

Appendix A: Comprehensive List of Adaptation Strategies

ECOSYSTEMS Adaptation Strategies

E-1: Enhance efforts to encourage breeding and planting of drought tolerant, resilient plant species					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
20	Awareness	Near-term	Agricultural/Forestry Sectors, Educational Organizations	<i>Highly adaptive, feasible, in line with political and social goals</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify most drought tolerant, resilient plant species for the region.
- Work with partners to develop and distribute education materials to homeowners, renters, and businesses.

E-2: Incorporate climate change more explicitly into comprehensive plans and Shoreline Master Programs (SMP)					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19	Planning	Near-term	County and City Governments	N/A	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Research sample language from other regional and national efforts. One example is the San Juan Islands- http://www.sanjuans.org/documents/Loring_2014_sea_level_rise_regulatory_review.pdf.
- Use best available climate change projections and share relevant information with County and City governments in region.
- See “Planning Language Examples for Climate Resiliency” document in section **Supplementary Information: C** for more details.
- Other relevant and critical plans that would benefit from climate change planning include: functional plans, strategic plans (especially those of Ports, PUDs, and non-profits), and comprehensive schemes.

E-3: Enhance promotion of agricultural best management practices to include future climate conditions

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Sectors of Co-benefit
19	Awareness	Immediate	Agricultural Sector, Educational Organizations	<i>Highly adaptive, feasible, in line with political and social goals</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Collaborate with Clallam Conservation District, Jefferson County Conservation District and Washington State University to identify priority BMPs, and lessons learned from implementation efforts.
- Identify practices most relevant to climate change impacts such as sustaining soil moisture and health, erosion control, conservation irrigation, diversity of crop species, incorporation of efficient water use technologies.
- Develop educational material about best practices and share with those in agricultural sector.

E-4: Update municipal codes to account for enhanced fire risk at forest/residential interface where needed

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19	Policy	Near-term	Local Governments	<i>Highly adaptive, feasible, in line with political and social goals</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Use education, incentives, and building codes to minimize fire risk, particularly in forest/residential interface.
- Enforce setbacks on building permits in forested areas.
- Update existing hazard analyses that incorporate historical climate variables (such as the Clallam County Community Wildfire Protection Program, 2009) with temperature and precipitation projections for a chosen climate change scenario.
- Review existing hazard analyses (such as the Clallam County Community Wildfire Protection Program, 2009) for strategies to mitigate the wildfire risk, and assess their continued viability with increased wildfire risk.

E-5: Increase regional capacity for water storage (preferably with natural systems)					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Long-term	Multi-stakeholder	<i>High need for additional capacity but facing numerous political barriers</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create water storage and usage options at all scales (recharge, mitigation, irrigation).
- Leverage natural systems where possible (wetlands, rainwater collection).
- Explore innovative technologies for water storage (e.g., bladders, engineered wetlands).

E-6: Encourage FEMA to incorporate climate change in rate maps and guidance					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Long-term	State and County Governments	<i>A way to incentivize adaptive measures taken by homeowners in the face of climate change, though FEMA's processes for updates are lengthy and slow.</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Update scope of flood maps to reflect changing risk associated with climate change (e.g. revisions to frequency of 100 year flood events).
- Update rate maps to reflect areas of continued or emerging risk to flooding under climate change.
- Hold workshop or training to educate residents and businesses on changes.

E-7: Develop graphical tool to illustrate climate impacts					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17.5	Planning	Near-term	Multi-stakeholder	<i>Complexity will depend on the approach and type of impact modeled</i>	<i>Water Supplies Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with key stakeholders to understand their needs and desires for a graphical tool. Consider applying existing graphical models (e.g. sea level rise) to areas of interest. Alternatively, could devise new combinations of models to graphically demonstrate climate impacts.
- Secure funding, if needed, to create tool.

E-8: Update financing policies for development in high risk areas

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Policy	Medium-term	Banks and Insurance Groups	<i>This action would remedy an inappropriate incentive to build in high-risk areas, though political support would be difficult.</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with banks to remove mortgage subsidies (e.g. loans) for areas with high climate change impact risk.
- Work with insurance industry to realistically incorporate risk into future policies and remove subsidies.
- Educate homeowners about the changes.

E-9: Enhance efforts to incentivize use of native plants landscaping in residential, commercial, industrial settings

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Awareness, Policy	Near-term	Local Governments and Private Sector	<i>Very feasible, low cost</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop financial, regulatory, or other incentive program to promote greater use of native plants at homes and at industrial / commercial sites.
- Integrate regulations requiring the use of native plant use into building codes.
- Provide incentives for removing lawns and invasive species and replacing them with native plans.
- Collaborate with Clallam Conservation District, Jefferson County Conservation District and local native plant societies on their efforts to sell affordable native plants.

