



Impacts of Climate Change on Municipal Water Supplies in Washington

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Presentation Outline

- Why forecast climate change impacts?
- What has already happened?
- How are predictions made?
- What do the predictions suggest?
- What can we do?

Why Forecast Climate Change Impacts?

The future ain't what it used to be.

**There is competition for water and
this will increase over time**



**To prepare and manage, we must
know what to anticipate**



What has already happened?

Since the 1950's we have seen

Warmer weather

and

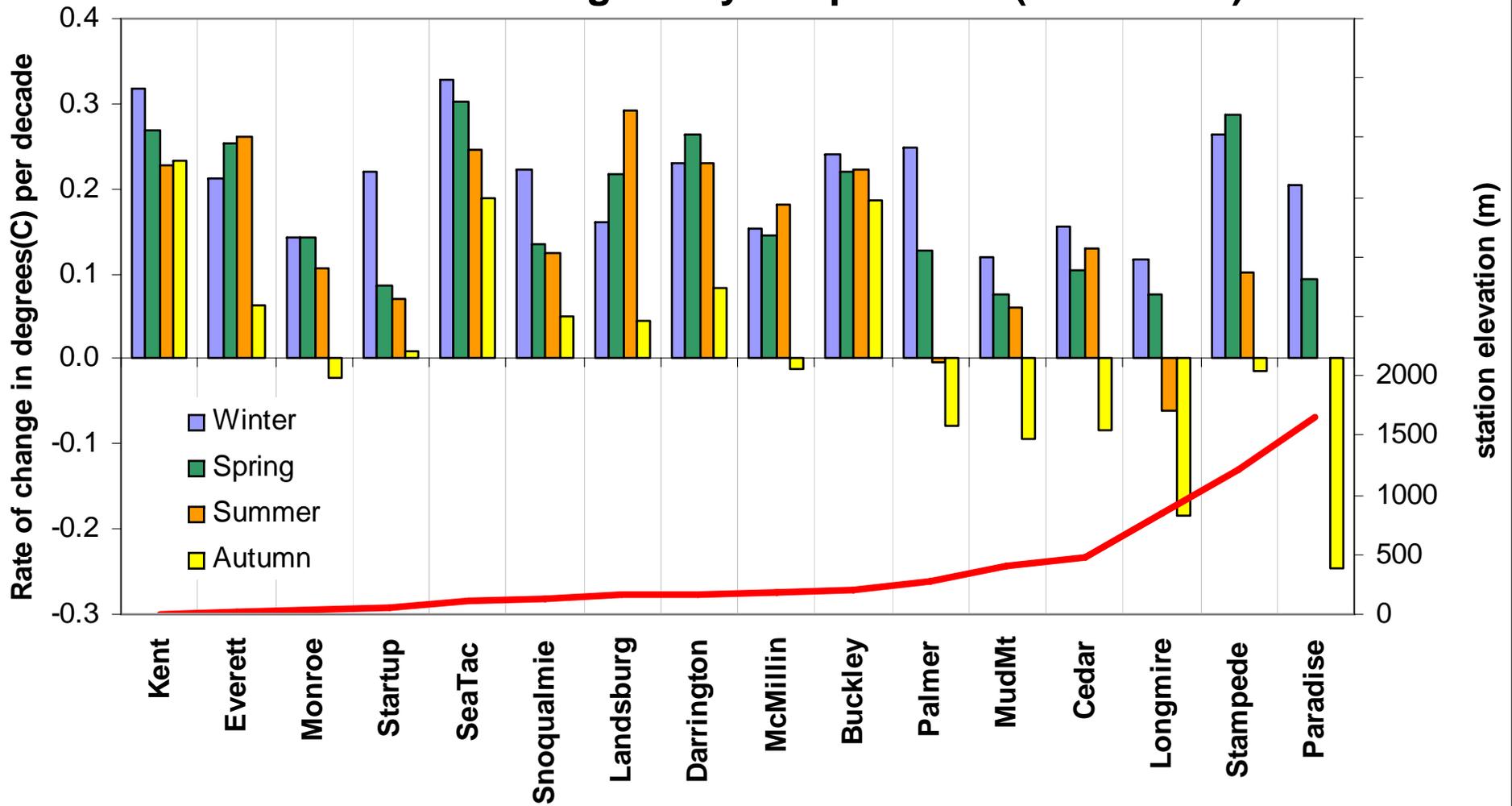
Variable precipitation

Spring Snowpack

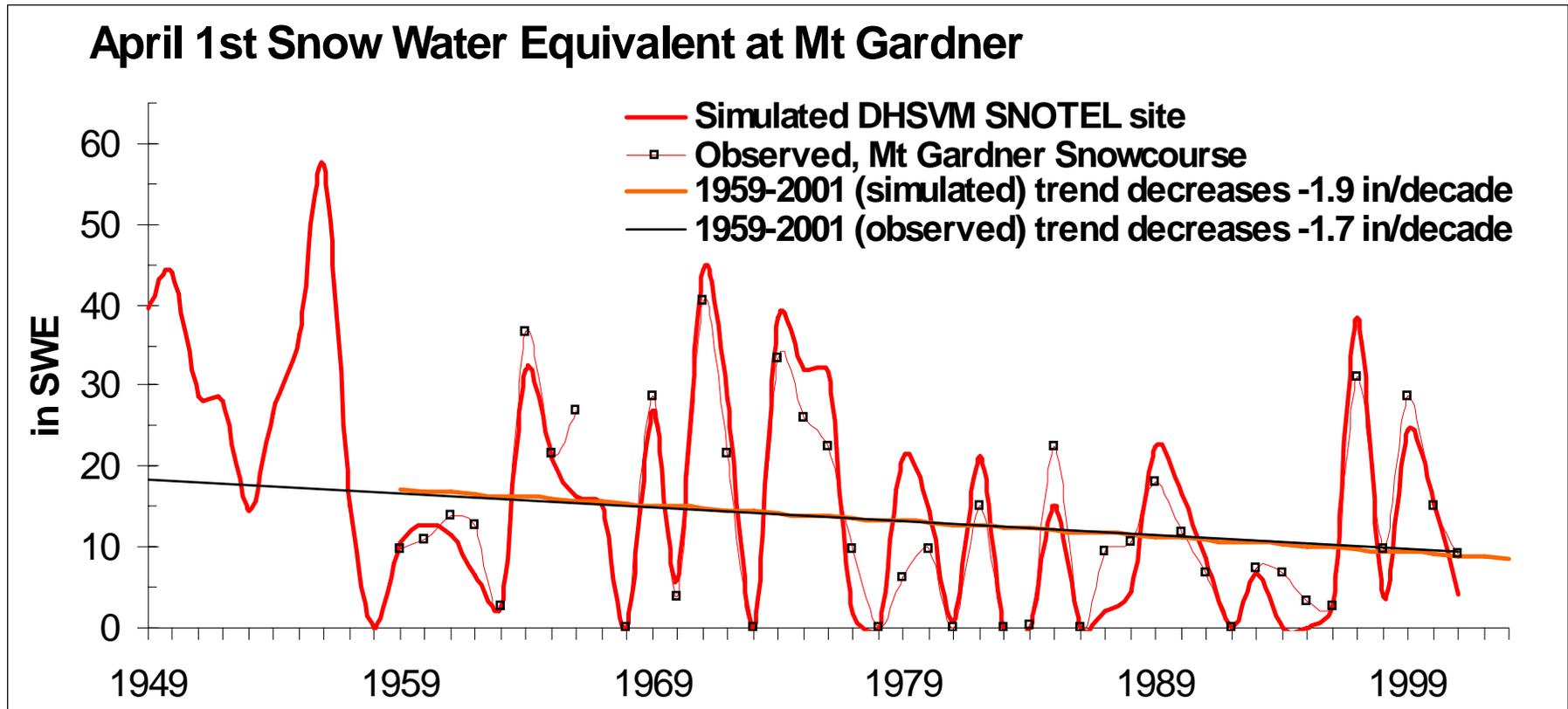
Is DOWN significantly



Trends in average daily temperature (1949-2002)



