

Goal & Stressor Table Includes Risks (-) and Opportunities (+)

		STRESSORS							
		Warmer Summer	Warmer Winter	Warmer Water	Increasing Drought	Increasing Storminess	Sea-Level Rise	Ocean Acidification	Population Change
GOALS	Goal 1: Create vibrant centers, corridors and neighborhoods while accommodating growth	(-) Causes urban heat islands, which affect livability/health in heavily developed centers and corridors [Sec. 2.1, pg. 17]			(-) Limits water available to support new development [Sec. 3.4, pg. 53]	(-) Increases volume of urban runoff and flooding and renders inadequate some stormwater/flood-control facilities [Sec. 2.3, pg. 27]	(-) Increases frequency, depth and duration of inundation of low coastal areas (e.g., downtown Olympia), which may damage or disrupt use infrastructure (e.g., homes, roads, etc.) [Sec. 4.1, pg. 54]		(+) Presents opportunity to focus growth in existing urban areas [Sec. 6.5, pg. 89]
	Goal 2: Preserve environmentally sensitive lands, farmlands, forest lands, prairies, and rural lands, and develop compact urban areas	(-) Decreases climatic suitability of areas that currently support Garry oak and Douglas fir but may increase the range of western hemlock, western red cedar and other species that can withstand warmer temperatures [Sec. 5.2, pgs. 70-71] (-) Decreases freshwater wetland habitat [Sec. 3.3, pg. 49] (-) Stresses sensitive species, leaving them more vulnerable to pests and pathogens [Sec. 5.2, pg. 71]	(-) Supports survival of invasive species that could outcompete native flora and fauna throughout the region's forests, prairies and grazing lands [Secs. 5.1 and 5.2, pgs. 67-71] (-) Shifts the timing of flowering and abundance of pollinators, which could reduce some species of plants throughout the region [Sec. 5.2, pg. 70]	(-) Increases periods of low dissolved oxygen and hypoxic conditions in both freshwater and marine areas [Sec. 3.2, pg. 45]	(-) Raises the risk of wildfires, which could damage forests and other sensitive habitat [Sec. 5.2, pg. 73] (-) Stresses sensitive plants and habitat, reducing long-term viability of preserved and restored areas [Sec. 5.2, pg. 71]	(-) Increases frequency and intensity of heaviest 24-hour rain events and overall volume of winter streamflow, which could scour streambeds and degrade sensitive riparian areas [Sec. 3.1, pg. 32]	(-) Increases frequency, depth and duration of inundation of low-lying coastal areas, which could turn marshes and other upland areas into mudflats [Sec. 4.1, pg. 54] (+) Increases the rate of erosion of unprotected coastal bluffs, which contributes sand and gravel that allows for down-drift shores to become higher and move landward, thereby maintaining the beach profile [Sec. 4.1, pg. 63]		(-) Increases pressure on rural land to develop [Sec. 6.5, pg. 89] (-) Increases pressure on existing parks and open space [Sec. 6.5, pg. 89]