E-10: Utilize low cost citizen science monitoring and analysis approaches and technologies

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Awareness	Near-term	Research Institutions, Non-profit Education Centers, Citizen Scientists	<i>Highly adaptive, feasible, and in line with political and social goals.</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop a citizen science program.
- Host trainings for interested individuals. Including detail about monitoring and analysis specific to emerging climate change impacts on the peninsula, such as: the presence of invasive/migrating fish species, monitored through trace DNA molecular analysis of seawater collected by citizen scientists.

E-11: Increase funding for harmful algae bloom monitoring

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16.5	Awareness	Near-term	Public Health Departments and Research Institutions	<i>Highly adaptive and feasible</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work to identify or develop environmental predictors of harmful algal blooms.
- Enhance public health engagement involving beach closures and response to biotoxin events.

E-12: Complete survey of sensitive submerged habitats and the species that utilize them

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16.5	Awareness	Medium-term	Research Institutions, Citizen Scientists	<i>Low social/political feasibility, would address the ecosystem wide impacts</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Inventory and monitor submerged habitats that may be affected by rising sea levels and ocean acidification.
- Promote preservation and restoration of submerged native aquatic vegetation for management of nutrient loading.
- Identify potential future habitats and protect species using or reliant on the habitat.

E-13: Enhance efforts to restore and develop wildlife corridors					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16.5	Planning	Medium-term	Multi-stakeholder	<i>Technically feasible, but with unknown cost and political support</i>	Water Supplies

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Oversee wildlife corridors (acquire, restore, manage) along floodplains/ riparian buffers to ensure “conductivity” along rivers.
- Create an interconnected network of green spaces to support biodiversity and watershed-based water quality management.
- Acquire and preserve existing vegetated, unprotected areas adjacent to river systems.

E-14: Strengthen enforcement on illegal shoreline uses					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Policy	Near-term	City and County Governments	<i>This is an action that is already legally required, need is to analyze existing enforcement failures, and staffing limitations</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Enforce professional license consequences for contractors/ developers.
- Remove financial incentives associated with illegal shoreline uses.
- Enforce required real estate disclosures.
- Enhance political will through effective messaging of enforcement rationale.

E-15: Restructure rural water and sewer systems where needed					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Planning	Medium-term	Local Governments and Community Groups	<i>Politically difficult to accomplish.</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Bring additional rural areas on-line to centralized systems.
- Evaluate decentralized sewage treatment in neighborhood clusters to transition users away from individual septic tanks.

E-16: Develop community climate action plans (if not already in place)					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15.5	Planning	Near-term	Local Government and Community Groups	<i>Highly adaptable, some political barriers</i>	Water Supplies, Critical Infrastructure

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify key stakeholders to assist with developing climate action plans, which can be useful tools for planning a municipality’s or organization’s overall strategy for climate change, including reducing greenhouse gas emissions as well as preparing for the impacts of climate change. This climate adaptation plan can help initiate this work.
- Secure funding to undertake appropriate planning processes and develop community climate action plans. If funding is not feasible, consider using volunteers (as Port Townsend / Jefferson County did) to complete plans.
- Developing a climate action plan may help acquire capital funding at the state level for infrastructure and economic development projects (<http://app.leg.wa.gov/rcw/default.aspx?cite=70.235.070>).
- The WA state departments of transportation, commerce, ecology and health are developing joint webpages and data resources to help create resilient, transportation efficient communities. This effort is carried out under the Governor’s Exec Order 1404. Staff at WSDOT and Commerce are available to coach community planners interested in conducting their own qualitative climate change vulnerability assessments (using WSDOT and Federal Highway’s framework):
<http://www.commerce.wa.gov/Services/localgovernment/GrowthManagement/Growth-Management-Planning-Topics/Climate-Change-and-Energy/Pages/Climate-Change-Adaptation.aspx>

E-17: Add climate impact overlays to existing “Critical Areas”					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15.5	Planning	Medium-term	City and County Governments	<i>Difficult to devise and implement, but would synthesize a range of climate variables; staffing may be a limitation</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Review current land types for vulnerabilities to climate change (e.g. wetlands or areas in the coastal flood risk zone).
- Devise new labels for types of land with climate impact overlay.
- Add specific building/protection requirements to enhance resilience.

E-18: Support and enhance watershed and nearshore habitat restoration

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15.5	Policy	Near-term	Multi-stakeholder	<i>Adaptable and technically feasible with moderate political support and community co-benefits</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify and prioritize sites in need of habitat restoration.
- Create policy to ensure the restoration of key areas.

