USGS Water Science and monitoring in the Carson River Basin

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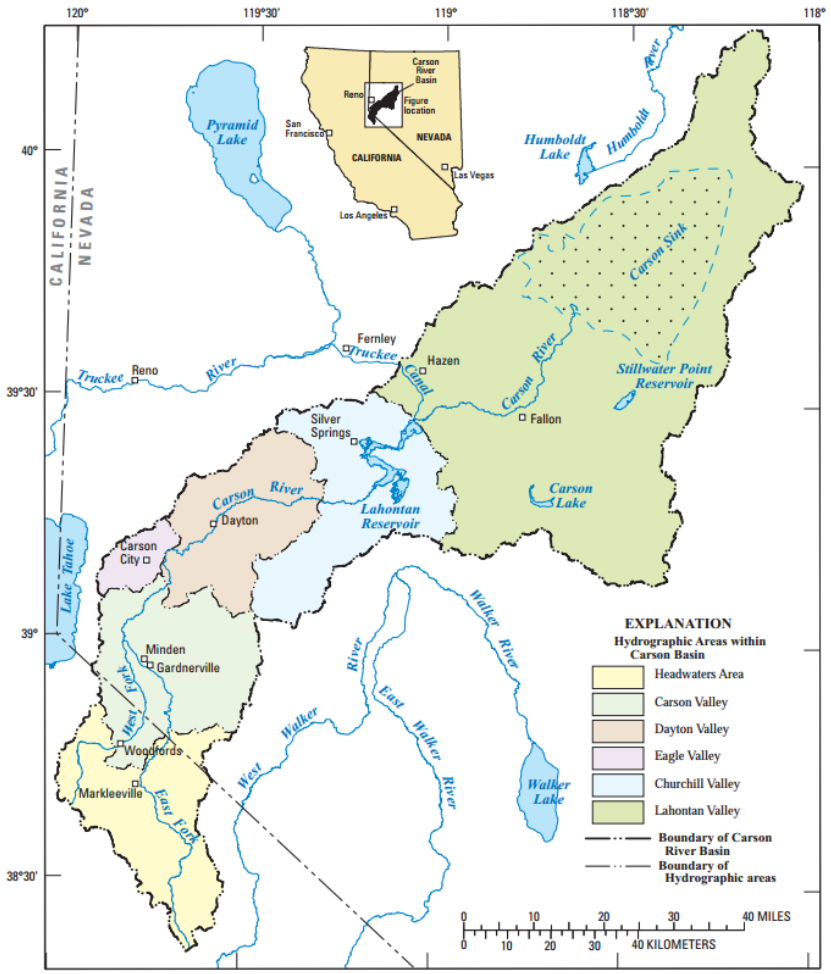
Joint Water Workshop – Churchill and Lyon County Commissioners
February 12, 2018, Fallon, NV

U.S. Department of the Interior
U.S. Geological Survey

Carson Water Science Overview

- Water for the Seasons and hydrologic models.
- Groundwater monitoring network.
- Streamgage network.
- 2017 runoff summary – a drought busting year.



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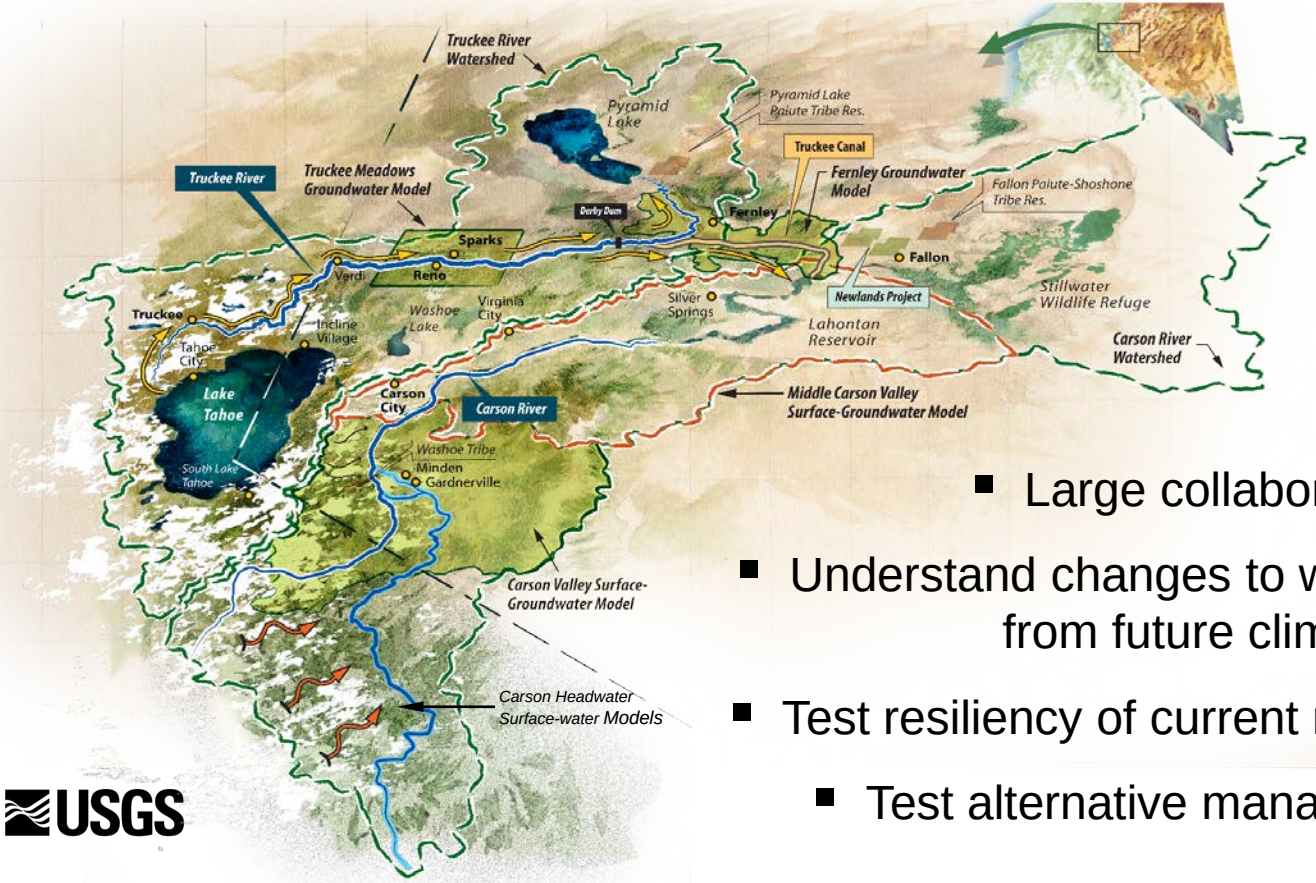
Water for the Seasons
Carson and Truckee Rivers



- Large collaborative project.
- Understand changes to water resources resulting from future climate variability.
- Test resiliency of current management framework.
  - Test alternative management approaches.

