Sacramento Pass, Nevada

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|--|----------|
| > Introduction                                       | 0900 PDT |
| ➤ Stop 1 – Cueva de Villa Luz                        | 0905 PDT |
| ➤ Stop 2 – Frasassi Caves                            | 0930 PDT |
| ➤ Stop 3 – Carlsbad Cavern                           | 0955 PDT |
| ➤ Stop 4 – Lechuguilla Cave                          | 1015 PDT |
| Stop 5 – Sacramento Pass<br>Don Sweetkind, Doug Powe | 1035 PDT |
|  |          |
| ➤ Break/Intermission                                 | 1055 PDT |
| ➤ Stop 6 – Lehman Caves                              | 1105 PDT |
| ➤ Break/Intermission                                 | 1245 PDT |
| ➤ Stop 7 — Burial Cave                               | 1255 PDT |
| ➤ Stop 8 – Crystal Ball Cave                         | 1305 PDT |
| ➤ Stop 9 - Pescio Cave                               | 1315 PDT |
| ➤ Stop 10 – Discovery Cave                           | 1325 PDT |
| ➤ Stop 11 – Old Mans Cave                            | 1335 PDT |
| Summary and questions                                | 1345 PDT |

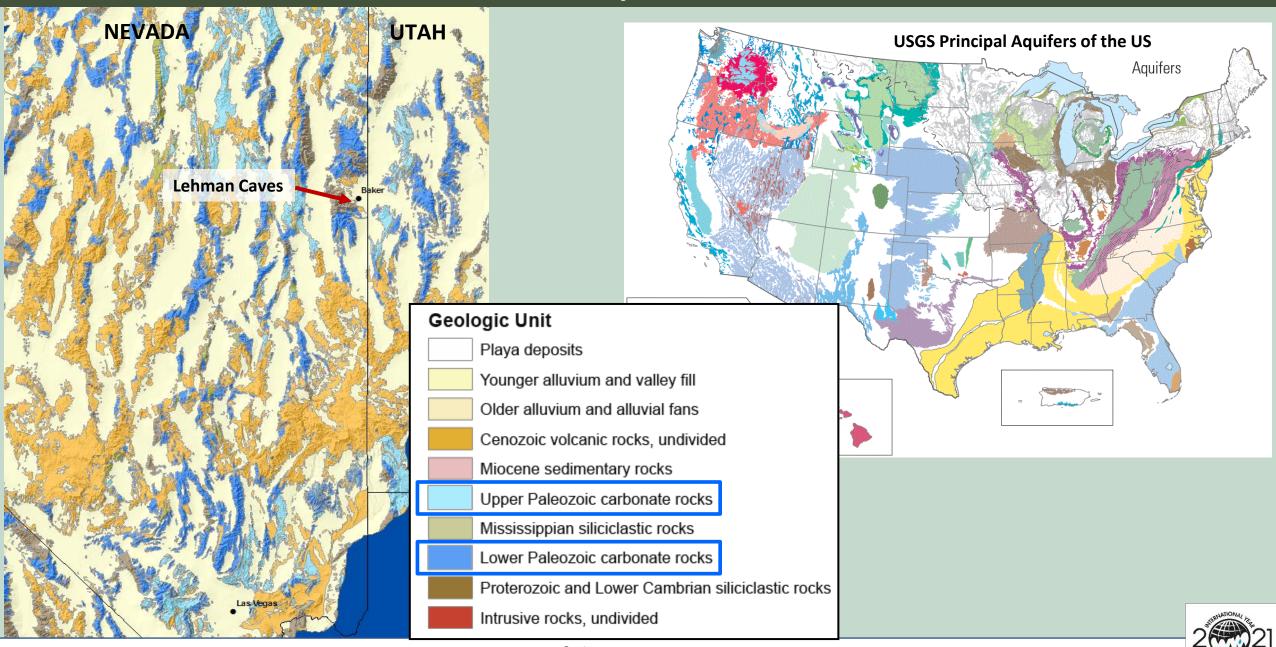




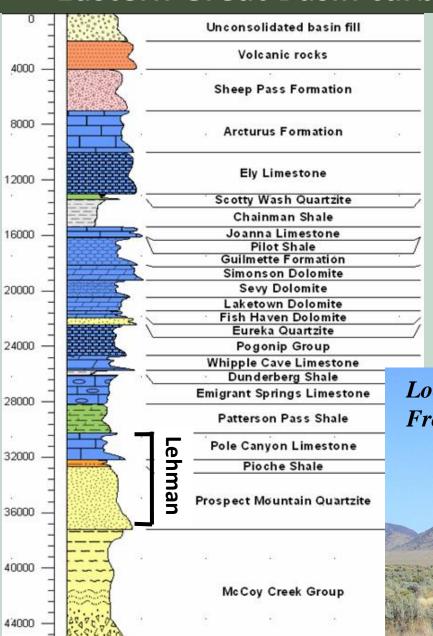




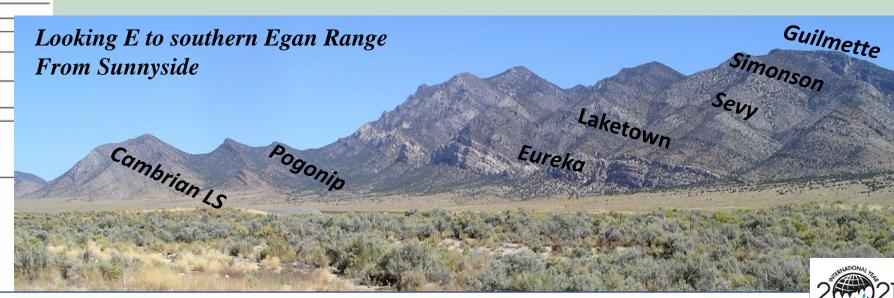
#### Eastern Great Basin carbonate-rock province



#### **Eastern Great Basin carbonate-rock province**



- In eastern Great Basin, Paleozoic carbonate rocks are many thousands of feet thick
- Lehman Caves area exposes the lowest
  Cambrian part of the carbonate-rock section

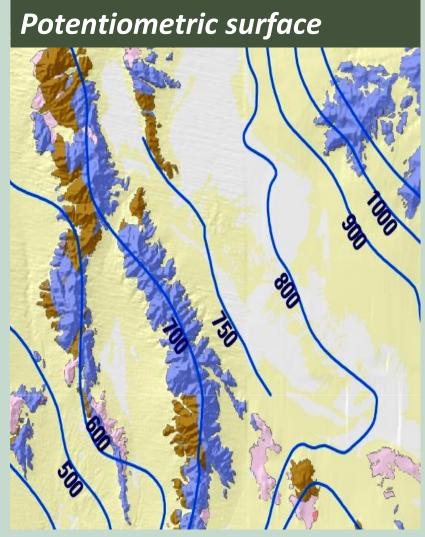


# "Many of the desert springs in southern Nevada derive their flow from distant recharge areas rather than from nearby rainfall."

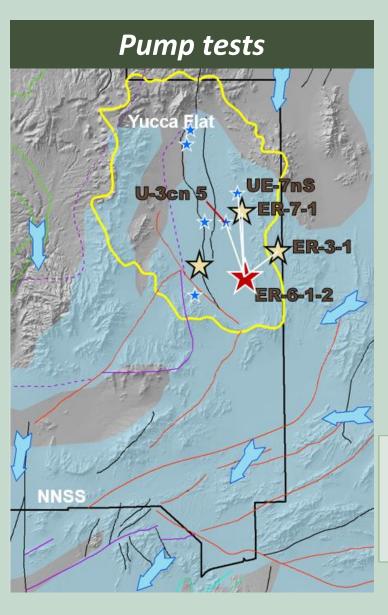
W.C. Mendenhall (1909) Some desert watering places in southeastern California and southwestern Nevada U.S. Geological Survey Water-Supply Paper 224



#### Evidence for permeability in Paleozoic carbonate-rock aquifers



Harrill, 1965, Ground-water storage depletion in Pahrump Valley, Nevada-California, 1962-75 U.S. Geological Survey Water-Supply Paper 2279