E-19: Monitor and analyze climate change impacts at salmon stream restoration sites

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15	Research and Awareness	Near-term	Research Institutions and Citizen Scientists, Salmon Recovery Organizations	<i>Highly adaptive, feasible, potentially facing barriers with political and social goals</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify appropriate research partners.
- Develop research and monitoring protocol that includes the monitoring of variables such as temperature, turbidity, pH, and flows.

E-20: Decrease non-climate ecosystem stressors

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15	Awareness	Near-term	Multi-stakeholders	<i>Immediate management strategy, difficult to implement</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify appropriate actions that other communities have taken.
- Educate residents, businesses, and major landowners about needed changes. Examples of possible changes include decreasing nutrient and pollution inputs to the nearshore environment.

E-21: Transition away from use of biosolids and industrial fertilizer on agriculture and forestry lands

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
14.5	Awareness	Medium-term	Agriculture and Forestry Sector	<i>Unknown cost, political barriers</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Delivery of nutrients and organic carbon from land can exacerbate Ocean Acidification: <https://fortress.wa.gov/ecy/publications/documents/1201015.pdf> , pg. 11.
- Identify alternatives to the use of biosolids and industrial fertilizer.
- Educate agricultural and forestry sectors.

E-22: Designate and prioritize funding for additional land designated for agriculture

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
14.5	Planning	Medium-term	Multi-stakeholder	<i>N/A</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify land that could be prioritized for agriculture.
- Identify funding sources that could be used to assist in transitioning land to agriculture use.

E-23: Develop a funding program appropriate for acquisition of high-risk structures in coastal or riverine flood zones

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
14	Policy	Long-term	Multi-stakeholder	<i>High cost/benefit opportunities, difficult social and political barriers</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify high-risk structures in coastal and/or riverine flood zones.
- Identify sources of funding, such as FEMA, to purchase high-risk structures for demolition or flood proofing.

E-24: Create funding mechanism for conservation projects in Clallam County

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
14	Policy	Medium-term	Multi-stakeholder	<i>Unknown overall cost and potentially low political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Potentially enact “Conservation Futures Tax”, similar to other WA counties.
- Create educational materials to let people know about funding mechanisms.

E-25: Provide guidance on right “timeline” for erosion buffers period (50, 75, 150 years) and setback distances (50ft to 200ft) that account for changing climate conditions

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
13	Planning	Medium-term	Local Government and Community Groups	<i>Difficult to implement and enforce socially and politically</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Compare and contrast existing buffers with range of climate change risk projections.
- Select level of risk planning entity is willing to assume over project lifespan.

E-26: Integrate climate change projections into salmon hatchery planning

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
12.5	Planning	Medium-term	Salmon Hatchery Managers	<i>Unknown technical feasibility and overall ability to adapt to climate change</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Explore emerging salmon hatchery technologies and management relevant to climate change impacts such as high temperature and altered river flows.

E-27: Identify and monetize environmental services

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
12	Awareness	Medium-term	Research Institutions and Governments	<i>Technically feasible and politically challenging</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Recognize the economic benefits of assessing a “triple-bottom line” and communicate this to stakeholders.
- Look at what others have done to monetize environmental services and apply that technique to those services available in the region. Examples include the Earth Economics report: “Nature’s value in Clallam County” - http://wdfw.wa.gov/grants/ps_marine_nearshore/files/ee_clallam_county_report_2013.pdf.
- Create a mechanism for compensating landowners for the environmental services maintained on their property.

E-28: Inventory and then prioritize shoreline and watershed areas appropriate for defense and retreat					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
11	Planning	Medium-term	Research Institutions and Local Government	<i>Politically and socially difficult</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify key shoreline and watershed areas in need of defense.
- Prioritize areas based on criteria such as need, available funding, political support, and upland assets.
- Research and secure funding for either protection or retreat.

E-29: Re-energize efforts to reduce stressors to salmon stream habitats					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Awareness	Near-term	Multi-stakeholder	<i>Existing attention and structure for salmon restoration. Many current stressors to address.</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Recognize existing efforts undertaken by Tribal, Federal, State, and Local entities to identify lessons learned and opportunities for participation.
- Organize convening of key local stakeholders to discuss stressors and possible solutions to restoring salmon stream habitats. Ongoing stressors include: urbanization, sedimentation and pollution of streams, changes in streamside vegetation, erosion due to land-use practices such as road building and timber harvest, undersize culverts on fish streams, and the draining of wetlands.

E-30: Incentivize agricultural water conservation					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Near-term	Multi-stakeholder	N/A	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Subsidize new on-demand water technologies.
- Encourage drought tolerant crop varieties.

E-31: Reduce local land-based pollutants that enhance acidification in marine waters

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Awareness	Medium-term	Multi-stakeholder	<i>Staffing limitations for monitoring</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Reductions could be accomplished through strengthening existing local source control programs.

