

# Impacts of Water Availability on Washington Agriculture in a Changing Climate

Fall 2005 Climate Change Conference  
Seattle, Washington  
October 27, 2005

# Water for agriculture in Washington-outline

- ▶ Impact of climate change depends on “what” you grow, “where” you grow it, “how” you grow it
- ▶ Dry-land agriculture in both Eastern Washington and Western Washington
- ▶ Irrigated agriculture in Central Washington -
  - Water from snowpack
  - Water priorities
  - Summer electricity prices
- ▶ Interpretation of crop model results

# Agricultural impacts in national analyses

Thomson, et al. (*Climatic Change* 2005) national analysis of dry-land yields:

Winter wheat yields (Yakima) —

+3 to +7% with 1°C warming and no CO<sub>2</sub> fertilization

+30 to +35% increase with 2°C and 560 ppm CO<sub>2</sub>

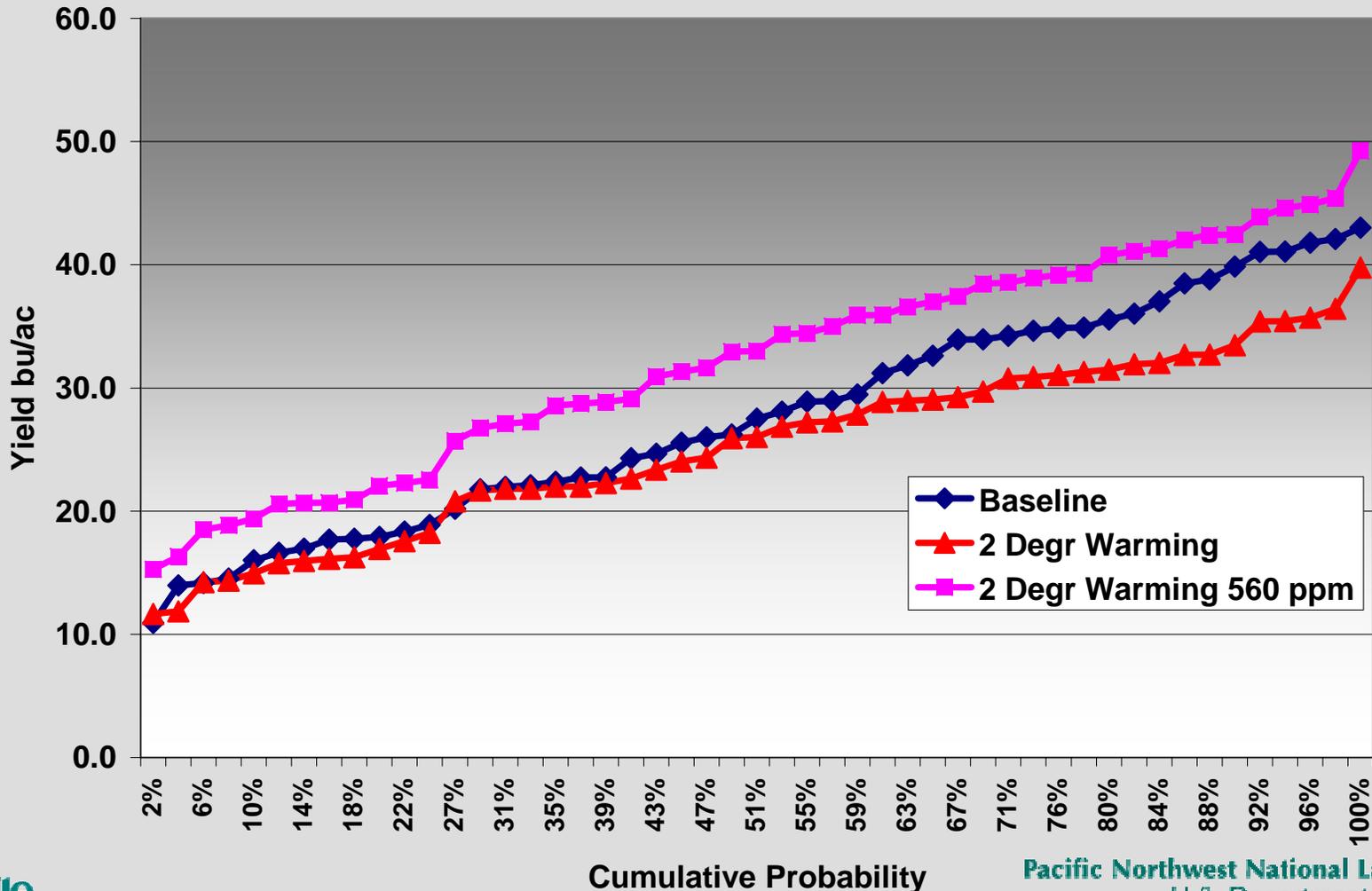
Alfalfa yields (Upper Columbia) —

+0 to +5% with 1°C warming and no CO<sub>2</sub> fertilization

+28 to +45% increase with 2°C and 560 ppm CO<sub>2</sub> (but depends on CO<sub>2</sub>)

# CropSYST dry-land wheat yields, 2°C warming (cumulative probability of yields)

Dryland Wheat (Horse Heaven Hills)

