Climate Resiliency

in Seattle's Parks and Recreation System

JANUARY 2022

Seattle Parks & Recreation

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Planning for Climate Change: Context

Earth's climate is changing. The science is clear, and the imperative to act is imminent, both to reduce our carbon emissions and to prepare for the impacts of this changing climate. The City of Seattle is committed to be carbon neutral by 2050 and efforts related to mitigating climate change can be found in the Appendix. While that work is underway, we are already seeing changes to our environment that we must adapt to today. Seattle Parks and Recreation (SPR), as manager of 12% of Seattle's land and water and the third largest department in the City, is preparing for these changes and working to build a climate resilient parks system. The strategies described in this report are intended to identify actions and guide plans and investments – including the Strategic Plan, Park District funding, and departmental work plans – to support climate resiliency efforts in Seattle's parks and recreation system.

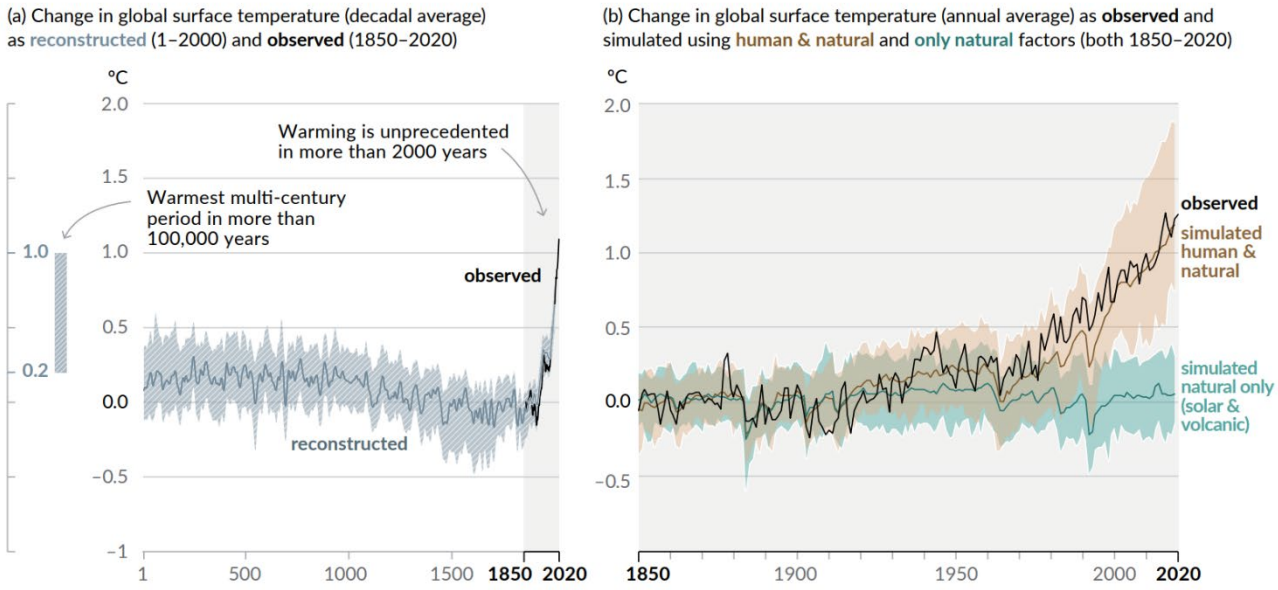
Science of Climate Change

The science of climate change is consistent and concerning. According to the 2021 Climate Change: The Physical Science Basis report from the Intergovernmental Panel on Climate Change, "It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred."

The World Meteorological Organization, in its 2019 report, states, "Science tells us that, even if we are successful in limiting warming to 1.5°C (35°F), we will face significantly increased risks to natural and human systems. Yet, the data in this report show that 2019 was already 1.1°C warmer than the pre-industrial era. The consequences are already apparent. More severe and frequent floods, droughts and tropical storms, dangerous heatwaves and rising sea levels are already severely threatening lives and livelihoods across the planet."

Our collective emissions of carbon and other heat-trapping gases over the last 150 years has created this problem, and only we can change the trajectory we are headed on (Figure 1). In 2015, 196 parties signed on the Paris Climate Agreement, committing to reducing greenhouse gas emissions to limit global warming to 1.5°C compared to pre-industrial levels. Seattle has made this commitment, and joined the Carbon Neutral Cities Alliance. In April 2018, Mayor Jenny A. Durkan released an updated Seattle climate strategy to reduce carbon pollution from our transportation and building sectors and make Seattle a national leader in fighting climate change. The strategy is a set of short- and long-term actions that provide a roadmap for our city, particularly on leading contributors of greenhouse gases: transportation and buildings. More details on these actions and plans are included in the Appendix.

Figure 1: Changes in Global Surface Temperature Relative to 1850-1900 Temperatures



(Source: IPCC 2021 Climate Change: The Physical Science Basis)