E-32: Integrate climate change projections into shellfish hatchery planning

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Planning	Medium-term	Shellfish Hatchery Managers	N/A	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Explore emerging shellfish hatchery technologies; hatcheries can treat water, hang matrices of algae and shellfish to improve water quality, and select species for survival under likely changing climate change.

E-33: Utilize climate sensitive tree species in riparian buffers

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Medium-term	Forestry and Conservation Groups	N/A	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Partnerships with the Olympic National Forest tree orchard could be strengthened to maintain genetic diversity and make climate sensitive tree species publically available.

E-34: Replace under-sized culverts to anticipate climate influenced run-off events					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Medium-term	Operations and Maintenance Departments	<i>State is required to replace culverts that impede salmon passage, has an ongoing effort. State does not always have funding for partnering.</i>	<i>Water Supplies, Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Assess existing vulnerable culverts and levels of climate change run-off risk.
- Select level of flooding "risk" planning entity is willing to assume.
- Design culverts to withstand future projections of change and install at key locations.
Coordinate culvert replacement upstream and downstream between jurisdictions (ALL culverts must function properly to gain benefits).
- Track progress of WSDOTs fish passage project (<http://www.wsdot.wa.gov/Projects/FishPassage/>) for opportunities to partner on culvert replacement.

WATER SUPPLIES Adaptation Strategies

WS-1: Enhance education on drought and water supplies issues for the peninsula					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
20	Awareness	Immediate	Multi-stakeholder	<i>Highly adaptive, feasible, in line with political and social goals, low cost</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify and implement appropriate educational activities. Options could include: tour of existing facilities/locations, targeted messaging around conservation, workshops and peer exchange, enhanced research partnerships.

WS-2: Adopt new regulations requiring water-efficient appliances					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
20	Policy	Medium-term	State Governments	<i>Technically and politically feasible, but potentially limited ability to influence state regulations</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with state legislators to revise regulations.

WS-3: Promote and incentivize smart irrigation technologies for agriculture					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
20	Awareness	Medium-term	Agriculture Sector	<i>High cost, technical and political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Promote benefits of decreasing “consumptive use” of water.
- Utilize Washington State University’s “CropSyst” software which, among other things, models cultivar water needs amount and timing (http://modeling.bsyste.wsu.edu/CS_Suite_4/CropSyst/index.html)
- Conduct assessment of existing irrigation issues: <http://drought.wsu.edu/tools-resources/irrigation/>
- Develop and distribute educational materials about smart irrigation technologies.
- Consider working with agricultural sector to host education workshop or convening related to water conservation.

WS-4: Identify monitoring needs and enhance water supply monitoring					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19	Awareness	Near-term	Multi-stakeholder	<i>Highly adaptive, feasible, in line with political and social goals, low cost</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create a data clearinghouse for water information from universities, cities, non-profits, others, and include both information resources and information needs (potential home is the NOPRCD).
- When and where it is needed, install additional flow and snowpack sensors.
- The data from all of these could be used to identify water storage sites, establish baseline of use and availability, and to enhance system management.

WS-5: Enhance efforts to educate home and business owners on the value of on-site water conservation, retention, and catchment					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Awareness	Immediate	Multi-stakeholder	<i>Highly adaptive, feasible, in line with community goals, low cost</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create outreach materials to explain to home and business owners the value of on-site stormwater retention, rainwater catchment, Low Impact Development (LID) techniques, and vegetation management to reduce water usage, including the availability of incentives, and value to the community and ecosystems.
- Educate on the broader issue of the need for water conservation, retention, and catchment.
- Decommission “forgotten” wells on properties served by public water.

WS-6: Continue to study ways to enhance water storage and groundwater recharge					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Near-term	Water Utilities and Local Governments	<i>Highly adaptive, feasible, in line with political and social goals, low cost</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Consider enlarging existing storage and identify locations for new structures.
- Identify off stream storage including conveyance, groundwater infiltration rates, and potential for active recharge of groundwater resources such as infiltration wells.
- Consider potential for “banking” water during high flow events for use in low flow times (Port Angeles and Peninsula College have data on this).
- Note that WRIA 18 has recently researched (2014) storage and recharge opportunities in the Dungeness River area, contact Washington Water Trust for details.

WS-7: Encourage forestry practices promoting water retention within the watershed

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Awareness	Medium-term	Forestry Sector	N/A	Ecosystems

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify forestry practices that promote upstream water retention and educate individuals about the practices.
- Consider integrating water retention into forestry practices permits.

WS-8: Research or develop model to assess sea level rise and saltwater intrusion to groundwater

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Medium-term	Local Government, PUDs	N/A	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Enhance seasonal ground water level monitoring.
- Research what other communities are doing to assess sea level rise and salt water intrusion into groundwater.

