

# ***The Nevada Water Initiative***

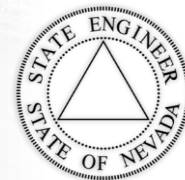
## ***Advancing the science to better understand “Where is the water coming from?”***

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# ***USGS Activities Update***

- Develop statewide database of historical non-irrigation pumping
- Evaluate & apply methods for updating recharge estimates & distribution
- Evaluate & apply methods for updating interbasin groundwater flow estimates
- Apply methods during studies of two demonstration basins
  - *Pine Valley*
  - *Railroad Valley*
- Add new monitoring & data collection (*flow/discharge, water levels, precipitation*)

# *Groundwater Pumping Database*

**256 hydrographic areas (HAs) in Nevada  
1985 – 2022, rates assigned to well location**

- NDWR data sources:
  - Basin-wide Pumpage Inventories  
(38 basins, 1 – 37 years)
  - Hydrographic Abstracts (permit, location, duty)
  - Well Drillers Reports (well information, location)



# *Groundwater Pumping Database*

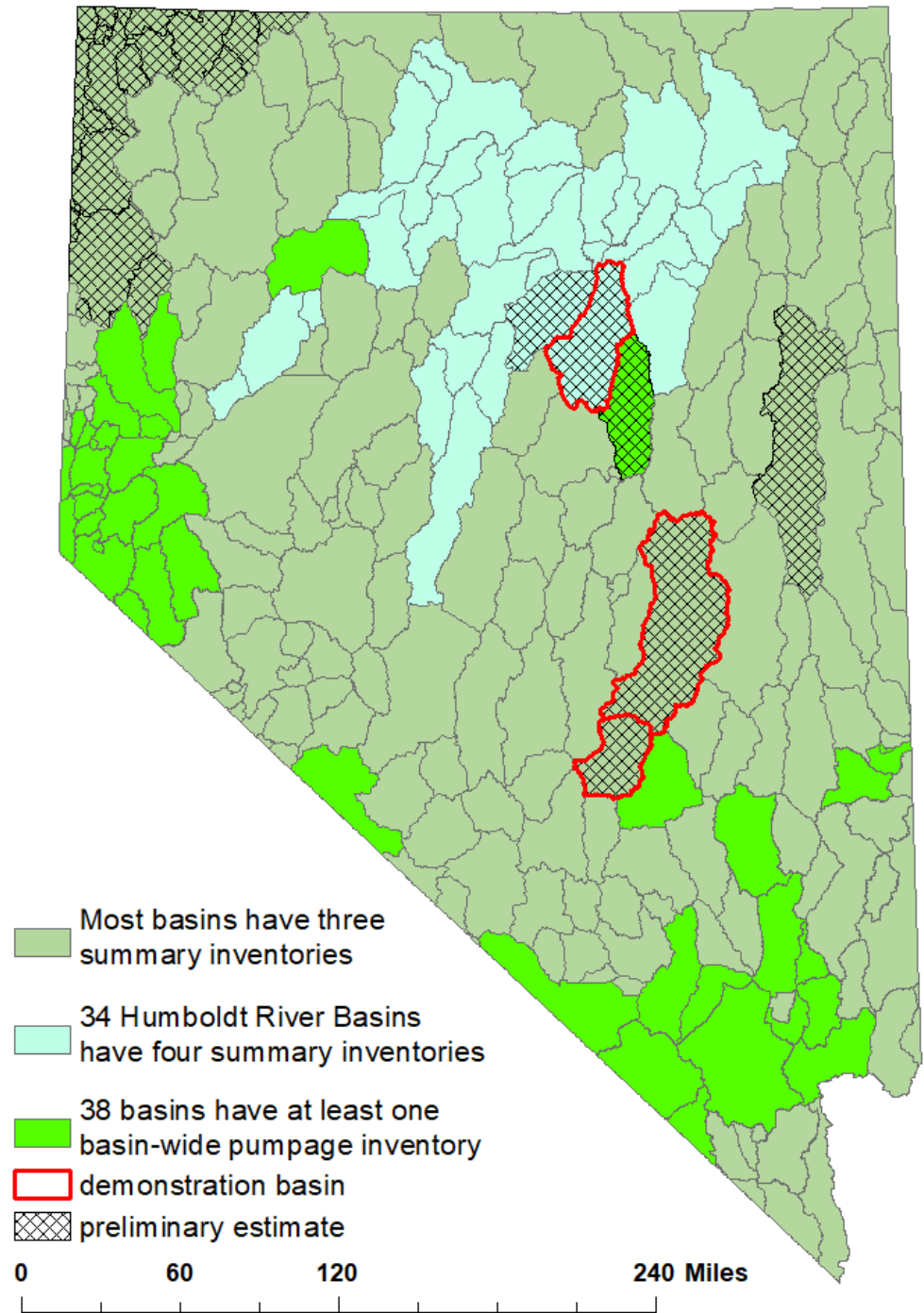
**Preliminary estimates for 30 basins**

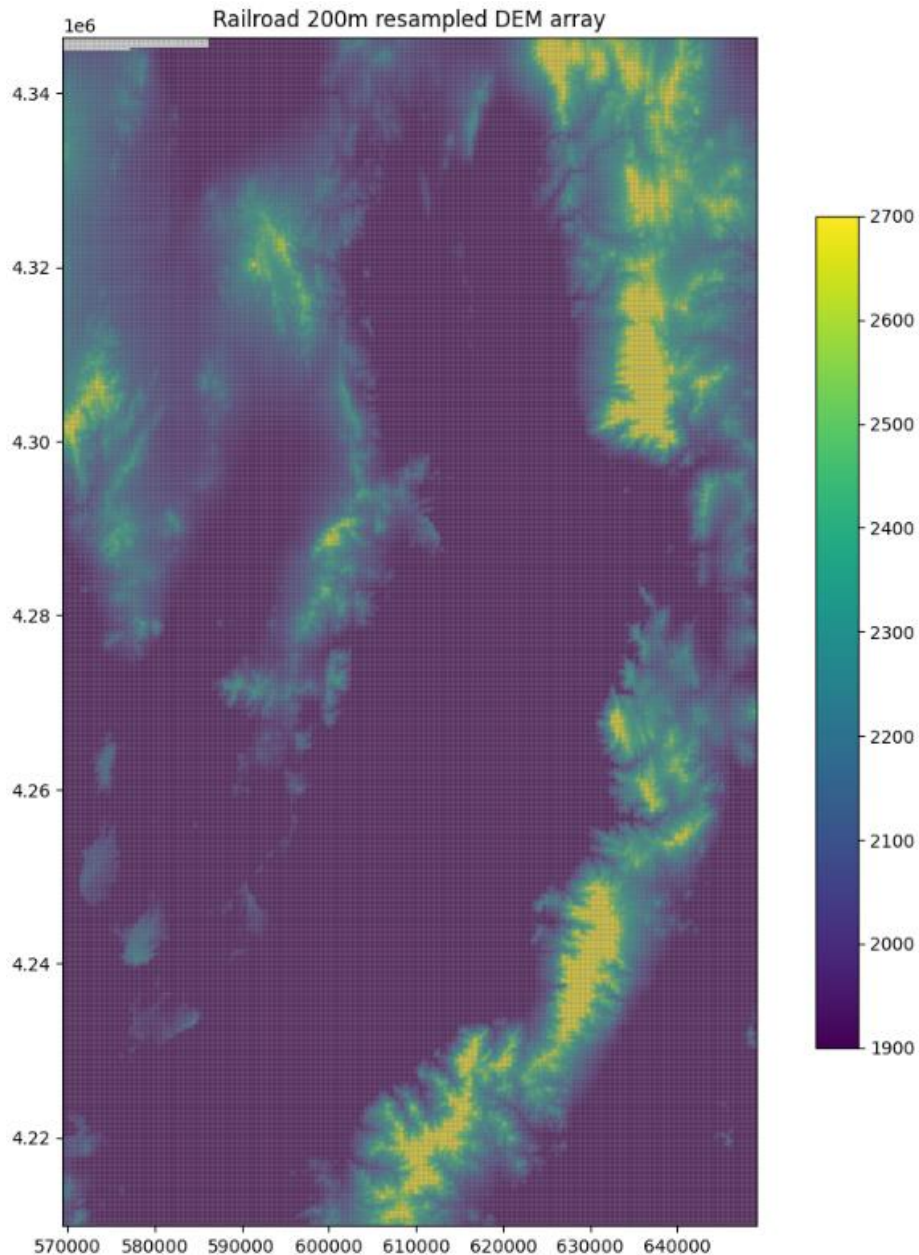
**Compared to 2013, 2015, and 2017**

**NDWR Statewide Inventories**

**Database of annual pumping**

*including location & well construction*





Upscaled DEM to model grid print out from pyGSFLOW  
\* SSURGO - Natural Resources Conservation Service "Soil Survey Geographic Database"

# *Estimating Recharge*

## *PRMS modeling using pyGSFLOW*

workflow for efficient construction

### Accompanying Data Bin

- Hydrographic area (HA) boundaries
- Regional flow system boundaries
- \*SSURGO soils data
  - Available Water Capacity (AWC)
  - Saturated hydraulic conductivity ( $K_{sat}$ )
  - sand/silt/clay %
- Vegetation type and coverage (LANDFIRE)
- Impervious cover

