Fourth National Climate Assessment:
Northwest Chapter

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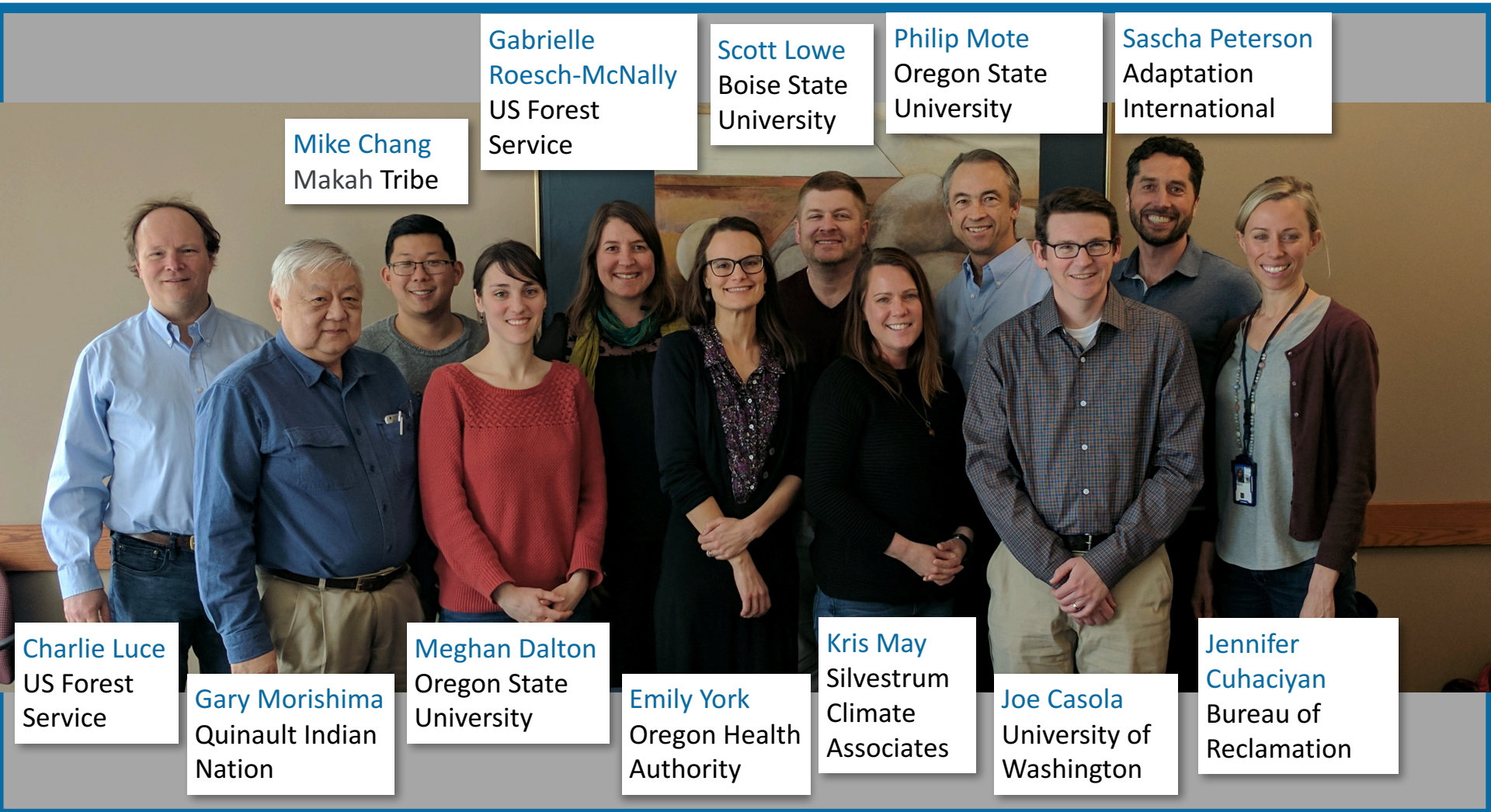
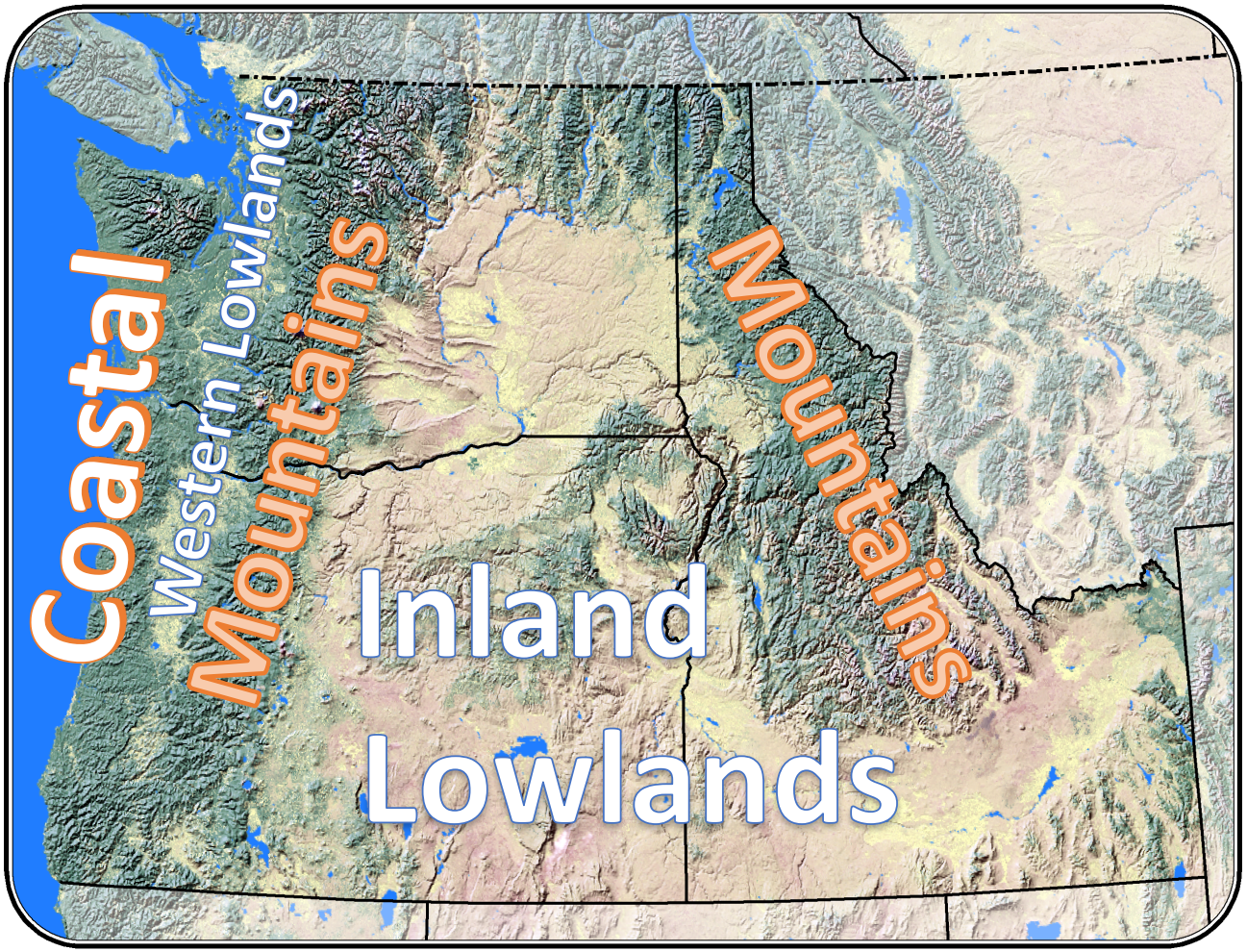
Northwest Author Team



