

Thurston Climate Adaptation Plan

Action Table

Flooding & Erosion (Education & Outreach)

Action 19

Educate commercial and residential building owners about proper maintenance of low-impact development (LID) facilities that treat stormwater runoff on site. [Washington's municipal stormwater permit directs recipients to make LID the preferred and commonly used approach to site development, where feasible. Such facilities reduce stormwater runoff, flooding, and water pollution.]

- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 56 Increasing drought increases the concentration of pollutants in first-flush runoff.
- 58 Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 59 Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 63 Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 60 Population change increases pollution related to development (e.g., more septic systems and impervious surfaces).
- 50 Intensifying precipitation raises the cost of development (flooding and runoff mitigation measures).
- 119 Intensifying precipitation increases volume of urban runoff and flooding, which decrease groundwater recharge.

Flooding & Erosion (Emergency Management)

Action 16

Designate alternative travel routes when roads must be closed because of natural hazards (floods, landslides, wildfires).

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.

Flooding & Erosion (Incentives)

Action 150

Incentivize residents to install rain gardens and plant drought-tolerant landscaping, where feasible, to adapt to changes in seasonal precipitation. [Incentives could include utility rebates or credits] [U.S. EPA has published a handbook with "Water-Smart" landscaping tips for rain gardens and other parts of the yard: https://www3.epa.gov/watersense/docs/water-efficient_landscaping_508.pdf]

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 13** Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 30** Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 63** Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 5** Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.

Flooding & Erosion (Infrastructure Management)

Action 6

Relocate or retrofit low-lying roads vulnerable to sea-levels rise. [Transferred actions could include encouraging the federal government to raise Interstate 5 at the Nisqually Estuary and U.S. Highway 101 at Mud Bay.]

Source: Modified Action 3-2B from NRF climate adaptation plan

- 12 Sea-level rise increases the frequency, depth and duration of inundation of low-lying coastal areas, which could turn marshes, estuaries and other upland areas into mudflats (dams limit sedimentation at Nisqually Delta).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 32 Sea-level rise raises the cost of new development and redevelopment.
- 112 Sea-level rise turns coastal marshes and forests into mudflats that alter nesting habitat.

Action 20

Decouple remaining combined storm and sewer systems. [adds capacity, mitigates back-ups and outbreaks of water-borne disease]

- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 63 Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.

Action 102

Install flood gates on stormwater outfalls that are connected to Puget Sound. [helps prevent back-ups during high tide/heavy rain events]

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 103

Evaluate the cost of protecting versus relocating critical facilities located in areas at risk of inundation from rising sea levels. Build floodwalls around critical facilities deemed worth protecting. Also, identify and set aside areas to receive critical facilities that should be moved at the end of their useful lifespan.

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 98 Sea-level rise reduces shoreline recreation opportunities.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Flooding & Erosion (Infrastructure Management)

Action 104

Design new stream culverts and other drainage infrastructure to accommodate projected higher peak flows. [This action includes replacement of existing culverts and other drainage infrastructure.]

- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.

Action 117

Evaluate options for protecting important historical or cultural sites at risk of coastal or inland flooding. [Options could include allowing inundation of the site, relocating the site to higher ground, or stabilizing the site's shoreline with vegetation, rip-rap or other materials.]

Source: Modified action in NFS/NPS Climate Adaptation Library

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).

Action 118

Consider retrofitting, rerouting or abandoning pedestrian/bicycle trails and bridges in areas that are subject to repetitive flooding and/or landslides.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).

Action 137

For sites where elevating or relocating a building is not a viable option, acquire the property, use the land for appropriate uses (e.g., flood storage or agriculture), and help the occupants resettle in the community.

Source: Modified action from Smart Growth Fixes for Climate Adaptation & Resilience

- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).

Action 142

Evaluate at a basin scale natural and constructed flood-storage options (e.g., wetlands or artificial ponds) upstream of concentrated development areas that are at risk of flooding.

Source: Modified action from Central Vermont climate resilience plan

- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.

Flooding & Erosion (Planning & Data)

Action 4

Establish basin goals for restoring a certain percentage of riparian vegetation along freshwater and marine shorelines. [stabilizes banks, provides shade and flood storage, slows and filters polluted runoff, stores carbon emissions and enhances air quality] [Note: The Alliance for a Healthy South Sound's draft South Sound Strategy sets acreage targets and identifies locations for protecting and restoring freshwater and marine riparian habitat, including estuaries.]

Source: Modified ST Action E-4.10

- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 11 Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 20 Sea-level rise increases wave-action effects, which could degrade coastal habitat.
- 54 Warmer summers increase water temperatures.
- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 56 Increasing drought increases the concentration of pollutants in first-flush runoff.
- 79 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 102 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 39 Warmer water thermally stresses salmonids, which support economically important fisheries.
- 42 Warmer winters reduce snowpack and alter stream volume and temperature, impacting long-term productivity of anadromous fish populations and fisheries.
- 64 Warmer water increases periods of low dissolved oxygen and hypoxic conditions in both freshwater and marine areas.

Action 25

Prioritize appropriate brownfield clean-up strategies/planned actions for low-lying sites that are most vulnerable to sea-level rise.

Source: Modified version of ST Action EC-5.6

- 62 Sea-level rise inundates former industrial sites, which could mobilize pollutants in the soil and degrade water quality.

Action 49

Map transportation infrastructure that is subject to frequent flooding or is prone to landslides.

