



PUBLIC HEALTH

**ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON**

Climate Change and Public Health

*A presentation to the Governor's Interagency Council on
Health Disparities*

December 9, 2015

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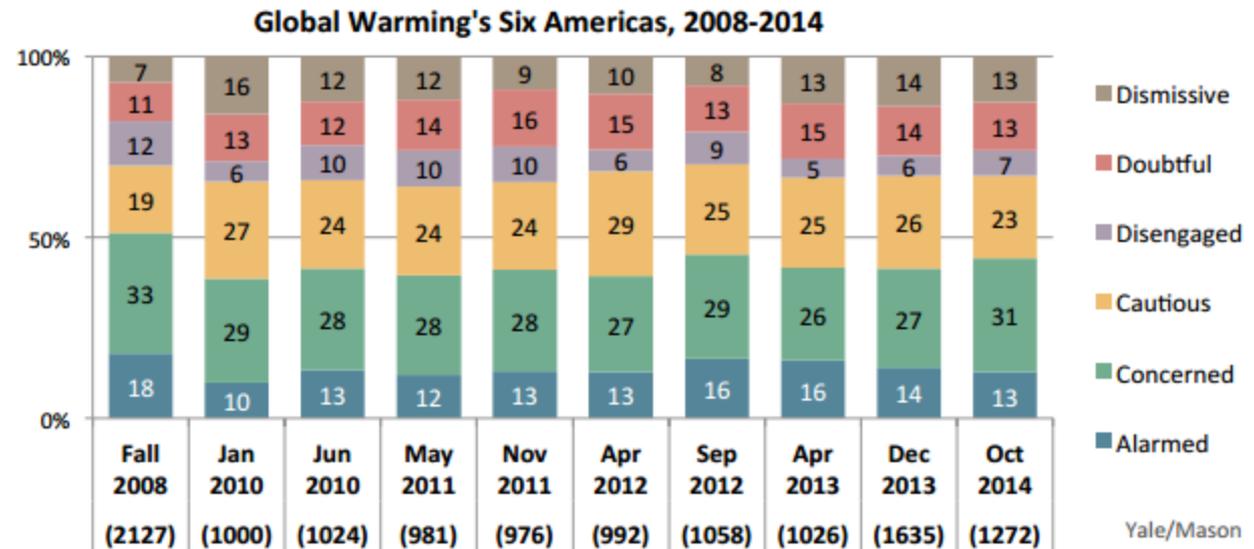
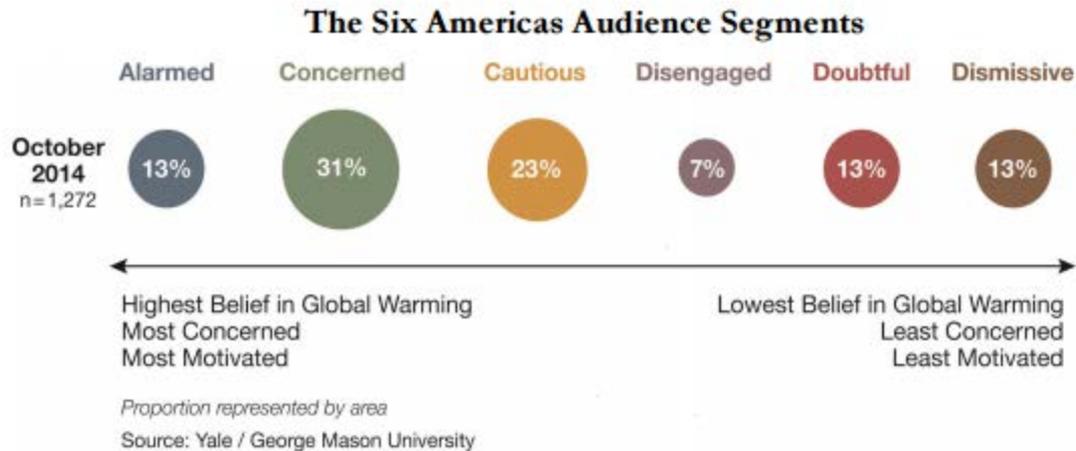
Marnie Boardman, MPH

