Sierra Valley Groundwater Sustainability Plan
Interconnected Surface Water (ISW)

Balance Hydrologics

Sierra Valley GSP

10 May 2021

Outline

01 Existing Available Data

02 Field Evaluation and Verification

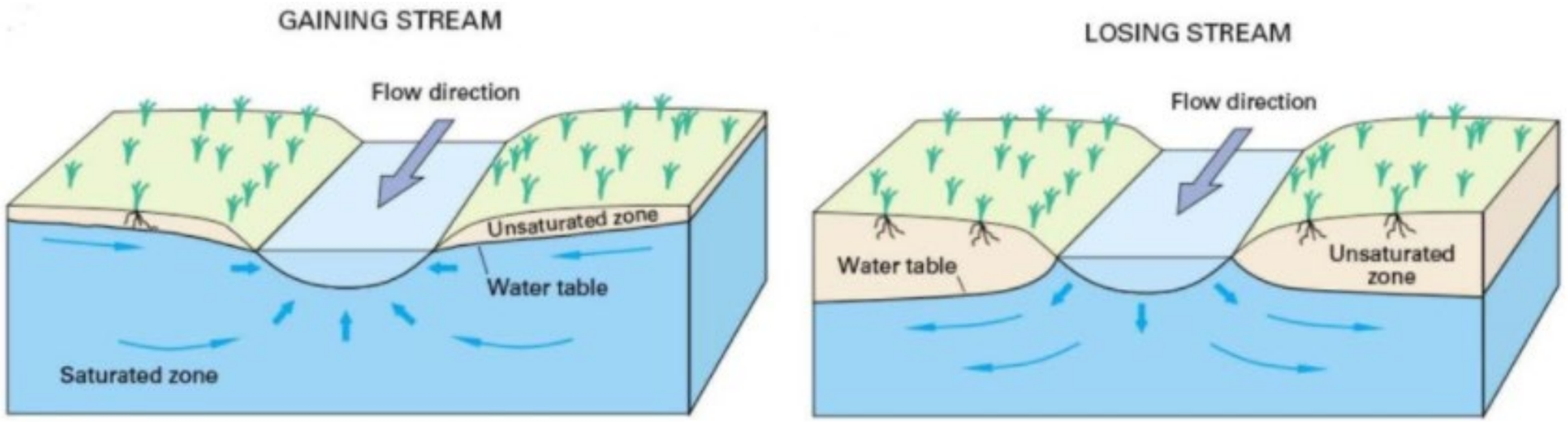
03 ISW Identification Approach

04 ISW Monitoring Approach

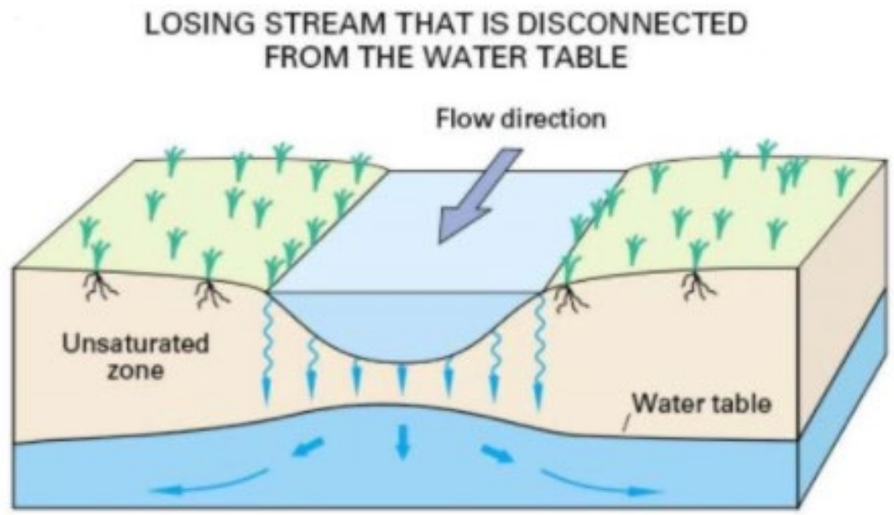
05 Initial Data Gaps Summary

Balance Hydrologics

What is Interconnected Surface Water (ISW)?



