

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
				OEA and the R10 Science Advisory Council			
<p>Incorporate climate change considerations into the CWA 404 regulatory program as they relate to permit reviews and compensatory mitigation</p> <ul style="list-style-type: none"> Consider the effects of climate change, as appropriate, when making significant degradation determinations in the CWA Section 404 wetlands permitting and enforcement program Evaluate, in conjunction with the U.S. Army Corps of Engineers, how wetland and stream compensation projects could be selected, designed, and sited to aid in reducing the effects of climate change 	Loss of wetland ecosystems and services	National Water Program Strategy ¹²⁸	Goal 2.	<p>R10 Lead: Linda Storm</p> <p>Partners: USACE</p>			
<p>As resources allow, improve baseline information on wetland extent, condition and performance to inform effective adaptation to climate change</p> <ul style="list-style-type: none"> Expand wetland mapping by supporting wetland mapping coalitions and training on use of the new federal Wetland Mapping Standard. Produce a statistically valid ecological condition assessment of the nation's wetlands 	Loss of wetland ecosystems and services	National Water Program Strategy ¹²⁹	Goal 2.	<p>R10 Lead: Maryann Thiesing</p> <p>Partners: ORD, USFWS, UW Wetlands Adaptation Group</p>			
FY13 and FY14 Region 10 Wetland Program Development Grants RFP integrates climate adaptation by considering how the design							

¹²⁸National Water Program 2012 Strategy: Response to Climate Change. Available at http://water.epa.gov/scitech/climatechange/upload/NWP_Draft_Strategy_03-27-2012.pdf

¹²⁹National Water Program 2012 Strategy: Response to Climate Change. Available at http://water.epa.gov/scitech/climatechange/upload/NWP_Draft_Strategy_03-27-2012.pdf

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
and installation of demonstration projects would take relevant potential impacts from climate change into account when considering long-term viability ¹³⁰							
Ocean Programs							
Participate in interagency development and implementation of federal strategies through the National Ocean Council (NOC) and the National Ocean Policy Implementation Plan	Increase in ocean temperatures, with potential for changes in ocean chemistry and increased ocean acidification	National Water Program Strategy ¹³¹	Goal 2.	R10 Lead: Sediment Management Staff Partners: NOC			
Tribes							
Build the capacity of Tribes to develop adaptation actions (plans) and to engage in the collaboration with local, state and federal agencies.	All (mitigation)	Regional Tribal Operations Committee	Goal 1.	R10 Lead: Michelle Davis-TTAU;	•	•	
EPA R10 Tribal Trust and Assistance Program will provide GAP funding as appropriate to support Tribes who have climate change in their GAP workplans to learn how to research climate change impacts upon their environment, natural resources, infrastructure to be used for development of a planning mechanism for adaptation and mitigation.	All	RTOC	Goal 1.	R10 Lead: TTAU; AIEO/OITA Partners: R10 Tribal Governments			
Through the GAP program, Tribes may be able to do baseline environmental assessments that will add to documentation of the impact on climate change on Tribal communities and their ecosystems and support their adaptation planning.	All	National Tribal Science Council	Goal 1.		•		

¹³⁰ http://www.epa.gov/region10/pdf/wetlands/FY13_Wetland_Program_Development_Grants_Request_for_Proposals.pdf

¹³¹ Goal 11 SA 28 and SA 31. See http://water.epa.gov/scitech/climatechange/upload/NWP_Draft_Strategy_03-27-2012.pdf

