

## Appendix C. Priority Response Strategies and Actions

Priority Response Strategies and Actions	
<p><b>1. Protect people and communities from climate change impacts.</b></p>	<ul style="list-style-type: none"> <li>• <i>Enhance core public health capacity.</i> Core public health capacity will need to be enhanced to increase surveillance, early detection, and response capabilities. Public health agencies should prepare to monitor and respond to diseases and carriers typically found in warmer climates, such as Rocky Mountain spotted fever, tularemia, and Lyme disease. Vulnerable and at-risk communities should be identified, especially for infectious diseases, heat stroke, and respiratory and cardiovascular disease caused by higher temperatures, heat waves, and smoke from more frequent wildfires. Public health agencies should raise awareness of new public health risks from climate change among health providers, health organizations, and the public.</li> <li>• <i>Enhance emergency response capacity to address increasingly extreme floods and fires.</i> State and local emergency response needs are expected to increase in flood- and fire-prone areas of the state. Police, fire and rescue, and wildland firefighting will have to prepare for increased activity, more challenging conditions, and additional costs. Populations that are vulnerable to increased incidence of floods and fires should be identified and educated about the increased risks, options to reduce risks, and appropriate responses in an emergency.</li> </ul>
<p><b>2. Reduce risk of damage to buildings, transportation systems, and other infrastructure.</b></p>	<ul style="list-style-type: none"> <li>• <i>Reduce flood damage by restoring floodplains and capturing more water.</i> As extreme storms increase, the most effective and least costly approach to managing larger floodwaters is often to enhance floodplains' ability to accommodate flood flows and using "green infrastructure" approaches to manage stormwater. Reconnecting rivers with their floodplains and providing rivers room to flow often reduces downstream flood risks and damage. Natural approaches such as wetlands and soft armoring tend to be more environmentally beneficial than levees, dams, and other "hard" approaches to flood management.</li> <li>• <i>Support local efforts to prepare for coastal flooding and storm surges.</i> Provide information, guidelines, and technical support to coastal counties, cities, and tribes to help them evaluate the risks and vulnerability to sea level rise and coastal flooding in their communities. Roads, bridges, wastewater treatment plants, sewer and stormwater systems, gas and electric transmission systems, communication systems, and other infrastructure could be at risk. Communities should consider options to reduce vulnerabilities without harming ecosystem functions.</li> <li>• <i>Consider climate change impacts when siting new development and infrastructure.</i> Consider future flood risk when planning for new growth or permitting new structures, even if the location is not currently in the Federal Emergency Management Agency's (FEMA) regulatory floodplain or critical areas designation. Ensure the building design can accommodate projected impacts and</li> </ul>

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does not increase risks for neighbors.

- *Plan for relocation if structures are damaged by floods or other impacts.* If critical structures are at risk of future flooding, communities should begin now to identify safer alternative locations for those structures. This planning will help prevent the typical response to rebuild structures in the same flood-prone location after a disaster.

## 3. Reduce forest and agriculture vulnerability to climate change impacts.

- *Enhance surveillance and eradication of pests and disease.* Pests and disease can cause significant damage and economic losses, and these problems are projected to increase as the climate warms. Surveillance can identify new outbreaks and promote rapid response that will reduce damage and costs. These efforts should be coordinated among federal, state, tribal, and local agencies.

- *Promote identification of and transition to plant species that are resilient to new climate conditions.* Support research and promote genetic diversity to ensure that agricultural and forest species living in Washington are able to survive under current and future climate conditions and emerging pests and diseases.

- *Conserve productive and adaptive farmland and forests.* Encourage local governments to adopt land use regulations and incentives to minimize conversion of farmland and forests and to support land conservation incentive programs.

- *Reduce forest and wildland fire risk in highly vulnerable areas.* Integrate wildfire management objectives with forest, shrub-steppe and grassland restoration objectives to enhance ecosystem health and resilience from pests, diseases, and invasive species that exacerbate fire risk.

## 4. Improve water management to address climate-related supply reductions.

- *Promote integrated water management in vulnerable basins.* Projected changes in streamflow and runoff patterns will more likely increase the competition and conflicts among water users. Integrated water management will address existing and future water resources and ecosystem problems affecting fish habitat and agriculture, municipal, and domestic water supplies. This approach supports flexibility and adaptability under changing hydrological conditions. Models for this work include the water management efforts in the Columbia, Yakima, and Walla Walla basins.

- *Implement enhanced water conservation and efficiency programs.* Reduce water demand, especially in water-limited basins, by monitoring water use and aggressively promoting and supporting water conservation and efficiency for agricultural, municipal, and industrial users.

- *Ensure sufficient cold water in salmon-bearing streams during critical seasons.* Increasing stream temperatures can create barriers to migration and can kill coldwater fish such as salmon, steelhead, and bull trout. Shade, increased streamflow, and other measures can keep water temperatures cool and allow rivers to continue supporting coldwater fisheries.

- *Incorporate climate change realities into agency decision-making.* Past hydrological data are an

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unreliable guide to project future conditions for water management decisions. Water resources managers will need to adapt their management and planning practice to reflect changing water availability. They need to take into account the change in timing and availability of water when planning for additional supplies, deciding whether water users may use their water rights for the amount allowed, and establishing instream flows for fish habitat and ecological purposes.

### 5. Safeguard fish and wildlife and protect critical ecosystem services that support human and natural systems.

- *Protect and restore habitat and improve the ability of species to migrate to more suitable habitat as the climate shifts.* Identify and protect areas most suitable for current and future habitat as well as the connections between habitats. Land use planning policies, guidance, technical assistance, and incentive programs are effective ways for protecting, restoring, and acquiring habitat areas that provide refuge to species under stress from climate change.

- *Protect sensitive and vulnerable species and their habitats.* Climate change will increase the stress on salmon and other culturally important species that are already sensitive or vulnerable. Climate risks and approaches to recover and protect vulnerable species should be incorporated into management and conservation plans and programs. This planning includes species recovery and management plans, water resources management plans, shoreline management plans, land use plans, and ocean management plans.

- *Reduce existing stresses on fish, wildlife, plants, and ecosystems.* Fish, wildlife, plants, and ecosystems already face an array of existing stresses from human development, habitat loss and degradation, pollution, unsustainable harvest, and invasive species. Reducing existing threats is an important and effective way to help natural systems cope with the additional pressures from a changing climate. For example, reducing stormwater pollution improves water quality and aquatic habitat, increasing the resilience of aquatic species to additional stresses from climate change.

### 6. Reduce the vulnerability of communities, habitat, and species.

- *Protect people, property, and infrastructure from coastal hazards and avoid new development in highly vulnerable areas.* Rising sea levels, more extreme rainfall, and excessive runoff may increase risks to people, property, and infrastructure from coastal erosion and flooding. Communities should identify vulnerable areas and take steps to reduce threats, while also prioritizing actions that protect habitat and natural areas. Risks to coastal communities should be incorporated into land use and shoreline management plans, and regulatory tools, incentives, and technical assistance should be expanded or developed to incorporate climate risks.

- *Prevent coastal habitat degradation and destruction and seek opportunities for upland habitat creation as sea levels rise.* Rising sea levels will cause a loss of valuable coastal habitats. As coastal flood risk increases, landowners should use natural approaches to reduce flood risks without harming species or habitat. Policies and incentives should be developed at the state or local level to reduce habitat degradation and destruction from hard armoring of coastlines. Incentives and regulatory tools should be modified or developed to guide development away from

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hazardous coastal areas to prevent costly flooding and to allow coastal ecosystems to be created in newly inundated areas.

- *Reduce shellfish vulnerability to ocean acidification by reducing land-based contributions of carbon and polluted runoff to the marine environment.* Acidification is caused by both atmospheric carbon dioxide and land-based contributions of carbon from sources such as polluted runoff and leaking septic systems. While atmospheric carbon dioxide contributions can only be slowed by reducing carbon emissions, the pace of acidification in some parts of Puget Sound can be reduced by eliminating polluted runoff, leaking septic systems, and other sources of land-based carbon in the waters.

