by providing input into science needs and maintaining opportunities for dialogue with the NW CSC regarding challenges, issues, barriers, and needs related to climate change science. States and tribes also need to be engaged in co-production – either as a research partner on a proposal or by being invited to contribute in some way during a project.

Eliza provided an overview of some of the issues specifically related to tribal organizations. Tribes represent a very diverse set of communities. For example, there are 20 tribes represented by the NW Indian Fisheries Commission. In tribal organizations, many people play both scientist and manager roles and almost all science is developed to inform management decisions. In addition, there are very strong cultural components involved in most natural resource issues and there is a wide range of priorities across the 50+ tribes in the NW CSC area.

The Tribal Liaison position (which should be filled in the near future) is needed to advocate for tribal priorities (e.g., in stream flows for fish) at the table with state/federal agencies. In addition, tribes need better communication and science information to help protect their treaty rights.

Eliza provided several suggestions for increasing tribal involvement in NW CSC activities, including inviting tribal members to participate as research partners and soliciting input for project review. In particular, inviting tribal scientists as SAP members is something that should be considered. Tribal scientists have historically received very little acknowledgment from academic/state/federal agency scientists.

**Time to talk; reflections on the meeting and future meeting schedules**

*Discussion facilitated by Donna Silverberg*

**Decisions made at this meeting:**

1. **Evaluate and re-envision role of ESAC as whole**
   a. The group decided to drop the “E” (representing “Executive”) from ESAC to better represent members who actually attend meetings and be consistent with the rest of CSCs across nation. The group is now the Stakeholder Advisory Committee.
   b. Capture who the SAC is in one paragraph (Michael Cox will lead this drafting exercise)
   c. Communication roles to help better identify management priorities within respective agency/organizations need to continue to be developed. The homework regarding fleshing out Tier 1 topics will help initiate this process.

2. **Discuss process to co-produce actionable science at scale and level that is meaningful and useful to your organization and the NW Region**
   a. Alison and Tamara’s project will assess the success of projects in co-producing actionable science
b. Implementation of Science Advisory Panel (SAP)

3. Initiate conversations about future processes and activities of NW CSC in 2017-2022
   a. Maintain the DEPTH database – CSC projects, LCCs, tribes, etc.
   b. Implementation of SAP
   c. Assignment on describing ESAC members’ organizations management priorities in relation to the four Tier 1 topics (Marty, Amy will lead)

Administration:
- 2-day meetings are important
- 2 in-person meetings will be held each year
- Call/WebEx meetings will be scheduled as needed
- Facilitator is a useful addition to these meetings

Potential Schedule for Future Meetings

2016
- Thurs, Dec 8, phone SAP/SAC

2017
- Wed, March 1 phone
- Wed-Thurs., May 3-4 face-to-face, SAP/SAC
- Wed-Thurs., Oct 18-19, face-to-face, SAC/SAP one day
MEETING PARTICIPANTS

**States**
Idaho Fish and Game – Sharon Kiefer, Leona Svancara  
Washington Department of Fish and Wildlife – Lynn Helbrecht

**Tribes**
Northwest Indian Fisheries Commission – Eliza Ghitis  
Cow Creek Band of Umpqua Tribe of Indians – Kelly Coates

**Federal**
Bonneville Power Administration – Chris Furey  
Bureau of Indian Affairs – David Redhorse  
Bureau of Land Management – Louisa Evers  
Bureau of Reclamation – Bryan Horsburgh  
Environmental Protection Agency – Michael Cox, Linda Anderson-Carnahan  
Great Northern Landscape Conservation Cooperative – Sean Finn  
Federal Highway Administration – Amit Armstrong, Jennifer Chariarse  
National Park Service – Chris Lauver  
NOAA Fisheries – Mark Strom  
NRCS National Water and Climate Center – Jolyne Lea  
North Pacific Landscape Conservation Cooperative – John Mankowski  
Northwest Climate Science Center – Gustavo Bisbal, Nicole DeCrappeo, Betsy Glenn, Aaron Ramirez  
USDA Northwest Climate Hub – Bea Van Horne  
US Fish and Wildlife Service – Stephen Zylstra  
US Forest Service – Katherine Smith  

**Other (invited as observers, presenters, or facilitators)**
Desert Research Institute – Tamara Wall  
Donna Silverberg – DS Consulting  
Oregon State University – Josh Foster  
University of Arizona – Alison Meadow  
University of Idaho – Jeremy Kenyon  
University of Washington – Eric Salathé, Amy Snover
Climate change and ecological drought:
Hotter droughts, reduced snow pack, and CO₂ enrichment

Hotter temperatures resulting from climate change are contributing to more severe drought impacts on ecosystems (Fig. 1). Future drought impacts will be driven more by increases in temperature and evaporative demand than changes in precipitation levels. Williams et al. (2014) demonstrated that increasing temperatures and associated increases in evaporative demand will lead to greater forest drought stress in the future even if precipitation patterns don’t change (Fig. 2). This is an important aspect of understanding the role of climate change...
on drought as many models predict either no change or increasing precipitation in the future. However, much of this work is based on research in arid and semi-arid ecosystems in the southwestern U.S. Similar studies from other parts of the U.S. involving other ecosystems and species are still needed.

Allen et al. (2015) recently summarized the implications of hotter droughts on the health of forest ecosystems, arguing that recent drought-related mortality events are just the beginning of a trend that will continue in the near future. Drought effects on forest ecosystems are exacerbated by climate-change driven increases in pest and pathogen outbreaks. In addition, greater impacts of drought on forests are linked to changing wildfire patterns (Williams et al. 2013). Understanding how climate change affects these interactions between drought, fire, pests, and pathogens is an active area of research.

Increasing temperatures associated with climate change may also change the form of precipitation, leading to less snow and more rain (Fig. 3). In the western US, the intensity of these “snow droughts” is unprecedented and making less water available during crucial parts of the dry season (Belmecheri et al. 2015). However, generally higher precipitation in some areas, like the northern Rockies, may result in higher snow pack in high elevation ecosystems. Knowing the spatial and temporal distribution of future snow droughts is an important area of drought research.

Despite the reality of a future characterized by hotter droughts, there are potential interactions between CO₂ enrichment and increasing temperatures that may offset the effects of future droughts on vegetation. Many of the models used to predict the effects of climate change on plant growth and water stress do not account for concurrent changes in atmospheric CO₂ concentrations, which may increase photosynthetic efficiency and offset some of the reductions in plant growth due to drought stress (Swann et al. 2016). However, recent climate change experiments show that CO₂ enrichment may not be sufficient to offset the temperature and drought effects on vegetation (Zhu et al. 2016). More work is needed to understand how these complex interactions between atmospheric CO₂ concentrations and increasing temperatures will affect ecosystems in the future.