WS-9: Improve forecasting for future water supply and demand

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Medium-term	Water Utility Managers	<i>Politically feasible but technically difficult</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Improve forecasting tools for matching expected demand (including expected growth) with models of water availability including climate change.

WS-10: Map water retention values for ecosystems

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Near-term	Multi-stakeholder	<i>Technically and politically feasible</i>	Ecosystems

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop methodology and implement to create a valuation of the water retention services a landscape provides (as opposed to engineering storage systems).
- Recognize the economic benefits of assessing a “triple-bottom line” and communicate this to stakeholders.
- Look at what others have done to monetize environmental services and apply that technique to those services available in the region. Examples include the Earth Economics report: “Nature’s value in Clallam County” - http://wdfw.wa.gov/grants/ps_marine_nearshore/files/ee_clallam_county_report_2013.pdf
- Create a mechanism for compensating landowners for the environmental services maintained on their property.

WS-11: Create an outreach, education, and incentive program for private well users					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Awareness	Near-term	Multi-stakeholder	<i>Technically and politically feasible, unknown funding resources</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop general awareness / educational materials related to water use issues including what aquifer the wells pull from, appropriate conservation techniques for the region, relevant incentive programs.

WS-12: Develop or increase incentives for low-water use landscaping					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Awareness	Near-term	Multi-stakeholder	<i>Highly adaptable, low cost, potentially facing political barriers</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop outdoor planting incentives (rebates or grants) for native, drought tolerant plants, and rainwater-capturing landscapes.

WS-13: Adjust rate structure for water use to incentivize conservation where needed					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Policy	Medium-term	Local Governments	<i>Somewhat adaptable to climate change impacts, marginally politically and socially feasible</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create inverted block rate structure for water use, or support those rate structures already in place.
- Consider developing time of use pricing.
- Price water on a sliding scale thereby allowing differential charging for certain uses.

WS-14: Develop code and infrastructure for a municipal reclaimed water system

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15	Planning	Long-term	Local Governments	<i>High cost for new infrastructure, somewhat technically and politically feasible</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Collaborate with WA Department of Ecology on their reclaimed water rules (accepting comments on new rule promoting reclaimed water in fall 2015).
- Research codes used by other communities.
- Draft code and develop infrastructure for municipal reclaimed water systems in the area.

WS-15: Enhance residential water conservation through incentives and outreach

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15	Awareness	Near-term	Multi-stakeholder	<i>Highly adaptable, low cost, potentially facing political barriers</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Extend incentives (rebates or grants) to use of drip irrigation, rain barrels and cisterns, and other residential conservation methods.

WS-16: Encourage the State to lift restrictions or permit grey water reuse

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
13.5	Policy	Medium-term	Local Governments and Community Groups	<i>Low cost, marginally politically and socially feasible</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Investigate existing recommendations for grey water use by WA State Department of Health: <http://www.doh.wa.gov/Portals/1/Documents/Pubs/337-016.pdf>
- Lobby government to make necessary changes (potentially revising building codes).
- Create an outreach and incentive program encouraging grey water systems within a property.

WS-17: Create a smart grid water use system and share data with consumers to increase conservation

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
12	Policy	Medium-term	Water Utility Managers	<i>High cost, lacking political feasibility</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Utilize smart grid technologies that use real time data; the data is available today but displaying the information to users real time is necessary to encourage them to take conservation measures and identify system leaks. Currently required to meter, but not report real time data.
- At water plants, have SCADA (Supervisor Control and Data Acquisition), which is a hardware/software combination, gives turbidity, pH at the intake/treatment source.
- Track water use happening in real time through reduction in water storage levels.

WS-18: Pilot programs for sub-basin management within water rights laws

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
12	Policy	Medium-term	State and County Governments	<i>High cost, political barriers</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with state and county governments to outline criteria associated with a pilot program. WA State Department of Ecology has pilot programs with sub-basins managing water rights (sub-basin understandings of inputs/ outputs, conservation/re-use), and pilots have been recently approved in Dungeness.

WS-19: Streamline the administrative process for adjusting water rights

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
11	Policy	Medium-term	Local Governments, Community Groups, Department of Ecology	<i>Low cost, minimal political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Adjustment could include: the ability to move the point of withdrawal within a service area to minimize impacts; put water rights in trust; trade water rights (permanent vs. temporary).
- Local governments can lobby and collaborate with the Department of Ecology to make these changes. The State has demonstrated examples in eastern Washington.

WS-20: Direct wastewater reuse between municipalities and industries

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
11	Policy	Long-term	Water Utilities and Local Government	<i>Technically and politically feasible</i>	<i>Critical Infrastructure</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Direct engagement between municipal & industrial water users – evaluation of water reuse would start by studying economics, needs, and capacity.
- Explore potential for connecting water treatment plant in Port Angeles or Port Townsend with the paper mill. In light of the current drought situation in the summer of 2015, the economics of this may be shifting.

