WildLinks 2014: Summary Report

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Introduction
The 8th annual WildLinks conference was held November 10-12, 2014 at the North Cascades Institute in Washington. Hosted by the Cascadia Partner Forum, the conference objectives were to:

- Share information on upcoming or underway adaptation related efforts in the transboundary region to increase coordination and involvement, while providing time and space to further these efforts;
- Gain local expertise and contribution to North Pacific and Great Northern Landscape Conservation Cooperatives regional planning efforts, including furthering input from Cascadia on three Great Northern LCC conservation targets prioritized by the Cascadia Partner Forum: Grizzly Bear, Salmon, and Ecological Connectivity (aquatic and terrestrial);
- Build on last year’s access management workshop by providing updates from the ground throughout Cascadia, while furthering road analyses in four spatial priority areas in or connecting to Cascadia to inform timely management discussions;
- Allowing time and space for side meeting on important topics within Cascadia and connected ecosystems;
- Continue building a network of practitioners working on building resiliency into the species and ecosystems of Cascadia and connected ecosystems.

A complete meeting agenda and attendee list is available in Appendix A.

Cascadia Partner Forum
Launched at the 2012 WildLinks meeting, the Cascadia Partner Forum seeks to foster a network of natural resource practitioners working with the Great Northern and North Pacific Landscape Conservation Cooperatives to build the adaptive capacity of the landscape and species living within it from Mount Rainier in Washington to Mount Truax in British Columbia. In its second year, the Cascadia Partner Forum has continued with the objectives established at its founding to:

- Identify and prioritize science and management needs and increase adaptive capacity in Cascadia landscape
- Highlight successes and challenges in implementation of adaptation actions
- Facilitate communication to share ideas and expand implementation of adaptive actions including identification of new approaches
- Draw attention to this unique landscape

In 2015 the forum will focus on transboundary coordination and planning for three conservation targets: grizzly bears, Pacific salmon, and ecological connectivity while continuing to build on the existing priority issues identified previously by the forum including access management. The forum will invest in access management planning in four landscapes within Cascadia: (1) Teanaway Community Forest, (2) Okanogan-Kettle sub region, (3) North Cascades Grizzly Bear Population Unit, and
Mount Baker Snoqualmie National Forest. More information is available at www.cascadiapartnerfourm.org

**Landscape Conservation Cooperative Updates**
With the signing of Secretarial Order No. 3289 in 2010, the United States Department of the Interior launched the Landscape Conservation Cooperatives (LCCs) to better integrate science and management to address climate change and other landscape scale issues. With the goal of building a network that is holistic, collaborative, adaptive, and grounded in science, LCCs aim to ensure the sustainability of our economy, land, water, wildlife, and cultural resources. There are 22 LCCs in the United States and neighboring countries. Each LCC brings together federal, state, and local governments along with Tribes and First Nations, non-governmental organizations, universities, and interested public and private organizations to collaboratively to identify best practices, connect efforts, identify science gaps, and avoid duplication through conservation planning and design. There are two LCCs that overlap the Cascadia landscape that divide largely at the Cascades crest: the Great Northern and North Pacific Landscape Conservation Cooperatives.

**Great Northern Landscape Conservation Cooperative**

The Great Northern LCC (GNLCC) territory expands across the 300 million acres, stretching from northern BC down into Wyoming, and overlaps four different geographic areas: Cascadia, Sage Steppe, the Rocky Mountains, and the Columbian River Basin. Great Northern LCC builds relationships between local, regional, and national organizations on both the Canadian and United States sides of the boarder, across the entire region to support the actualization restoration goals by giving them a broader context and showing how they fit into a the big picture of large landscape restoration.

Its mission is to coordinate, facilitate, promote, and add value to large landscape conservation to build resource resilience in the face of climate change and other landscape-level stressors through supporting science development, effecting coordination, informing conservation action, monitoring and evaluating, communicating and educating.
During the conference, Sean Finn of the GNLCC provided an overview for attendees of the structure and mission of their LCC as well as updates on their current focus including development of a Science Plan. The Science Plan builds off of the GNLCC’s Strategic Framework, which established the conservation goals of the LCC and 29 conservation targets. The Science Plan is a living document for the GNLCC that details a collaboratively developed set of information for each conservation target that includes a status of that specific conservation target in the landscape, how it relates to the GNLCC conservation goals, a logical process for identifying science information needs and development, expertise on the target in the region, threats, opportunities, and actions necessary for collaborative conservation delivery. A draft plan is available on the GNLCC website that partner forums and the GNLCC Science Team will continue to develop including contributions from the Cascadia Partner Forum on conservation targets present in our landscape.

North Pacific Landscape Conservation Cooperative

The North Pacific LCC (NPLCC) brings together Canadian and US Federal agencies, Tribes and First Nations, and NGOs working to protect the 204,000 square miles along the coast making up the Northern Pacific territory. Through a collaborative effort, the cooperative co-develops and translates new science to support its successful application by the Northern Pacific LCC partners.

The NPLCC promotes development, coordination, and dissemination of science to inform landscape level conservation and sustainable resource management in the face of a changing climate and related stressors.

Mary Mahaffey and Tom Miewald of the NPLCC presented a summary of their LCC work to date, while noting two areas where collaboration with the partner forum is ongoing and can build in the coming year: (1) Providing input into the revisions and implementation of the NPLCC’s Strategy for Science and Traditional Ecological Knowledge, and (2) Utilization and continued development of the Cascadia Partner Forum workgroup within the NPLCC’s Conservation Atlas on Databasin that allows easy public sharing of data layers relevant to the work of the partner forum.
**Conservation Target Briefings**

The [Great Northern LCC Strategic Conservation Framework](#) identifies a suite of conservation targets, many of which are present and/or important within Cascadia. By understanding and tracking the conservation challenges associated with these ecosystems, species, and processes today and in light of a changing climate they believe they can meet their stated conservation goals.