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustainability	EJ
Share information to support climate change educational outreach and adaptation activities within Tribal communities	All	National Tribal Science Council	Goal 1.		•		
Tribal Program staff will regularly submit articles on climate change to Tribal newsletters. Coordinate with other programs and their Tribal specialists on climate change info and resources to include in the EPA Tribal newsletter.	All	2010 Tribal Leader's Summit Action Plan	Goal 1.		•		
Continue to offer quarterly calls to Alaskan Tribes with Institute for Tribal Environmental Professionals on tribal climate change adaptation models and resources.	All	2010 Tribal Leader's Summit Action Plan	Goal 1.	R10 Lead: Michelle Davis Partners: ITEP	•		
Puget Sound Program							
Address Climate change in Puget Sound Grants, consistent with the Puget Sound Action Agenda. Grant activities include: Conduct an erosion survey to evaluate sea level rise threat in San Juan County; b) Map habitat and infrastructure vulnerability in Puget Sound and restoration potential for reducing vulnerability; c) Several Tribes and counties will incorporate climate change in their plans and/or analyses. Puget Sound Grant partners include: <i>Puget Sound Partnership, Friends of the San Juan's, The Nature Conservancy, Snohomish County, Washington Dept. of Ecology, Samish Indian Nation, Swinomish Tribe, Nooksack Tribe, Suquamish Tribe, Port Gamble Indian Commission.</i>	Sea Level Rise/erosion	Puget Sound Action Agenda	Goal 2.	R10 Lead: ETPA/Puget Sound: Angela Bonifaci; See partner list under description	•	•	
Puget Sound Partnership is working to control source pollution. <ul style="list-style-type: none"> No Discharge Zone Evaluation and Petition. Draft petition to EPA by September 2013 	Increasing heavy precipitation events. Increased pollutant	Puget Sound Action Agenda ¹³²	Goal 2.	R10 Lead: EPA Team			

¹³² http://www.psp.wa.gov/downloads/AA2011/083012_final/Action%20Agenda%20Book%201_Aug%2029%202012.pdf

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustainability	EJ
<ul style="list-style-type: none"> • Pollution Control Action Team to respond quickly when areas are identified where water quality problems threaten shellfish areas. The first effort will be in Drayton Harbor and Portage Bay. • Pollution Identification and Correction Programs to identify and correct nonpoint source pollution sources. 	loads in runoff and the velocity of runoff will scour and erode creek beds.			Partner: Puget Sound Partnership, Washington Department of Ecology, DOH, WSDA, Tribes			
The Puget Sound Partnership has developed climate change indicators which will allow them to track climate-driven changes and identify vulnerabilities or ecological thresholds	Increase in ocean temperatures, with potential for changes in ocean chemistry and increased ocean acidification	Climate Ready Estuaries ¹³³ National Water Program Strategy ¹³⁴	Goal 2.	R10 Lead: Michael Rylko Partners: OCPD, National Estuary Programs, EPA Climate Change Division			
Puget Sound Grants process integrates climate adaptation concepts by considering how the design and installation of projects would take relevant potential impacts from climate change into account	All	U.S. EPA Climate Adaptation Plan/ FY 2011-2015 EPA Strategic Plan ¹³⁵	Goal 2.	R10 Lead: Puget Sound Grants Team			
A four part effort, comprising climate statistics, GIS visualization and analysis, data delivery platform development, and engagement with policy and management entities, will underlie the proposed development and delivery of information about the	All	Puget Sound NEP.	Goal 2.	R10 Lead: Jon Schweiss. Partners: UW			

¹³³Climate Ready Estuaries 2012 Progress Report. Available at http://water.epa.gov/type/oceb/cre/upload/CRE_2012Report_122612a.pdf

¹³⁴ Goal 9, SA 23. See http://water.epa.gov/scitech/climatechange/upload/NWP_Draft_Strategy_03-27-2012.pdf

¹³⁵ 3.3.1 Priority: Fulfill Strategic Measures in FY 2011-2015 EPA Strategic Plan. Strategic Measure 2: Integrate climate adaptation into financial mechanisms. <http://www.epa.gov/climatechange/pdfs/EPA-climate-change-adaptation-plan-final-for-public-comment-2-7-13.pdf>