**Related Questions:**

1. When and where will hotter droughts occur?
2. How do hotter droughts interact with patterns of wildfire? … with pest and pathogen outbreaks?
3. How will snow droughts affect fish, wildlife, plants, and ecosystems?
4. When and where can CO₂ enrichment offset temperature effects on plant growth and drought stress?
5. How will climate change alter the intensity, duration, frequency, and extent of drought?

**Human activity and ecological drought:**

*Land use, resource management, and ecosystem services*

We are used to thinking of drought as something that affects human communities. However, Van Loon et al. (2016) argue that in a world increasingly dominated by human activity, our own actions are more and more capable of driving drought conditions, interacting with more natural drivers of drought like climate and hydrology (Fig. 4). Human-
modified and human-induced droughts present a new challenge to ecosystems and may cause novel ecological responses. Despite this threat, ecologists often fail to include human land use as a factor when studying ecological drought. Wilson et al. (2016) recently developed a new way of quantifying the effects of human land use on water availability that can be useful for comparing the effects of human activity to climatic drivers of drought. Additional research is needed, in more places, to parse out human vs. natural drought drivers and improve our understanding of when/where human effects occur and what the consequences are for ecosystems.

By making stronger connections between the human and natural dimensions of drought we can identify novel solutions for reducing drought impacts in the short to medium-term. For example, redesigning our water infrastructure to provide more water for both people and nature is something we have much more control over, on shorter time scales than reversing global climate change. In some cases, such solutions may be as simple and cost-effective as reintroducing ecosystem engineers, like beavers, that can naturally alter water systems to increase water availability for natural wetlands as well as agricultural rangelands (McFarlane et al. 2015). These strategies for building drought resilience hold great promise for reducing the risks associated with ecological drought, but they are currently underutilized and their efficacy and cost is rarely quantified or compared to infrastructure-based mitigation techniques (Jones et al. 2012).

In addition, recent work examining the effects of fuels treatments on drought resilience has shown that humans can reduce impacts on forests by thinning stands and reducing the competition for water during drought (Van Mantgem & Stephenson. 2016; Thomas & Waring 2015; Fig. 5). Future forest management efforts and especially fuels treatments should be carried out with an eye for increasing drought resilience. However, the effectiveness of such treatments is likely to vary across the landscape and may only provide a short-term solution for increasing drought resilience. Additional work is needed to build our understanding of when and where the benefits of managing forests for fire and drought are likely to occur.

Drought impacts to ecosystems are often viewed as unrelated to drought impacts on human agricultural and urban systems. Often, efforts to protect environmental water supplies in the face of drought are met with disdain because doing so affects the supply of water for human use (Fig. 6). However, this perspective of separate water needs for humans and nature is shortsighted because impacts to

![Image](https://example.com/image.png)

Figure 5. Different management approaches can affect how ecosystems respond to disturbances like drought. Correct management can increase resilience of forests to drought and reduce impacts to ecosystem services. source: Millar & Stephenson 2015

![Image](https://example.com/image.png)

Figure 6. Citizens protest agricultural water restrictions in the CA Central Valley. Reduced water diversions from the San Francisco Bay Delta were mandated to halt the decline of the Delta Smelt, an endangered native fish species and an indicator of ecosystem health. source: redstate.com
ecosystems trickle down to human systems through lost ecosystem services. In fact, not accounting for these ecological impacts can be an expensive mistake. Banerjee et al. (2013) estimated that unanticipated ecosystem service losses cost Australians over $800M, as money was spent to replace these services and adapt to new drought-impacted ecosystems. Despite the high costs of ecological impacts to both nature and people, current research, management, and policies often fail to evaluate how drought affects ecosystems and the “natural capital” they provide to human communities (Schaefer et al. 2015).

Related Questions:
1. When and where will human-modified and human-induced droughts occur?
2. What are the consequences of human-induced droughts for ecosystems?
3. How can current resource management actions (e.g., thinning) be used to increase drought resilience?
4. How do “ecosystem-based” management strategies compare to “infrastructure-based” techniques?
5. How can losses to ecosystem services due to drought be identified, quantified, and mitigated?

Conclusion: Addressing complexity with the right questions
Existing definitions of drought (i.e., agricultural, hydrological, socioeconomic, and meteorological drought) do not capture the diverse and interacting dimensions of the ecological effects of drought. A novel way to conceptualize drought is needed to clarify the complex interactions between natural and human systems and prepare us for the rising risk of drought in the 21st century. To that end, we need to ask questions that are specific and targeted at the complex issues presented here and, importantly, to natural and cultural resource managers’ needs. This primer can serve as a guide for developing a list of questions capable of directing future drought programs, clarifying important policy and management decisions, and leading the way to a sustainable future for our ecosystems and the human communities that depend on them.

References

For additional information, contact:
Aaron Ramirez, PhD
Postdoctoral Associate
National Center for Ecological Analysis & Synthesis
Northwest Climate Science Center
U.S. Geological Survey
777 NW 9th Street
Corvallis, Oregon 97330
The Northwest Climate Science Center (NW CSC) is embarking on an effort to facilitate a dialogue on climate change issues between scientists and natural and cultural resource managers who are members of the NW CSC Executive Stakeholder Advisory Committee (ESAC). The establishment of a **Science Advisory Panel (SAP)** to contribute the scientific perspective to a regional dialogue with resource managers is a central element of this effort. The goal is to support development of research initiatives that address management priorities for climate change adaptation as communicated by ESAC. The SAP-ESAC dialogue is also intended to guide development of the NW CSC’s 2017-2022 *Science Agenda*.

**Context**: The NW CSC prioritizes the delivery of actionable science products (e.g., synthesized scientific information, maps and models, decision support tools, etc.) that are focused on key management priorities and co-produced by teams of scientists and managers. The NW CSC has been successful at promoting and supporting the co-production of actionable climate science at the individual project level, but it has been difficult to replicate this success at the regional program level. We are creating a SAP to enhance the interaction between ESAC resource managers and scientists engaged with the NW CSC and develop management-relevant research initiatives that can be broadly applied across the Northwest region.

**Goal**: The NW CSC intends for the SAP-ESAC dialogue to guide development of its 5-year *Science Agenda*. The 2017-2022 *Science Agenda* will be built around the management priorities identified by the ESAC and the science themes identified with the support of the SAP. The timeline for this effort is November 2016 through October 2017.