### 7. Support the efforts of local communities and strengthen capacity to respond and engage the public.

- *Identify existing and new funding mechanisms to support adaptation work at the local level.* In some cases, climate adaptation can be integrated into existing programs with little or no cost or additional resources. In many cases, the cost of making changes and actively managing natural and built environments to cope with the impacts of changing climate may be substantial. However, these costs are far less than costs of inaction. State agencies should leverage existing federal and state funding as well as seek new sources of funding to implement high-priority adaptation projects at the state and local levels.

- *Develop an institutional structure to improve coordination and support an integrated approach.* Successful climate change adaptation cannot be accomplished by a single agency or organization. An effective structure is needed to support cross-agency collaboration, ensure implementation of cross-cutting strategies, and link efforts across all governmental agencies, nongovernmental organizations, and other interests. An improved coordination mechanism is needed to determine and provide state input on research needs and priorities, develop mechanisms to track and monitor progress in implementing the strategies and actions, and ensure new information on climate impacts and effective responses is integrated.

- *Support information-gathering on climate impacts and ensure scientific information is easily accessible.* Understanding of climate impacts and responses is growing rapidly and is continually being expanded. Tracking climate-related trends such as sea level rise, severe storms, and pest and disease invasions can help the state prepare for and respond with the least cost and disruption. Tools need to be developed to make this information accessible and useful to the public and to decision makers at all levels.

- *Engage the public in determining appropriate responses to climate change.* The state must provide leadership to ensure that communities, businesses, schools, and the public have accurate information and a forum to consider climate impacts and responses. Agencies should develop consistent messages, provide access to relevant information, and work with partners, stakeholders, and others to identify concerns and prioritize responses.

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## A. Human Health

### A-1. Protect the communities that are most vulnerable to impacts of climate change.

1. Identify people, communities, regions, infrastructure, and local economies that are most vulnerable to climate impacts. Provide tools that local health departments and communities can use to conduct community-wide assessments. Provide financial and technical support for local communities to develop and implement appropriate adaptation strategies to respond to current and future threats.
2. Enhance the capacity of state and local health organizations and communities to implement preventive actions that reduce public health risks related to climate change. The focus will be on ensuring efficient organizational structure, effective policies and programs, and adequate funding.
3. Work collaboratively with local health departments, community-based organizations, state and local planning organizations, and transportation agencies to:
  - Improve community planning and design, to support and promote healthy built environments and healthy living.
  - Expand and protect urban vegetation and open space.
  - Prevent construction of new critical infrastructure in vulnerable areas.
4. Work with state and local agencies and organizations to:
  - Enhance efforts to develop transportation options and evacuation routes to ensure safety of vulnerable people.
  - Develop and publicize shelters and responses to heat and flooding extremes.
  - Increase access to health care for at-risk populations.
  - Prepare for aftermath of extreme events.
  - Enhance preparedness for disease prevention of vector-borne and water-borne diseases following floods and storms.

### A-2. Enhance surveillance and reporting systems to monitor and support early detection of climate-related risks and swift responses to emerging health threats associated with climate change.

1. Maintain, rebuild, and increase overall efficiency of current surveillance systems—at the state level and in local health departments and health care organizations—to monitor and identify outbreaks of climate-related health diseases and illnesses.
2. Continue development of the Department of Health’s Environmental Public Health Tracking network, and focus future efforts on expanding data and health indicators linked to climate change and healthy communities.
3. Enhance surveillance and electronic reporting from laboratories to support our ability to detect emerging health issues rapidly and implement timely and effective community responses.
4. Develop meaningful data sets to better understand changes in zoonotic disease patterns and disease vectors, air quality conditions, and harmful algae blooms. This information will assist our future efforts in preparing for and adapting to climate change-related conditions affecting our

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health.

5. Develop an early warning system to identify and predict when and where a harmful algae bloom or pathogen event may occur in our marine waters. This initiative will focus on:
  - Characterizing environmental and biological factors that contribute to biotoxin or bacterial events.
  - The public health burden associated with these toxic events.
  - Potential policy and scientific solutions and/or information and data needs for mitigating human exposure from recreational, occupational, and seafood-related pathways during such events.
  - Increase collaboration between the Health and Agriculture departments on zoonotic disease surveillance improvements.

**A-3. Incorporate climate adaptation strategies into the overall context of Department of Health’s *Agenda for Change*, with a focus on prevention, early detection, and swift responses to protect people from diseases and other health threats caused by changing climate conditions.**

1. Identify, prioritize, and incorporate into health planning and regulations climate change mitigation and adaptation strategies and actions that promote and improve healthy living and reduce greenhouse gas emissions and toxic pollutants. Collaboration with local governments can help incorporate healthy living strategies into land use planning and regulations, such as compact development that concentrates growth in compact walkable urban centers to avoid sprawl.
2. Refine existing emergency response and public health preparedness planning to enable local health and emergency response agencies to:
  - Anticipate impacts of severe heat events, droughts, wildfires, and coastal flooding.
  - Develop early warning systems.
  - Quickly respond to extreme weather events.
  - Help local health departments assess their capacity to respond to health threats and to integrate climate preparedness into their hazard response plans and daily operations.

**A-4. Engage and motivate citizens and organizations to take actions to build resilient communities.**

1. Collaborate with the Northwest Center for Public Health Practice and other academic partnerships to develop a web-based resource hub to provide information and technical resources on public health and climate change preparedness. This website should provide information in several languages to help meet the needs of communities most at risk.
2. Enhance the ability of local organizations to understand climate risks and reach vulnerable populations. Provide vulnerable populations with information on what they need to know and how to prepare for and address the risks of climate change.
3. Pursue partnerships with non-profit organizations and businesses to develop climate change communication tools, messages, and social support networks that promote active community involvement and raise public awareness about the health problems related to changing climate.

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4. Using the medical system, enhance awareness of the projected health problems that come from a changing climate and the services (response strategies) that are available – including the mental health system.
5. Distribute information on how a changing climate can affect human health to doctors, nurses, and emergency response personnel that provide direct services to vulnerable citizens. Expected impacts include increased asthma, heat exhaustion, and potential new diseases transmitted from animals to humans.
6. Pursue opportunities to engage with medical and academic institutions to raise awareness of the overarching mental health problems that come from the social and environmental disruptions related to emergencies. Potential partners include the state’s mental health system, the Washington Medical Association, Washington State Department of Social and Health Services, University of Washington Medical School and School of Public Health, and the schools of social work at Washington State University, Portland State University, and Eastern Washington University.
7. Distribute alerts to the service providers of the medical and mental health communities during extreme weather events (and in advance, when possible), so they can be best prepared to serve members of their communities that may be adversely impacted.
8. Encourage the Washington State Public Health Association to dedicate time at the annual Joint Conference on Health to raise awareness and engage the public health and healthcare service providers about the health problems related to a changing climate. This conference also provides an opportunity to raise awareness about the tools and strategies that local communities can use to prepare for health problems associated with climate change.
9. Use existing programs within the Department of Health’s Office of Drinking Water to educate and alert public water system operators and their customers about likely impacts of climate change and the need for enhanced emergency preparedness.

### **A-5. Build capacity and support to safeguard human health in the face of climate change.**

1. Expand training and education of health and social services providers, including mental health agencies, to build capacity to respond appropriately to human health risks of climate change.
2. Improve our understanding of human health impacts of climate change and extreme weather through continued interdisciplinary studies at the University of Washington, Washington State University, and with agency scientists. Further work needs to focus on better understanding the risks; identifying the areas and populations at greatest risk; and exploring new methods to address the identified risks.
3. Seek more reliable funding mechanisms that can support more localized forecasting and risk modeling to address the health implications of climate change from extreme heat events, flooding, other extreme weather events, and increased forest fires.

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4. Pursue future funding opportunities, such as the Centers for Disease Control and Prevention (CDC) funds, to support the enhancement of critical public health infrastructure needed to promote healthy communities and to address the impacts of climate change.

