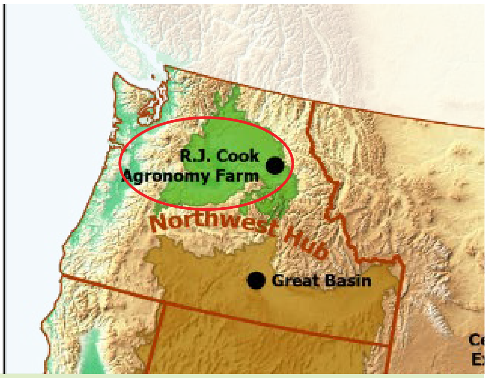
R. J. COOK AGRONOMY FARM (CAF)



LTAR Network and USDA Climate Hubs are working to develop knowledge and technology for sound resource management **via research with partners**. The goal is to ensure **sustained crop and livestock production and ecosystem services** from agroecosystems, and to forecast and verify the effects of environmental changes, public policies, and emerging technologies.

Location and Climate

The R. J. Cook Agronomy Farm (CAF) is located in the inland Pacific Northwest (iPNW) within the Northwest Climate Hub. The CAF site has a Mediterranean climate with warm, dry summers and cool, wetter falls and winters. The surrounding region mimics variations of this climate, primarily with respect to annual precipitation..

Historic Temperature

Historic long-term average annual temperature in Pullman, WA / CAF from 1920-2010 is 47.3°F. Mean maximum temperature is highest in July (82°F) and August (81°F) and mean minimum temperature is lowest in January (23°F).

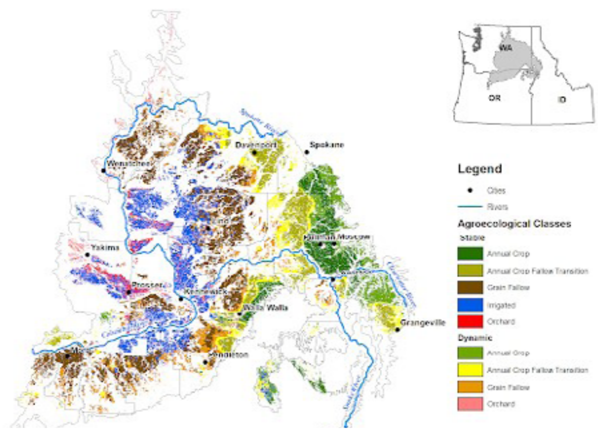
Historic Precipitation

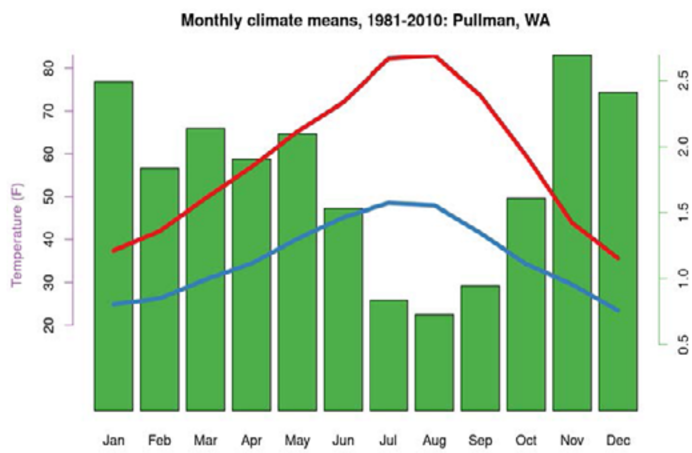
Average annual precipitation for Pullman, WA / CAF is 20-25 inches with the majority of the precipitation falling between October to April. Annual precipitation across the region is dominated by the rain shadow of the Cascade Mountains.

Growing Season

The regional growing season is typically between April through August. Fall crops are seeded in late September to October and spring crops are seeded in March to May with harvest activities occurring through August into early September

Agroecological classes (AEC) for the region show the range of cropping systems practiced. The CAF site (red dot) is located within the annual crop class with satellite sites in the annual crop fallow transition and annual fallow zones. The AECs are dependent on the climate of the region, mainly with respect to precipitation and water availability. (Kaur et al., 2017)





Average maximum and minimum temperature and mean precipitation 1981-2010 (credit: Climate Toolbox, data source: gridMET.

Measuring Weather and Climate

The AEC region has wet winters and springs with drier summers into the early fall. There is a significant rainfall gradient that spans from the eastern range of the Cascades in Washington to the Western range of the Rockies in Idaho. Precipitation increases approximately 1 inch for every 10 miles from the Cascades in the west to the Rockies in the east and is a major determinant of cropping systems and tillage regimes used by farmers.

Impacts to Agriculture

The region has a mix of spring and winter cereals (wheat and barley), pulse crops (peas, lentils and garbanzo beans) and canola with management practices driven by water availability (precipitation) across the region. This variability generates a range of management practices from annual cropping to integration of annual fallow that stabilizes crop yields. Winter precipitation combined with steep slopes, silt loam soils and low surface residues creates an extreme erosion hazard.

