



Assessing the Impacts of Alternative Pumping Scenarios in Douglas County, NV

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Preliminary Notes

- Prepared in cooperation with the Carson Water Subconservancy District
- Available for free at:
<http://pubs.usgs.gov/sir/2012/5262/pdf/sir2012-5262.pdf>
- See me afterwards for a copy of the report (up to 10 available)

Approach

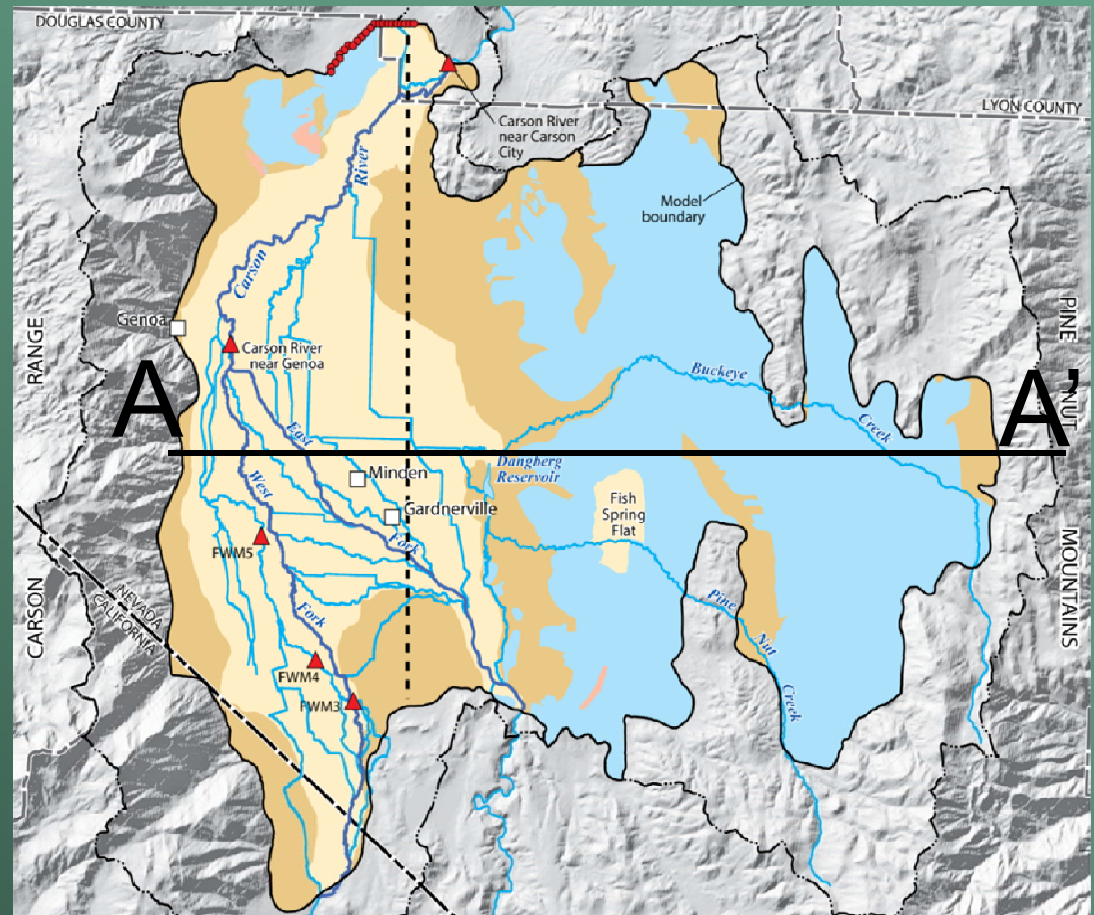
- Gather information about the groundwater system
 - Aquifer properties
 - Observations of the “state” of the aquifer
 - Compile the gathered data into a groundwater model
 - Calibrate the groundwater model
 - Simulate “scenarios” with the calibrated model
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What is 'modeling'?

- A model is a representation of the groundwater flow system in the environment
- The Carson Valley model is physically based
- Can be used to predict the effects resulting from hydrological changes
 - New or increased pumping
 - Changed in recharge resulting from changes in water use