## B. Ecosystem, Species, and Habitats

**B-1. Conserve habitat necessary to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate, including connectivity areas between critical habitats to allow the movement of species in response to climate change.**

1. Identify opportunities and priorities for habitat connectivity, such as buffers, wildlife corridors, and a connected network of conservation areas in Washington. This action builds on the work of the Washington Wildlife Habitat Connectivity Working Group and the Western Governors' Wildlife Corridors Initiative.
2. Increase the quantity, quality, and size of conservation areas, buffers, and connectivity corridors using the full range of conservation tools available. This action will enhance key habitat areas, facilitate migration opportunities for species vulnerable to climate change, and increase connectivity in areas at high risk from climate impacts, such as coastal habitats at risk of sea level rise.
3. Encourage partnerships with federal, tribal, and local government, private landowners, and conservation organizations to implement landscape planning and foster adaptation strategies and actions that protect and restore habitat corridors across jurisdictional and land ownership boundaries.
4. Identify high-quality habitats and conservation areas that are minimally affected by (or resistant to) climate change, able to sustain diverse and healthy populations, and can be used as refugia for species under stress from climate change. Prioritize these areas for protection and ecosystem management.
5. Protect and restore high-quality freshwater habitat through the reintroduction of beavers, wetland mitigation and creation, groundwater recharge, flow augmentation, and protection of coldwater springs.

**B-2. Reduce non-climate stressors to help fish, wildlife, plants, and ecosystems be more resilient to the effects of climate change.**

1. Use and improve existing regulatory and enforcement programs to build the resilience of natural systems to climate change, including such efforts as the following:
  - Protect and restore the connections between rivers and their floodplains.
  - Reduce existing pollution and contamination of freshwaters.
  - Manage freshwater withdrawals.
  - Maintain and restore streamflows and lake levels.
  - Reduce forest fuel buildup.
  - Reduce other human-induced impacts in watersheds most vulnerable to climate change.
2. Define priorities for land management in areas important to biodiversity to emphasize resilience to fire and decrease the likelihood of severe fires.

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3. Take early action to eliminate or control non-native invasive species that take advantage of climate changes, especially where they threaten native species or current ecosystem function.
4. Restore riparian zones, estuaries, wetlands, and floodplains by implementing appropriate conservation, restoration, and other land stewardship actions and practices, such as mitigation banking.
5. Collaborate with local governments to reduce and reverse habitat fragmentation and loss through comprehensive land use policies, zoning regulations, critical area ordinances, and other regulatory and non-regulatory approaches.

### **B-3. Manage species and habitats to protect ecosystem functions and provide sustainable cultural, recreational, and commercial use in a changing climate.**

1. Incorporate climate change considerations into existing and new management plans for protecting sensitive and vulnerable species, using best available science regarding projected climate changes and trends as well as vulnerability and risk assessments. Modify protection and recovery plans to accommodate migration as well as longer-term shifts in species range associated with climate change and its effects.
2. Conduct and refine species and habitat vulnerability assessments (such as the Pacific Northwest Climate Change Vulnerability Assessment for Habitats and Species) and other scientific studies to determine appropriate management approaches.
3. Conserve genetic diversity by protecting diverse populations and genetic material across the full range of species. Such efforts may include identifying areas for seed collection across different elevations and across the ranges of target species.

### **B-4. Integrate climate adaptation considerations for species and ecosystems into natural resource and conservation planning, land use and infrastructure planning, and resource allocation and public investment initiatives.**

1. Incorporate climate change considerations for species, habitats, and ecosystem processes into planning and regulatory activities related to implementation of the Growth Management Act, Shoreline Management Act, Watershed Management Act, State Environmental Policy Act, and other state goals and policies.
2. Ensure that land and water resources managers at the state and local levels integrate adaptation options into plans, programs, and practices. These options should address and limit the impacts of climate extremes, such as severe storms, floods, droughts, and heat waves, without causing harm to fish, wildlife, habitats, and ecosystem functions.
3. Engage with cities and counties to support incorporation of climate change considerations into activities, guidelines, and both regulatory and non-regulatory programs that protect or conserve habitats and species. The changes should consider the impacts of climate change on habitats and species and potential for safeguarding priority habitats and species from the effects of climate change and catastrophic events.
4. Update natural resource protection plans, land use plans, and water resources management plans to address climate change considerations for species and ecosystems and to support habitat resilience in a changing climate.

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5. Develop criteria and guidance to consider impacts of climate change on species and ecosystems when funding new infrastructure and economic development, mitigating impacts from ongoing degradation associated with human development, and compensating private landowners for conservation practices.

### **B-5. Build capacity and support for the adoption of response strategies that help protect and restore ecosystem function and services at risk from climate change.**

1. Establish an interagency, multidisciplinary forum (such as an interagency climate change task force) to strengthen existing partnerships and build new collaborations across jurisdictions. The forum would facilitate sharing new research and approaches to address climate impacts to ecosystems and to ensure that the needs of species, habitats, and ecosystems are considered in other areas such as agriculture, forests, infrastructure, and human health.
2. Increase coordination and participation in existing regional and national research and policy forums—such as the National Climate Assessment, Climate Science Centers, Regional Integrated Science and Assessment partnerships, and Landscape Conservation Cooperatives—to ensure that regional efforts recognize Washington’s unique and important natural resources.
3. Develop and integrate messages about the benefits of ecological services at risk from climate change into education programs and curriculum related to natural resources management.
4. Initiate and support efforts to quantify the benefits of ecological services and natural systems at risk from climate change. Compare lifetime cost-effectiveness of nature-based versus engineered options for climate response to help identify cost-effective adaptation options.
5. Develop programs to engage citizens in monitoring impacts of climate change on our shorelines, forests, rivers and streams, and other natural systems and in sharing their observations, case studies, stewardship efforts, and other activities using multimedia resources.
6. Coordinate development and maintenance of integrated long-term, large-scale monitoring of early-warning indicators of species responses, including range shifts, population status, and changes in ecological systems functions and processes. Reconsider monitoring approaches to ensure that indicators track changes associated with climate change.
7. Develop applied tools for decision makers and land managers to maximize the adoption of climate adaptation strategies for species and ecosystems. Such efforts may include:
  - Guidance, tools and technical assistance to local governments to enable them to identify, designate, and protect locally important habitats, corridors, and species at risk from a changing climate.
  - Incentives, tools, and information to increase the contribution of working lands to ecological resilience.
  - Tools to promote nature-based alternatives to engineered adaptation options such as flood control, erosion control, and protection of water quality and quantity.

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## C. Coasts and Oceans

**C-1. Lead by example by developing a framework to guide decision-making and protect people, assets, and natural areas from coastal hazards.**

1. Evaluate and propose revisions of laws and rules that govern land use, shoreline management, and other programs to effectively address sea level rise and other climate change impacts.
2. Develop guidance and require state agencies to integrate current and anticipated coastal climate impacts into planning, policies, programs, and investment decisions related to:
  - Land use.
  - Transportation
  - Shoreline management.
  - Economic development.
  - Facility siting and design.
  - Conservation and restoration.
  - Emergency preparedness.
3. Require all projects that the state funds, permits, or approves in vulnerable coastal areas to consider the effects of sea level rise and other coastal hazards. Evaluate alternatives to reduce vulnerability and protect communities and coastal ecosystems.
4. Identify essential public infrastructure at risk and develop a decision-making process to determine when to protect, retrofit, relocate, or manage retreat.
5. Revise oil spill response plans to consider climate change. The plan revisions should include geographic-specific response strategies based on risk assessments and considerations of changes in infrastructure and logistical support.
6. Recommend an institutional arrangement to align state agencies' coastal adaptation strategies and actions, help prioritize actions across state agencies, and enhance emergency preparedness and response to extreme weather events.

**C-2. Avoid development in highly vulnerable areas and promote sustainable development in appropriate, less vulnerable areas.**

1. Provide guidance, updated maps, tools, and information to help local jurisdictions assess risk and vulnerability and incorporate best available information on sea level rise, climate impacts, and adaptation options into their planning, regulations, project siting, and permitting.
2. Identify incentives and regulatory tools to reduce exposure to risk and discourage new public development in coastal areas at high risk from erosion, landslides, flooding, and storm surges. The tools should include:
  - Acquisition/easements.
  - Transfer development rights.
  - Setbacks.
  - Rebuilding restrictions.
  - Tax incentives and fees.