**SAP Role**: The role of the SAP is to identify strategic-level *Science Agenda* Themes, and Objectives within those Themes, that most adequately address management priorities articulated by the ESAC. As needed, the SAP will consult or convene additional subject matter expertise. The ESAC will work with the SAP to achieve consensus on the final Themes and Objectives.

**SAP Membership**: The SAP acts at a strategic, programmatic level. Rather than having specific scientific interests, SAP members are integrators and synthesizers of scientific expertise within their organizations or disciplines. The SAP is drawn from NW academic institutions and USGS Science Centers servicing the region. The SAP will initially be co-led by Dr. Amy Snover (Climate Impacts Group, University of Washington) and Marty Fitzpatrick (USGS, Forest and Rangeland Ecosystem Science Center). Additional SAP membership will be invited in consultation with, and approved by, the NW CSC Director.

**Engagement Process**: 
The objectives of creating the SAP, the process of engagement and the relative roles of the ESAC and SAP were discussed at the annual ESAC in-person meeting (October 2016).

The SAP will be invited to attend ESAC meetings, and joint meetings of the two groups may be scheduled, to enable the development of shared understanding of regional climate change adaptation-related management priorities, and description of those priorities at a level of detail sufficient to enable strategic identification of knowledge gaps and needs.

At times, it may be necessary for the SAP to work independently of the ESAC, or with a subset of ESAC members, to draft strategic research Science Agenda Themes & Objectives. The SAP will be expected to engage relevant additional subject matter experts both within and outside their home institutions in this process, as appropriate.

Several SAP-ESAC meetings and webexes will be held between November 2016 – October 2017. This schedule will be developed soon.

ESAC meetings will be chaired by Rich Ferrero, Regional Director (USGS Pacific Northwest). Development of the management priorities and science themes will be led by a professional facilitator / negotiator. The NW CSC Research Coordinator will be the primary staff support for this process.

**Guidance for development of the NW CSC 2017-2022 Science Agenda Themes and Objectives:**

- In October 2014, NW CSC ESAC members collectively stated their management organizations’ top management priorities as related to climate change. These were condensed into 10 themes, four of which were identified by the NW CSC Leadership Team as being ones that the NW CSC was well-positioned to address. These four themes – examining 1) hydrologic regime shifts on infrastructure, agriculture, and aquatic habitat, 2) ecological impacts of drought, 3) trigger points and ecosystem thresholds, and 4) climate change effects on invasive species, diseases, and pests – will serve as a starting point for building the Science Agenda.

- The NW CSC Science Agenda should be built on the following pillars:
  - It must be actionable: science themes and objectives must respond to explicit management priorities articulated by stakeholders,
  - It must encourage co-development – the joint participation of scientists and resource managers throughout the life of each project – as the path to assuring management relevance of scientific products,
  - It must concentrate on climate change issues: some management priorities expressed by ESAC will have little to do with climate change, or will have complex multivariate causality or interactions,
  - It must reflect the mission of the Department of the Interior by focusing on the effects of climate change on plants, animals, their habitats, or human communities,
  - It must evaluate adaptive responses and climate adaptation actions, rather than mitigation efforts.
  - It should retain flexibility to respond to managers’ needs, shifting conditions, and funding opportunities.
• There is no need for one-to-one mapping of individual management priorities onto individual Science Themes. It’s likely that there will be some unbundling of the management priorities conceptually, followed by some lumping and splitting, and the subsequent structuring of the Science Themes and Objectives.

• Science Themes do not have to be mutually exclusive.

• Strategic sequencing and dependencies between Objectives (i.e., one must be accomplished before another one can begin) should be highlighted.
ESAC
Executive Stakeholder Advisory Committee

26 entities
6 Tribal/Inter-tribal
12 Federal
4 States
3 LCCs
1 Hub
The ESAC Questionnaire and Survey

Gustavo Bisbal, Director

ESAC Annual meeting – Portland, OR – October 19-20 2016
ESAC questionnaire (Summer 2016)

- 6 questions
- 100% email response (25/25)
- 88% in-person follow up (22/25) and counting...

1. I’m an ESAC member: Am I a science user?
   (1) Nicole 10:50, Gus 2:40, (2) Mike 9:15

2. ESAC members as couriers of information
   (1) Gus 2:40, (2) Stephen 1:00
Q: Do you serve as a nexus for the line managers and the regional executives in your organization?

A: “yes”
“yes, in a limited sense”
“somewhat”
“to some degree”
“at times, yes”
“I serve as a nexus for information on some topics”
“I typically do not serve this role”
“no”
ESAC questionnaire (Summer 2016)

- 6 questions
- 100% email response (25/25)
- 88% in-person follow up (22/25) and counting...

1. I’m an ESAC member: Am I a science user?
   (1) Nicole 10:50, Gus 2:40, (2) Mike 9:15

2. ESAC members as couriers of information
   (1) Gus 2:40, (2) Mike 9:15, Stephen 1:00

3. Your neighbor’s actionable science looks different
   (1) Alison & Tamara 9:45, Nicole 10:50, Gus 2:40
Q: What makes research “actionable” in your experience?

A: “if the resource manager utilizes the research in any way”
   “when information is at a scale that is relevant”
   “project developed in response to an actual problem the manager faces”
   “having something tangible showing that the project is effective”
   “science that is timely and available when needed”
   “when information can be used to develop a better project for the future”
   “communicating research results with a simple tool”
   “research that can be repeated with the same or similar results”
   “research that can be picked up and utilized”
   “science that is peer reviewed and meets data quality standards”
ESAC questionnaire (Summer 2016)

- 6 questions
- 100% email response (25/25)
- 88% in-person follow up (22/25) and counting...

1. I’m an ESAC member: Am I a science user?
   (1) Nicole 10:50, Gus 2:20, (2) Mike 9:15

2. ESAC members as couriers of information
   (1) Gus 2:20, (2) Stephen 1:00

3. Your neighbor’s actionable science looks different
   (1) Alison & Tamara 9:45, Nicole 10:50, Gus 2:20

4. What projects resonate with you and why?
   (1) Alison 11:20, (2) Robin 11:10
ESAC online survey (October 2016)

- 3 questions
- 96% response (24/25)

1. Foundation for 2017-2022 Science Agenda
2. Remember the 2014 Lightning Talks?
3. Confirmation of resource management priorities
4. Products you expect from the NW CSC
Actionable Science

What is it?