**Contouring of regional potentiometric surface** 

#### **Evidence from springs**

- Elevated temperature
- Large volume, constant flow
- Chemistry
- Isotopes

**Pump tests** 

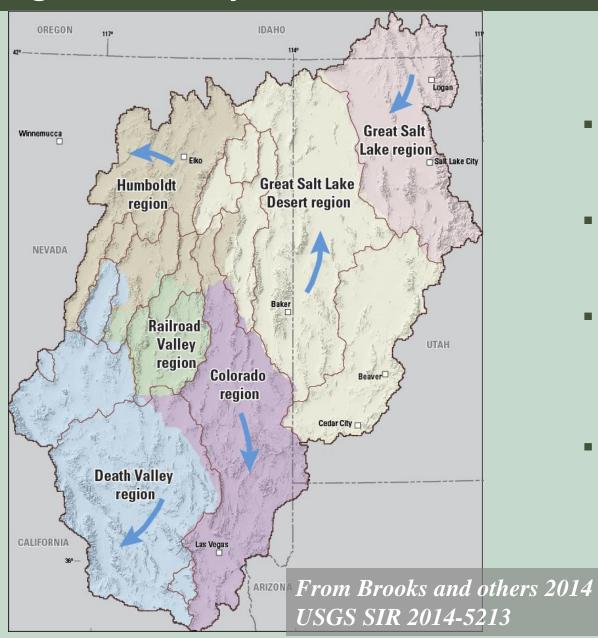
#### **Pumping at ER-6-1-2 at NNSS**

Large, immediate, and widespread response Responses noted miles away within hours of pumping

Two-feet of drawdown measured 8 miles away

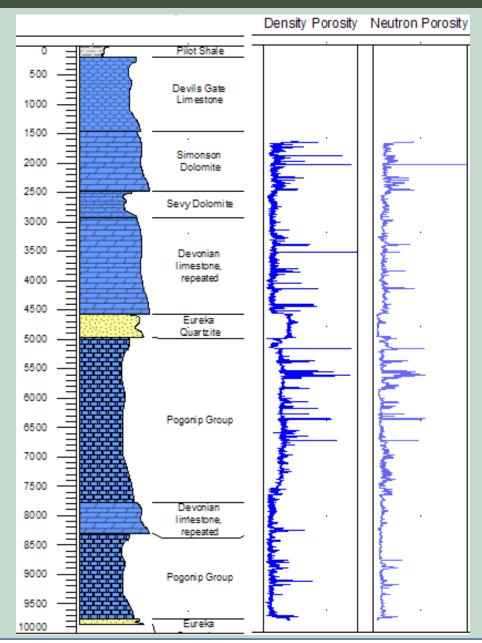


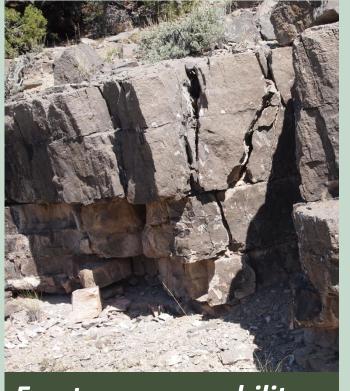
### Regional flow systems in Paleozoic carbonate-rock aquifers



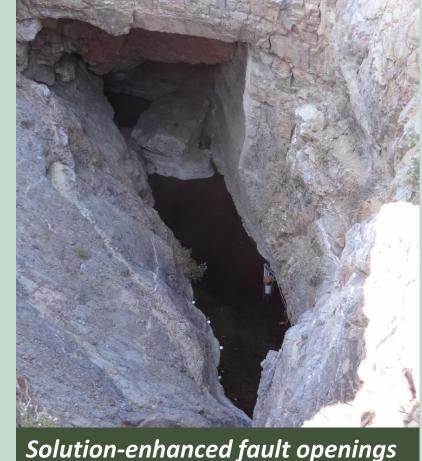
- Carbonate-rock province supports deep, regional flow
- Integrates recharge from numerous ranges and basins
- Broad regions of subsurface flow that connect recharge and discharge areas
- Variable degree of connection between regions