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3. Update various planning guidelines and provide incentives to local governments to consider impacts of climate change and adaptation actions when amending shoreline master programs, land use management plans, and other plans.
4. Develop policies and information to guide insurers in dealing with properties in vulnerable areas. Inform property purchasers and investors regarding sea level risks that may affect coastal property.
5. Assess damage costs and remove incentives that encourage rebuilding in at-risk areas.
6. If rebuilding is the only option, construction techniques and building code amendments should be adopted to increase resilience and reduce risk to development projects.

### **C-3. Accelerate efforts to protect and restore nearshore habitat and natural processes.**

1. Identify priority conservation and restoration areas that can increase natural resiliency and protect vulnerable communities. Identify regulatory and non-regulatory mechanisms that local jurisdictions can use to conserve and protect those areas.
2. Develop guidelines for state agencies, local governments, watershed groups, nongovernmental organizations, and others to address sea level rise in coastal habitat restoration and protection. Direct state agencies to use the guidelines to incorporate sea level rise into state-managed and supported coastal restoration and protection projects.
3. Identify feasible state level policy options to avoid or minimize shoreline hardening, especially in Puget Sound. Policy options should seek to streamline state and local permitting processes to provide incentives for green shoreline and soft armoring practices.
4. Develop a program to promote green shoreline programs for Puget Sound and some urbanized coastal areas. This program can be built on the lessons learned from pilot projects currently in progress in San Juan County and Lake Washington (City of Seattle), as well as the green shores initiative in British Columbia. Develop and provide state and local jurisdictions with green shoreline design manuals for different types of shoreline along Puget Sound and the Pacific coast.
5. Incorporate future sea level rise in the prioritization, design, and post-project maintenance of toxic clean-up sites near the shoreline.

### **C-4. Build local capacity to respond to coastal climate impacts by providing tools to assess vulnerability and advancing research, monitoring, and engagement efforts.**

1. Complete a coast-wide (including Puget Sound) sea level rise vulnerability assessment. Update periodically as new and improved scientific information becomes available.
2. Identify and provide local jurisdictions with information, web-based tools, training, case studies, locally effective adaptation policies and actions, and other resources needed to build resilient coastal communities. Case studies could address, for example, how communities are using the National Oceanic and Atmospheric Administration's (NOAA) Digital Coast, which provides data, tools, and training to help manage coastal resources.
3. Assist coastal planners with activities such as:
  - Simulating potential impacts of long-term sea level rise on wetlands and shorelines.

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- Analyzing risks and potential losses from floods, sea level rise and storm surges.
- Mapping hazard areas.
- Assessing and evaluating the risks from sea level rise and other climate change impacts within the local jurisdictions.
- Enhancing sustainable development in coastal areas.
- Identifying community exposure to climate change – considering land cover, land use, zoning, structures, vacant lots, parcel values, and social disruption.

4. Identify potential funding mechanisms and help local governments seek funding to incorporate climate adaptation into plans, policies, and projects.

5. Assist local jurisdictions in raising awareness about the impacts of sea level rise and the need for adaptation actions by providing educational materials, participating in local events, and engaging the communities in efforts such as the King Tides, Washington Beach Program, and water quality monitoring programs.

6. Collaborate with local partners—including local governments, tribal governments, federal agencies, universities, nonprofits, NOAA Sea Grant, and National Estuarine Research Reserves—to monitor the effectiveness of climate adaptation tools and options and to identify changes that are needed.

7. Expand essential data collection and monitoring programs to improve our understanding of climate impacts, including:

- The impacts of sea level rise and storm surge on the shoreline.
- Changes in erosion.
- Unstable bluffs.
- Saltwater intrusion and inundation of freshwater areas.

8. Develop an inventory of dikes, levees, tide gates, clean-up sites, nearshore fuel storage facilities, and other facilities. Provide this information to local jurisdictions and others to plan for and adapt to rising sea levels and coastal hazards and to aid investment decisions in coastal areas. Ensure that the inventory products and maps are widely available to planners, agencies, tribes, and other users.

**C-5. Enhance our understanding and monitoring of ocean acidification (pH) in Puget Sound and coastal waters as well as our ability to adapt to and mitigate effects of seawater acidity on shellfish, other marine organisms, and marine ecosystems.**

1. Support the work of the newly created Blue-Ribbon Panel on Ocean Acidification, convened under the auspices of the Washington Shellfish Initiative. The Blue-Ribbon Panel will focus on documenting the current state of scientific knowledge and ways to advance our scientific understanding of the effects of ocean acidification. The Panel will recommend actions to respond to increasing ocean acidification, reduce harmful effects on Washington’s shellfish and other marine organisms, and adapt to the impacts of acidified waters. A report will be submitted to the Governor, NOAA’s administrator, regional research groups, and other policymakers in October

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2. Expand collaboration with NOAA Fisheries, other federal agencies, nonprofit organizations, academic groups, and the shellfish industry to enhance monitoring to track biological and chemistry changes in oceans and coastal areas of Washington, including key areas such as Hood Canal and Willapa Bay.
3. Coordinate with state and federal agencies to improve monitoring by evaluating and adopting improved pH measurement protocols to support fine-scale data analysis and tracking of small changes in pH. Create a new baseline data set.
4. Continue to actively address problems of pollutants in marine waters (which add to acidity problems) by studying toxics and nutrients entering Puget Sound. Develop models to determine the effects of nitrogen discharges on dissolved oxygen levels in Puget Sound. Evaluate trends in water quality over time and detect emerging issues.
5. Continue to explore how Clean Water Act authorities can be used to prevent or reduce localized effects from ocean acidification and climate change.

### D. Water Resources

#### D-1. Manage water resources in a changing climate by implementing Integrated Water Resources Management approaches in highly vulnerable basins.

1. Ensure that long-range plans developed for highly vulnerable basins—including the Columbia, Yakima, and Walla Walla river basins—account for climate change impacts. Consider the risks and vulnerabilities to water resources and infrastructure, agriculture, forest, and other sectors. Integrate adaptation actions into basin plans to enhance water supply reliability, improve water quality, and improve instream flows and fish passage at existing reservoirs.
2. Promote broader recognition that an integrated approach is feasible and beneficial, by documenting lessons learned and conclusions from the implementation of integrated water resources management plans in the Columbia, Yakima, and other river basins.
3. Expand the models of the Columbia River Program, the Yakima River Integrated Water Management Plan, and the Walla Walla flexible water management system to other basins (such as the Dungeness and Wenatchee river basins), sub-basins and/or aquifers, based on:
  - Existing and emerging water management issues.
  - Need for integrated planning.
  - Community and stakeholders engagement.
  - Legal and institutional framework.
  - Capacity to develop and implement an integrated plan.

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4. Develop guidance for analyzing whether and how to incorporate projected climate information and adaptation actions into planning, policies, and investment decisions. The analysis would help state, local, federal and tribal governments and water organizations understand how changes in watershed hydrology, ecosystems, water quality, and species and habitat conditions in a given watershed may affect activities such as:
  - Water allocation decisions.
  - Water delivery.
  - Water systems operations.
  - Water quality standards.
  - Stormwater and floodplain management.
  - Infrastructure safety.
  - Ecosystem restoration and species recovery.
  - Environmental preservation and restoration efforts.

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5. Incorporate climate change realities—recognizing that past hydrological data are no longer a reliable guide to project future conditions—into agency decision-making to:
  - Approve new or change existing water rights.
  - Adopt instream flows for fish habitat and ecological purposes.
  - Decide whether water users are able to utilize their water rights for the amount allowed, when purchasing or banking trust water rights.

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6. Use the watershed-based framework created under Watershed Planning (RCW 90.82) to establish a well-coordinated water and land use policy that takes an integrated approach to planning. Such plans should reduce risks to rural and urban communities from extreme weather events (such as intensive flooding and frequent droughts).