In early 2014, the Cascadia Partner Forum chose to conduct conservation design planning on three of these conservation targets in Cascadia that meet the following criteria: relevant across the full spatial scale of Cascadia, strong transboundary expertise and collaboration with practitioners in Cascadia, timely priority for management decisions, and scientifically linked to the effects of our identified priority landscape stressor - roads. The three conservation targets of focus became grizzly bear, salmon, and ecological connectivity (terrestrial and aquatic). This meeting’s agenda included sessions focused on each of these targets to bring together experts from throughout Cascadia on both sides of the border to share information about the status, ongoing conservation and management efforts, threats, and opportunities.

**Conservation Target: Grizzly Bear**

Grizzly bears once had the widest distribution of any bears in the world, including throughout Cascadia. But due to large-scale habitat loss and related human conflict and decades of persecution, grizzly numbers and range have been reduced by 98% in the continental US. This iconic species is culturally and ecologically significant, particularly to indigenous communities in the Cascades and throughout western US and Canada.

Grizzly bears feed on a wide variety of plants and animals, and rely on large intact interconnected habitats. Because of their large home ranges and wide variety of habitat needs, grizzly bears

![Map of grizzly bear management units in British Columbia and Washington with the Cascadia Partner Forum boundary. Credit: A. Head](#)
are considered an excellent umbrella species, the conservation of which benefits a large number of other species; and an indicator of habitat quality and a range of ecosystem benefits, like clean water.

British Columbia has an estimated half of Canada’s grizzlies, but their range continues to contract in most of southern BC due to ongoing habitat fragmentation and associated human conflict. Washington’s North Cascades and BC’s Manning Provincial Park offer high quality habitat, but likely have fewer than 10 individual grizzly bears remaining. Cooperative recovery planning and related actions are needed on both sides of the Washington-BC border in recognition of adjacent habitats and the security needs of grizzly bears.

Bill Gaines, of Washington Conservation Science Institute and formerly with the Okanogan-Wenatchee National Forest, presented information regarding the current status of grizzly bear populations in Washington’s North Cascades Grizzly Bear Recovery Zone. From 2008-2012, Washington Conservation Science Institute conducted monitoring to detect grizzly bears in Washington’s North Cascades including 604 corral stations no positive results. In a similar time period one report of a grizzly bear in the recovery zone was validated, but no evidence of reproduction. Bill stated it is possible there are a small number of grizzly bears remaining in Washington’s North Cascades, but there is no indication of a population as defined by US Fish and Wildlife Service. Recovery planning for the North Cascades population began in 1986 with an official designated recovery area in 1993. Interim direction for land managers was finalized in 1997, and this fall the National Park Service announced that it will begin a three-year process to develop an Environmental Impact Statement (EIS) to analyze options for recovery of a population in the North Cascades. Bill suggested that moving ahead four areas have been recognized as important to address: (1) interim access management direction needs to be replaced by policy, especially as forest plans are revised; (2) decision is reached through EIS process on how to best restore a population in the North Cascades; (3) collaboration with British Columbia ensures we move forward as one ecosystem; and (4) work supports the North Cascades connection to a regional network of habitats.

Based on USFWS 2000:
“ A minimum grizzly bear population is defined by verified evidence within the previous six years, consisting of photos within the area, verified tracks and/or sightings by reputable scientists or agency personnel, of at least two different female grizzly bears with young or one female seen with different litters in two different years in an area geographically distinct from other grizzly bear populations. Verifiable evidence of females with young, to be geographically distinct, would have to occur at least 20 miles from the nearest non-experimental grizzly bear population recovery zone boundary.”
Immediately north of the border from Washington’s North Cascades Grizzly Bear Recovery Zone lies British Columbia’s North Cascades Grizzly Bear Population Unit, one unit within the province’s grizzly bear management system for populations and habitats. Tony Hamilton with the Ministry of Environment presented recent news relevant to grizzly bears in population units within Cascadia, status of grizzly bear records from the North Cascades Population Unit, and road analyses underway to inform provincial habitat management. British Columbia is engaged in the recovery planning now initiated in Washington’s North Cascades Recovery Zone as well as an official member of the [Interagency Grizzly Bear Committee](https://www.interagencygrizzlybearcommittee.org). The province is also addressing grizzly bear habitat through a Provincial **Cumulative Effects Framework**. Current population data for the North Cascades Population Unit tells a similar story to Washington. While there is successful documentation of individuals, the evidence does not support a population. Grizzly bear specialists point to open road access throughout prime habitat as the greatest burden on this species in this landscape. Multiple road analyses are underway or completed examining impacts of road densities and availability of roadlessness on the landscape in the province, including one in development with the Cascadia Partner Forum unique to the North Cascades Grizzly Bear Management Unit. Following an understanding of the current condition of the landscape, GIS tools are being developed that allow managers to assess scenarios for increasing grizzly bear habitat through various access management options. This “Road Closure Optimization Tool” would allow simulation of thousands of options, several alternative scenarios result that would inform management actions to close the least amount of road that recaptures the greatest amount of productive roadless habitat. In making decisions, not all roads pose the same threat to grizzly bears and actions taken must be deliberate and informed while keeping in mind where and why the best opportunities for management exist.