Source: CW-MH10 Countywide Hazard Mitigation Initiative

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 97

Conduct stormwater infrastructure retrofit studies for all Thurston County basins, and establish funding to retrofit existing development.

Source: Modified ST Action E-4.4

- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.

Flooding & Erosion (Regulations)

Action 2

Require additional setbacks and vegetated buffers for new construction adjacent to shorelines vulnerable to accelerated erosion exacerbated by sea-level rise.

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut of access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.

Action 3

Where appropriate, limit installation of new coastal seawalls and rip-rap, as well as consider removing or retrofitting existing armoring to accommodate natural shoreline translation. [Such a “managed retreat” could entail replacing steep seawalls with gradual slopes, native vegetation, gravel and driftwood to slow erosion.] [Note: The Alliance for a Healthy South Sound's draft South Sound Strategy sets numerical targets for protecting coastal "feeder" bluffs, as well as targets for protecting intact shorelines/restoring modified shorelines].

Source: (Johannessen and MacLennan, 2007)

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut of access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.

Action 17

Prohibit construction of new buildings and roads in areas where flood and landslide risks are highest.

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut of access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
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- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 101

Require that the finished floors of new buildings near shorelines are raised sufficiently to accommodate projected sea-level rise over the structure's lifespan.

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut of access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 32 Sea-level rise raises the cost of new development and redevelopment.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Flooding & Erosion (Regulations)

Action 108

Minimize development, disturbance and vegetation removal on or near steep slopes (>25% gradient) adjacent to waterbodies.

Source: Modified Action 10 from Deschutes River Watershed project; action also in Columbia Basin Trust adaptation toolkit

- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 57 Intensifying precipitation contaminates water (turbidity and sedimentation) due to landslides.

Flooding & Erosion (Restoration & Conservation)

Action 89

Evaluate funding mechanisms to help restore and protect shoreline and stream riparian areas. [For example, a municipality could add a vegetation restoration surcharge to its stormwater utility rate.]

Source: Modified ST Action E-4.10

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 11 Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 20 Sea-level rise increases wave-action effects, which could degrade coastal habitat.
- 54 Warmer summers increase water temperatures.
- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 56 Increasing drought increases the concentration of pollutants in first-flush runoff.
- 79 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 102 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 39 Warmer water thermally stresses salmonids, which support economically important fisheries.
- 42 Warmer winters reduce snowpack and alter stream volume and temperature, impacting long-term productivity of anadromous fish populations and fisheries.
- 64 Warmer water increases periods of low dissolved oxygen and hypoxic conditions in both freshwater and marine areas.

Action 107

Determine which coastal estuaries are worth protecting and support their natural inland migration as sea levels rise.

Source: Modified Action 3.1a from NRF adaptation plan

- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 10 Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 11 Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 12 Sea-level rise increases the frequency, depth and duration of inundation of low-lying coastal areas, which could turn marshes, estuaries and other upland areas into mudflats (dams limit sedimentation at Nisqually Delta).
- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 20 Sea-level rise increases wave-action effects, which could degrade coastal habitat.

Plants & Animals (Education & Outreach)

Action 78

Educate waterfront property owners about the benefits of voluntary oyster seeding and other shellfish production and encourage such practices.

Source: Modified ST Action F-2.10

- 20 Sea-level rise increases wave-action effects, which could degrade coastal habitat.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut of access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 59 Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 83 Ocean acidification makes it harder for calcifying organisms to form shells, and ultimately harms commercial and recreational shellfisheries.
- 85 Warmer winters shift life cycle of fish and wildlife, which could reduce populations that support subsistence and recreational hunting.
- 103 Ocean acidification makes it harder for calcifying organisms to form shells, and it ultimately harms commercial and recreational fisheries.
- 104 Ocean acidification reduces the food available for and survival of salmon and other marine life.
- 41 Ocean acidification reduces food available for and survival of salmon and other marine life.
- 109 Sea-level rise pushes saltwater farther into estuaries, which may inundate near-coastal farms and ranches.
- 45 Warmer water increases the risk of marine water stratification and hypoxia, which could alter the timing of spring plankton blooms that support the marine food web (including salmon and other economically important fish).

Action 122

Increase education efforts about efficient of crop irrigation and soil water-retention techniques.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 38 Warmer summers raise the risk of low crop yields or failure due to warmer temperature, reduced summer precipitation and increased pest prevalence.
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 96 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Action 124

Create a health impacts of climate change website, hosted by Thurston County Health & Social Services, and update the site with information that helps the community prepare for and respond to drought, air quality, extreme heat, disease vectors, and other threats.

Source: Modified action from draft Thurston County drought planning effort

- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 116 Increasing drought raises pollutant concentrations in shallow wells and surface waters.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.

Plants & Animals (Education & Outreach)

Action 131

Expand education and outreach to youth and adults about how forests, prairies and streams support ecosystem services and climate resiliency (providing habitat for fish and wildlife, mitigating erosion, etc.) so as to encourage sustainable land-use practices by residents.