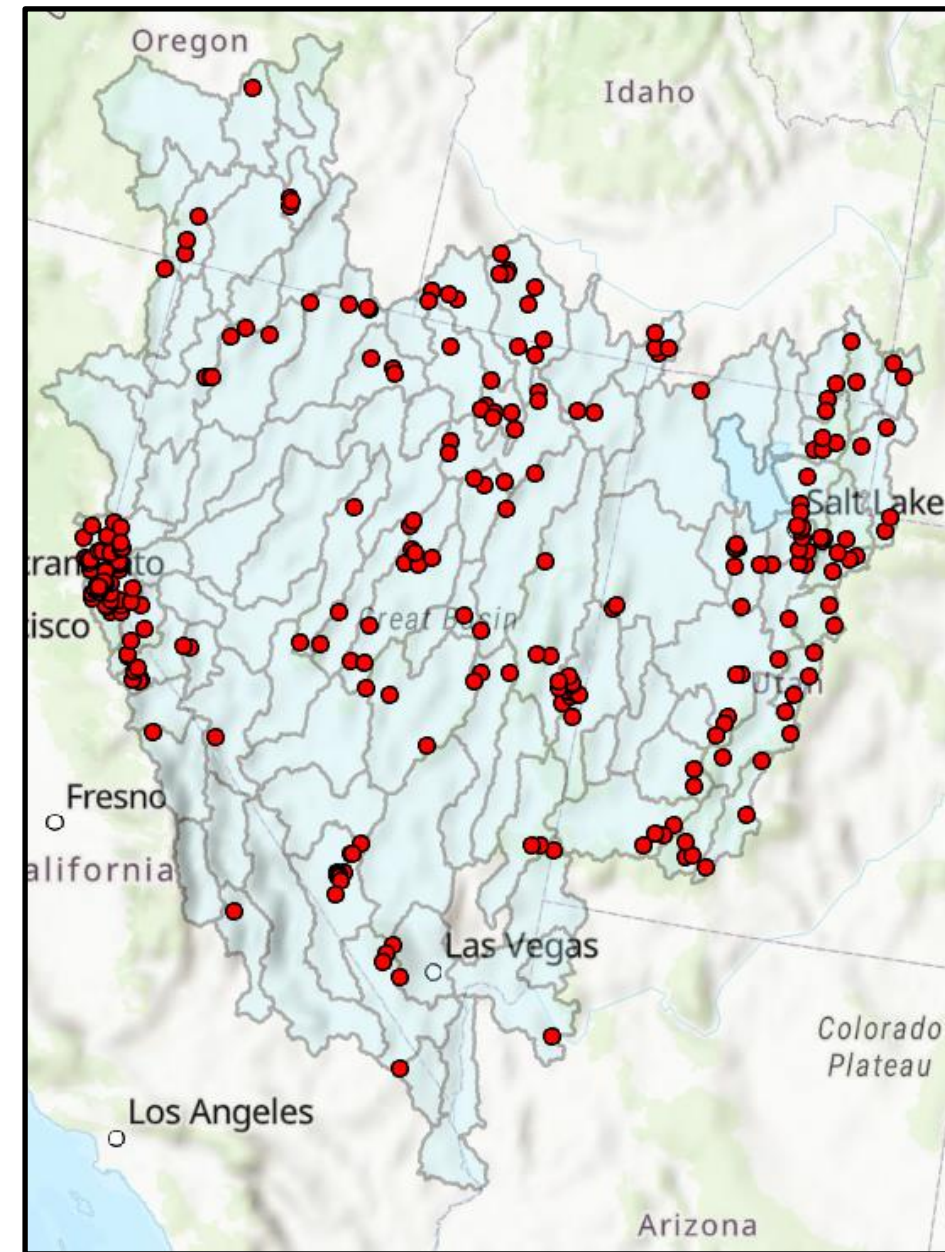
# *Estimating Recharge*

Streamflow compiled, PRMS calibration

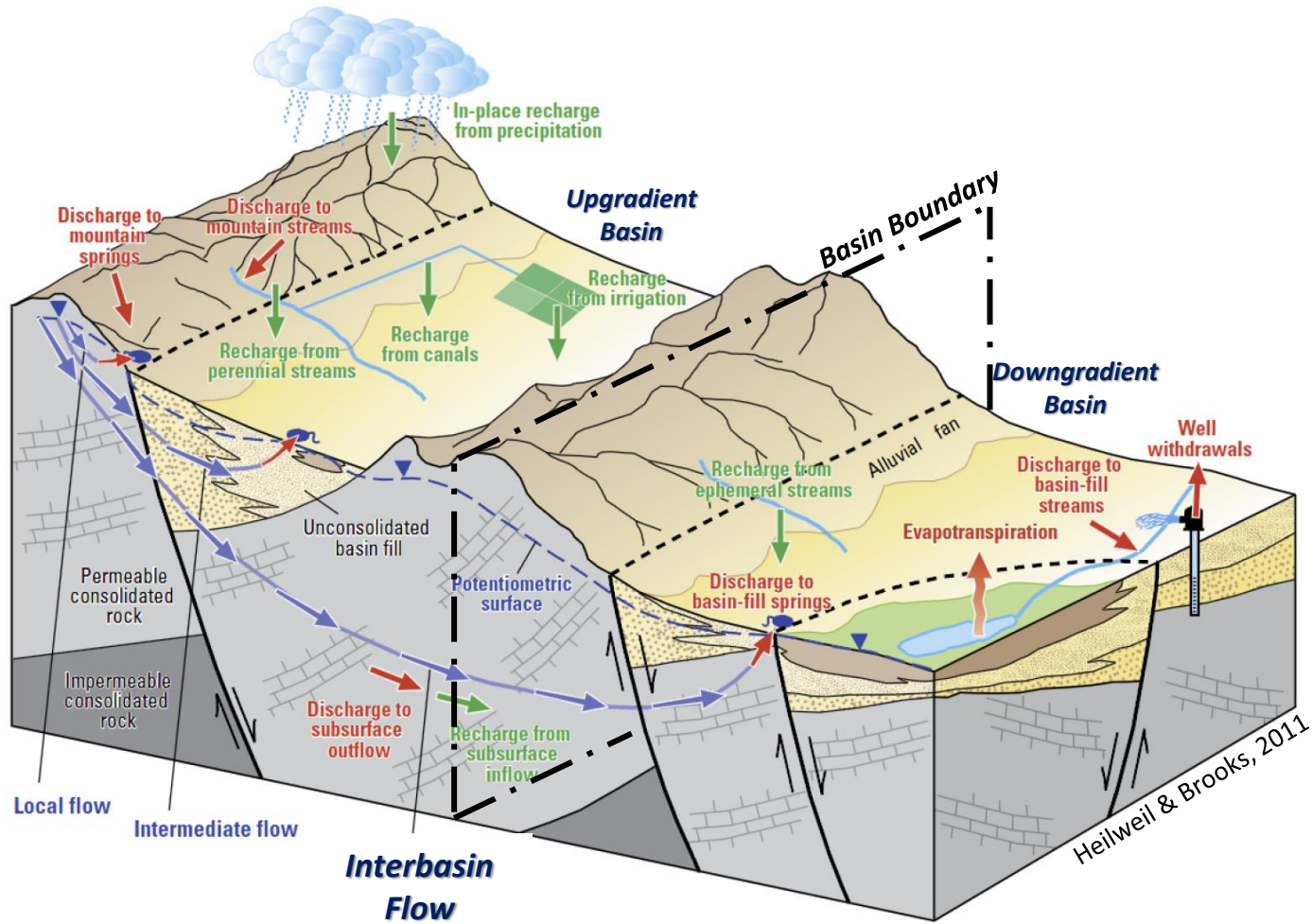
- > 200 sites
- Mountain front, above diversion

