

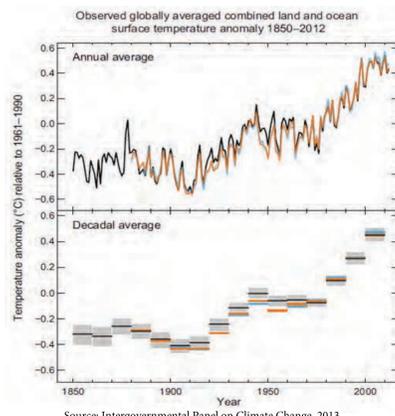


Climate Change in the Pacific Northwest

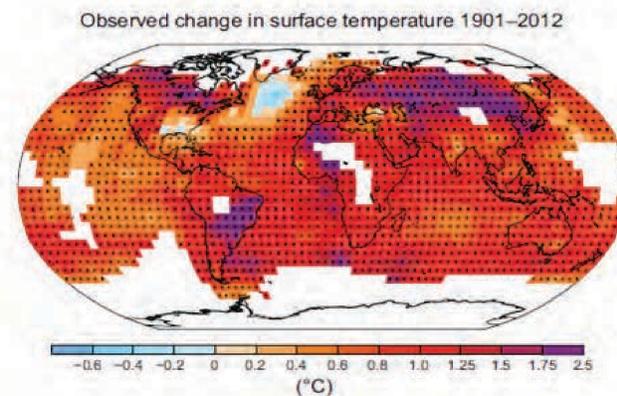
Global Climate Change:

- ▶ The Earth is warming
 - Global annual average temperature has increased 1.5°F since 1880 (through 2012)
 - 2001-2015, every year was warmer than 1990s average
- ▶ Warming is not spread evenly throughout planet
- ▶ Human-induced climate change is projected to continue and accelerate as global emissions increase

Source: US National Climate Assessment, 2014



Source: Intergovernmental Panel on Climate Change, 2013



Global Emissions Scenarios:

Carbon emissions drive climate change. The more fossil fuels burned, the higher the emissions and global temperatures.

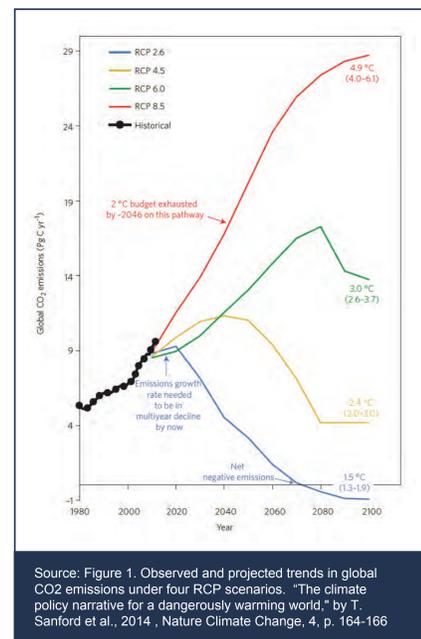
Representative Concentration Pathways (RCP) developed by Intergovernmental Panel on Climate Change (IPCC):

RCP8.5* - Currently surpassing this rate "Business as usual", rising

RCP6.0 - Peak at ~2080, stabilization after 2100

RCP4.5* - Peak at ~2050, stabilization after 2100

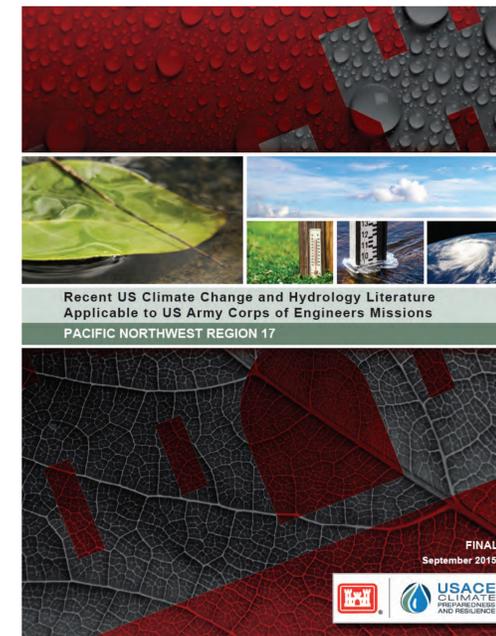
RCP2.6 - Presently no technology to make feasible near-term peak, decline to net negative emissions



Source: Figure 1. Observed and projected trends in global CO₂ emissions under four RCP scenarios. "The climate policy narrative for a dangerously warming world," by T. Sanford et al., 2014, Nature Climate Change, 4, p. 164-166

*scenarios used for latest PNW climate change scenarios update

What does Climate Change mean here in the PNW?



| PRIMARY VARIABLE | OBSERVED | | PROJECTED | |
|------------------------|----------|--------------------------|-----------|--------------------------|
| | Trend | Literature Consensus (n) | Trend | Literature Consensus (n) |
| Temperature | ↑ | (6) | ↑ | (3) |
| Temperature MINIMUMS | ↑ | (1) | ↑ | (1) |
| Temperature MAXIMUMS | ↑ | (1) | ↑ | (3) |
| Precipitation | ↑ | (6) | ↕ | (5) |
| Precipitation EXTREMES | ↕ | (3) | ↑ | (3) |
| Hydrology/ Streamflow | ↓ | (5) | ↕ | (5) |

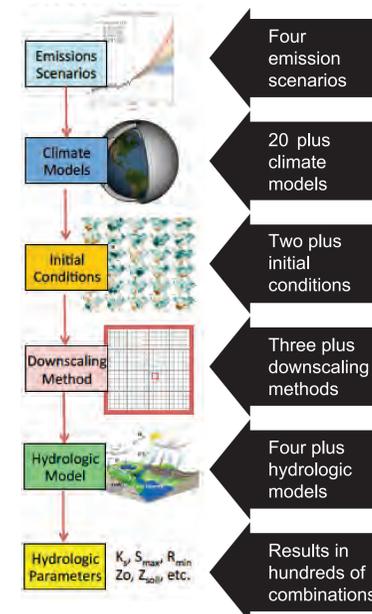
NOTE: Trend variability was observed (both magnitude and direction) in the literature review for Observed Precipitation Extremes. Trend variability (both magnitude and direction) was observed in the literature review for Projected Precipitation and Projected Hydrology.

TREND SCALE
 ↑ = Large Increase ↗ = Small Increase — = No Change ↘ = Variable
 ↓ = Large Decrease ↙ = Small Decrease ○ = No Literature

LITERATURE CONSENSUS SCALE
 ☐ = All literature report similar trend ☐ = Low consensus
 ☐ = Majority report similar trends ☐ = No peer-reviewed literature available for review
 (n) = number of relevant literature studies reviewed

Modeling Climate Change in the PNW:

Steps of Modeling Process



- ▶ Federal agencies have been monitoring, studying climate change for over a decade
- ▶ Converting data from the global to the local level requires many steps
- ▶ Each step has multiple methods
- ▶ There is no correct combination
- ▶ BPA, Reclamation and the Corps are working with University of Washington/Oregon State University on creating new datasets for the PNW
- ▶ In 2017 there will be 172 new climate change streamflow datasets
- ▶ Reservoir operation modeling is being completed to look at potential effects of climate change in the region