Depth and Breadth of Expertise – *beyond climate change science*

- Social science
- Economics
- Health
- Tribal communities
- Frontline communities
- Climate adaptation
- Agriculture
- Forestry
- Hydrology
- Coasts and beaches
- Marine science
- Ecology

Take 1: Focus on Geography



Regional Stressors and Impacts

Coastal

Erosion
Inundation
Flooding
Sea level rise
Storm surge
Wave hazards
Threats to critical infrastructure
Endangers human life and safety
Ocean acidification
Ocean warming
Natural habitats may not keep pace
Shifts in marine species
Toxic algal blooms

Inland

Higher temps
Heat stress
Plant growth
Forage quality
Fruit quality
Livestock health
Farmworker health
Increased pests
Seasonal changes
Shifts in growing seasons
Changes in Rangeland productivity
Reduced snowpack
Reduced water availability

Mountains

Higher temps
More rain/less snow
Earlier peak flow
Lower summer flows
More insects and disease
Increased wildfire risks
Shifting vegetation types
Loss of biodiversity
Reduced air and water quality
Increased flood potential
Impacts to recreation and tourism

Western Lowlands

High temps
Hydrologic change
More frequent and severe flooding
Health risks
Climate migration
Lower summer flows challenge salmon survival
Higher winter flows affect riparian ecosystems
Increased wildfire risks
Shifts in tree species and habitat diversity

Regional Engagement Workshops

March 21st in Portland, OR

March 23rd in Boise, ID

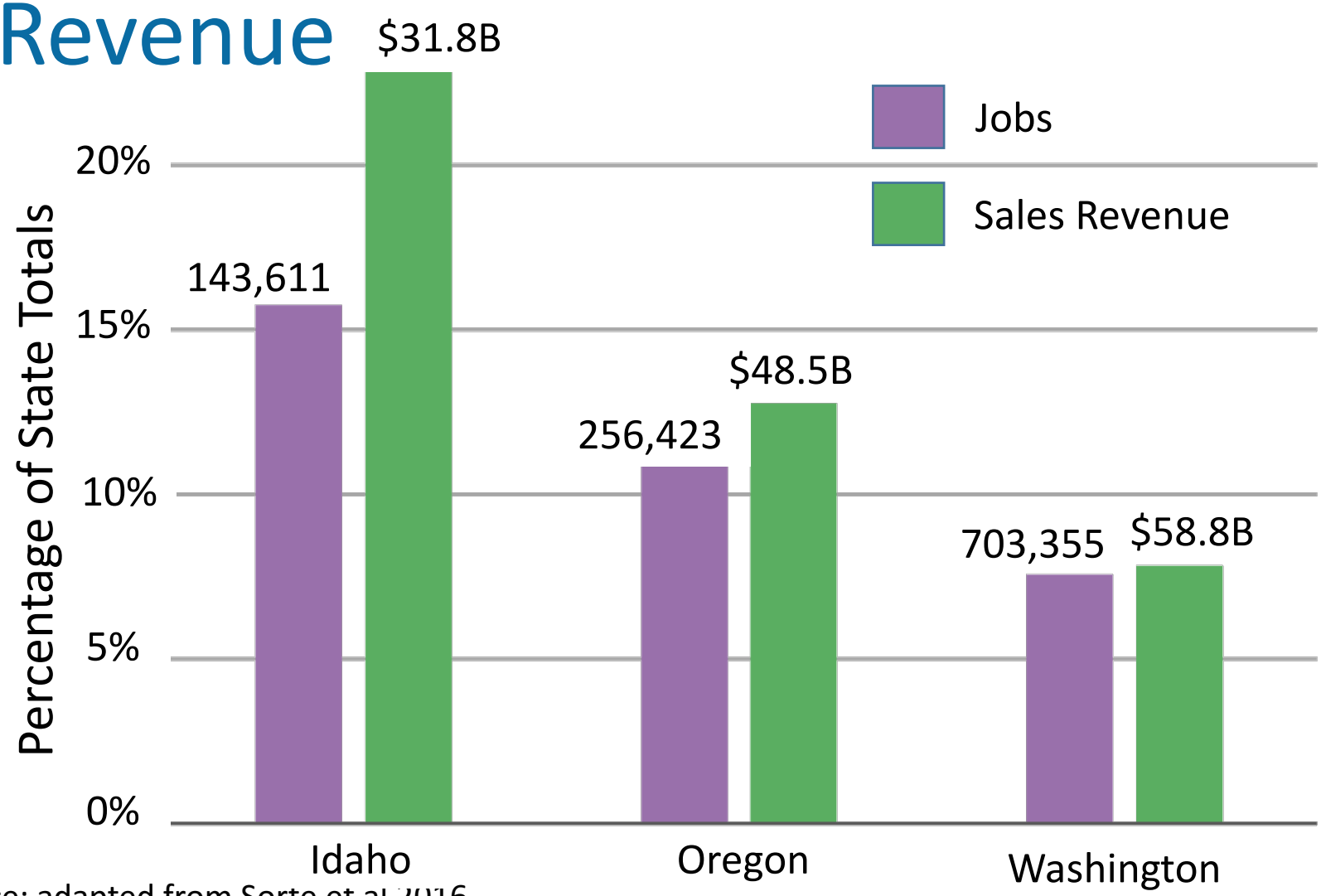
- What we heard changed our approach
- Strong key messages should focus on how climate change will impact what Northwest resident's and communities ***value***
  - Clean water
  - Clean air
  - Jobs
  - Communities
  - Natural environment
  - Outdoor recreation
  - Support systems
  - Cultural heritage / Tribal communities