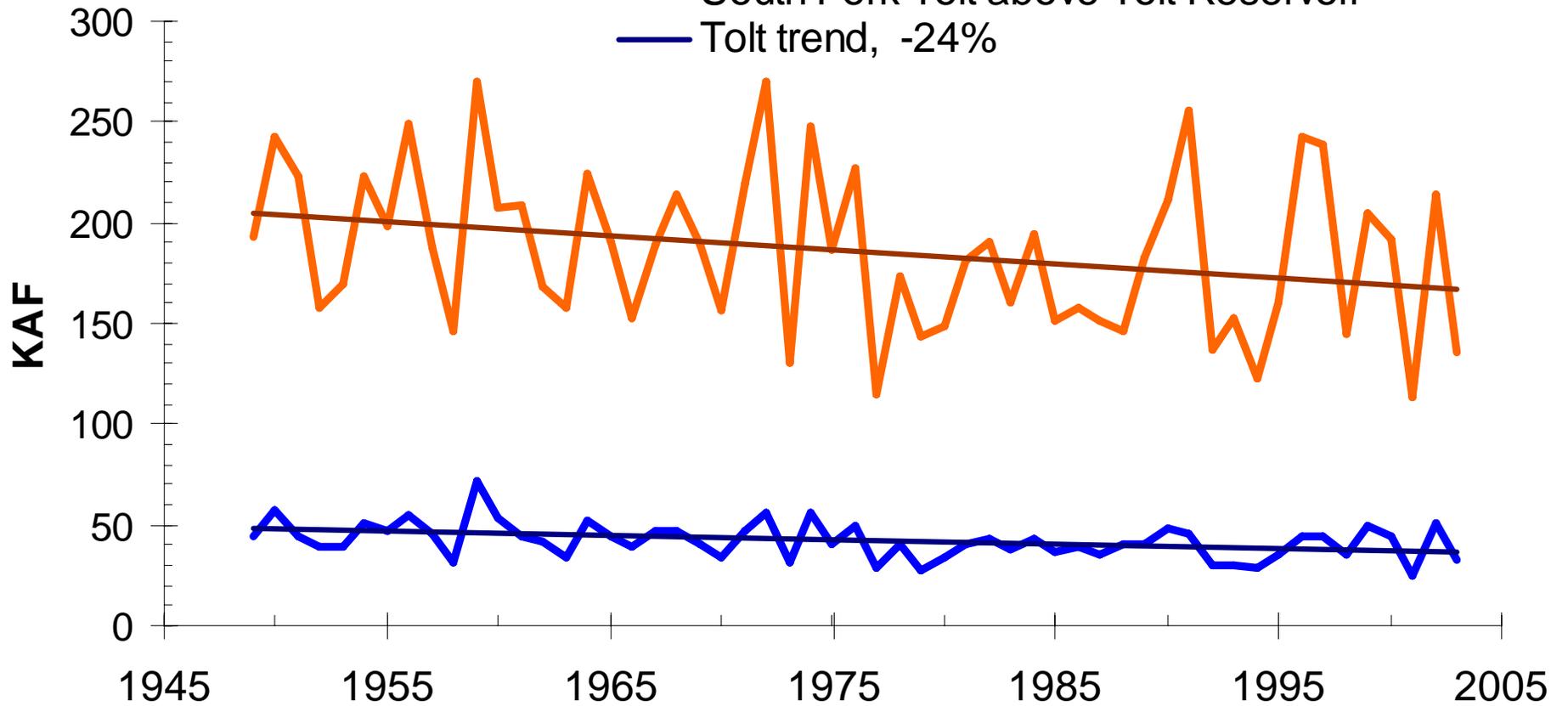
April 1 SWE at Mt. Gardner



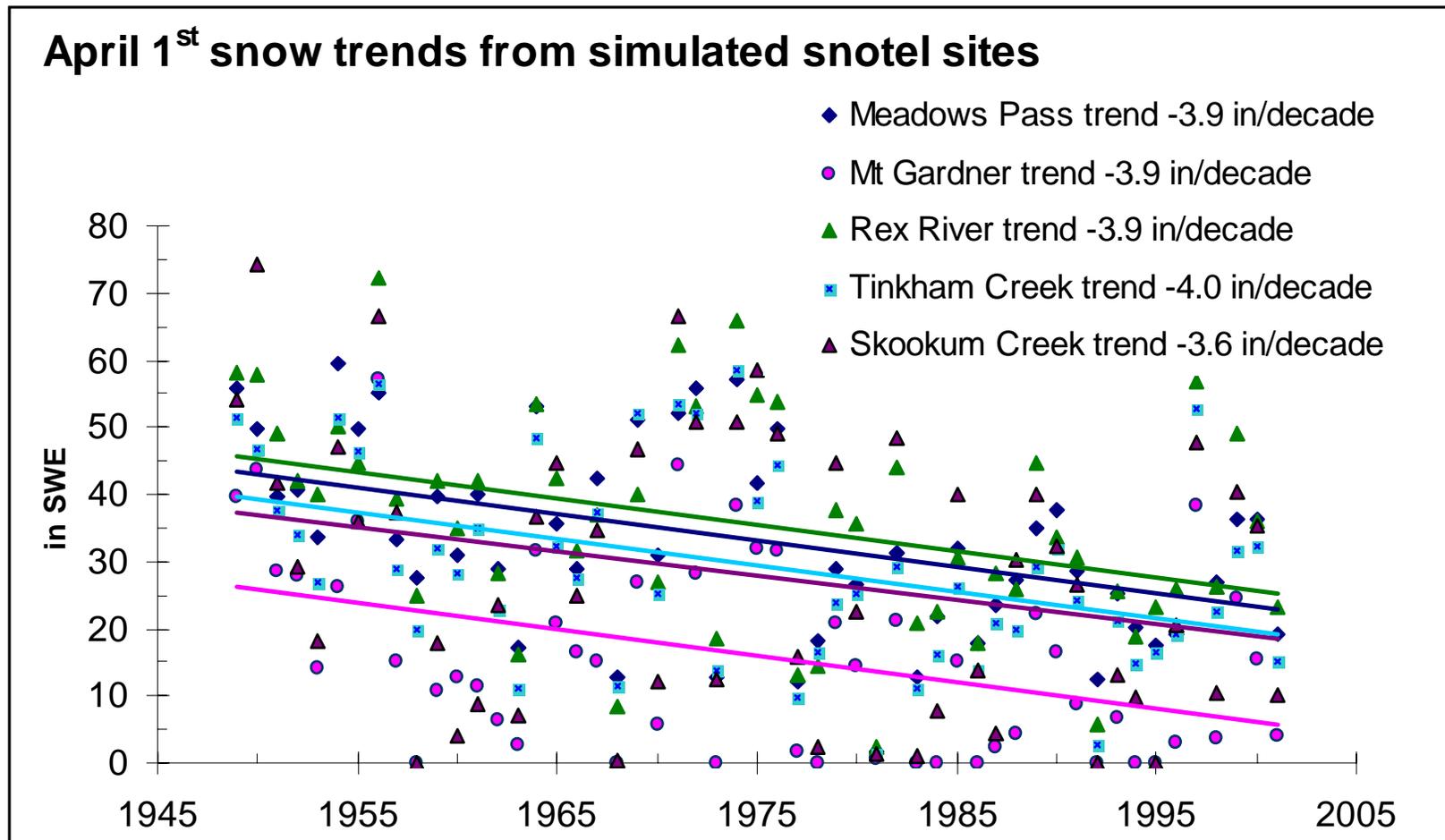
Consistent declining trend between observed and simulated April 1 SWE for Mt. Gardner