Source: Modified action from Alliance for a Healthy Sound's draft (2016) South Sound Strategy

- 11** Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 79** Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 85** Warmer winters shift life cycle of fish and wildlife, which could reduce populations that support subsistence and recreational hunting.
- 39** Warmer water thermally stresses salmonids, which support economically important fisheries.
- 113** Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Plants & Animals (Incentives)

Action 106

Increase funding, education and incentives for private landowners so that they may practice land management in a way that enhances ecological and economic resilience. [protecting and restoring forests, prairies and shoreline/riparian areas] [incentives could include providing landowners payments for the ecosystem services that the conserved/restored lands provide, as well as expanding Thurston County's Transfer of Development Rights (TDR) program]

Source: Hybrid of Action 1.1a from NRF adaptation plan and Action 5 from Deschutes River Watershed project

- 22** Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 85** Warmer winters shift life cycle of fish and wildlife, which could reduce populations that support subsistence and recreational hunting.
- 15** Warmer summers decrease climatic suitability of areas that currently support Garry oak and prairie habitat.
- 139** Warmer summers decrease climatic suitability of areas that currently support Douglas fir.
- 112** Sea-level rise turns coastal marshes and forests into mudflats that alter nesting habitat.
- 113** Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Plants & Animals (Infrastructure Management)

Action 18

Increase the urban canopy with drought-tolerant and pest-resistant vegetation. [conserves water, provides cooling shade, as well as improves air and water quality, flood storage/infiltration, and pedestrian experience]

Source: Columbia Basin Trust Adaptation Resource Kit

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 54 Warmer summers increase water temperatures.
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 23 Population change increases pressure on existing parks and open space.
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 132 Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.
- 50 Intensifying precipitation raises the cost of development (flooding and runoff mitigation measures).
- 111 Warmer summers increase atmospheric CO₂, which decreases the nutritional quality of forage and pasture lands for livestock and wild animals.

Action 121

Improve coordination of efforts to identify stream crossings that impede fish movements, share data, and prioritize culvert replacement.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.

Plants & Animals (Planning & Data)

Action 116

Expand efforts to monitor the cause and extent of changes in native and invasive plant distribution.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 16 Warmer winters increase the range and survival of invasive species, pests and diseases that threaten native flora and fauna.
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.

Plants & Animals (Restoration & Conservation)

Action 5

Implement early detection of invasive species on land and in water, and expand biological control and manual removal of such plants and insects.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 10 Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 16 Warmer winters increase the range and survival of invasive species, pests and diseases that threaten native flora and fauna.
- 106 Warmer winters increase the range and survival of pests and diseases that affect crops.

Action 62

Set basin goals for resource and habitat protection, such as no net loss of farmland, forest cover and prairie habitat.

Source: Modified ST Action C-4.1

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 10 Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 11 Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 14 Warmer winters cause salmon to remain active during winter and deplete their store of energy/health.
- 16 Warmer winters increase the range and survival of invasive species, pests and diseases that threaten native flora and fauna.
- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 79 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 83 Ocean acidification makes it harder for calcifying organisms to form shells, and ultimately harms commercial and recreational shellfisheries.
- 102 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 103 Ocean acidification makes it harder for calcifying organisms to form shells, and it ultimately harms commercial and recreational fisheries.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 15 Warmer summers decrease climatic suitability of areas that currently support Garry oak and prairie habitat.
- 38 Warmer summers raise the risk of low crop yields or failure due to warmer temperature, reduced summer precipitation and increased pest prevalence.
- 39 Warmer water thermally stresses salmonids, which support economically important fisheries.
- 42 Warmer winters reduce snowpack and alter stream volume and temperature, impacting long-term productivity of anadromous fish populations and fisheries.
- 105 Increasing drought raises the risk of lower crop yield or failure.
- 106 Warmer winters increase the range and survival of pests and diseases that affect crops.
- 109 Sea-level rise pushes saltwater farther into estuaries, which may inundate near-coastal farms and ranches.
- 139 Warmer summers decrease climatic suitability of areas that currently support Douglas fir.
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 96 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 110 Warmer summers increase the heat stress risk for dairy cows and other large livestock.
- 113 Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Plants & Animals (Restoration & Conservation)

Action 75

Increase opportunities for urban agriculture and less land-intensive farming models such as aquaponics and vertical gardening.

Source: Modified ST Action ST F-1.5

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 38 Warmer summers raise the risk of low crop yields or failure due to warmer temperature, reduced summer precipitation and increased pest prevalence.
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 105 Increasing drought raises the risk of lower crop yield or failure.
- 106 Warmer winters increase the range and survival of pests and diseases that affect crops.
- 107 Warmer summers accelerate the risk of food spoilage before it reaches market.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 113 Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Action 99

Protect and enhance marine vegetation such as eelgrass. [helps clean water, sequester carbon dioxide, improve fish habitat and survival] [Note: The Alliance for a Healthy South Sound's draft South Sound Strategy does not propose a local target for eelgrass beds; the Nisqually Estuary has Thurston County's only significant eelgrass beds.]

- 20 Sea-level rise increases wave-action effects, which could degrade coastal habitat.
- 59 Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 79 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 83 Ocean acidification makes it harder for calcifying organisms to form shells, and ultimately harms commercial and recreational shellfisheries.
- 103 Ocean acidification makes it harder for calcifying organisms to form shells, and it ultimately harms commercial and recreational fisheries.
- 104 Ocean acidification reduces the food available for and survival of salmon and other marine life.
- 41 Ocean acidification reduces food available for and survival of salmon and other marine life.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.

Action 114

Consider additional assisted migration of vulnerable plant and animal species to suitable habitat.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 10 Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 15 Warmer summers decrease climatic suitability of areas that currently support Garry oak and prairie habitat.
- 139 Warmer summers decrease climatic suitability of areas that currently support Douglas fir.