Local Impacts

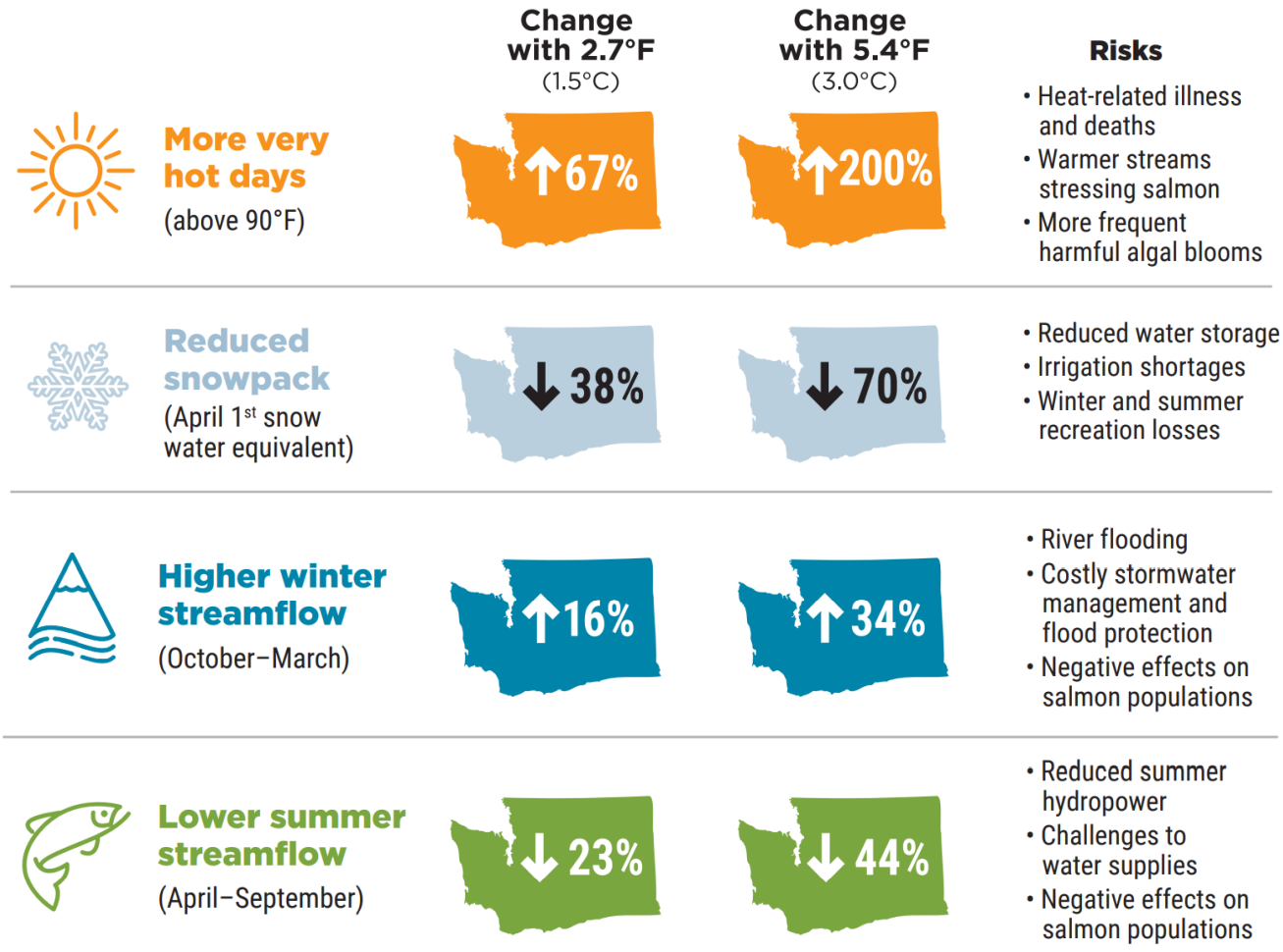
Many communities around the world are experiencing and expecting major impacts from climate change. The Salish Sea region is relatively sheltered from many of these challenges, such as hurricanes, tornados, and extreme drought, but not immune to other impacts. The King County 2020 Strategic Climate Action Plan describes some of the local impacts we can expect to see in our region (Figure 2).

Seattle's Preparing for Climate Change report from 2017 lists many of the challenges we will need to plan for. Currently Seattle is experiencing more hotter days; in 2018, 28 days rose above 85°F, creating unhealthy conditions for vulnerable populations. According to the report, Seattle is likely to see an additional 18 days of temperatures above 86°F degrees by the 2050s (compared to an average high in August of 73°F). In addition to an increase in extreme heat days, Seattle is also experiencing the impacts of a more intense and longer wildfire season caused by these summer temperatures and droughts. In the summers of both 2017 and 2018, 24 days in Seattle had air quality that was unhealthy for everyone, compared to zero in 2019 and four days in 2020. (Smoke-Ready Seattle)

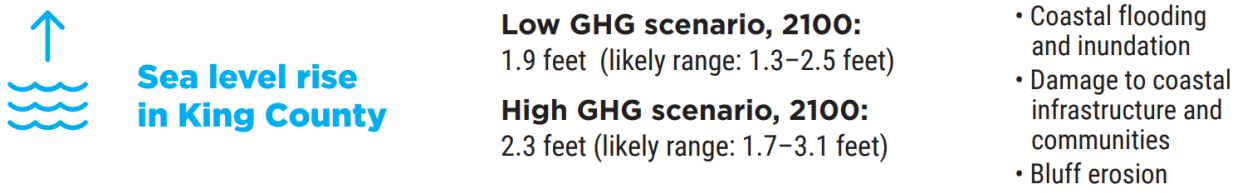
Sea-level rise due to changes in ocean temperatures and melting ice caps is also a local impact we should expect in the near future. While the immediate impact is not as noticeable, the Puget Sound region is expected to experience sea levels rise an additional 12 inches by 2035 with storm surges adding one to three additional feet. King Tide events (extreme high tides) during recent winters, provide a glimpse of what to expect in a matter of a few short decades. Our region is expected to see the mean sea level rise from 1.9 to 2.3 feet by 2100. (Figure 2)

Figure 2: Projected Local Impacts of Climate

Projected changes in very hot days, snowpack, and streamflow in Washington State with up to 5.4°F of warming globally. This amount of warming is currently expected as soon as the 2060s (2050–2079) under a high GHG emission scenario. Higher amounts of warming are possible (up to 8.6°F globally) by 2100 under the high GHG scenario. Changes in hot days are relative to 1976–2005; all others are relative to 1970–1999.



Projected change in sea level rise in 2100, relative to 1991–2009, for King County for a low and high GHG emission scenario. Values are the median estimates and likely range, and do not include +3 feet of storm surge. Higher amounts of sea level rise (up to 5 feet) are possible by 2100 under the high GHG scenario.



Graphic: King County 2020 Strategic Climate Action Plan. Data: UW Climate Impacts Group, No Time to Waste, 2019

