

CLACKAMAS WATERSHED RESILIENCE STAKEHOLDER WORKSHOP FINAL REPORT

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Overview

This report describes the results of a climate adaptation workshop hosted by Portland State University (PSU), the Clackamas River Water Providers, and Clackamas County Water Environment Services. The goals of the Workshop were to (1) communicate the latest climate impact science for the Clackamas River Watershed (CRW), and (2) identify actions that build on the existing assets within the watershed to address climate change. The workshop was attended by a total of nearly 50 stakeholder and PSU participants. Stakeholders representing federal, state, and local agency natural resource management staff, as well as elected officials and other engaged stakeholders in water and natural resources in the CRW. Following a poster session with PSU faculty and graduate students, participants convened in small groups to discuss the results.

Key Findings

1. Participants noted the importance of translating scientific data to interpretable narratives for stakeholders and broader audiences to help communicate the potential impacts from climate change and relevant adaptation options.
2. Existing activities and future opportunities focused around the themes of infrastructure considerations, environmental conservation efforts, planning and management initiatives, community and professional engagement, and investment in science and research.
3. Discussion about priorities for the future focused on (1) maintaining ecosystem health for the CRW (including the river, tributaries and forested areas), (2) focusing on education and outreach efforts, (3) increasing organizational collaboration and program efficiency, and (4) establishing management and research priorities.
4. Adaptation strategies will likely fall into one of four categories:
 - Alternative, bigger, or new green and grey infrastructure for drinking, storm, and wastewater management,
 - Alternative sources of drinking water,
 - Alternative land management strategies that impact watershed health and function, and
 - Water conservation strategies implemented by water consumers.
5. Next steps should focus on continued convening around climate adaptation planning, including incorporating climate impact research into current and near future projects and

initiatives in the watershed, such as the **Clackamas County Climate Action Plan** and the **Clackamas County Watershed Health Plan**, local cities' climate action plans, and **US Forest Service climate vulnerability assessments**.

Introduction

Over 300,000 people in Clackamas and Washington Counties depend on the Clackamas River Watershed (CRW) for high quality drinking water and other watershed services including stormwater management, recreation, and more. Drought, changes in snowpack, increasing wildfires, and other ecological changes impact water resources in the CRW and the natural and human systems that depend on them. This report describes the second phase of a multi-phase applied research project developed in partnership with CRW community partners to inform stakeholder understanding of CRW resilience to climate variability and change. The first phase established a baseline of historically observed data on water quantity, quality, and management ¹. This second phase of research focuses on developing and evaluating climate change impact models for the CRW, and then simulating and assessing future conditions in the CRW hydro-climate system. Phase 2 research includes examining the impacts of climate change on temperature, snow-rain partitioning, wildfire, and water quantity and quality.

To communicate the results of both phases of the Clackamas Watershed Resilience research project Portland State University, the Clackamas River Water Providers, and Clackamas County Water Environment Services hosted a Clackamas Watershed Resilience and Climate Adaptation Workshop. The workshop focused on communicating the latest climate impact science, and identifying actions to address the vulnerabilities and risks posed by climate change in the CRW. Our focus for the climate impact science addresses predicted changes in temperature and precipitation, water quality and quantity, snowpack, and wildfire under different climate change scenarios. In addition, we examine stakeholder perspectives on vulnerabilities and risks to the watershed.

Workshop Format

The workshop was held May 13th from 1-4pm. Following a welcome and introduction to the workshop agenda, the participants formed four groups for a “round-robin” poster session. Four teams of PSU researchers prepared a poster presentation designed to communicate with an educated, but not necessarily scientific audience. The posters described climate impacts to temperature and snowpack, wildfire, and water quantity and supply, as well as stakeholder concerns about climate change. The poster presentations focused on communicating key findings (both observed and predicted) to draw participants towards discussion of implications.

¹ The Clackamas Watershed Resilience Phase 1 Report is available online at [URL]: http://www.clackamasproviders.org/wp-content/uploads/2019/01/CWR_Phase_1_Report.pdf.

The four participant groups convened at tables, each with a facilitator and note taker, to discuss the relevance of the findings for their organization and to determine how the findings could relate to future actions and goals. The facilitated discussions addressed each of the following questions:

1. How is the research you heard about today important to you and/or your organization?
2. What actions are already occurring to address these challenges, and what opportunities do you think would be important to pursue in the future?
3. What are your priorities for addressing future climate risks?