Plants & Animals (Restoration & Conservation)

Action 123

Plant vegetation to increase shading of wetlands and riparian areas, where appropriate.

Source: Action from NFS/NPS Climate Adaptation Library

- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.

Action 145

Build logjams with large woody debris to improve river channel conditions and cool water temperatures. [Such structures vary the river by digging out pools for fish to rest and creating sediment-free riffles for fish to spawn.]

Source: Squaxin Island Tribe: <http://www.squaxin-nr.org/page/24/>

- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 10 Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 79 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.

Transportation & Energy (Education & Outreach)

Action 54

Expand outreach and education to commercial and residential power customers about the benefits of clean and efficient energy technologies and practices.

Source: Modified ST Action EN-3.4

- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.

Action 135

Develop the technical expertise and skills of municipal staff in preparing for and responding to climate change impacts.

Source: Modified action from King County Strategic Climate Action Plan

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 52 Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.

Transportation & Energy (Emergency Management)

Action 42

Create a lifeline transportation route GIS map for the Thurston Region and integrate the data into the Thurston County Emergency Operations Plan and other local planning needs.

Source: CW-MH4 Countywide Hazard Mitigation Initiative

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 47** Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 95** Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99** Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Transportation & Energy (Incentives)

Action 22

Explore "on-bill" financing of dispersed (on-site) renewable energy generation systems that spread out capital costs over time. (e.g., building- and district-scale solar power). [reduces grid/utility dependence and greenhouse gas emissions, saves money]

Source: Modified version of ST Action EN-1.1

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 97 Warmer summers raise home cooling costs (e.g., buying, installing, and using air-conditioning).

Action 37

Explore additional incentives that support the installation of small-scale renewable energy systems in buildings. [An example of an incentive is Property Assessed Clean Energy (PACE) financing, which provides installation capital that is subsequently paid back via a special assessment on the recipient's property taxes]

Source: Combination of ST Actions EN-1.3 and EN-1.5

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 97 Warmer summers raise home cooling costs (e.g., buying, installing, and using air-conditioning).
- 136 Intensifying precipitation increases use of polluting generators following storm-induced power outages.

Action 55

Increase incentives for the use of ductless and high-efficiency heat pumps.

Source: Modified ST Action EN-3.5

- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 97 Warmer summers raise home cooling costs (e.g., buying, installing, and using air-conditioning).

Transportation & Energy (Incentives)

Action 58

Increase incentives to improve financial viability for infill and redevelopment projects.

Source: Modified ST Action C-1.5

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 61 Intensifying precipitation contaminates water (nutrients) from septic systems due to high groundwater flooding.
- 65 Population change increases transportation-related energy consumption, CO2 emissions, and other pollutants related to buildings and transportation.
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 36 Population change puts more strain on transportation (roads, transit, etc.).
- 60 Population change increases pollution related to development (e.g., more septic systems and impervious surfaces).
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 113 Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Action 98

Offer rebates or utility bill credits for residential rate-payers to weatherize their home, install renewable energy systems, and purchase energy-efficient appliances (including air conditioners). [incentives could be increased for low-income people, rental properties]

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.
- 97 Warmer summers raise home cooling costs (e.g., buying, installing, and using air-conditioning).

Transportation & Energy (Infrastructure Management)

Action 23

Expand and retrofit the region's energy distribution, monitoring and storage infrastructure to support renewable and dispersed (on-site) energy generation.

Source: Modified version of ST Goal EN-2

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.

Action 38

Build additional large-scale renewable energy projects (e.g., utility-scale solar arrays and wind farms) in Thurston County.

Source: Modified ST Action EN-1.4

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.

Action 40

Generate additional energy from waste products (e.g., woody biomass and sewage) in Thurston County. [LOTT's downtown Olympia sewage-treatment plant already captures methane to generate heat and electricity on site.]

Source: Modified ST Action EN-1.6

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 29 Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91 Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.

Transportation & Energy (Infrastructure Management)

Action 133

Consider the full life-cycle costs and climate change impacts on municipal assets (e.g., roads, buildings, parks) -- from initial siting and design to ongoing operations and maintenance.

Source: Modified actions from King County Strategic Climate Action Plan

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 7** Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 87** Intensifying precipitation puts more strain on services (social, emergency, etc.).

Action 141

Elevate, reinforce or relocate important electrical equipment that is within areas at risk of flooding and/or landslides (e.g., low-lying substations and underground lines).

Source: Modified action from "Power Failure," a 2014 report by the Union of Concerned Scientists

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).

Transportation & Energy (Planning & Data)

Action 51

Factor climate change impacts into consideration of local transportation projects submitted for federal transportation funding. [For example, projects could be assessed for whether they increase hazard resiliency or vulnerability, as well as whether they help reduce the region's carbon footprint.]

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 68** Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 74** Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 71

Consider how land-use decisions affect environmental quality. [Reduce the region's vehicle miles traveled (and related air and water pollution) by focusing more job and housing density where there is access to services as well as safe and viable choices for travel.]

Source: Modified ST Action E-1.1

- 65** Population change increases transportation-related energy consumption, CO2 emissions, and other pollutants related to buildings and transportation.
- 36** Population change puts more strain on transportation (roads, transit, etc.).
- 132** Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).

Action 73

Increase resources to monitor air quality and enforce air pollution regulations.