Environmental Public Health Sciences



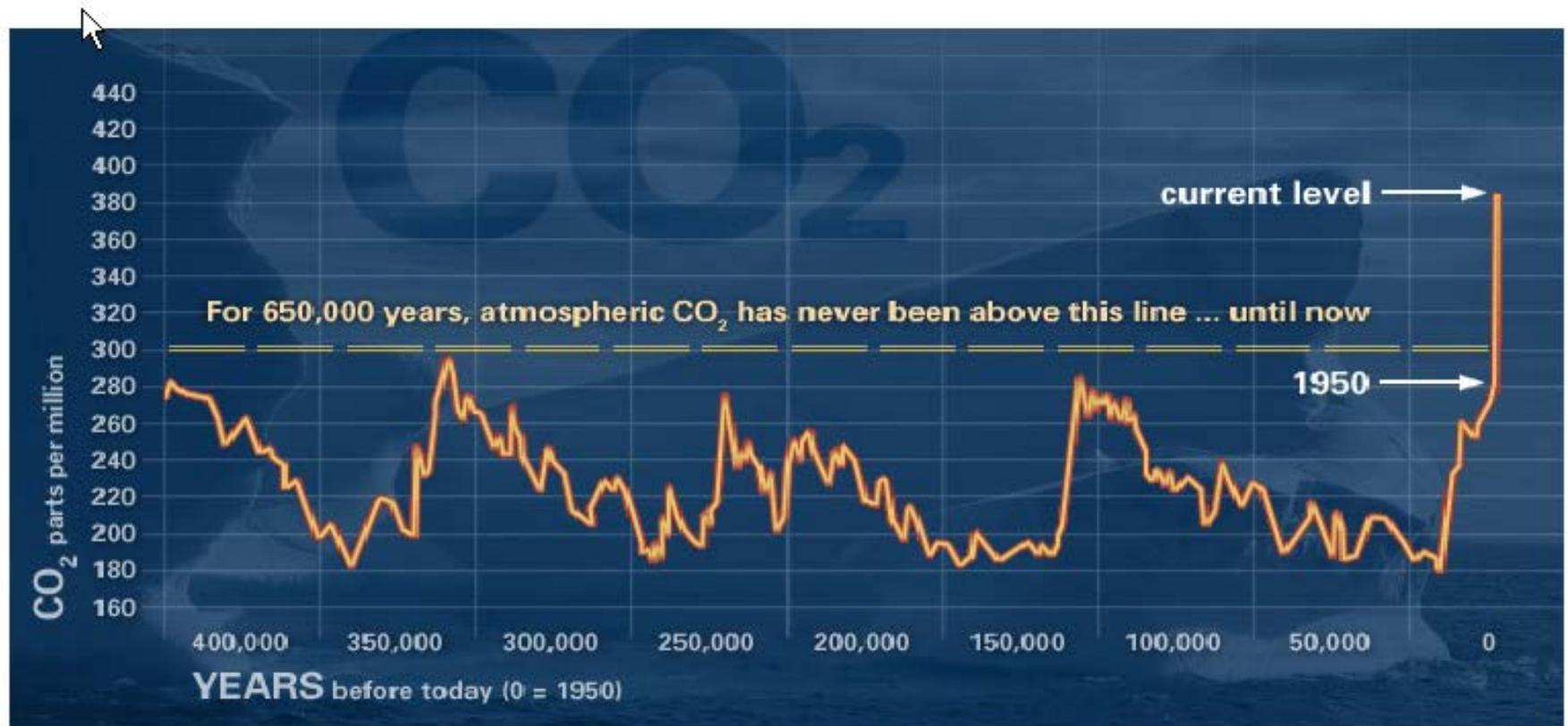


Perceptions of climate change



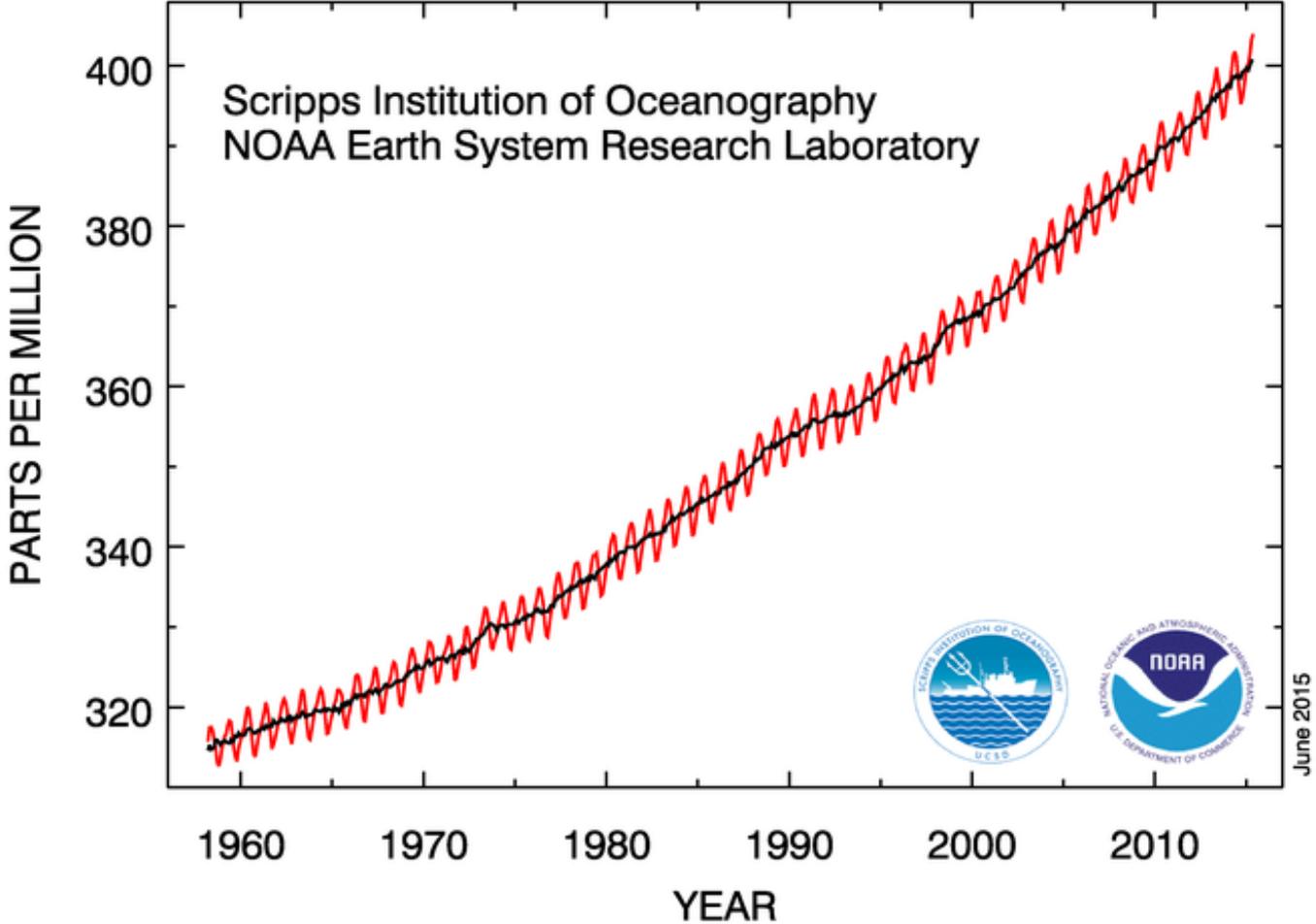
⁴ Mildenberger, M. & Leiserowitz, A. (in revision). Why did public concern for climate change decline?: Evidence from an opinion panel. *Global Environmental Change*. Manuscript is under revision and available upon request.

Climate change: How do we know?