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7. Integrate climate change adaptation into ongoing efforts that address management of stormwater, wastewater, water quality, water reuse, and potable water demand—to ensure that planning decisions and investments made now are not increasing future vulnerability and causing unintended consequences. Require consideration of the impacts of extreme weather events in planning, siting, and designing of water, wastewater, and stormwater infrastructure and related facilities.

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### D-2. Improve water supply and quality in basins most likely to be affected by changing climate.

1. Strengthen and increase the capacity of natural systems to respond to droughts, streamflow changes, and flooding by encouraging local governments to adopt land use policies and best practices. Examples include practices that reduce impervious surfaces to protect surface water quality, improve infiltration, and reduce stream erosion and sedimentation. These policies and practices would:
  - Direct development away from vulnerable areas.
  - Decrease flood risk.
  - Expand the protection and restoration of prime agricultural and forest lands, aquifer recharge areas, wetlands, floodplains, and wildlife habitat and corridors.

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2. Encourage the state Department of Natural Resources and the U.S. Forest Service to develop and implement forest management practices that would improve water-holding capacity in watersheds and help protect water quality from increased temperature, erosion, and associated pollutants.

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3. Support new surface and aquifer storage by capturing winter and spring runoff to make up for summer low flows, where feasible and environmentally sound; and increase storage capacity in existing reservoirs. Doing so could improve water supply reliability, and enhance instream flows, if and when stored water is released during low flow conditions.

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4. Conserve water and support water reuse, retention, and infiltration by designing development sites to minimize water needs (such as drought-tolerant landscaping), retaining graywater and stormwater on site and using reclaimed water, and expanding adoption of low-impact development (LID).

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5. Foster the development of climate-ready water utility initiatives. Highlight existing utility efforts to evaluate and incorporate climate information into planning, and support the development of peer-to-peer information sharing. Assist water and wastewater utilities, along with stormwater and floodplain managers, in implementing climate change adaptation and mitigation strategies, with the goal of fostering more resilient water systems. Provide water system planners and operators with the knowledge, capacity, resources, and skills necessary to adapt to a changing climate and continue to fulfill their public health and environmental missions.

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6. Support the development and delivery to water utilities of early-warning or rapid-response information, to address challenges and disaster risk to water systems from extreme climate events, such as devastating floods, droughts, fires, and storms.

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7. Aggressively pursue reallocation and redistribution of water in critical basins, through water transfers, water transactions, water markets, and water banks with the goal of increasing streamflows for fisheries and improving habitat conditions.

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8. Work with federal and local partners to improve the performance of existing water infrastructure, such as reservoirs, to respond to extreme events that may result from climate change and to

## Priority Response Strategies and Actions

improve local water supplies.

### **D-3. Implement water conservation and efficiency programs to reduce the amount of water needed for irrigation, municipal, and industrial users and improve basin-wide water supply.**

1. Adopt the most up-to-date water conservation technologies, water-efficient practices, and alternative water supplies whenever possible and where they:
  - Provide the most beneficial and least costly way to decrease water demand across all sectors.
  - Reduce stress on existing water supplies.
  - Increase the benefits to aquatic ecosystems.Because of the connection between water and energy use, new energy efficient technologies may provide opportunities to reduce both energy and water use, along with greenhouse gas emissions.
2. Expand and accelerate improvements of irrigation infrastructure, starting with aging systems in basins most vulnerable to droughts and climate change. Local conservation districts and various funding agencies—such as the Natural Resources Conservation Service (NRCS), Ecology, U.S. Bureau of Reclamation (USBR), and the Bonneville Power Administration (BPA)—must continue to help irrigation organizations and landowners improve water delivery and distribution systems. These improvements can be done through projects such as:
  - Lining ditches.
  - Piping.
  - Re-regulating reservoirs.
  - On-farm conservation.
  - Pump exchange (replacing water from one source with water from another).
  - Water use management projects.
3. Expand and accelerate implementation of water conservation and efficiency standards for industries and businesses.
4. Expand the US Geological Survey (USGS) and the National Weather Service (NWS) Methow Basin project—“Future Runoff Scenarios for Decision Makers for the Methow River, Washington—to other watersheds to understand and quantify how hydrologic systems respond to land use, water use, and climate changes. This effort includes using the interactive web-based database being developed for the Methow. <http://wa.water.usgs.gov/projects/methow/summary.htm>.

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5. Expand accelerate implementation of municipal water use efficiency improvements to reduce amount of water used per capita/household. Improvements could include:
  - Water rate setting.
  - Water smart landscape programs.
  - Rebate to install/upgrade landscape irrigation systems.
  - Water waste regulations.
  - Water budgets (large water users are given a water budget instead of watering days).
  - Development codes and policies for new development.
  - Rainwater harvesting from roofs.
  - Education and public outreach campaigns.

6. Seek more reliable funding mechanisms to help water providers implement climate-ready plans and practices.

**D-4. Build the capacity of state, tribal, and local governments; watershed and regional groups; water managers; and communities to identify and assess risks and vulnerabilities to climate change impacts on water supplies and water quality.**

1. Provide local communities and watershed groups with water forecast projections using best available data, tools, and models to assess watershed vulnerability and determine priority risks that require a response. Provide examples of management strategies that will build resilient watersheds and communities.
2. Help watershed groups and communities identify vulnerable areas and assets at risk. Develop climate-readiness plans using approaches that would most sustainably and effectively prepare for and adapt to changes in the watershed.
3. Provide tools and incentives to watershed groups to implement watershed protection and restoration plans focusing on:
  - Controlling stormwater on a regional or watershed basis.
  - Reducing flood peaks.
  - Reducing sedimentation.
  - Increasing recharge aquifers.
  - Restoring instream flows.
4. Collaborate with the scientific community and water management entities to develop and disseminate best available data, information, and tools on:
  - Hydrologic changes and hazards, such as extreme floods and droughts.
  - Projected impacts and risks of climate change on long-term water budgets and on ecological resources in a given basin.
  - Alternatives to effectively respond to these changes.

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5. Expand the central clearinghouse of data and case studies to support climate change and adaptation planning. Provide information and examples of effective strategies to prepare for climate impacts, including:
  - Operational changes.
  - Engineering and design options.
  - Green infrastructure approaches.
  - New infrastructure investment.
  - Planning.
  - Land-use controls.

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6. Inform utilities about the Climate Ready Water Utility Initiative and tools such as the Climate Resilience Evaluation and Assessment Tool (CREAT). Support water utilities, working with the University of Washington’s Climate Impacts Group (CIG) and the Climate Impacts Research Consortium (CIRC), to incorporate information on climate impacts into models used in water, wastewater, and stormwater systems planning and site design.

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7. Continue to invest in improvements and expansion of online data-sharing systems to provide farmers, water utilities, and other customers with timely information on weather, soil conditions, crop water requirements, as well as water efficiency and conservation practices.

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8. Improve information on water use by expanding use of meters and implementing methodologies using satellite imagery and other technologies.

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9. Improve understanding of climate change impacts on water resources by supporting expansion and refinement of regional climate impact assessment tools and models developed by CIG, CIRC, U.S. Geological Survey (USGS), and other scientific entities. These tools are intended to cover climate change impacts on surface waters, groundwater recharge and groundwater availability and the interaction between climate, hydrology, and vegetation.

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10. Explore cooperative work with regional Climate Science Centers, NRCS, USGS, CIRC, and the Climate Impacts Group. Continue and expand existing monitoring networks, such as streamflow gages.

## E. Agriculture

### **E-1. Maintain and enhance agriculture productivity by supporting farmers and ranchers transition towards the goal of sustainable agriculture.**

1. Conserve and protect productive and adaptable farmlands by supporting county and city policies and programs that limit sprawl and conversion of agricultural lands to development and facilitate locally-grown food and community garden plots.

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2. Maintain agricultural land in production and compensate farmers for the environmental benefits of conservation projects implemented on their lands. Examples of projects include ones that:
  - Preserve and restore wetlands, riparian corridors, and wildlife habitat.
  - Improve water quality.

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- Sequester carbon (keep carbon in the soil).