Total annual volume at major reservoir inflows points (1949-2003)

- Cedar River above Chester Morse Reservoir
- Cedar trend, -18%
- South Fork Tolt above Tolt Reservoir
- Tolt trend, -24%

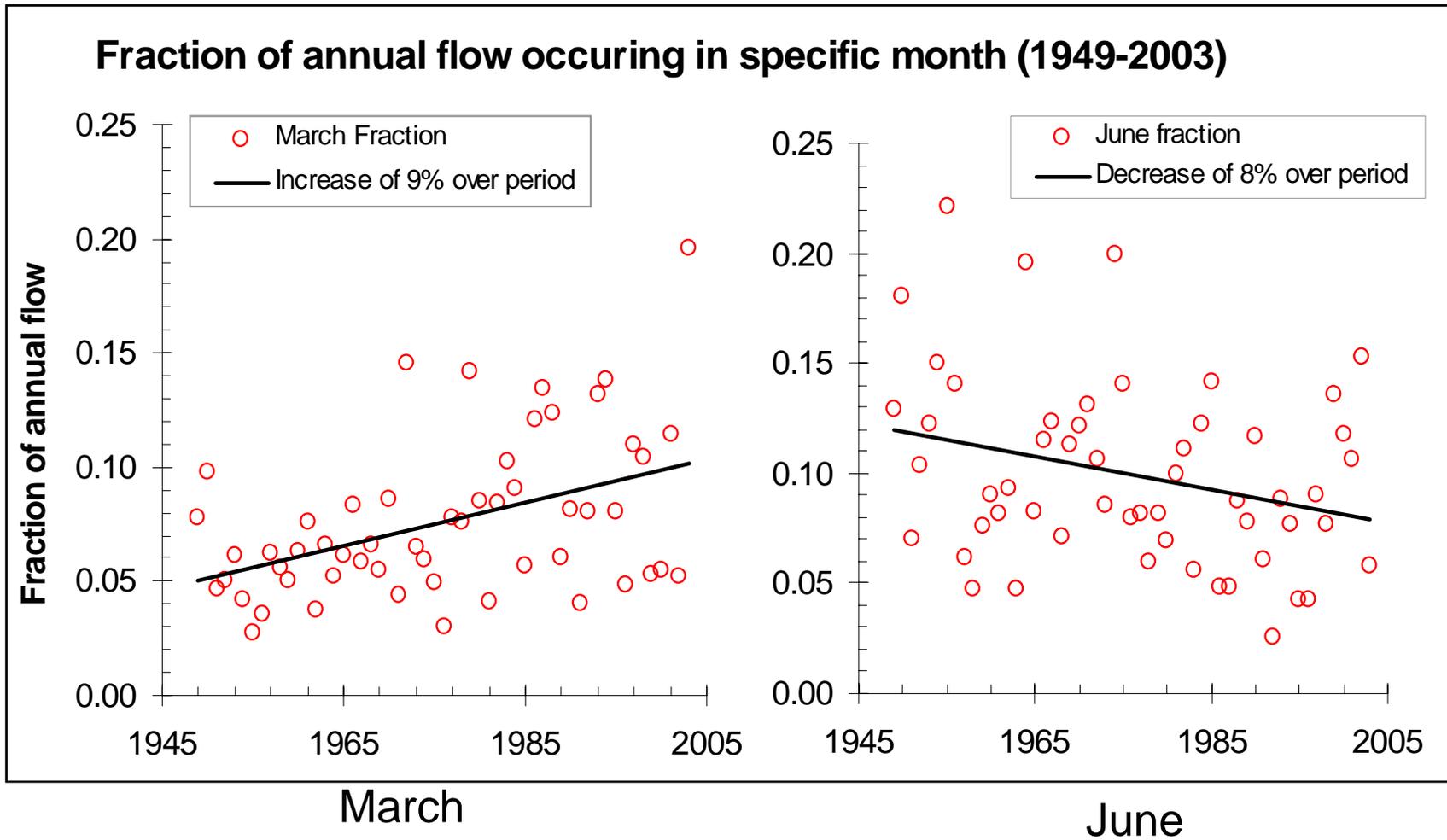


April 1 SWE Trends Water Supply Basins



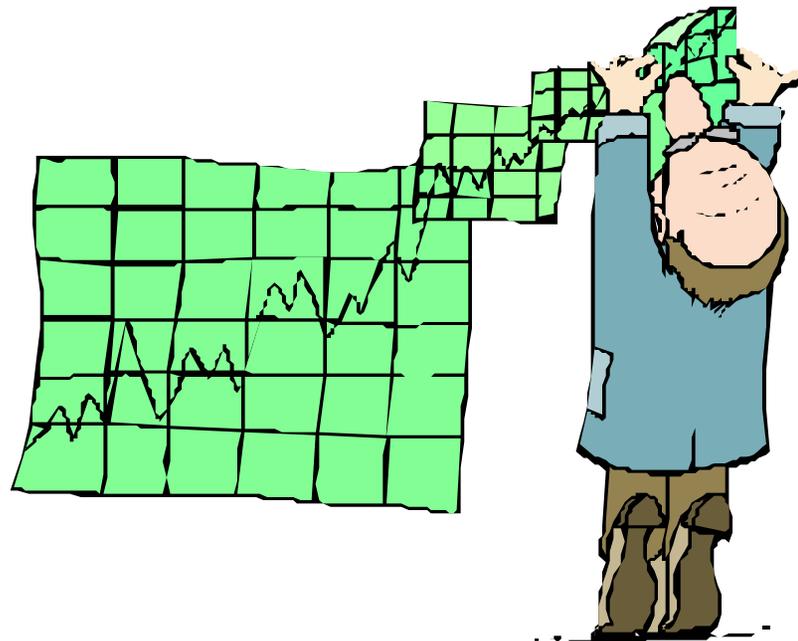
Declining trends also seen in other PNW water supply basins

Changes in Annual Spring Flow on the Cedar River above Chester Morse Reservoir, 1949-2003