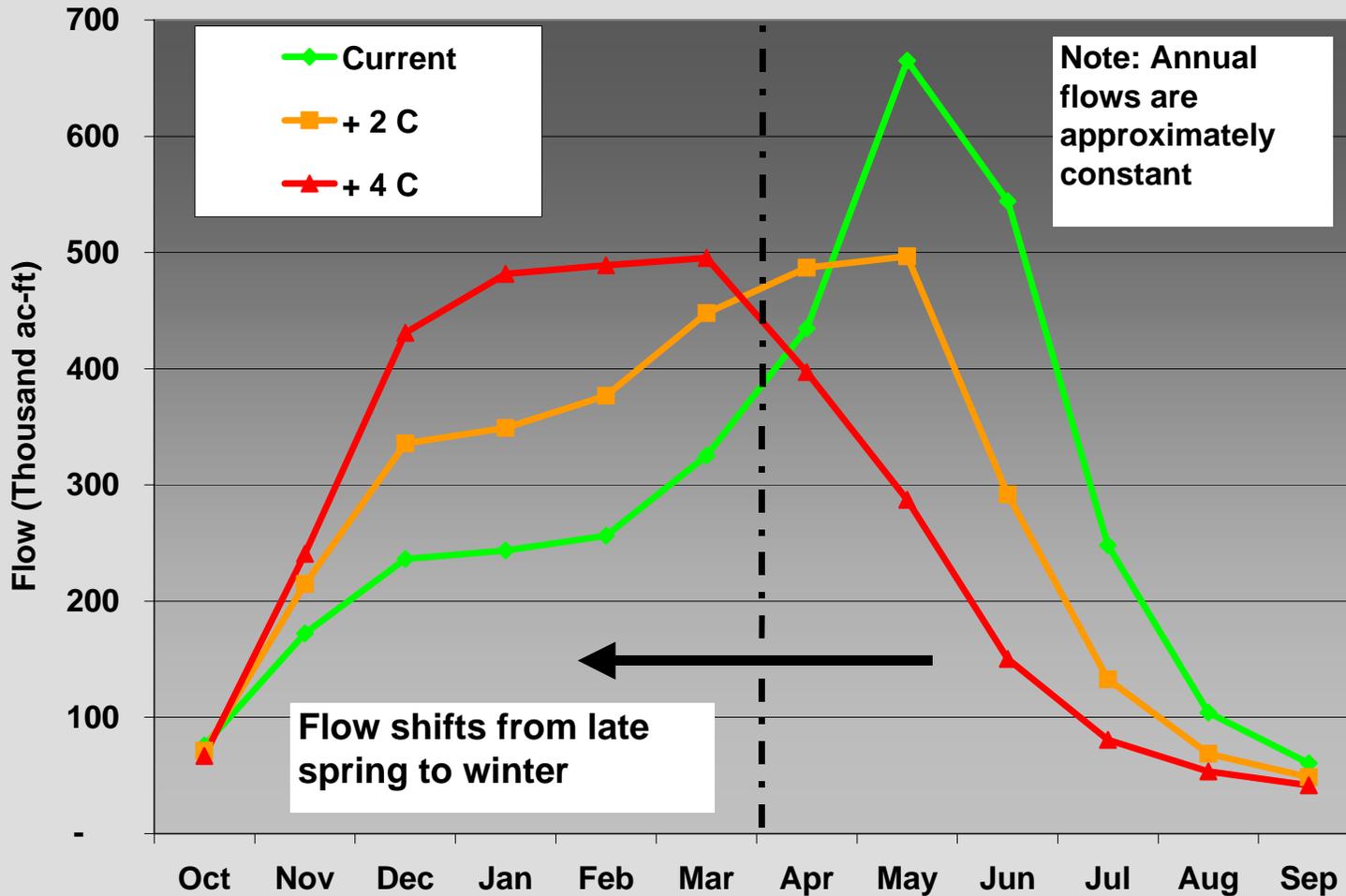


# High temperatures and low water: three observations and two questions

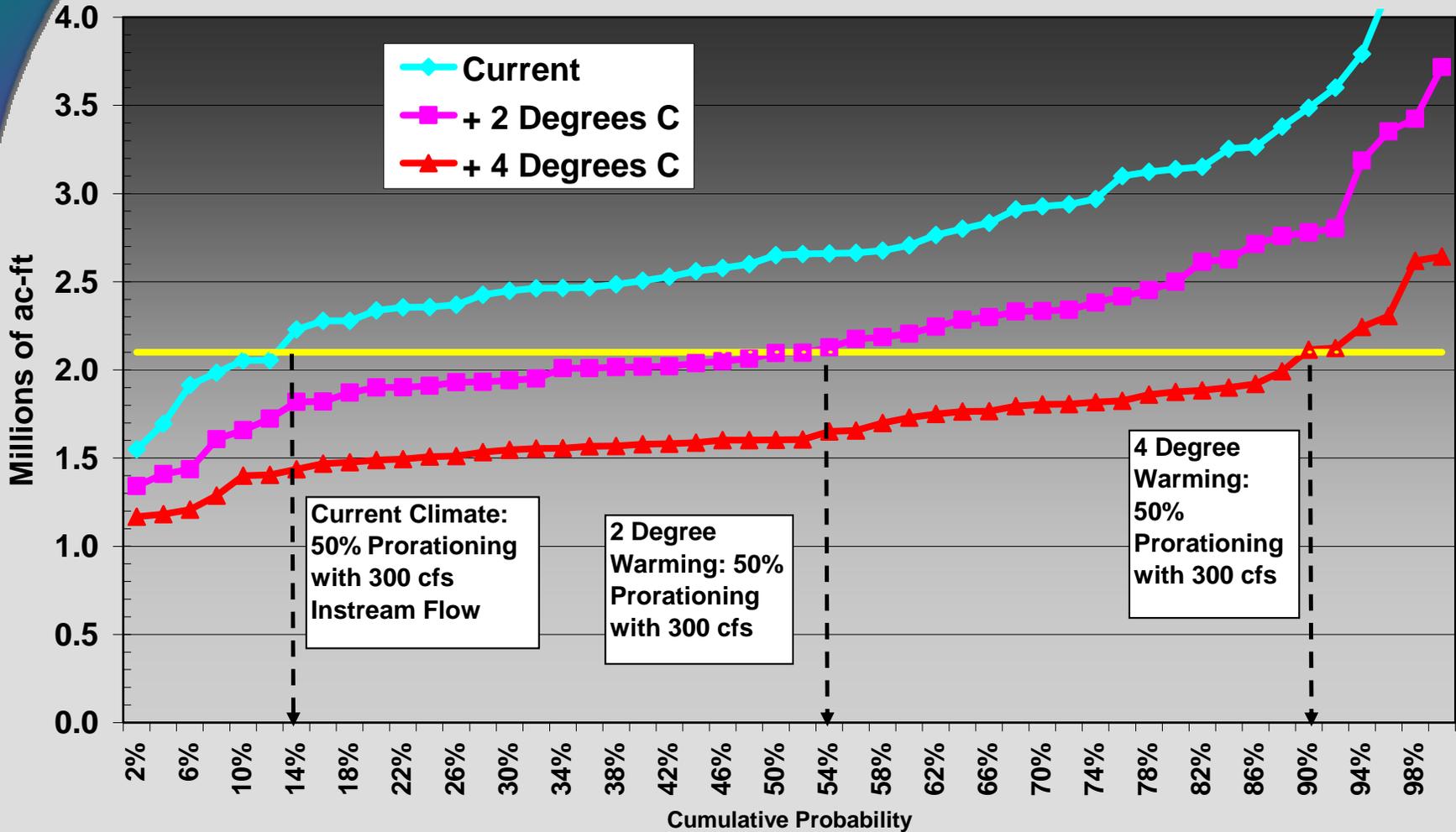
- ▶ In 2000: summer PNW peak loads 3,400 MW higher than 1999, California 1,400 MW higher (<http://www.nwcouncil.org/library/2000/2000-18.pdf> )
- ▶ Hydropower generation was down 6000 MW in late June 2000
- ▶ Models show summer hydropower production down by 2000 MW to 4000 MW in 2020; 2500 MW to 7000 MW in 2040 (Casola et al. 2005, this conference)
  - What will the effects of warmer temperatures be on salmon survival and instream water policy?
  - What will be the effects on power prices, water priority?