How do we do it?
Actionable science provides data, analyses, projections, or tools that can support decisions regarding the management of the risks and impacts of climate change. It is ideally co-produced by scientists and decision makers and creates rigorous and accessible products to meet the needs of stakeholders.
Usability depends on three interconnected factors: users’ perception of information fit; how new knowledge interplays with other kinds of knowledge that are currently used by users; and the level and quality of interaction between producers and users.
Whether a decision maker uses new information depends on:

- Their relative familiarity with the problem at hand
- Organizational characteristics related to decision making
- The decision maker’s motivation for searching for information
- Characteristics of how information is presented
NW CSC ESAC

- Includes an implementation strategy
- Is presented at the same scale as the decision
- Directly relevant to a decision; feasible within agency’s authority
- Timely – delivered when we need it
- Involves decision makers in shaping questions
- Uncertainties are well-defined
- Accessible format/easy-to-use tool
THINK ABOUT A TIME YOU SAW THE IMPACT OF RESEARCH ON A MANAGEMENT DECISION OR ACTION... WHAT HAPPENED?

GIVE YOUR STORY A TITLE AND WRITE IT ON A STICKY NOTE

2 MINUTES-
WHAT WERE THE KEY THEMES IN THE STORIES YOU SHARED?
WHAT TYPE OF DECISION WAS MADE IN THE STORY YOU SHARED?

- **conceptual use**—decision maker perceives herself to be better informed about the issue or has changed his opinion.

- **justification use**—information is used to justify a decision that may have already been made

- **instrumental use**—decision maker perceives a use for the information and it has contributed to a decision.

- **other use**
Actionable Science at the NW CSC

NICOLE DECRAPPEO, NW CSC DEPUTY DIRECTOR
ESAC ANNUAL MEETING, OCTOBER 19-20, 2016
What criteria does the NW CSC operate under?

How do we ensure our science is co-produced and actionable?

How many resource managers have we engaged?
Actionable Science Criteria

- Provides data, projections, or tools that can **support decisions** regarding the management of climate change risks and impacts

- Strongly encourage and support **co-production** throughout life of project:
  - scientists and managers discuss a management priority
  - converse regularly and meaningfully throughout
  - create products that are tailor-made to meet managers’ needs
RFP: Management Significance & Engagement (25%)

- Identify the direct applicability of the approach, tool, or adaptation technique to lessen climate change impacts

- Identify intended end users

- Explain how intended users will be engaged in project planning and administration
Ensuring Actionable Science

RFP: Management Significance & Engagement (25%)

- Identify potential barriers to using the tool or adaptation technique (economic, institutional, social, legal, political) and how these might be overcome

- Describe outreach components to disseminate research findings and information
Ensuring Actionable Science

Letters of Support

- Demonstrate understanding of the proposed study, including the anticipated outcomes and products
- State how project outcomes will be used to address a specific management priority
- Commit to engaging throughout life of the project
Ensuring Actionable Science

Administration of Project

- Recommendations of managers to engage
- Quarterly check-ins
- Progress and final reports
We counted resource managers named in:

Proposals
Letters of Support
Advisory Committees
Progress & Final Reports
Workshop Attendee Lists
24 projects
445 managers
109 organizations
# Resource Managers Engaged

**FY11-14**

## Federal
1. BLM
2. CALCC
3. EPA
4. GBLCC
5. GNLLCC
6. NOAA
7. NPLCC
8. NPS
9. NRCS
10. USACOE
11. USDA
12. USFS
13. USFWS
14. USGS

## State, County, City
1. CA Dept of Fish & Wildlife
2. CA State Coastal Conservancy
3. City of Arcata
4. City of Eugene
5. City of Eureka
6. City of Portland
7. City of Seattle
8. Humboldt County, CA
9. ID De pt of Lands
10. ID Dept of Fish and Game
11. ID National Guard
12. MT Fish, Wildlife and Parks
13. OR Dept of Fish and Wildlife
14. OR Coastal Management Program
15. OR Dept of State Lands
16. Pacific County, WA
17. Pierce County Surface Water Mngmt
18. WA Dept of Ecology
19. WA Dept of Fish and Wildlife
20. WA Dept of Natural Resources

## Tribes & Intertribal Entities
1. Burns Paiute Tribe
2. Coeur d’Alene Tribe of Indians
3. CRITFC
4. Colville Confederated Tribes
5. Confederated Salish and Kootenai Tribes
6. Confed. Tribes of Siletz Indians
7. Confed. Tribes and Bands of the Yakama Nation
8. Confed. Tribes of the Umatilla Indian Reservation
9. Confed. Tribes of the Warm Springs Reservation
10. Cowlitz Indian Tribe
11. Duck Valley Shoshone Paiute Tribe
12. Fort Hall Shoshone-Bannock Tribes
13. Fort McDermitt Paiute Shoshone Tribes
14. Kalispel Tribe of Indians
15. Lower Similkameen Indian Band
16. Makah Fisheries Management
17. Mandan Hidatsa Sahnish Nation
18. Nez Perce Tribe
19. Nisqually Indian Tribe
20. Nooksack Tribe
21. Okanagan Nation Alliance
22. Penticon Indian Band
23. Port Gamble S’Klallam Tribe
24. Quinault Indian Nation
25. Skokomish Indian Tribe
26. Spokane Tribe of Indians
27. Swinomish Indian Tribal Community
28. The Confederated Tribes of Salish & Kootenai
29. Tsleil-Waututh First Nation
30. Upper Columbia United Tribes
31. Upper Similkameen Indian Band
32. Upper Snake River Tribes
33. Yakama Nation
34. Yurok Tribe

## NGOs, Other
1. American Rivers
2. CA Native Plant Society
3. CA Sea Grant
4. CA State Coastal Conservancy
5. Caltrans
6. Coastal Ecosystems Institute
7. Columbia River Estuary study Taskforce
8. Crown Managers Partnership
9. Crown of the Continent Initiative
10. Ducks Unlimited
11. Environmental Science Associates
12. GAIA Consulting
13. GHD
14. Gonzales Stoller Corporation
15. H. T. Harvey & Associates
16. Lava Lake Institute
17. Lava Lake Land & Livestock LLC
18. Lower Columbia Estuary Partnership
20. Natural Resources Defense Council
21. Nisqually Reach Nature Center
22. Nisqually River Foundation
23. Northern Hydrology & Engineering
24. Northwest Power and Conservation Council
25. Okanagan Collaborative Connectivity Group
26. OR Cattlemans’ Associations
27. OR Habitat Joint Venture
28. Redwood Community Action Agency
29. Redwood Region Audubon Society
30. Redwood Region Audubon Society
31. San Diego Audubon Society
32. South Okanagan Similkameen Conservation
33. Southwest Wetlands Interpretive Assoc.
34. The Nature Conservancy
35. The Wilderness Society
36. Transboundary Connectivity Group
37. Trout Unlimited
38. WA Wildlife Habitat Connect. Work. Group
39. Western Aspen Alliance
40. Wilburforce Federation
41. Woodland Park Zoo
42. Yakima Basin Joint Board

## International
1. BC Ministry of Environment
2. BC Ministry of Forests, Lands, & Natural Resource Operations
3. BC Parks
4. Alberta Environment and Parks
<table>
<thead>
<tr>
<th>Resource Managers Engaged – 2012 projects</th>
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<td><strong>Proposal</strong></td>
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Resource Managers Engaged

Takeaways

- Not all resource managers are created equal
- Not all managers are engaged in the same capacity
- We don’t know how project products have been used
Evaluating the Process and Impacts of Co-Produced Actionable Science:

How Do We Know When It’s Working?
How Do We Know What “Working” Means?