The things we Value

Key Message 1 (Natural Resource Economy)

- Climate change is already affecting the Northwest's diverse natural resources, which support sustainable livelihoods and provide a robust foundation for Tribal and rural communities.
- Increasing temperatures, changing precipitation patterns, and changes in coastal ocean waters have already reduced agricultural and fishery productivity, while also providing new business opportunities for parts of the natural resource economy.
- Climate change is expected to continue affecting the natural resource sector, valued at over $180 billion per year, but the economic consequences will depend on future market dynamics and adaptation efforts.
- Proactive management can increase the resilience of natural resources and economies.

Natural Resource Jobs & Sales Revenue



Source: adapted from Sorte et al 2016

Current and Future Trends

- Higher temperatures and reduced precipitation is adversely impacting agriculture → Heat stress and reduced water availability is impacting plant, livestock, and worker health
  - 2015 was one of the toughest farming seasons on record
- Higher temperatures and reduced snowpack is adversely impacting forests and forestry → increased wildfire, pest, and disease risks are devastating our forest resources
  - 2015 was one of the biggest wildfire seasons on record
- Higher ocean temperatures and acidity are impacting fisheries → increased toxic algal blooms, changes in species diversity, etc.
  - 2015 had the largest algal bloom on record, “the Blob”, and extensive fisheries closures

