



WELCOME TO OUR WORKSHOP!

**The Effects of Climate Change on Vulnerable Populations
in the Puget Sound**

AGENDA

START: 1:55 PM

END: 2:55 PM

Welcome

Who are we?

What is Sunrise?

What does climate change look like in the PNW?

What populations are vulnerable?

Accountability

Solutions

Final discussion

Wrap up

The background features a series of radial lines in shades of purple and blue, emanating from the bottom center. Two horizontal lines, one on the left and one on the right, are positioned below the main text.

ABOUT THE PRESENTERS

Farris and Emi

WHAT IS SUNRISE?

- Youth-led, grassroots organization dedicated to climate activism.
- Hubs all across the country!
- The South Kitsap hub was started in March 2020
- We organize protests, demonstrations and outreach events.





**WHAT DOES CLIMATE
CHANGE LOOK LIKE IN
THE PNW?**

GENERAL CLIMATE INFORMATION

Warming

- Average U.S temperatures have increased 1.3°F since 1850
 - Caused by human emitted greenhouse gasses
- Statistically-significant warming currently occurring in all seasons
- During the 2050s (2041 to 2070) relative to 1950-1999, temperature is projected to rise 5.8°F (range: 3.1 to 8.5°F)
- Much higher warming is possible after 2050



General Climate Information *Seasons*

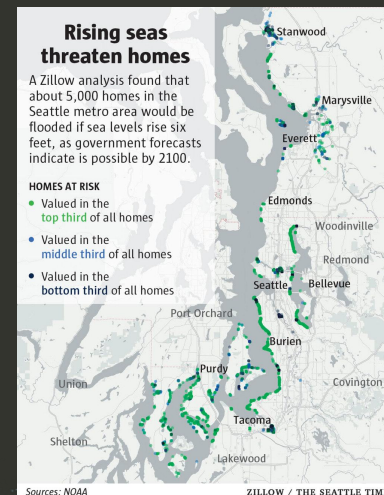
- 6-8% **drier summers** during the 2050s
- Increase of winter, fall, spring and precipitation by 2-7%
- Percents depend on greenhouse gas scenario



General Climate Information

Rising Sea Levels and Temperatures

- Coastal ocean temps projected to increase about 2° F by 2040 for a medium greenhouse gas scenario
- Sea level is projected to increase by +28 inches on average in the Puget Sound region by 2100
- *“Coastal areas in Washington will experience sea level rise, although some areas may continue to experience decreases due to trends in vertical land movement.”*
-Climate Impacts Group, University of Washington



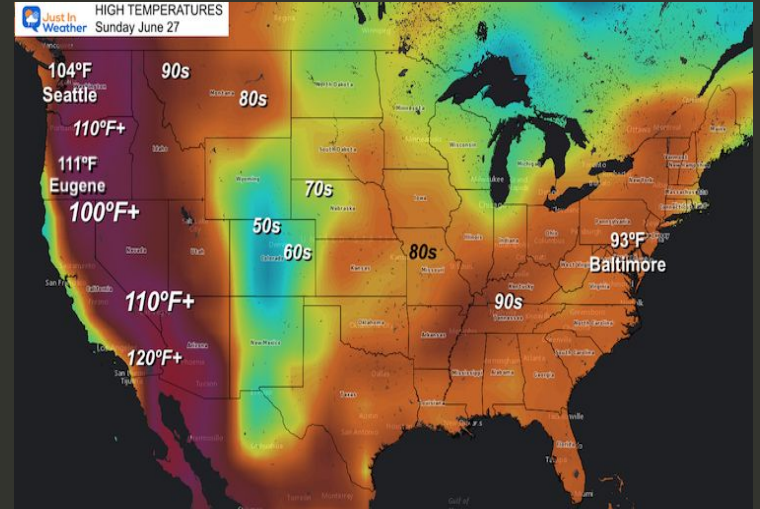
Discussion question

**How might climate change affect us
on a regional (Pacific Northwest)
and local (Puget Sound) level?**



SUNRISE MOVEMENT

- PNW will continue to warm during all seasons under all future scenarios
- Nighttime heat waves, which have more of an impact on human health and have increased since 2001
- More frequent extreme heat events and less frequent extreme cold events



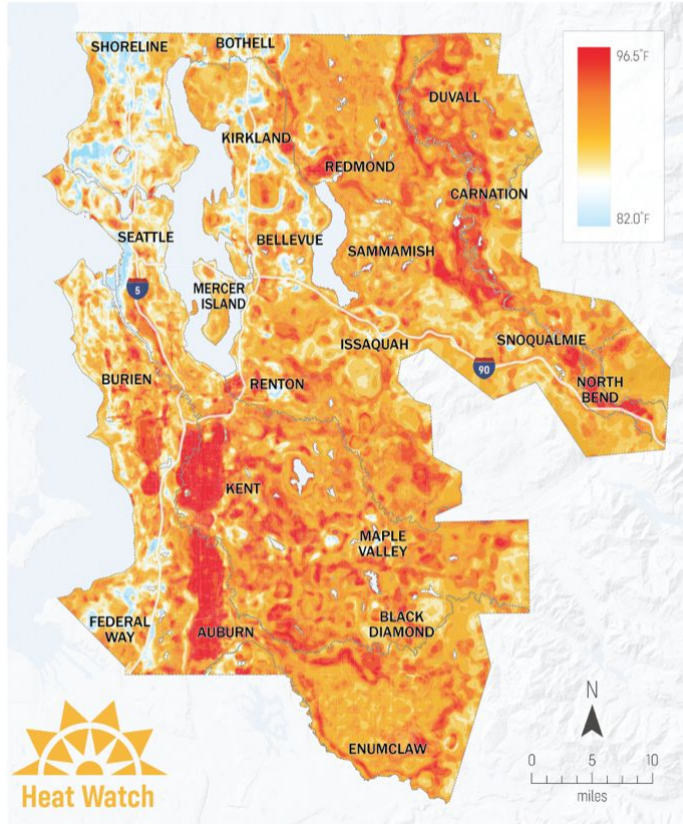
Heat Waves

- Heat islands are a big problem in urban areas
 - Hard surfaces (parking lots, rooftops, roads, concrete) absorb the heat
 - Add very little vegetation (tree canopy) and industrial activity and you get a heat island.