Overlapping four grizzly bear populations northwest of the North Cascades Grizzly Bear Population Unit in British Columbia is the St’át’imc First Nation’s traditional
A nation representing 11 First Nation communities covering 2.2 million hectares of land. Sue Senger, a wildlife biologist with the St’át’ímc First Nation introduced Landscape Unit Planning throughout the territory, as well as remote sensing efforts to improve habitat mapping and road access analyses underway. The Nxekménlhkálha ti tmicwa (St’át’ímc Land Use Plan) was drafted in 2004 that identified grizzly bear as one of the key elements. The plan established Landscape Units throughout the St’át’ímc territory, and remote sensing was conducted to provide higher quality, seamless habitat mapping for the territory. The sensing effort utilized satellite imagery to 30m pixel resolution, and when completed provides maps that can be interpreted for many species including grizzly bears. Simultaneously, a partnership was established to examine one of the largest impacts to grizzly bear habitat in the territory - over 10,000 km of roads. With researchers at the Foothills Research Institute, road density impacts were analyzed to grizzly bear habitat throughout the territory integrating Traditional Knowledge and Science and referencing research examining the effect of road density on population viability (see the Access Management section of this report for further information from Gordon Stenhouse on this research). The results lead to defined road density thresholds of population survival translated to individual Landscape Units throughout the St’át’ímc First Nation’s traditional territory. Each unit was identified as either stable, on the threshold of decline, or in decline for providing suitable habitat for grizzly bear populations. In the coming months, managers and communities will look at the Landscape Units on the threshold in of decline in greater detail. Senger noted this is where the application of the road closure optimization tool proposed by Tony Hamilton previously would be useful.

Finally, in addition to the land and species managers looking into grizzly bear management there are active efforts of non-profits focused on recovering populations within and connected to Cascadia. In British Columbia, the Coast to Cascades Grizzly Bear Initiative aims to generate and display public support for grizzly bear recovery by bringing the science to the people. Johnny Mikes, Coast to Cascades field coordinator, explained that the boundary of extirpation in BC is at risk of moving further north as new land use projects and threats continue to move into the landscape. He noted that a lot of the burden placed on grizzlies by open roads mentioned in earlier presentations is due to associated human conflict brought on by hunting, livestock grazing, and industrial and recreational use. Informing forest users of threats to current populations and the consequences of those threats will encourage actions to mitigate the negative impacts of land use placed on wildlife. A local and regional coalition of organizations, the Coast to Cascades Grizzly Bear Initiative aims to restore the five threatened grizzly bear populations in southwest British Columbia and to connect grizzly bear habitat while encouraging environmentally responsible development. We can accomplish this by protecting grizzly bears from mounting threats and stemming their loss from our wild places, safeguarding year-round ample habitat, and ensuring connectivity between grizzly bear populations.
**Conservation Target: Salmon**

Not simply inhabitants of the Pacific Northwest, salmon act more as proprietors of the landscape, embodying the role of the “nutrient backbone” to Cascadia. Utilizing Cascadia’s waterways to migrate and spawn, salmon are a highly specialized species relying on the abundance of clean and cool water, habitat connectivity, and functioning ecosystems. They respond quickly to habitat degradation making them apt indicator species to understand the health of our ecological systems today and into a changing future. They have shared a long and close relationship with people of the Northwest. They have remained an important cultural and economic resource to this day, providing commercial and recreational fishing, attracting visitors, and even adding to the scenery. Salmon are most certainly the icon of the Pacific Northwest.

Pacific Salmon (*Oncorhynchus*) have evolved closely with the landscape. Many of the behaviors and biological traits that vary amongst species and populations were developed to give them an advantage in the specific areas they inhabit. The Pacific Northwest infrastructure has drastically changed over the last two centuries. Dams, roads, and other developments related to western expansion have obstructed and diverted primary stream passages as well as introduced multiple stressors such as pollution and disease. The degradation of what was fundamental habitat has taken its toll on our salmon populations. There are currently eight salmonids that occur between British Columbia and Washington State, six of which are recognized as endangered or threatened under the U.S. Endangered Species Act or the Canadian Species at Risk Act. Species in some areas are estimated at less than 10 percent of their historic stock numbers. Experts agree that our salmon populations will never fully recover to pre-European contact levels, but gradually, with diligence and over a long period of time, we can expect healthy and harvestable runs. While rehabilitation of salmon depends on the participation and work done within local communities and watersheds, if there is hope to reach the goal of sustainable populations over time these efforts must be coordinated over the entire Cascadia landscape.

Climate change will present a number of issues for salmon in Cascadia, as they must soon try to exist in an ecosystem they are not adapted to. Research at [Northwest](#)
Fisheries Science Center (NWFSC) predicted future stream flow and temperature trends of the Columbian River Basin and Puget Sound throughout the twenty-first century. The goal was to help land managers address climate change within current restoration plans. Impacts of the changing landscape will vary between species having different life history events. Tim Beechie, Supervisory Research Fish Biologist at NWFSC, provided insight on how climate change may affect the important life stages of our salmon populations in Cascadia. Warmer stream temperatures may decrease spawning fecundity and limit the growth of young salmon. Increased flood flow can wash away salmon eggs and lead to mortality in areas lacking refugia. The loss of snowpack and later decrease in summer low flow levels will reduce freshwater habitat as well as limit access to important areas like refugia. The greatest threats are posed to salmonids that have an extended freshwater rearing period (stream-type Chinook, coho, steelhead).

Tim’s presentation shared that researchers categorized three different hydrological regimes to represent Pacific Northwest streams: snowmelt-dominated (where peak flow is associated with spring runoff from snowmelt); rainfall-dominated (where peak flow occurs during fall and winter floods); and transitional (where peak flows occur during both spring runoff and fall winter floods). The progression to a mostly rainfall-dominated flow regime will change existing stream dynamics. Earlier snowmelt, due to warmer temperatures and less accumulated snow, will affect peak flow timing and reduce summer flow levels in transitional streams. More rain will raise maximum flow levels between 10 and 50 percent across the landscape, in some places more, simultaneously increasing flood flow. The greatest impacts will be seen in areas that suffer the total loss of accumulated snowpack, particularly in the places moving from transitional to rainfall-dominated regimes in the Cascade and Olympic Mountain ranges. In these areas, summer low flow levels are estimated to reduce between 30 and 75 percent. Additionally, stream temperature throughout the Pacific Northwest is predicted to have
increased on average between 2 and 6°C by the end of the century causing many streams to be near or above salmon thermal thresholds for habitable conditions.