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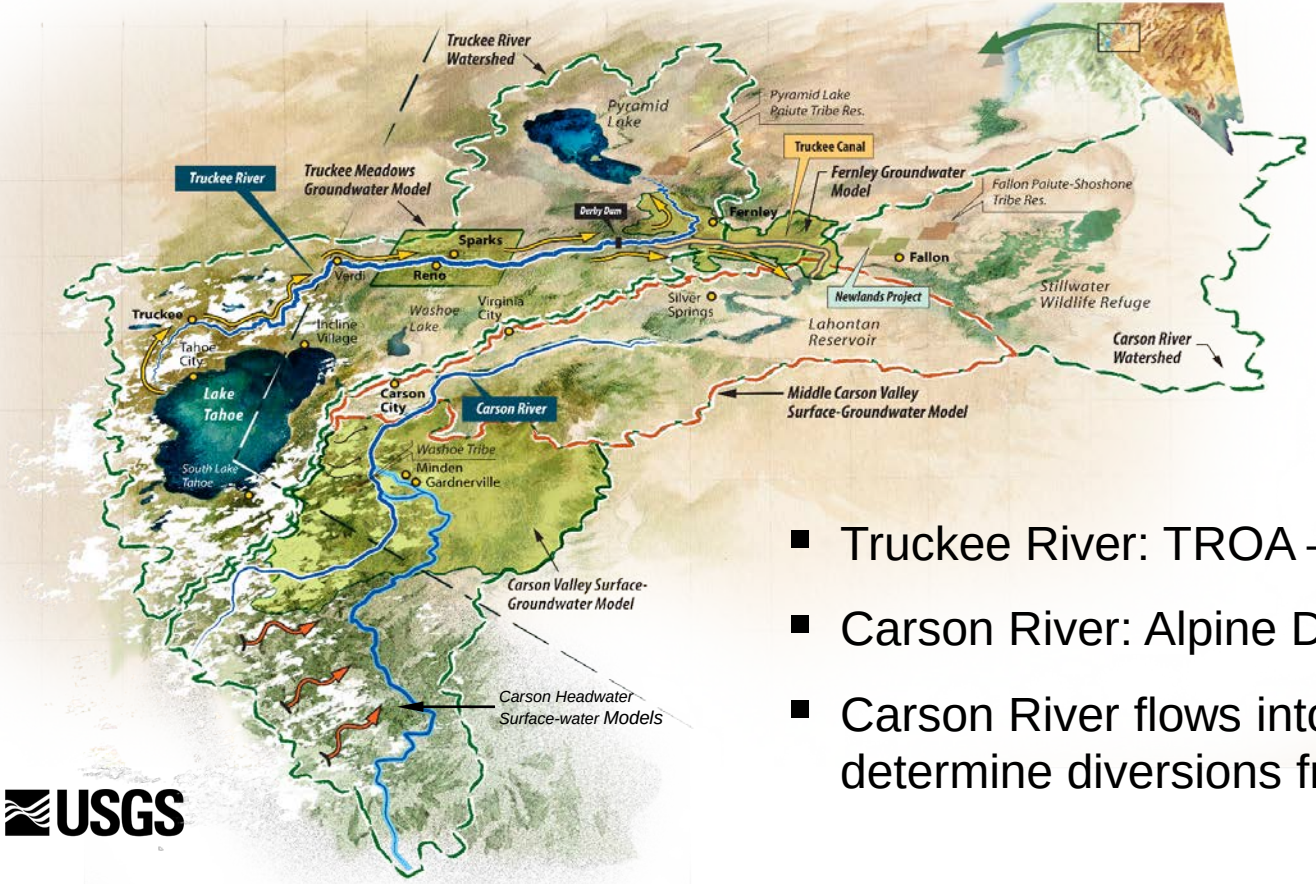
Water for the Seasons
Carson and Truckee Rivers



- Truckee River: TROA – DRI & UNR
- Carson River: Alpine Decree – USGS
- Carson River flows into Lahontan Reservoir determine diversions from Truckee River

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Water for the Seasons
Carson River Basin

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Carson River Team:

Richard Niswonger – Carson Team Lead

Michael Dettinger – Climate projections

Murphy Gardner – Headwater models

Wes Kitlasten – Carson Valley model

Eric Morway – Middle Carson model

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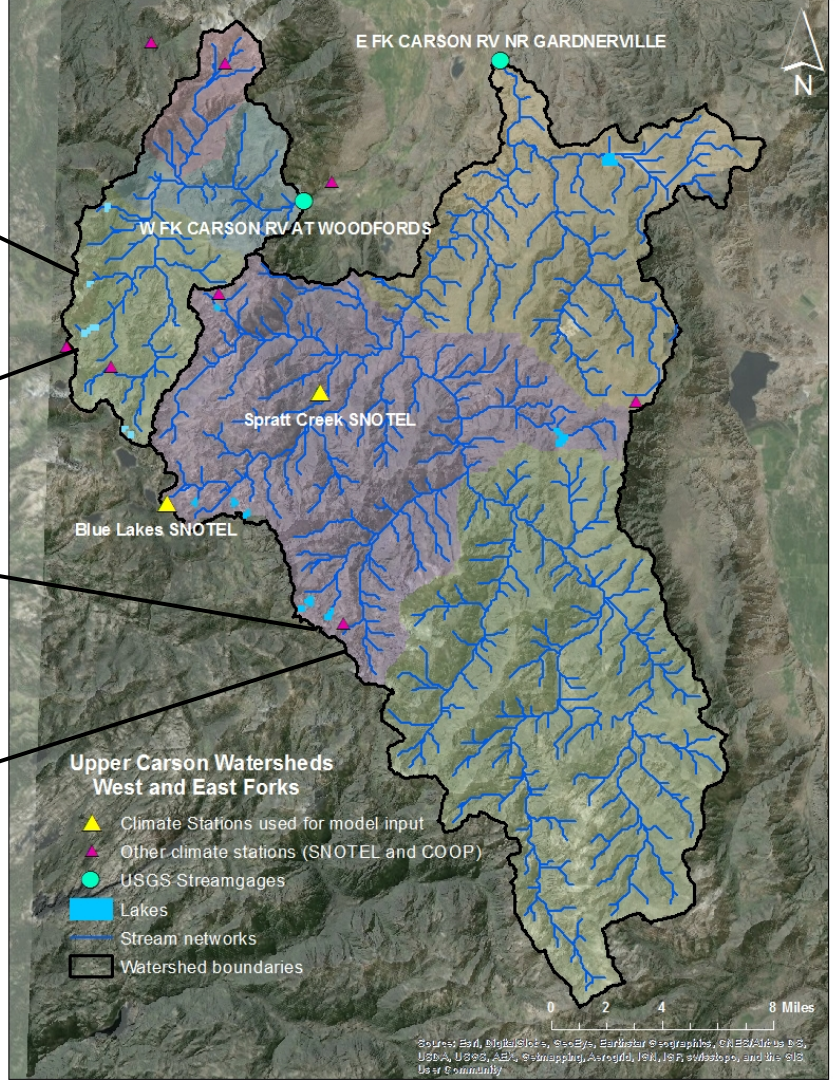
Carson Headwater Flow Models

West fork Carson River near Woodfords. Photo: M. Gardner

West Fork
66 mi^2

East Fork
357 mi^2



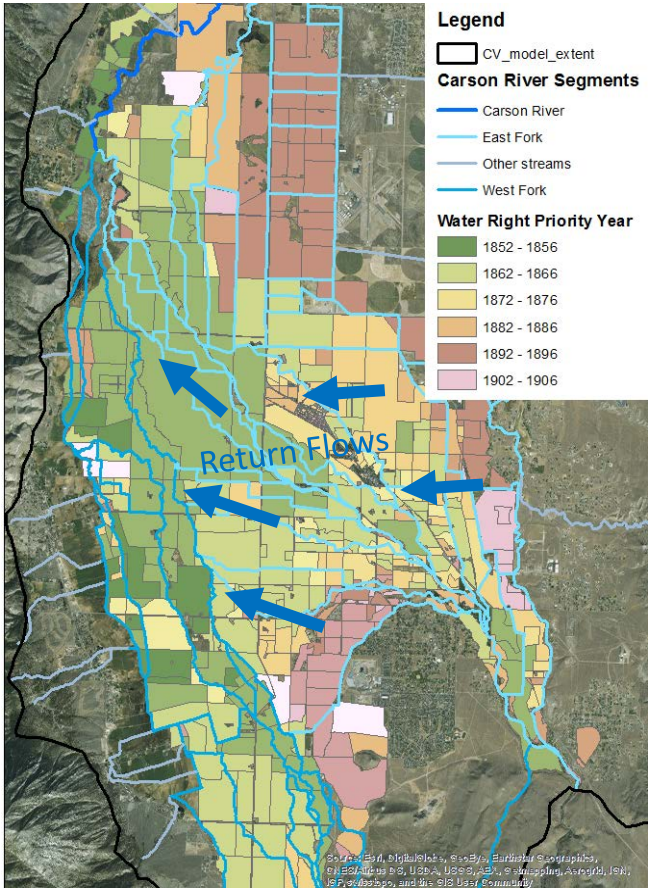
Streamflow is simulated for climate scenarios, results are passed to downstream models