Alison M. Meadow – University of Arizona
Tamara Wall – Desert Research Institute
Collaboration to produce knowledge with greater impact

Engaged, collaborative approaches to knowledge production seem to have better outcomes than "loading dock" – the knowledge is more likely to be used by decision makers.

Funders and agencies are recognizing the importance of collaborative research and the production of "usable" science.

http://www.cs.berkeley.edu/~bh/hs/people.html
Why does (do we think) collaboration makes science more usable?

- Decision makers understand the information better and feel a greater sense of ownership.
- Information is more likely to meet their specific needs.
- Information is more likely to fit organizations’ decision making processes.
How is science co-produced?

- End-user works with researcher to define the problem and craft the research question
- End-user works with research to select methods, conduct research, and analyze findings
- End-user works with research to test and evaluate results
- Interplay between “science” and “society” is acknowledged – both representatives are given equal weight and influence in the process
The Challenges of Collaborative Research
Supporting Effective Co-Production – the many questions

- How do we do this *efficiently and effectively*?
- What *actions and practices* are most helpful in establishing collaborative partnerships?
- What is the best way to incorporate both scientists’ and stakeholders’ *interests, needs, and perspectives* into a project?
- Which *actions and practices* most influence the development of usable (and used) science?
- How do we know whether the project *worked* and the science was *used*?
Evaluating Collaboratively Produced Actionable Science

An evaluation framework for co-produced climate science research projects.

- What process factors most influence the outcome of usable science?
- What outputs, outcomes, and impacts do we observe in these projects and how were they achieved?
- How does context – and factors outside the control of the researchers and end-users – affect project processes, outcomes, and impacts?
Building the Framework

Indicators of Successful Collaborative Production of Knowledge

Lived Experience of Climate Science Researchers

Evaluation Literature

Information Use Literature

Co-Production/Collaborative Research Literature

Agency Performance Metrics

SW CSC Case Studies

Refine Indicators

SW CSC Case Studies

Guidance to Funders, Researchers, and Stakeholders

NW CSC Case Studies

Programmatic Support for use of Best Practices

Improved outcomes; greater impacts from CSC-funded projects
Indicators

PROPOSED INDICATORS

CONTEXT

INPUTS
Resources and capacity going into the project

EXTERNAL INFLUENCES
Conditions that affect the project, but which participants have no control over.

PROCESS

RESEARCHERS AND CLIMATE SCIENCE END-USERS ARE COMMUNICATING ABOUT THE PROJECT AND CLIMATE CHANGE ISSUES IN GENERAL.

RESEARCHERS AND CLIMATE SCIENCE END-USERS ARE WORKING TOGETHER TO DEVELOP CLIMATE SCIENCE FOR DECISION SUPPORT.

OUTPUTS

Tangible results from the research

OUTCOMES

Science developed through the co-production process is welcomed as usable by end-users

IMPACTS

Science is being used to support climate adaptation decisions

Meadow, Wall, and Horangic (2015) meadow@email.arizona.edu
## Sample Indicators

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<tr>
<th>CATEGORY</th>
<th>INDICATOR</th>
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| INPUTS       | Necessary disciplines to answer the research question are included on research team. (I.1.)  
Proposal includes a clear plan for collaboration between agency representatives and research team. (I.7.) |
| PROCESS      | Timing – when did agency representative enter the research process? (P.1.)  
Participants perceive that they had equitable opportunities to participate in the project. (P.3.)  
Both groups are satisfied with their level of engagement in the project. (P.5.) |
| OUTPUTS      | Number of peer-reviewed articles. (OP.1.)                                                                                                                                                        |
| OUTCOMES     | End-users perceive the science as credible (OC.2.)  
End-users perceive the science as salient to their problem (OC.4.)                                                                 |
| IMPACTS      | Findings from study are explicitly used in agency planning, resource allocation, or policy decision. (IM.9)                                                                                   |
Use existing framework to evaluate a subset of NW CSC projects

Use lessons from evaluation outcomes to collaboratively refine RFPs, proposal reviewer guidance, evaluate future projects

Use lessons from evaluation outcomes to collaboratively design a program framework to integrate new knowledge and demonstrate effectiveness.
Methods

- Semi-structured interviews with research teams, resource manager participants, and agency representatives
- Document analysis (proposals, project reports, publications, and other outputs)
- Observations (occasionally) of joint meetings of researchers and agency partners
- Regular feedback to NW CSC and ESAC of preliminary findings
Project Selections

- Range of sectors
- Range of PI “types”
- Range of agency partners
- Variety of engagement/collaboration approaches
- ESAC interest
- Leadership interest
- Year of funding
A few lessons (so far) about co-production (from SW CSC cases)

Co-designing projects is challenging because of the way most projects are funded.

It is also a paradigm shift for many people.

“We needed to be brought in sooner . . . If we’d been included as more of a real collaborator . . .”

“I appreciate that ____ is unique in a researcher in that he is looking at how this will effect decision making and a lot of researchers don’t take that step . . . it’s just a lot more beneficial if that’s part of their thought process; as they’re putting a plan together of what they want to do they’re kind of looking ahead to how could this be applicable.”
Lessons (so far)

Collaborative research is a *skill*.