Finally Tim shared research\(^1\) on potential restoration actions to facilitate adaptation by salmon to changing climate conditions. He noted that in considering salmon’s ability to adapt, we must recognize that salmon already affected by one form of stress are less capable of adapting to additional new stressors. Tim presented the results of a literature review that assessed specific restoration actions and their ability to help address the effects anticipated with a changing climate most likely to affect salmon: low flow, peak flow, and stream temperature.

<table>
<thead>
<tr>
<th>Restoration action</th>
<th>Reduce temperature</th>
<th>Increase low flow</th>
<th>Decrease peak flow</th>
<th>Increase resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal connectivity</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Floodplain connectivity</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
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<td>Restore incised channel</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Restore in-stream flow</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/Y</td>
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<tr>
<td>Riparian rehabilitation</td>
<td>Y</td>
<td>N/Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Sediment reduction</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>In-stream habitat</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Nutrient enrichment</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Chart summarizing the results of a literature review to assess the ability of a restoration action to ameliorate the effects of climate change. Credit: Beechie et al 2013

While some strategies may not directly manage for climate change, they are still viable and important methods. Tim stated, it is important to note this research is not meant to discourage the use of specific restoration actions but rather point out more effective ones in implementing adaptation strategies. Managers will need to identify the local factors limiting salmon recovery and evaluate recovery plans using this information as a guide, making sure they focus on promoting diversity and reconnecting the landscape.

Following Tim’s presentation on the broad impacts of climate change on salmon in Cascadia and research that can inform adaptation strategies, presentations by regional collaborations from two recovery regions in Washington within Cascadia (Puget Sound and Upper Columbia Recovery Regions) introduced the audience to

how these collaborations work and how climate is integrated into their recovery planning for salmon.

Jeanette Dorner is the Ecosystem & Salmon Recovery Program Director and Tribal Affairs with the Puget Sound Partnership, a state agency serving as the backbone organization for Puget Sound recovery. The Partnership coordinates the efforts of citizens, governments, tribes, scientists, businesses and nonprofits to set priorities, implement a regional recovery plan, and ensure accountability for results. They administer the implementation of the Puget Sound Salmon Recovery Plan by bringing people together in the 14 watersheds of the Puget Sound region to agree on science-based recovery priorities, mobilize funding to implementation partners for priority actions, and help develop and implement shared measurement systems to track progress. The Puget Sound Recovery Council, composed of representatives from each watershed, an NOAA appointed Regional Implementation Technical Team, as well as members of the environmental and economic community, Indian tribes, and state and federal agencies, provides guidance on implementation of the plan and decides on overarching priorities for the entire region.

Between 2013 and 2015 Puget Sound Partnership generated $70 million in funding through the Puget Sound Acquisition and Restoration Fund. The funds were used to complete the first regionally prioritized list of habitat restoration projects from salmon recovery watershed restoration projects. These projects include hundreds of acres of estuary restoration in the Snohomish and Skagit rivers, dry lake bed reforestation behind the Elwha dams, restoration of over three acres of eelgrass bed near Bainbridge Island, and the largest shoreline armoring removal in Puget Sound. The partnership will request $130 million for proposed restoration projects between 2015 and 2017 proposed restoration projects between 2015 and 2017. All of these projects address existing threats to Puget Sound salmon species, increasing the resiliency of the populations today and in anticipation of new stressors. Jeanette noted that while progress is being made through these projects, it is inconsistent throughout the region and habitat continues to be lost throughout Puget Sound. For example, nearly one mile of hard armoring is added to Puget Sound shoreline every year. Additional challenges noted for Puget Sound salmon recovery include the need to coordinate with willing private landowners where important restoration areas are identified, more planning and coordination capacity to support watershed efforts and project development, and community engagement. Revisions to each of the watershed plans and project level planning are opportunities for integrating
climate science, but additional capacity to translate the science to inform these efforts is needed in some areas of the Puget Sound.

Chuck Peven with the Upper Columbia Regional Technical Team shared the ecological and social complexity of planning for salmon recovery in this region within Cascadia. In 2007 the Upper Columbia Spring Chinook, Salmon, and Steelhead Recovery Plan was adopted by National Marine Fisheries Services. The Recovery Plan asks the following questions to ensure the Plan is working, and other important questions are being addressed:

- Is the status of the population/ESU/DPS improving?
- Are the primary factors limiting the status of the population/ESU/DPS increasing or decreasing?
- Are the actions identified in the recovery plan being implemented correctly and according to the implementation schedule?
- Which actions are effective and should be continued?
- How will the data be managed and curated?

Since 1996 (before the recovery plan was adopted), implementation efforts for salmon recovery in the Upper Columbia Salmon Recovery Zone have invested $63 million dollars on habitat restoration and protection projects and an additional $6.8 million on assessment and design projects. These investments have improved 22 miles of stream, placed 518 in stream structures, restored flow to 28 miles, created off channel habitat on 11 miles, removed 93 barriers (282 miles opened to fish), improved 127 acres of riparian habitat, and protected 3,379 acres protected (47 miles of stream protected).

Chuck noted some challenges regarding implementation of actions to improve salmonid habitat in the Upper Columbia Region are:

- The need for a better project prioritization framework;
- Coordination of the various funding processes;
- Ensuring that project design is carried through implementation.