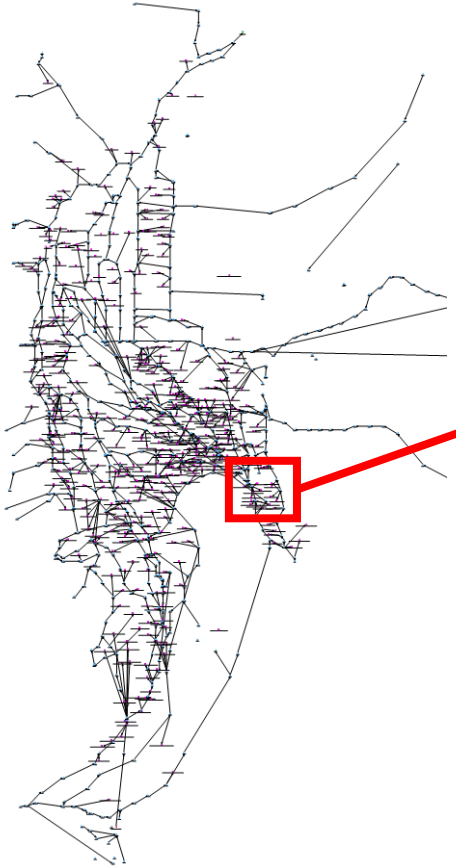
Downstream models use simulated streamflows to evaluate downstream water resources and changes in allocations and deliveries.

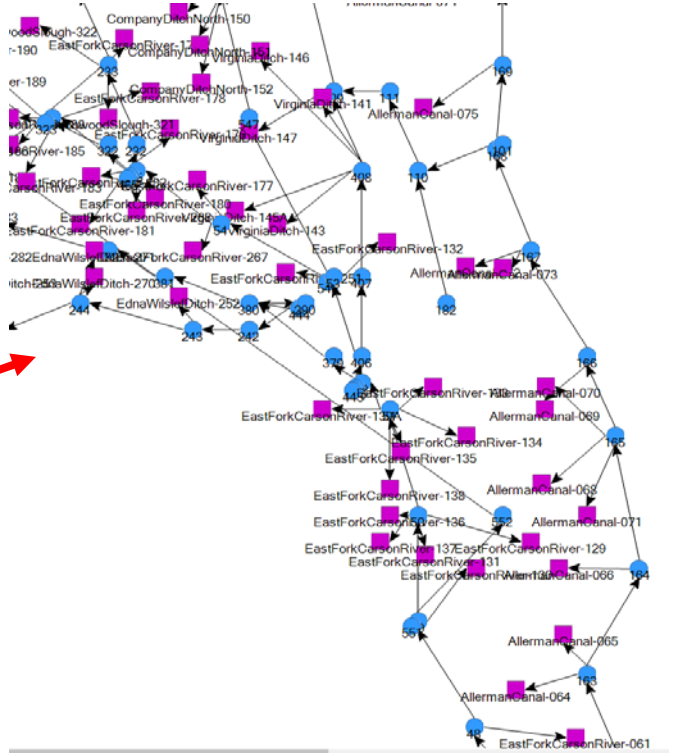
Downstream models also test different management strategies to adapt to changing supply characteristics.

East fork Carson River near Markleeville. Photo: M. Gardner

Carson Valley Hydrologic Model

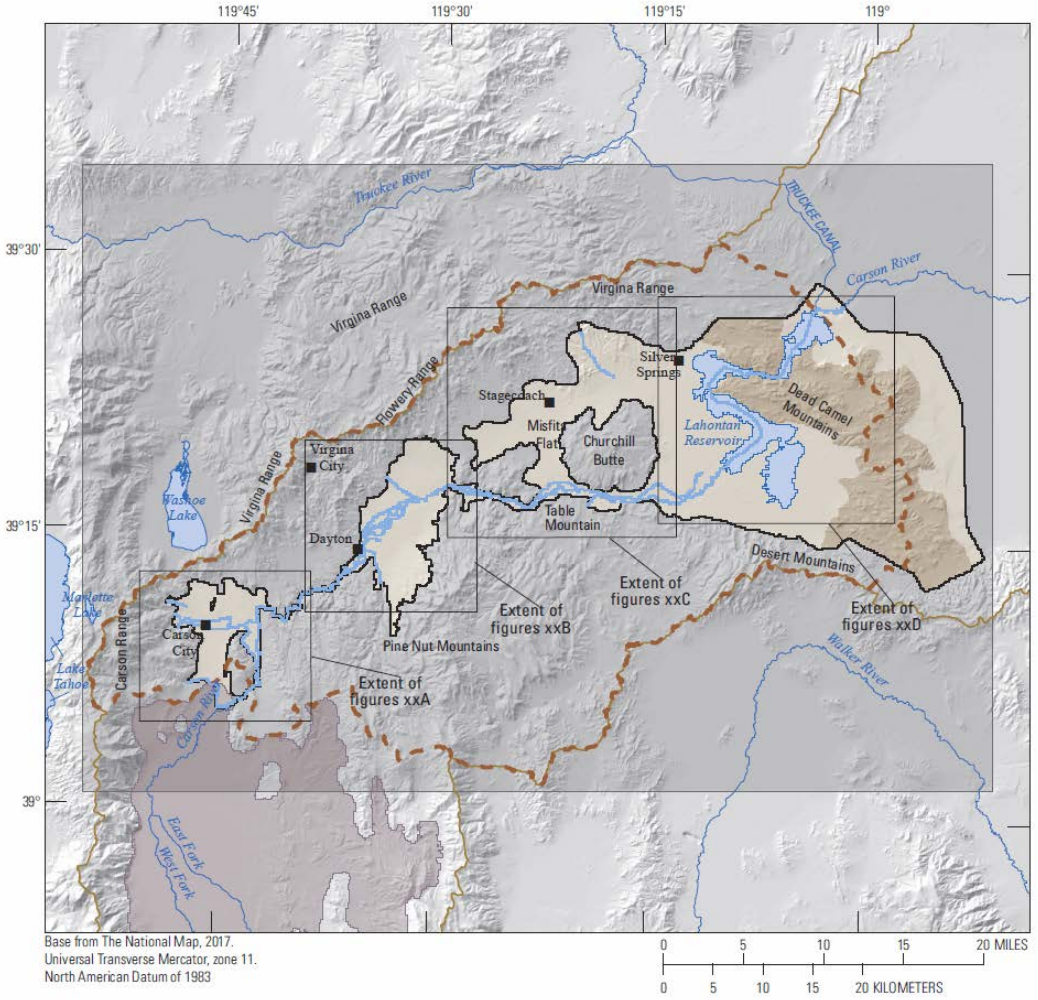






Middle Carson Hydrologic Model

- Streamflow from Carson R. at Carson gage to below Lahontan gage.
- Lahontan Reservoir.
  - Volume, level, ET.
- Groundwater systems:
  - Eagle, Dayton, Stagecoach and Churchill Valleys.