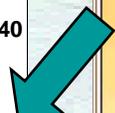
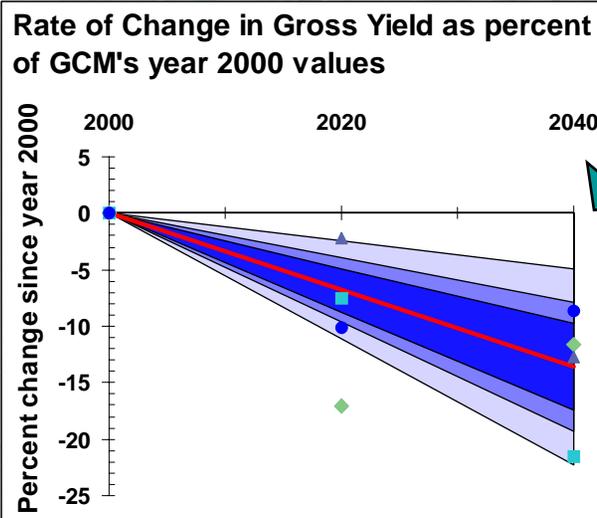
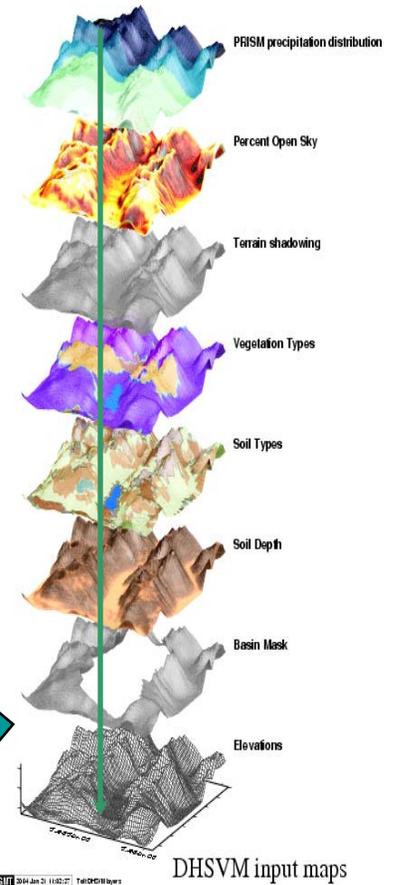
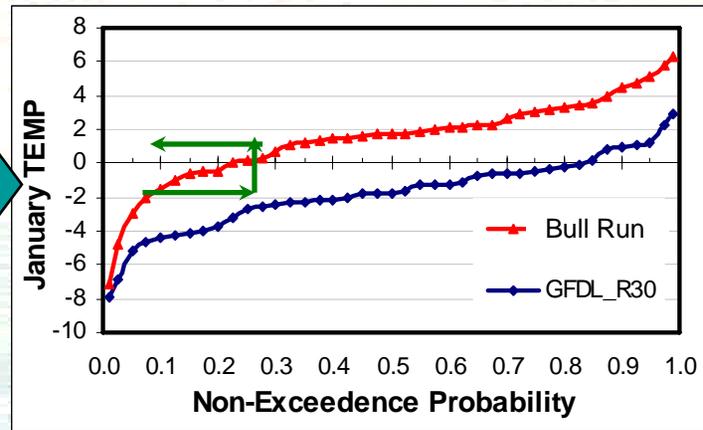
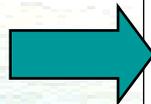
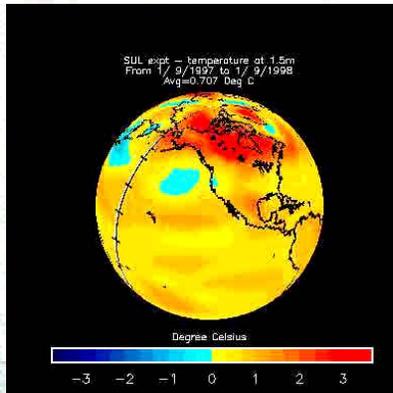


Fractions of annual flow occurring in March and June on the Cedar River above Chester Morse reservoir. Station Elevation 1560 ft.

How are Predictions Made?



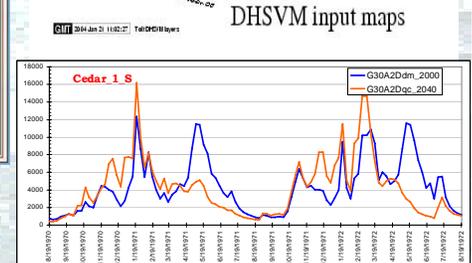
Prediction Method



Main Menu

Information Demand Year <input type="text" value="2000"/> Start Dates for Model Runs About Portland Water Works Node Descriptions Status Quo To Title Page Scenario Values	Control Panels Main Control Panel Reservoir Rule Curves Alternate Sources Groundwater Conduits Scenario Run	Metrics Summary Output Portland M&I Dam Annual Summaries Groundwater Bull Run River Hydropower Transmission Drawdown Work in Progress
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Above: Photograph of Bull Run Dam 2 and Power House
Right: Photograph of Bull Run Dam 1 and Power House