WS-21: Explore opportunities for artificial recharge of groundwater aquifers

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
11	Planning	Long-term	Multi-stakeholder	<i>Minimally adaptable, high cost, facing technical and political barriers</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Research options, including infiltration basins, injection wells, and artificial lakes/ponds.
- Assess water sources (reclaimed water, stormwater, peak river flows).
- Collaborate with WA Department of Ecology on their reclaimed water rules (accepting comments on new rule promoting reclaimed water in fall 2015).

WS-22: Research the development and construction of a desalination plant

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
9	Planning	Long-term	Local Governments	<i>High cost, subject to significant political and social barriers</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with partners to research feasibility and cost associated with desalination plant.

WS-23: Research regulatory framework on water hauling/delivery

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Planning	Near-term	Multi-stakeholder	N/A	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Research examples from other communities. One example is Chimacum, where they are already receiving water delivered to the area with no regulations in existence.
- Identify the best practices and gauge how they would apply to the North Olympic Peninsula.

WS-24: Enhance management of septic water quality issues					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Medium-term	Local Government	N/A	Ecosystems

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Modify on-site septic requirements to anticipate impaired performance as water table levels rise, such as determining the feasibility of replacing traditional septic systems with mound systems or holding tanks.
- In problematic areas known for septic system failures, evaluate alternative wastewater treatment solutions, particularly for properties in areas vulnerable to sea level rise.

WS-25: Manage/enhance upstream watersheds					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not scored	Policy	Medium-term	Multi-stakeholders	Highly adaptable, technically and politically feasible	Ecosystems

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Slow down surface water flow to increase water retention rates and infiltration. This will improve water quality as slower runoff means extra filtration.
- Consider increasing buffers and using bioswales so that it recharges into the soil.
- Identify, protect, and restore natural recharge areas including floodplains and wetlands.
- Minimize runoff through: Low Impact Development (LID), forest and vegetation management, floodplain management; and reestablishment of natural surface water off-stream retention ponds and storage areas. Retention ponds could be used for storing water for agriculture while also restoring important waterfowl habitat and increasing groundwater recharge.
- Create new wetlands or wetland banks for water storage and filtration purposes. Utilize historical ditches where appropriate. In the Dungeness area it was found that when some ditches were tight-lined (solid pipes were used to channel the water), the wells went dry, indicating the ditches were good sources for recharging the aquifer. Roadside ditches could be rerouted and widened to promote infiltration.

CRITICAL INFRASTRUCTURE Adaptation Strategies

CI-1: Update emergency management and response planning to include climate change where needed					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
20	Planning	Near Term	Emergency Managers	<i>Highly adaptive with very good political support</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Prior to a hazard event, identify lead contacts serving vulnerable populations and coordinate actions to maximize safety and information sharing. Leads can assist and provide support during hazard events.
- Establish a network of “block captains” that can be activated to go door to door to check on the health of high-risk neighbors.
- Work with residents to create a home emergency kit that ensures that all residents have the resources they need to survive during an event. This kit should include back-up medications, rations of food, and secondary communication technologies.
- Help individual households to take their own steps to reduce flooding, such as installing rain barrels and back-up power for sump pumps.
- Expand training and education of health and social services systems/providers to identify and treat mental health problems after extreme climate events.

CI-2: Reduce inflow and infiltration to wastewater systems					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19.5	Policy	Immediate	Operations and Maintenance Dept.	<i>Current issue with high levels of political/social support but also higher costs</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify current inflow and infiltration to wastewater system.
- Draft revised inflow and infiltration standards and meet with stakeholders to review standards.
- Formalize standards and conduct education with key stakeholders to make them aware of key changes and new requirements.
- Enhance funding to accelerate repairs and replacement of critical areas.

CI-3: Update planning documents for sea level rise and flooding where needed					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19	Planning	Near Term	Multi-Stakeholder	<i>Medium and long-term issue where current planning can help reduce future costs</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create a sea level risk district for inclusion in Comprehensive Plan and promulgate new codes and code changes associated with managing for sea level risk.
- Incorporate climate change and coastal hazard considerations into building codes by increasing freeboard requirements to two feet (three feet for critical projects) above the current 100-yr flood plain as buildings are redeveloped, developed, or renovated.
- See “Planning Language Examples for Climate Resiliency” document in section **Supplementary Information: C** for more details.