Source: Modified ST Action E-1.3

- 65** Population change increases transportation-related energy consumption, CO2 emissions, and other pollutants related to buildings and transportation.
- 36** Population change puts more strain on transportation (roads, transit, etc.).
- 132** Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).

Action 132

Update the regional climate adaptation plan on a regular basis with new information, evaluate implementation efforts and effectiveness, and amend strategies and actions as necessary. [How often -- every 5 years?]

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 7** Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 82** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 83** Ocean acidification makes it harder for calcifying organisms to form shells, and ultimately harms commercial and recreational shellfisheries.

Transportation & Energy (Planning & Data)

Action 136

Align land use, hazard mitigation, transportation, capital improvement, and other plans so that they are working toward the same goals.

Source: Modified action from Smart Growth Fixes for Climate Adaptation & Resilience

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 7** Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 87** Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 95** Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.

Action 138

Incorporate projected sea-level rise impacts into all future land-use and water-system planning and regulations.

Source: Modified action from Smart Growth Fixes for Climate Adaptation & Resilience

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 58** Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 114** Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.

Transportation & Energy (Regulations)

Action 41

Establish local government energy goals/benchmarks (e.g., LEED) for new buildings, and adopt permitting practices and design guidelines that support clean and efficient energy practices and technologies (e.g., passive design and rooftop solar panels).

Source: *Combinaton of ST Actions EN-1.7, EN-3.3*

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 29** Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120** Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91** Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 136** Intensifying precipitation increases use of polluting generators following storm-induced power outages.

Action 57

Consider adopting policies that require residential and commercial properties to undertake an energy audit at the time of sale during substantial remodel, including, if deficiencies are found, encouraging energy retrofits to upgrade properties to a specified level.

Source: *ST Action EN-3.10*

- 29** Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 120** Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which — depending on the energy source — may increase carbon emissions.
- 91** Warmer summers increase summer peak energy demand for cooling residential and commercial buildings, which could place more demand on grid and reduce energy security.
- 97** Warmer summers raise home cooling costs (e.g., buying, installing, and using air-conditioning).

Action 109

Downzone parcels and decrease impervious surface limits near streams and lakes with nutrient-loading problems.

Source: *Modified Actions 11, 12 and 13 from Deschutes River Watershed project*

- 8** Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 55** Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 56** Increasing drought increases the concentration of pollutants in first-flush runoff.

Water Use (Education & Outreach)

Action 15

Expand septic system operation and maintenance education and outreach programs.

Source: Modified Action 3 from Deschutes Watershed project

- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 61 Intensifying precipitation contaminates water (nutrients) from septic systems due to high groundwater flooding.
- 60 Population change increases pollution related to development (e.g., more septic systems and impervious surfaces).

Action 93

Identify a local non-regulatory entity to provide technical assistance to private well owners regarding conserving water and detecting leaks and pollution.

Source: Modified ST Action E-3.3

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 52 Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 114 Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 116 Increasing drought raises pollutant concentrations in shallow wells and surface waters.
- 129 Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.

Water Use (Emergency Management)

Action 12

Develop a comprehensive drought-response strategy that sets action levels for different drought stages.

Source: Andrew Kinney

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8** Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 10** Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 29** Increasing drought reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 105** Increasing drought raises the risk of lower crop yield or failure.
- 5** Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 96** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 125** Increasing drought lowers reservoir levels, which exposes organic materials and causes them to decay and emit greenhouse gases.
- 129** Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.
- 135** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Action 120

Consider constructing new emergency/reserve water-storage systems (e.g., large cisterns).

Source: Modified action from NFS/NPS Climate Adaptation Library

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).

Water Use (Incentives)

Action 13

Increase incentives for water conservation during dry months.

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 52 Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 105 Increasing drought raises the risk of lower crop yield or failure.
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 96 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 125 Increasing drought lowers reservoir levels, which exposes organic materials and causes them to decay and emit greenhouse gases.
- 129 Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.
- 135 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Action 28

Incentivize new commercial construction to include on-site rainwater harvesting facilities.

Source: *Smart Growth Fixes for Climate Adaptation and Resilience*, pg. vi, 69

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 63 Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 138 Intensifying precipitation necessitates retrofitting stormwater and wastewater infrastructure to mitigate flooding and backups that threaten water quality and human health and welfare.
- 80 Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 119 Intensifying precipitation increases volume of urban runoff and flooding, which decrease groundwater recharge.

Water Use (Infrastructure Management)

Action 24

Increase the energy efficiency of the region's water infrastructure (includes replacing pumps and other drinking, waste and storm water systems that consume large amounts of energy).

Source: Modified version of ST EN-3.7

- 65 Population change increases transportation-related energy consumption, CO2 emissions, and other pollutants related to buildings and transportation.
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 126 Sea-level rise increases energy consumed to pump wastewater and stormwater.
- 129 Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.

Water Use (Planning & Data)

Action 90

Identify and secure a consistent funding source to support long-term monitoring of ground and surface water quality and quantity. As part of this comprehensive program, incentivize water metering for all wells and assess near-shore wells' vulnerability to saltwater intrusion and inundation.