Heatwaves in Urban Areas

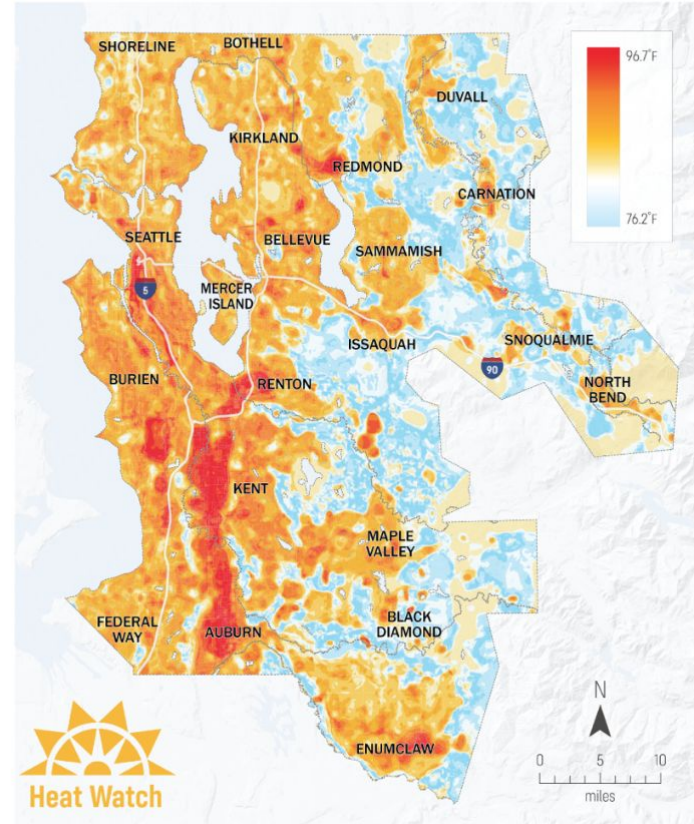
Heat is evenly distributed during the afternoon

Afternoon Study Results



Areas with more natural landscapes retain less heat

Evening Study Results



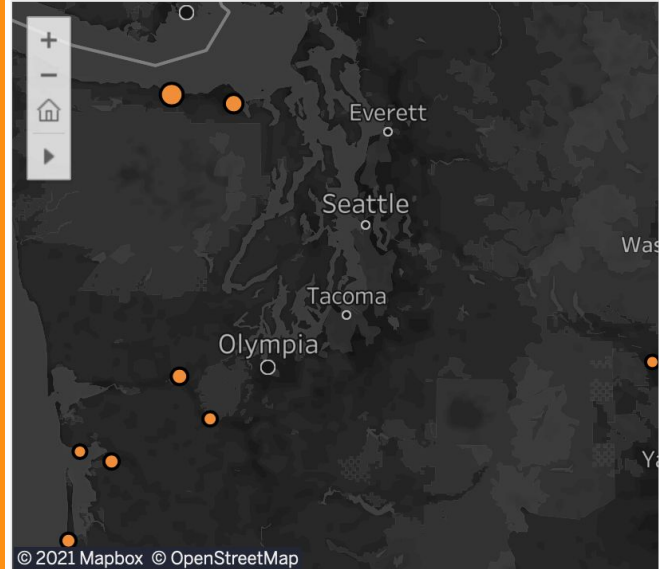
Heatwaves and Health

- Heat-related health risks in King County are exacerbated by existing inequities in housing, and lack of access to healthcare.
- Many of the areas affected by heat are the same areas that have been disproportionately affected by COVID-19 and other health inequities.

Heat Vulnerability

75 communities in Washington and Oregon have above average extreme heat risk, poverty, adults over 65, and people with disabilities.

Hover & click to learn more.



○ ○ ○ Size indicates population.

Communities shown have above average extreme heat risk (tree canopy <20%), poverty (>10%), adults over 65 (>20%), and people with disabilities (>18%).

- 1.6% increase in hospitalizations for all ages per degree increase when average daily temperatures are above 99° F
- Statistically significant increases in hospitalizations for all ages were found for **respiratory, nephritis and nephrotic syndromes, acute renal failure,** and **natural heat exposure**
- Extreme heat increases the risk of illness and fatality from heat stroke and cardiovascular disease
- 85+ age group are at the greatest risk for all causes of hospital admission

Heatwaves and Health

A Study in King County

Heatwaves and Health



- Increased circulatory and cardiovascular deaths with each degree increase in humidex above 97 °F.
- 78% greater risk of death from **diabetes** was observed on a heat day compared to a non-heat day, with risk increasing 14.22% for each degree increase in humidex above 97 °F
- Hospitalizations/mortality will significantly increase on an extreme heat days, which will become more frequent.

Discussion question

How did the June 2021 heat wave affect you personally?



SUNRISE MOVEMENT

The background features a sunburst pattern with rays emanating from the bottom center. The rays are dark brown and set against a lighter brown background. The text is centered and enclosed in a dark brown rectangular box.

**“HEAT ITSELF MIGHT NOT
CAUSE DEATH BUT IT
EXACERBATES PRE-EXISTING
CONDITIONS.”**

- Climate change will increase the number and severity of floods in the PS
- Heavy rainfall events are projected to become more intense
 - Intensity of the heaviest 24-hour rain events is projected to increase by 22% by the 2080s in the NW
 - Little change in annual precipitation but individual rainfalls will be more heavy
- Less snow fall due to warming temps
 - More rain and less snow = more water = increased flood risk in PS watersheds



Flooding



- Rising sea levels will prolong the extent and longevity of river flooding
 - More difficult for flood waters to drain into Puget Sound.
- Historical floods are going to be more frequent
 - For example: Skagit River 100 year flood becomes a 22 year flood
- Increased flood risks around rivers that receive waters from both winter rains and peak runoff



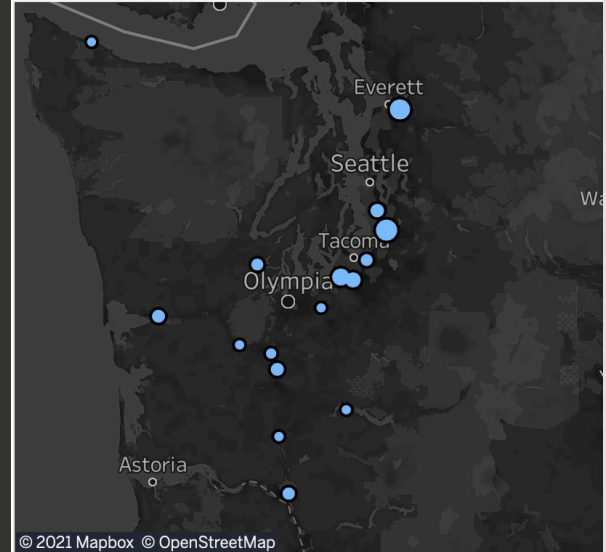
River Flooding

- Potentially affected infrastructure includes homes and businesses, health services, transportation, and water and wastewater treatment plants
- Flooding can introduce biochemicals to drinking, storm and recreational water.
 - Lower flows in the summer can result in concentrated contamination in surface and well water
- Causes immediate physical health effects.
- Can prevent people from reaching critical health services
- **However, death as a result of flooding is rare in WA**

Flooding and Health

Flood Vulnerability

60 communities in Washington and Oregon have above average flood risk, poverty, and racial & ethnic diversity. Hover & click to learn more.



○ ○ ○ Size indicates population.
Communities shown have above average flood risk (>6% of land in the 500 year floodplain), poverty (>10%), racial and ethnic diversity (>22%).