Empirical model assessment

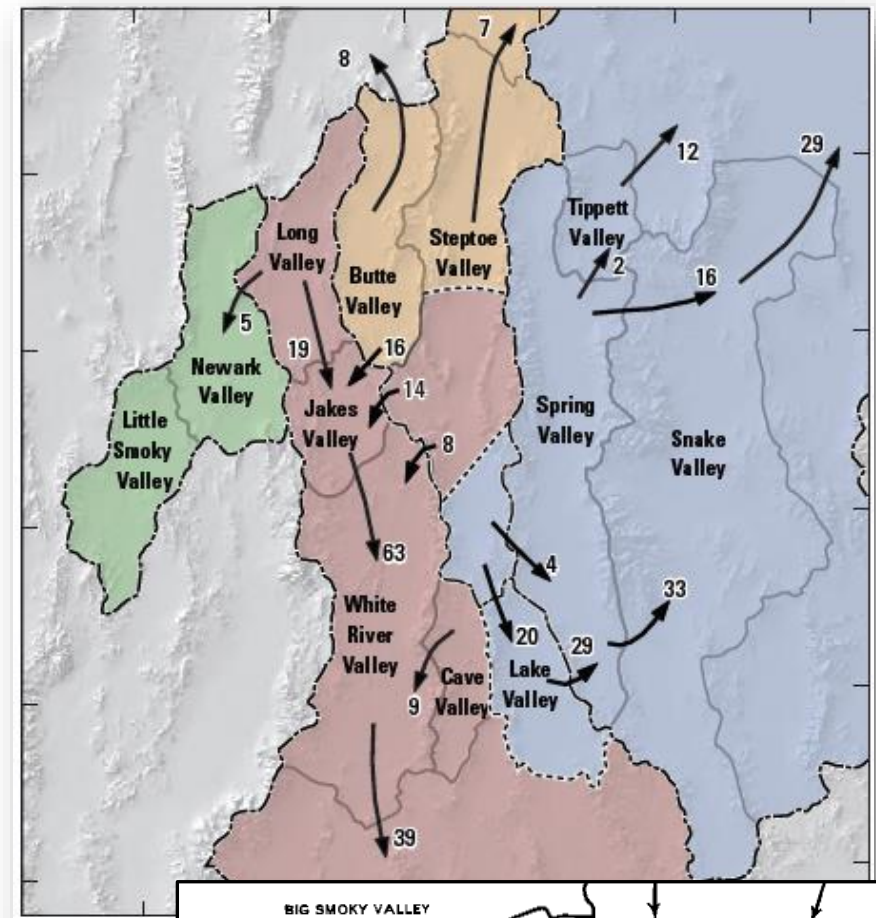
- Delineate watershed boundaries
  - Extract watershed hydrologic / geologic information
  - Create watershed database
  - Examine relationships
    - *Precipitation*
    - $ET_o - Precipitation$
    - *Hydrogeology*
- } vs. *streamflow*



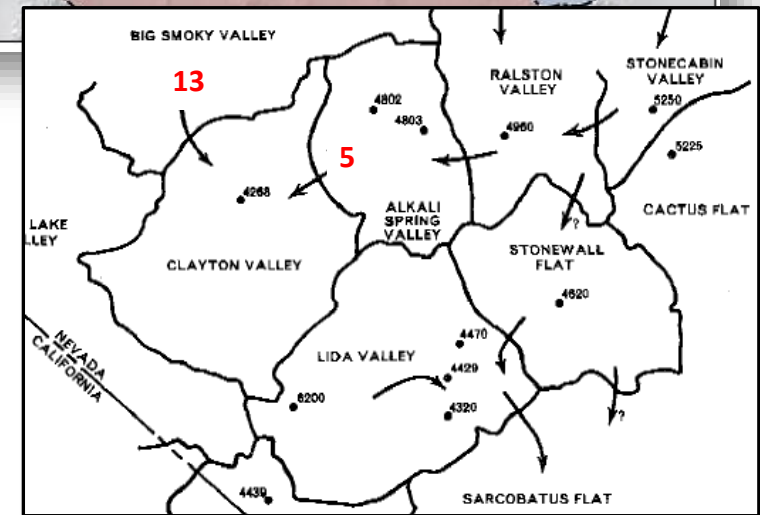
# Interbasin Flows



Heilweil & Brooks, 2011



Weich and others, 2007



Rush, 1968

\*interbasin flow estimates in figures on the right are 1,000s of Acre-feet per year