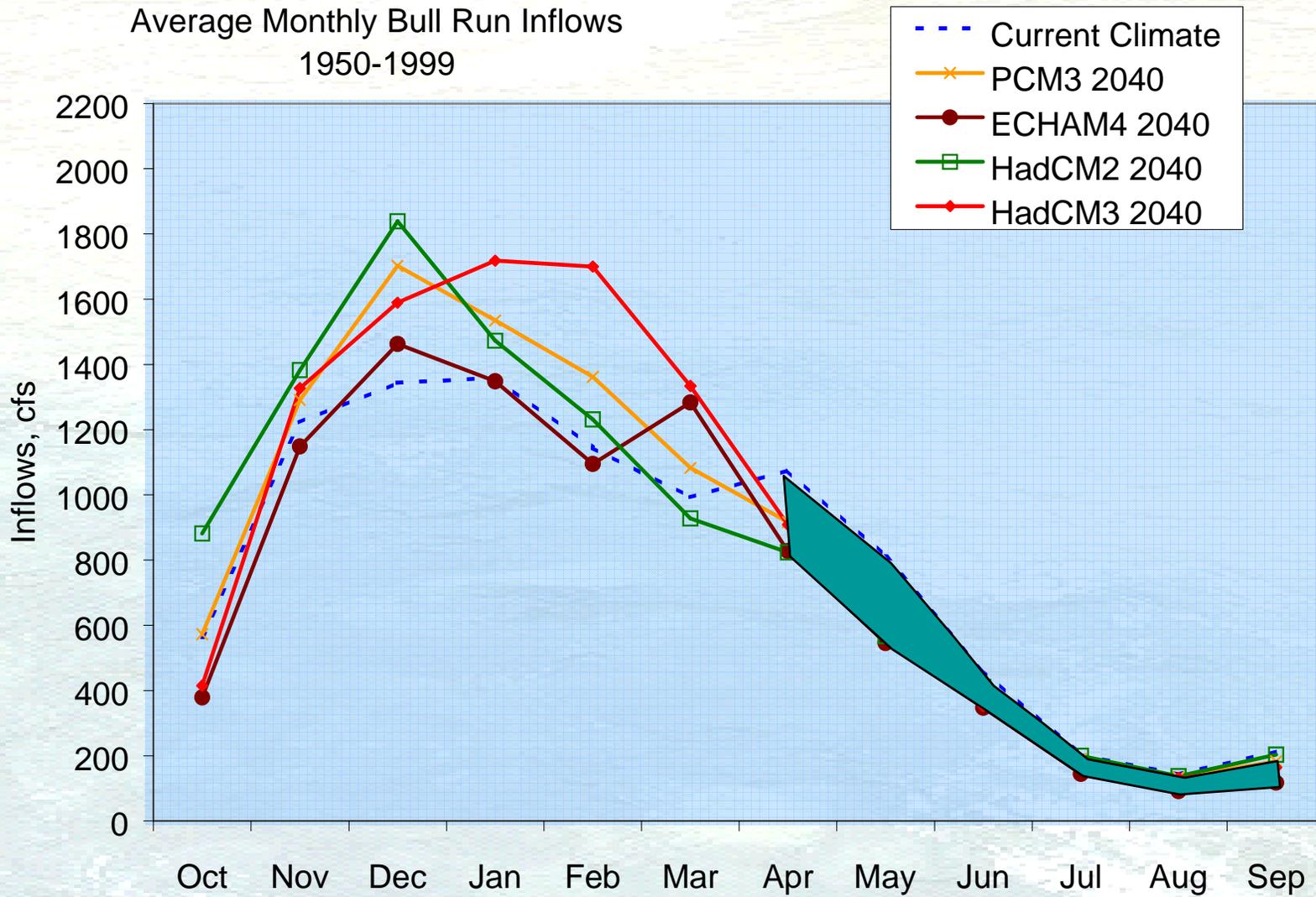


What do the predictions suggest?



- Warmer temperatures
- Lower spring snowpack
- Earlier runoff
- Longer drawdown periods of storage
- Traditionally, higher demand