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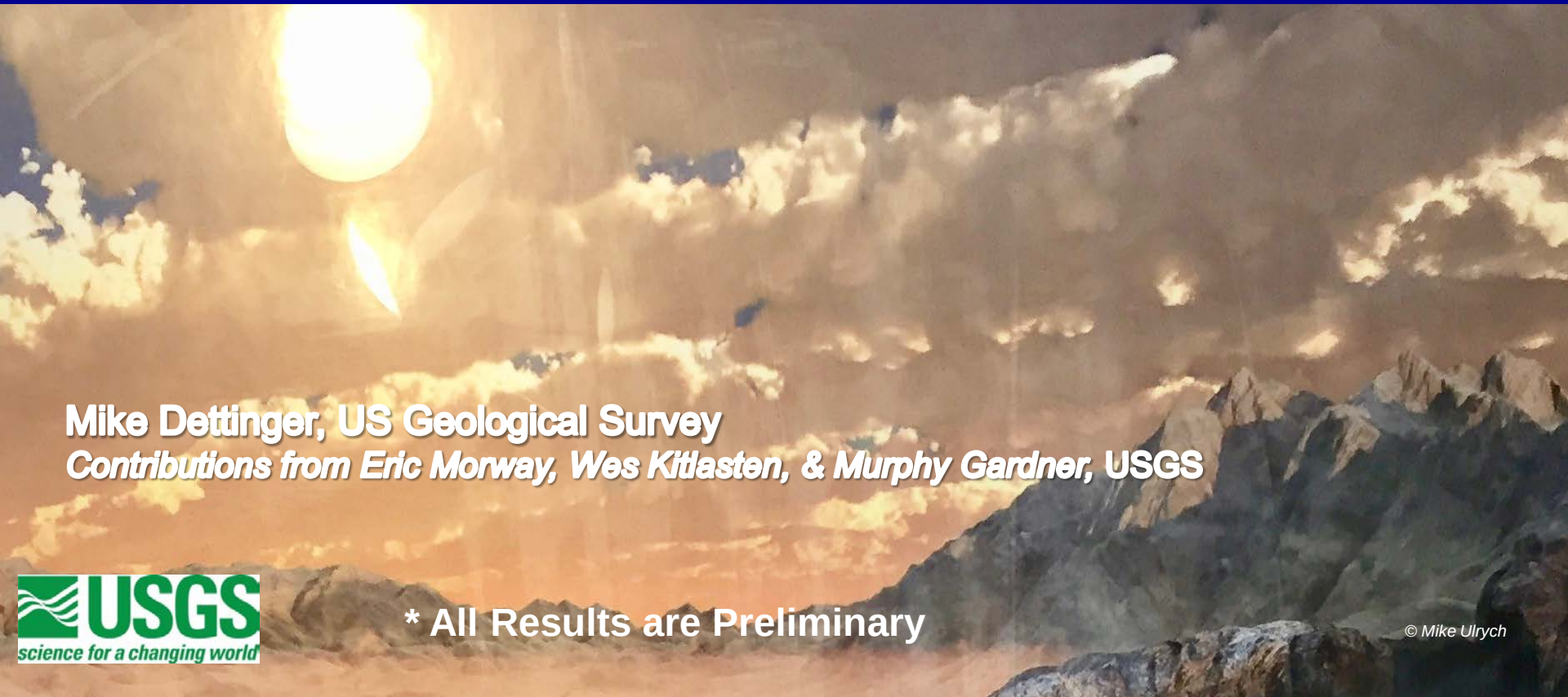
WHAT WILL THE CARSON RIVER BE LIKE IN THE FUTURE?*



Mike Dettinger, US Geological Survey
***Contributions from Eric Morway, Wes Kitlasten, & Murphy Gardner,* USGS**

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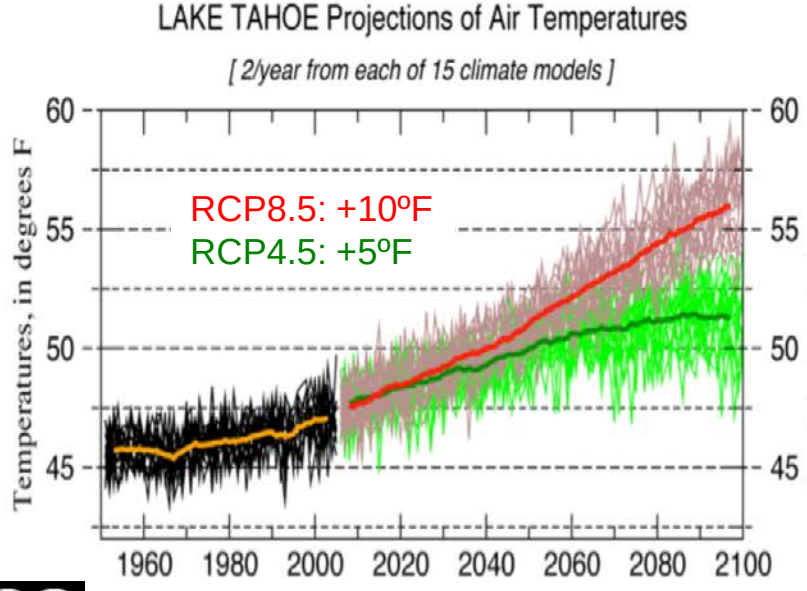
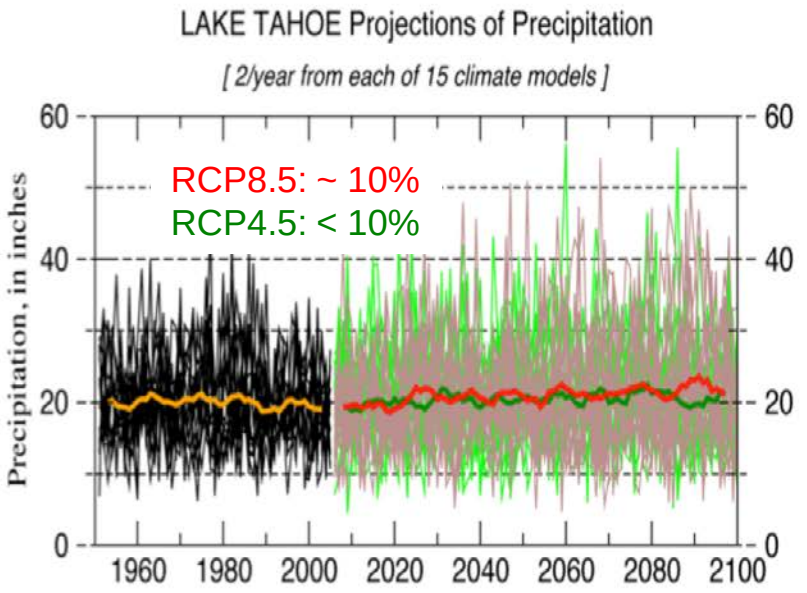
*** All Results are Preliminary**

PROJECTED CLIMATE CHANGES AT TAHOE





Src: Native Water on Arid Lands project

RCP8.5: CO_2 emissions rise through end of century.
RCP4.5: CO_2 emissions peak in 2040.