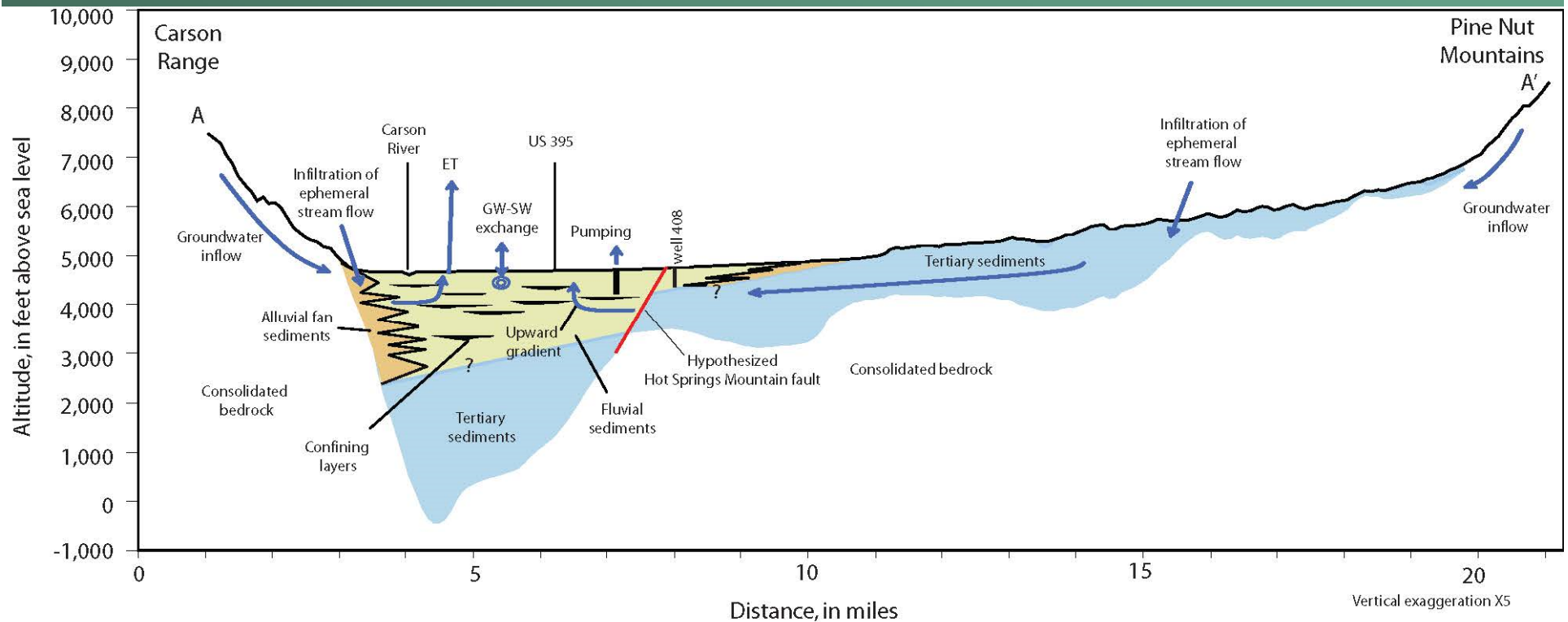
A Model for Carson Valley

- Aquifer geometry



A Model for Carson Valley

■ Aquifer geometry

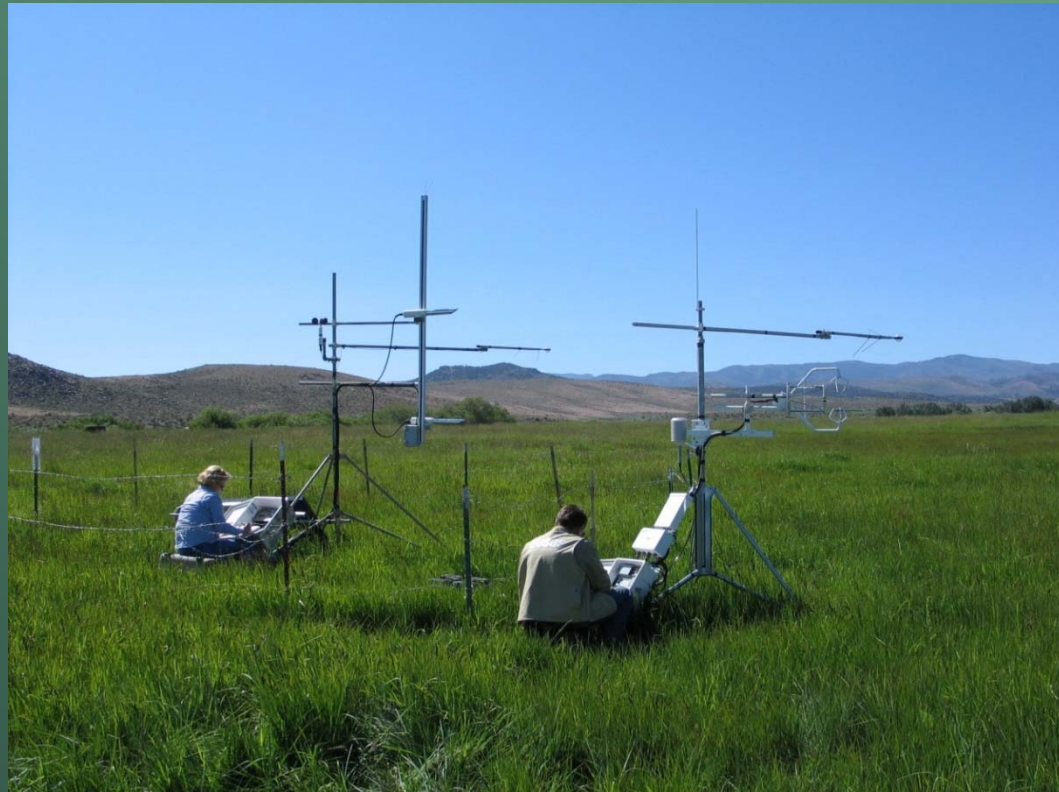


A Model for Carson Valley

- Includes over 20 years of data collection:
 - Precipitation (Douglas County, NRCS, NOAA)
 - Streamflow of Carson River and tributaries (USGS, Federal Water Master)
 - Groundwater levels (USGS)
 - Effluent imports (STPUD, DCSID, IVGID, MGSD, CC)

A Model for Carson Valley

- Data collection (continued): Consumptive Use (ET)