Population Percent in Floodplain

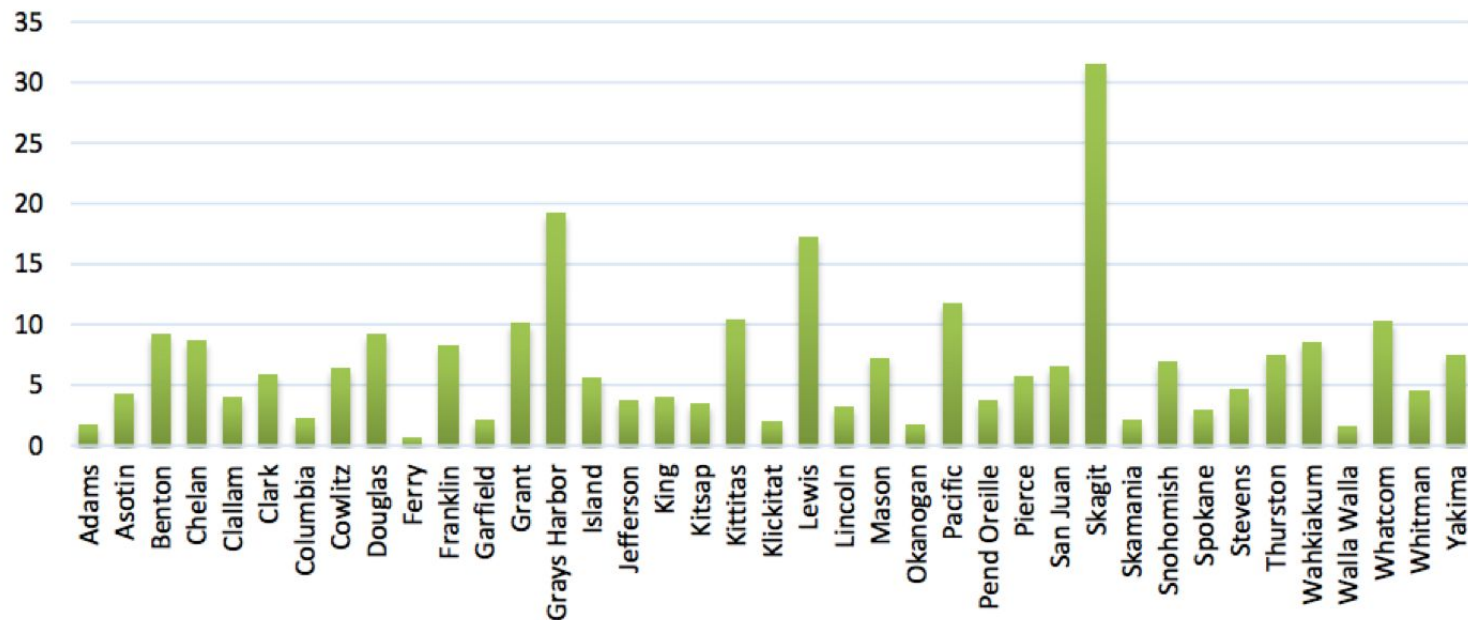
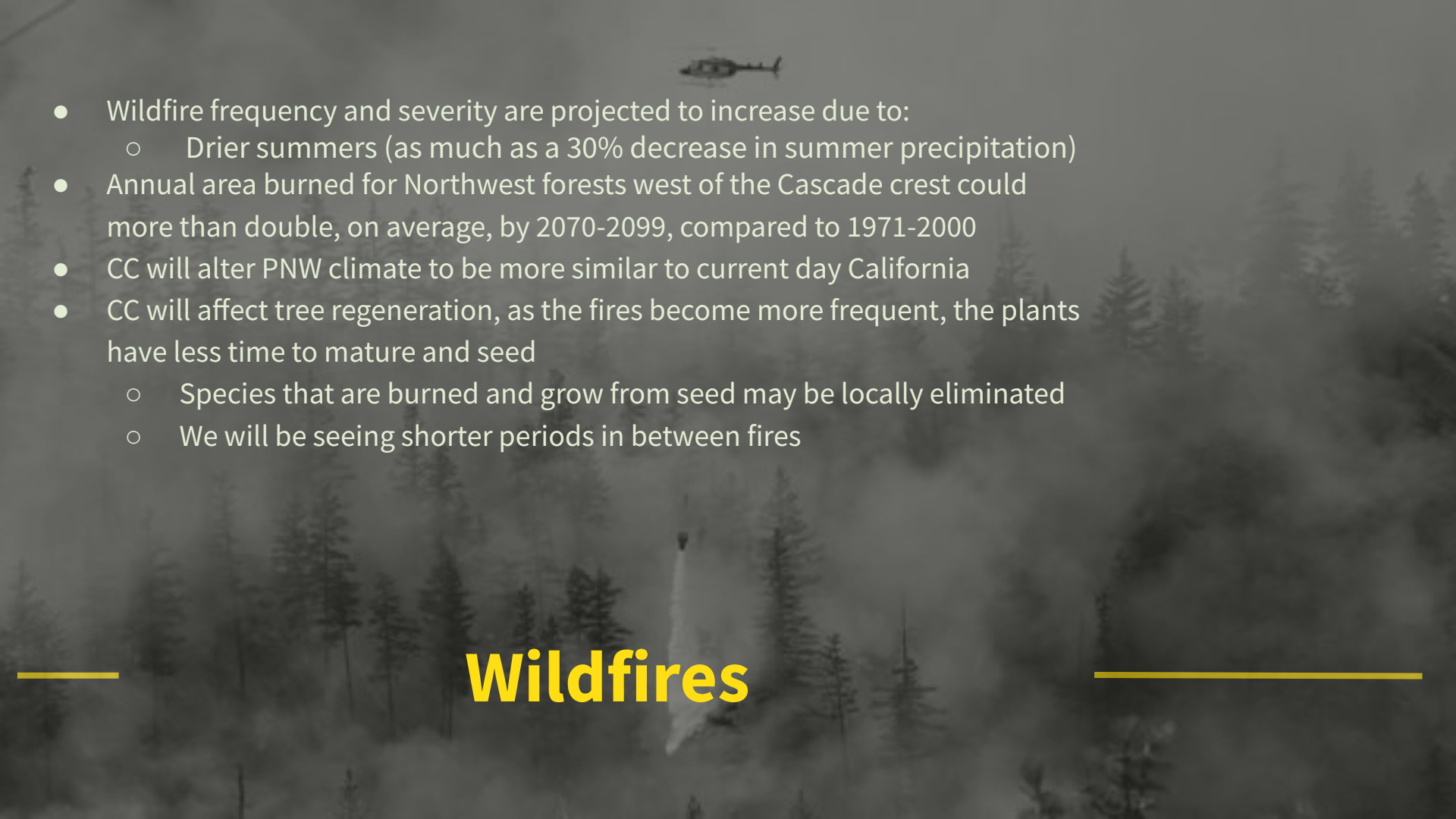


FIGURE 7: A relatively large proportion of the population in western Washington lives in floodplains. The greatest exposure is in Skagit, Grays Harbor, and Lewis Counties. From: Washington Department of Ecology, RiskMAP Business Plan (WA ECY, 2016b).