# Warming moves unregulated flow to winter (Yakima River)

Mean Monthly Flow at Parker, Water Years 1950-1999

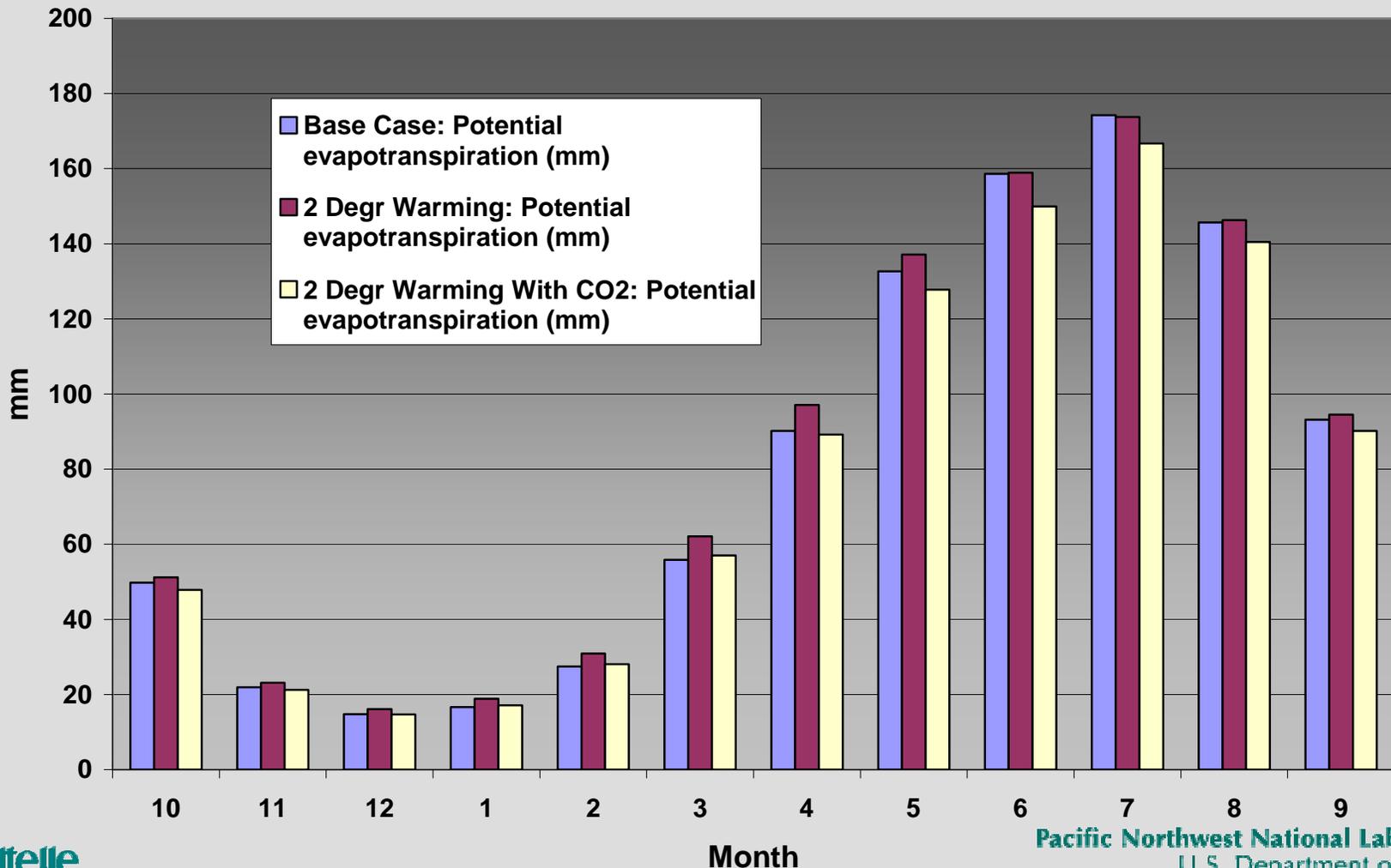


# Effect of climate warming on irrigation—less