Source: Modified ST Action E-4.12

- 7 Intensifying precipitation increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could degrade sensitive riparian areas.
- 8 Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 11 Warmer winters degrade critical habitat (rivers and streams) due to greater winter runoff.
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 56 Increasing drought increases the concentration of pollutants in first-flush runoff.
- 57 Intensifying precipitation contaminates water (turbidity and sedimentation) due to landslides.
- 58 Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 59 Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 61 Intensifying precipitation contaminates water (nutrients) from septic systems due to high groundwater flooding.
- 62 Sea-level rise inundates former industrial sites, which could mobilize pollutants in the soil and degrade water quality.
- 63 Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 102 Warmer water threatens the survival of salmon, which support cultural and economic practices and ecosystem services.
- 114 Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.
- 64 Warmer water increases periods of low dissolved oxygen and hypoxic conditions in both freshwater and marine areas.
- 45 Warmer water increases the risk of marine water stratification and hypoxia, which could alter the timing of spring plankton blooms that support the marine food web (including salmon and other economically important fish).
- 66 Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 67 Warmer summers increase recreational activity in waterbodies and risk of boat fuel spills.

Action 92

Assess drinking water wells' vulnerability to sea-level rise inundation and saltwater intrusion, and develop adaptation measures (e.g., relocating wells).

- 114 Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.

Water Use (Planning & Data)

Action 125

Enhance the ability to predict drought and flood conditions by improving tools that track soil moisture, streamflow, precipitation, groundwater levels, tide levels, well levels, reservoir levels and weather forecasts. [The Water Resources Dashboard -- an online tool created by NOAA and other partners -- has maps and data that can help local resource managers monitor for the potential for extreme precipitation and drought: <https://toolkit.climate.gov/topics/water-resources/water-resources-dashboard>.]

Source: Modified action from draft Thurston County drought plan

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 25** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 87** Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 33** Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 105** Increasing drought raises the risk of lower crop yield or failure.
- 109** Sea-level rise pushes saltwater farther into estuaries, which may inundate near-coastal farms and ranches.
- 133** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 5** Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 94** Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95** Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 96** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 99** Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 110** Warmer summers increase the heat stress risk for dairy cows and other large livestock.
- 135** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Water Use (Regulations)

Action 26

Implement a water impact fee that reflects each property's water consumption.

Source: Smart Growth Fixes for Climate Adaptation and Resilience, pg. v, 66

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.

Action 94

Develop a regulatory structure to allocate water for all users (rural and urban homes, commercial businesses, etc.).

Source: Modified ST Action E-3.5

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8** Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 114** Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 116** Increasing drought raises pollutant concentrations in shallow wells and surface waters.
- 129** Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.

Water Use (Restoration & Conservation)

Action 14

Increase treatment and reuse of greywater (i.e., gently used water from bathroom sinks, showers, tubs, and washing machines) for irrigating plants, supplementing low streamflows, and other purposes.

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 10** Increasing drought stresses sensitive plants and habitat, which could reduce long-term viability of preserved and restored areas.
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 129** Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.

Action 29

Increase the use of water-efficient plumbing fixtures in various building types (residential, industrial, commercial, institutional).

Source: *Smart Growth Fixes for Climate Adaptation and Resilience*, pg. v, 66, 68

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8** Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.
- 129** Increasing drought necessitates moving water farther distances, which consumes more energy/causes more greenhouse gas emissions.

Action 30

Establish water usage goals/benchmarks for various building types (residential, industrial, commercial, institutional).

Source: *Smart Growth Fixes for Climate Adaptation and Resilience*, pg. v, 68

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 8** Increasing drought degrades critical habitat (lakes, rivers, streams and watersheds) due to changes in water volume and temperature.
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.

Action 45

Purchase and retire water rights and/or transfer them to a water bank.

Source: *Action 20 from Deschutes River Watershed project*

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 80** Increasing drought reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels and raise the cost of pumping water from greater depths.

Water Use (Restoration & Conservation)

Action 95

Facilitate new residential water connections to municipal sources, where feasible.

Source: Modified ST Action E-3.6

- 1** Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 52** Increasing drought reduces groundwater recharge (drinking water and in-stream flows).
- 117** Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).

Wildfire & Hazard Response (Education & Outreach)

Action 9

Encourage private forestland owners and residents living in Wildland-Urban Interface (WUI) areas to use Firewise practices.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 66 Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Action 11

Enhance training and financial support for wildfire response.

- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 66 Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Education & Outreach)

Action 44

Develop and maintain a countywide hazards mitigation public outreach strategy.

Source: *Modified CW-MH6 Countywide Hazard Mitigation Initiative*

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 63 Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 114 Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.
- 132 Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 96 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Action 146

Encourage residents to receive Community Emergency Response Team (CERT) training and help coordinate hazard recovery efforts locally. [Lead for this action could be a tribe, neighborhood association and/or other community group]

Source: *PDX community disaster preparedness plan*

- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.

Wildfire & Hazard Response (Education & Outreach)

Action 147

Create and publicize widely a directory of neighbors (and their special needs or skills) and map of nearby assets (e.g., medical facilities, police and fire stations, grocery stores, bicycle shops) to aid hazard response and recovery efforts. [Washington Emergency Management promotes the "Map Your Neighborhood" tool: <http://mil.wa.gov/emergency-management-division/preparedness/map-your-neighborhood>] [Lead for this action could be a tribe, neighborhood association and/or other community group]

Source: *PDX community disaster preparedness plan*

- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.

Action 148

Select a neighborhood hub (e.g., a school or other location that's safe, accessible and well-known) to serve as a temporary shelter, cooling center or coordination site for hazard-recovery efforts, and publicize its location widely. Create a hub "go kit," containing waterproof signs, emergency radios and other materials. [Lead for this action could be a tribe, neighborhood association and/or other community group]

Source: *PDX community disaster preparedness plan*

- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.