3. Compensate farmers using mechanisms such as purchases, leases, and establishment of conservation markets. Support the agricultural community in accessing funding programs within various state, federal, and local agencies and conservation organizations.

4. Protect the productivity of agricultural soils from water runoff, erosion, wind storms, and excessive heat through such management practices as:

- Direct-seeding.
- No-till farming.
- Reduced-volume irrigation systems.
- On-farm water conservation and storage.
- Biological and organic soil amendments, such as manure and compost.
- Integrated pest management practices.
- Cover-crop and fall-planted crops

5. Facilitate access by farmers and growers to technical and financial assistance to implement the practices.

6. Help growers select more economically and ecologically resilient crops, such as:

- Pest-resistant crops.
- Drought-tolerant crops.
- Diversified variety of crops.
- Soil and water holding crops, such as alfalfa seed.

7. Safeguard livestock against the impacts of climate change, and protect livestock by:

- Modifying facilities to reduce heat stress.
- Dispersing stock in pastures.
- Ensuring properly managed grazing.
- Improving herd performance through good genetic stock.
- Adapting the reproduction season to fit the climate and sources of feed and forage.

8. Establishing a herd health program in impacted areas.

## **E-2. Reduce impacts of severe droughts and extreme weather events on irrigated agriculture.**

1. Increase the ability of the state, local governments, irrigation districts, and other entities to obtain the most up-to-date forecasts of droughts and extreme events. Integrate these forecasts into drought planning and decision-making by policymakers, water users, and water managers. Improve and update existing data provided through federal agencies such as the National Oceanic and Atmospheric Administration, Natural Resources Conservation Service, and National Weather Service as well as universities including the WSU AgWeatherNet Program.

2. Prepare for and respond more effectively to droughts. This may require revising the statutory authority for drought emergency declarations by the Governor. The declaration triggers several

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drought response activities.

3. Identify highly drought-vulnerable basins, provide advance warning of drought and extreme events, develop drought plans, and enable decision makers to reduce risks and damages from droughts.
4. Enhance water conservation and efficiency activities at the farm and district levels in highly drought-vulnerable basins by expanding technical and financial cost-share assistance programs. These programs help growers reduce irrigation needs and runoff, such as improving water conveyance, improving groundwater infiltration and soil retention/capture, and planting drought-tolerant crops.
5. Improve water reliability and increase water supplies through continued support for integrated basin water management planning and by fostering voluntary transfer of water. (Changes to current statutes may be needed to provide incentives to increase participation of existing water right holders in water transfer programs.)
6. Expand and improve the effectiveness of the state’s water right transfer program by seeking statutory changes that provide flexibility and incentives to current water right holders interested in transferring their water to other users.

**E-3. Prevent, eradicate, and control pests, diseases, and weeds potentially harmful to public health, the environmental, and agriculture production.**

1. Implement tracking and monitoring, pest and weed control, and eradication actions. State and federal agencies, county noxious weed boards, and county pest and disease boards should conduct these efforts collaboratively.
2. Provide information to the agricultural community to enable farmers and growers to modify agricultural practices and to adapt to new pests and diseases.
3. Increase awareness and protect pollinator (bees) habitat by incorporating conservation of bee habitat into land management and farm practices that minimize land use impacts on pollinators—including tillage, pesticide use, burning, grazing, cover-cropping, and roadside management.
4. Develop and enhance emergency response plans to manage significant pest outbreaks that harm human health, the environment, and the economic viability of the agriculture sector. These plans should include streamlined approval mechanisms of new biological and chemical tools as well as monitoring.

**E-4. Promote opportunities to engage the agricultural sector and rural communities in developing and implementing new policies, technologies, and practices addressing the impacts of climate change.**

1. Increase participation of farmers, producers, farm organizations, industry leaders, and rural communities in research, changes to public policies, and implementation of new policies and programs that promote:
  - Ecosystem services.
  - Environmental health.
  - Economic profitability.
  - Social and economic equity.

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2. Create or enhance existing networks to facilitate rapid transfer and adoption of new knowledge and technologies to help farmers adapt to changing climate, promote sustainability, and benefit the environment, rural communities, and farmers.
3. Engage the agricultural community in research to assess vulnerability of various annual (e.g., cereal grains) and perennial crops, and select crop varieties capable of adapting to expected climate changes.

## F. Forests

### **F-1. Conserve and restore healthy, resilient forests across ownership boundaries and large geographic ranges to minimize the threats from climate change and extreme weather events.**

1. Develop a comprehensive approach that integrates objectives and actions for preservation of working forests, wildfire management, insects and diseases control, and forest health protection and restoration. Developing the integrated approach needs to occur in partnership with tribal, federal, state, and local resource protection agencies; public land management agencies (DNR, USFS, BLM and others); private forest landowners; nongovernmental organizations; and other stakeholders.
2. Develop a coordinated plan for fire hazard reduction and suppression for at-risk forests to assist policymakers, communities, and jurisdictions with land-management decisions so that forest fire threats are reduced. Information on existing and projected forest health and fire hazard conditions should be widely shared with forest landowners, managers, decision makers, and the public.
3. Reduce development pressures on forestlands by working with local governments to protect forestlands from conversion, such as through zoning and transfers of development rights. Facilitate implementation of best practices, and engage private landowners through market and investment opportunities.
4. Secure sustainable funding and expand financial and technical assistance to forest landowners. Use an “all-lands” approach for allocating public funding to forest landowners to implement new and modified practices that reduce risks from:
  - Forest fires.
  - Pests and diseases.
  - Erosion and sediment loads into rivers.
  - Loss of habitat.
  - Loss of soil moisture.
5. Advocate at the federal level for:
  - Increased funding for the Land and Water Conservation Fund, Forest Legacy Program, and Environmental Quality Incentives program funding, which will benefit several states including Washington.
  - Passage of the Community Forestry Conservation Act, a bill that will authorize tax-exempt

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revenue bonds for working forest conservation.

**F-2. Maintain and protect forest species and genetic diversity across the landscape to ensure long-term conservation of our forest genetic resources and help buffer against impacts of climate change.**

1. Ensure forest landowners continue to manage for native species and structural diversity. Use current reforestation practices to maintain species and genetic diversity across their forest lands.
2. Build disease resistance in five-needle pines and other tree species with serious disease issues, in cooperation with existing U.S. Forest Service efforts.
3. Maintain and expand participation in tree breeding, testing, and selection programs, such as those operated by the Northwest Tree Improvement Cooperative and the Inland Empire Tree Improvement Cooperative. Ensure that testing by cooperative members incorporates greater geographic diversity and adaptive traits such as cold-hardiness and drought-tolerance.
4. Create a gene conservation plan for tree species in Washington based on vulnerability assessments to climate change of various eastern and western Washington tree species. The U.S. Forest Service has completed a vulnerability assessment for western Washington.
5. Create a cooperative tree seed bank within Washington State Department of Natural Resources to provide for recovery from large-scale disturbances, such as fire or insect outbreaks. This effort may begin with a “virtual” seed bank created with cooperative agreements among landowners who maintain seed inventories and are willing to make their seed available in the event of major disturbance.
6. Build on existing monitoring and evaluation programs to detect problems with tree growth, phenology, reproduction, or tree health.

**F-3. Protect, expand, and manage urban forests to help communities reduce impacts of rising temperatures and extreme precipitation runoff events.**

1. Expand Urban Forests Assistance Program (authorized under the Washington State Urban and Community Forestry Act) to help mitigate the impacts of climate change, such as the following:
  - Airborne pollution.
  - Higher water temperatures in urban streams.
  - Urban heat island (metropolitan area that is significantly warmer than its surrounding rural areas).
  - Heat waves.
  - Severe stormwater runoff.
  - Flooding.
  - Erosion.
2. Secure sustainable funding sources to build the Urban Forest Assistance Program’s capacity to increase participation by cities, towns, and communities in planting and sustaining healthy trees and vegetation in urban areas.

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3. Support cities and towns in developing education and community programs to enhance community awareness of the benefits that trees provide—including public health, environmental, ecological, and economic improvements. Support communities in adopting sound tree protection and management ordinances in all communities faced with threats from heat waves, flooding, and landslides.