Connected surface water



Disconnected surface water

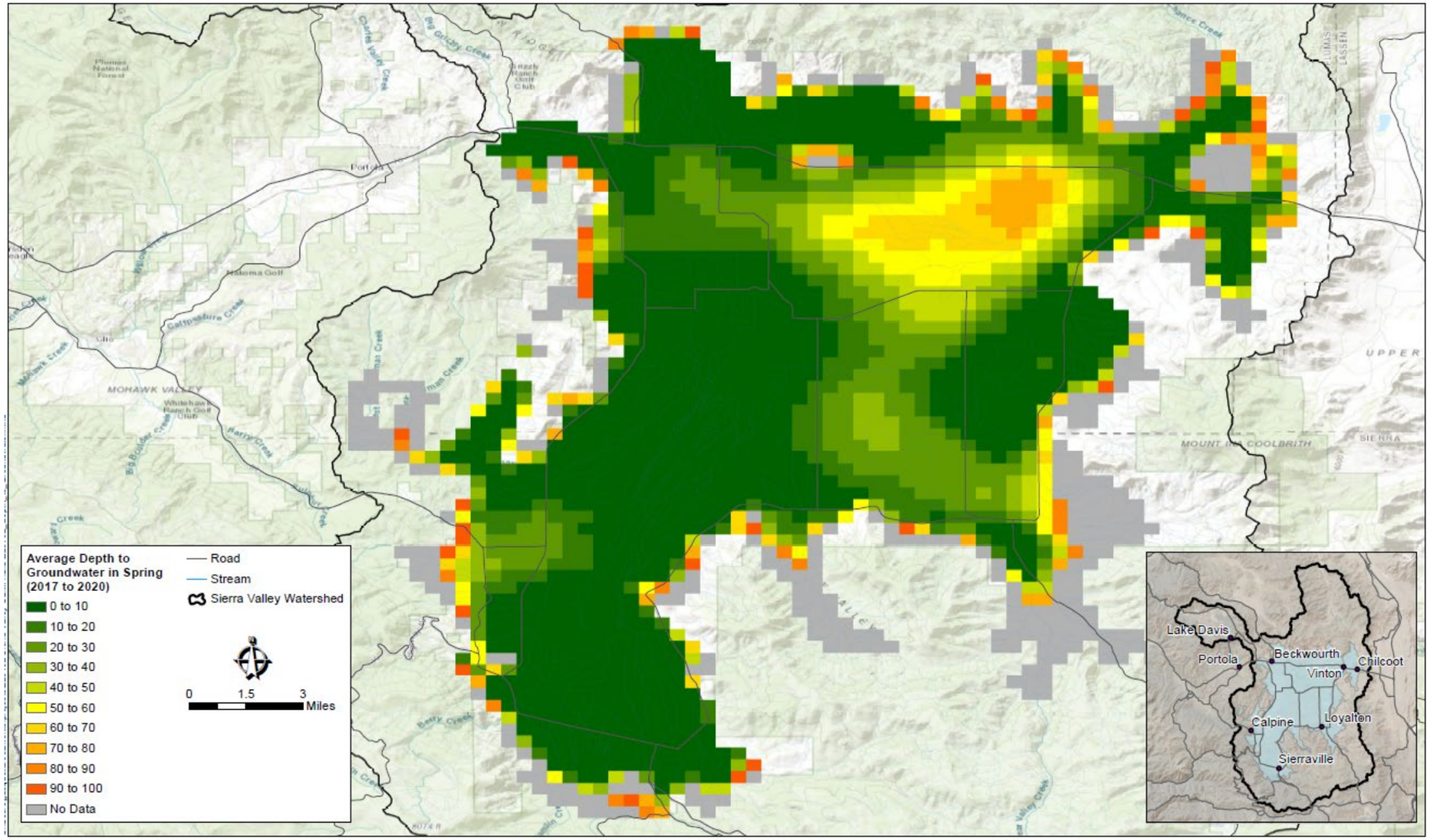
23 CCR § 351(o) “Interconnected surface water” refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted.