Natural and physical scientists aren’t necessarily training to do the things they are being asked to do.
Lessons (so far)

- Time frame to see *impacts* may be longer than we think

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<tr>
<th>Conceptual Use</th>
<th>Justification Use</th>
<th>Instrumental Use</th>
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<tr>
<td>Decision maker perceives herself to be better</td>
<td>Information is used to justify a decision that may</td>
<td>Decision maker perceives a use for the information and it</td>
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<tr>
<td>informed about the issue or has change his opinion</td>
<td>have already been made.</td>
<td>has contributed to a decision.</td>
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<td>about the issue; may share information with others.</td>
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Based on Oh (1996) *Linking Social Science Information to Policy-Making*
Impacts might be different from what we expect

One project can demonstrate an “instrumental use” of their research findings; but another group of stakeholders used their findings to spur proposal development. That’s not a direct application of the science to decision making, but it is an important use of the information.
“Stakeholder” is a term that gets over-used in our field. Its imprecise definition can be detrimental to understanding how and why collaborations succeed and fail.

A few characteristics that get lost when we just say “stakeholder.”

- General public stakeholder vs. professional resource manager
- Scale of decisions: national, regional, local?
- Different agencies have different mandates
- Different agencies have different technical capacities
- End-user’s personal experience with the science matters
Questions?

THANK YOU!

Alison Meadow
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University of Arizona
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Tamara Wall
Desert Research Institute
Tamara.Wall@dri.edu
Assessment of the 2011-2016 NW CSC Science Agenda

NICOLE DECRAPPEO, DEPUTY DIRECTOR
ESAC ANNUAL MEETING, OCTOBER 19-20, 2016
Overview

- 2011-2016 Science Agenda
- Science portfolio highlights
- OGEL Challenge
- What comes next?
2011-2016 Science Agenda

1. Climate science and modeling
2. Response of physical systems to CC
3. Response of biological systems to CC
4. Vulnerability and adaptation
5. Monitoring and observation systems
6. Data infrastructure, analysis, and modeling - SP
7. Communication of science findings - SP
Climate science and modeling:

• Next generation climate model downscaling
• Integrated climate, hydrology, and vegetation scenarios
• Climate projections for specific locations and applications
Climate change effects on **hydrologic** systems:

- Extreme flood and drought event projections
- Snowpack loss and sediment inputs
- Changes to mountain wetlands
- Sea-level rise effects on tidal marshes
Climate change effects on biological systems:

- Sage grouse and spotted owl habitat projections
- Changes to invasive weed distributions
- Future aspen distribution and productivity
- Disappearing habitat refugia after wildfire
Climate vulnerability and adaptation:

- Native salmon and trout vulnerability
- Whitebark pine vulnerability to mountain pine beetles
- Forest snow retention strategies
- Tribal climate change vulnerability assessment
Over 6 years... 61 projects 41 completed $7.5M funding
The OGEL Challenge
Collective NW Climate Research Portfolio 2011-2015

NW CSC Science Agenda Sub-theme

Number of Projects

- BIA
- BOR
- CIRC
- GBLCC
- NOAA
- NPS
- USFS
- USGS
- BLM
- BPA/CRITFC
- EPA
- GNLCC
- NPLCC
- OWEB
- USFWS
- WDFW
- NW CSC

18 15 8 5 73
12 6 4 8 17
39 27 15 9 111
25 9 27 208
28 37 94 108
54 30 37 35 40
14 11 7 8 13
13 8 9 6
DEPTH Web Portal

- Create, edit, and search CSC projects
- Access climate projects contributed by ESAC
- Search projects by specific NW locations
- Open access and freely available to public

https://www.sciencebase.gov/depth
What comes next?

- Where relevant and appropriate, build on work completed in support of 2011-2016 Science Agenda

- Begin developing 2017-2022 Science Agenda, which will have a different structure
A look into the Future:
NW CSC Science Agenda 2017-2022

Gustavo Bisbal, Director

ESAC Annual meeting – Portland, OR – October 19-20 2016
The Lightning Talk Experiment (2014)

- Promote *manager/scientist dialogue* on actionable science
- **Phase 1**: Management priorities related to climate change
- **Phase 2**: Science response & suggestions
- **Iteration & refinement**
Phase 1
Initial resource management priorities

- ESAC members asked to present their top resource management priorities related to climate change
- 15 presenters
- Some management priorities, some science needs
- Many specific topics, many overlapping themes
Phase 1
Lightning Talks Summary

1. Accessing downscaled climate data
2. Hydrologic regime shift effects on infrastructure/ag./salmonid habitat
3. Sea-level rise effects on estuaries
4. Landscape connectivity
5. Prioritization of conservation or restoration areas
6. Ecological impacts of drought
7. Ocean acidification effects on shellfish
8. Fire risk
9. Identification of trigger points and thresholds
10. Invasive species, diseases, pests
Triage Considerations

- Set realistic expectations
- Can’t do it all... alone
- Recognize our past and current efforts
- Recognize contributions by others
- Explore new opportunities
Phase 1
Triage: 3 Tiers

Tier 3
What the NW CSC has done so far

Tier 2
Where others lead

Tier 1
Opportunities for NW CSC leadership
Phase 1
Triage: 3 Tiers

**Tier 3**
1. Accessing downscaled climate data
3. Sea-level rise effects on estuaries
8. Fire risk

**Tier 2**
4. Landscape connectivity
5. Prioritization of conservation or restoration areas
7. Ocean acidification effects on shellfish

**Tier 1**
2. Hydrologic regime shift effects on infrastructure/agriculture/salmonid habitat
6. Ecological impacts of drought
9. Identification of trigger points and thresholds
10. Invasive species, diseases, pests
What priority would your organization, stakeholders, or members assign to the following management concerns over the next 5 years?

1. Access to downscaled climate data
2. Hydro effects on infra/ag/salmon
3. Sea-level rise and estuaries
4. Landscape connectivity
5. Prioritize cons/restoration areas
6. Ecological impacts of drought
7. Ocean acidification/shellfish
8. Fire risk
9. ID trigger points and thresholds
10. Invasive spp./diseases/pests
Some additional ideas

• Temp, DO and pH impacts of CC on marine ecosystems
• Hydro regime shift effect on riparian habitats & aquatic connectivity, wetland persistence & function
• Climate driven water quantity impacts on water quality
• Social science research of visitors to evaluate use patterns/trends
• Climate change effects on wildlife
Which of the following should be the research (and funding) priorities for the NW CSC during the next 5 years?

1. Access to downscaled climate data
2. Hydro effects on infra/ag/salmon
3. Sea-level rise and estuaries
4. Landscape connectivity
5. Prioritize cons/restoration areas
6. Ecological impacts of drought
7. Ocean acidification/shellfish
8. Fire risk
9. ID trigger points and thresholds
10. Invasive spp./diseases/pests
Some additional ideas

- ID, evaluation & ranking of adaptation actions that can help mitigate climate impacts to high priority habitats and species
1. Access downscaled climate data
2. Hydro effects on infra/ag/salmon
3. Sea-level rise and estuaries
4. Landscape connectivity
5. Prioritize cons/restoration areas
6. Ecological impacts of drought
7. Ocean acidification/shellfish
8. Fire risk
9. ID trigger points and thresholds
10. Invasive spp./diseases/pests
What priority would you assign to the following NW CSC science products in the next 5 years?