water available



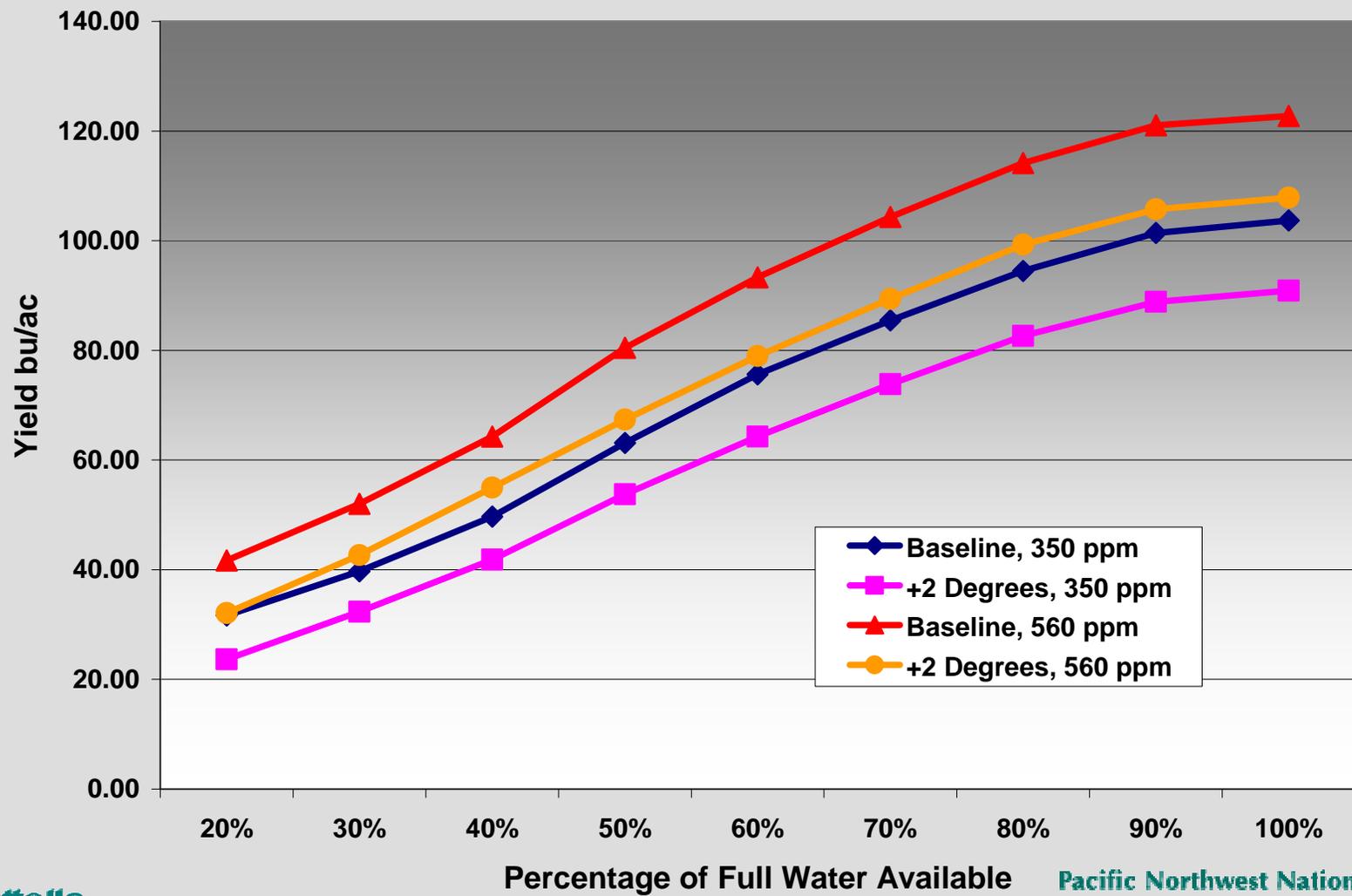
# Average water *demand* changes relatively little with modest warming

Irrigated Winter Wheat Potential Evapotranspiration (mm)