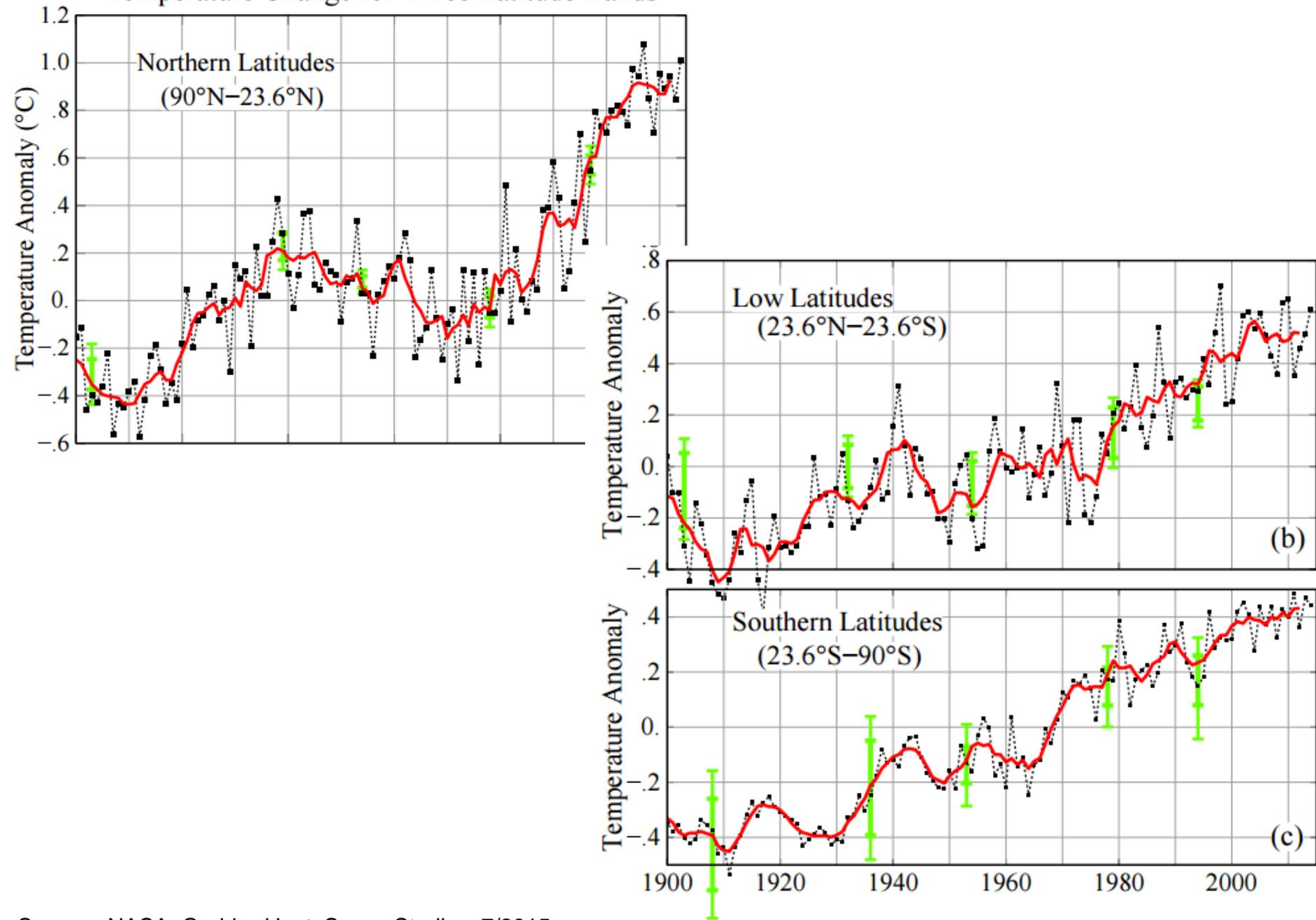


This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO₂ has increased since the Industrial Revolution. (Source: NOAA)

Atmospheric CO₂ at Mauna Loa Observatory



Temperature Change for Three Latitude Bands



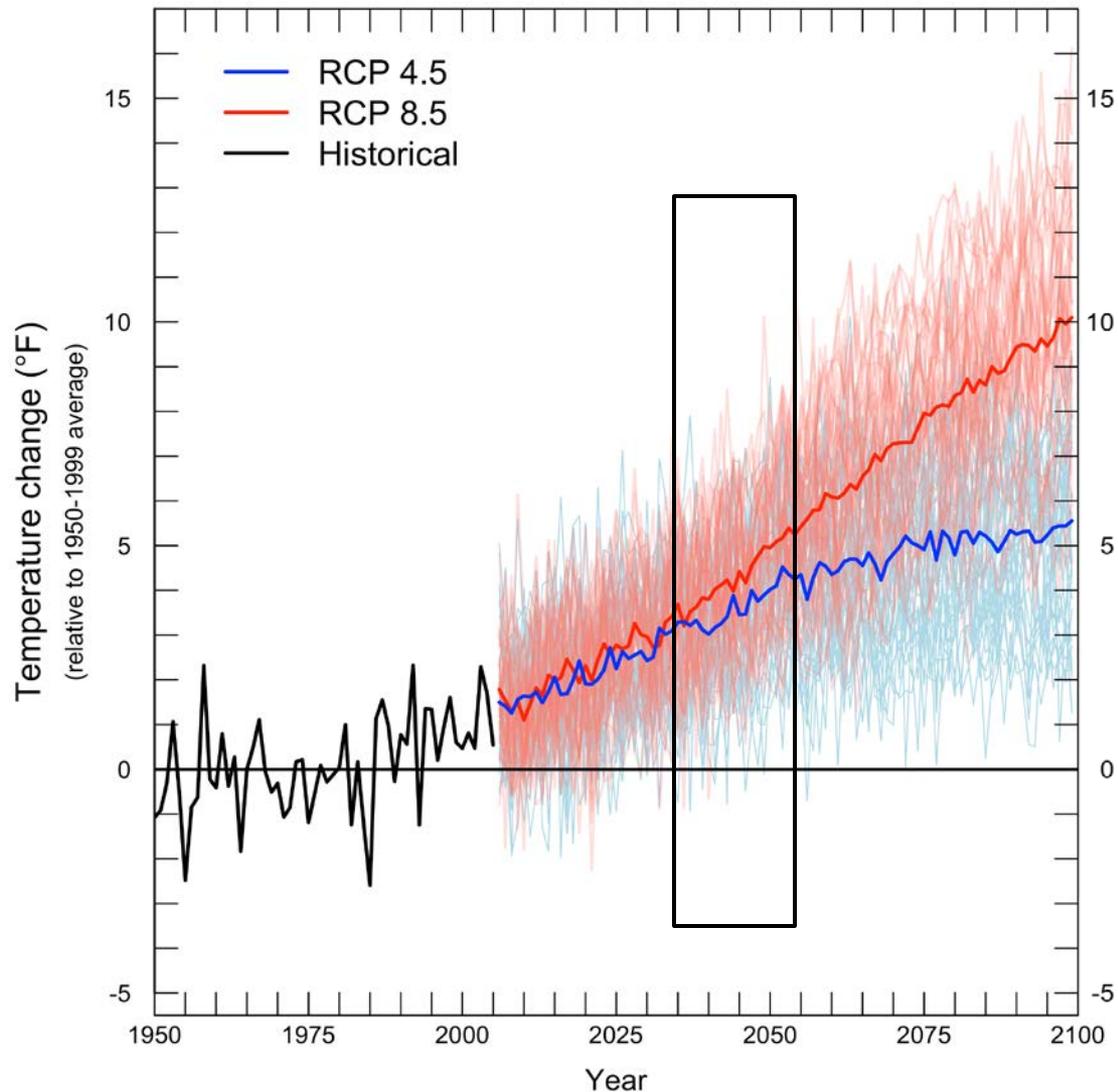
Source: NASA, Goddard Inst. Space Studies, 7/2015