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustainability	EJ
projected time of emergence of various elements of a changing climate in the Puget Sound Basin.							
Children’s health and vulnerable populations							
Through work on children’s health, develop and host training for professionals in the housing, health and educational fields on making indoor environments healthier for the most vulnerable populations	Changes in precipitation, extreme temperatures, more frequent wildfires, and severe weather events will impact <u>outdoor air quality</u> and <u>indoor air quality</u> since ambient air is entrained indoors		Goal 1 and Regional Goal 7	R10 Lead: Margo Young			•
Provide technical assistance and training to affected communities on risks associated with poor outdoor air quality <ul style="list-style-type: none"> • Work with Tribal Air Program • Convene Rural Alaska Children’s Environmental Initiative 			Goal 1 and Regional Goals 6 and 7.	R10 Lead: Margo Young, Erin Mader Partners: EPA Tribal Air Program, ANCH	•		•
Outreach/risk communication to vulnerable and economically deprived communities.	Decreasing precipitation days and increasing drought intensity	U.S.EPA Climate Adaptation Plan	Regional Goals 6 and 7.	R10 Lead: Sheryl Stohs Partners:			•

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
	Increasing risk of floods			Beyond Toxics, Eugene; Verde of Portland; DRCC of Seattle			
Regional Clean Air Act Grants are provided to Tribes to build capacity and knowledge and assess and address air quality concerns. Many grant-funded programs aim to prevent the presence of and exposure to indoor air pollution, for example, through supporting clean burning practices for wood stoves and adequate and effective ventilation in homes and public buildings. Ambient pollutants are also targeted, for example, from idling vehicles, diesel generators, outdoor burning, agricultural burning, wood stoves, and wildfires. Many of these factors will worsen with climate change, making tribal capacity building in these areas critical.	Indoor air quality	R10 Strategic Alignment Plan.	Regional Goals 6 and 7.	R10 Lead: Erin Mader Partners: Tribes	•		
Region 10's Children's Environmental Health and Tribal Air Program co-lead the Rural Alaska Children's Environmental Health Initiative and its two active workgroups, the Alaska Healthy Homes and the Alaska Healthy Schools Workgroups. These groups were established in December 2010 and work together regularly to protect children from harmful environmental exposures in rural Alaska, including factors related to climate change.	All.	R10 Strategic Alignment Plan.	Goals 6 and 7.	R10 Lead: Erin Mader Partners: Tribes	•		•
The Tribal Air Program has an IPA position in the Anchorage office serving as the Alaska Tribal Air Liaison. She provides direct assistance to Alaska Tribes and GAP grantees to do air quality work, including climate change related topics.	Air quality	R10 Strategic Alignment Plan.	Goals 6 and 7.	R10 Lead: Michelle Davis Partners: Tribes	•		•
Other actions							
As appropriate, communicate with the public about hazards posed by climate change and EPA response/ remedies to events exacerbated by climate change (storm events, flood, drought)	All	U.S.EPA Climate	Goal 3.	R10 Lead: Public Affairs Unit			

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

					Linked to		
	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Tribes	Sustainability	EJ
		Adaptation Plan					
As appropriate, raise public awareness about climate change and actions being taken by the EPA to address climate change	All	U.S.EPA Climate Adaptation Plan	Goal 3.	R10 Lead: Public Affairs Unit			
Puget Sound Projects							
Vulnerability and Resilience of Puget Sound Estuaries to Climate Change. Vulnerability assessments will allow decision makers to understand known risks, key uncertainties and the level of vulnerability their habitats and communities face from future storms and elevated sea levels (Cooper et al. 2008).	In the Puget Sound basin these include increased winter precipitation, higher river flooding, lower summer low flows (Hamlet and Lettenmaier 2007), sea level rise (Mote et al. 2008), and uncertain effects on wind storms, sediment recruitment, and larger scale wind and ocean currents.	Puget Sound Action Plan. Objective 3. Vulnerability analysis	Goal 2.	R10 Lead: Michael Rylko Partners: The Nature Conservancy in collaboration with USGS and UW CIG			
The Puget Sound Partnership plans to launch a tree planting/canopy cover campaign in FY13	Increased stream temperatures	Puget Sound Partnership Stewardship grant	Goal 2.	R10 Lead: Partner: Puget Sound Partnership			
In FY13, Snohomish County's Department of Public Works will address the threats of climate change and increased population growth with a focus on addressing altered basin hydrology.	Change in basin hydrology	Puget Sound NEP.	Goal 2	R10 Lead:			