Key Message 2: Natural World / Cultural Heritage

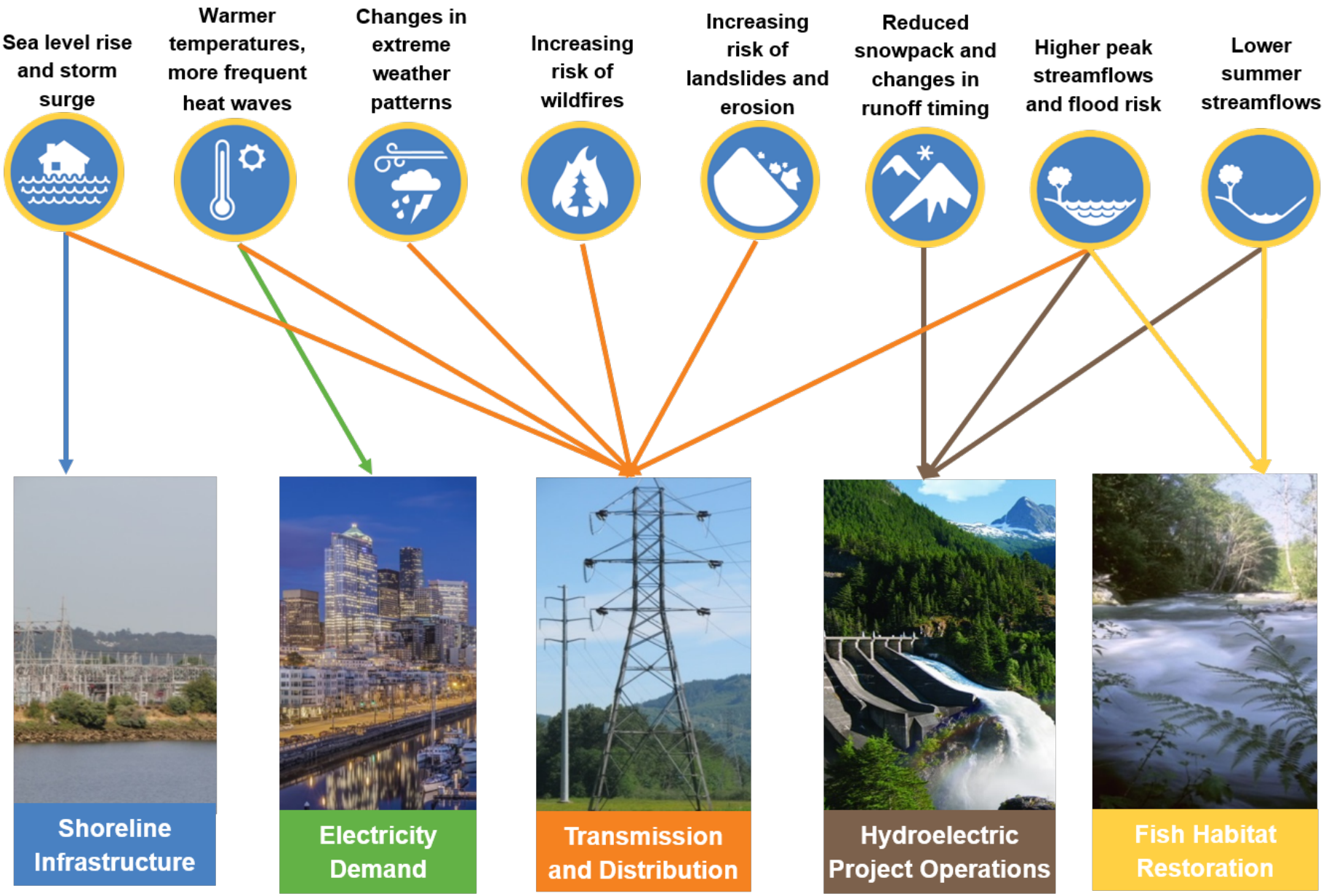
- Valued aspects of Northwest heritage and quality of life—the natural environment, wildlife, outdoor recreation, and Tribal cultures—will change with the climate.
- Increasing temperatures, reduced water availability, changing snow conditions, forest fires, habitat fragmentation, and other changes are endangering the well-being of a wide range of wildlife, and threatening popular recreational activities, Tribal subsistence, and culture.
- For the Tribes, the health and vitality of the salmon runs is a direct indicator of the wider health of the region.

Current and Future Trends

- Nearly 50% of Northwest adults participated in outdoor recreation in 2010
- As temperatures increase
  - Demand for warm-weather recreation may increase
  - Visitation to local, state, and national parks may increase
  - Availability of winter recreation will decrease
  - 2015 saw the shortest skiing season on record
- Tribal access to First Foods (e.g., salmon, berries, roots) is changing
- Wildlife habitat is degrading and changing

Key Message 3: Infrastructure

- Existing water, transportation, and energy infrastructure already face challenges from flooding, landslides, drought, wildfire, and heat waves.
- Future climate change raises the risk for many of these extreme events, potentially compromising the reliability of water supplies, hydropower, and transportation across the region.
- Isolated communities and those with systems that lack redundancy are the most vulnerable.
- Adaptation strategies that address more than one sector, or are coupled with social and environmental co-benefits, can increase resilience.