### Type of permeability in Paleozoic carbonate-rock aquifers





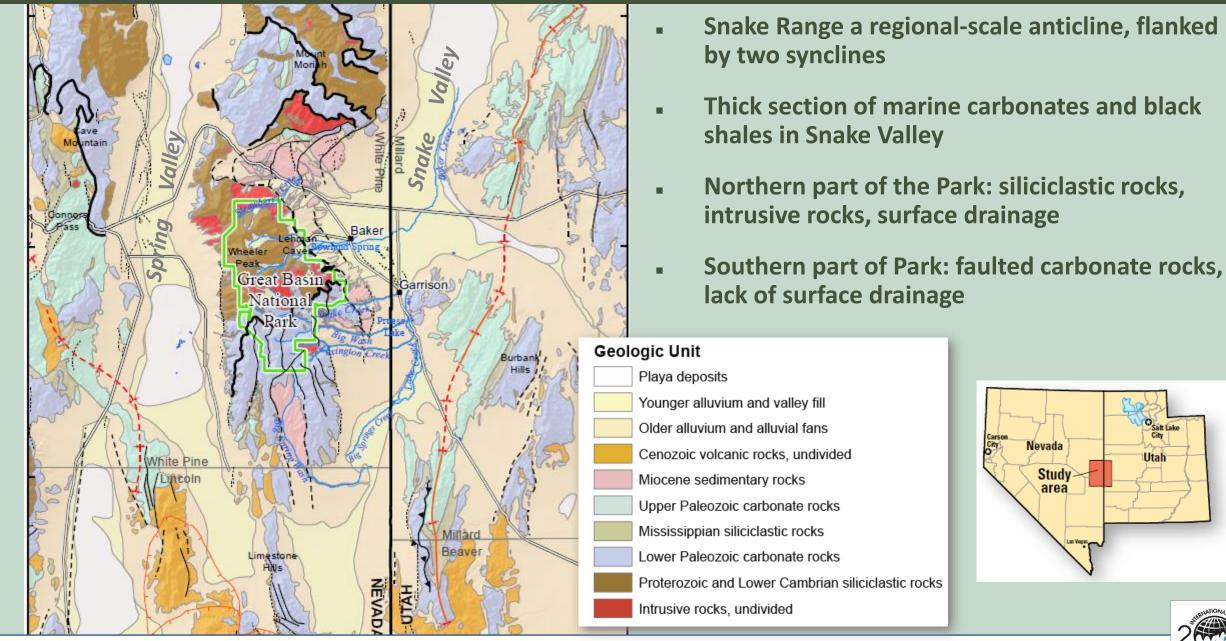
Fracture permeability



- Low matrix porosity
- Fracture-related permeability
- Multiple fractured formations
- Not much karst!