CI-4: Do outreach and education on climate adaptation to build community support					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
19	Awareness	Immediate	Multi-Stakeholder	<i>Low cost but only moderate political support</i>	<i>Ecosystems Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Conduct outreach and education on climate issues and adaptation solutions to multi-stakeholder groups of residents, businesses, and politicians. Examples include: Public outreach for opportunities in existing relevant stormwater programs (e.g. rain gardens, cisterns).
- Consider real estate disclosures of climate change risk for residential property owners.
- Establish Community Design Centers to assist property owners in designing and retrofitting infrastructure.

CI-5: Develop and utilize decision making tools related to climate change risks					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
18	Planning	Medium-term	Local Governments	<i>Highly adaptable until tools are developed then hard to change. These tools receive moderate/low political support</i>	<i>Ecosystems Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with key stakeholders to identify the types of resources, tools, and information they need to make climate-appropriate decisions. For instance, a cost analysis tool that could help the Port guide investment decisions in the face of sea level rise may be a valuable tool to develop.
- As an example, WSDOT has committed to consulting the results of its vulnerability assessment (2011) when designing future transportation improvements.
- The WA state departments of transportation, commerce, ecology and health are developing joint webpages and data resources to help create resilient, transportation efficient communities. This effort is carried out under the Governor’s Exec Order 1404. Staff at WSDOT and Commerce are available to coach community planners interested in conducting their own qualitative climate change vulnerability assessments (using WSDOT and Federal Highway’s framework):

<http://www.commerce.wa.gov/Services/localgovernment/GrowthManagement/Growth-Management-Planning-Topics/Climate-Change-and-Energy/Pages/Climate-Change-Adaptation.aspx>

CI-6: Create critical area flood mapping beyond FEMA’s historical flood data					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
17	Planning	Near-term	Multi-Stakeholder	<i>Low cost with moderate political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Cities and Counties should establish a climate change flood overlay as part of the critical area designations specific to their future flood concerns and use it to in addition to the FEMA flood maps which are constrained by only using historical data.
- Conduct education to community and developers about the change.

CI-7: Encourage soft defenses for shoreline infrastructure					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Policy	Near-term	Local Governments and Private Sector	<i>High cost with moderate political support. Rated highly for environmental benefits.</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Protect and restore natural systems along the shoreline to enhance buffer between coastal storms and development.
- Develop protective green infrastructure in front of the facilities to create a natural buffer to storm surge and flooding.
- Remove hard protection or other barriers to shoreline retreat where feasible.
- Adopt soft defense strategies, such as establishing aquatic vegetation beds, using natural or artificial breakwaters and beach nourishment, where appropriate (e.g., sensitive habitats).

CI-8: Improve on-site stormwater management practices					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Policy	Near-term	Multi-stakeholder	<i>Adaptable, high cost, and moderate political and social feasibility</i>	<i>Ecosystems Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create monetary & non-monetary incentives for Stormwater Management or re-use, including within Low Impact Development (LID) projects. Applies to residential, industry, agriculture, and forestry sectors.
- Create pilot projects to demonstrate the value of on-site stormwater management. Examples include green roofs, rain gardens, cisterns, and bioswales.
- Effective on-site stormwater management can assist in preventing roads from washing out.

CI-9: Participate in FEMA’s Community Rating System (CRS)					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Planning	Medium-term	Multi-stakeholder	<i>Less adaptable, low cost, and with moderate political support</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Dedicate a staff person to learn more about what is involved in participation in the FEMA Community Rating System (CRS): <http://www.fema.gov/national-flood-insurance-program-community-rating-system>.
- Explore and if needed, develop more stringent regulations for homeowners in flood zones, so that the community is eligible for a reduction in insurance rates.
- Implement relevant actions under the CRS to become an official CRS community.

CI-10: Enhance stormwater retention in upstream areas					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
16	Policy	Medium-term	Multi-stakeholder	<i>Marginally adaptable, high cost, and marginally politically feasible</i>	<i>Ecosystems Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Review other community policies aimed at stormwater retention.
- Draft and pass policy that uses conservation of natural ecosystems, enhance riparian buffers and land management to increase stormwater retention.
- Effective stormwater retention in upstream areas can assist in preventing roads from washing out.

CI-11: Install tide gates, “duckbill” valves for stormwater outfall infrastructure where needed					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15.5	Policy	Near-term	Operation and Maintenance Departments	<i>Less adaptive, moderate cost, and good political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Work with operation and maintenance departments to secure funding (if needed) and install Duckbill valves, which seal a pipe end but still allow water to drain, in order to reduce flooding.

CI-12: Retrofit infrastructure for coastal flooding and sea level rise					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15.5	Policy	Long-term	Local Governments and Private Sector	<i>Moderate cost, with good political support</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Retrofit existing infrastructure to deal with sea level rise (elevate buildings, etc.).
- Downtown Port Townsend will need a new underground water removal system, but in the long term may have to add fill.
- Elevate and seal utilities.