A Model for Carson Valley

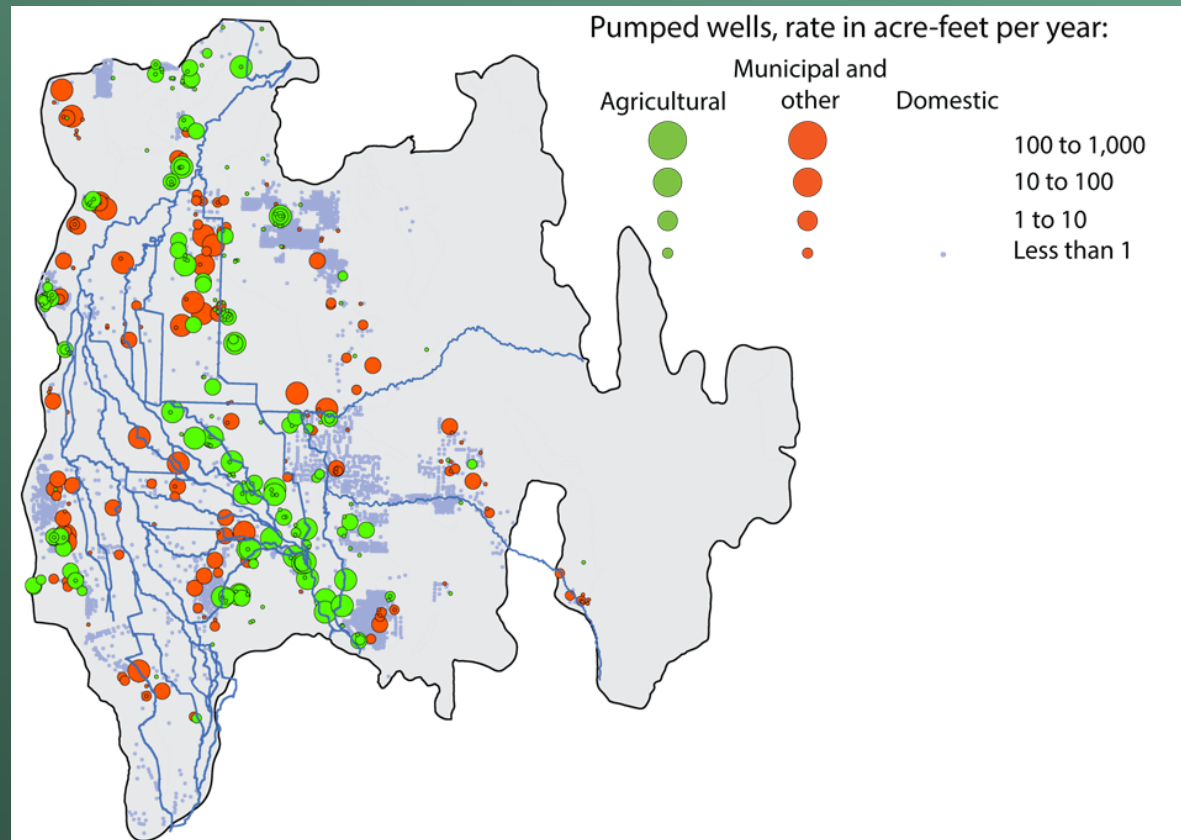
- Data collection (continued): Temperature fluctuation beneath ditches and the Carson River



Brockliss Slough

A Model for Carson Valley

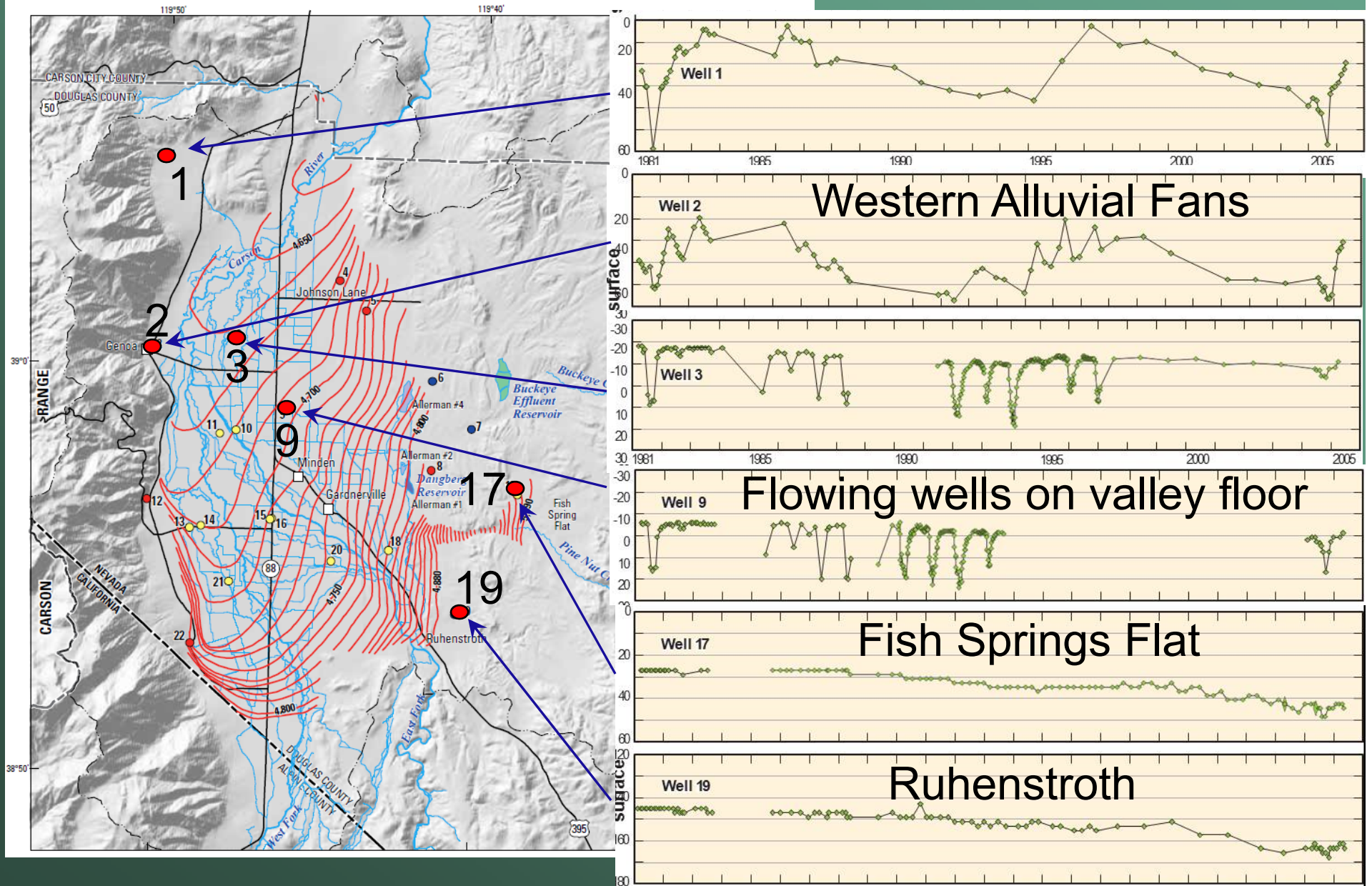
■ Groundwater pumping (NV Div. of Wat. Resources, USGS)