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G O A L S	Goal 3: Create a robust economy	(-) Raises risk of low crop yields or failure due to warmer temperature, reduced summer precipitation and increased pest prevalence [Sec. 5.1, pg. 69]	(-) Reduces snowpack and alters streamflow volume and temperature, impacting long-term productivity of anadromous fish populations and fisheries [Sec. 3.1, pgs. 32-36]	(-) Increases the risk of marine water stratification and hypoxia and could alter the timing of spring plankton blooms that support the marine food web, including salmon and other economically important fish [Sec. 4.2, pg. 66]	(-) Decreases summer streamflow, which could reduce the habitat, health, and survival of salmonids [Sec. 3.1, pg. 34]	(-) Raises the risk of floods and landslides, which could damage utility infrastructure and close roads, cutting off access to goods, natural resources, and services vital to region's economy [Sec. 6.2, pg. 78]	(-) Threatens to flood local highways, railways, bridges, port marine terminal and other transportation infrastructure that are critical to moving people and goods throughout the region [Sec. 4.1, pg. 35]	(-) Threatens Puget Sound fisheries (e.g., shellfish, crabs and salmon) -- both commercial and recreational harvests [Sec. 4.2, pg. 65]	(+) Increases local demand for goods and services and supports local job creation and demand [Sec. 6.5, pg. 89]
		(-) Increases demand/cost for emergency medical services and hospitalizations [Sec. 2.1, pg. 17]	(+) Supports longer growing season, new range of crops [Sec. 5.1, pg. 68]	(-) Thermally stresses salmonids, which support economically important fisheries [Sec. 3.1, pg. 38]	(-) Increases wildfire risk -- especially amid the urban-wildland interface -- which can damage forests and infrastructure critical to the region's economy [Sec. 5.2, pg. 73]	(-) Raises the risk of flooding, which could damage agricultural crops, buildings and equipment [Sec. 5.1, pg. 67]	(-) Threatens to flood low-lying industrial, commercial, agricultural, and residential properties, disrupt commerce and damage infrastructure [Sec. 4.1, pg. 67]		(-) Increases demand for and cost to provide services (social, emergency, etc.) [Sec. 6.5, pg. 89]
		(-) Impacts outdoor occupations, especially in the construction industry, and could result in project delays and increased costs [Sec. 2.1, pg. 17]			(-) Reduces summer hydropower production, a comparatively clean and inexpensive electricity source for commercial and residential customers [Sec. 3.1, pgs. 36-37]	(-) Raises the risk of flooding that could disrupt transportation, business, school, emergency service, and public works and private utility operations [Sec. 6.2, pg. 78]	(+) Inundates coastal marshes, which could turn them into mudflats that support shellfish and estuarine fish [Sec. 4.1, pg. 63]		(-) Puts more strain on transportation (roads, transit, etc.) [Sec. 6.5, pg. 89]
				(-) Reduces water supply, which is critical for agriculture and industry [Sec. 5.1, pg. 67]	(-) Increases risk of flooding that could damage private property and result in economic losses [Sec. 6.2, pg. 78]	(-) Increases the rate of erosion of unprotected coastal bluffs, which may threaten the property and safety of nearby residents [Sec. 4.1, pg. 63]			

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GOALS	Goal 4: Protect and improve water quality, including groundwater, rivers, streams, lakes and Puget Sound <i>(Water quality measured by temperature, volume, habitat and pollution)</i>	(-) Degrades water quality by supporting algal blooms [Sec. 3.2, pg. 45] (-) Degrades critical habitat due to increasing temperatures in freshwater (non-tidal) wetlands [Sec. 3.3, pg. 49] (-) Degrades critical habitat due to decreased habitat extent [Sec. 3.3, pg. 49]	(+) Increases the extent of seasonal (winter) wetlands on poorly drained soils (e.g., prairies) [Sec. 5.2, pg. 70] (-) Degrades critical habitat (temperature) due to decreases snowpack [Sec. 3.1, pgs. 32-39] (-) Degrades critical habitat (altered stream volume) due to increased rainfall and runoff [Sec. 3.1, pgs. 32-39]	(-) Degrades critical habitat due to increasing water temperature (alters fish migration timing, reach and success) [Sec. 3.1, pg. 38] (-) Increases the growth and reach of pathogens (e.g., cyanobacteria) harmful to humans, fish and other water users [Sec. 3.2, pg. 46] (-) Increases the risk of marine water stratification and hypoxia and could alter the timing of spring plankton blooms that support the marine food web [Sec. 4.2, pg. 66] (-) Degrades critical habitat due to increasing water temperature (expands range for warm water-adapted invasive fish) [Sec. 3.1, pg. 38]	(-) Contaminates water (turbidity and sedimentation) due to wildfires that burn water-filtering plants [Sec. 6.1, pg. 73-74] (-) Alters stream depth and breadth (erosion) due to greater incidence of wildfires [Sec. 6.1, pgs. 73-74] (-) Reduces groundwater recharge (drinking water) [Sec. 3.4, pg. 49] (-) Degrades critical habitat due to changes in lake, river and stream volume [Sec. 3.1, pg. 32]	(-) Contaminates water (nutrients, pathogens, turbidity and sedimentation) due to flooding [Sec. 6.2, pg. 79] (-) Contaminates water (turbidity and sedimentation) due to landslides [Sec. 6.2, pg. 81] (-) Contaminates water (bacteria, pathogens) due to a greater incidence of combined stormwater/sewer system overflows [Sec. 2.3, pg. 36] (-) Contaminates water (nutrients, turbidity, sedimentation) due to stormwater overflows [Sec. 2.3, pg. 36]	(-) Inundates former industrial sites, which could mobilize pollutants in the soil and degrade water quality [Sec. 4.1, pg. 57] (-) Inundates downtown Olympia and LOTT wastewater treatment plant assets, threatening ability to treat and discharge water [Sec. 4.1, pg. 58]	(-) Increases in ocean pH, coupled with increases in ocean temperature and land-borne pollution, threatens marine water quality [Sec. 4.2, pg. 65] (-) Increases in freshwater runoff with organic matter, which releases CO2 as it decomposes, exacerbates to ocean acidification and degrades marine water quality [Sec. 4.2, pg. 66]	(-) Increases pollution related to development (e.g., more septic systems and impervious surfaces) [Sec. 4.2, pg. 65]
	Goal 5: Plan and act toward zero waste in the region	(-) Raises the risk of greater die-off of vegetation (e.g., trees, crops) and volume of organic waste [Sec. 5.1, pg. 72]			(-) 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 [Sec. 6.1, pg. 73]	(-) Raises the risk of floods and landslides, which could damage public- and private-sector infrastructure (homes, businesses, roads, etc.) and create waste that cannot be reused or recycled [Sec. 6.2, pg. 78]	(-) 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 [Sec. 6.2, pg. 78]		(-) Increases solid and organic waste [Sec. 6.5, pg. 78]