Downscaled by LOCA (Pierce et al. 2014)

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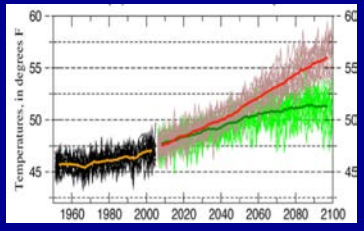
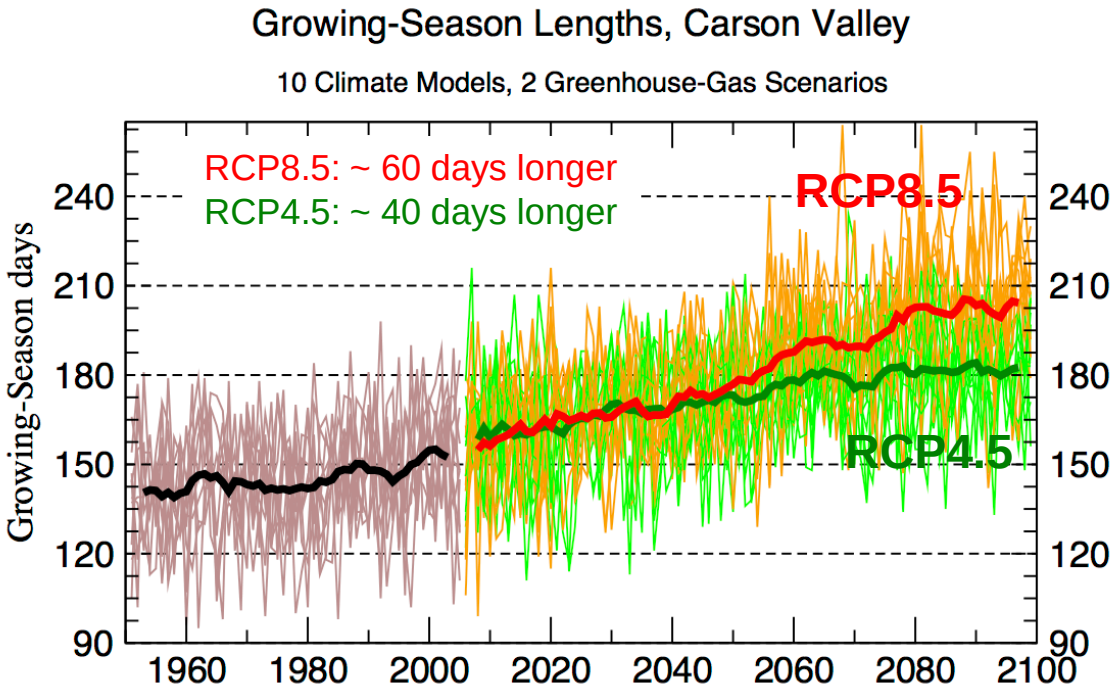
CNAP California-Nevada Climate Applications Program

PROJECTED GROWING SEASON LENGTHS, CARSON VALLEY





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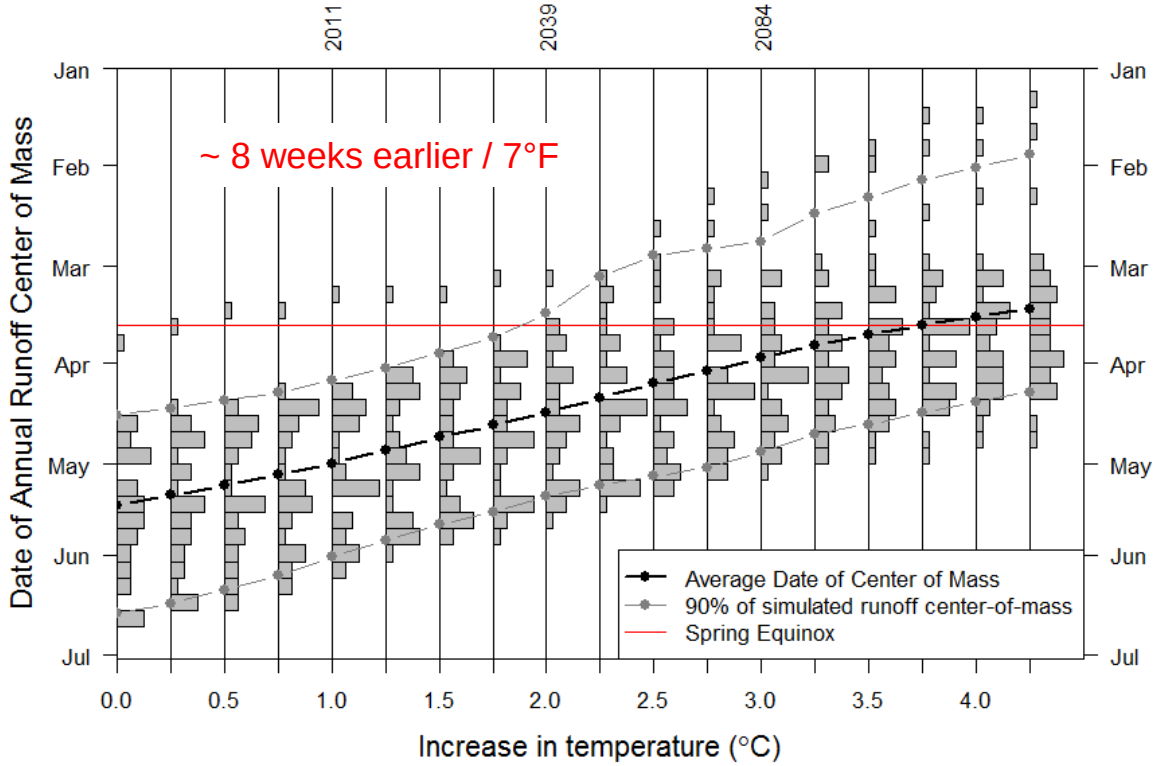
Growing season = *Season between last 6-day period < 50ºF in spring and first 6-day period < 50ºF in autumn*

Src: California 4th Climate Assmt (Sierra Nv regional report), in progress

Runoff occurs earlier with warming climate - West Fork Carson River



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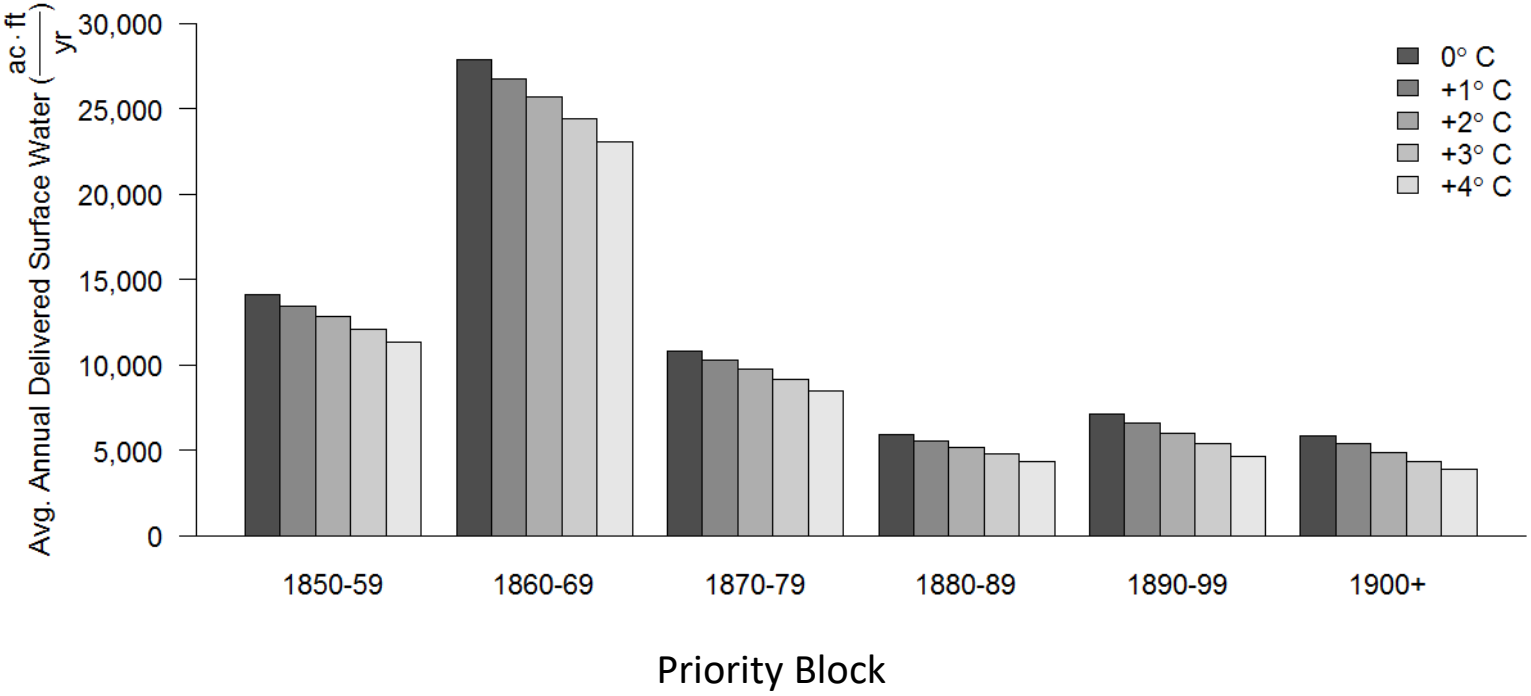
Decrease in Deliveries in Carson Valley – by Priority