1. Access to climate downscaled models/data
2. Habitat projections and/or spp. distribution models
3. Climate VAs
4. Eval. climate adaptation actions
5. Syntheses & interpretation of CC topics
6. Decision support tool development

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<tr>
<th></th>
<th>Less important</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Extremely important</th>
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<td>1. Access</td>
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<td>2. Habitat</td>
<td>3.7</td>
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<td>3. Climate VAs</td>
<td>3.8</td>
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<td>4. Eval.</td>
<td>4.0</td>
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<td>5. Syntheses</td>
<td>3.8</td>
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<td>6. Decision</td>
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</table>
There is a lot of information out there

Where is it?

What does it all mean?
Proposed pillars of the NW CSC Science Agenda 2017-2022

- **Broad** array of research, but **tiered**
- Focus on **Adaptation responses**
- **Actionable**: mgmt. priorities drive research direction
- **Co-produced** outcomes: manager-scientist partnerships
- **Flexible**: responds to shifting needs/conditions/opportunities
- **Innovative**: encourages creative approaches
- **Leveraged**: co-fund and build on own & partners’ work
- Strong focus on **synthesis** and **interpretation**
impacts
water
ecosystem
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Ecological Drought: an episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and human systems.
Ecologically available water

Exposure
- Meteorological drought
- Landscape characteristics
- Anthropogenic climate change
- Human land & water use

Sensitivity / adaptive capacity
- Ecological characteristics
- Natural resource management

Thresholds of vulnerability

Ecological responses
- Ecological impacts
- Ecosystem service impacts

Human responses

NATURE  HUMANS
Introduction of the Science Advisory Panel

Gustavo Bisbal, Director

ESAC Annual meeting – Portland, OR – October 19-20 2016
The Lightning Talk Experiment (2014)

- Promote **manager/scientist dialogue** on actionable science
- **Phase 1**: Management priorities related to climate change
- **Phase 2**: Science response & suggestions
- Iteration & refinement
1. Accessing downscaled climate data
2. Hydrologic regime shift effects on infrastructure/ag./salmonid habitat
3. Sea-level rise effects on estuaries
4. Landscape connectivity
5. Prioritization of conservation or restoration areas
6. Ecological impacts of drought
7. Ocean acidification effects on shellfish
8. Fire risk
9. Identification of trigger points and thresholds
10. Invasive species, diseases, pests
An episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and human systems.
Co-production of Actionable Climate Science at the NW CSC
Science Advisory Panel: An experiment

Program level

Project level

A

ESAC ← EX

B

SAP ← ESAC ← EX

PI ← MGR

?
<table>
<thead>
<tr>
<th></th>
<th>Executive Stakeholder Advisory Committee (ESAC)</th>
<th>Science Advisory Panel (SAP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO?</strong></td>
<td>Resource Managers, Cultural Stewards, Regulators, Decision Makers, and Climate partners</td>
<td>NW CSC Science Providers • USGS • NW academic partners</td>
</tr>
<tr>
<td><strong>WHAT?</strong></td>
<td>Focus on how changing climate will impact resources and the management priorities in a climate context</td>
<td>Focus on identifying the science products and tools needed to address ESAC management questions</td>
</tr>
<tr>
<td><strong>HOW?</strong></td>
<td>SAC members integrate mgmt. perspectives and urgencies of the programs they represent</td>
<td>SAP members tap into and integrate scientific expertise within their institutions</td>
</tr>
</tbody>
</table>
The Lightning Talk Experiment (2014)

- Promote *manager/scientist dialogue* on actionable science
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Phase 1
Triage: 3 Tiers

Tier 3
1. Accessing downscaled climate data
3. Sea-level rise effects on estuaries
8. Fire risk

Tier 2
4. Landscape connectivity
5. Prioritization of conservation or restoration areas
7. Ocean acidification effects on shellfish

Tier 1
2. Hydrologic regime shift effects on infrastructure/agriculture/salmonid habitat
6. Ecological impacts of drought
9. Identification of trigger points and thresholds
10. Invasive species, diseases, pests
2. Hydrologic regime shift effects on infrastructure/agriculture/salmonid habitat

6. Ecological impacts of drought

9. Identification of trigger points and thresholds

10. Invasive species, diseases, pests
ESAC homework

Goal: to gain some specificity on the items under Tier 1.

Task: answer 4 questions in no more than 1 page per item.

Q1: What is your organization’s specific management application? Provide 2-3 highest priority applications.

Q2: What is the scope (geographic, financial, jurisdictional, social, etc.)?

Q3: What are other dimensions associated with this issue?

Q4: What is the timescale of the need?

Schedule: November 10

Send to Nicole (ndecrappeo@usgs.gov)
The Quest for ESAC’s Identity

Who are we?

Who do we want to be?
Who are we?

• # ESAC members in room and on phone?

• # people representing executive?

• # managers?

• # staff?

• # scientists?
Terms of Reference: Purpose/Roles

• **Purpose:** Assist CSC Director in the identification of regional natural and cultural resource management priorities and science needs.

• **Roles/Responsibilities**
  • Provide counsel to CSC Director for the development and periodic updating of the regional science agenda
  • Provide counsel to CSC Director on the development of planning/implementation documents including short-term science plans and strategic solicitation documents for funding.
  • Provide and facilitate feedback concerning how effectively CSC products meet the needs of stakeholders.
• Only government entities are formal members.

• Others can participate/observe, including host consortium.

• Executive level participation highly valued.
  • If consistent participation is not realistic, delegation to an appropriate alternate is acceptable. Technical staff members are welcome as participants.
Questions to Help Us Find Ourselves

Purpose

• Is the purpose of ESAC clear?
• Are we currently meeting the purpose?
• Does it reflect what we think ESAC should be doing?
• If no, how would we revise the purpose?
Questions to Help Us Find Ourselves

Roles/Responsibilities

• Are the roles/responsibilities clear?
• Are we currently meeting the roles/responsibilities?
• Do they reflect what we think ESAC should be doing?
• If no, how would we revise the roles/responsibilities?
Questions to Help Us Find Ourselves

Members

• Do we continue to strive for executive level participation?