Rapid Warming Projected

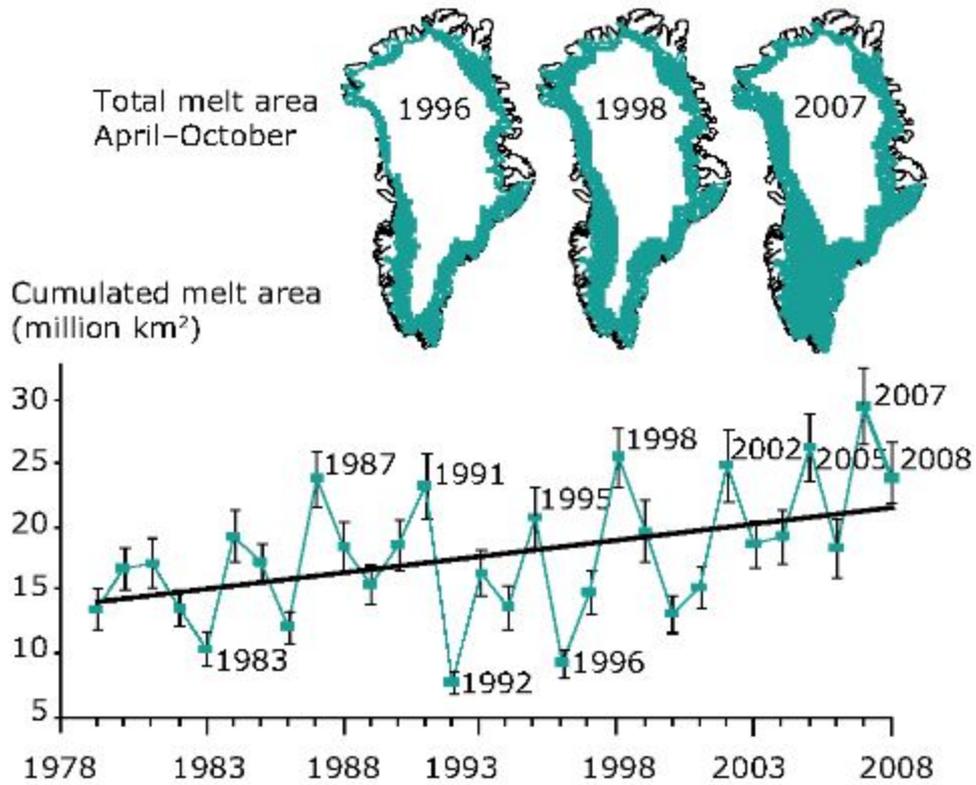
All scenarios indicate warming in the 21st century

2050s <i>(relative to 1950-1999)</i>	
Low emissions <i>(RCP 4.5)</i>	+4.3°F <i>(2.0-6.7°F)</i>
High emissions <i>(RCP 8.5)</i>	+5.8°F <i>(3.1-8.5°F)</i>

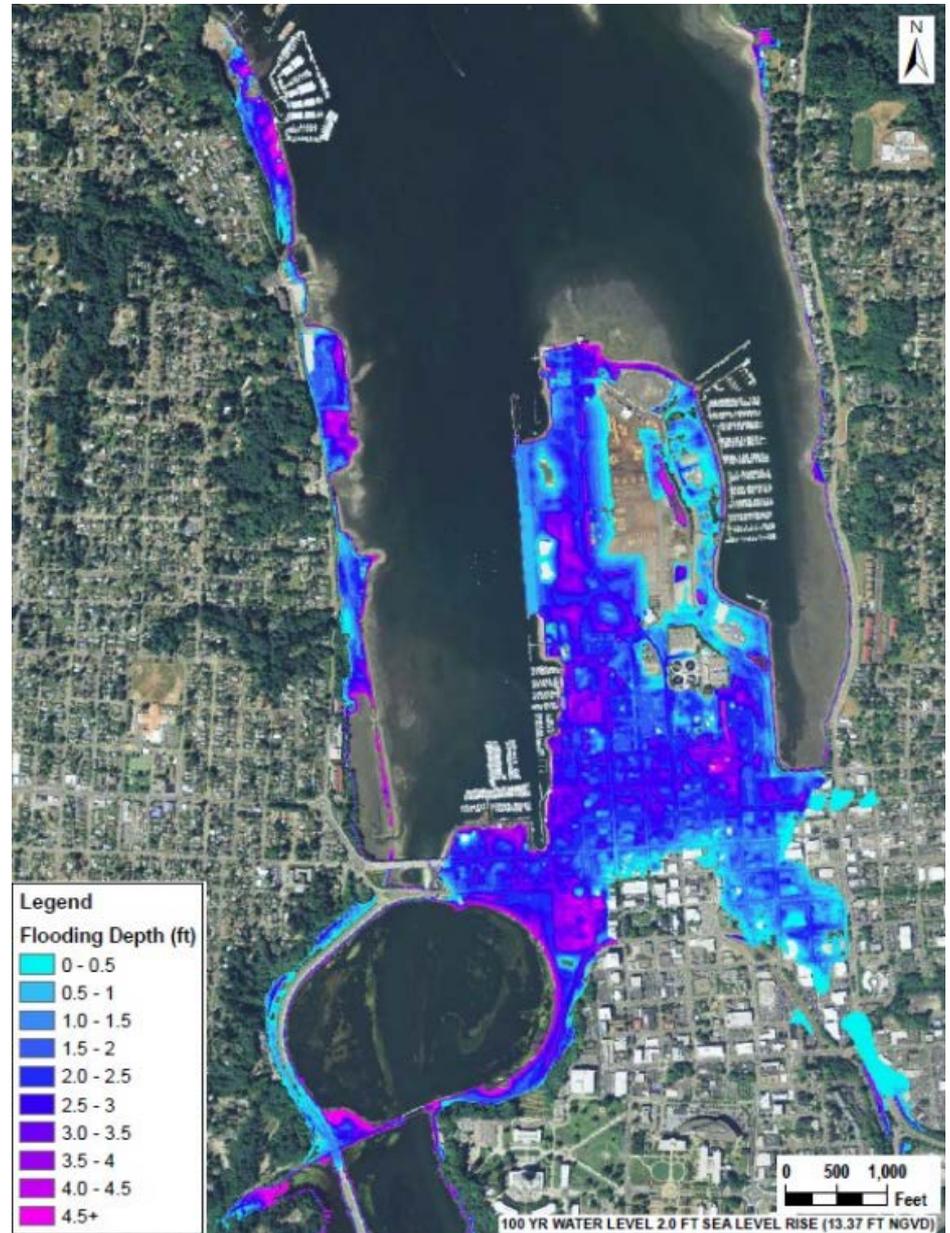
Projected Change in Average Annual PNW Temperature
(relative to 1950-1999 average)