based on 35 year simulation



CARSON RIVER IN THE FUTURE--Summary

- **Expect warming, snowpack losses, longer growing seasons & increased evaporative demands – pretty certain**
- **Projected annual-precipitation changes remain modest & uncertain**
- **Largest precipitation changes will be in increased # dry days & increased large storms with modest changes in small-medium storms – increasingly certain**
- **Total streamflow nearly the same. Runoff occurs earlier.**

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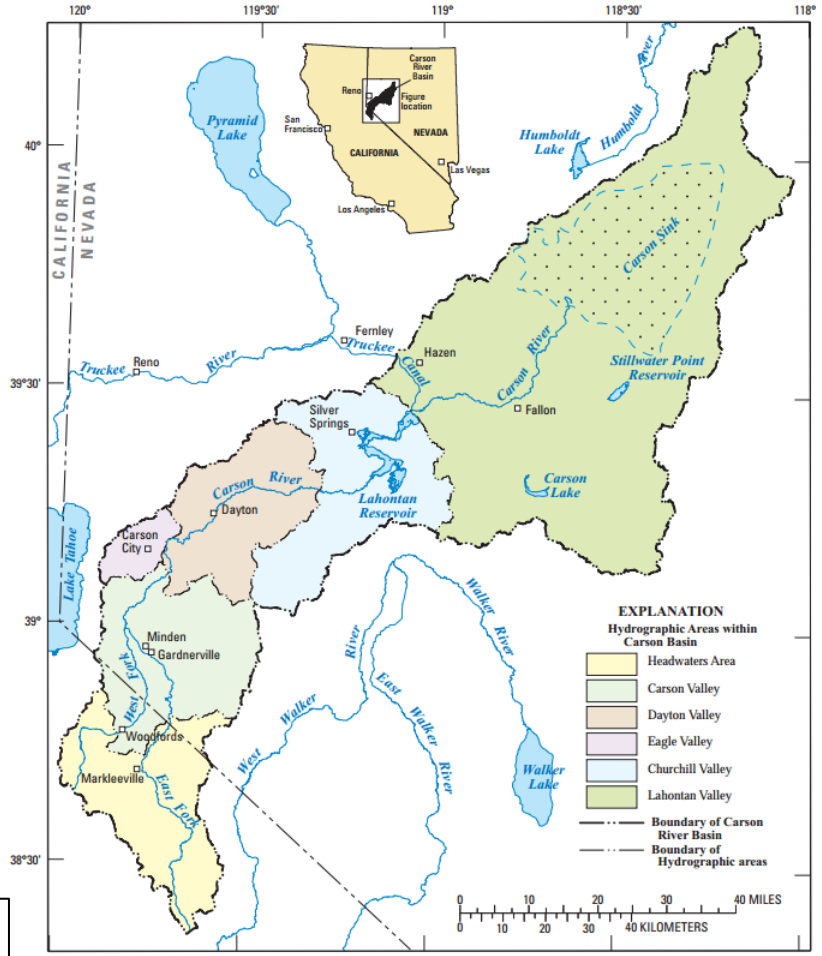
Groundwater Monitoring

- Long-term monitoring network.
  - Carson, Eagle, Dayton, Stagecoach, and Churchill valleys.
- Monitors trends in water levels.
- Aquifer conditions.
- Data used for:
  - Trends
  - Aquifer properties/conditions
  - Modeling efforts/Calibrations
  - Impacts of management actions



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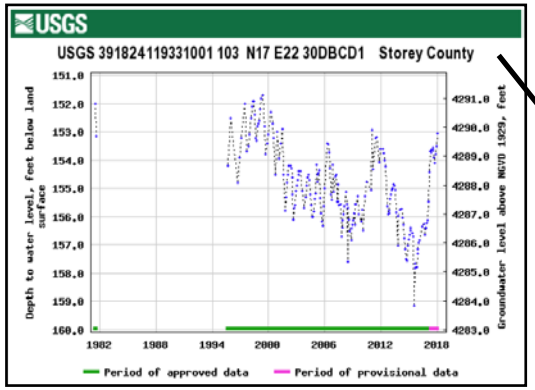
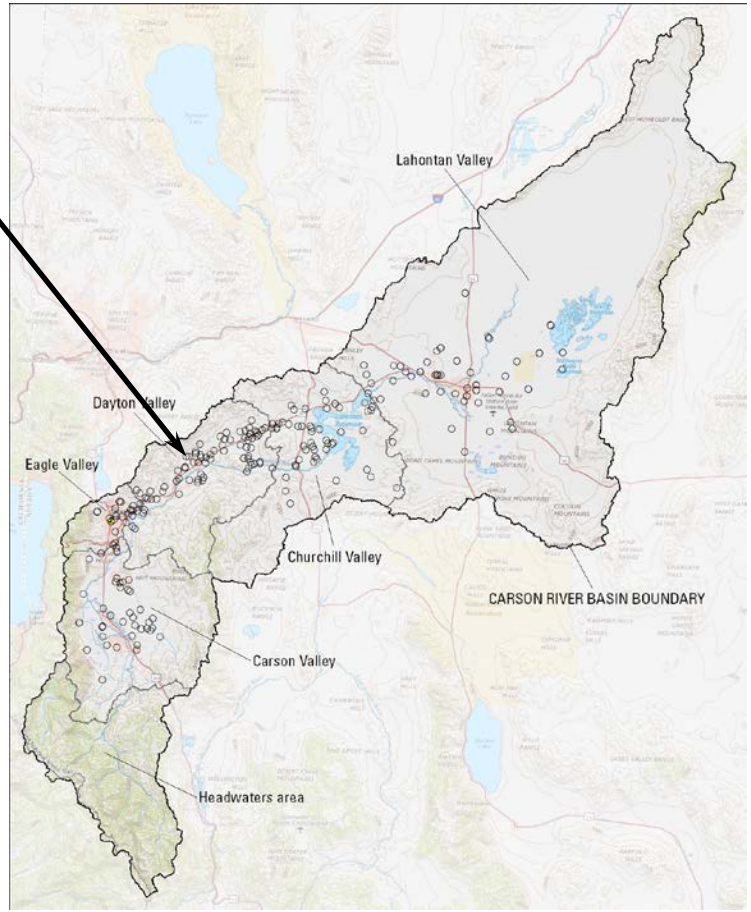
Principle Investigator:
David Smith, Hydrologist NVWSC

Groundwater Monitoring





- Quarterly and annual networks.
- Monthly monitoring in select areas with local issues (Mark Twain Estates).
- Some water-quality monitoring.
- Data available online – near real-time.