CI-13: Require education/training/monitoring for homeowners with septic systems

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
15	Awareness	Near-term	Local Governments	<i>Highly adaptive, low cost, low political support</i>	<i>Ecosystems</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Increase monitoring and enforcement for failing septic systems.
- Educate homeowners on options for re-engineering septic systems.
- Explore existing opportunities for funding that supports septic repairs (e.g. <http://www.craft3.org/CleanWater>)

CI-14: Consider hard shoreline protection in certain situations

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
14	Policy	Medium-term	Local Governments and Private Sector	<i>Less adaptable, high cost, and with moderate political support. Ranked very low on environmental benefit due to negative impacts on nearshore habitat.</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify locations where hard armoring makes sense. Key types of hard armoring include reinforced rock walls, riprap, and other shoreline protection, including seawalls. This strategy is likely cost effective for critical infrastructure, high value assets, or some urban areas. However, it was ranked very low for environmental benefit due to negative impacts on nearshore habitat such as beach scouring, limits to migration for nearshore habitat. Secure funding to install hard shoreline protections and conduct all relevant regulatory and environmental reviews.
- Implement and monitor the success of the hard shoreline protection features.

CI-15: Develop inverted block rate pricing structure for water and sewer

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
13	Policy	Medium-term	Utility Managers	<i>Somewhat adaptable, moderate cost, and very little political support</i>	<i>Water Supplies</i>

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Develop and Implement an inverted block rate pricing structure for water and wastewater use that incentivizes conservation.

CI-16: Use homeowner outreach to encourage relocation outside floodplains

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
10.5	Awareness	Medium-term	Multi-stakeholder	<i>Less adaptable, extremely low political support</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create and distribute educational materials about the risk of living in vulnerable areas such as floodplains.
- Explore creative financing programs or cheaper insurance structures to help incentivize residents to move out of vulnerable areas.

CI-17: Encourage relocation of infrastructure outside of coastal flood zone

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
9	Policy	Long-term	Local Governments and Private Sector	<i>High cost, and very difficult to achieve politically</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Create redevelopment restrictions, incentives for retreat, and building code changes with enhanced enforcement to move infrastructure from vulnerable locations.
- Determine if it is best to relocate, raise, seal or abandon any infrastructure that will sustain damage by inundation.

CI-18: Relocate Port Townsend municipal wastewater treatment plant long-term

Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
9	Policy	Long-term	City of Port Townsend	<i>High cost, and moderate political feasibility</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- While the location where the wastewater treatment plant is located is not likely to be subject to flooding until near the end of the century, the plant itself will eventually need to be repaired or replaced and this is the most cost effective time to plan for and incorporate future projections of sea level rise and changes to the coastal flood risk for the area where the plant will be located. As such, any redevelopment designs for the plant should include projections of future climate change, including sea level rise.
- Evaluate and relocate other vulnerable aspects of the wastewater treatment system such as lift pump stations vulnerable to sea level rise and storm surge.

CI-19: Adopt new flood risk management standards and guidelines					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Planning	Medium-term	Multi-stakeholder	<i>Mirrors current guidance to federal agencies</i>	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify appropriate flood risk acceptance and develop supporting standards and guidelines. Three options include:
 - Informed Science Approach*: Use the best available climate science data to determine future flood conditions, and elevate structures above that future flood level.
 - Freeboard Value Approach*: Elevate structures and facilities two feet for standard projects and three feet for critical projects above the 100-year flood level.
 - 500-Year Elevation Approach*: Elevate structures to the 500-year flood level (a flood with a 0.2 percent chance of occurring in any given year).

CI-20: Install pumps for stormwater outfalls subject to sea level rise					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Medium-term	Operation and Maintenance Dept.	N/A	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify locations where pumps would be viable. Note that pumping would address limitations of tide gates over the long term.

CI-21: Renovate Clallam Bay/Seki wastewater treatment plant					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Long-term	Local Government	N/A	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)

Key Action Steps:

- Identify desired approach - rebuild two plants, interconnect two plants, or build a pump station to the prison. Determine if it is feasible to pump sewage to the prison treatment plant if needed.
- Seek funding for desired approach. Note that system serves economically distressed community so may have adaptation funds available; some funding is potentially already available.



CI-22: Renovate Elwha lowlands vacuum sewer system					
Score	Type of Strategy	Timeframe for Implementation*	Lead Group (s)	Opportunities or Concerns	Focus Area Co-benefits
Not Scored	Policy	Long-term	Tribal Government	Location in lowlands means moving system uphill is probably the central option since the Tribe has upland properties that may be suitable.	

*Near-term (0-3 years), Medium-term (3-10 years), Long-term (>10 years)