Following the discussions at individual tables, each small group reported back to the whole group the significant themes that arose in their discussions.

Results

We convened 39 stakeholders participants representing federal, state, and local agency natural resource management staff, as well as elected officials and other engaged stakeholders in water and natural resources in the CRB². The workshop was also attended by 10 faculty and graduate students from Portland State University. Results from the workshop are divided into two sections. The first section is a series abstracts conveying the objectives and results from each poster. The second section is a synthesis of the topics covered during the discussion groups and report out.

The original posters are on display at Clackamas County Water and Environment Services and electronic versions of each poster are available [online](#)³ along with other research findings relevant to the CRW.

Poster Session Abstracts

PROJECTED CHANGES IN TEMPERATURE, RAIN, AND SNOW

Arielle Catalano and Paul Loikith, Portland State University, Department of Geography

² Participants included representatives from Clackamas County Planning and Zoning Division, Clackamas County Sustainability Office, GeoSyntec Consultants, Oregon Department of Environmental Quality, Oak Lodge Water Services District, Clackamas River Basin Council, the United States Forest Service Mount Hood National Forest, 350 Clackamas, Clackamas County Environmental Health, City of Milwaukie, Clackamas Water Environmental Services, Trout Unlimited, University of California Natural Reserve System, Clackamas Community College Environmental Learning Center, Sunrise Water Authority, Clackamas River Water Providers, Clackamas Soil and Water Conservation District, Oregon Small Woodlot Owners, Clackamas Stewardship Partners, Bark, North Clackamas Urban Watershed Council, Wolf Water Resources, Oregon Department of Fish and Wildlife, Clackamas County Forestry, Greater Oregon City Watershed Council, Clackamas River Water.

³ <https://sites.google.com/a/pdx.edu/maxnp/research/Clackamas-watershed>

In the Clackamas River Watershed, warming temperatures may impact freshwater resources by increasing snowmelt and reducing the amount of snowfall, but no recent trends have been observed. Our goals were to determine (1) how temperature and precipitation are likely to change in the future, and (2) how the number of snow days versus rain days will change in the future over the Clackamas River Watershed. For the first objective, we used a set of downscaled climate models under “historical”, “moderate”, and “business-as-usual” emissions pathways to analyze changes in watershed-average temperature and total precipitation (i.e. rain, snow) over this century. For the second objective, we used a different ensemble of climate models at a coarser resolution to analyze changes in the rain-to-snow ratio under the “business-as-usual” scenario. Although there is a range of uncertainty associated with projections, models indicate an increase in average seasonal temperatures under both “moderate” and “business-as-usual” scenarios. This leads to a decrease in the number of days with temperatures below 32°F, and an increase in above-90°F days. Under both scenarios, we find no significant trends in watershed-average precipitation by the end of the century. However, there is an overall decline in the number of snow days out of all wet days during an average cold-season (November–April). Average declines in this “snowfall frequency” across certain time periods are also presented. Results indicate that although climate change is unlikely to result in a change in annual precipitation, changes in average temperature and days below 32°F are likely to result in a reduced fraction of snowfall at higher elevations in the watershed. In addition, an increase in the frequency of days above 90°F may lead to earlier snowmelt, which could further impact water availability.

CLIMATE AND LAND USE CHANGE IMPACTS ON WATER QUALITY AND QUANTITY

Junjie Chen and Heejun Chang, Portland State University, Department of Geography

Extensive land use changes, rapid population gain, and climate variability and change raise concerns regarding their impacts on water quantity and quality in the Clackamas River Basin (CRB). This study aims to quantify potential impacts of integrated climate and land cover changes on water resources at multiple spatiotemporal scales using the Soil and Water Assessment Tool (SWAT). Historical streamflow and turbidity relationship and data were used to calibrate and verify SWAT outputs that were simulated using downscaled climate data. After model calibration, high-resolution future climate projections data downscaled using Multivariate Adaptive Constructed Analogs (MACA) from 19 CMIP5 GCMs and under RCP8.5 were used to simulate near (mid-21st century) and distant future (late-21st century) streamflow and sediment load with various land cover change scenarios. We analyzed model outputs using statistical analysis to test for sensitivity of flow and sediment to climate, land cover, urbanization, and fire suppression. Streamflow is projected to increase in winter and is projected to decrease in summer in both near and distant future scenarios, with higher variability toward the end of the 21st century. High and low urbanization land cover change will yield moderately higher streamflow in winter and lower in summer while increasing annual suspended sediment load substantially. The combination of high climate change and high urbanization scenario will have the most devastating impacts on water-related ecosystem services. This research will inform

stakeholders to increase watershed resilience in the CRB by planning adaptation strategies to climate change, future land use, population increase, and water resource management.