- 
- A helicopter is visible in the upper center of the frame, flying over a forest. In the background, a large plume of white smoke or steam rises from a fire, partially obscuring the trees. The overall scene is dark and smoky, suggesting a wildfire environment.
- Wildfire frequency and severity are projected to increase due to:
 - Drier summers (as much as a 30% decrease in summer precipitation)
 - Annual area burned for Northwest forests west of the Cascade crest could more than double, on average, by 2070-2099, compared to 1971-2000
 - CC will alter PNW climate to be more similar to current day California
 - CC will affect tree regeneration, as the fires become more frequent, the plants have less time to mature and seed
 - Species that are burned and grow from seed may be locally eliminated
 - We will be seeing shorter periods in between fires

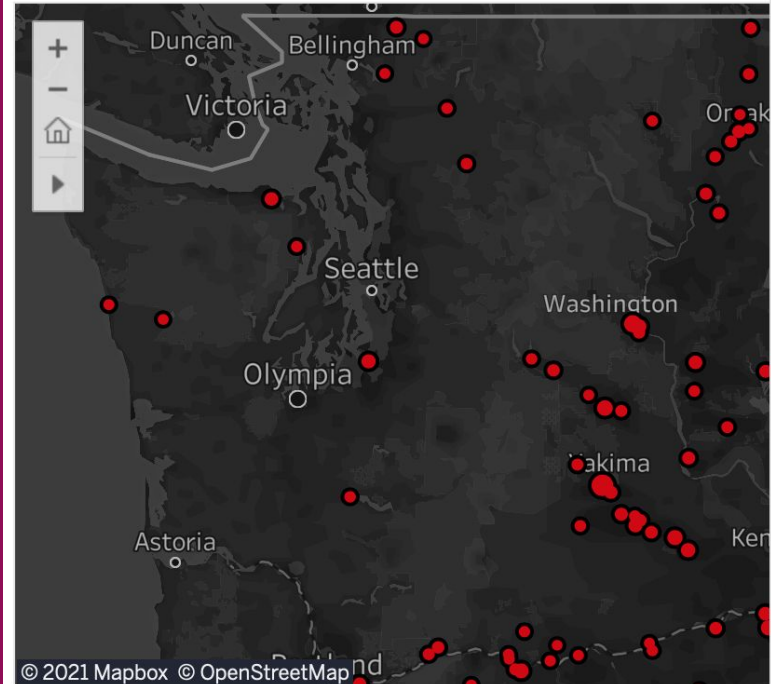
Wildfires

Points near us: Fife,
Sequim, and Quilcene

Wildfire Vulnerability

152 communities in Washington and Oregon have above average wildfire risk, poverty, and rental housing.

Hover & click to learn more.



Size indicates population.

Wildland-Urban Interface: The transition from natural, undeveloped lands to developed lands, seen along the I-5 corridor.

- This is where most of the risk of direct wildfire exposure is
- However, the smoke can travel and affect everyone else



Wildfires and the Wildland-Urban Interface

“We can’t attribute single fire events to climate change. But the trends in large fire events that have been occurring in the region are consistent with expected trends in a warming climate.”

-Brian Harvey, assistant professor at the UW School of Environmental and Forest Sciences

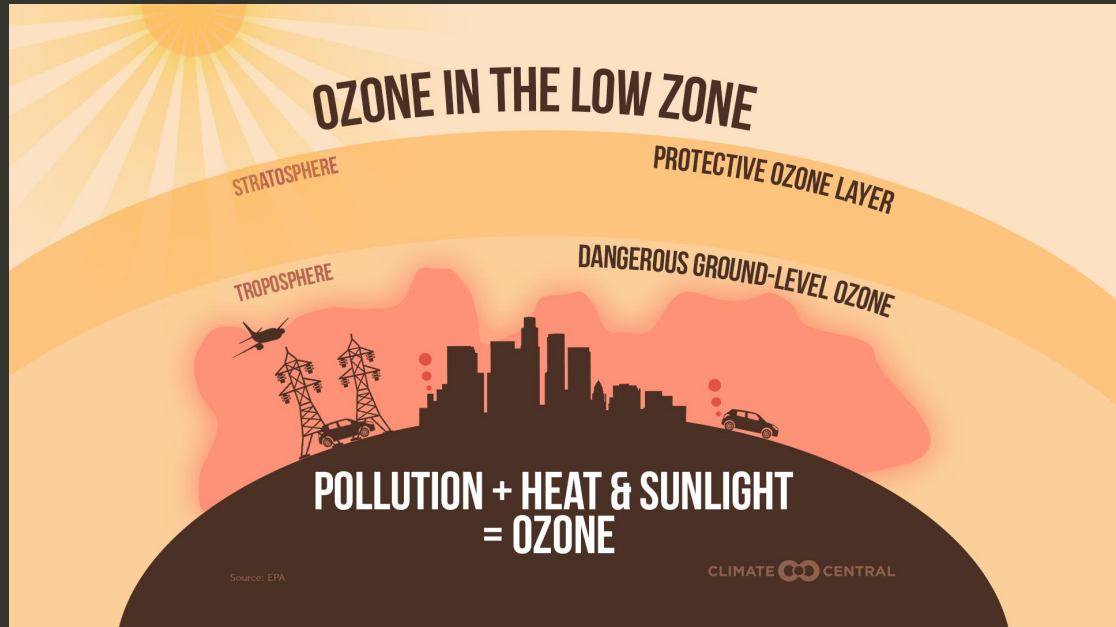
Discussion question

How has the annual wildfire smoke affected you?



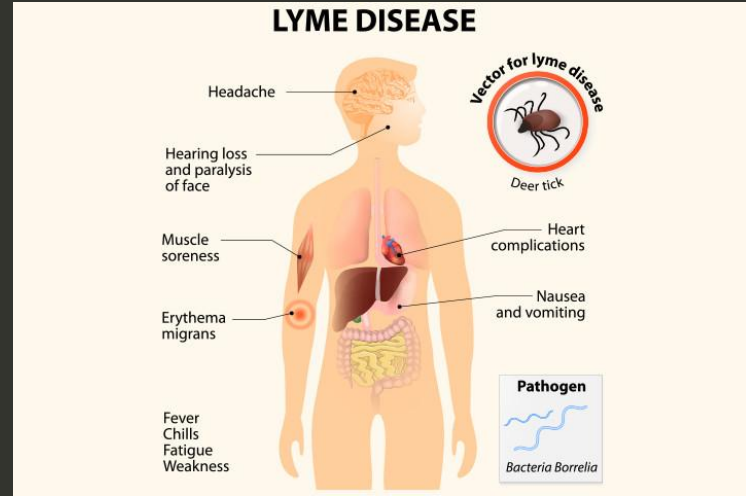
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- Climate change worsens air quality because warming temperatures make it easier for ground-level ozone to form, causing respiratory issues.
- Can also lengthen the season of aeroallergens (pollen).
- Additionally increasing wildfires will increase the amount of smoke, dust, and pollution in the air.