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G O A L S	Goal 6: Ensure that residents have the resources to meet their daily needs <i>(needs include water, food, shelter, healthcare, employment, education, transportation)</i>	(-) Increases extreme temperatures that could cause hyperthermia -- a major risk for people who are homeless or work outdoors [Sec. 2.1, pg. 17]	(+) Lowers home heating demand and utility bills, leaving more money to meet basic needs [Sec. 3.1, pg. 37]	(-) Threatens the survival of salmon, which support cultural and economic practices and ecosystem services [Sec. 3.1, pg. 38]	(-) Raises the risk of wildfires, which could damage utility infrastructure, close roads and cut off access to vital goods and services [Sec. 6.1, pg. 73]	(-) Raises the risk of floods and landslides, which could damage utility infrastructure and close roads, cutting off access to vital goods and services [Sec. 6.2, pg. 78]	(-) Raises the risk of coastal inundation, which could damage key infrastructure (wastewater, port, roads, government buildings) and cut off key routes that provide residents access to vital goods and services [Sec. 6.2, pg. 78]	(-) Threatens the ability of people to harvest and consume shellfish, which support cultural and economic practices and ecosystem services [Sec. 6.4, pg. 84]	(-) Puts more strain on services (social, emergency, etc.) [Sec. 6.5, pg. 89]
		(-) Introduces or exacerbates disease vectors (e.g., plants that carry fungi and insects that carry viruses), which could harm human health (warmer, wetter winters also exacerbate exposure to pathogens and other health threats) [Sec. 6.4, pg. 84]			(-) Decreases summer streamflow, which makes it harder to balance competing demands for water and reduces energy security for residents and businesses. [Sec. 3.1, pg. 36]	(-) Raises the risk of flooding that could displace residents [Sec. 6.2, pg. 78]			(-) Puts more strain on schools (e.g., unplanned influx or loss of students) [Sec. 6.5, pg. 89]
		(-) Raises home cooling costs (e.g., buying, installing and using air-conditioning), leaving less money to meet basic needs [Sec. 3.1, pg. 37]							(-) Puts more strain on transportation (roads, transit, etc.) [Sec. 6.5, pg. 89]