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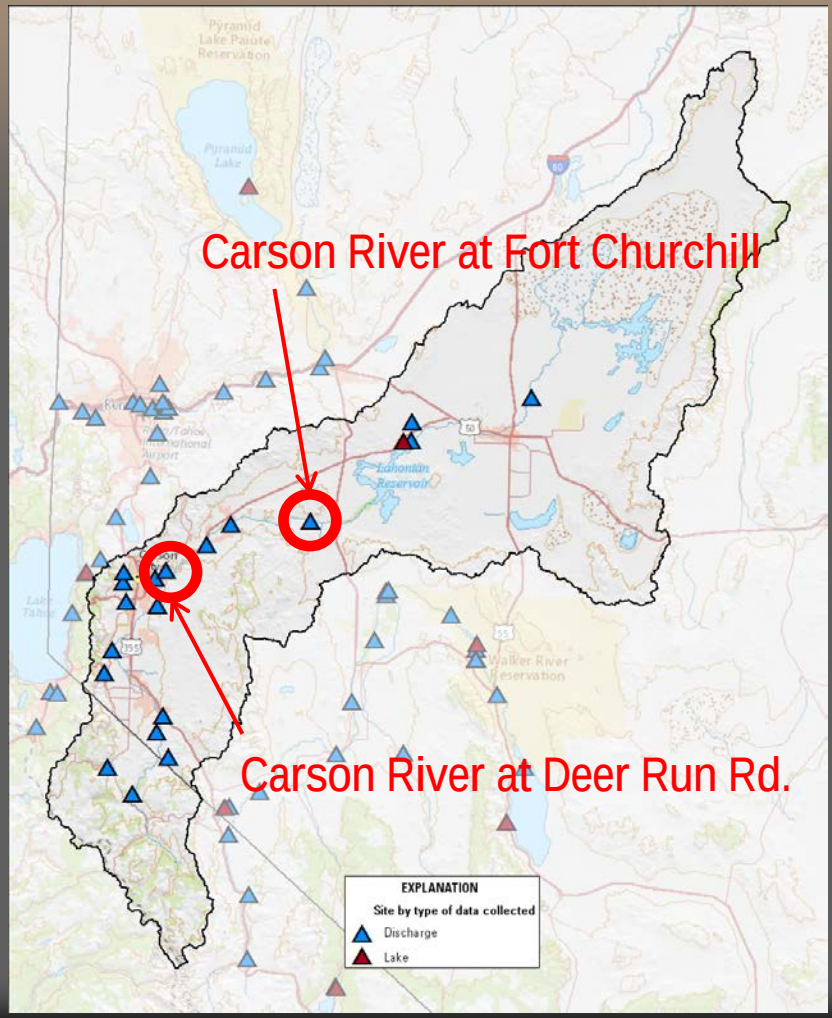
Carson River Gage Network

- 3 East Fork Carson
- 1 West Fork
- 7 main stem
- 6 tributaries
- Lahontan Reservoir



Marsha Gipson, N Nevada Networks Chief
Steven Berris, Hydrologic Networks Chief

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2017 Runoff – A drought busting year

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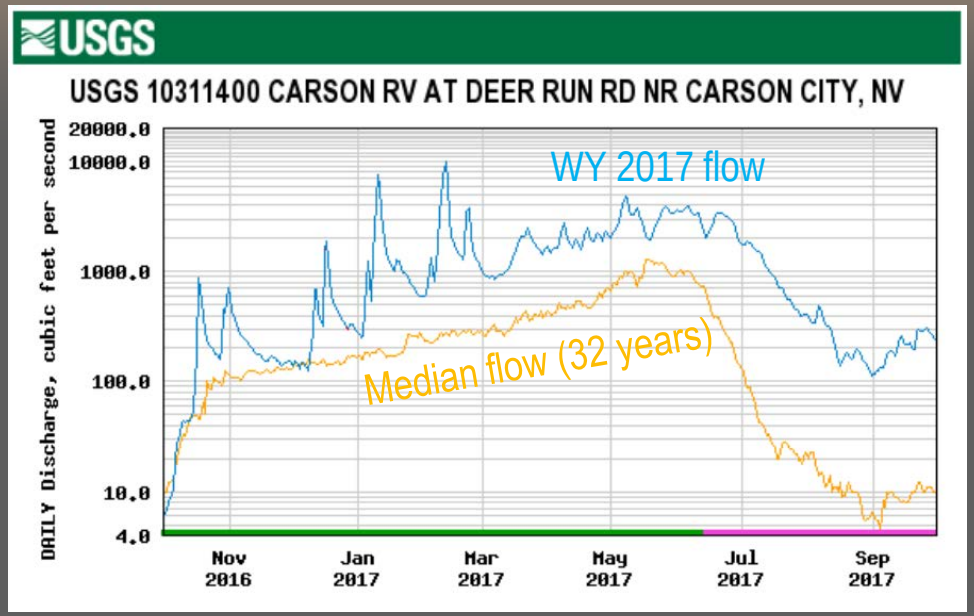
CARSON RV AT DEER RUN RD NR CARSON CITY



Peak: 10,800 cfs, 2/11/2017

Peak of Record: 24,000 cfs, 1/3/1997

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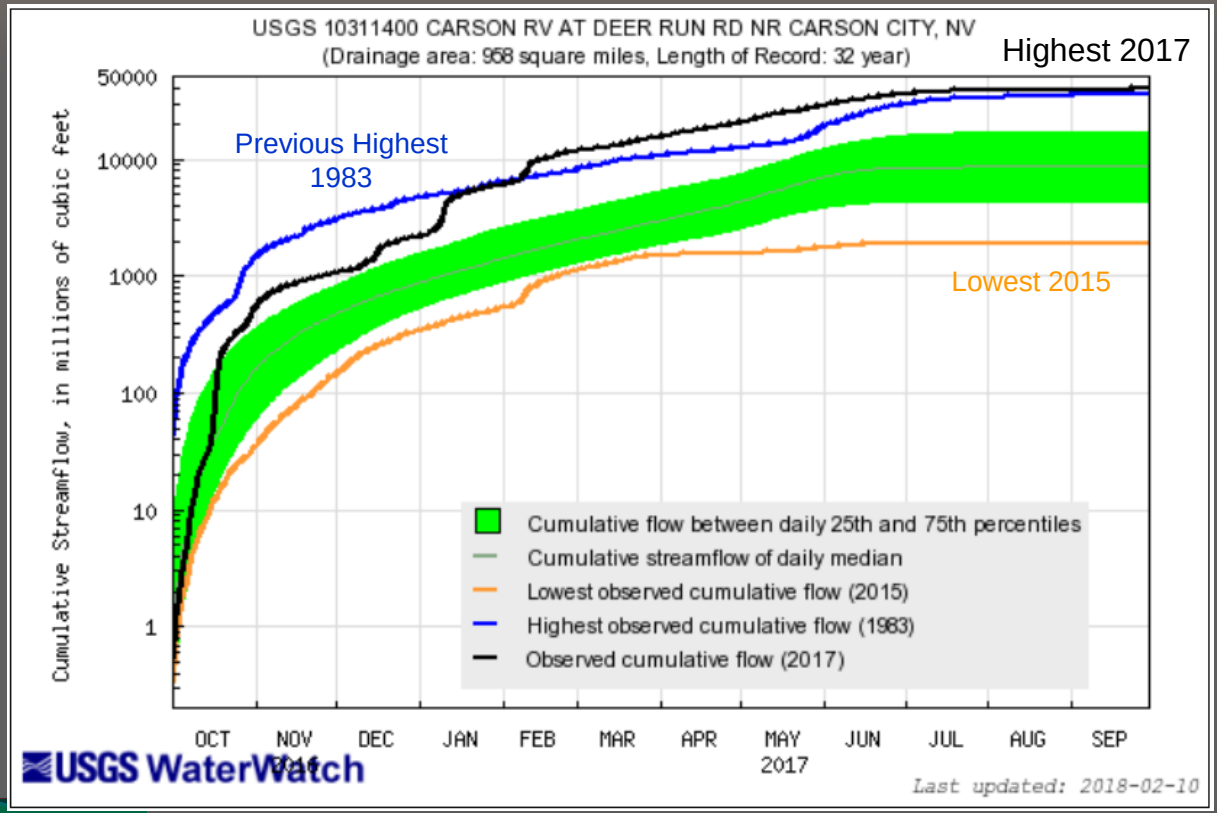
CARSON RV AT DEER RUN RD NR CARSON CITY