#### **Geologic setting of Great Basin National Park**

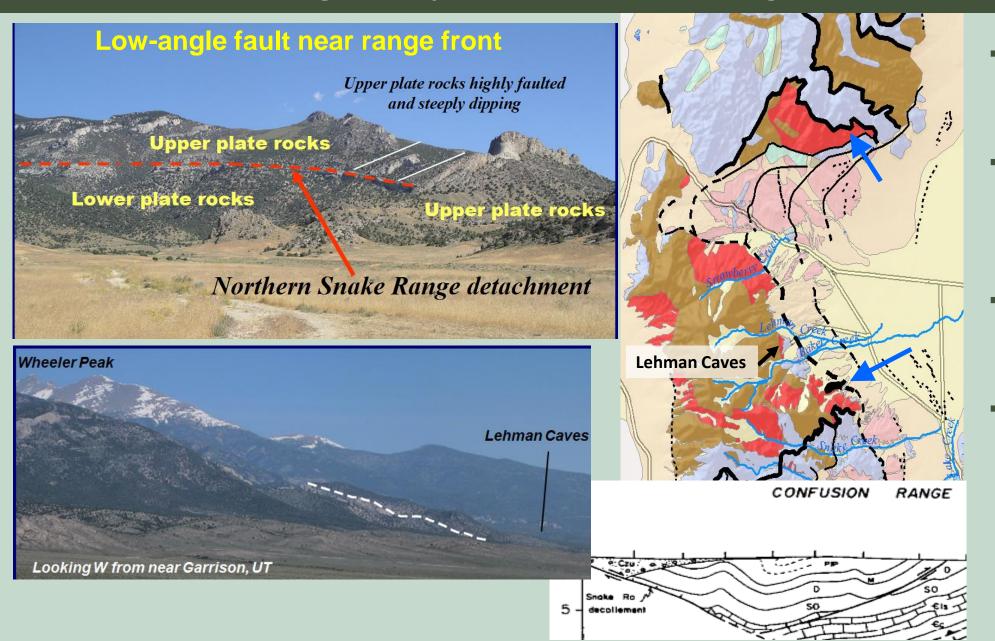






Hypogenic Caves of the Great Basin: Sacramento Pass

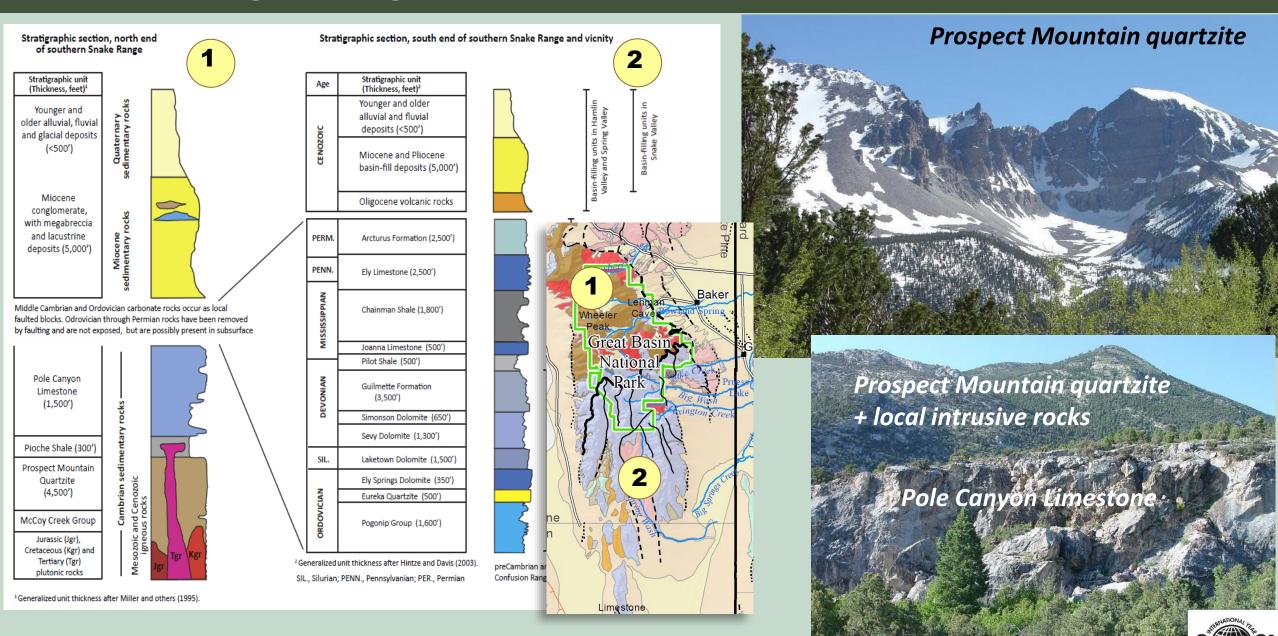
### Faulting and uplift of the Snake Range



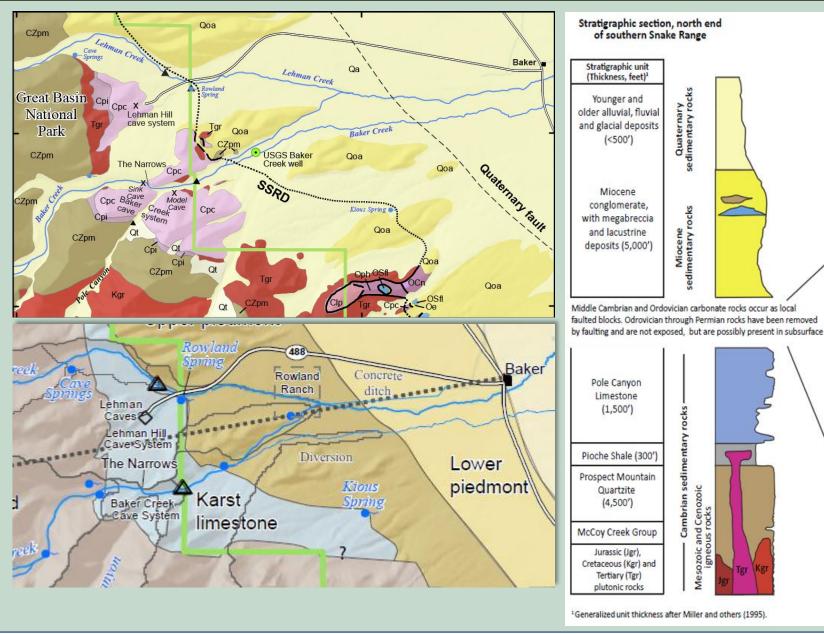
- Low-angle and highangle faults near range front
- Youngest intrusions are 36 Ma Young Canyon pluton, 28.5 Ma aplite
- Faulting causes considerable Miocene uplift of range block
- Footwall, lower-plate rocks (including Pole Canyon Limestone) are foliated and metamorphosed