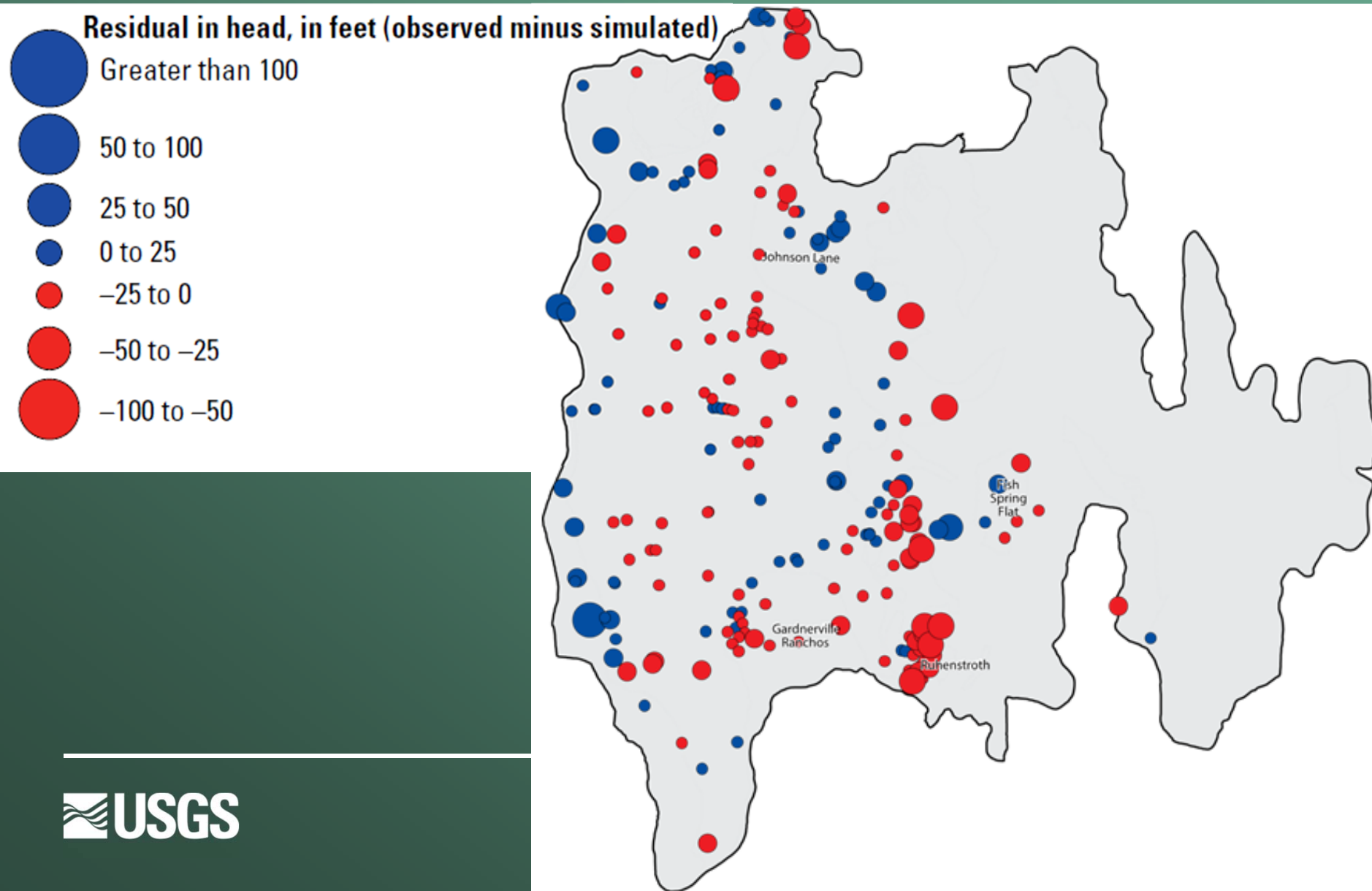
Model Calibration

- The processing of changing uncertain model parameters such that simulated quantities match observation of the system.
- Observations include:
 - Several gaging locations
 - Streamflows
 - Gaining and losing reaches
 - ~5,500 observations of groundwater head
 - 37 aquifer tests