Wildfire & Hazard Response (Emergency Management)

Action 43

Strengthen interjurisdictional asset-management capabilities.

Source: CW-MH7 Countywide Hazard Mitigation Initiative

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.

Action 50

Strengthen the capabilities of the Disaster Medical Coordination Center (DMCC) hospital.

Source: CW-MH8 Countywide Hazard Mitigation Initiative

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Emergency Management)

Action 59

Convene the region's health, social service, and public safety partners to seek opportunities to bridge the area's safety gaps.

Source: *ST Action PS-1.1*

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 55** Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 57** Intensifying precipitation contaminates water (turbidity and sedimentation) due to landslides.
- 59** Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 61** Intensifying precipitation contaminates water (nutrients) from septic systems due to high groundwater flooding.
- 63** Intensifying precipitation contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows.
- 78** Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 82** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 87** Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90** Population change increases strain on social and emergency services.
- 92** Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 132** Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).
- 133** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 4** Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 96** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.
- 99** Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 135** Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Wildfire & Hazard Response (Emergency Management)

Action 61

Upgrade all emergency services radio communications equipment and infrastructure to an interoperable countywide platform that is responsive to changes in technology.

Source: Modified ST Action PS-1.6

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 132 Warmer summers increase production of surface ozone (VOCs interacting with NOx) and accumulation of fine particulate matter (PM2.5).
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 135 Increasing drought parches farm fields and other open spaces, which could erode and release windblown dust (e.g., PM10) that degrades air quality.

Action 67

Prioritize relationship-building among public safety agencies and other entities to leverage response capabilities during disaster events.

Source: ST Action PS-2.5

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.

Action 69

Participate in regional emergency exercises and recovery planning processes.

Source: ST Action PS-2.6

- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.

Wildfire & Hazard Response (Emergency Management)

Action 81

Integrate long-term recovery planning into disaster response efforts that prioritize restoration of vital public safety facilities and other essential community assets.

Source: ST Action PS-2.7

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 58 Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 109 Sea-level rise pushes saltwater farther into estuaries, which may inundate near-coastal farms and ranches.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 110 Warmer summers increase the heat stress risk for dairy cows and other large livestock.

Wildfire & Hazard Response (Emergency Management)

Action 82

Enhance training of emergency personnel and other responders in preparedness, response and mitigation best practices, and evaluate lessons learned following disasters.

Source: Modified ST Action PS-2.8

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 58 Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 109 Sea-level rise pushes saltwater farther into estuaries, which may inundate near-coastal farms and ranches.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 110 Warmer summers increase the heat stress risk for dairy cows and other large livestock.

Action 86

Coordinate on strategies for containing urban wildfires.

Source: ST Action PS-2.16

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Emergency Management)

Action 119

Limit activities in parks and other outdoor recreation areas when natural hazards pose risks to public safety.

Source: Modified action from NFS/NPS Climate Adaptation Library

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.

Wildfire & Hazard Response (Incentives)

Action 149

Incentivize residents to attend community events focused on emergency preparedness, response and recovery (e.g., neighborhood potlucks with mock disaster drills, skills sharing, and speakers from local police and fire agencies) by offering door prizes (e.g., flashlights, hand-crank radios, emergency blankets). [Lead for this action could be TCEM, tribe, a neighborhood association and/or other community group]

Source: PDX community disaster preparedness plan

- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.

Wildfire & Hazard Response (Infrastructure Management)

Action 87

Expand the eligibility of Federal Emergency Management Agency (FEMA) mitigation grant programs to allow replacement of aging infrastructure. [This includes facilities such as water infrastructure, fire stations, transportation infrastructure, emergency coordination shelters, and buildings used as emergency shelters that are better suited to serve communities in the future.]

Source: Modified ST Action PS-2.17

- 3** Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26** Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27** Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30** Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 58** Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 92** Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 114** Sea-level rise makes coastal groundwater more vulnerable to saltwater intrusion and inundation.
- 68** Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 74** Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 111

Design sidewalks, boulevards and highways to act as firebreaks and evacuation routes.

Source: Modified Action 2.3 from Columbia Basin Trust adaptation toolkit

- 22** Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33** Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122** Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133** Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 66** Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 74** Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94** Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95** Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99** Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Planning & Data)

Action 46

Map the region's high-risk wildland urban interface communities and locations of wildfires.

Source: *Modified CW-WH1 Countywide Hazard Mitigation Initiative*

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Action 47

Inventory essential facilities and assets (e.g., police and fire stations) to support hazard mitigation planning and emergency management.

Source: *CW-MH1 Countywide Hazard Mitigation Initiative*

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 30 Intensifying precipitation increases volume of urban runoff and flooding, which could render inadequate some stormwater/flood-control facilities.
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).

Action 48

Inventory emergency facilities (e.g., cooling centers and temporary shelters) and assess operational (staffing and support) needs.

Source: *CW-MH11 Countywide Hazard Mitigation Initiatives*

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 4 Warmer summers cause urban heat islands, which could affect livability/health in heavily developed centers and corridors.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Planning & Data)

Action 65

Assess and improve the adaptive capacity of people who might be particularly vulnerable or most affected by climate change (e.g., people who are elderly, socially isolated, and/or live in high-risk areas).