**Conservation Target: Ecological Connectivity (Aquatic and Terrestrial)**

Maintaining a connected network of ecological systems, both aquatic and terrestrial, is often identified as one of the most important strategies we can often offer species to adapt to a changing climate. “Terrestrial habitat connectivity” is a term used to refer to the ability of animals to move within a habitat or from one habitat to another. Different species move at different temporal and spatial scales for a wide variety of reasons. These movements can occur daily for food, seasonally as some species migrate with changing conditions, or over generations as new territory is explored. With predicted shifts in habitat due to climate change, wildlife will need the ability to move from habitat that becomes unsuitable for them to more favorable conditions. Additionally, “aquatic connectivity” refers to the network created by water throughout Cascadia in streams, rivers and lakes as they flow into one
another. The quality of these connections is important for a variety of Cascadia’s fish species including salmon and bull trout, while also directly related to the landscapes ability to hold and release water. The Cascadia Partner Forum works with partners to synthesize existing spatial information on both terrestrial and aquatic connectivity throughout Cascadia, policies that guide implementation, and highlight projects and collaborations addressing connectivity on the ground. This session at *WildLinks* aimed to share two new terrestrial connectivity analyses overlapping Cascadia as well as a new conservation initiative implementing connectivity conservation based on science shared at previous *WildLinks*. Additionally the session aimed to introduce attendees to approaches by a non-profit in Cascadia addressing threats to aquatic connectivity.

Meade Krosby of the University of Washington’s [Climate Impacts Group](http://climate.washington.edu) presented on a new analysis entitled *Pacific Northwest Riparian Climate Corridors*[^1] which she conducted with colleagues that identifies potential riparian areas that span large temperature gradients, have high levels of canopy cover, are relatively wide, have low solar insolation, and low levels of human modification – characteristics expected to enhance their ability to facilitate climate-driven range shifts and provide micro-climatic refugia from warming. Riparian areas are key targets for conservation efforts aimed at promoting biological resilience to climate change. However, few methods are available to managers to prioritize specific riparian areas when developing climate adaptation strategies. Current methods typically use riverine connectivity as a coarse proxy for riparian connectivity and do not account for variability in habitat quality, which should influence species range shifts and availability of refugia. This new analysis aimed to improve upon these methods with a fine-resolution analysis integrating results from across scales – from local watersheds to the entire Pacific Northwest. The analysis does not extend currently into British Columbia, but presents a wide range of conditions for watersheds in Washington’s portion of Cascadia. Some key take homes from the analysis were that riparian areas offer high climate adaptation bang for your buck in terms of investments, the analysis provides a climate lens for management decision-making and conservation planning that is complementary to existing tools and planning efforts underway (i.e. WGA CHAT, State Wildlife Action Plans), and the analysis does not rely on projections of future climate that introduces uncertainties in interpretation.

An additional terrestrial connectivity analysis underway currently was presented by the Transboundary Subgroup of the [Washington Wildlife Habitat Connectivity Working Group](http://nplcc.databasin.org/datasets) in coordination with colleagues from British Columbia focused on the transboundary Okanagan-Kettle subregion stretching from the Cascades crest eastward to the Kettle River Range. The Okanagan-Kettle subregion includes the northern-most extent of the Columbia Plateau Ecoregion and poses a potential

bottleneck to climate-driven range shifts of shrubsteppe species, and is also a central region between coastal and rocky mountain ranges that support large predators and their prey populations. Maintaining the Okanagan-Kettle’s permeability to wildlife movement is thus vital for maintaining today’s populations, and in promoting regional resilience to climate change. The Transboundary Subgroup spent 2014 interpreting the results of all existing analyses for this landscape to identify the important connectivity patterns including both key linkages and barriers to movement for wildlife. They presented their initial findings, requesting feedback in the break that followed from attendees with knowledge of this landscape and wildlife living within it. They shared that through 2015 they would work with partners on-the-ground in this landscape to select two important linkages that emerged from their work to date to conduct operational scale conservation planning. A final report is due out by the end of 2015 summarizing all work to date.

APPENDIX A. Map: Okanagan-Kettle Subregion and Fracture Zones.
Dave Werntz, Science and Conservation Director with Conservation Northwest, introduced attendees to a new public-private initiative that is investing in conservation of a critical east-west wildlife connection that has been highlighted by multiple terrestrial connectivity analyses to date. The Working for Wildlife Initiative led by the National Fish and Wildlife Foundation brings together partners to take advantage of timely opportunities to maintain and restore habitat connectivity between the Cascade Mountains and Kettle River Range for Canada lynx, Columbian sharp-tailed grouse, and mule deer. By 2020 the initiative aims to conserve existing habitat values on tens of thousands of acres of private land, construct three wildlife underpasses on Highway 97 to facilitate safer passage, restore habitat quality and resiliency on 20,000 acres, augment the local population of Columbian sharp-tailed grouse, lay the groundwork for recovery of Canada lynx in the Kettle River Range, and establish programs and relationships to increase the community’s tools and pride in co-existing with wildlife so this work will continue over time. A business plan has been developed that outlines the goals and strategies of this initiative, which is available on the National Fish and Wildlife Foundation website. A decision support tool is being developed that will allow partners to use GIS information to inform implementation of strategies by assessing which investments will have the largest contribution to connectivity within the linkage, while also assisting in monitoring the cumulative impact of investments over time.

Finally Michael Garrity of American Rivers shared his experience and perspective on approaching aquatic connectivity conservation in Washington. He highlighted several of the barriers that effect aquatic connectivity for fish species in the Pacific Northwest: dams, poorly designed culverts under roadways, inadequate in-stream flows, channelized rivers and degraded floodplains. These were followed by examples of conservation actions that can be taken to mitigate or remove these barriers when investments are made both in the mainstem Columbia River and in tributaries of the Columbia and Puget Sound. He then highlighted the Yakima Basin Integrated Plan that he helped to develop, which overlaps the southern portion of the Cascadia landscape. This plan integrates the social and economic needs for water in a basin that is already stressed for this resource and is expected to face increased stresses under climate change predictions with the ecological needs for fish passage, increased consistent in-stream flows, floodplain restoration, and improved riparian and upland habitat.