Groundwater Elevation Data



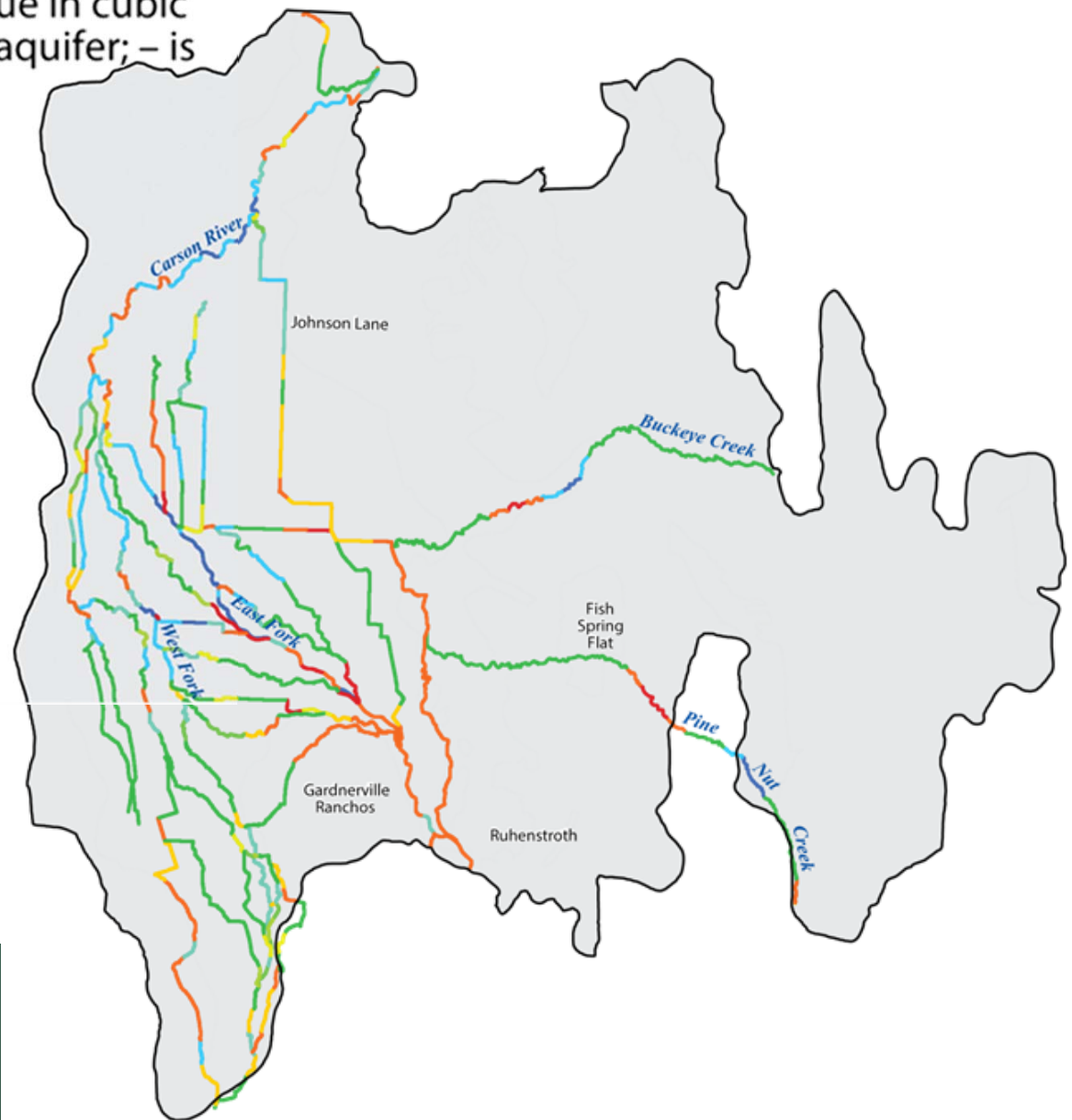
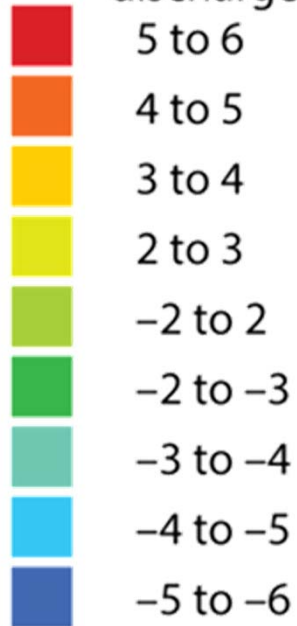
Evaluate Model Results – Groundwater Heads