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

					Linked to		
	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Tribes	Sustain-ability	EJ
				Partner: Snohomish County's Department of Public Works			
The Washington State Department of Ecology will continue to work on a Puget Sound Circulation and Dissolved Oxygen Model (v2.0) in order to determine climate change effects on Puget Sound water quality.	Increase in ocean temperature.	Puget Sound NEP.	Goal 2.	R10 Lead: Ben Cope Partner: WA Ecology			
King County will produce modeled flow and water quality conditions in the rivers and streams of WRIA 9 for idealized fully forested conditions, and anticipated 2040 conditions considering population growth and climate change	Sea level rise.	Puget Sound NEP.	Goal 2.	R10 Lead: Michael Rylko Partner: King County.			
Tribal Related projects in Puget Sound							
The Samish Indian Nation will continue its climate change monitoring of Fidalgo Bay waters in FY13 providing continuous temperature data for trend analysis	Increasing ocean temperature.	Puget Sound NEP.	Goal 2 and Regional Goal 7.	R10 Lead: Lisa Chang Partner: Samish Indian Nation	•		
The Swinomish Tribe will hold its annual workshop on climate change issues in the Skagit, with a written report to follow	All.	Puget Sound NEP.	Goal 2 and Regional Goal 7.	R10 lead: Lisa Chang Partner: Swinomish Tribe	•		
The Nooksack Tribe will attend climate change conferences, meeting, and presentations, and review technical reports to evaluate the magnitude of expected local changes. This	All.	Puget Sound NEP.	Goal 2 and Regional Goal 7.	R10 lead: Lisa Chang	•		

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
information will be considered in the salmon recovery plan implementation for WRIA 1				Partner: Nooksack Tribe			
The Suquamish Tribe will continue to monitor the work of the Climate Change Study Group, review climate change related studies and documents, and attend related meetings in order to build tribal capacity with respect to climate change	All.	Puget Sound NEP.	Goal 2 and Regional Goal 7.	R10 lead: Lisa Chang Partner: Suquamish Tribe	•		
The Port Gamble Indian Commission of the Port Gamble Reserve plans to participate in climate change and ocean acidification programs in order to inform the development of a climate change program in FY13	Ocean acidification.	Puget Sound NEP.	Goal 2 and Regional Goal 7.	R10 lead: Lisa Chang Partner: Port Gamble Indian Commission	•		

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

Office of Environmental Assessment

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
Inreach Project – Meet with each unit within OEA (including our Manchester Environmental Laboratory Director) and determine where climate science can be used in our work for programs: e.g., EJ related apps and heat stress/vegetation; riparian setbacks and hyporheic flow models; TMDL models; Any modeling involving temperature or flow terms.	All	R10 Strategic Alignment plan		R10 Lead: Mike Cox Partners: POCs in Offices	•	•	•
Regional Outreach/Training – Continue to brief offices on vulnerabilities and tee up discussions where climate science can be used in decisions.	All	R10 Strategic Alignment plan		R10 Lead: Mike Cox Partners: POC in offices	•	•	•
Coordination with other federal agencies by participating on Climate Change Cooperative	All	R10 Strategic Alignment plan		R10 Lead: Mike Cox; Partners: Other federal agencies	•		
Support Pacific NW Landscape Conservation Cooperative - Steering Committee – OEA Director, Sci TEK subcommittee – CC Science Advisor	All coastal & marine-related	R10 Strategic Alignment plan		R10 Leads: Joyce Kelly an; Mike Cox; Partners: NPLCC participants.	•		
Participate on the National Tribal Science Council, and support actions related to climate change and tribes	All	National Tribal Science Council	Goal 1.	R10 Lead: Lon Kissinger Partners: RTOC	•		