Source: Modified action from *Smarsh Growth Fixes for Climate Adaptation & Resilience*

- 55 Warmer water increases the growth and reach of pathogens (e.g., cyanobacteria and algal blooms) harmful to humans, fish and other water users.
- 59 Ocean acidification decreases marine pH, and such changes -- coupled with increases in ocean temperature and land-borne pollution -- threaten marine water quality.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 83 Ocean acidification makes it harder for calcifying organisms to form shells, and ultimately harms commercial and recreational shellfisheries.
- 90 Population change increases strain on social and emergency services.
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 64 Warmer water increases periods of low dissolved oxygen and hypoxic conditions in both freshwater and marine areas.
- 46 Warmer summers increase the risk for heat injuries due to rising temperatures, which will increase demand/cost for emergency medical services and hospitalizations.

Action 85

Jurisdictions with adopted hazard-mitigation plans should actively pursue funding opportunities to implement their highest-priority mitigation actions.

Source: *ST Action PS-2.15*

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 25 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and result in economic losses.
- 26 Sea-level rise raises the risk of coastal inundation and erosion, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 58 Sea-level rise increases coastal flooding of downtown Olympia and LOTT wastewater treatment plant assets, which could threaten the ability to treat and discharge water.
- 78 Warmer summers introduce or exacerbate disease vectors (carriers), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 92 Warmer summers increase extreme temperatures, which could cause hyperthermia -- a major risk for elderly, homeless and other especially vulnerable populations.
- 47 Sea-level rise increases the rate of erosion of unprotected coastal bluffs, which could threaten the property and safety of nearby residents.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Planning & Data)

Action 88

Develop a countywide disaster debris management plan with actions to efficiently dispose of or recycle materials (organic and artificial).

Source: Modified ST Action SW-1.9

- 13 Warmer summers stress sensitive plants and habitat, which could leave them vulnerable to extreme heat, pests or pathogens.
- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 5 Increasing drought stresses sensitive urban landscaping, which could leave them vulnerable to extreme heat, pests or pathogens.
- 68 Sea-level rise raises the risk of coastal inundation, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 71 Population change increases the solid waste generation.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.

Action 100

Assess climate change-induced migration within and to the Thurston Region and evaluate response strategies. [This could entail assessing which of the region's residents are most vulnerable to temporary or permanent displacement (e.g., low-income or socially isolated residents who may be forced to move because of climate-exacerbated hazards) and what resources they might need. This could also entail assessing who is most likely to move to the region and how to accommodate them in ways consistent with community values. This could be done by studying "chain migration," the tendency of migrants to follow those of similar ethnicity, language or job skillset, as well as by evaluating migrants' needs and where/how much growth should occur so that it's consistent with local comprehensive plans.]

- 1 Increasing drought makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 65 Population change increases transportation-related energy consumption, CO2 emissions, and other pollutants related to buildings and transportation.
- 90 Population change increases strain on social and emergency services.
- 117 Population change makes it harder to balance competing demands for water (for housing, industry, energy, agriculture, and the environment).
- 23 Population change increases pressure on existing parks and open space.
- 36 Population change puts more strain on transportation (roads, transit, etc.).
- 60 Population change increases pollution related to development (e.g., more septic systems and impervious surfaces).
- 89 Population change puts more strain on schools (e.g., unplanned influx or loss of students).
- 71 Population change increases the solid waste generation.
- 113 Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Wildfire & Hazard Response (Regulations)

Action 7

Extend and enforce the rural burn ban season during droughts.

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 66 Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Action 8

Downzone areas with highest risk of wildfire.

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
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- 66 Increasing drought contaminates water (turbidity and sedimentation) due to wildfires.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 95 Increasing drought raises the risk of wildfires, which could close roads and cut off access to vital goods and services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.
- 113 Population change increases pressure to develop rural areas, which could reduce, fragment and/or degrade farms, forests, and prairies.

Action 60

Modify building codes where necessary to address emergency service radio communications, fire sprinkler systems in all new residential and commercial construction, and access and egress issues to emergency response and equipment.

Source: ST Action PS-1.5

- 3 Sea-level rise increases the frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which could damage or disrupt use infrastructure and result in loss of cultural resources (e.g., homes, roads, etc.).
- 27 Intensifying precipitation raises the risk of floods and landslides, which could damage private property and public infrastructure, endanger lives, and cut off access to goods and services (affects agriculture, buildings, roads, bridges, and other assets).
- 87 Intensifying precipitation puts more strain on services (social, emergency, etc.).
- 90 Population change increases strain on social and emergency services.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Wildfire & Hazard Response (Regulations)

Action 139

Require new developments to submit a fire-protection plan during site plan review.

Source: Action from Smart Growth Fixes for Climate Adaptation & Resilience

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
- 122 Increasing drought raises the risk of wildfires, which could destroy forests that serve as a net carbon sink.
- 133 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 74 Increasing drought raises the risk of wildfires, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled.
- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.

Action 140

Adopt wildfire hazard overlay districts with development regulations based on factors such as slope, structure, and fuel hazards. [regulations for new developments]

Source: Modified Action from Smart Growth Fixes for Climate Adaptation & Resilience

- 22 Increasing drought raises the risk of wildfires, which could damage forests and other sensitive lands that provide habitat.
- 82 Increasing drought raises the risk of wildfires and elevated levels of PM10 from smoke.
- 33 Increasing drought raises the risk of wildfires which could damage forests that are important to the region's economy.
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- 94 Increasing drought raises the risk of wildfires, which could damage utility infrastructure.
- 99 Increasing drought raises the risk of wildfires, which could result in personal injury or death.