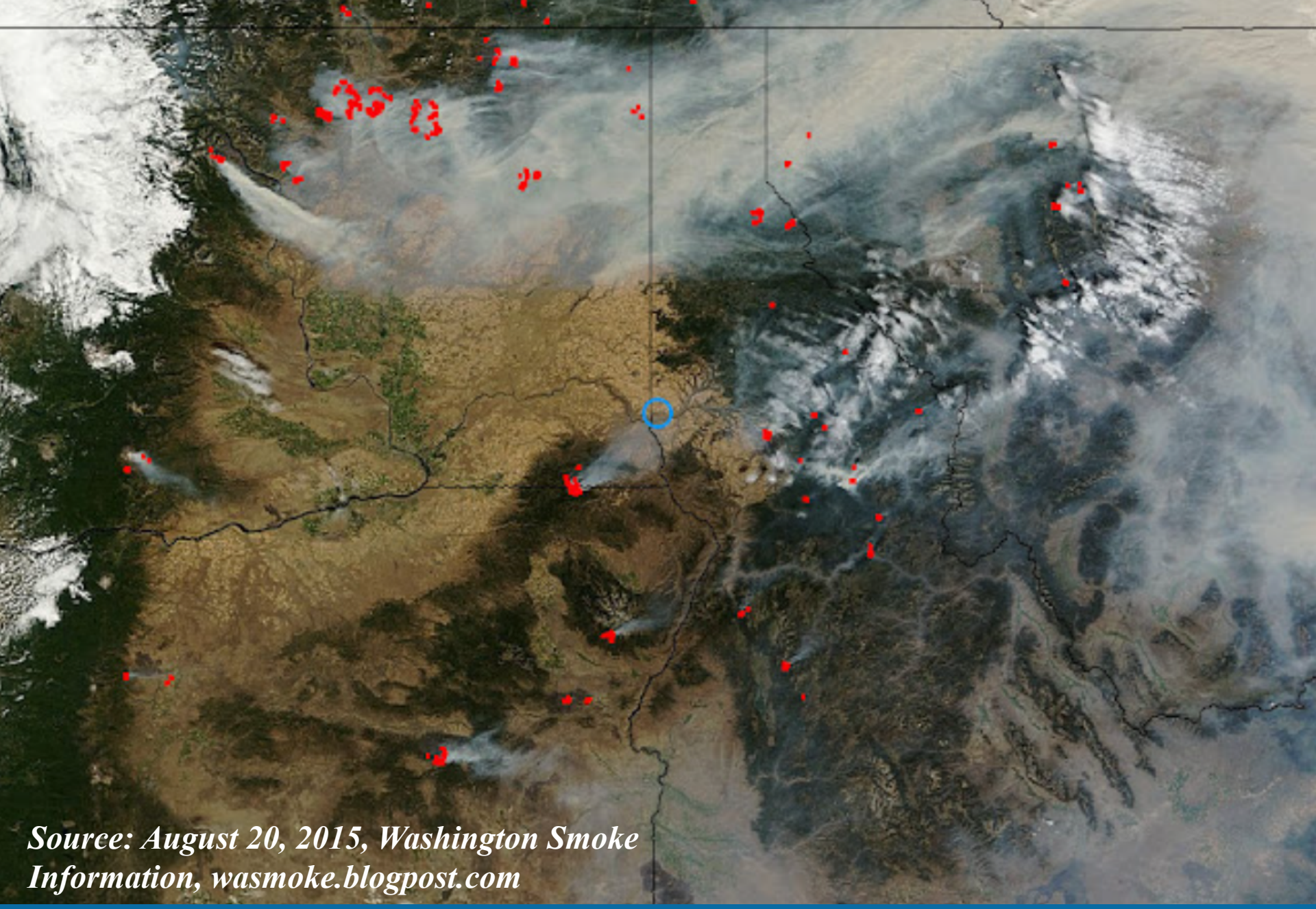
Source: Seattle City Light

Current and Future Trends

- Transportation road and railway closures result from flooding, landslides, mudslides
  - Tillamook, OR; December 2015 – Heavy rainfall and high coastal water levels led to flooding, culvert failures, road closures, and reduced access to health facilities.
  - Snoqualmie Pass, WA; December 2015 – landslide closed eastbound Interstate 90
- Water availability
  - Washington Department of Ecology allocated nearly 7 Million for drought relief in 2015 – backup and emergency water for irrigation and human consumption
- Power disruption
  - Goodell wildfire in August 2015 resulted in 3 Million in damages and lost production at the Skagit Hydroelectric Project

Key Message 4: Health

- The surge capacity of regional social and healthcare systems will fall short if cascading or acute hazards occur, exacerbating existing socioeconomic disparities.
- In addition to an increased likelihood of acute hazards and epidemics, disruptions in local economies and food systems could result in more chronic health risks.
- Organizations and volunteers that make up the Northwest's collective safety net are already stretched thin with current demands and will be further challenged by climate stressors.
- The potential health co-benefits of future climate mitigation investments could help to counterbalance these risks.



Source: August 20, 2015, Washington Smoke Information, wasmoke.blogpost.com

Current and Future Trends

- Warmer and dryer conditions have led to:
  - Increases in respiratory hospital admissions among adults over 65
  - Increases in heat-related hospital admissions and deaths
  - Increases in Lyme Disease cases
  - Earlier onset of West Nile Virus-carrying mosquitos
- Notable incidents in 2015 include:
  - Spikes in cases of Salmonella and E-coli during months with extreme heat
  - Shigellosis outbreak in late 2015 associated with heavy rainfall. This affecting a large number of homeless people in the Portland-Metro region.

Key Message 5: Frontline Communities

- Communities on the front lines of climate change experience the first, and often the worst, effects.