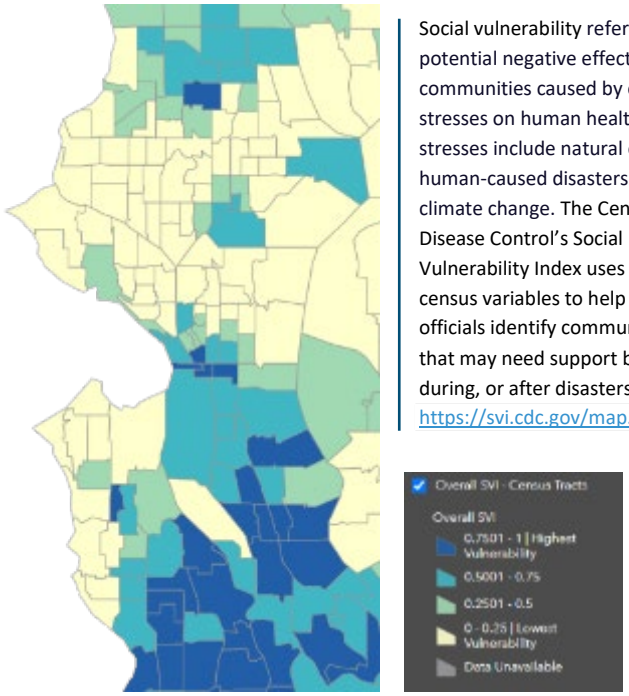
Finally, regional impacts on precipitation are already being felt, and will increase. The impact has less to do with the change in annual precipitation and is more a matter of when and how much it rains. "The heaviest (top 1%) 24-hour rain events in western Washington and Oregon are expected to be +22% more intense, on average, by the 2080s for a high warming scenario. The frequency of today's heaviest 24-hour rain events also increases, occurring seven days per year by the 2080s, on average, compared to two days per year historically (1970-1999)." (Preparing for Climate Change, 2017)

Equity Impacts

The impacts of climate change mentioned above are not born equally by the residents of Seattle. Due to historical injustices in housing opportunity and other barriers, Black, Indigenous and Peoples of Color (BIPOC) in our community disproportionately live in areas where climate impacts are greatest (King County 2020 Strategic Climate Action Plan). Environmental exposures and health vulnerabilities are highest in these areas where many BIPOC, immigrants, elderly, and economically disadvantaged people live. The Social Vulnerability analysis below combines information about household socioeconomic status, household composition, race and language information, housing, and transportation data to create a ranking of vulnerability to disasters (Figure 3). King County's Environmental Exposure Index developed for their Strategic Climate Action Plan looks at many of these same elements and then lays them over exposure to environmental hazards such as air pollution and toxic releases (Figure 4).

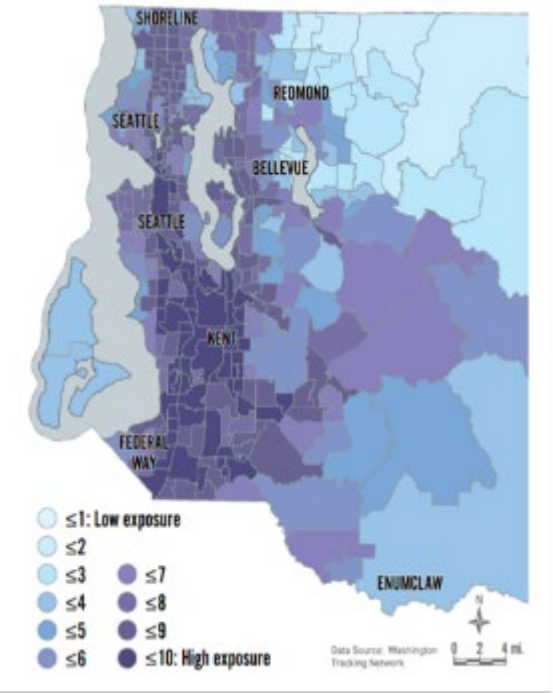
The communities that are most vulnerable are also most likely to be impacted by climate change. A recent effort to collect heat data on the hottest day in Seattle during 2020, shows that the same areas, such as in the Duwamish Valley and the Central District also were the hottest on that day (Figure 5). These same disparities are shown in the distribution of the urban tree canopy (Figure 6). Neighborhoods along the Duwamish River, such as South Park and Georgetown, are also most likely to be impacted by rising sea levels (Figure 7). Climate change is a multiplier of existing disparities in our community.

Figure 3: Social Vulnerability Ranking



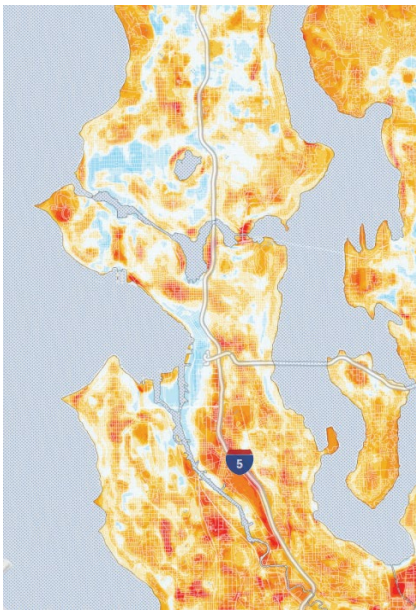
Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters such as climate change. The Center for Disease Control's Social Vulnerability Index uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters. https://svi.cdc.gov/map.html

Figure 4: Environmental Exposure Index



King County Strategic Climate Action Plan, 2020 and Washington Tracking Network (WS DOH).

Figure 5: Extreme Heat



Heat Vulnerability (Mapping Communities Vulnerable to Extreme Heat, 2016) and King County Extreme Heat Project, 2020 (Heat Watch Report).

Figure 6: Canopy Cover

Tree canopy cover mitigates urban heat islands but is not equitably distributed. (2016 Seattle Tree Canopy Assessment)