CURRENT AND FUTURE WILDFIRE RISK ASSESSMENT

Andrew McEvoy & Max Nielsen-Pincus, Portland State University, Department of Environmental Science and Management

Andres Holz, Portland State University, Department of Geography

Large fires occur infrequently in Pacific Northwest forests because of limitations imposed by climate, not by fuel availability. In west-side Cascade forests, large wildfire occurrence has been historically coincident with uncommon windows of especially dry climate conditions immediately preceding and during the fire event. Climate change is predicted to increase the number of days each summer during which fuels are sufficiently dry and on which large fires are possible.

Understanding future fire activity can inform strategic efforts to plan for wildfire risk and associated impacts to watershed services. The purpose of this wildfire risk assessment is to help water resource managers better understand (1) current wildfire risk in the Clackamas River watershed, (2) the magnitude of plausible changes in wildfire frequency, size, and season during the 21st Century, and (3) the effects of large wildfire activity on essential watershed processes and infrastructure. We used the large wildfire simulator FSim to evaluate wildfire risk from large fires (>100 acres) over three time periods: recent historic, 2010-2039, and 2040-2069. Three Global Climate Models (GCMs) were selected to predict future fire season climates under an RCP 8.5 scenario. Results indicate that fire seasonality is unlikely to change significantly, but within peak fire season, fire danger on any given day is predicted to be more severe. Currently there is less than 1% chance of a fire growing larger than 50,000 acres; projections indicate that by mid-century that probability is nearly 5%, a 7x increase. Our wildfire risk assessment for the Clackamas watershed will continue to evaluate the impacts of future wildfires on water quantity needed for municipal consumption and fish habitat.

STAKEHOLDER ENGAGEMENT AROUND WATER QUALITY AND QUANTITY

Erin Upton and Max Nielsen-Pincus, Portland State University, Department of Environmental Science and Management

Stakeholders in Clackamas water resource management include municipal water users, developers, agriculture, conservationists, and natural resource managers. Resilience planning can help identify strategies to address uncertainties perceived by different stakeholders due to climate change and other factors. Recent research has identified rural landowner support for stewardship programs and urban water consumer support for source water protection. Our primary goal was to understand convergence and divergence in perceptions held by different stakeholders in Clackamas basin water resource management about (1) the risks and vulnerabilities to water resources in the Clackamas basin, (2) the opportunities and barriers to adapt to risks and vulnerabilities, and (3) stakeholder engagement & political will to advance adaptation efforts. Our secondary goal was to use our learning to foster dialogue about

watershed resilience. The team interviewed fifteen governmental and non-governmental stakeholders in the Clackamas water resource management to understand the major areas of concern around water availability & quality. Participants responded to questions about threats to water resources, current stakeholder engagement, and opportunities or barriers to adaptation. Cross-cutting themes from the interviews included a desire for more partnership engagement around climate adaptation and water resource resilience planning for the Clackamas; a convergence of concerns around the relationships between development, urbanization, and climate change challenges; a need for increased education for elected officials about land use impacts on water resources; as well as a need for translated and relevant science to better inform management and policy decision-making. Major areas of concern for stakeholders include development and planning in the urbanizing areas of the Clackamas Watershed, pesticide and chemical use, wildfire risks, septic system failures, and balancing water supply and consumption. Our next steps are to continue to foster dialogue among stakeholders around locally relevant scientific information on climate change to increase the capacity to develop resilience and adaptation strategies in the Clackamas.

Discussion Synthesis

Poster Session Discussion

Workshop participants were divided into four groups, with each group spending about 15 minutes at each of the four workshop posters in a round robin format. After brief poster presentations, participants asked questions and engaged with project scientists before rotating to the next poster. The poster session resulted in a number of common questions and discussion points about projections for extreme weather events, the timing and amount of snow or rain in future scenarios, the role of human activity and fire ignition, water quantity and quality, and stakeholder engagement in the Clackamas watershed.