Greenland Ice Sheet Melt



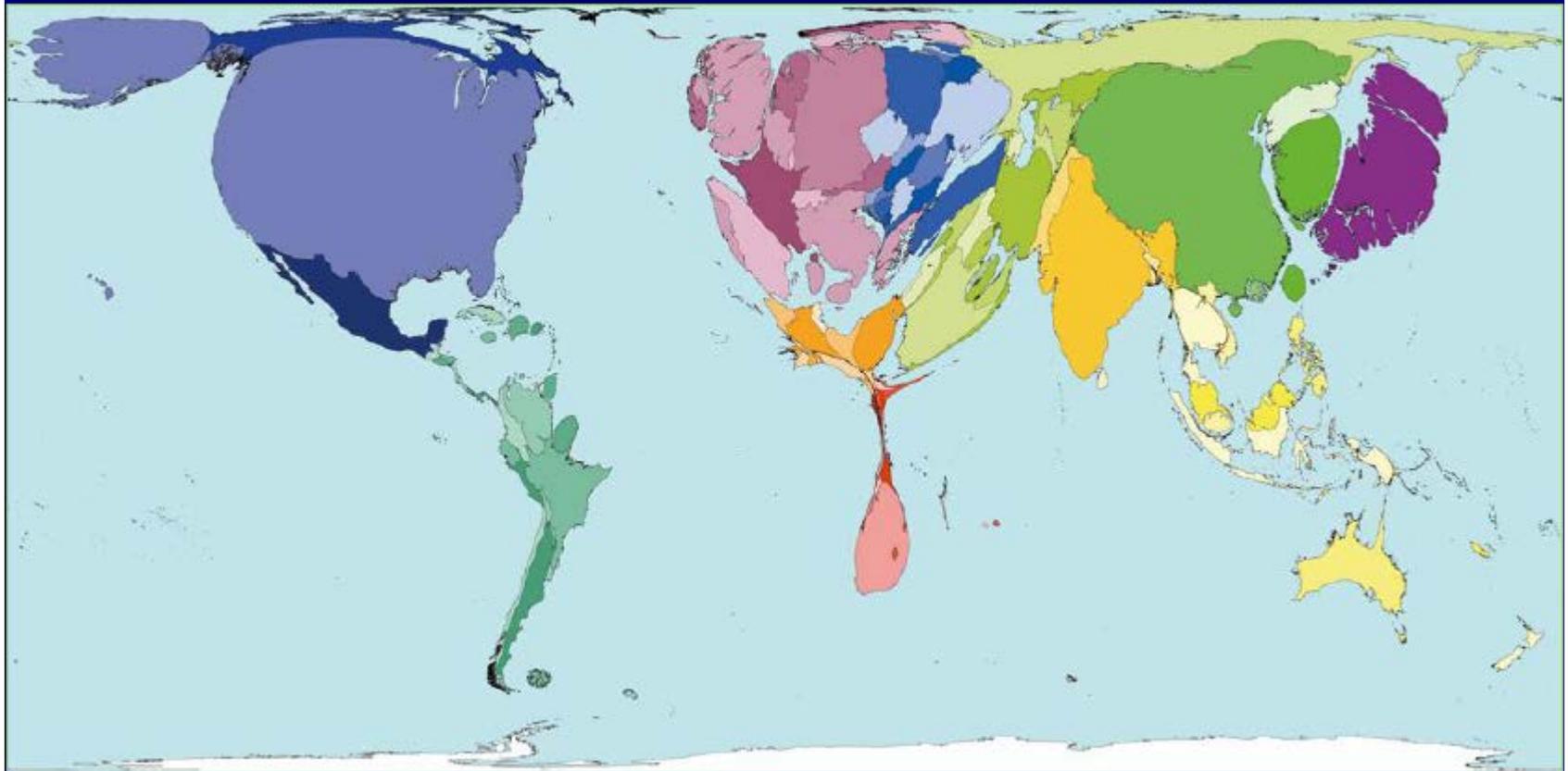
Olympia flood area and depths of 100-year return period, 2 ft sea level rise



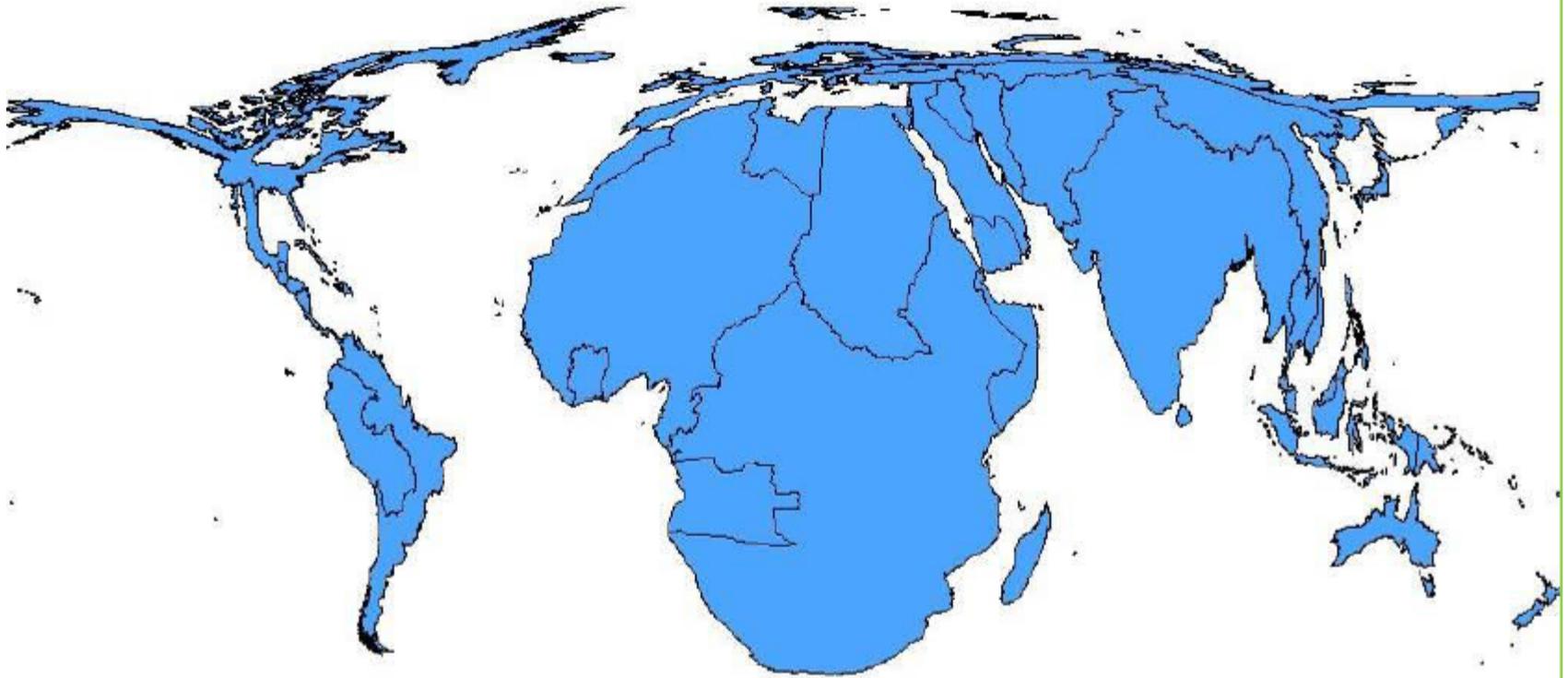
City of Olympia, Engineered Response to Sea Level Rise, 2011

Greenhouse Emissions by Country

(Density-Equalizing Cartogram)



Climate-Related Mortality



Jonathan Patz, University of Wisconsin

Potential Health Effects of Climate Change

Climate change:

- Temperature rise
- Sea level rise
- Hydrologic extremes



HEAT

SEVERE WEATHER

AIR POLLUTION

ALLERGIES

VECTOR-BORNE DISEASES

WATER-BORNE DISEASES

WATER AND FOOD SUPPLY

MENTAL HEALTH

ENVIRONMENTAL REFUGEES



Heat stress, cardiovascular failure



Injuries, fatalities



Asthma, cardiovascular disease



Resp allergies, poison ivy



Malaria, dengue, hantavirus, encephalitis, Rift Valley fever



Cholera, cryptosporidiosis, campylobacter, leptospirosis



Malnutrition, diarrhea, harmful algal blooms



Anxiety, post-traumatic stress, depression, despair

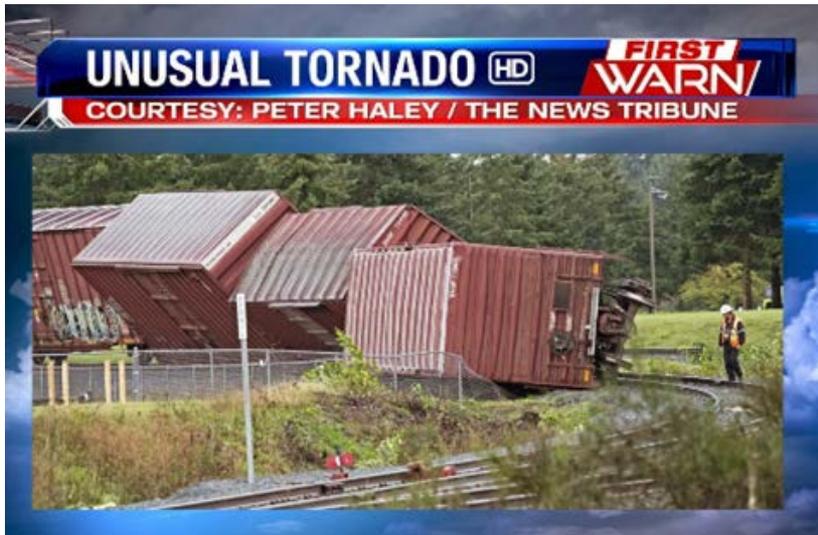


Forced migration, civil conflict

We're Already Seeing Impacts On...

Our weather and seasons

- ❖ Increased extreme weather events lead to more flooding
- ❖ Longer, hotter summers will impact the health of vulnerable people and increase demand for water and electricity
- ❖ Increased vector-borne diseases



Epidemiology of heat waves

Risk factors for hyperthermia:

Individual

- Age
- Underlying medical conditions / mental illness
- Income and poverty status
- Homelessness
- Social isolation
- Lack of access to health care and cooling facilities
- Neighborhood characteristics: land use/ land cover, crime rate, housing type, urban heat island

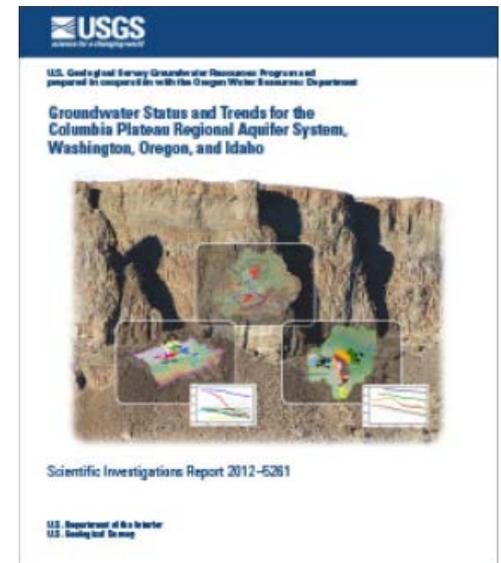


Community Characteristics

We're Already Seeing Impacts On...

Our drinking water

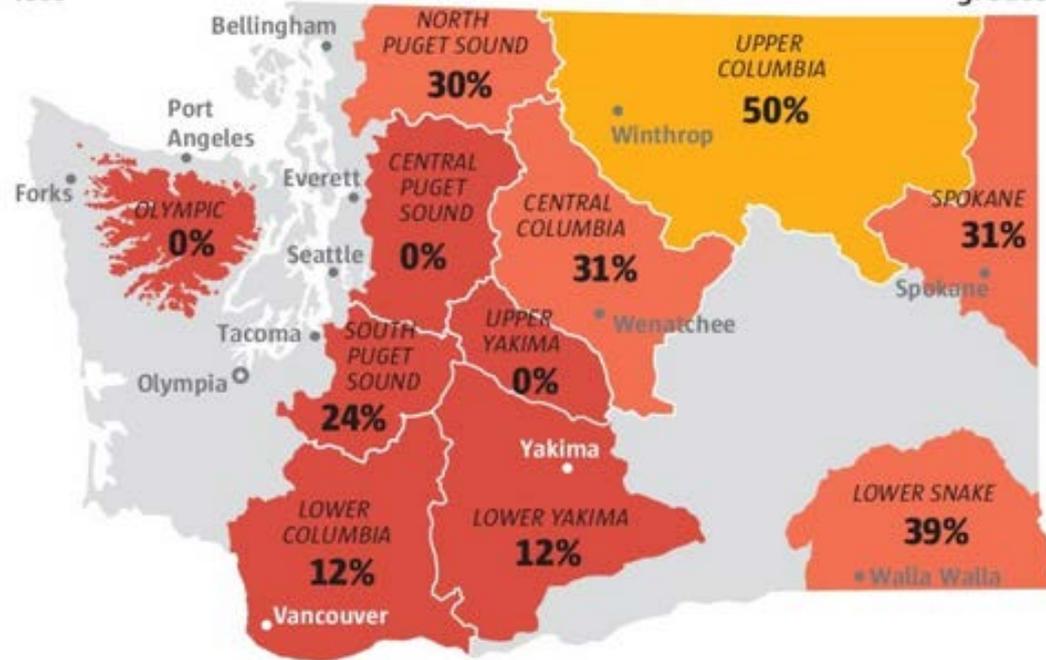
- ❖ Earlier and faster snow melts make our water supply less reliable
- ❖ Severe storms cause flooding and other damage that jeopardizes water systems



Washington snowpack

Snowpack as of May 14, 2015, as a percentage of annual average for this date (*based on the first reading of the day*):

SNOW WATER EQUIVALENT* BASIN-WIDE (*Percent of 1981-2010 normal*)



*Snow water equivalent represents the depth of water in the snowpack, if the snowpack were melted, in inches.