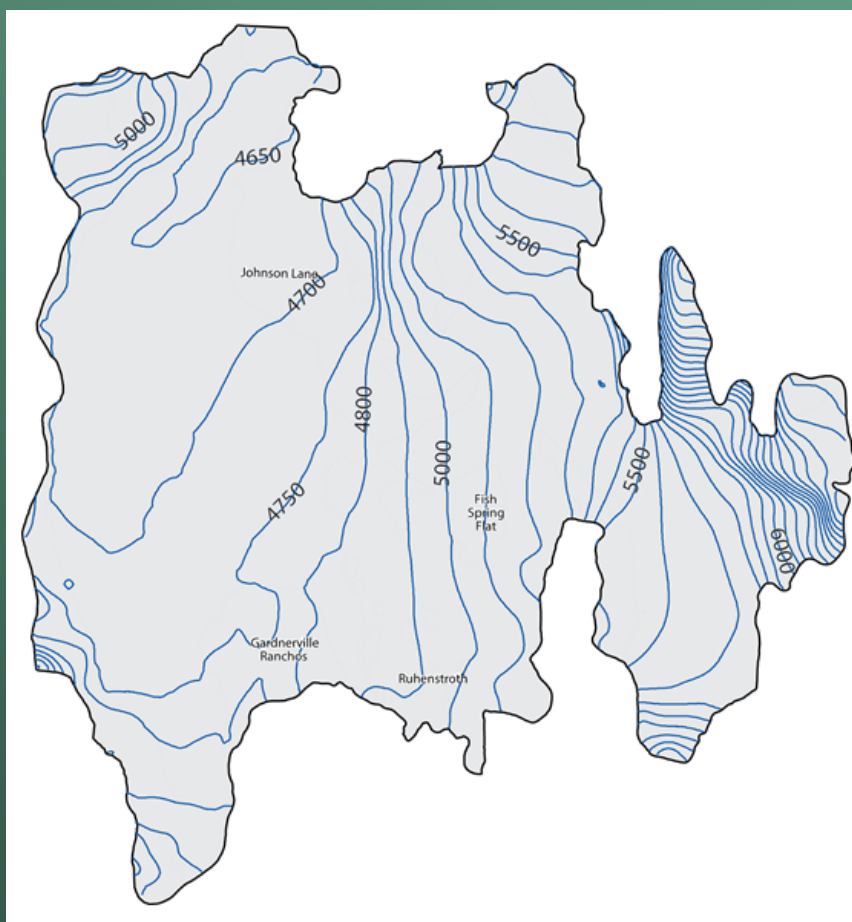
Evaluate Model Results – Streamflow Gain/Loss

EXPLANATION

Surface-water exchange; Log value in cubic feet per day (+ is infiltration to aquifer; – is discharge to stream)



Evaluate Model Results – Head Distribution

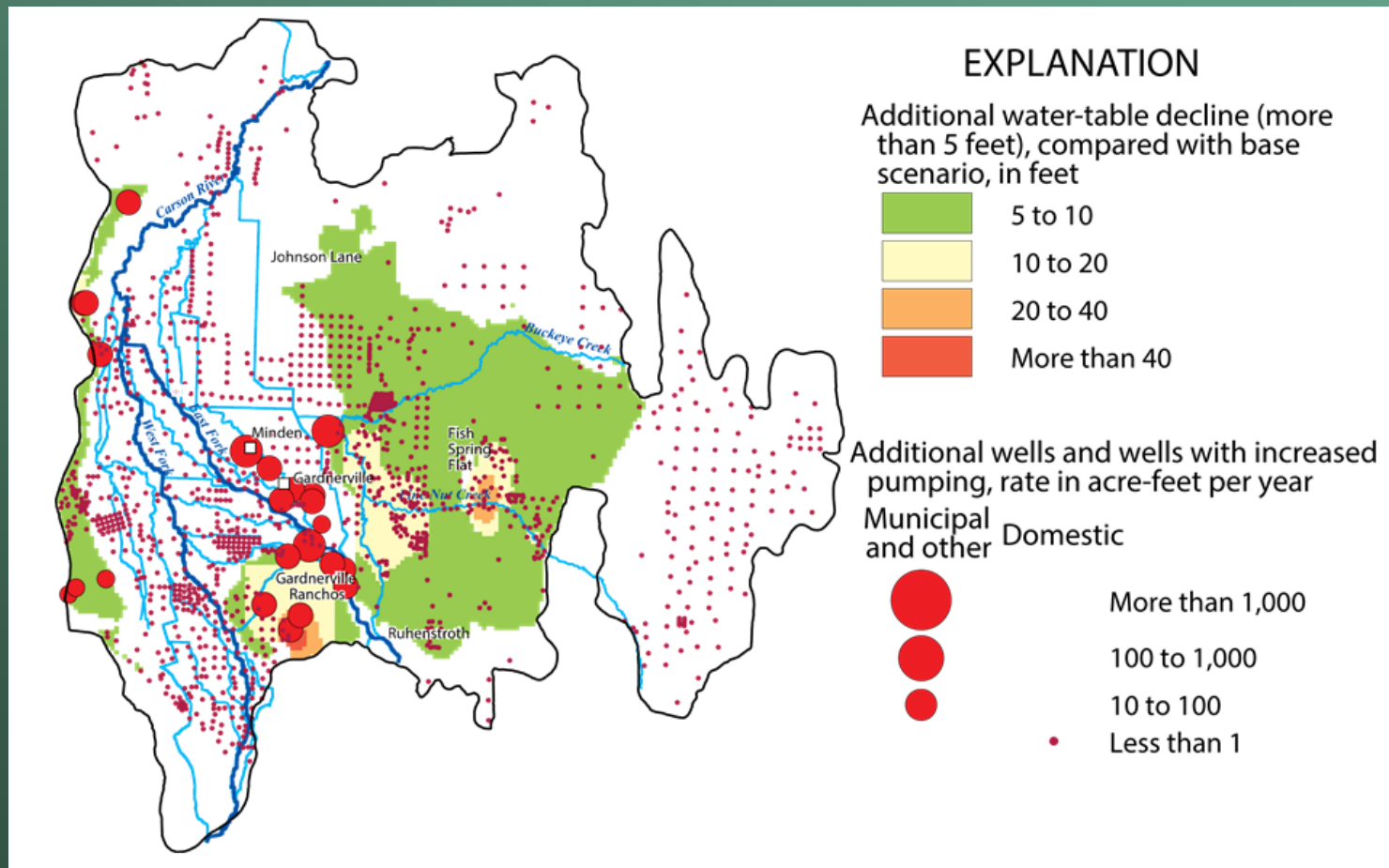


Application of Calibrated Model

- **Five 55-year projection simulations (WY2005-2060):**
 - Base case: 2005 municipal pumping (~9,000 ac-ft/yr) and surface-water irrigation repeated
 - Scenario 1: Municipal pumping increased to 22,000 ac-ft/yr
 - Scenario 2A: Municipal pumping increased to 33,000 ac-ft/yr
 - Scenario 2B: Municipal pumping increased to 35,000 ac-ft/yr and in year 2020, pumpage from 2,042 domestic wells shifted to 6 municipal wells
 - Scenario 3: Same as 2A, with 3,700 irrigated acres retired