Figure 7: Sea Level Rise

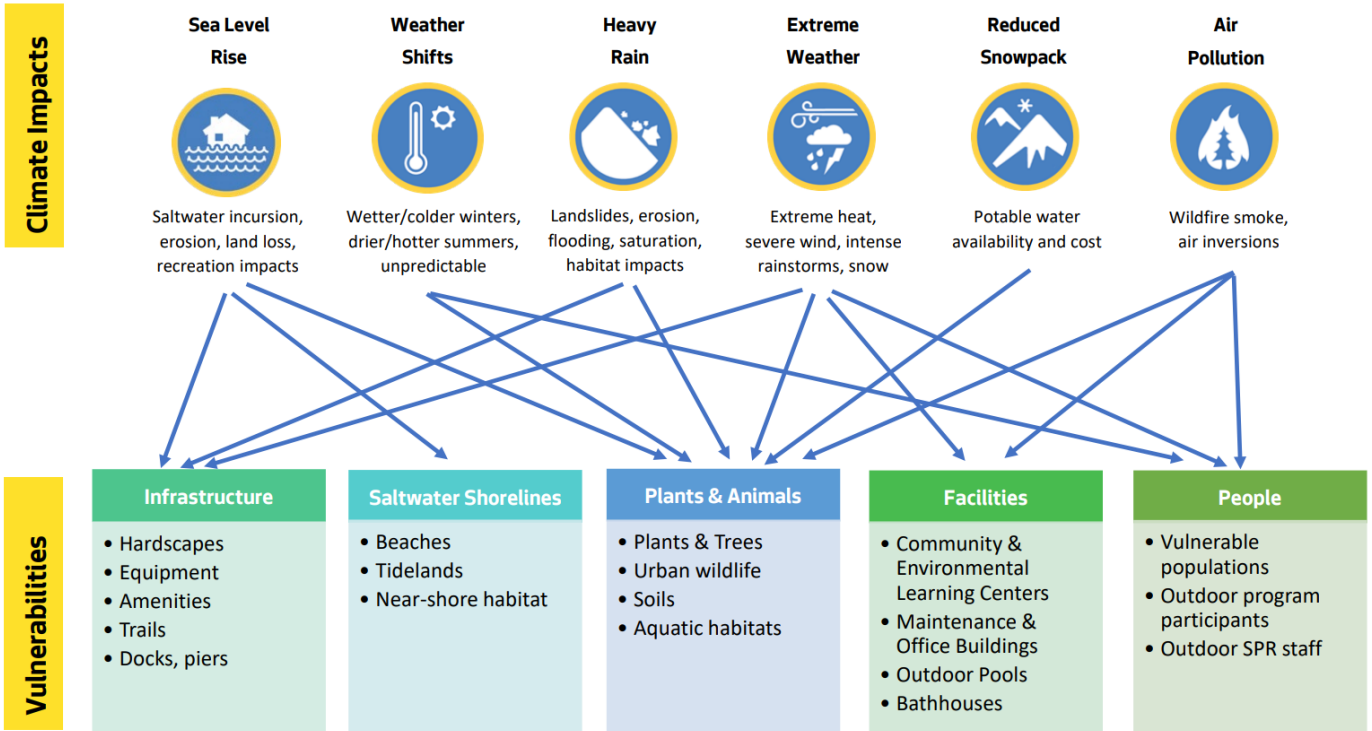
Sea level rise projections for Seattle, showing the greatest impact along the Duwamish River. Data shown for two to four feet of sea level rise. (Seattle Public Utilities Sea Level Rise Map, 2020)

Planning for Climate Change: SPR

Seattle Parks and Recreation (SPR) manages a 6,414-acre park system of more than 485 parks and extensive natural areas. SPR provides athletic fields, tennis courts, play areas, specialty gardens, and more than 25 miles of boulevards and 120 miles of trails. The system comprises about 12% of the city's land area. SPR also manages many facilities, including 27 community centers, eight indoor swimming pools, two outdoor (summer) swimming pools, four environmental education centers, two small craft centers, four golf courses, an outdoor stadium, and much more. SPR is also the third largest City department. Climate change impacts nearly all these assets in one way or another.

In 2019, SPR analyzed the science of climate change impacts to explore the particular vulnerabilities to Seattle's parks and recreation system. Five areas were identified **– infrastructure, shorelines, plants and animals, facilities,** and **people**. SPR's analysis builds upon Seattle City Light's Climate Change Vulnerability Assessment and Adaptation Plan and illustrates the connections among the various known climate impacts and the specific vulnerability to Seattle Parks and Recreation (Figure 8).

Figure 8: Projected Local Impacts of Climate Change in Seattle's Parks and Recreation System



People

SPR's parks and programs are vitally important for our residents, and climate change will create many challenges for them. Increased wildfire smoke, extreme heat events, and snowstorms will impact vulnerable populations most dramatically, who are already disproportionately challenged with health disparities and have fewer resources to filter air, cool off indoors, and stay safe in winter storm events. This extreme weather will impact programming both indoors and outdoors. The same impacts will be felt by SPR's employees as well.

Infrastructure

SPR cares for many infrastructure elements in our parks that may be impacted by sea level rise, heavy rain events, and extreme weather due to climate change. Sea walls, docks, piers, and shoreline trails are all at risk from a rising sea level and the associated King Tide events that amplify this impact. In addition, trails in our natural areas and developed parks are likely to be damaged due to winter heavy rain events, landslides, and flooding. The same extreme weather events will also stress green stormwater infrastructure in our parks system, making them less effective for managing run-off. Finally, extreme heat events can damage roadways, and potentially impact the integrity and durability of materials in our buildings, play structures, and other elements of the built environment.

Saltwater Shorelines

Shoreline parks are particularly vulnerable to sea level rise, as many contain large tidelands, sensitive ecosystems, or beaches. Saltwater incursion from rising ocean water can impact nearshore plants, causing decline and altering the habitat of this transitional ecosystem. Beaches in our parks are vulnerable to erosion from rising sea levels and landslides along shoreline slopes are more likely due to severe winter storm events.

Plants and Animals

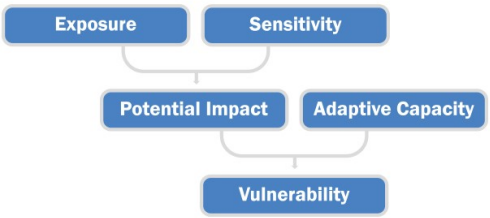
Seattle Parks and Recreation stewards the vast majority of habitat for the urban wildlife and plants in our community, most of which will be impacted by a changing climate. Climatic shifts, including hotter drier summers and wetter winters, stress plants and animals that have adapted to particular conditions. This can lead to an increase in unhealthy algal blooms in lakes and ponds. Increased saturation from winter rains combined with an increase in pests and summer droughts can combine to increase tree failures for many species. Newly planted vegetation will need longer establishment periods at a time when water may increase in cost. As the seasons shift in duration or timing, insects and birds reliant on blooms and berries arriving at certain times may have difficulty finding the food needed to prosper. Salmon, adapted to spring melt bringing cold water at certain times for spawning are impacted by shifts in snow accumulation, in addition to riparian habitat loss due to climatic shifts.

Facilities

The buildings and other facilities in SPR's system are also vulnerable to the impacts from climate change. Some impacts are secondary, such as loss of power due to downed trees, or increased use in extreme weather events. Along Seattle's saltwater shorelines, however, buildings, picnic shelters, outdoor pools, and other structures are also directly at risk from rising sea levels. Erosion and intense storm events can damage foundations, utilities, and other infrastructure elements of the building. Also, it is possible the life of materials will be shortened due to extreme heat and other impacts.