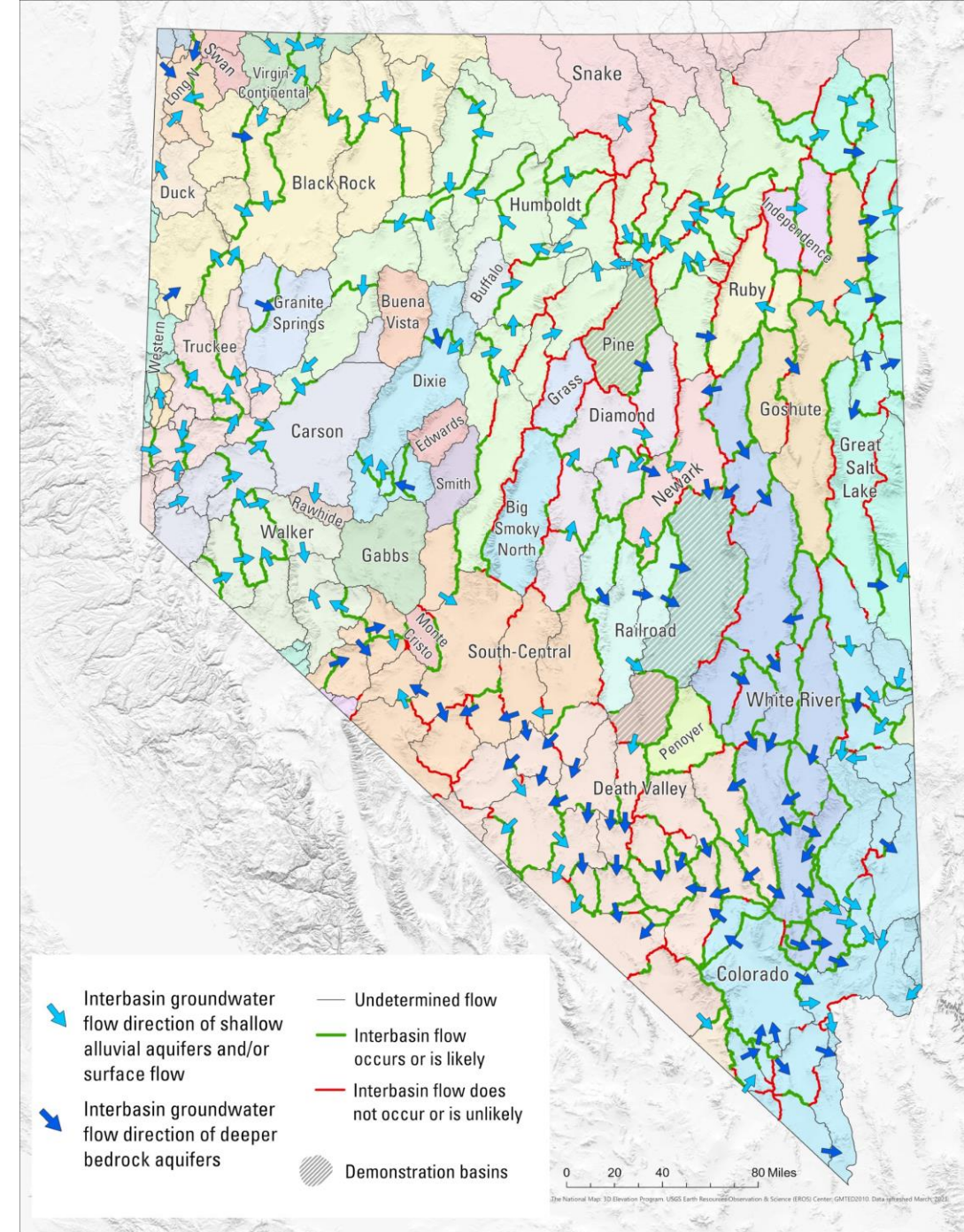
# Interbasin Flows

## Building an *Interbasin Flow Database*

- Summary of existing estimates including
  - Methods (budget imbalance, Darcy estimate?)
  - References

## New estimates for *Pine & Railroad*

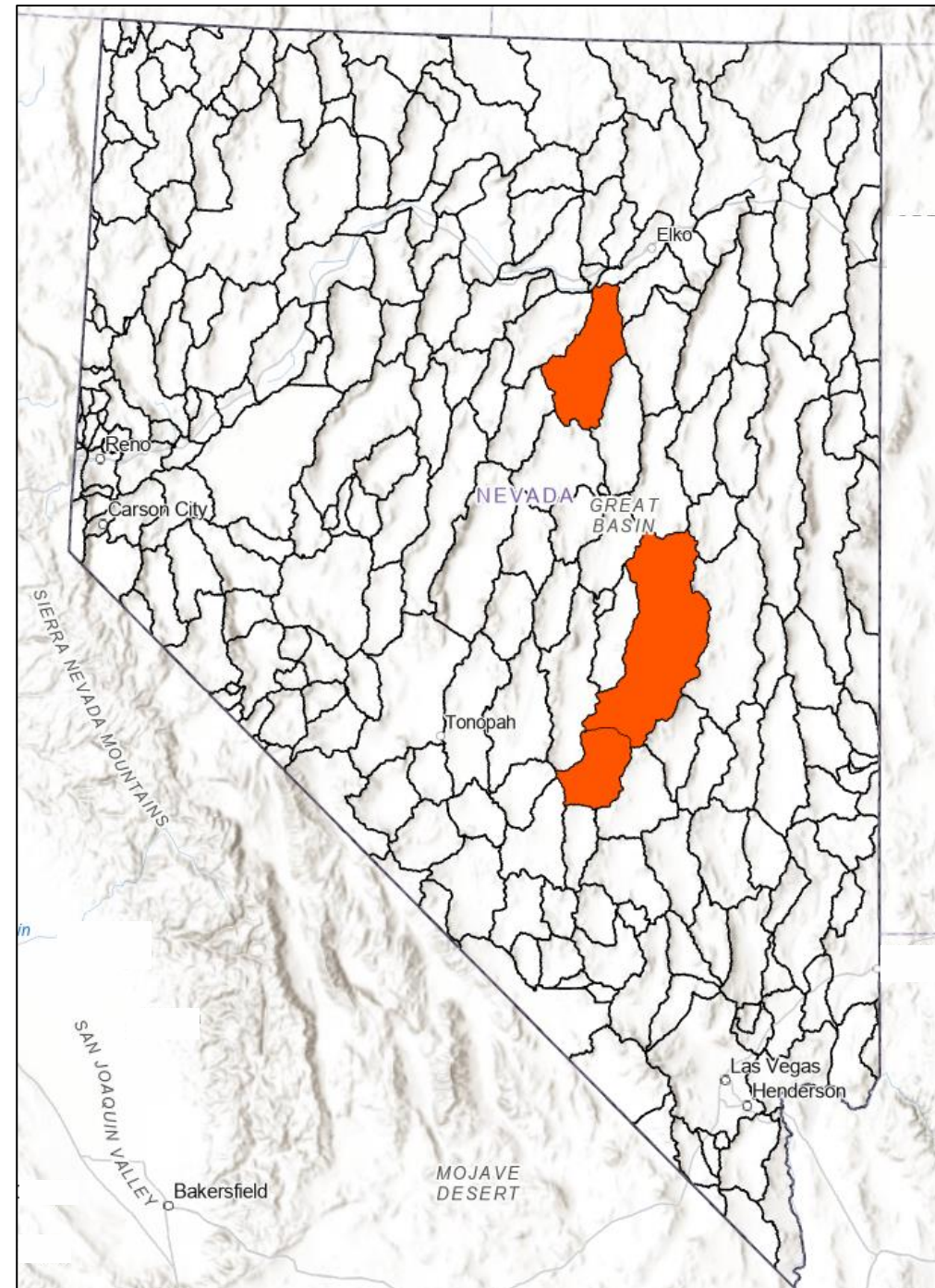
- New (*existing*) hydrologic data / aquifer tests
- New (*existing*) geologic / geophysical data
- Updated groundwater budget information
- Isotopic geochemical tracers
  - *Independent & supporting evidence*
  - *Ages, flow velocity*
  - *Connected groundwater flow paths*