Common themes discussed during the poster session included the following:

- The timing of the snow/rain partition and whether the changes in the proportion of snow and rain will affect surface water availability, especially in the summer.
- The effect of earlier snowmelt on flooding, and the likelihood of changes in extreme rainfall or snowfall events.
- The effect of short, but intense storms on surface flows.
- A desire to see wildfire modeling results that incorporate future land use changes, vegetation succession, and wildfire dynamics (e.g., re-burns) over time.
- The role of human activity in future fires and whether population growth will impact ignition patterns.
- The need to translate research findings into outreach and education materials for Clackamas stakeholder communities, including the recreation community.
- The political will necessary to adapt to climate change.
- Water ratepayer willingness to pay and rural landowner willingness to participate in source water protection efforts.

In summary, the poster session provided an opportunity for resource managers and stakeholders to engage with project scientists about specific climate impact and adaptation topics, while also helping establish a baseline of knowledge, priming discussion questions, and fostering cognitive processes needed to discuss climate impacts and adaptation options in subsequent breakout group discussions.

Synthesis of Breakout Group Discussions

Following the poster session and a brief break, participants created four groups at separate tables. A facilitator guided each group through a structured discussion and a note taker kept flip chart notes of the conversation. Following the breakout group discussions, each group presented the key themes of their discussion in a full group report out.

The structured discussion was comprised of three questions:

1. How is the research presented in the posters important to you and your organization?
2. What actions are you or your organization already taking and what opportunities do you think will be important to pursue in the future to address these challenges?
3. What are your priorities for addressing future climate risks?

Importance of the research

Respondents highlighted the importance of research that provides localized, place-based data specific to the CRW. Some participants reported that the research results reiterated broader-scale results they had heard before (e.g., for the region or from the National Climate Assessment). Some participants noted how the research was useful for increasing their understanding of water quality, quantity, and timing, as well as impacts to forest health and fish habitat. The timing of flows and water quality may change in the future impacting protected fish species, investments in fish habitat restoration, and water supply. Others discussed how effective climate change planning isn't possible without localized data related to water, habitat, wildfire, and other climate impacts. Climate impact assessments are needed to estimate the changes to existing municipal infrastructure, programs, policies, and financial mechanisms required to adapt to future climate. Many participants also noted the benefit the research could have if translated into education and outreach efforts for local communities and stakeholder groups outside of those present at the workshop. A platform is needed to translate the research findings for different stakeholders in the watershed. Finally, some participants, to paraphrase, indicated that *we're past the time for data and need action*.

Existing actions and future opportunities to address climate-related challenges

After discussing how the research was important or relevant, participants considered what actions are already being undertaken by local agencies and organizations and future opportunities to address climate-related watershed challenges. Five main discussion topic areas emerged, including (in no specific order):

1. Infrastructure considerations

Infrastructure was a common discussion topic and participants talked about existing work and future opportunities. For example, participants discussed how ecological restoration projects are improving green infrastructure in the watershed to help mitigate stormwater runoff (e.g., the [Carli Creek project](#) implemented by Water Environment Services) and the impacts of extreme events. Some participants mentioned depaving and other alternative infiltration strategies. Restoration of floodplain habitats was discussed as an alternative water storage system and a means to reduce sediment loading downstream. Several participants noted the need to use climate projections to determine whether investments in ecological restoration projects are robust enough to withstand the impacts of climate change and to inform future project designs. Other conversations focused on improving aging water infrastructure and assessing whether existing infrastructure would be sufficient to offset likely increases in water consumption due to extended heat during unprecedented low flows that may result from climate change. Future opportunities to address this challenge focused on identifying potential alternative sources of water supply and maximizing collaboration with neighboring public water systems (e.g., interties) that improve the reliability and management of increasingly limited public water supplies.