**EPA Region 10 Climate Change Adaptation
Implementation Plan**

June 2014

Office of Compliance and Enforcement

	Vulnerability	Relevant Agency Direction	Relevant EPA Goal	R10 Lead/ Partners	Linked to		
					Tribes	Sustain-ability	EJ
Climate change may have more impact on overburdened communities as these communities, due to various concerns, adapt less well than other communities. OCE is using an Environmental Justice Screening tool to identify regulated facilities located in these overburdened communities. This tool was nationally developed to screen for communities with environmental justice concerns for implementation in various EPA programs.	All	R10 Strategic Alignment plan	Goal 5	R10 Lead: Anne Dalrymple Partners: Running Grass			•
Permitting Class I Underground Injection Control (UIC) Wells in the North Slope of Alaska. The permafrost in the North Slope of Alaska has been identified as a vulnerable resource. In substitution for retention ponds used to store oil and gas industry’s drilling wastes, the UIC program continues to permit several Class I wells for underground injection of those wastes. This reduces the need to establish waste retention ponds on the increasingly vulnerable permafrost.	Permafrost thawing.	R10 Strategic Alignment plan	Goal 5	R10 Lead: UIC Compliance Team Partners:	•		
Continuing to support the Regional Support Corps by deploying staff for varying emergency response efforts (e.g. Hurricane Katrina).	All	R10 Strategic Alignment plan	Goal 5 and Operations and Facilities.	R10 Lead: Wendy Adams Partners: Ann Williamson			
Continuing to look for opportunities to encompass green infrastructure as part of settlement agreements. An example of this is the City of Seattle, Washington and King County, Washington CSO settlement agreements. These settlements allow for the City of Seattle and King County to substitute green infrastructure projects for gray infrastructure projects (e.g. green roofs, permeable pavements, urban gardens).	All	R10 Strategic Alignment plan	Goal 5	R10 Lead: Depends on the case. Partners:		•	

Appendix D: Comparison of Vulnerabilities and EPA Region 10 Existing Actions

Appendix D compares the vulnerabilities identified in Section 2 and Appendix B with the existing actions identified in Section 3 and Appendix C. This comparison provides valuable information as EPA Region 10 evaluates how to best proceed to integrate climate change into the programs.

Goal 1: Taking Action on Climate Change and Improving Air Quality

Vulnerability	Action(s)
Increase in tropospheric ozone pollution may occur in certain areas due to increased average summertime temperature	No specific existing actions.
Increase in air toxics from anthropogenic sources is uncertain due to variability in effects of temperature increase on individual air toxics.	No specific existing actions.
Increase in particulate matter levels is occurring now and is very likely to increase due to increased frequency or intensity of wildfires due to increased summertime temperatures, prolonged droughts, and decreased soil moisture.	No specific existing actions.
Indoor air quality is very likely to be impacted, especially in Alaska, due to changes in precipitation, extreme temperatures, more frequent wildfires, and severe weather events.	Develop and host training for professionals (housing, medical, schools) on making indoor environments healthier for the most vulnerable. Assist Tribes to build capacity and knowledge and assess and address air quality concerns including those related to climate change through the Regional Clean Air Act Grants.
Stratospheric ozone layer is likely to be impacted in Alaska due to climate change effects	No specific existing actions.
Increased rate and deposition of sulfates, nitrates, and mercury is uncertain due to changes in precipitation patterns.	No specific existing actions.

Goal 2: Protecting America's Water

Vulnerability	Action(s)
Drinking water, wastewater, stormwater, and agricultural infrastructure is likely to be impacted by increased heavy precipitation, more frequent flood events, storm surge, coastal erosion, and drought.	Work with the State of Alaska to identify alternative technologies for providing first time service to unserved homes in a more sustainable way compared to a traditional piped system. Work with the Water Sense program to encourage water efficiency in homes, landscaping and commercial buildings with a focus on new homes.