Vulnerability Ranking Approach

In 2020, SPR further examined the degree of vulnerability for each expected impact and the potential magnitude of the impact. To create consistency across City departments, this analysis paralleled a similar body of work by Seattle City Light while focusing on SPR's particular concerns.



Vulnerability to climate change impacts is a combination of many determinants. For this analysis, SPR first considered the *potential for impact* based on the *level of exposure* (the expected change in the climate) and *sensitivity to changes* (the susceptibility of the system to the change). SPR then considered the organization's *capacity to adapt* (current processes or procedures that provide capacity to adapt).

Figure 9: Climate Vulnerability Ranking

Component of Vulnerability	Rank	Description
Exposure (the expected change in the climate)	●	Low: Projected change in the climate is small within the timeframe and unlikely to be distinguishable from historical variability.
	■	Medium: Projected change in the climate is moderate and more likely to be distinguished from historical variability.
	▲	High: Projected change in the climate is significant and likely to be distinguishable from historical variability.
Sensitivity (the susceptibility of the system to the change)	●	Low: Current conditions greatly reduce sensitivity to the expected change.
	■	Medium: Current conditions provide some buffer to the expected change.
	▲	High: Current conditions are highly sensitive to the expected change if no action is taken.
Capacity to Adapt (current processes or procedures that provide capacity to adapt)	●	Low: Existing capacity to prepare is high and can significantly reduce vulnerability.
	■	Medium: Some capacity exists that can be leveraged to reduce vulnerability.
	▲	High: Limited capacity exists that can be leveraged to reduce vulnerability; there is significant room for enhancing capacity.

These three components – exposure, sensitivity, and capacity to adapt – were analyzed and ranked (low, medium, or high) for each identified aspect of SPR's responsibilities that are vulnerable to climate change impacts.

This *degree of vulnerability* was then considered alongside the timeline of the climate change impact and potential effect of a "do-nothing approach" to create the Seattle Parks and Recreation Climate Vulnerabilities Assessment (Figure 10).

- Timeline (shown as "Year of Impact"): Based on the latest climate change models, SPR assessed when the particular climate change impact may be experienced. While many impacts will be felt gradually and incrementally over the years, Figure 10 uses the years 2020, 2030 and 2050 as a filter for prioritization to consider immediately, during the next decade and in the following decades.

- Potential result of a "do nothing approach" is shown under Magnitude of Impact heading to inform future prioritization of climate resiliency efforts. Four areas were considered for this analysis: Financial Cost, Health and Safety, Natural Resources, and Recreation. Each potential impact was assessed to have a Low (limited impact), Medium (moderate impact), or High (severe impact).

Climate Vulnerabilities Assessment

The Seattle Parks and Recreation Climate Vulnerabilities Assessment (Figure 10) provides a picture of the impacts of climate change on Seattle's parks and recreation system. It is not intended to be a ranked order of prioritization, but rather a tool to help planners, policy makers, programming staff and maintenance crews to strategically adapt to the challenges posed by climate change.

Figure 10: Climate Vulnerabilities Assessment

			Vulnerability			Potential Magnitude of Impact			
Area of Impact	Climate Change Impact	Year of Impact	Exposure	Sensitivity	Capacity to Adapt	Financial Cost	Health & Safety	Natural Resources	Recreation
Saltwater Shorelines	Lost recreational opportunities and access due to reduced or lost beaches	2050	■	■	●	Low	Low	-	Medium
	Loss of land due to rising sea levels and erosion of shoreline.	2050	▲	▲	■	Medium	Low	High	Medium
	Loss of vegetation due to higher water levels and saltwater incursion	2050	■	■	●	Low	Low	Medium	Low
	Loss of vegetation due to erosion and landslides.	2030	■	■	●	Low	Medium	Medium	Low
Plants & Animals	Increased rate of tree failure due to drought stress, increased saturation, high winds, and disease/insects.	2020	■	■	■	High	High	High	Low
	Loss of vegetation due to the stresses from extreme weather, shifting weather patterns, and new diseases.	2020	■	■	■	Medium	Medium	Medium	Low
	Change in species mix due to habitat changes or climatic shifts, including keystone species and subsequent impacts.	2050	■	■	●	Low	Low	High	Low
	Decreased capacity to support native wildlife species due to loss or degraded habitat and temperature extremes.	2050	■	■	●	Low	Low	High	Low
	Increase in demand for water due to drought and heat.	2020	■	■	■	High	Low	Medium	Low
	Reduced potable water supply due to reduced snowpack.	2050	■	■	■	High	Low	Medium	Low
	Impact to near shore habitat for salmon and marine wildlife.	2050	■	■	▲	Medium	Low	Medium	Low
	Pollinators and native insects impacted through shift in hibernation and blossom cycles.	2030	▲	▲	■	Low	Low	High	Low
Infrastructure	Impacts to seawalls and riprap due to rising sea levels	2050	■	▲	■	High	Low	Medium	Low
	Impacts to nearshore drainage infrastructure	2050	■	■	▲	Medium	Medium	Low	Low
	Damage to soft surface trails due to weather extremes, erosion and landslides.	2030	▲	■	●	Medium	Low	Low	Medium
	Damage to retaining walls, pathways, and roads due to landslides and sea level rise	2050	■	■	▲	High	Low	Low	Medium
	Green Stormwater Infrastructure failure due to intensity and duration of rainfall events	2050	●	■	●	Medium	Low	Low	Low
	Increased damage to play areas, shelters, trails and other amenities due to increased rate of tree failure	2030	●	■	●	High	Low	Low	Medium
Facilities	Loss of electricity due to tree falls and storm events.	2030	●	■	●	Low	Medium	Low	Low
	Impacts to nearshore buildings and outdoor aquatic facilities due to rising sea levels.	2050	■	●	●	Medium	Low	Low	Low
People	Lost cooling/shade areas	2050	■	▲	●	Low	Medium	Medium	Medium
	Vulnerable populations impacted by air pollution and extreme heat events	2020	■	▲	■	Medium	High	-	Medium
	Productivity decline due to extreme heat events and shifting work duties	2030	■	■	●	Medium	Medium	Low	Low
	Lost programming opportunities due to outdoor challenges	2030	■	■	●	Medium	Medium	Low	Medium
	Increased wading pool hours due to hotter summers	2030	■	■	●	Medium	Low	Low	-