2. Environmental conservation efforts

Environmental conservation efforts were a common topic of discussion across all of the breakout groups. While not everyone saw eye to eye on all the environmental conservation topics discussed, most were generally supported. Common areas of agreement focused on removing invasive plant species, increasing urban tree canopies, enhancing floodplain and wetland areas, and planting riparian trees. Removal of invasive species from the watershed was seen as a strategy to encourage biodiversity and habitats that improve resilience of native species to climate change. Increasing urban tree canopy was discussed as a means of reducing heat island impacts in urban areas while also potentially reducing energy consumption. Enhancing floodplain and wetland areas was discussed as a buffer to improve water quality and a potential mechanism to augment late summer water supplies, as well as a means to improve fish and wildlife habitat. Planting riparian trees increases stream shading over time and improves water quality that otherwise may harm endangered fish species. Several private sector, government, and non-governmental organizations in cooperation with private and public landowners are collaborating to make these types of environmental conservation outcomes possible (e.g., [WeedWise](#), [Shade Our Streams](#), [Clackamas Partnership](#), [Milwaukie Urban Forest Management Plan](#)). Other environmental conservation topics were discussed, but with less consensus, including the transfer of (unused) agricultural water rights to instream flows, and the prohibition or reduction of logging in riparian, floodplain, or source water areas.

3. Planning and management initiatives

Participants discussed the planning and management needs for adapting to climate change both in general terms as well as referencing specific initiatives. In general, many participants identified current political interests in climate-related issues in Clackamas County, suggesting that there is growing local social agreement on the need to act. Many also discussed the need to coordinate across scales to link climate action efforts and find synergies across the efforts of the US Forest Service, Clackamas County, local cities, and other governmental and non-governmental organizational efforts. One comment noted the need to create a trackable database of actions undertaken across organizations. Another, a participant from a rural part of the watershed, noted the need for resources; to paraphrase, *it's going to cost a lot of money to address these challenges, and we're going to need the federal government to step up and appropriate money*. Many agreed that adaptation planning is important for the future, and that incorporating a diverse set of perspectives into those initiatives is important to their success. A variety of on-going plans and initiatives were discussed throughout the breakout group discussions, including:

- The [Clackamas County Climate Action Plan](#)
- The [Milwaukie Climate Action Plan](#)
- Oregon Department of Fish and Wildlife state level [strategic planning for fisheries and hatchery management under climate change](#) (i.e., low flow, high temperature scenarios)
- Clackamas County Water and Environment Services design standards for climate change
- [Clackamas County Watershed Health Plan](#)
- [National Forest Vulnerability and Adaptation Assessments](#)

4. Community and professional engagement

Workshop participants highlighted the need for increased public engagement around themes of public health, pollution awareness, water consumption, water quality and quantity, and watershed function. Examples of existing community and professional engagement included work by Clackamas Community College, collaborative groups, non-governmental organizations, and Clackamas County. For example, the professional development programs of the [Environmental Learning Center](#) at Clackamas Community College offers short courses on stormwater management as well as wetland and river restoration. The [Clackamas Stewardship Partners](#) (CSP) is a diverse stakeholder group focused on identifying zones of agreement around watershed management that restores ecological function while benefiting local economies. CSP is open to the public, facilitates watershed tours, and provides a collaborative forum for the exchange of information and ideas across a diverse set of interests. Non-governmental organizations, like the [Clackamas River Basin Council](#), offer opportunities for partnerships and provide educational outreach throughout the watershed. Clackamas County is conducting community and professional engagement in a variety of forums, including through its recently authorized [climate action plan](#) initiative as well as with the business community through a series of lunchtime presentations and workshop delivered to targeted business audiences.

Participants discussed the importance of considering the potential role of landowners in the watershed as a positive force for stewardship, while also looking for opportunities that improve a sense of connection and understanding of the river for water consumers. On the water consumption side, participants discussed alternative drinking water pricing strategies that focus on incentivizing water conservation, messaging strategies targeted for drinking water customers during times of need for water conservation (e.g., postcard outreach about long-term behavioral change and current water supply conditions), and developing a public outreach toolkit focused on initiating water conservation actions. Future opportunities for engagement also focused on:

- The importance of involving youth.
- Helping the business community invest in climate adaptation outcomes.
- Creating climate change exchange groups that offer opportunities for community members and professionals to engage with each other.
- Working with local meteorologists to develop public service announcements.
- Developing an annual symposium on Climate impacts and adaptation in the Clackamas River watershed.