For more information visit https://ltar.ars.usda.gov/sites/caf/ or cafltar.org

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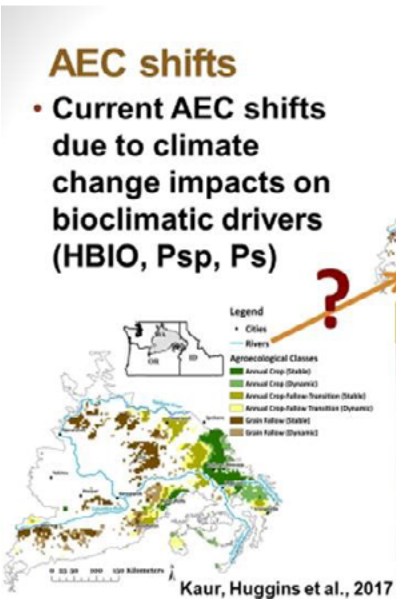
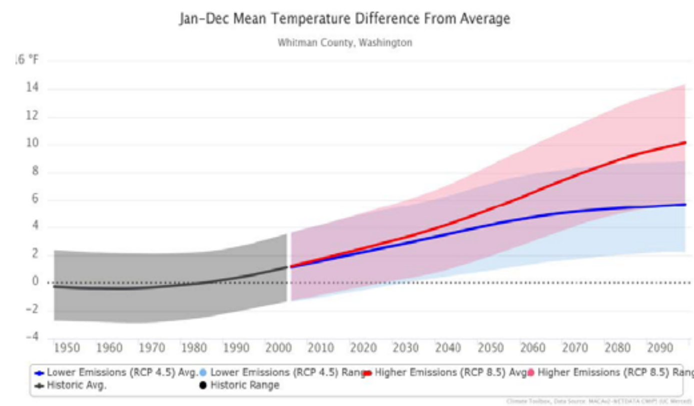
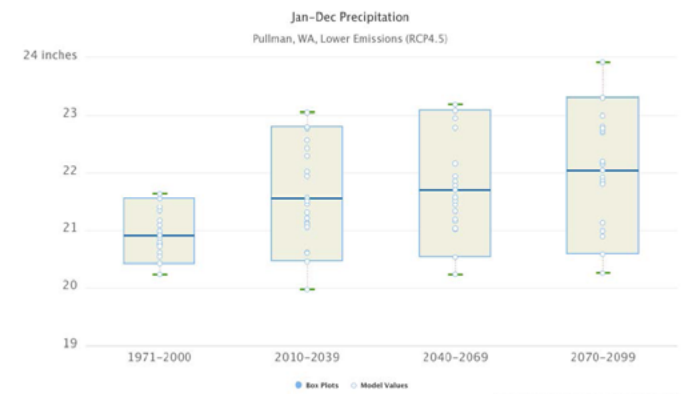
Climate and Climate Change

Overall, temperature is projected to increase across the iPNW over the next 100 years with a slight increase in annual precipitation. Shifts in AECs are projected due to climate change leading to more dynamic AECs, increased use of annual fallow, less cropping intensity, greater erosion hazard and declining soil organic matter.



From Current to RCP 8.5, 2070	
AECs	Δ,%
Annual Crop –S	-8
Annual Crop –D	-46
Annual Crop Transition –S	-46
Annual Crop Transition –D	+58
Grain Fallow –S	-13
Grain Fallow –D	+63





Mean annual precipitation projections at Pullman, WA broken into 30-year increments (credit: Climate Toolbox)

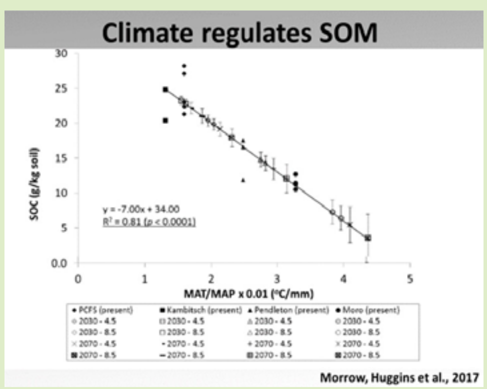
To manage land sustainably, consider weather and climate.

Agroecological Classes (AECs)

- The rainfall gradient has given rise to multiple cropping systems within a small region with three major agroecological classes of annual-fallow, transition, and annual cropping. As climate changes, the agroecological classes and major cropping systems will shift (Kaur et al., 2017).
- Research to address resilience and sustainability in the face of increasing uncertainty includes flex cropping, intercropping, livestock integration, crop diversification and precision agriculture

Soil Organic Matter

- Climate is a major driver of soil organic matter and increasing annual temperature is projected to decrease SOM (Morrow et al., 2017).



Greenhouse Gas Exchange

- Greenhouse gases (CO2 and N2O) have been monitored over the CAF since 2011 (Chi et al, 2017, Russell et al., 2019).
- Estimates of the amount of N lost as N2O has put it between 2-5% of N inputs (Waldo et al., 2019) with ongoing work to further understand the N-pathways under cover crops.

- Nitrogen Use efficiency has been increased through precision agricultural practices.

Hydrology/Tillage vs. No-Tillage

- No-tillage (NT) has curbed soil erosion and significantly reduced overland flow, compared to reduced tillage (RT); however, NT has increased subsurface drainage loss of water and nutrients (Ortega-Pieck, 2020).

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