Air Pollution

- A warmer PNW with longer summers will be a suitable habitat for mosquitoes, ticks and fleas carrying Lyme disease and West Nile virus
- Climate change will allow ticks and mosquitoes to expand their ranges and being around for longer seasons
 - Increases risk of being bitten by disease-carrying ticks and mosquitoes
 - **Lyme disease carrying ticks in WA are still rare, as of now**
- Climate change can affect the presence of food-borne diseases
 - Vibrio bacterial outbreaks in shellfish



Disease

Discussion question

**Who do you think these issues
affect the most?**



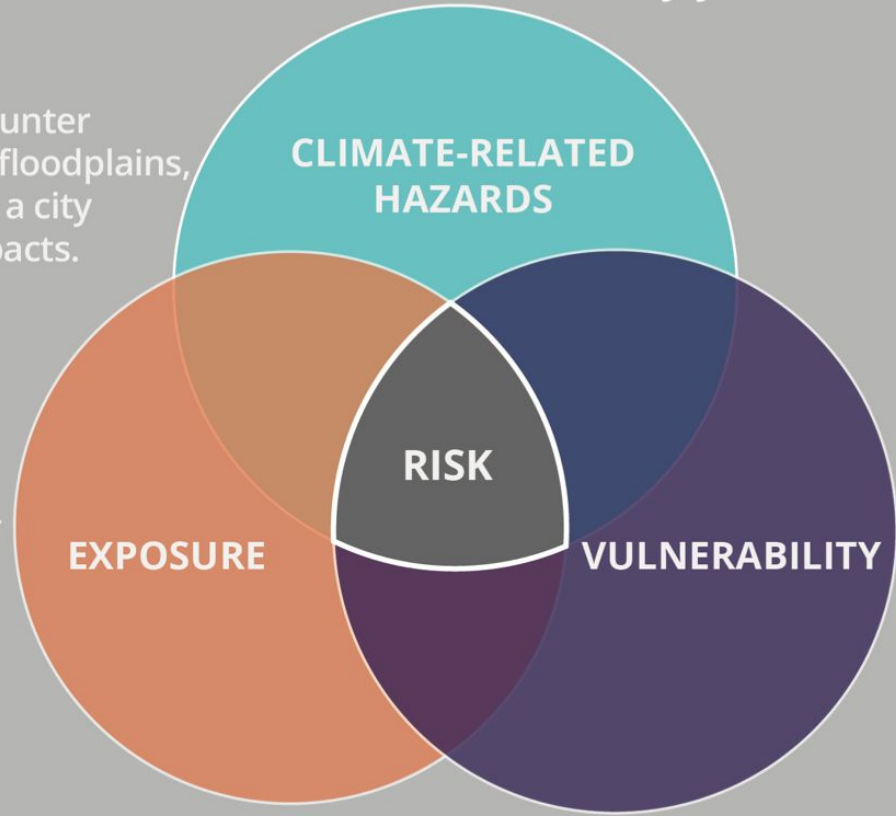
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**WHO ARE THESE
CHANGES
DISPORTIONATELY
IMPACTING?**

The *risk* you face from climate-related events is determined by your *exposure* and *vulnerability*.

EXPOSURE is your likelihood to encounter climate-related hazards. Living near floodplains, at the wildland-urban interface or in a city exposes you to different climate impacts. Your place of employment can also increase your exposure to different climate-related hazards.

VULNERABILITY is your ability to withstand and recover from climate-related hazards. For instance, if you are low-income, have poor health or lack insurance it can be harder to recover from hazards like flooding, heat waves, or wildfire.



after IPCC (2014b)

- Climate change will **disproportionately** affect vulnerable populations.
 - Communities with higher rates of illness and death often have less adaptive capability and are more vulnerable to climate stressors.
 - People with fewer resources to cope with and prepare for CC
- They experience direct health impacts, such as physical injury during severe weather and indirect impacts, such as food insecurity or mental health conditions like PTSD.

A photograph showing a makeshift homeless encampment. Numerous tents made from various colored tarps (blue, green, grey) are pitched on a dirt area. The ground is covered with debris, including plastic, cardboard, and other trash. In the background, there are buildings and trees. The scene is dimly lit, suggesting an overcast day. Two horizontal yellow lines are drawn on the image, one on the left and one on the right, framing the text below.

Who is at Risk?

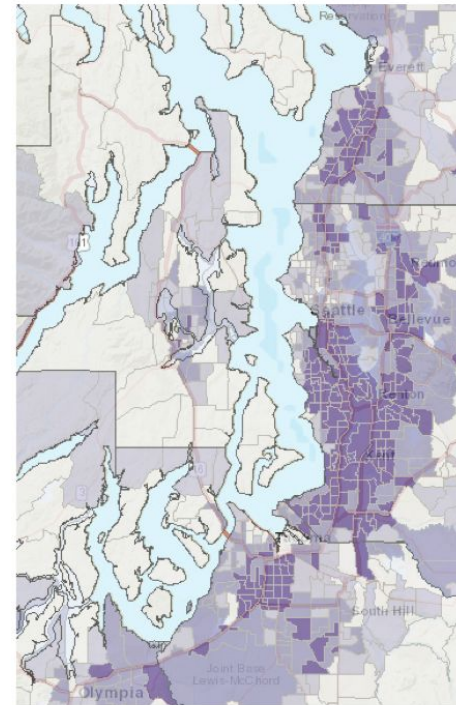
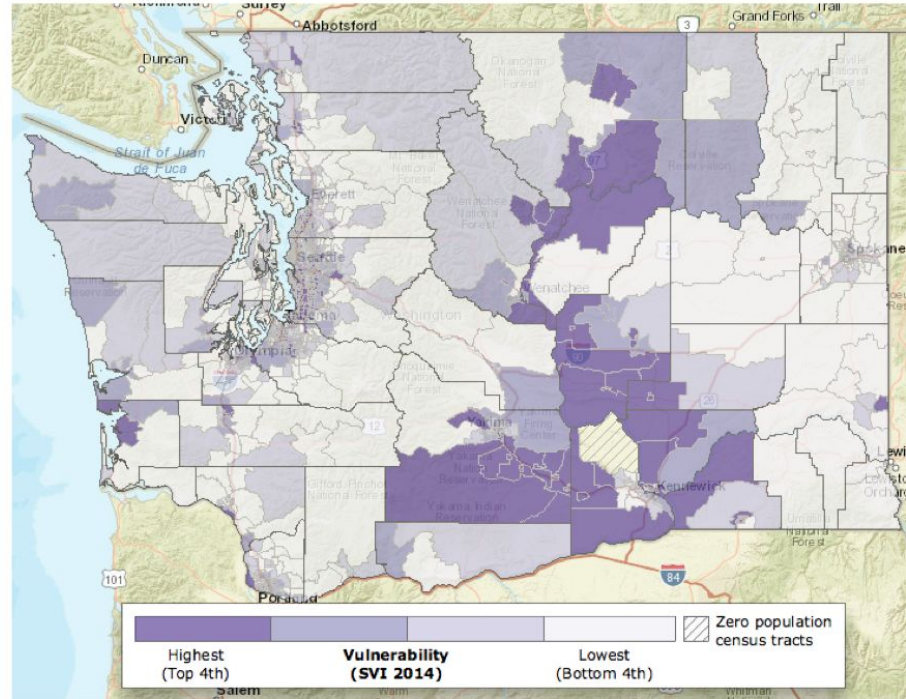


FIGURE 4: ‘Social Vulnerability Index’ (SVI) maps like these are used to indicate the relative vulnerability of given area (drawn by U.S. census tracts) due to specific socioeconomic and demographic variables. Here, darker shading (or a higher SVI) indicates greater proportions of non-white residents and less English proficiency in Washington (left) and in Puget Sound (right). From: CDC (2018).