5. Investment in science and research

Finally, science and research needs were a common topic of discussion. Many research interests discussed were specific to the participants' specific knowledge or practice area; however a number of common themes arose across all the breakout groups, including the importance of investing in science and research projects that translate broad ideas about climate impacts and adaptation into specific local applications. Some participants discussed the importance of partnerships between researchers and local organizations in order to advance understanding of climate impacts and adaptation options in the CRW, while simultaneously building local organizational capacity to address and implement solutions. Others discussed existing work by the US Forest Service on [climate change vulnerability and adaptation in the Columbia River Gorge, and Mt Hood and Willamette National Forests](#). Many participants also pointed to the research presented in the workshop as an example of existing applied research that could be modeled for future empirical studies focused on water availability, infrastructure resilience, geohydrology, land use change, and vegetation change.

Priorities for the future

Participants were asked to consider priorities for addressing future climate risks. Responses covered many areas of interest and ranged from broad approaches to specific actions. The responses fit into several major categories, including: (1) Maintain ecosystem health for the Clackamas watershed (including the river, tributaries and forested areas), (2) Focus on education and outreach efforts, (3) Increase organizational collaboration and program efficiency, and (4) Establish management and research priorities.

Maintaining ecosystem health focused on conserving the water quality and quantity and watershed health for wild native fish species, with the idea that sustaining native fish species is good for natural, economic, and social systems. To do so requires consideration of agricultural

practices, erosion, wildfire risk, as well as federal environmental policy like the Endangered Species Act. The *education and outreach priority* focused on making the story of climate change impacts in the CRW interpretable to different communities, including the general public, the business community, as well as decision-makers. Improving education and outreach around climate impacts includes consideration of cultural differences among different communities as well as clarifying the connections people have to the watershed. Increasing organizational collaboration and program efficiency involves identifying opportunities for synergies across organizational boundaries and boundaries of land ownership, jurisdictions, and interests to address and adapt to climate impacts, as well as identifying opportunities to increase efficiency of program delivery across organizations working on climate adaptation by reducing unnecessary duplication of efforts. Finally, *establishing management and research priorities* involves evaluating existing practices in the face of potential future impacts from climate change like those presented in the workshop. Doing so may require identifying specific mechanisms like updating code to require the inclusion of more green infrastructure in new developments, or revising the Mt. Hood National Forest Plan with a focus on climate resilience. Other priorities may be found by examining actions occurring elsewhere, like the [Pure Water Partners Program](#) in the McKenzie River watershed, to determine if similar actions may be appropriate for the CRW.

Ultimately, adapting to the impacts of climate change in the Clackamas River watershed will require the implementation of adaptation strategies by different organizations in the public and private sectors as well as across levels of government and other social organizations (e.g., local governments to federal agencies, as well as individuals, families, businesses, and non-profit organizations). Those adaptation strategies will likely fall into one of four categories:

- Alternative, bigger, or new green and grey infrastructure for drinking, storm, and waste water management,
- Alternative sources of drinking water,
- Alternative land management strategies that impact watershed health and function, and
- Water conservation strategies implemented by water consumers.

Education, outreach, and collaboration will be important in all cases.

Conclusions

The Clackamas Watershed Resilience Workshop presented nearly 40 natural resource and land management professionals with the latest climate impact science for the Clackamas River watershed. The workshop served to encourage discussion and brainstorming among participants towards the importance of localized climate science, existing activities and future opportunities to address climate change and priorities for the future. The end of the workshop focused on considering next steps. Questions included:

- How do we find synergy between different initiatives and the goals of different organizations? How can we build a shared understanding? How do we start moving in the same direction?

- How do we convert science to information, using common language, that everyday people can act on and interpret? How do we then spread and communicate the resulting messages?
- How can we leverage trusting relationships between stakeholders to increase success with outreach with different groups of people.
- How can we bridge the urban/rural divide in the watershed? How can payments for ecosystem services initiatives help?

Answers to these questions will likely be found through on-going practice and successes and failures that will occur in the future. Towards that end, there was a desire to continue convening around climate adaptation and incorporate results from this research project into current and near future projects and initiatives in the CRW, including the **Clackamas County Climate Action Plan** and the **Clackamas County Watershed Health Plan**, local cities climate action plans, **US Forest Service climate vulnerability assessments**. In addition, at least one breakout group suggested Clackamas Community College could be a convener for followup conversations, and serve as a driver for continuing momentum in bringing different interests and expertises together. A need was also expressed to create a written history of actions undertaken to build climate change resiliency in the watershed to serve as a record for ongoing learning on the process of climate adaptation.