# *Demonstration Basins*

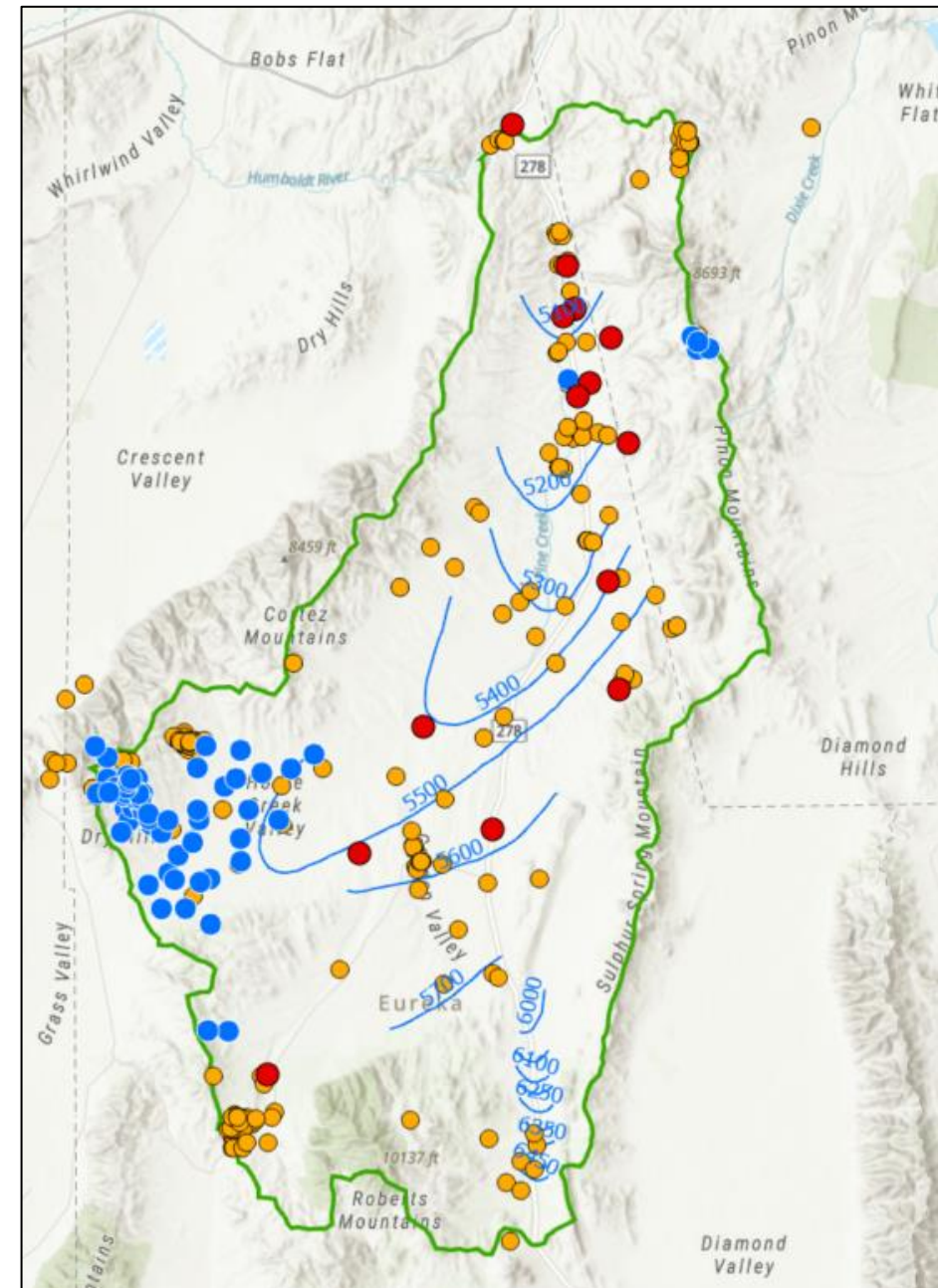
- Pine Valley
  - Reconnaissance Series Report No. 2  
*(Eakin, 1960)*
- Railroad Valley
  - Reconnaissance Series Report No. 60  
*(Van Denburgh & Rush, 1974)*



# Pine Valley

## Well & water-level reconnaissance

- 381 wells identified in / near Pine Valley
- 72 Active NDWR and NV Gold Mines
- Established well network for repeated measurements to (water-level trends)



Water-level contours from Lopes and others, 2006

# Pine Valley

## ● 3 OTT Pluvio heated weighing precip. gages

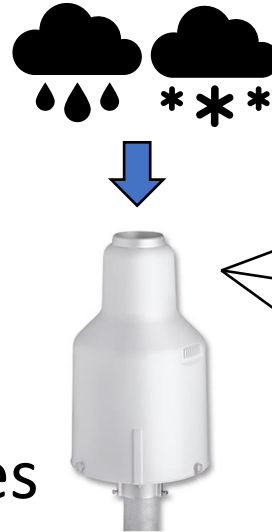
- WEST: Cortez Mountains 9,000'
- SOUTH: Roberts Mountain 7,000'
- EAST: Pinon Mountains 8,600'