**Building on a priority adaptation issue: Access Management**

Roads of all kinds from highways to gravel single lane routes provide valuable access to the landscape of Cascadia. Access is needed for land and species management, recreation, and enjoyment. Roads also can pose natural resource risks to the landscape as well from reducing watershed health and security habitats for wildlife to providing vectors that facilitate the spread of invasive plants. Identifying a balanced sustainable road system that provides needed access to our landscape while ensuring healthy watersheds and habitats is a priority that our Partner Forum has identified. In identifying a system is sustainable over time, climate change must be considered both for the vulnerabilities that changing conditions may pose to the
Gordon Stenhouse of the Foothills Research Institute shared what they have learned about the effect of roads on grizzly bears from their research in Alberta, building on nearly 20 research papers. He provided an introduction to the grizzly bear population and status in Alberta that he studied including DNA information on the demography of these populations, and the research methodology for his work understanding the interaction between grizzly bears and open road densities. He ran through findings from previous research with published papers that showed direct relationships between survival rates of grizzly bears and probability of den occurrence with specific thresholds of open road densities. In their 2012 research paper, they found that females with cubs do occur closer to roads and not surprisingly the strongest relationship between roads and probability of mortality are for females with cubs of the year and yearlings. There new paper3 confirmed the link between population trends for grizzly bears and open roads. He concluded that roads affect grizzly bear survival – there are different survival rates for both sex and age class, and reproductive status. Additionally, we have now established a linkage between open road densities and grizzly bear population trajectories that is important to consider within Cascadia when managing for this conservation target as well.

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Loren Everest, a fisheries biologist with the Mount Baker Snoqualmie National Forest followed Gordon’s presentation with a discussion about how their national forest in Washington’s west Cascades is analyzing the impact of roads on aquatic resources to fulfill federal direction in the 2005 Travel Management Rule. The 2005 Travel Rule requires travel analysis be completed at a ‘forest scale’. This means the Forest Service takes a broad look at the whole road system and the associated risks and benefits to users and resources. It’s a science-based process coupled with input from interested public, including those who use and are affected by the roads. The process will identify potential opportunities for changes to the road system. Inputs to the process include ecological, social, cultural and economic information. The outcome is a report that identifies a “minimum road system” to inform management going forward, not a decision. A minimum road system is one that MRS is the minimum system of roads that: (1) Meets resource management objectives adopted in the land management plan, (2) Meets applicable statutory and regulatory requirements, (3) Reflects long-term funding expectations, (4) Minimizes adverse environmental impacts associated with road use, reconstruction, decommissioning, and maintenance. The final rule mandates that this Minimum Road System be determined by September of 2015 and comply with long-term budget expectations. The Mount Baker Snoqualmie National Forest is referring to their travel analysis and public engagement as the Sustainable Roads process. In the Sustainable Roads process, Loren is leading an evaluation of each segment of the approximately 2,500 miles of road on the forest based on nine Aquatic Risk Factors and six Aquatic Resource Values. These evaluations will serve as an Aquatic Risk Assessment, which will be referenced when deciding which roads to continue to maintain and which to close or schedule for decommission. The nine Aquatic Risk Factors are measured with numerical values using a scoring system. The sum of a segment’s risk factor scores is multiplied by its associated Consequence of Failure score to generate an overall risk rating of high, medium, or low. The Consequence of Failure score represents the severity of potential degradation in water quality, watershed values, and fish habitat in the event of a road failure. This
calculation allows forest managers to better understand the effects of a road failure rather than just the probability of occurrence. These final risk rankings for aquatics will be combined with rankings based on analyses for the other resources on the national forest, and summarized in the final Sustainable Roads report by the end of 2015.

On the other side of the Cascades crest in Washington from the Mount Baker Snoqualmie National Forest lies the 4 million acres of the Okanogan-Wenatchee National Forest. Richard Vacirca is a fisheries biologist on the Okanogan-Wenatchee National Forest that presented on his work to develop a Whole Watershed Restoration Procedures to integrate into the Okanogan-Wenatchee Forest Restoration Strategy. Richard described a process on the forest that began by prioritizing subwatersheds on the forest to focus restoration investments within. Prioritizing is informed by the subwatershed's ranking in the Watershed Condition Framework, Aquatic Species AEC Score, and whether or not it is a focus within a Recovery Plan. Prioritized subwatersheds will then get linked into a larger Forest out-year planning process called the Mid-scale Assessment. High priority watersheds that emerged in the from this analysis effort include Potato Creek-Entiat River, Nile Creek, Tillicum Creek, Lower Little Naches River, Eight Mile Creek, and Upper Peshastin. Once a determination is made to plan active management in a subwatershed the Hydrologist and Fisheries Biologist team initiates the subwatershed assessment portion of the Procedures, which is designed to answer which roads are causing the problems. Roads are a primary cause of impairment of aquatic function on the Okanogan-Wenatchee National Forest causing functional impairments on physical watershed processes, functional impairments on chemical processes, and functional impairments on biological processes. This subwatershed assessment helps to highlight catchments within the subwatershed that are most impaired, directly attention to where restoration needs to occur (see image to the right). Restoration actions on the national forest can range from decommissioning to upgrading of roads to address aquatic concerns, but actions will have varying degrees of how much of the impairment they are likely to address. For example, decommissioning

Sample map product from one analysis identifying priority catchments within a subwatershed on the Okanogan-Wenatchee National Forest from the Whole Watershed Restoration Initiative in development. Credit: R. Vacirca
of the road is estimated to address 90-95% of the impairment while upgrading a road system by upsizing a road crossing of a stream may only address 50-70%. This assessment allows land managers to see the current condition of the subwatershed, and make decisions based on where the greatest risks to aquatic function are within the subwatershed while understanding the potential for reducing impairment of function as well as the trade-offs of different restoration options. In addition, the subwatershed assessment portion of the Procedures can be re-run on a proposed action or alternative to a proposed action, which will indicate that effectiveness of addressing watershed-scale restoration goals. Next steps are to finalize prioritization of subwatersheds, refine and test metrics that formulate restoration objectives for these subwatersheds, build the GIS tool that allows analysis to occur within each subwatershed, develop field validation procedure, develop a process for what to do with problem roads as they are identified, and initiate review of the whole process with scientists.