Simulated Response – Scenario 1

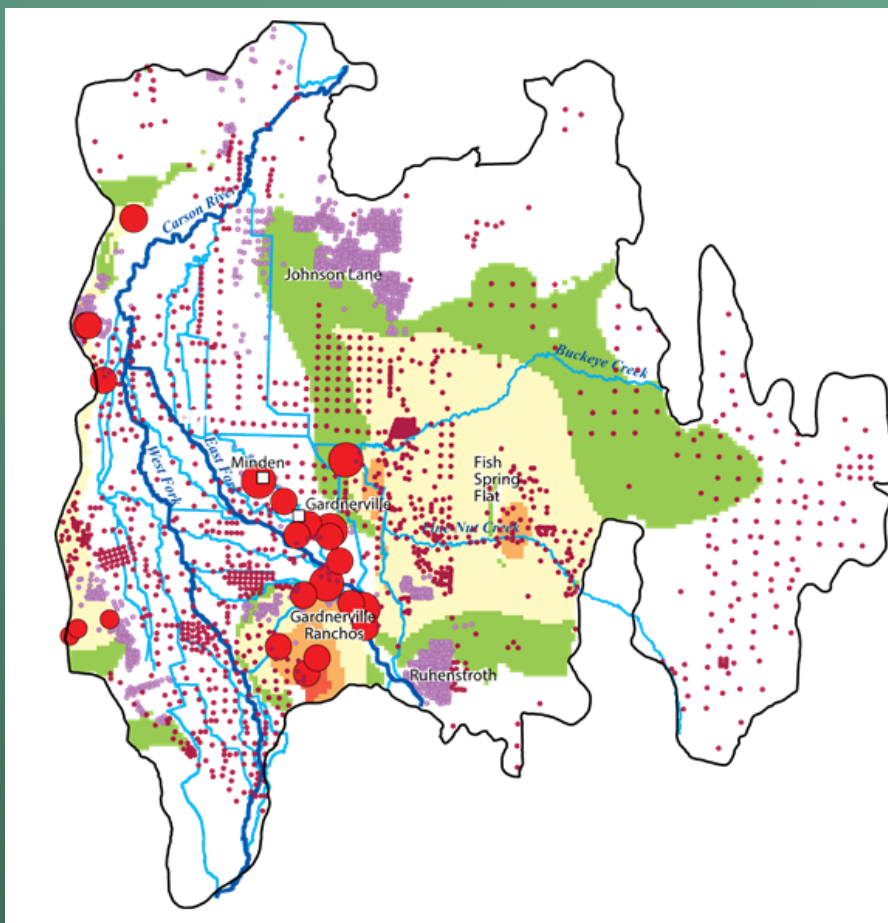
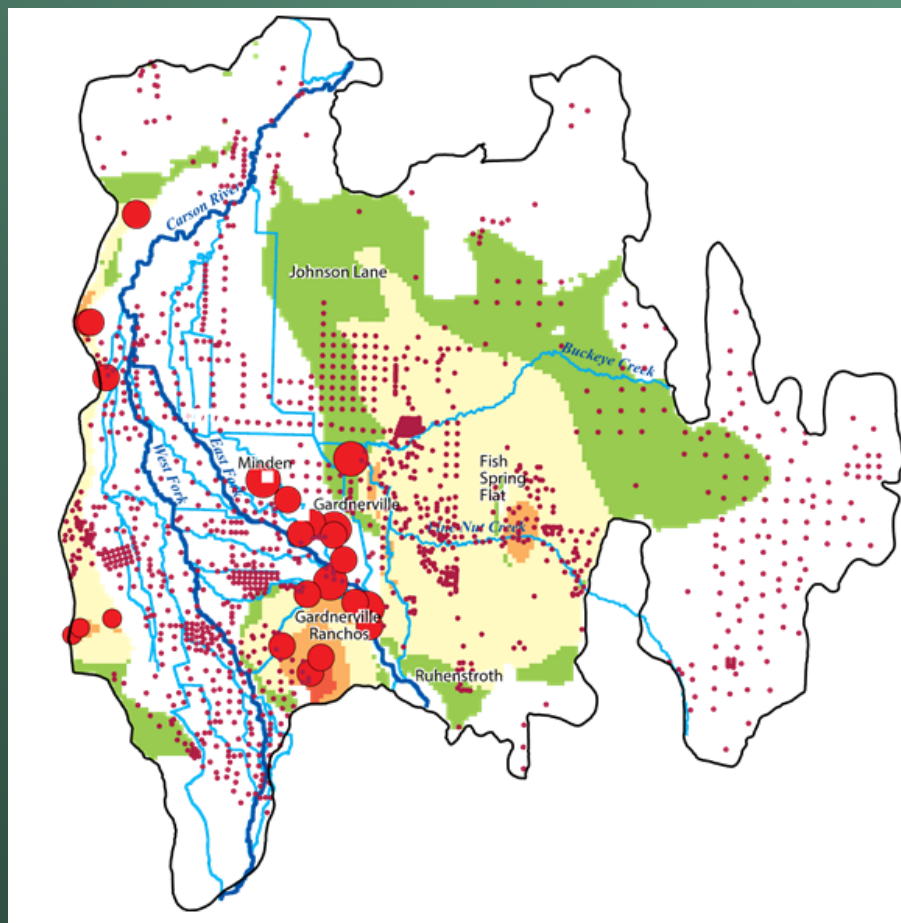
Municipal pumping increased from 9,000 to 22,000 ac·ft/yr