Climate Resiliency: Context

Planning ⟺ Adapting

The climate is changing, and as described above Seattle will be impacted in many ways. We have assessed the vulnerability of Seattle's parks and recreation system, created analyses for prioritization decisions and continue to learn from best practice to adapt to these coming changes and build a resilient parks system for this future. Many plans have already been created for our city, including:

Climate Resilience

Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks. (C2ES)

- The **Seattle Climate Action Plan**, adopted in 2013, focuses on city actions that reduce greenhouse emissions and support vibrant neighborhoods, economic prosperity, and social equity. The plan also includes areas of focus that will increase our community's resilience to the likely impacts of climate change, including urban forest management, stormwater management, water system, water shortage contingency, disaster readiness and response, and hazards mitigation.
- The **Seattle Climate Preparedness Strategy** was published in 2017 to address specific resiliency actions in various sectors of the city, including transportation, land use and buildings, City buildings, parks, drainage and water supply, electricity system, community preparedness.
- The **Urban Forest Stewardship Plan** provides a long-term vision for increasing tree canopy cover and the many environmental, social, and economic benefits associated with trees in urban areas. The plan prioritizes climate resiliency by seeking to create a climate change vulnerability assessment and develop a list of tree species resilient to climate change and pests.
- The **Water Shortage Contingency Plan** provides guidelines to manage water supply and demand in the event of a supply disruption, such as climate change impacts. SPR has created our own plan to address these issues as well.
- The **Duwamish Valley Action Plan** is a City-community shared vision for the South Park and Georgetown neighborhoods, which are disproportionately impacted by climate change. The Action Plan is organized into seven priority areas: Healthy Environment, Parks and Open Space, Community Capacity, Economic Opportunity and Jobs, Mobility and Transportation, Affordable Housing, and Public Safety.

Seattle Parks and Recreation also has many plans, programs, and policies in place to inform and support climate resiliency efforts.

- The **Green Seattle Partnership** is a City-community partnership to restore Seattle's urban forests. The 2017 Strategic Plan is currently being updated.
- SPR has many **Vegetation Management Plans**, individual plans for parks that guide their development, including some actions that address changing climatic conditions.
- SPR's **Tree Management, Maintenance, Pruning and/or Removal Policy** determines how trees are managed in Seattle's parks to ensure the greatest health; it is currently being updated to incorporate climate change considerations.
- The **Native Plant Policy** establishes a priority to ensure SPR installs plants in our parks that are adapted to our climate, require less water, and are resilient to upcoming changes in climate.
- The **Environmental Policy** states SPR's commitment to seeking environmentally friendly solutions to design, maintenance and operations of our parks and facilities.
- SPR's **Asset Management Plans** guide capital project developments and incorporate resiliency efforts such as electrification, green stormwater infrastructure, and water reuse into the periodic renewal cycle of assets.

More planning is needed, however, to ensure Seattle's parks and recreation system is prepared for the impacts of climate change. This report is a first step in describing adaptation actions currently being taken to develop a resilient park and recreation system and in strategically pulling together lessons learned from previous planning efforts and best practice to identify what additional steps we can take as a department. We recognize we will need to adapt again as new science is shared and impacts from climate change become more prevalent.

So, how can SPR prepare for a changing and uncertain future? Follow the science, identify the challenges, research the solutions, and remain nimble. Then do it over and over again. The next section describes actions we are currently taking to develop a resilient parks system. The following section identifies actions we can add to this preparation.

Climate Resiliency: Today

Current Actions to Prepare for Impacts from Climate Change

Adapting to the impacts of climate change is already occurring at SPR. From planning and design for our facilities to landscape management practices, SPR is taking action today to prepare for this new future climate. Many of these practices can be applied by residents, too.

People

Seattle's parks are an asset used by 750,000+ residents and many more people visiting from the region and beyond. Parks and nature are critical to the mental, physical, and emotional health of people, particularly those most impacted by climate change. Providing clean air and cool shade by increasing our tree canopy through tree replacement, focusing on evergreen trees, and restoring our urban forests is underway.

In addition to planting and maintaining trees, SPR provides many ways for people to cool down in our parks. The 22 wading pools and 11 spray parks we manage offer watery respite on extreme heat days, as do the nine lifeguarded beaches and two outdoor pools. Artificial turf athletic fields are being converted to using cork infill (instead of rubber) to reduce heat impacts.

SPR has also installed heat pump systems in four recreation facilities in equity areas to provide clean and cool air that can provide respite during heat events and also filter out wildfire smoke. This is crucial, particularly for elderly residents and people with health concerns.

Finally, we realize the importance of providing access to healthy local food in Seattle, particularly in areas where such options are not common. SPR's Urban Food System manages over 700 fruit trees that are available for harvest, hosts dozens of gardens as part of the City's P-Patch community gardening program and supports healthy food programming in our community centers.

Infrastructure

Maintaining aging infrastructure is not new to SPR, however the added impacts from climate change are a new challenge. Along Seattle's saltwater coastline where sea-level rise and king tides are already present, we are removing seawalls and restoring natural beaches, such as at Lowman Beach Park. In the natural areas, the Seattle Trails Program works to ensure heavy winter rains are diverted under or around trails and bridges are rebuilt to account for winter storms.

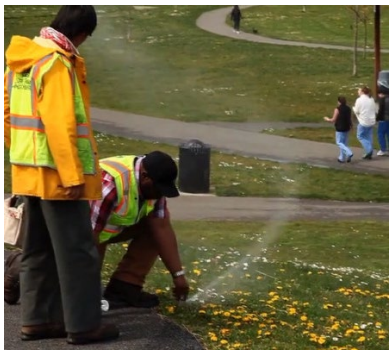
SPR's living green infrastructure is just as much a part of this work. Through the Tree Inspection Program, SPR examines the health of over 2,100 trees each year (on average), and the Green Seattle Partnership inspects and maintains plants in restoration areas to ensure the long-term health of these investments.

Saltwater Shorelines

SPR manages about 11 miles of saltwater coastline, most notably at regional parks like Discovery Park, Alki Park, and Lincoln Park. These beaches and vistas are popular for walks, nature exploration, and launching points for kayaks and stand-up paddleboards. The Beach Restoration Program boosted salmon habitat and helped strengthen beaches against storm surges. The Green Seattle Partnership removed invasive plants and placed native species in many of the forested shorelines. Stabilizing steep slopes and increasing nearshore habitat ensures these shorelines can better withstand rising seas and increased rain.