Cumulative Flow Volume

2017 volume
948,000 acre-feet
(avg 310,000)

Biggest year on record (32 years)



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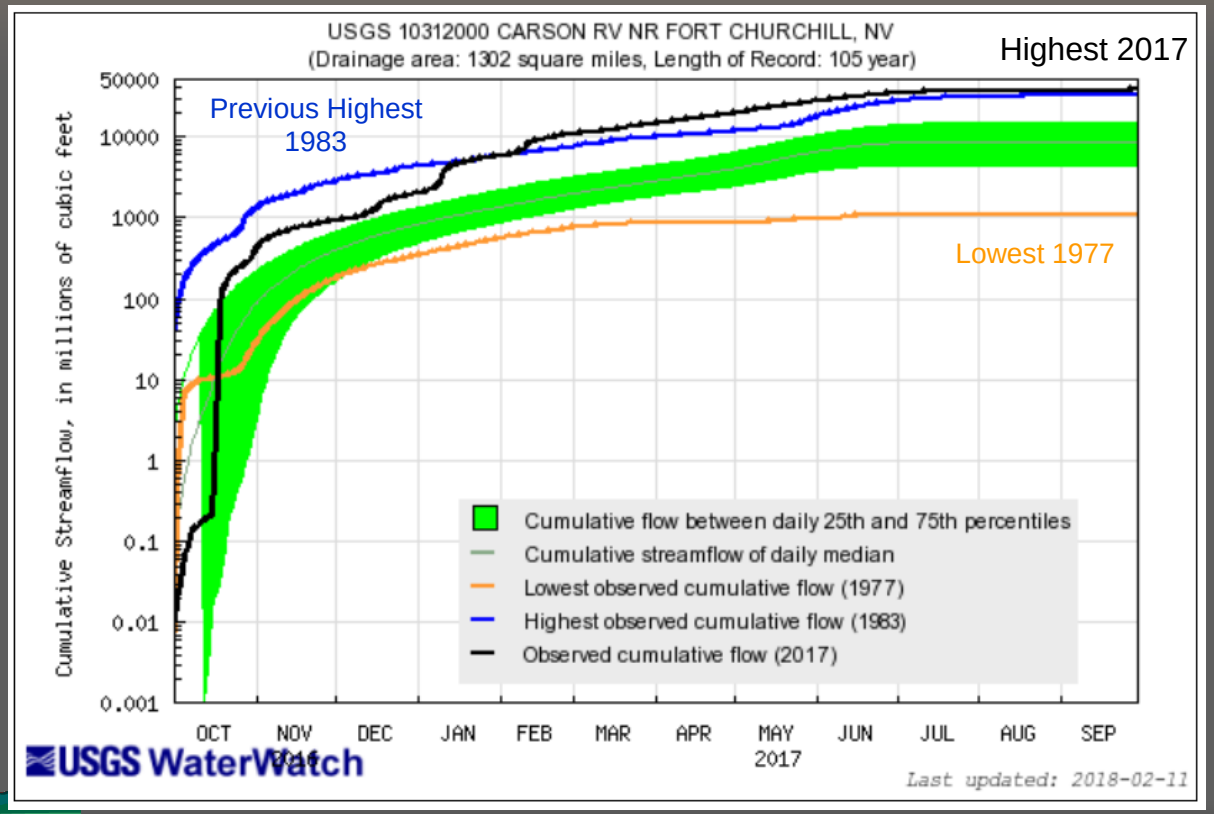
CARSON RV NEAR FORT CHURCHILL

Cumulative Flow Volume

2017 volume
920,000 acre-feet
(avg 269,000)

Biggest year on
record (105 years)



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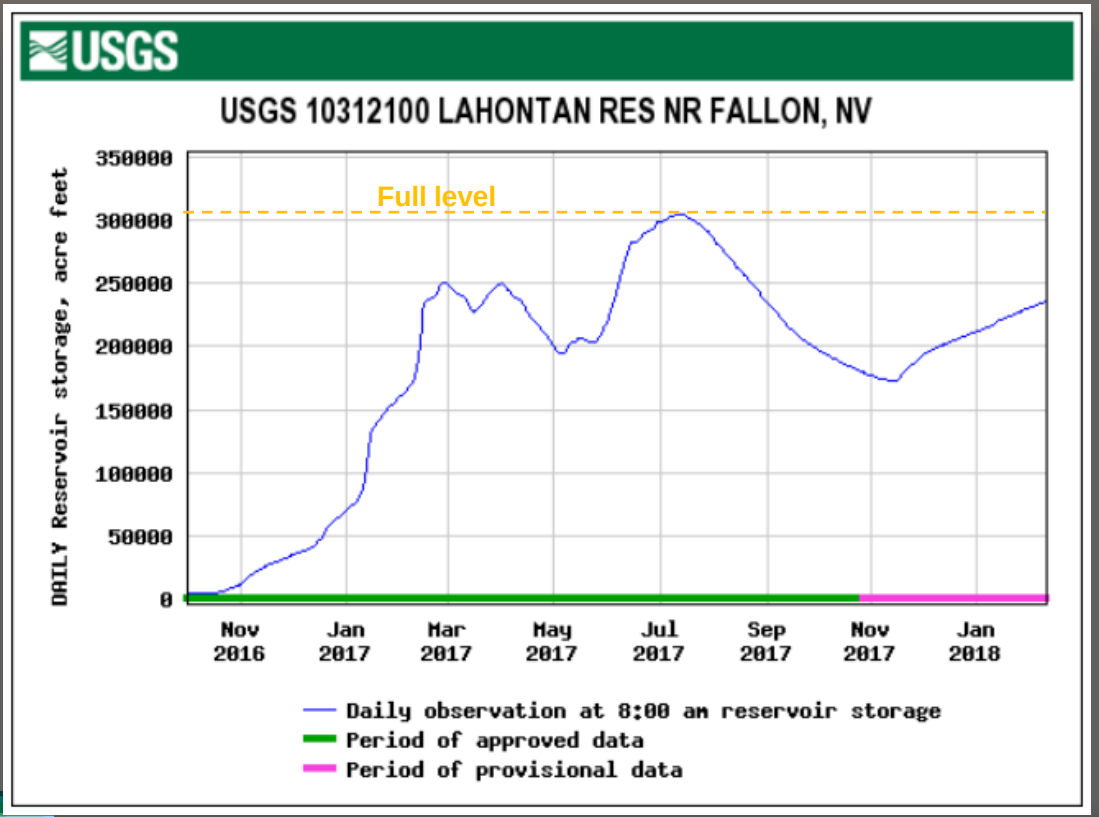
Lahontan Reservoir

Storage Volume

2017 outflow volume
693,000 acre-feet

2nd Biggest outflow year (50 years)



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Questions?

Web: https://nevada.usgs.gov
Data: https://waterdata.usgs.gov
Twitter: @USGS_Nevada

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