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4. Promote urban forests by engaging cities, communities, neighborhoods, local and state park officials, and volunteers in:
  - Planting trees more tolerant of heat and drought conditions.
  - Implementing effective options for tree watering and maintenance.
  - Selecting pest- and disease-resistant trees.
  - Removing invasive species.
  - Monitoring the health of the trees.

### **F-4. Build capacity and support for maintaining, enhancing, and restoring resilient and healthy forests.**

1. Build on existing or create new pilot projects, experiments, and research to better understand how forests are likely to respond after severe disturbance events. For example, would a combination of thinning and prescribed fires help vulnerable forests better adapt to fire?

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2. Strengthen existing partnerships and build new collaborations across jurisdictions to share knowledge and information on climate change impacts and adaptation across all sectors and across broad landscapes of varying ownerships and jurisdictions. This approach is referred to as an all-lands approach.

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3. Increase coordination and collaboration with federal and tribal governments, the scientific community, and private conservation groups to ensure that research and management strategies address Washington’s forest needs and recognize the important social, economic, and environmental benefits of forests.

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4. Improve forest health and reduce forest hazard conditions by providing data and information to landowners, policy makers and the public about wildfires, and pests and diseases, and benefits provided by forest ecosystem services.

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5. Improve understanding and communication of impacts and adaptation responses by engaging all levels of government, stakeholders, and the public in adaptation planning and decision-making affecting forests.

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6. Integrate messages about the benefits of forest ecosystem services into education programs and curriculum related to natural resources management, environmental protection, urban planning, economics, and other programs.

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7. Coordinate development and maintenance of integrated long-term, large-scale monitoring of early-warning indicators of species responses, including range shifts, population status, and changes in ecological systems functions and processes.

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## G. Infrastructure and the Built Environment

### **G-1. Protect vulnerable infrastructure and ensure it is safe, functional, and resilient to climate impacts.**

1. Develop a common framework and methodology for transportation infrastructure risk assessment at a regional scale and for all transportation modes and operations.
2. Encourage local, regional, tribal, and federal governments and private entities to prepare detailed inventories, and climate vulnerability assessments to identify critical and vulnerable infrastructure within their jurisdictions.
3. Work with ports to determine short- and long-term strategies to protect port infrastructure and transportation linkages to ensure movement of commerce and international trade.
4. Encourage owners and operators of critical energy infrastructure to evaluate vulnerability to the impacts of climate change, including risks of damage and the potential for disruptions and outages from flooding, sea level rise, extreme heat, erosion, and extreme weather events.
5. Adopt regulatory and incentive programs to encourage state, tribal and local funded transit organizations; public works departments; utilities; and other partners to demonstrate awareness and, where possible, consistency with efforts to address vulnerable systems.
6. Work with the insurance industry to identify and implement mechanisms to reduce risks to property owners from climate-related hazards, and to educate consumers on ways to reduce exposure to risk.

### **G-2. Guide future development away from areas at risk.**

1. Gather and provide the best available scientific information on climate impacts and areas at high risk from flooding, seawater inundation, landslides, extreme heat, and wildfires. Provide information for a range of climate scenarios, for all regions in the state and on a basin-by-basin basis, using consistent data from the UW Climate Impacts Group and other reputable sources. Make the information available and readily accessible to citizens, businesses, local governments, tribes, and others to assist in making informed decisions to prepare for and adapt to climate impacts.
2. Develop guidance as well as regulatory and incentive programs to encourage state and local governments to limit new development in high-risk areas and to incorporate projected climate change impacts and adaptation actions into long-term planning, policies, and investment decisions. These policies and plans include regional or countywide planning policies, comprehensive plans, shoreline master plans, development regulations, and urban growth area expansions.
3. Determine how to consider potential climate impacts and adaptation options for non-project and project actions, as part of the State Environmental Policy Act.
4. Encourage the federal government to accelerate modernized flood mapping and implement fundamental reforms to the National Flood Insurance Program to incorporate risks from climate

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change.

5. Limit new development in floodplains and coastal areas vulnerable to sea level rise and return some coastal and floodplain areas to natural conditions.
6. Encourage local jurisdictions to identify and implement ordinances and other approaches to reduce wildfire risks.

**G-3. Reduce or avoid climate risks by considering climate in the planning, funding, design, and construction of infrastructure projects and by promoting improved design and construction standards in areas vulnerable to climate risks.**

1. Develop a framework to guide the state’s planning and investments to:
  - Protect, repair, elevate, or decommission vulnerable infrastructure.
  - Protect safety and key evacuation routes.
  - Protect critical transportation facilities and corridors for the movement of people and freight, both within Washington and to nearby states and Canada.
  - Potential financial, social, and environmental impacts.
  - The framework should identify a process to decide when the state will not invest in at-risk projects with a long lifespan.
2. Require incorporation of climate impacts and response strategies in the state’s long-range transportation plans; mode-specific plans for highways, rail, aviation, and ferries; and regional transportation plans.
3. Develop transportation design and engineering guidance to minimize climate change risks. The design guidance should be used when siting and designing new transportation infrastructure and project-related infrastructure, such as stormwater treatment and flow control, wetlands protection and mitigation, and fish passages. The guidance should provide information on techniques and materials resistant to increased heat and other climate impacts.
4. Require consideration of climate risks and response strategies in the site selection, design, and construction of state-funded infrastructure projects.
5. Advance the adoption and enforcement of progressive building codes and design standards to reduce vulnerability of structures to climate-related hazards.
6. Provide incentives to incorporate climate risks and response strategies in the design of commercial and residential buildings. Promote strategies and technologies, including those that:
  - Reduce energy and water use.
  - Accelerate deployment of smart-grid technologies—using electronic control, metering, and monitoring to reduce energy.
  - Maximize rain and snow seepage into the ground, which reduces runoff and replenishes groundwater, using green infrastructure and low-impact development approaches.
  - Collect rainwater onsite.
  - Maximize open spaces to reduce urban heat effects.
7. Identify and provide financial incentives to property owners to reduce exposure to risk, such as low-cost

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loans or financial incentives to rebuild—or relocate—according to improved construction standards, increased setbacks, or elevation of the structure.

## G-4. Enhance the preparedness of transportation, energy, and emergency service providers to respond to more frequent and intense weather-related emergencies.

1. Incorporate information about climate impacts into state and local emergency planning efforts, including the Comprehensive Emergency Management Plan, the State Hazard Mitigation Plan, and the Hazard Identification and Vulnerability Analysis.
2. Bolster contingency plans for key critical transportation, energy supply and distribution networks, telecommunications, and water infrastructure at risk.
3. Identify and protect critical evacuation routes. Coordinate emergency evacuation planning among adjacent cities and counties.
4. Improve systems to provide engineers, public works, and maintenance staff with early warning of problems, engage onsite protections in advance of an emergency, and provide early warning to the public. Revise existing systems—or develop better systems, such as using sensors and smart technologies—for monitoring:
  - Bridge abutments.
  - Land slopes.
  - Stormwater runoff and drainage systems.
  - Real-time flood levels and storm surge.
  - Other climate impacts on infrastructure.
5. Adjust routine operations, maintenance and inspection, and capital budget expenses to prepare for more frequent and intense storms, floods, landslides, wildfires, and extreme heat events.
6. Seek more reliable funding mechanisms to ensure that local governments can safeguard vulnerable populations, especially during heat waves. Provide incentives to prepare for energy supply interruptions and develop backup systems in schools, clinics, and emergency shelters.
7. Foster interaction with communication service providers to improve reliability of emergency services during extreme weather events, encourage communication companies to identify alternative means of communication during emergencies, and seek incentives for new technology to diversify and decouple communications from electric grids or otherwise improve their resilience.

## G-5. Build capacity of the energy sector to respond to climate-related disruptions and meet potential increases in energy demand and changes in supply.