Plants and Animals

SPR has decades of experience stewarding the plants and animals that call Seattle's parks home. In natural areas, SPR's Green Seattle Partnership is an urban forest restoration program that is preparing 40% of the land we manage to transition from an aging second-growth forest to a resilient mature conifer habitat. Invasive plants are removed, climate-resilient strains of native species are planted, and establishment periods for watering are lengthening to respond to changing climate conditions. In and out of natural areas, arborists inspect tree health regularly.



In all our parks, SPR is managing water use efficiently to ensure plants receive what they need, and water is not wasted. Smart irrigation systems are monitored constantly and adjusted immediately based on current weather data. Repairs are made promptly. To retain water during the summer and slow its release during the winter, SPR applies arborist wood chips, which include all parts of trees processed through a chipper, in garden beds and tree rings.

We are also adapting mowing and management practices in our turf areas and meadows to be more resilient and provide increased habitat. Mowers are set at a minimum of three inches to increase turf health and carbon sequestration and reduce water needs. Pollinator gardens and corridors are being established in passive turf areas and golf courses to extend habitat beyond the existing meadows throughout Seattle's parks.

Facilities

SPR is lucky that most of our buildings are not within the impact zones for sea-level rise or near steep slopes. However, with around 11 miles of saltwater coastline to manage, including many buildings near the coast, we now incorporate sea-level rise projections into our planning. We also partnered with Seattle City Light to install a solar-powered microgrid at Miller Community Center that can act as an independent clean energy emergency shelter during disasters and have added emergency generators to all our community centers that are designated Tier 1 priority shelters. In addition, SPR has installed water reuse cisterns, including our largest, a 300 cubic foot tank at Northgate Community Center.

Climate Resiliency: Tomorrow

Future Opportunities to Prepare for Impacts from Climate Change

Seattle Parks and Recreation has implemented many actions that mitigate and prepare for the impacts of climate change. Yet it is imperative that we expand on these efforts to ensure Seattle's 6,400+-acre parks and recreation system is resilient to these impacts. Moving forward, SPR will update policies and standards, training and practices, and programs and services to be more responsive to climate changes. The specific strategies and actions described below will inform SPR's planning and investments over the coming years to ensure a resilient parks and recreation system.

People

The health of visitors to Seattle's parks and of the employees who maintain and work in them is central to our department's values. The primary concern for people regarding climate change is extreme heat events and associated increased prevalence of wildfire smoke. SPR could further support their resiliency through:

- **More Tree Groves:** In developed parks we will identify areas to transition passive turf to groves of climate adapted evergreen tree groves to increase shade. Shade is a critical component of providing natural cooling areas in parks.
- **Building Improvements:** In community centers and other public facilities, SPR has already installed HVAC systems that can provide cooling as well as air filtration. However, additional planning and significant resources are needed to seal the building envelopes of the remaining facilities so that these systems can be installed in more places.
- **Building Enhancements:** For more immediate building improvements, there is an opportunity to install misting stations, canopies, and other cooling features in outdoor courtyards or other public spaces near community centers.
- **Wading Pool Conversions:** People love to cool off in water. SPR will continue to convert wading pools to spray parks when possible, to save water and increase operating hours. For the remaining wading pools SPR will investigate systems that reuse water for irrigation or other uses.

- **Swimming Beach Staffing:** The importance of staffing swimming beaches with lifeguards will become increasingly important as people look toward our lakes and oceans to cool down during hotter summers. This likely increase in use will require an increase in service levels.
- **Artificial Turf Upgrades:** SPR will continue to convert all artificial turf infill from crumb rubber to renewable cork, which reduces heat for players on these fields during the popular summer months.

Infrastructure

In addition to buildings, SPR maintains many different types of infrastructure – from built elements such as seawalls and roads to natural elements like green stormwater infrastructure and trees. Climate change impacts these infrastructure elements in different ways, so mitigation and adaptation strategies will vary as well.

- **Infrastructure Assessment:** Some infrastructure should be replaced or modified, such as seawalls that could instead be natural shoreline habitat or buildings near landslide-prone areas. SPR should conduct a comprehensive infrastructure assessment looking at vulnerabilities to climate change impacts, as outlined in this report.
- **Trail Maintenance:** Trails and roads will undergo intensified impacts from rain events, such as flooding and landslides. SPR needs to invest more in trails maintenance, including updating standards, in our natural areas to improve this infrastructure to handle these impacts and support trail use year-round.
- **Green Stormwater Infrastructure:** GSI, which absorbs and mitigates stormwater through natural means, is expected to be increasingly stressed by climate impacts such as drought and intense rain events. Our GSI installations will require increased monitoring and maintenance to continue work well.
- **Tree Health:** Trees are living assets that provide many ecosystem benefits (mitigation of rainstorms, shade) that are parallel to other parts of SPR's built infrastructure assets. SPR should plant only future climate tolerant trees, prioritize tree inspections near play areas, and invest in irrigation upgrades and water reuse projects to support tree health.

Saltwater Shorelines

Saltwater shorelines we manage will continue to be impacted from rising seas and king tide events. SPR could further support their resiliency through:

- **Scientific Modeling and Shoreline Standards:** SPR collaborates with Seattle Public Utilities and other agencies to ensure the most accurate sea-level rise models are being used for planning purposes. This information can inform policies and regulations to keep structures out of harm's way by increasing required setbacks from the water, establish performance standards for erosion protection projects and shoreline structures, and require post-construction standards such as revegetation or beach and backshore restoration.

- **Resilient Design:** SPR can think ahead by designing and developing resilient shorelines. Soft shoreline techniques, which incorporate natural materials in a design that minimizes impacts to natural processes, are a great fit for many applications in Seattle's parks. This includes planting native, deep-rooting, and salt-incursion resistant tree and shrub species that can naturally reestablish after disturbances and contribute forage food sources for native fish. In addition, dune grass and berm vegetation can greatly increase the resilience of beaches to storm waves. Where planting is not sufficient to stop erosion, a bioengineering approach may be more appropriate. Bioengineering incorporates plants in combination with natural materials such as logs, live stakes (e.g., cuttings from species like willow), and brush bundles (i.e., branches from live woody plants), creating a natural appearance and habitat for fish and wildlife that also helps to retain sediments and absorb wave energy.