- Frontline communities in the Northwest include Tribal and Indigenous peoples, the economically disadvantaged, and those most dependent on natural resources for their livelihoods.
- These communities generally prioritize basic needs, such as shelter, food, and transportation; frequently lack economic and political capital; and have fewer resources to prepare for and cope with climate disruptions.
- However, the social and cultural cohesion inherent in many of these communities provides a foundation for building community capacity and increasing resilience.

Frontline Communities

- Experience climate impacts first and the worst
  - Higher exposure, More sensitive, Less able to adapt
- Climate change is a risk multiplier that increases current risks
- Tribes
  - Reduced access to natural resources and First Foods
  - Relocation
  - Broad physical, cultural, and spiritual impacts, including diabetes, heart disease, mental health impacts, and loss of cultural identity

Credit: Northwest Treaty Tribes, 2012

Frontline Communities

- Farmworkers
  - High exposure to heat-related illness
  - Face very low wages, discrimination, and workplace hazards
  - Chronic and acute health impacts
  - Do not seek health care because of high costs, language barriers, and fear of deportation

Credit: NPR

- Urban Poor and Homeless
  - Greatest exposure to climate and extreme events
  - Proximity to urban heat islands, worsening air quality, pollution and other factors can lead to injury, illness, and death

Social Cohesion Matters

- Community-based organizations are working to engage and empower Frontline communities to build community and climate resilience.
  - Got Green
  - Our People, Our Planet, Our Power
  - Tyee Khunamokwst: Leading Together

Credit: gotgreenseattle.org

2015 Case Study: A Prelude of What's to Come?

- The warmest year on record (back to 1880)
  - 3.8° F warmer on average for the year
  - 6.5° F warmer in winter
  - Consistent with a mid-century projection under RCP8.5, or late-century projection under RCP4.5
- Below normal precipitation – extreme drought
  - Winter 13% below normal
  - Summer 38.5% below normal
  - Summer deficit consistent with the largest decreases in summer precipitation for end of century under RCP8.5

Thank you!

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