Source: Natural Resources Conservation Service

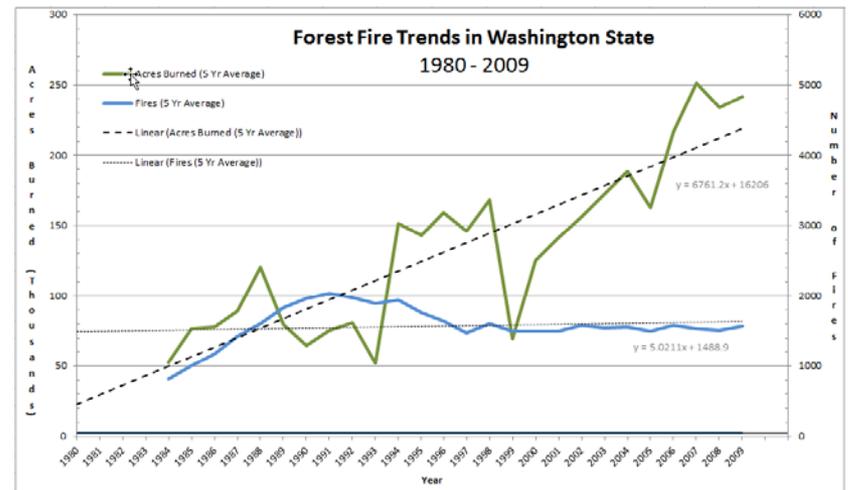
We're Already Seeing Impacts On...

Our air quality

- ❖ Particulate matter from forest fires impacts the air we breathe and causes increased hospitalizations
- ❖ Warmer temperatures contribute to increased ground-level ozone
- ❖ Air stagnation and increased temperatures increase human exposure to air pollution



Washington State Department of Health



* Data from U.S. Bureau of Indian Affairs, Bureau of Land Management, National Park Service, Fish and Wildlife Service, U.S. Forest Service

Forest Fires and Public Health

DRIVERS:

- Warmer summer temperatures
- Earlier spring snowmelt (*likely*)
- Reduced soil moisture
- Stress from insects such as the Mountain Pine Beetle



adult beetle



adult and larval galleries



pitch tubes

We're Already Seeing Impacts On...

Our health

- ❖ Increased CO₂ and temperature leads to increase pollen counts, longer growing season for ragweed and other allergenic plants
- ❖ Changing ecosystem creates opportunities for new fungal exposures
- ❖ Increased vector-borne diseases



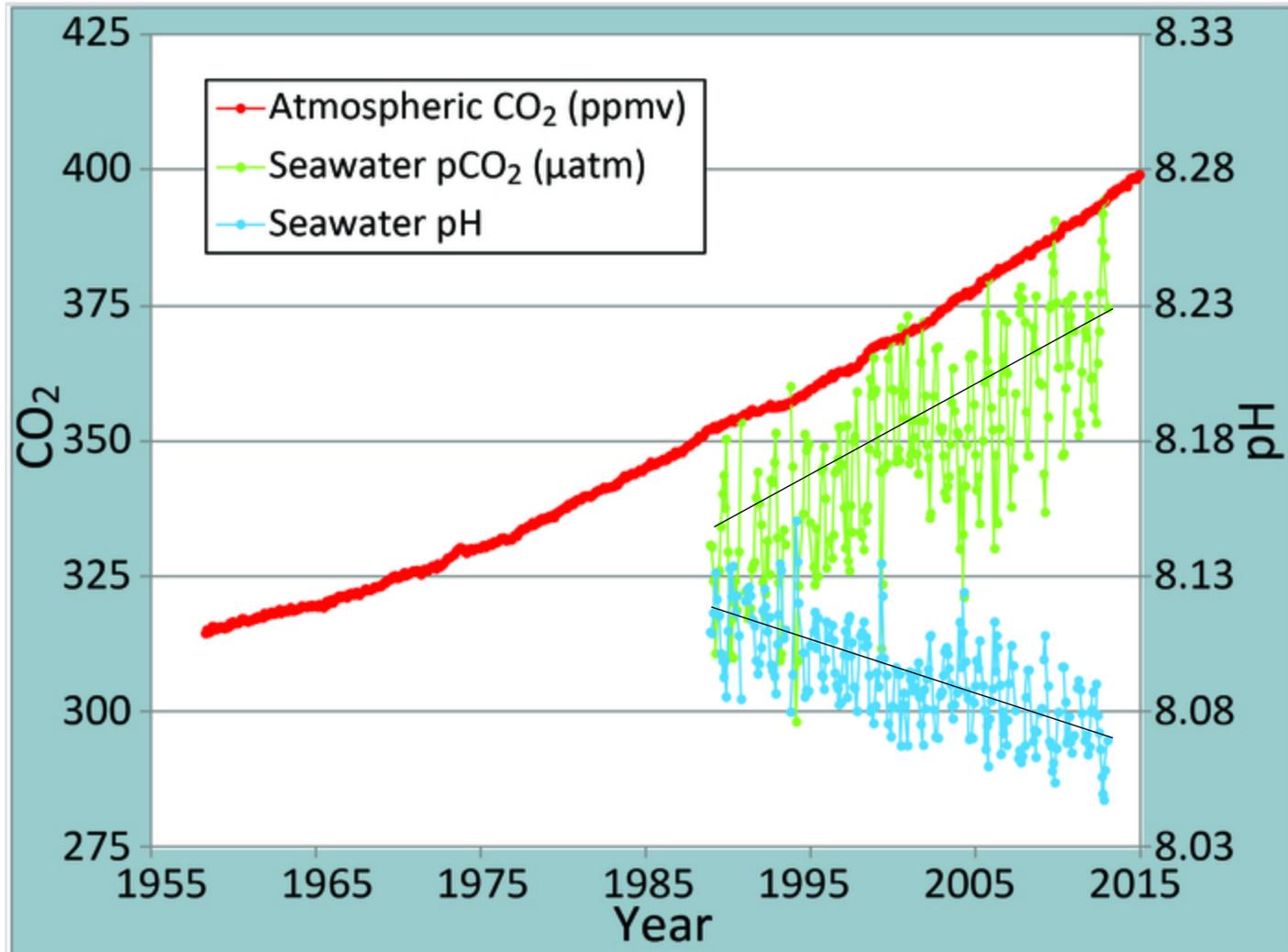
We're Already Seeing Impacts On...

Our food supply

- ❖ Exposure to a variety of pathogens
- ❖ Shellfish: new toxins and pathogens are appearing and toxic bloom season is lengthening
- ❖ Puget Sound is becoming too acidic for oyster shells to form properly; higher acid -> more blooms
- ❖ Water shortages and temperatures could impact agriculture & aquaculture yields and food availability



Ocean Acidification



We're Already Seeing Impacts On...

The places we live

- ❖ Sea-level rise and intensified storms are impacting ocean coastal communities, and tribes in particular.
- ❖ Higher storm surges and erosion have impacted lands of the Quinault Indian Nation (QIN), Quileute Nation, Hoh Indian Tribe, the Makah Tribe, and others.