**Managers Roundtable**

Four managers coming from different transboundary regions of the Cascades spoke on a panel about how they are addressing climate in their region. Each was asked to address the following questions: *how are land managers in the transboundary Cascades addressing climate adaptation on their lands, what are the challenges and opportunities they are running into, what policies and direction on adaptation do they have, and what can partners do to help them as they move forward?* They each individually responded to these questions for the land that they manage, which was then followed by a Q&A with the audience. The managers were Jennifer Eberlien (Supervisor of the Mount Baker Snoqualmie National Forest), Karen Taylor-Goodrich (Supervisor of the North Cascades Park), Jennie Alkman (Regional Planner of BC Parks), and Stuart Wooley (Okanogan Wenatchee National Forest).

**Sharing a new climate adaptation tool: Adapt West**

The last presentation at WildLinks 2014 was the introduction of a new climate adaptation tool to the audience. Carlos Carroll of the Klamath Center for Conservation Research presented the development of a new spatial database created to help land managers in Western North America address climate change efficiently and effectively – AdaptWest.

AdaptWest is a unique tool that catalogs a wide range of information pertinent to climate change planning and presents it in a standardized format. As preparing for climate change becomes an increasing concern, more data on climate and conservation methods are being
generated. AdaptWest combines a broad geographic coverage with high resolution (1km or less) to give spatial context to these mounting and diverse sets of data. AdaptWest features metrics based on physical habitat types (land facets and topodiversity), downscaled projections of future climate, velocity of climate change, biotic velocity, and projected climate refugia for individual species. Operators can use this information to test assumptions and compare the potential of one or combined conservation methods in a given area.

Carlos drew attention to new methods adopted within the AdaptWest database providing a direct estimate of the velocity of climate change, or climatic velocity, which is the rate at which a species must move to track climate. The new method highlights two different directions of velocity: forwards and backwards. Forward climatic velocity measures how fast populations will need to move to maintain similar climate. Backwards velocity measures how distant a source of colonizers adapted to a site’s future climate is. Together, they give more depth to climatic velocity analyses. This analysis is used to display areas with high adaptive capacity as well as those with high levels of threat to ecosystem services. If a species is able to access them, areas with low climatic velocity can serve as refugia. The climate velocity for Cascadia was found to be highest in alpine and interior areas, while lowest on mid-elevation slopes.

Locating areas of refugia is a key strategy when managing for climate change, and is another benefit of using AdaptWest. Inconsistencies in the approach used to identify refugia may result in missed opportunities; an area of land analyzed using a species-
based (fine-filter) approach may classify different areas of refugia than when analyzed using a habitat-based (course-filter) approach.

Specific to potential planning efforts ongoing in Cascadia, Carlos suggested that the scale of information provided through AdaptWest would be appropriate for integration into forest plan revisions, such as the Okanogan-Wenatchee National Forest Plan revision on 4 million acres. However, it would not be appropriate to integrate into decisions on individual road segments as presented earlier in the Mount Baker Snoqualmie National Forest Sustainable Roads process or in decisions on smaller land acreage such as the Teanaway Community Forest Trust at 50,000 acres.

Future plans for improvement of AdaptWest include linking information that is currently available on the publicly available Databasin to other workgroups within Databasin such as the Cascadia Partner Forum. Expansion of case studies and guides helping users to better understand the information displayed in AdaptWest is underway. Carlos noted that developers would like feedback from potential users concerning how AdaptWest might be more useful to specific projects and planning efforts.
Appendix A: Agenda and Attendee List

Wild Links Briefing: November 10-12, 2014

This event is made possible through the generous support of our sponsors including Conservation Northwest, Great Northern Landscape Conservation Cooperative, North Pacific Landscape Conservation Cooperative, Seattle City Light, & Wilburforce Foundation.

Meeting Objectives:

- Share information on adaptation related efforts in the transboundary region that are underway or upcoming to increase coordination and involvement, while providing time and space to further these efforts while we are all together;
- Gain local expertise and contribution to North Pacific and Great Northern Landscape Conservation Cooperatives regional planning efforts, including furthering input from Cascadia on three Great Northern LCC conservation targets that the Cascadia Partner Forum has prioritized: Salmon, Grizzly Bear, and Ecological Connectivity (aquatic and terrestrial);
- Build on our access management workshop from last year’s WildLinks by providing updates from the ground throughout Cascadia, while furthering road analyses in four spatial priority areas in or connecting to Cascadia to inform timely management discussions (Teanaway Community Forest, Okanogan-Kettle subregion, North Cascades Grizzly Bear Population Unit, Mount Baker Snoqualmie National Forest);
- Allowing time and space for side meetings on important topics within Cascadia and connected ecosystems;
- Continue building a network of practitioners working on building resiliency into the species and ecosystems of Cascadia and connected ecosystems.

Monday, November 10th

Check in for lodging and conference available at front desk beginning at 3pm.

2:00 pm, Front Desk: Daytime guided North Cascades Institute outdoor hike of Diable Lake East Trail (7 miles roundtrip) leaves. Pre-registration is required for this group hike.

7:00 pm, Dining Hall: Opening Reception including welcome, overview of objectives of this year’s WildLinks conference, video of messages to meeting attendees from North Cascades Institute Youth Leadership Conference attendees, and remarks from North Cascades Institute Director Saul Weisburg.
Reception includes a hosted bar.