## ● 5 Nova Lynx bulk precip. gages

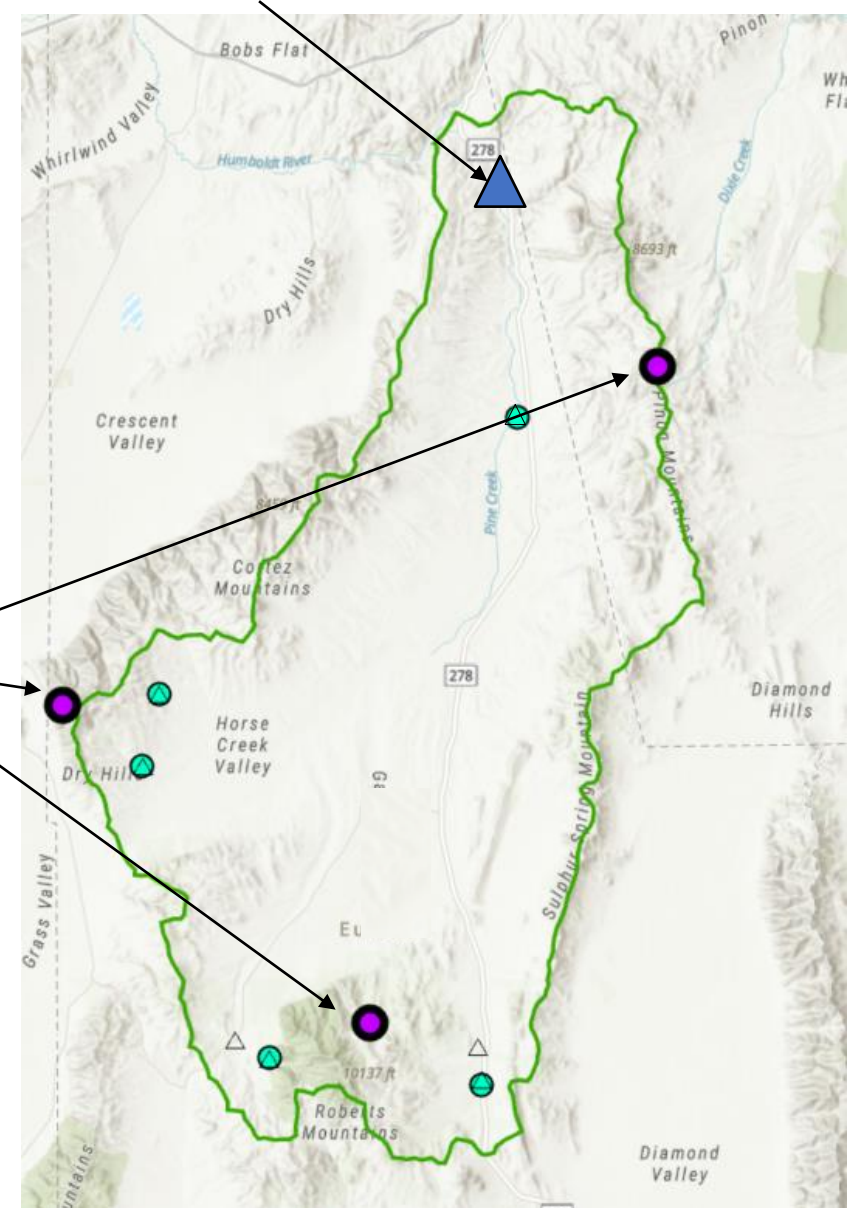
- (quarterly measurements)