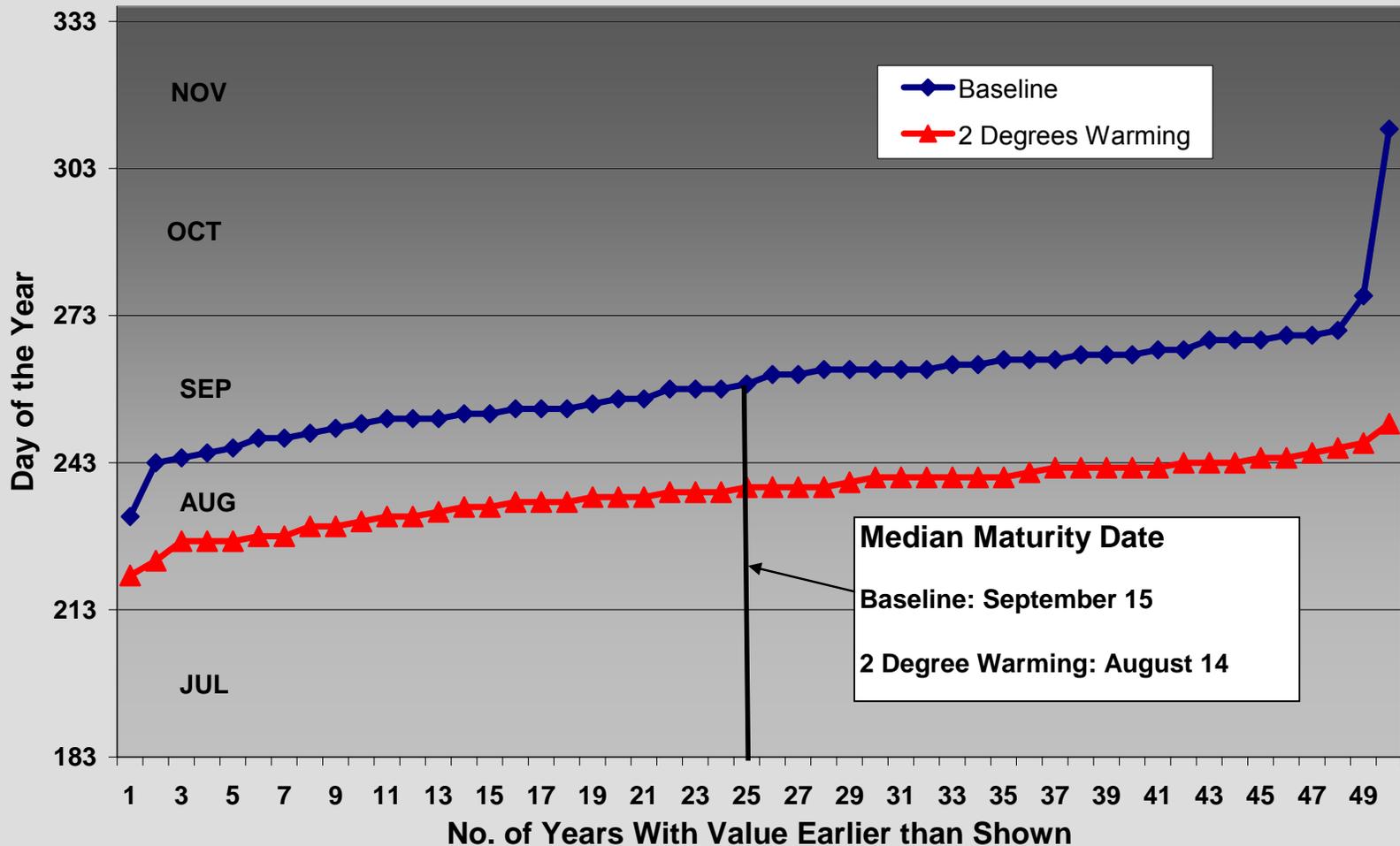
# Water available and wheat yields: global warming (CropSYST)

## Irrigated Wheat Yields



# Impact of warming on crop maturity

## Maturity Date for Trellis Apples



# Summary: Water for agriculture in Washington

- ▶ Dry-land agriculture in both Eastern Washington and Western Washington may benefit from warmer and wetter winters
- ▶ Irrigated agriculture in Central Washington may suffer — even if precipitation is unaffected
  - Lack of water from snowpack
  - Water priorities may change
  - Summer electricity prices may be affected
- ▶ Crop models show some hard-to-interpret results