Vulnerability	Action(s)
	Continue implementing the Sustainable Energy Management Program with a Western Washington cohort of drinking water and wastewater utilities.
Impacts to freshwater fisheries is occurring now and likely to increase due to earlier stream runoff and scouring of streambeds due to earlier snow melt, decreased summer stream flows and increased steam temperatures, and longer periods of low stream flow.	Continue with pilot program examining how to integrate climate change in an ongoing TMDL by examining how temperature can be improved in the Nooksack watershed in order to support salmon restoration.
Estuarine watersheds, aquatic ecosystems, and wetlands are very likely to be impacted by sea-level rise, sea surface temperature and increasing heavy precipitation events during the winter months, and decreasing precipitation days and increasing drought intensity during the summer months.	<p>Coordinate a <i>Wetlands and Climate Change Research Meeting</i> focused on new approaches and tools to better understand, manage, and conserve wetlands in a changing climate.</p> <p>Incorporate climate change considerations into the CWA 404 regulatory program as they relate to permit reviews and compensatory mitigation.</p> <p>As resources allow, improve baseline information on wetland extent, condition and performance to inform effective adaptation to climate change.</p> <p>Integrate climate adaptation in the FFY13/14 Region 10 Wetland Program Development Grants RFP.</p>
Forest ecosystems will likely be impacted by warming temperatures and more frequent and intense drought conditions.	Through the NEPA review process ensure consideration of climate change in review of all federal projects and incorporate climate change adaptation into land management planning and other projects as appropriate.
Loss of sea ice is occurring now and will very likely increase in Alaska due to warming air and water temperatures.	No specific existing actions.
Ocean acidification is occurring now and is very likely to increase due to increasing concentrations of CO ₂ in the atmosphere.	<p>Include ocean acidification language in NEPA review comment letters as appropriate and develop template language in letters and example NEPA analyses that include ocean acidification information.</p> <p>Participate in interagency development and implementation of federal strategies through the National Ocean Council (NOC) and the National Ocean Policy Implementation Plan</p>
Change in vegetation is likely in eastern Washington and Oregon and Idaho due to pest outbreaks, invasive species, increased fire, shifts in species ranges and increased erosion, drier soils, and depletion of water.	Through the NEPA review process ensure consideration of climate change in review of all federal projects and incorporate climate change adaptation into land management planning and other projects as appropriate.

Vulnerability	Action(s)
Puget Sound: Many of these projects address multiple vulnerabilities.	<p>Support Tribal projects on climate change in Puget Sound through the National Estuary Program. A listing of those projects is included in Appendix C.</p> <p>Continue to support projects in Puget Sound related to climate change. There are several on-going projects that are highlighted in Appendix C.</p> <p>Work with the University of Washington to develop a system for visualizing and analyzing a variety of climate change-related features that are shifting with time and probability across the Region.</p>
Training and Outreach	<p>Inform and educate water program managers in the public and private sectors on climate change and water issues and EPA related activities such as the National and Regional climate change adaptation strategies.</p> <p>Work with States, Tribes, municipalities, non-profit organizations and businesses to promote the Climate Ready Water Utilities (CRWU) and Climate Ready Estuaries (CRE) Programs and new Climate Ready Resilience and Awareness (CREAT) Version 2.0.</p> <p>Support Development of a Climate Change Section in the “Green” Paper for the State Revolving Loan Funds and Annual Review Checklists.</p>

Goal 3: Cleaning Up Communities and Advancing Sustainable Development

Vulnerability	Action(s)
Remedial, removal, brownfield, corrective action or permitted sites may be impacted due to flooding, sea level risk, storm surges, extreme events, and landslides.	No specific existing actions.
Increase in work for Alaska’s Tribal and emergency response programs is occurring now and likely to increase due to thawing permafrost and changes in sea ice that leads to damage of roads, runways, water and sewer systems, and other infrastructure.	Work with federally recognized tribes in Region 10 to address landfills and unconfined open dumps which are impacted by climate change and help develop appropriate responses to these threats.
EPA Region 10, Tribal and state partners will have increasing workloads in many aspects of site and waste management as well as work related to the formation and implementation of sustainable	Work with our partners through the West Coast Climate and Materials Management Forum and our pollution prevention technical assistance providers and grants to assist in the transition to

development and materials management programs, partnerships and initiatives.	sustainable materials management processes and source reduction.
Availability of raw materials and the cost of mining and refining raw materials, producing products, transporting products, and disposing products may increase due to impacts of climate change.	Recruiting and retaining participants for the Federal Green Challenge and for the Food Recovery Challenge in support of the EPA's Sustainable Materials Management (SMM) Program.

Goal 4: Ensuring the Safety of Chemicals and Preventing Pollution

Vulnerability	Action(s)
Increased exposure and risk to hazardous chemicals is likely due to increasing extreme temperatures and heavy precipitation events, changes in storm intensities, and increasing frequency of floods.	Incorporating green remediation in corrective action decision-making and raising issues nationally regarding the potential impacts of climate change on alternative landfill covers.