Predictions suggest changes in runoff

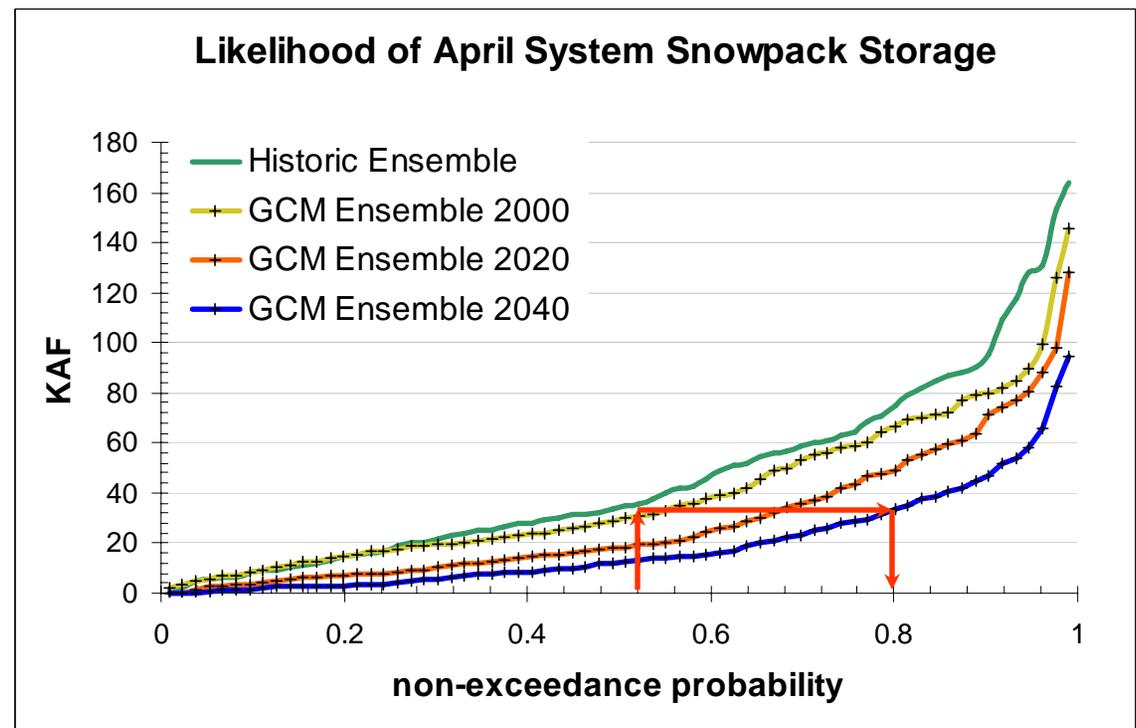


Climate Change Impacts on Bull Run Inflows, 2040

Predictions suggest changes in snowpack storage

- Average annual maximum decreases by as much as 50% by 2040
- Timing of peak shifts earlier in year
- Extreme event more common -- a 50 year event by 2000 standards is a 5 year event by 2040

Cedar and Tolt Snowpack Volume on April 1





Other Impacts

- Increased risk of **winter flooding** and stormwater challenges in mid- and low-elevation basins due to potential for...
 - More winter precipitation (rain)
 - More rain-on-snow events
 - Raised groundwater tables

- Impaired **water/habitat quality** possible due to potential for:
 - Reduced summer streamflows (temp, dissolved oxygen, concentration of contaminants)
 - Higher winter flows (turbidity, scour events)





So what do we do about it?...

Planning for Climate Change





Expect and Plan for

- Regional warming of 2-4°F by 2040s
- Reduced winter snowpack and summer streamflow
- Longer drawdown periods of storage
- Increased spring and late summer competition for water
- Impacts on water demand, but mediated by changing habits
- Increased winter flooding



Actions

- Incorporate climate change into planning
- Seek regional solutions
- Identify robust solutions
- Use existing tools and experience
- Use mid-range forecasts
- Rethink what we know

Puget Sound Mid-Range Forecasts - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www.tag.washington.edu/projects/midrange.html>



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Puget Sound Mid-Range Forecasts

Forecasts are accessible for individual locations within each sub-basin. Please click on the basin of interest on the map below to view the forecasts available. For a summary of each forecasts is available with interpretation as a pdf document select the Puget Sound Water Supply Outlook links on the right.

Basin-Specific Streamflow Forecasts

[Sultan River](#) (City of Everett water supply)

[South Fork Tolt River](#) (City of Seattle Water Supply)

[Cedar River](#) (City of Seattle Water Supply)

[Green River](#) (City of Tacoma Water Supply)

White River (Proposed future supply)

**Puget Sound Water Supply Forecasts
(summary in pdf form)**

[Current](#)

[October 2005](#)

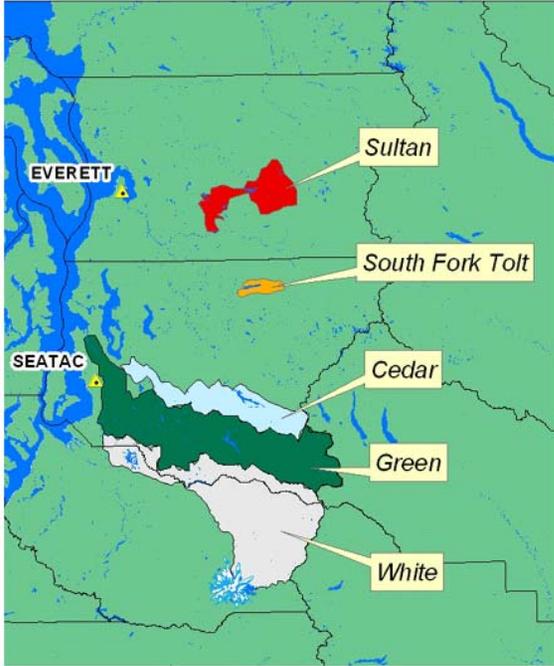
[September 2005](#)

[August 2005](#)

[July 2005](#)

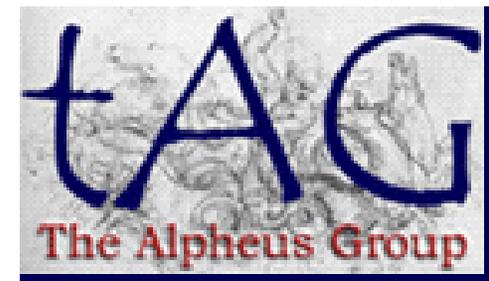
[June 2005](#)

[May 2005](#)





<http://www.tag.washington.edu/projects/midrange.html>





Questions?