Simulated Response – Scenarios 2A & 2B

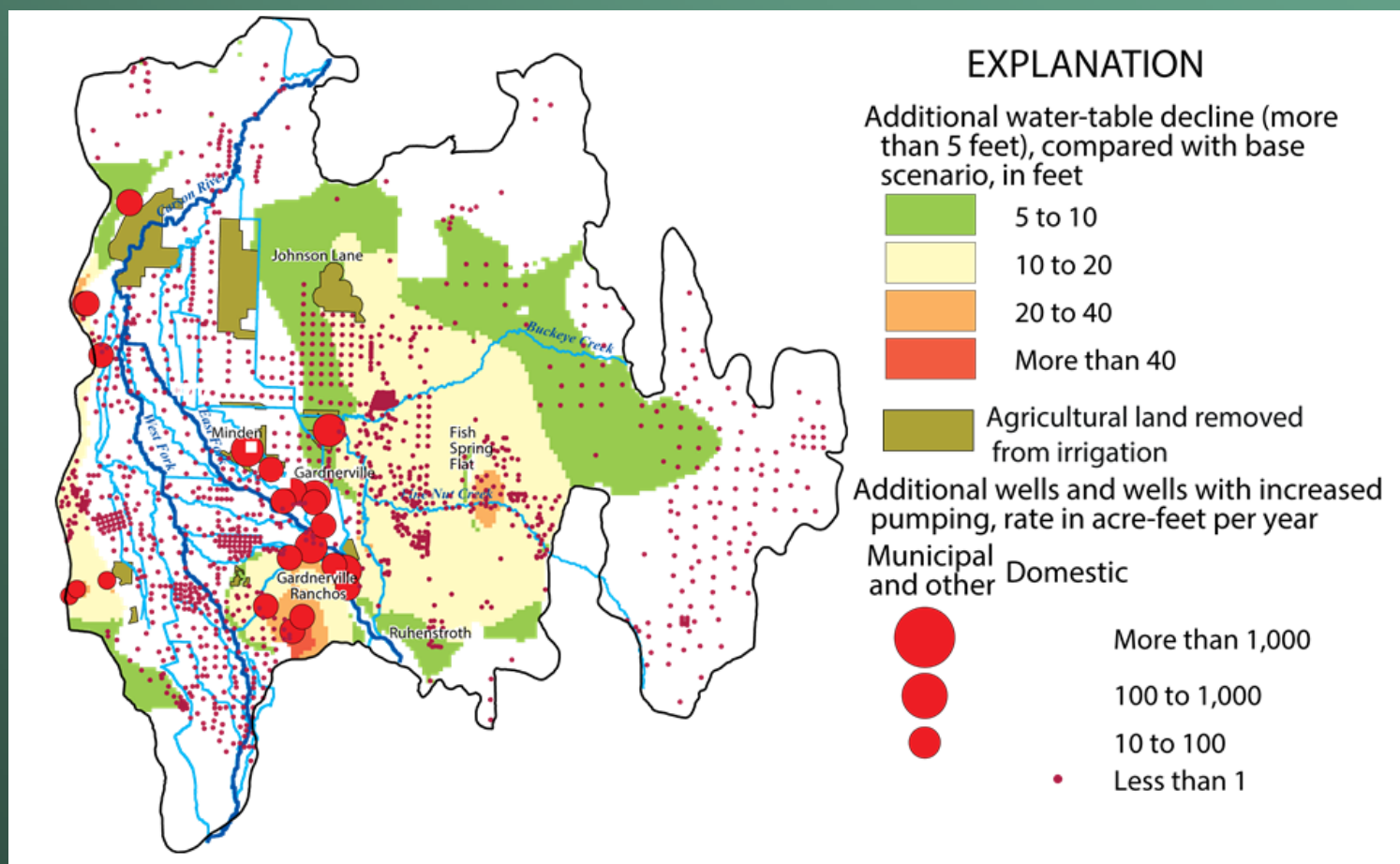
2A: Municipal pumping increased from 9,000 to 33,000 ac-ft/yr

2B: Municipal pumping 35,000 ac ·ft/yr & 2,042 domestic well converted



Simulated Response – Scenario 3

Municipal pumping increased from 9,000 to 22,000 ac-ft/yr and 3,700 irrigated acres retired



Summary

- Predicted decrease in Carson River flow:
 - Scenario 1 9,600 ac-ft/yr
 - Scenario 2A 16,300 ac-ft/yr
 - Scenario 2B 16,500 ac-ft/yr
 - Scenario 3 6,500 ac-ft/yr
 - Predicted decreases in Carson River flows is offset as land is removed from irrigation
 - Timing of declines is 'worst case' because pumping is increased all at once
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What Next?

- Add existing wells to groundwater monitoring network concentrating on areas of predicted drawdown.
 - Continue monitoring and tracking changes in land and water use.
 - Better aquifer characterization in areas where data is lacking (tertiary sediments).
 - Water quantity is only the first half of the story, water quality is the other, equally as important, half.
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