- Native Americans are the first to experience climate impacts because they depend on natural resources
 - Sacred connections to specific locations, which might include residences, trading routes, or meeting places are facing pressures from CC, especially coastal regions where the sea-level is rising
- NA's and POC face participation barriers in spaces where climate change decisions and investments are made
- Native Americans are extremely vulnerable to flooding because their reservations sit on floodplains
 - 90% of the The Hoh Indian Reservation sits on a 100-year floodplain
 - 15% of the Swinomish Tribe is at risk from sea level rise



Native Americans

- Climate change will also impact First Foods
 - Foods that tribes have historically cultivated for subsistence, economic, and ceremonial purposes
- Often include berries, roots, water, fish, and local wildlife but can vary amongst the tribes
- The loss or decline of First Foods is projected to have both physical and mental health impacts on Indigenous peoples



Native Americans and First Foods

- Salmon is at risk due to CC
- Salmon is essential to most PNW tribes culture and identity.
 - It's an extension of life, an indicator of environmental health
- Success to solve this issue has been found when traditional knowledge is coupled with modern science.
 - The Nez Perce Tribe “used local tribal knowledge to construct “natural” rearing ponds in the Columbia River coupled with introducing wild salmon as broodstock to enhance and restore a culturally significant salmon population.”



— Native Americans and Salmon —

“We need the salmon because it is part of our lives and part of our history. The salmon is a part of us, and we are a part of it. Our children need to be able to feel what it is like to catch and eat salmon. They need to be able to experience that sense of respect that many of us have felt in past years.”

-Julia Davis-Wheeler, a Nez Perce elder

Discussion question

How are socio-economics tied to climate change?

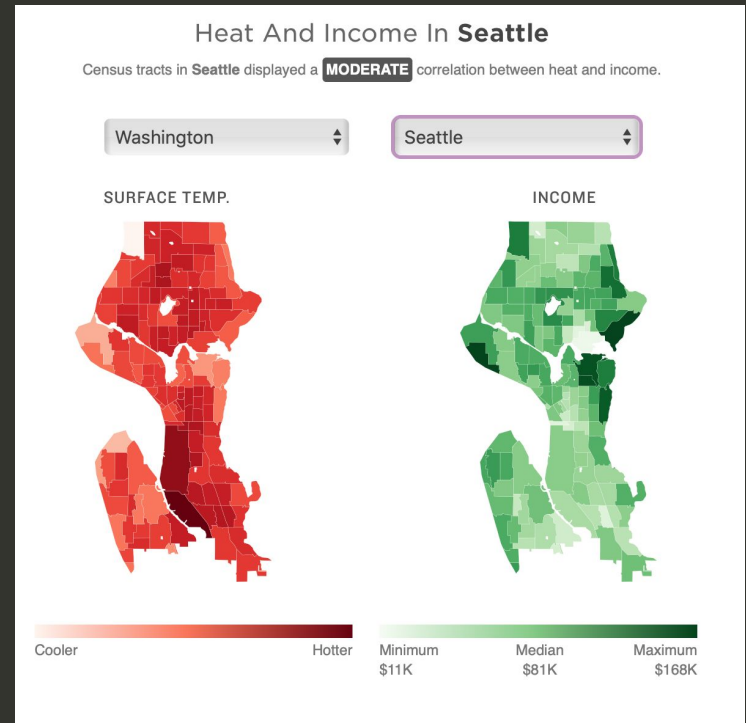


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- Those who are **suffering the most** under extreme weather (the poor, POC communities, unhoused, undocumented), **can't afford solutions** to make climate change events tolerable
 - For example, a fire resistant roof, moving out of a neighborhood on a flood plain, etc.
- They have less resources to rebuild and recover following extreme weather events and less access to insurance

— **Economically Disadvantaged** —

- Neighborhoods with fewer parks, green space and trees easily become heat islands. Income is a big factor affecting risk of illness/death due to extreme heat exposure
 - Electricity bills go up during a heat event
 - Those with A/C in their house may not be able to use it during heat waves because of the high cost to operate them

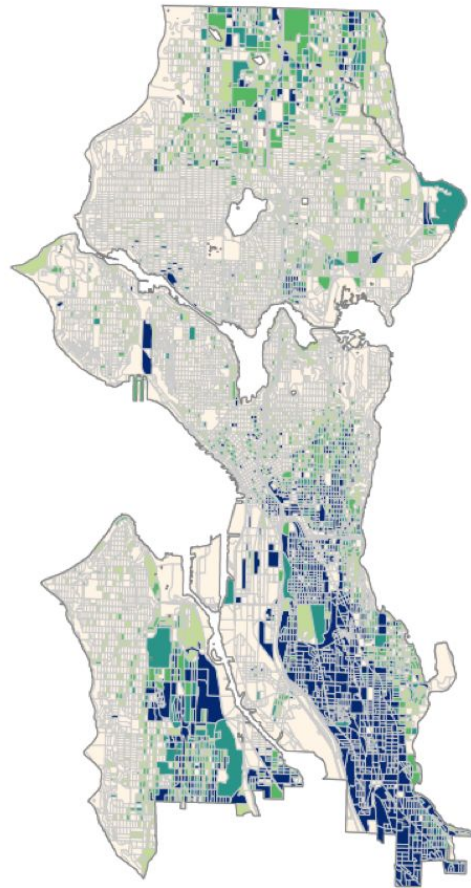
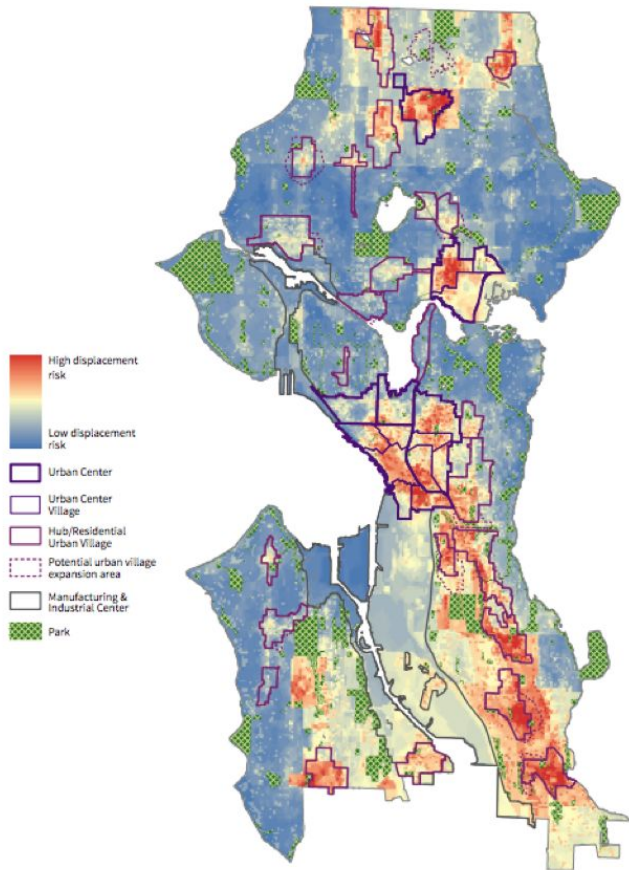