Sources: Northwest Tribes: [Meeting the Challenge of Climate Change](#), a report from the Northwest Indian Applied Research institute, edited by Debra McNutt; [IndianCountryTodayMediaNetwork.com](#)



Seawall breach pictures from King Tides Project : <http://anecdota.org/projects/view/62>.

QIN Tahola Village Relocation Masterplan: <http://quinaultindiannation.com/planning/masterplan.html>

Our choices matter

- The amount of warming projected to occur depends on today's and future choices about greenhouse gas emissions.
- Preparing for a changing climate requires clear-eyed assessment of risks, consequences, and response options.
- Responding to changes in climate means **we** will have to change.

DOH Response

Cross-Agency Climate Change Workgroup:

- Raise awareness (e.g., Greenbag series)
- Develop indicators
- Build partnerships
- Reduce the agency's carbon footprint

Institutionalizing climate change work:

- Create Climate Change Coordinator position
- Climate Communication Work Group
- Work with partners to apply for grants

Raising Awareness: Climate change education

Accomplishments



Plans for 2016



WTN Climate Change Indicators

- **Health**

- Marine harmful algal blooms (HABs)
- Freshwater HABs
- Vibrio
- Mosquito distribution

- **Vulnerability**

- Impervious surface
- Flooding vulnerability

- **Mitigation**

- Commute time to work
- Total/renewable energy consumption

- **Adaption**

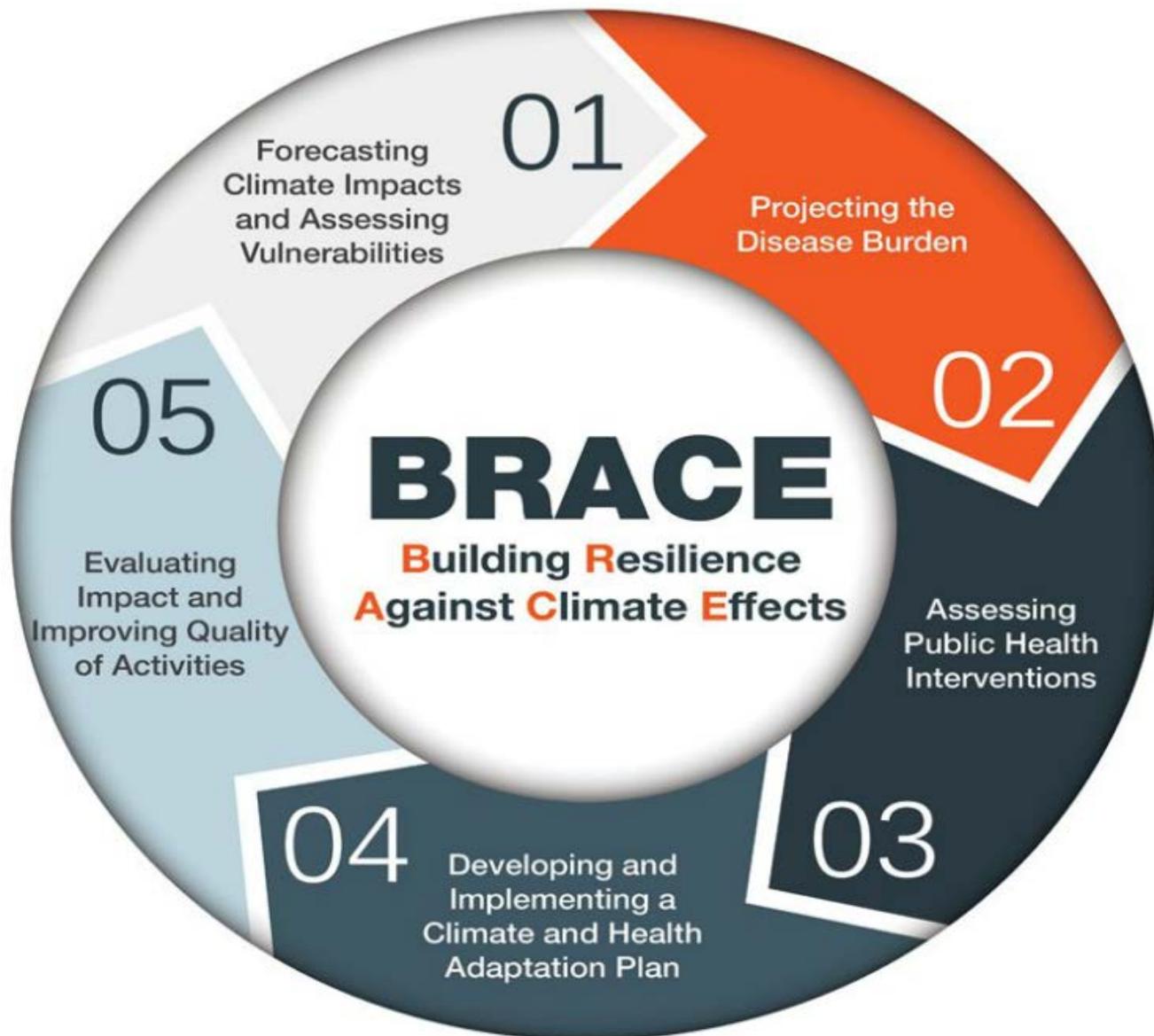
- Access to cooling centers
- Local adaptation plan development

- **Environmental**

- Air mass stagnation events
- Drought
- Extreme heat days
- Heavy precipitation
- Snowpack
- Wildfires

Building Partnerships

- UW School of Public Health
- UW Climate Impacts Group
- OSU School of Public Health
- Oregon Health Authority
- NOAA
- Governor's Office
- State Agencies
- Shellfish Climate Action Plan
- LHJs—EH Directors, Healthy Community Design and Sustainability Committee



Approach to Climate Change Adaptation

- Apply a climate change lens to our work
 - Use projections from [UW Climate Impacts Group](#) and other reports to inform planning
- Apply a health equity lens to climate change vulnerability assessments
 - Who is at risk?
 - Who benefits from investments in infrastructure?

Community Resilience and Opportunities for Health Equity

- Efforts to build community resilience (e.g., urban planning decisions, transportation, water systems, natural resources) may provide an opportunity for public health to:
 - Spot light health equity issues.
 - Identify investments that have co-benefits for health equity
 - Employ the experience of communities working to address health equity issues.

Climate Change Synergies

Heat wave plans including “buddy systems”	↑ social capital
↓ Vehicular travel	↓ car crashes; clean air; ↑ physical activity
↑ Fuel efficiency	↓ air pollution
Locally grown food	Fresh food; ↓ pesticide exposure; local business
Energy-efficient buildings	↓ operating costs
Alternative energy sources	Business opportunities

Discussion

- We are in an exploratory & formative stage. Feedback and recommendations are welcome!
 - What kind of information is useful?
 - What projects and community work should we know about?
 - People we should talk to, and partnerships to cultivate?

Acknowledgements in addition to sources cited:

- Lara Whitely-Binder, UW CIG
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