• Are there other organizations that should be invited?
Who do we want to be?

- Do we want to be more engaged in CSC operations? If yes, then....
  - What should we be more engaged in?
  - How do we do that?

- Should non-governmental groups be more engaged in ESAC? If yes, then....
  - What should they be more engaged in?
  - How do we do that?
Landscape Conservation Cooperatives
What are we, collectively, doing for
the tribes
university research and education
federal natural resource managers
state natural resource managers
private land managers
forestry
range
agriculture
recreationists
Who Loves Us?

What difference do we, collectively, make in how landscapes are managed to adapt to or mitigate climate change?

What goes into stakeholder decisions?

What goes into policy changes?

Political Costs and Benefits
Dollar Costs and Benefits
<table>
<thead>
<tr>
<th>Organization</th>
<th>Agency</th>
<th>Key Stakeholders</th>
<th>Scale</th>
<th>Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Science Centers</td>
<td>DOI</td>
<td>land managers, tribes</td>
<td>Local, regional</td>
<td>University, tribal and agency researchers</td>
</tr>
<tr>
<td>LCCs</td>
<td>DOI</td>
<td>land managers, tribes</td>
<td>Local</td>
<td>universities, ngos, agencies, tribes</td>
</tr>
<tr>
<td>Climate Hubs</td>
<td>USDA</td>
<td>Extension natural resource managers, tribes</td>
<td>Local, regional, national</td>
<td>universities, agencies</td>
</tr>
<tr>
<td>NOAA</td>
<td>Commerce</td>
<td>Public, private</td>
<td>National</td>
<td>universities</td>
</tr>
<tr>
<td>EPA</td>
<td></td>
<td>Regulators, agencies</td>
<td>Regional, national</td>
<td>universities, agencies, policy makers</td>
</tr>
<tr>
<td>National Climate Assessment</td>
<td>USGCRP</td>
<td>everyone</td>
<td>National, regional</td>
<td>agencies, universities</td>
</tr>
</tbody>
</table>
REFUGIA RESEARCH COALITION

Synthetic, Actionable Science to Meet Regional Management Needs
What Are Refugia?

Areas relatively buffered from contemporary climate change[fire/drought] over time that enable persistence of valued physical, ecological, and socio-cultural resources.
Topographically complex terrain creates varied microclimates and increases the likelihood that current climates will continue to exist nearby.

Deep snow drifts provide insulation to the surface below and provide water later in the season.

Valleys that harbor cold air pools and inversions can decouple local climatic conditions from regional circulation patterns.

Canopy cover can buffer local temperature maximums and minimums throughout the year.

Poleward-facing slopes and aspects result in shaded areas that buffer solar heating, particularly during the low solar angles of winter and early spring.

Cold groundwater inputs produce local cold-water refuges in which stream temperature is decoupled from air temperature.

Areas near or in large deep lakes or oceans will warm more slowly due to the high heat capacity of water.
The Goals

- **Identify regional management priorities** related to refugia.

- **Synthesize the science** related to refugia (disturbance, climate, resilient landscapes), relevant to regional management priorities.

- **Develop products** that are specific to management priorities and actionable by managers in the NW region.
Managing Climate Change
Refugia for Climate Adaptation
Toni Lyn Morelli, Christopher Daly, Solomon Z. Dobrowski, Deanna M. Dulen, Joseph L. Ebersole, Stephen T. Jackson, Jessica D. Lundquist, Constance I. Millar, Sean P. Maher, William B. Monahan, Koren R. Nydick, Kelly T. Redmond, Sarah C. Sawyer, Sarah Stock, Steven R. Beissinger

The Working Group

- **CSC-funded PIs** working on projects related to climate, fire, and drought refugia

- **Other refugia experts** from state and federal agencies, universities, and NGOs

- **Managers** (state, fed, private, tribes) interested in incorporation refugia science into adaptive management
The Approach

- **In-person meetings** between managers and scientists (*First meeting Nov. 21st, 2016*).

- **Remotely-attended meetings** to maintain connections and continue conversations between in-person meetings.

- **Showcase** to roll out actionable science and synthesis products to broader research and management communities.
Stay tuned...
How to improve the NW CSC profile among tribes and states

• NW CSC visibility and perceived service to tribes and states

• Ideas to improve how the NW CSC may best assist tribes and states
Framing the Issue
Before we dive in, let’s clarify - what’s the problem?

• What does success look like? What we are aiming for?
  – Maximize NW CSC services
  – Leverage products across organizations
  – Respond effectively to needs

• What is our current situation, relative to our goal? How are we doing?
  – Very haphazard (in terms of how information travels)
  – An ESAC member from one agency or tribe can’t by themselves represent the needs of all state agencies, or regional tribes. Consequently, NW CSC may be missing opportunities.
  – It feels to staff as is awareness about NW CSC is very mixed, and could be much improved to both tribes and state entities.
Framing the Issue
Different “levels” of engagement = different ways to address

Level one: **AWARENESS**
  Tribes and states are aware of NW CSC
  – States and Tribes are aware of the products and services provided by NW CSC and understand how to apply them to their work.

Level two: **DEEPER ENGAGEMENT**
  Tribes and states are engaged.
  – They provide input into science priorities
  – They have opportunities for dialogue with the NW CSC regarding challenges, issues, barriers, and needs related to climate change science.
  – They are engaged in co-production – either as a research partner on a proposal, or invited to contribute in some way during a project.
  – They participate in actively applying science products to their work.
Options to improve awareness and engagement

Level one: AWARENESS

– Regular updates by NW CSC at Washington Interagency Climate Adaptation Network, and Regional Adaptation Practitioners
– Other

Level two: ENGAGEMENT

– Encourage researchers to include agencies on proposals and engage in genuine “co-production”.
– Find ways to surface issues and barriers using climate science amongst states and convene dialogues to address
– Others
Egg-to-Migrant Survival (%) vs. Highest Mean Daily Flow (cfs) on the NF Stillaguamish During Incubation (Oct 1 - Jan 31)
Level One: Awareness

Success = Tribes are aware of the products and services provided by NW CSC and understand how to apply them to their work.

Ideas:
- PNW Tribal Climate Change Network
- NWIFC Tribal Climate Change Forum
- Build relationships
- Access to results
  - Direct contact with PI
  - Webinars
  - Project completion alerts?
Level Two: Engagement

Success = Input into science priorities, opportunities for dialogue, co-production, actively applying science products

Ideas:

– Research partners
– Project review
– “Tribes can’t represent each other on policy issues, but can provide background information and alert each other on important issues”
– Open SAP to tribal scientists?