Economically Disadvantaged and Heat Waves



People of Color

- Historical practice of redlining forces POC to live in areas with more exposure to environmental pollutants that compromise health
- A study looking at Seattle neighborhoods found areas like the Rainier Valley neighborhood, are 1.6°F warmer than average
- Race and ethnicity are huge factors connected to the risk of displacement
 - Displacement erodes social cohesion and connection, increasing an individual's vulnerability to CC hazards
- Already problems with POC/low income having adequate access to healthcare
 - CC will exacerbate the infrastructure problems

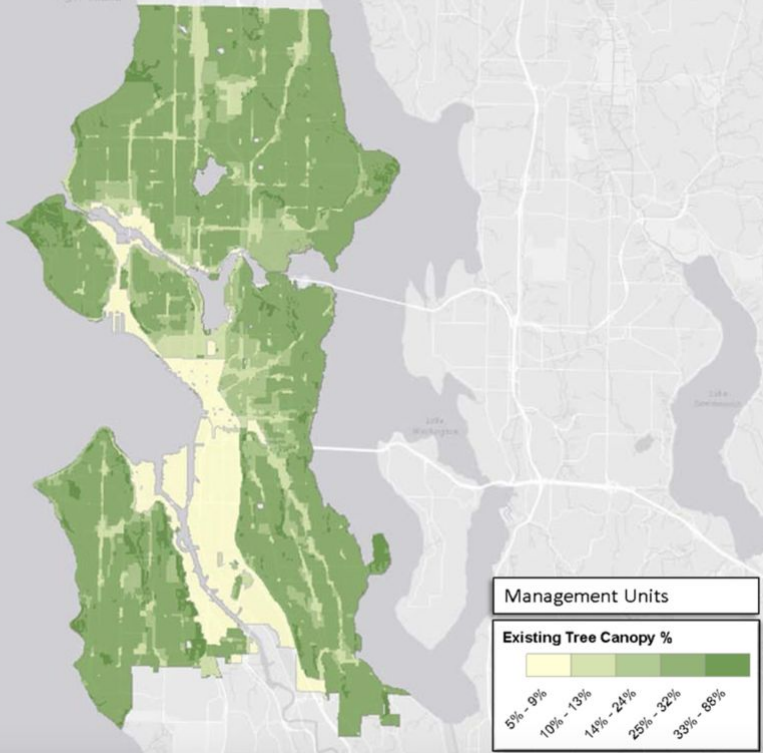


Percentage of population that is a race other than non-Hispanic White (Census block)

- < 20%
- 20% - 30%
- 31% - 40%
- 41% - 50%
- > 50%

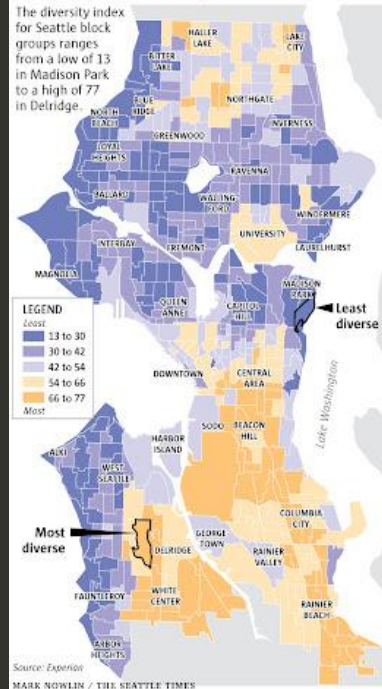
Source: 2010 Census

2016 Seattle Canopy Cover



Diversity varies widely among Seattle neighborhoods

The diversity index for Seattle block groups ranges from a low of 13 in Madison Park to a high of 77 in Delridge.



Areas with high proportions of people of color or low-income individuals tend to have less tree canopy, creating a racial/ethnic and socioeconomic disparity in exposure to heat.

- Hot weather exacerbates conditions such as **heart, lung and kidney disease, and diabetes**
 - Dehydration issues with extreme heat
- Climate change is lengthening allergy season
 - Plants are producing more pollen because of increased levels of carbon dioxide in the air.
- Air pollution worsens respiratory conditions such as asthma and chronic obstructive pulmonary disorder
- Pre-existing conditions can make it harder to evacuate from extreme weather events
- Those with **cardiovascular disease, diabetes and asthma** are more susceptible to illness/mortality during extreme weather events.

Health

- Extreme heat can increase the likely of illness and death in the elderly, especially those with congestive heart failure, diabetes and other chronic conditions
 - Western WA's lack of A/C exacerbates this problem
- Air pollution can increase the risk of a heart attack in elderly especially those with diabetes or obesity
- Elderly more likely to suffer from storm and flood related fatalities
 - If an event causes a mandatory evacuation, older adults more likely to suffer from physical/mental health impacts
- West Nile and St. Louis encephalitis viruses are a greater risk to the elderly because of their weakened immune system
- **Reduced mobility, social isolation and limited access to services = reduced capacity to cope with climate change events**



Elderly

- Agricultural workforce at risk because they perform heavy labor, work outside and work throughout the summer
 - Most are male, foreign born, have little formal education and more likely to suffer from chronic health issues
 - Most often experiences **heat related illness** during the summer harvest season
 - Risk increases if workers are wearing protective gear because it restricts evaporation
 - Same risks for construction workers (primarily roof and highway workers)



Outdoor Workers

- From 2007 to 2017, homelessness in Pacific Northwest cities has increased 47%
 - The percentage of homeless who are unsheltered has also increased dramatically over this time period.
 - In Seattle, this increase has been from 28% in 2007 to 47% in 2017.
- The homeless face direct risk (exposure to heat waves or storms) and indirect vulnerabilities (poorer health/less access to resources).
- Those experiencing homelessness tend to be skeptical/unwilling to seek shelter at cooling centers during heat waves
- Rising sea levels in coastal zones could displace more people and therefore contribute to more homelessness.
 - To combat this issue a nonprofit group in Portland brought water/cooling devices to homeless sites during the heatwave in August 2021.



The Homeless

Discussion question

**Do you personally know anyone
from these impacted groups?**



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Accountability

Who caused this?

- **Corporations**
 - The top 100 fossil fuel producers are responsible for 70% of greenhouse gas emissions
 - Spend billions to push climate science denial
 - And the narrative individuals can solve climate change
 - A large portion the American public is uncertain about the climate science because of the misinformation
 - They also mislead Congress, causing no legislation to be passed
 - Lobby for trillion dollar subsidies for cheaper fossil fuels
 - Hence the argument against green energy is that it's too expensive; compared with fossil fuels, it is
 - We must hold the industry accountable for their massive contribution to the climate crisis and efforts to overthrow meaningful climate action



- **Rich countries**

- Developed countries emit much more carbon so it's their responsibility to severely cut back and come up with the finances/technology to lead less developed countries down a climate friendly path
- **The United States**, Canada, Japan and much of western Europe, account for 12% of the global population today but are responsible for 50% of greenhouses gases.

Accountability

Which countries are historically responsible for climate change?