Goal 5: Enforcing Environmental Laws

Vulnerability	Action(s)
Non-compliance at regulated entities may increase due to extreme weather events and changing weather patterns.	Continue to use an Environmental Justice Screening tool to identify regulated facilities located in overburdened communities. Continue to look for opportunities to encompass green infrastructure as part of settlement agreements.
Shift in regional enforcement priorities due to changes in compliance (both increased compliance and non-compliance in different sectors) and increased number of inquiries from industry about maintaining compliance due to extreme weather events and changing weather patterns.	No specific existing actions.
Increased permitting of Class VI Underground Injection Control (UIC) wells for Carbon Dioxide sequestration and Class V UIC wells for stormwater management.	No specific existing actions.
An increase in regulated industrial activities in Alaska may result as the melting of sea ice opens new areas for activities.	No specific existing actions.

Facilities and Operations

Vulnerability	Action(s)
Drinking water may be limited and an increase in demand for air conditioning is possible due to increasing drought frequency and intensity.	No specific existing actions.

Operations of Region 10 facilities may be impacted by increasing risk of floods and increasing intensity of storms.	Continuing to support the Regional Support Corps by deploying staff for varying emergency response efforts
---	--

Tribal and Vulnerable Populations

Vulnerability	Action(s)
Vulnerable population such as children, the elderly, poor, and the infirm may be at increased health risk due to increased temperatures, failing infrastructure, and extreme weather events.	<p>Support the Rural Alaska Children’s Health Initiative which works to protect children from harmful environmental exposures in rural Alaska, including factors related to climate change.</p> <p>Through work on children’s health, develop and host training for professionals in the housing, health and educational fields on making indoor environments healthier for the most vulnerable populations.</p> <p>Provide technical assistance and training to affected communities on risks associated with poor outdoor air quality (e.g., work with Tribal Air Program and convene Rural Alaska Children’s Environmental Initiative).</p> <p>Outreach/risk communication to vulnerable and economically deprived communities.</p>
Food security for native Alaskans and Tribal people in the Pacific Northwest who live a subsistence lifestyle may be at risk due to warming associated with climate change.	<p>Support Tribes to develop adaptation actions (plans), to document that impact from climate change and to engage in the collaboration with local, state and federal agencies working on broad based adaptation plans.</p> <p>Provide GAP funding as appropriate to Tribes with climate change in their GAP workplans to do baseline environmental assessments and support adaptation planning.</p>
Increased erosion of shorelines is likely to increase risk to coastal native villages due to increased intensity of coastal storms and rising sea levels.	No specific existing actions.
Decreased access to clean drinking water is very likely due to loss of permafrost.	No specific existing actions.
Reduced availability of fish and shellfish resources is occurring now and is likely to increase due to changing water conditions.	No specific existing actions.
Training and Outreach which will address all vulnerabilities.	Raise awareness by providing educational outreach, training, and webinars to Tribes and work with the Institute for Tribal Environmental Professionals on tribal climate change adaptation models and resources.

Training and Outreach (supports all the goals)

Vulnerability	Action(s)
General training and outreach that supports all the goals and programs	Provide outreach/trainings to increase awareness of climate science to regional staff, and work with staff to incorporate climate science into their work programs. Communicate with the public about hazards posed by climate change and actions being taken by the EPA to address climate change. Coordinate with other federal agencies by participating on Climate Change Cooperative and supporting the Regional Landscape Conservation Cooperatives.

Appendix E: EPA Region 10 Approach for Measuring Success

Several key steps to developing the Region 10 approach to meeting our Strategic Alignment Plan, measuring our progress, and adapting as we go are discussed below. In Region 10 we have identified a point of contact (POCs) for each of our offices to assist with developing the Implementation Plan and they will have a critical role in collecting measures from their offices.

Collate the measures and reporting requirements for the existing actions.