## ▲ Reactivated Pine Creek at Palisades continuous streamgage

## △ 7 active USGS SW gages in Pine Valley



## Pine Creek at Palisades



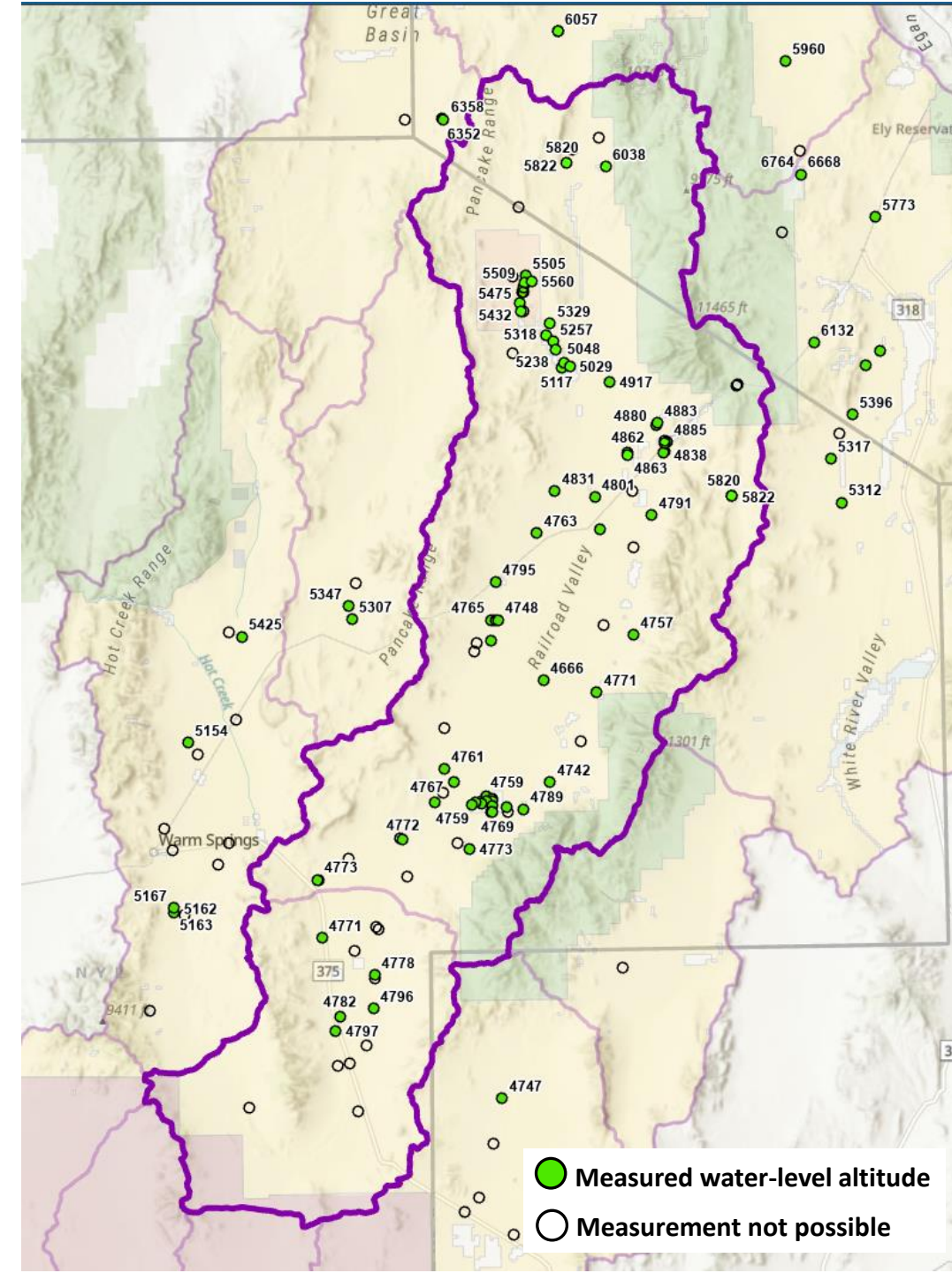
# *Railroad Valley*

Well & water-level reconnaissance

177 wells visited and inventoried








117 water levels measured

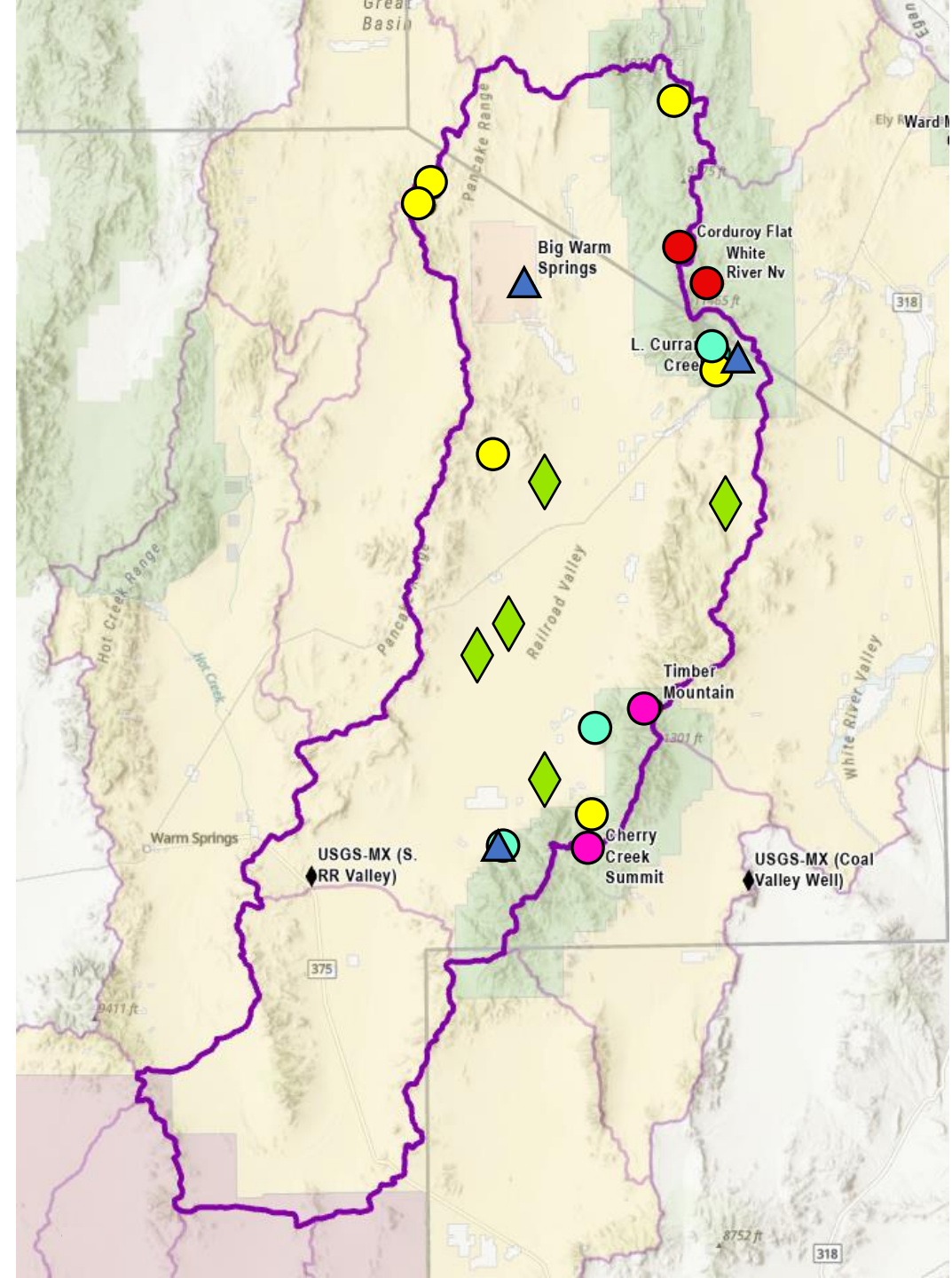
*Many new wells since Reconnaissance Report 60, 1974*



# *Railroad Valley*

## USGS Installations:

-  2x Weighing precip gages
-  6x Bulk precip gages
-  3x Continuous stream gages
-  3x Flow trail cameras
-  5x Continuous GW pressure transducer
  
-  NRCS Snolite  
Corduroy Flat upgrade
  
-  Existing USGS Long-term groundwater levels



# *Planned Products & Publications*

- *Pumping*

- *Statewide pumping database*

- *Recharge*

- *USGS report including recharge literature review, empirical model analysis, & PRMS model documentation*
- *PRMS data bin and flow-system models (Pine & Railroad Valleys)*

- *Interbasin Groundwater Flow*

- *Summary report describing methods evaluation & Demo basin updates*
- *Interbasin flow database*

- *Demonstration Basins (Pine & Railroad Valleys)*

- *Two USGS reports summarizing conceptual model updates & with updates groundwater flow budgets*