1850 - 2021



CarbonBrief
CLEAR ON CLIMATE

- **Individual consumers**
 - Some hold much more responsibility than others
 - The top 1% take more vacations, travel more, own private jets, own more cars, etc
 - One opinion is that individuals are not the problem at all
 - It is a systemic problem that starts and ends with the industry
 - Others believe individual change is the foundation required for effective collective action.
 - One can try to live for environmentally friendly while still advocating for industry change
- It's agreed upon that there are limits to what individual action can achieve.



Accountability

“By hiding who’s really responsible for our current, terrifying predicament, we provide political cover for the people who are happy to let hundreds of millions of other **people die for their own profit and pleasure.” -Genevieve Guenthe, climate scholar and author.**

Discussion question

How should the responsibility be distributed amongst governments, corporations, the rich, and individuals?



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SOLUTIONS

General Solutions

- Social networks, capital and cohesion can aid communities in being more resilient to climate change
 - Native Americans have shown such resilience and adaptability to changing environments
- Building community resilience to climate change is more effective if there's a focus on inclusivity and cohesion
 - It's essential to communicate, cooperate, access and share resources to reduce negative consequences
- Frontline community members most impacted by climate change must share decision power with officials and **help produce strategies focused on their priorities and concerns.**
- Community partnership and collaboration are essential for climate resilience planning

Social Cohesion

General Solutions

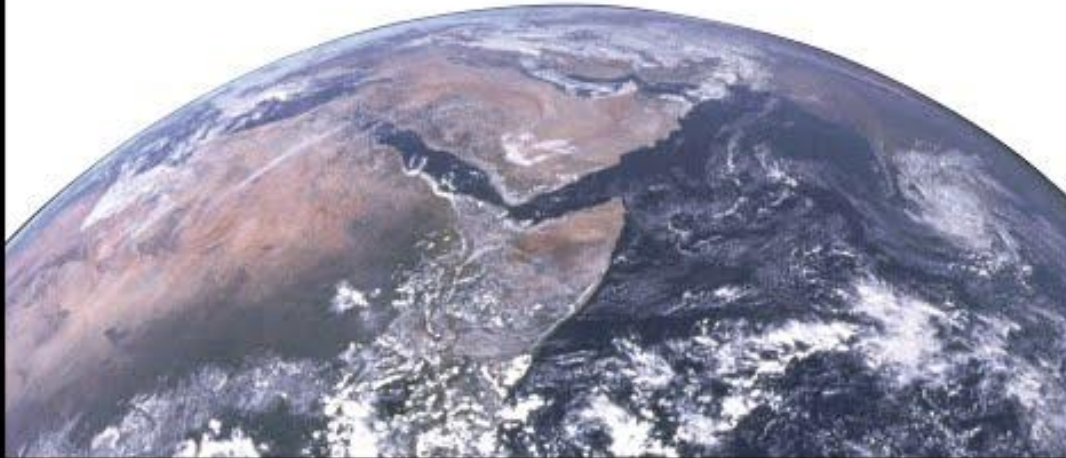
Social Inequity

- To combat disadvantages faced by POC, social inequity, and environmental concerns, we must **target investments in frontline communities** by providing job training and employment opportunity
- Correcting structural inequalities, such as poverty, income inequality, and the nature gap (the varying access to green spaces) are critical to mitigating the effects of climate change on vulnerable populations.



General Solutions -Carbon Pricing

THERE IS GOOD NEWS



Public Transportation

- “National level data show significant greenhouse gas emission savings by use of public transportation, which offers a low emissions alternative to driving” (US Department of Transportation).
- A 40-seat full diesel transit bus has 82% less greenhouse emissions than the avg. single-passenger vehicle in the US.
- “Public transportation reduces emissions by facilitating higher density development, which conserves land and decreases the distances people need to travel to reach destinations”



Heat Wave Solutions

- Coordinated Care Organizations in Oregon are beginning to invest in certain climate protections for members.
 - For example, some are covering the cost of air conditioning units for patients at risk of heat-related illnesses
- Organization called Solid Ground is working with the King County health department to cool Seattle residents by establishing cooling stations
 - Intermediary from local govts and its residents
 - By using a community-centered approach that values the perspectives by the people of front line communities, officials can create new infrastructure and heat mitigation strategies that will benefit everyone in the region
- Strengthening heatwave awareness
- Improving access to appropriate heat resilient shelters for older people.
 - Strengthen health services to ensure that older people receive targeted medical support during heatwaves



Solutions for Wildfires

- **Forest Fires:**

- **Controlled Burns**

- Utilizes the main idea of natural forest fires, burning excess organic material on the ground to cycle nutrients
- Does still involve burning, which could if done poorly, get out of hand
- Has been done by Californian Native Americans for hundreds of years, with success

- **Education**

- Forest fires are commonly due to anthropogenic causes
- Education on forest fire prevention, while not 100% reliable, still helps reduce forest fires
- Advocacy

- **Putting forth funding to prevent fires**

- The majority of funding to fighting fires has been fighting active fires
- More budgeting should be focused on prevention



Solutions for Floods

- **Flooding:**

- Develop better ways to drain excess rain water
- Permeable sidewalks and roads
- Stop major development on drainage areas



Discussion question

What are some other solutions you believe could make a difference?



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Discussion question

**Do you have any questions about
what you have learned today?**



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THANK YOU FOR COMING TO OUR WORKSHOP!

Contact Info

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Sources

- <https://stacks.cdc.gov/view/cdc/42110>
- https://cig.uw.edu/wp-content/uploads/sites/2/2014/11/ps-sok_sec13_humanhealth_2015.pdf
- <https://nca2018.globalchange.gov/chapter/24/>
- <https://cig.uw.edu/learn/climate-change/>
- <https://www.washington.edu/news/2020/04/01/study-synthesizes-what-climate-change-means-for-northwest-wildfires/>
- <https://fireecology.springeropen.com/articles/10.1186/s42408-019-0062-8#Abs2>
- https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-northwest_.html#Reference%202
- <https://www.invw.org/2021/02/24/mapping-climate-vulnerability/>
- <https://prismreports.org/2021/08/05/what-do-at-risk-communities-in-the-pacific-northwest-need-to-survive-the-changing-climate/>
-
- <https://www.dw.com/en/heatwave-climate-us-pacific-northwest/a-58191437>
- <https://www.seattletimes.com/seattle-news/environment/how-climate-change-threatens-our-health-in-the-pacific-northwest/>
- <https://cig.uw.edu/wp-content/uploads/sites/2/2020/12/snoveretalsok2013sec5.pdf>
- <https://www.cmu.edu/steinbrenner/EPA%20Factsheets/older-adults-health-climate-change.pdf>
- https://reliefweb.int/sites/reliefweb.int/files/resources/COP21_HelpAge_PositionPaper_Final_0.pdf
- https://cig.uw.edu/wp-content/uploads/sites/2/2018/08/AnUnfairShare_WashingtonState_August2018.pdf
 - Loads of solutions at the end of the pdf
- <https://smea.uw.edu/currents/heat-and-housing-a-link-between-historic-racism-and-current-environmental-inequities/>
- <https://harvardpolitics.com/climate-change-responsibility/>
- <https://news.climate.columbia.edu/2021/05/10/the-role-of-individual-responsibility-in-the-transition-to-environmental-sustainability/>