- **Coastal Infrastructure Assessment:** SPR also manages many docks and boat launches along Seattle's shorelines. This natural and physical infrastructure needs to be prepared for increased king tide impacts. This includes identifying and planning for the long-term improvement or replacement of docks, piers, and boat ramps. An assessment of such needs using the best available science and most adaptive techniques can establish a baseline to begin from.

Plants and Animals

The plants and animals that live in Seattle's parks are increasingly impacted by more intense winter storms, hotter drier summers, and more pests – we have identified some ways to be a more resilient system. SPR could further support their resiliency through:

- **Standardized Mulching:** While mulching currently occurs in most parks, improvements through a standardized and cyclical approach including annual mulch replenishment in the developed parks would ensure the impact of heavy rains are moderated in the winter and water is retained in the summer. Mulching with arborist wood chips also supports a healthy soil biome, which benefits the plants and animals. This would be furthered through a policy and practice to retain leaf, branch, and tree debris in the garden beds of our developed parks, in addition to our natural areas.
- **Water Reuse:** Another adaptive technique to save diminishing water resources is to reuse water for irrigation. This could not only save water, but money as well.
- **Climate Resilient Species:** SPR should formalize its plant lists to include species and varieties that are adapted to the future climatic conditions. While we currently have a Native Plant Policy, this policy and associated Vegetation Management Plans must be updated to prioritize native, drought-tolerant, and resilient plants. This includes considerations for increased parasites, pathogens, and pests due to climate change.
- **Extend Plant Establishment:** It is increasingly apparent that SPR needs to increase the plant establishment period for newly installed plants in natural areas and developed parks beyond the current three-year best management practice. To ensure survival of new living assets in a changing climate, we need to give them a solid start through extended watering.
- **Turf Diversity:** There are additional opportunities to increase resilient habitat in Seattle's parks through increasing the diversity of our turf. Intentionally identifying and seeding passive turf areas (those not used for active recreation) with flowering perennials will increase pollinator habitat and nutrients, reduce irrigation needs and labor while continuing to support passive recreation.

- **Shoreline Habitat Restoration:** Building off previous efforts, funding a shoreline restoration program for both our freshwater and saltwater coasts will set a path forward for increased coastal resilience. Using the successful model of the Green Seattle Partnership, restored marine and terrestrial habitats can support species such as salmon and migrating birds, that rely on these ecosystems. Including riparian areas that benefit salmon and other species in our urban creeks will also ensure these anadromous species are more successful.

Facilities

SPR facilities will require significant investments over the coming decade to adapt to the impacts of climate change.

- **Energy Resilience:** Buildings offer an excellent opportunity to add solar power input to the city's electrical grid, adding energy resilience in times of power outages from the grid. An excellent example is the Miller Community Center microgrid project, which will host a battery bank attached to a solar array to support emergency operations when needed. This type of alternative energy project should be expanded.

- **Water Reuse:** SPR should ensure efficient and effective use of limited water resources. Other resource savings are possible at facilities through water reuse and recirculation, which can not only save water, but reduce operating costs as well.

- **Facility Assessment:** SPR's facilities also need to prepare for the direct impacts of climate change. Along with an infrastructure vulnerability assessment, SPR should also investigate buildings near shorelines, steep slopes, and otherwise at risk of impacts from climate change. GIS technology should be used to analyze the intersection or proximity of SPR buildings and outdoor facilities in relation to anticipated sea level rise extents, regulatory FEMA floodplain mapping (in partnership with SPU), and annual flooding extents. It would also Identify structures and assets at greatest risk and develop mitigation strategy for each (i.e., elevate, install flood vents, re-locate structure).

- **Facility Renovations and Building Standards:** SPR facilities have inherited decades of thoughtful design that were based on goals and conditions that are now changing. This includes

LEED design standards that increase air flow, but now limit abilities to address extreme heat and wildfire smoke. Significant investment will be needed to renovate community centers and other buildings so that they can provide the same cooling and filtering services already in place at the few more recently designed facilities. This will include sealing the building envelope, replacing HVAC systems with heat pumps, and other improvements. A short-term fix could be installing mobile cooling units that can provide this functionality in certain rooms within existing facilities.

Conclusion

A Parks and Recreation System for the Future

SPR is uniquely positioned to plan for long-term changes in Seattle. Uncertainty is inevitable, but the latest science, combined with current experience, show that we must plan for climate change impacts today to be prepared for tomorrow. This document gathers the challenges and opportunities as currently known to support prioritization of resources for climate resiliency. In all matters of such long-term planning, this strategy, and the specific solutions identified should be reviewed, analyzed, and improved upon as the science improves and the impacts become more immediate. This report will guide SPR's Strategic Plan, budget and work plans, and prioritization of the Seattle Parks District funding. We must do this because we know that climate change is real, the impacts are already here, and to adapt to them institutions need to be proactive. As responsible stewards of 6,400+ acres of public land and providers of services for more than 750,000 people, SPR needs to act today. Future generations are counting on us.

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Appendix: Climate Mitigation Actions

This report is focused on adapting to the current and likely impacts of climate change in Seattle's parks and recreation system. In addition, Seattle has taken many actions to reduce carbon emissions in our city, an important complementary part of our climate change commitments. Many of these mitigation actions are detailed in the Seattle Climate Action report from 2018. Below is a partial list of resources for climate mitigation actions by the City of Seattle.

Climate Planning

- Climate Action Plan
- Performance Monitoring

Buildings and Energy

- Energy Benchmarking
- Seattle Building Tune-Ups
- Seattle Energy Code
- Building Performance Standards
- Clean Heat Program
- City Facilities

Transportation Electrification

- Green Fleet Action Plan
- Drive Clean Seattle Implementation Strategy
- Transportation Electrification Blueprint
- EV Charging Roadmap for Shared Mobility
- SCL Transportation Electrification Strategic Investment Plan
- Equitable Transportation Pricing

In alignment with these efforts, Seattle Parks and Recreation is also working to reduce carbon emissions through:

- Electrification of small equipment when possible
- Energy efficiency upgrades to lighting
- Conversion of all oil heat systems to electric or natural gas
- Installation of heat pump systems where appropriate
- Restoration of Seattle's urban forests
- Supporting public access to electric vehicle charging stations
- Food truck electric power pedestal pilot
- Anti-idling policy