Section 3 identifies existing actions that Region 10 has underway. Many actions are part of the Region 10 Strategic Alignment Plan and SMART (Specific, Measurable, Attainable, Relevant and Time-sensitive) and some may have measures associated with them. These available measures will be collated. For all other actions, we will seek clarification through our POC network on the status of development of SMART measures and how to prioritize completion of the SMART process.

Consider developing Logic Model as the underlying framework for Measures.

Under a Logic Model, the ultimate goal is to measure changes, commonly called outcomes, which often are changes in behavior. In the figure below shared nationally by the Office of Water, goals of awareness are followed by the desired behavior that climate science is incorporated into federal policies and programs. Measures of outcomes also benefit from determining a baseline condition as well as benchmarks for success. Both of these will be considered in implementing the Region 10 approach.

The Logic Model example below is based on the following considerations:

- Diagram/Text illustrating the relationships among program elements
- Identifies key activities, “players”, and expected results
- Identifies program span of control and external influences
- Span of control: Region 10 only has direct influence over key activities & outputs

The model is developed keeping in mind that:

- To meet ultimate goals, Region 10 will seek to change the attitudes, knowledge, and behavior of others (outcomes).
- The challenge of the measurement approach is to balance output vs outcome measurement.
- In order to obtain Buy-In we will clearly define the purpose of the measurement effort to staff (how will the information be used) and minimize staff time needed to report the measures.
- We will need to address Measurement “apprehension”: Programs recognize progress toward outcomes is important, but hesitate to be held “accountable” for things outside their direct control.

Consider existing climate vulnerabilities in refining/selecting Measures.

For climate change adaptation, successful adaptation would be measured against conditions we do not expect to face for several decades. However, some conditions are occurring now and actions in response to these conditions are ones where meaningful measures of outcomes could be generated. In Region 10, particularly Alaska, we are seeing accelerated changes that are documented in our vulnerability analysis. And, in Puget Sound, ocean acidification is already affecting larval cultures of oyster growers.

Include other considerations in refining/selecting Metrics:

How many measures are too many?

How “measureable” are the metrics (precision of language, access & availability of data)?

Output (short term) vs. Outcome (longer term) Focus

Challenges to Analysis:

How will reporting and analysis take place (process)

How information can/will be presented to meet the needs of key stakeholders (utility)
Retaining the flexibility to modify the measurement framework as the program “learns” vs. need
to retain core metrics for comparability.

Learn from other regions and the national program.

The key areas Region 10 will look for concerning measures are specific benchmarks/ commitments, ease of reporting, matching with national and regional reporting requirements, ability to adapt/adjust measures in the future, how closely measures relate to outcomes, and how other efforts have developed measures based on immediacy of vulnerabilities (for example, how hurricane Sandy and other recent extreme events have shaped measures developed for the east coast).

How to track and report progress

- Consider an annual *Highlights of Progress* document that is excerpted from the existing Region 10 reporting requirements and provided in a useful format common to other regions and national programs
- Consider how our strategic action contacts would report internally on adaptive management phase, with guidance provided from the Climate Change Science Advisor
- Region 10 Strategic Alignment could include an adaptive management phase at the Goal level in Highlights of Progress.
- The Climate Change Science Advisor will use the Evaluation and state of management phase to:
 - Inform any needed changes to the Region 10 Climate Change Adaptation Strategy.
 - Identify appropriate performance measures for measuring the effectiveness of the Strategy.

Document regional program awareness and use of climate science even as we develop measures.

Even without a logic model structure in place for climate change adaptation actions, in Region 10 we are seeing awareness of the availability and use of climate science increasing, and can begin to document this trend. An example is awareness and use of climate science and tools in our Office of Water and Watersheds TMDL program. For approximately the past two years, we have been conducting an ongoing pilot project where we have been incorporating climate science into an ongoing temperature TMDL. As follow-on to this process, the TMDL unit in March 2013, held an internal demonstration of where to find downscaled 7Q10 flow data projections under climate change scenario models on an interactive website. Similarly, our regional wetlands program led (co-sponsored with our Region 10 Science Steering Council) a workshop on new tools to assess the impact of climate change on wetlands.

Office of Water, Logic model example:

EPA Region 10 Climate Change Adaptation Implementation Plan

June 2014