1. Continue to consider climate-related changes in energy supply and demand, system reliability, and in the State Energy Strategy and the Northwest Power Plan. Encourage utilities to consider potential climate impacts in integrated resource plans.
2. Require consideration of climate risks in relicensing existing and siting new energy projects.
3. Aggressively increase energy efficiency and conservation efforts.
4. Encourage additional research into the impacts of climate change on alternative energy sources. Identify how future climate impacts could affect the state’s renewable energy goals , and work

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with utilities to ensure that renewable energy and energy conservation goals are met.

5. Encourage the development of small energy sources on site (e.g., solar panels) to increase reliability by having redundant systems and to reduce risks associated with the long-distance transmission of energy.
6. Construct stronger, more resilient transmission and distribution systems to improve system reliability and to create additional capacity and redundancy.
7. Adjust reservoir management to account for climate impacts—either too little water or too much water—in considering multiple objectives for energy production, agriculture irrigation, flood management, fish flows, and other needs.

## H. Research and Monitoring

**H-1. Improve scientific knowledge and ensure that climate science is responsive and applied to the needs of policymakers, managers, planners and others.**

1. Solicit input from local governments, tribes, businesses, nongovernmental organizations, and other stakeholders to identify needs for data, information, and resources that would foster their understanding of the risks and consequences of climate change at the regional, state, and local levels.
2. Participate in current research efforts conducted by the UW Climate Impacts Group, Climate Science Centers, Regional Integrated Science and Assessment Center - Climate Impacts Research Consortium (CIRC) - the North Pacific and Great Northern Landscape Conservation Cooperatives, and others to ensure the scientific research agenda recognizes Washington’s distinctive natural resources and addresses priority needs of the state.
3. Support the periodic update of the National Climate Assessment and CIG’s comprehensive regional climate scenarios for Washington State.

**H-2. Partner and collaborate with state, federal, tribal, and local governments and various organizations to enhance existing monitoring systems, and develop new systems where needed to monitor the impacts of climate change and the efficacy of adaptation responses.**

1. Establish an extensive network of sentinel site monitoring stations at locations that are not expected to be subject to local land use changes. The term “sentinel site” is used to describe a monitoring station for which long-term monitoring data are available.
2. Include continuous monitors that track multiple measures, such as temperature and streamflow gages, at sentinel sites and at selected long-term ambient monitoring sites. Develop and revise field and statistical procedures.
3. Take measurements in and around streams to:
  - Assess hydrologic effects to stream channels from extreme storm events, including measuring the geometry and sediment composition of stream channels.
  - Assess biological integrity with regard to climate change impacts, such as monitoring of sediment- tolerant/intolerant organisms (taxa) and heat-tolerant/intolerant organisms.
  - Assess the stresses to riparian vegetation from dropping water tables and changing temperatures.

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4. Evaluate signals in hydrology such as those developed by The Nature Conservancy through the Indicators of Hydrologic Alteration (IHA) software.

5. Work with the U.S. Geological Survey to implement a robust, multi-purpose groundwater monitoring program in Washington State, which will be part of the national groundwater climate response network (CRN). In Washington, a minimally functional groundwater CRN consists of at least 11 wells, of which five are currently in place.

6. Implement monitoring programs designed specifically to test the effectiveness of adaptation actions and the assumptions underlying proposed adaptation actions. Encourage each agency or partner to monitor the implementation of its respective actions.

7. Collaborate with various agencies to monitor the spread of pests and diseases and to increase the overall efficiency and sensitivity of current surveillance systems.

### **H-3. Support development and use of applied tools for decision makers and land and water managers to help them understand the risks and consequences of changing climatic conditions on communities, infrastructure, and natural systems; and select effective adaptation options to build resilience.**

1. Share existing tools with local governments, state and tribal agencies, and local communities to help them understand key vulnerabilities to climate impacts and what actions can be taken. Examples include the Climate Ready Water Utilities Toolbox, Georgetown Climate Center sea level rise tool, and other tools. Incorporate climate change considerations into existing planning tools that evaluate the effects of alternative land use policies, such as ENVISION, INVEST, and models from the Natural Capital Project.

2. Maintain the state’s climate adaptation clearinghouse and link to other clearinghouses to improve the availability of information. Leverage and link existing efforts to support climate adaptation efforts at the state, tribe, and local levels.

## I. Climate Communication, Public Awareness, and Engagement

### **I-1. Create coordinated and cohesive communication messages and tools on climate change impacts and adaptation, and ensure they are effectively distributed to a wide variety of people and professionals across all**

1. Continue to leverage partnerships between state agencies and research organizations to develop clear and consistent messaging on climate change impacts and adaptation. The messages must connect to other priority issues and resonate with people’s core values, such as health, safety, and the economy.

2. Develop targeted climate change risk communication training for communications staff.

3. Conduct targeted outreach to state and local elected officials, leaders, and staff to share

# Priority Response Strategies and Actions

<p><b>levels of government and the public.</b></p>	<p>information and outreach materials, improve the understanding of risks, and inform decision-making.</p> <hr/> <p>4. Develop communication materials focused on vulnerable communities that are at high risk and have a low capacity to respond, paying particular attention to low-income and underserved populations.</p> <hr/> <p>5. Develop risk maps and decision-support tools to identify climate change risks for specific geographic areas throughout the state.</p> <hr/> <p>6. Support additional research to identify how people perceive climate risks, what messages resonate with people, and how people learn and respond to information about climate change.</p>
<p><b>I-2. Leverage existing education and outreach networks and integrate communication about climate change.</b></p>	<p>1. Build on existing networks and integrate climate change into current state agency education and outreach efforts related to public health, land use, ecosystems, water resources, coastal management, agriculture, forests, and infrastructure.</p> <hr/> <p>2. Use a variety of channels to communicate about climate change, such as:</p> <ul style="list-style-type: none"> <li>• Web sites, agency listservs, newsletters, and news releases.</li> <li>• Social media, including Facebook, Twitter, and video clips.</li> <li>• Climate educator network and climate communicators group.</li> <li>• Presentations at public events.</li> <li>• Publications including Frequently Asked Questions (FAQs).</li> </ul> <hr/> <p>3. Promote effective integration of climate change education into K-12 educational programs and school curricula.</p> <hr/> <p>4. Bolster the network for climate educators, such as hosting peer-to-peer networking events and summits to share and exchange information, experiences, and best practices.</p> <hr/> <p>5. Encourage universities and community colleges to integrate climate considerations into vocational and educational training programs. For example, provide training for engineering students to incorporate more frequent and severe weather, flooding, sea level rise, or other climate impacts into design.</p> <hr/> <p>6. Build on the climate education website and continue to provide information on existing tools, materials, and best practices in teaching and learning about climate change.</p> <hr/> <p>7. Partner with extension programs to incorporate climate information into community outreach efforts and programs. Build on successful models such as the Washington State University Extension’s Carbon Masters program, the Master Gardeners program, and others.</p> <hr/> <p>8. Provide peer-to-peer professional training opportunities and encourage sharing of information among levels of government, nongovernmental organizations, and professional associations.</p>
<p><b>I-3. Engage the public in climate change conversations and solutions for</b></p>	<p>1. Develop a framework for citizen engagement and action, modeled after the framework developed in 2007 as part of the Governor’s climate change challenge.</p>

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### addressing impacts.

2. Develop compelling, visual stories and social media to connect climate change impacts to concerns people already have, convey the benefits of addressing climate change, and demonstrate how actions currently underway can address impacts of climate change.

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3. Partner with scientists, community leaders, and organizations credible to target audiences and those affected directly by the impacts of climate change when delivering messages on climate change to citizens.

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4. Engage the news media and provide information to help citizens make informed choices.

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5. Develop “citizen science” initiatives that engage the public in making observations and collecting and recording data on climate change and its effects on communities and the environment. Build on successful initiatives, such as the Washington King Tides Photo Initiative, Washington Sea Grant citizen science initiatives, National Phenology Network, and Audubon’s Christmas Bird Count.

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6. Improve the climate change clearinghouse to make the information more accessible and easier to understand. Build off successful models in other states, such as the Cal-Adapt website and link to existing tools, case studies, projects and portals, such as the Climate Adaptation Knowledge Exchange (CAKE) and the Georgetown Climate Center’s Adaptation Clearinghouse.