**Tuesday, November 11th**

7:30- 8:30am, Dining Hall – Hosted breakfast

8:30am, Classroom 1: Welcome and event overview

8:45am to 9:30am - Opening remarks:
- Mitch Friedman, Conservation Northwest
- Larry Campbell, Swinomish Tribe

9:30am to 10:15am - Updates from the Cascadia Partner Forum and Landscape Conservation Cooperatives followed by questions
- Cascadia Partner Forum update – Tory Stevens, BC Parks** and Cynthia Wilkerson, WA Department of Fish and Wildlife
- Great Northern LCC – Sean Finn, Great Northern LCC
- North Pacific LCC – Mary Mahaffey and Tom Miewald, North Pacific LCC

10:15am to 11:30am – Panel on grizzly bears
- Why did the Cascadia Partner Forum choose grizzlies to focus on? Video
- Status, recovery planning, & looking ahead, US – Bill Gaines, WA Conservation Science Institute
- Status, recovery planning, & looking ahead, BC – Tony Hamilton, Ministry of Environment
- St’at’imc recovery planning – Sue Senger, St’at’imc First Nation
- Coast to Cascades Initiative – Johnny Mikes

11:30am to 11:45am – Break

11:45am to 1pm: – Panel on salmon
- Why did the Cascadia Partner Forum choose salmon to focus on? Video
- Salmon habitat restoration and climate considerations – Tim Beechie, National Oceanic and Atmospheric Administration
- Salmon Recovery in the Puget Sound - Jeanette Dorner, Puget Sound Partnership
- Upper Columbia Salmon Recovery - Chuck Peven, Peven Consulting

1pm to 2pm, Dining Hall: Hosted lunch
2pm to 4pm – Revisiting access management - Panel of presentations on applied science to inform access management in spatial priority areas in Cascadia
  • Review of where Cascadia Partner Forum will be bringing applied science over the next year to access management planning
  • The impacts of roads on Grizzly Bears in Alberta: new knowledge to guide management - Gordon Stenhouse, Foothills Research Institute
  • Analyzing hydrologic and fisheries impacts of roads today and into a changing future on the Mount Baker Snoqualmie NF - Loren Everest, Mount Baker Snoqualmie National Forest
  • Whole Watershed Restoration procedures - Richard Vacirca, Okanogan-Wenatchee NF

4 to 6pm – Time reserved for side meetings, optional breakout groups on conservation targets to work through science planning logic for GNLCC Science Plan and input to NPLCC Science and TEK strategies, and free time to occur throughout campus before dinner.

6:30pm, Dining Hall – Hosted dinner and reception including Skagit Environmental Endowment Commission’s Premiere of their short film Wolverines of the Transboundary North Cascades including interviews with attendees from last year’s WildLinks.

**wednesday, November 12th**

** Remember to check-out of your rooms by 10am

7:30am to 8:30am, Dining Hall – Hosted breakfast

8:30am, Classroom 1 – Day 2 Opening Remarks

8:45am to 9:45am – Managers roundtable (4 managers with 10-15 minutes each) – how are land managers in the transboundary Cascades addressing climate adaptation on their lands, what are the challenges and opportunities they are running into, what policies and direction on adaptation do they have, and what can partners do to help them as they move forward?
  • Jennifer Eberlien, Supervisor of the Mount Baker Snoqualmie National Forest
  • Karen Taylor-Goodrich, Supervisor of North Cascades National Park
  • Jennie Aikman, Regional Planner, BC Parks **
  • Stuart Wooley, Okanogan-Wenatchee National Forest

9:45am to 10:30am – AdaptWest presentation and application to spatial priorities in Cascadia by Carlos Carroll

10:30am to Noon:  Maintaining and restoring connections – aquatic and terrestrial
• Approaching aquatic connectivity in the Washington - Michael Garrity, American Rivers
• New product: Riparian Climate Corridor Analysis – Meade Krosby, University of Washington
• New product: Okanogan-Kettle subregion transboundary analysis – Rachel Holt, Veridian Ecological and Andrew Shirk, University of Washington
• New conservation effort: National Fish and Wildlife Foundation’s Working for Wildlife Initiative connecting the Cascades to Kettles – Dave Werntz, Conservation Northwest
• Panel and full group discussion

Noon to 1pm, Dining Hall – Hosted lunch

1pm to 4pm – Open time for work groups and small group discussions throughout the campus

**Attendee List:**

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<td>Penny Becker</td>
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<td>Tim Beechie</td>
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<td>James Begley</td>
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<td>Shawn Cantrell</td>
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<td>Carlos Carroll</td>
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<td>Curtis Chance</td>
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<td>Kitty Craig</td>
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<td>Paul DeBruyn</td>
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<td>Brent DeWolff</td>
<td>Cascadia Partner Forum Fellow</td>
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<td>Jeanette Dorner</td>
<td>Puget Sound Partnership</td>
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<td>Jennifer Eberlien</td>
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<td>Sean Finn</td>
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<td>Marc Gauthier</td>
<td>Upper Columbia United Tribes</td>
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<td>Lillian Gottfriedson</td>
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Karen Taylor-Goodrich, North Cascades National Park
Chase Gunnel, Conservation Northwest
Tony Hamilton, Ministry of Environment
Jeff Heinlen, Washington Department of Fish and Wildlife
Karen Hodges, University of British Columbia – Okanagan
Alison Huyett, Conservation Northwest and Pacific Wolf Coalition
Kodi Jo Jaspers, Colville Confederated Tribes
Darwin John, Statimic Nation
Wayne Kasworm, US Fish and Wildlife Service
Gregory Kehm
Meade Krosby, University of Washington
Jeff Lewis, Washington Department of Fish and Wildlife
Robert Long, Woodland Park Zoo
Andrea Lyons, Washington Conservation Science Institute
Paula MacKay
Mary Mahaffey, North Pacific Landscape Conservation Cooperative
Greer Maier, Upper Columbia Salmon Recovery Board
Tom Miewald, North Pacific Landscape Conservation Cooperative
Johnny Mikes, Cascades to Coast Initiative
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Sue Senger, Statimic Nation
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Rob Smith, National Park Conservation Association
Gord Stenhouse, Foothills Research Institute
Tory Stevens, BC Parks
Dixon Terbasket, Okanagan Nation Alliance
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