#### **Geologic setting of Great Basin National Park**



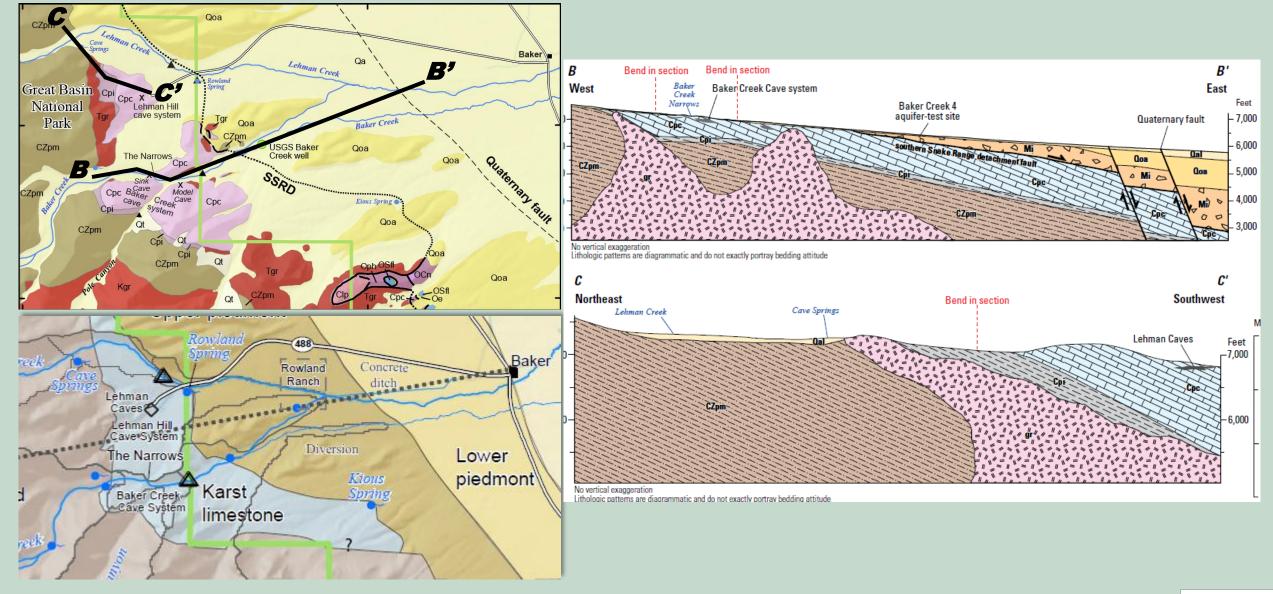
## **Geologic setting of Lehman Caves**



- Extensive cave development in Pole Canyon Limestone
- Subsurface extent of limestone is limited

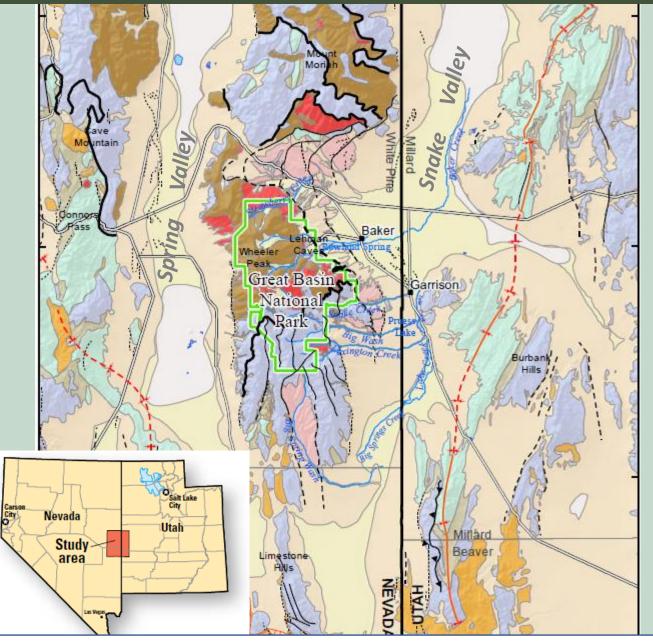


#### **Geologic setting of Lehman Caves**





### Hydrogeologic questions



- Deep subsurface extent of carbonate rocks and cavernous porosity to east of Lehman Caves
- Connection between Pole Canyon Limestone and either basin-fill or deep carbonate aquifers in Snake Valley
- Precise uplift and thermal history of the southern Snake Range since Miocene time
- Paleohydrology of Snake Valley during and after extension, uplift, and Miocene intrusions

On to the cave tour!