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GOALS	Goal 7: Support a local food system to increase community resilience, health and economic prosperity	(+) Supports "carbon fertilization," more atmospheric CO2 and warmer temperature that increases the biomass and productivity of some crops grown in the region, including beans and grasses [Sec. 5.1, pg. 68]	(-) Increases range and survival of pests and diseases that affect crops [Sec. 5.1, pg. 68]	(-) Threatens the sustainability of local fisheries [Sec. 3.1, pg. 38]	(-) Decreases the viability of berries, tree fruit, tubers and other crops grown in the region [Sec. 5.1, pg. 68]	(-) Increases risk of flooding that could damage agricultural lands and assets (crops and livestock) [Sec. 5.1, pg. 68]	(-) Pushes saltwater further into estuaries, which may inundate near-coastal farms and ranches [Sec. 5.1, pg. 67]	(-) Reduces food available for and survival of salmon and other marine life [Sec. 4.2, pg. 65]	(+) Increases demand for locally grown food [Sec. 6.5, pg. 89]
	Goal 8: Ensure that the region's water supply sustains people in perpetuity while protecting the environment	(-) Increases in atmospheric CO2 decreases the nutritional quality of forage and pasture lands for livestock and wild animals [Sec. 5.1, pg. 68]	(+) Extends the growing season and supports crops that tolerate warmer temperatures [Sec. 5.1, pg. 68]		(-) Reduces water available for junior water right holders, threatening the survival of livestock and crops for newer farmers [Sec. 5.1, pg. 70]	(-) Raises the risk of lower crop yield or failure [Sec. 5.1, pg. 69]		(-) Turns upland habitat (e.g., marshes and forests) into mudflats that destroys habitat for ducks and other waterfowl [Sec. 4.1, pg. 64]	(-) Makes it harder for calcifying organisms to form shells, and ultimately harms shellfisheries [Sec. 4.2, pg. 65]
		(-) Increases heat stress risk for horses, dairy cows and other large livestock [Sec. 5.1, pg. 67]			(-) Reduces aquifer recharge and could spur more groundwater pumping when surface water is scarce, which could lower well levels raise the cost of pumping water from greater depths [Sec. 3.4, pg. 53]		(-) Reduces aquifer recharge, which makes coastal groundwater more vulnerable to saltwater intrusion and inundation [Sec. 3.4, pg. 49]		(-) Increases demand for water (drinking, irrigation, etc.) [Sec. 6.5, pg. 89]
					(-) Decreases precipitation volume and groundwater recharge, which may raise pollutant concentrations in shallow wells and surface waters [Sec. 3.4, pg. 51]				

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GOALS	Goal 9: Move toward a carbon-neutral community	<p>(-) Increases energy demand for cooling residential and commercial buildings, which -- depending on the energy source -- may increase carbon emissions [Sec. 3.1, pg. 37]</p> <p>(-) Decreases production of hydropower (more summer evaporation) [Sec. 3.1, pg. 36]</p>	<p>(-) Reduces extent and volume of snowpack and glaciers, exacerbating sediment runoff that builds up in Alder Lake and reduces the reservoir's capacity to generate hydropower [Sec. 3.1, pg. 37]</p> <p>(+) Decreases energy demand for heating residential and commercial buildings [Sec. 3.1, pg. 36]</p> <p>(+) Increases production of hydropower (less snow, more rain due to warmer air temperatures) [Sec. 3.1, pg. 36]</p>		<p>(-) Decreases capacity to produce clean hydropower (less rainfall and water behind dams) [Sec. 3.1, pg. 36]</p> <p>(-) Raises the risk of wildfires, which could destroy forests that serve as a net carbon sink [Sec. 6.1, pgs. 73-74]</p> <p>(-) Lowers reservoir levels, which exposes organic materials and causes them to decay and emit greenhouse gases [Sec. 3.1, pgs. 36-37]</p>	<p>(-) Causes erosion and loss of organic materials (e.g., plants) that build up in reservoirs (e.g., Alder Lake and Skookumchuck), decay and emit greenhouse gases (e.g., methane) [Sec. 3.1, pg. 36]</p> <p>(+) Increases production of clean hydropower (warmer, wetter winters) [Sec. 3.1, pg. 36]</p>			<p>(-) Increases overall energy consumption [Sec. 6.5, pg. 89]</p>
	Goal 10: Maintain air quality standards	<p>(-) Increases production of surface ozone and accumulation of PM2.5 [pg. Sec. 2.2, pg. 22]</p> <p>(-) Increases summer energy peak demand for cooling [Sec. 3.1, pg. 36]</p>			<p>(-) Raises the risk of wildfires and elevated levels of PM10 from smoke [Sec. 6.1, pg. 74]</p> <p>(-) Parches farm fields and other open spaces which could release windblown dust (e.g., PM10) that degrades air quality and harms human health [Sec. 5.1, pg. 68]</p>				<p>(-) Increases overall energy consumption [Sec. 6.5, pg. 89]</p>
	Goal 11: Provide opportunities for everyone in the Thurston Region to learn about and practice sustainability	<p>(+) Creating a Thurston Climate Adaptation Plan presents another opportunity for the region to learn about and practice sustainability. Cumulative stressors necessitate climate adaptation, which IPCC says is now "unavoidable" because accumulation of past GHG emissions [Sec. 7, pg. 90].</p>							

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G O A L S	Goal 12: Make strategic investments to advance sustainability regionally					(-) Necessitates retrofitting stormwater and wastewater infrastructure to mitigate flooding and backups that threaten water quality and human health and welfare [Sec. 2.3., pg. 27; 4.1, pg. 57]			