01

Existing Available Data: Monitoring Wells

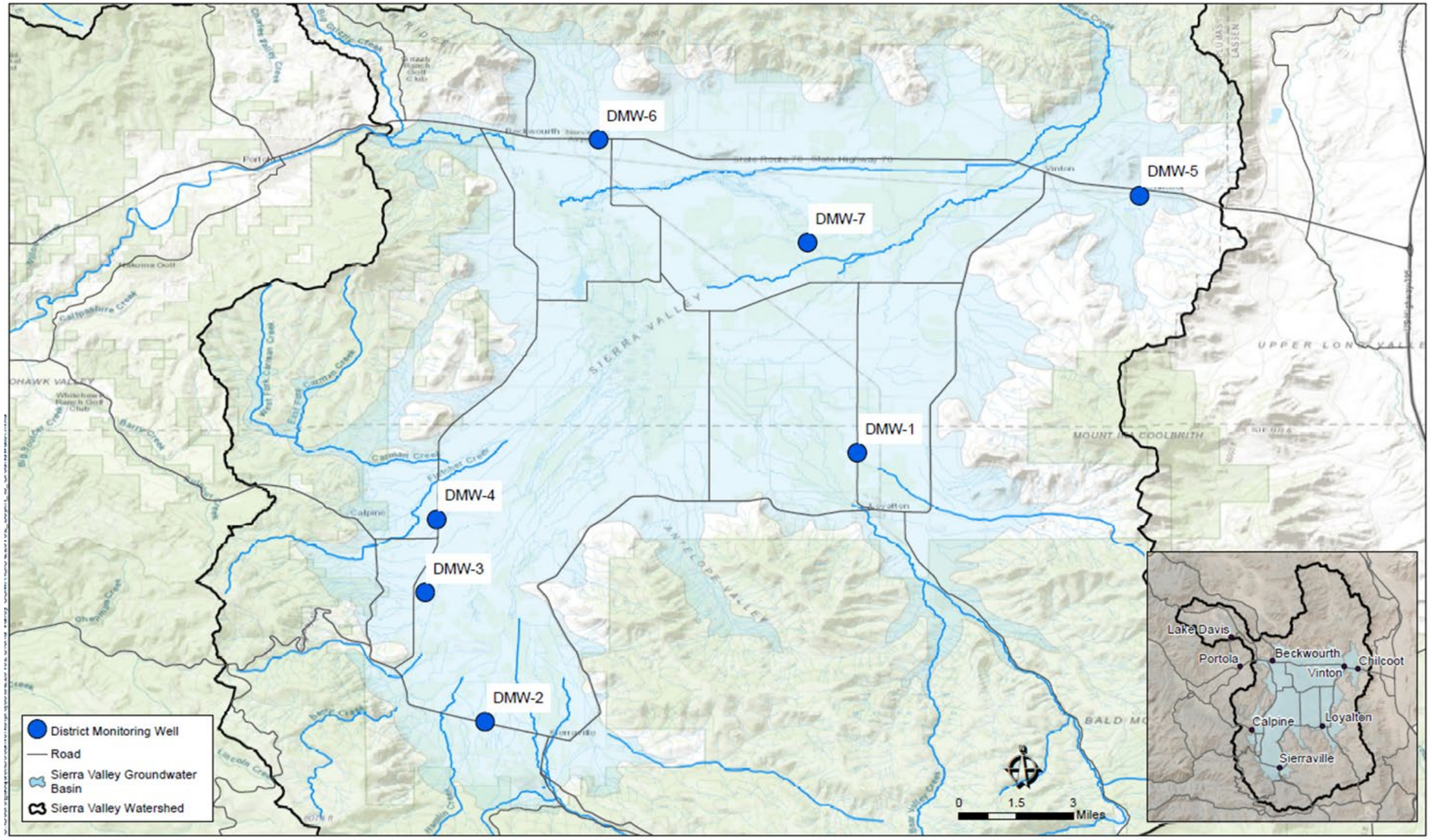
Balance Hydrologics

Depth to Groundwater in Monitoring Wells



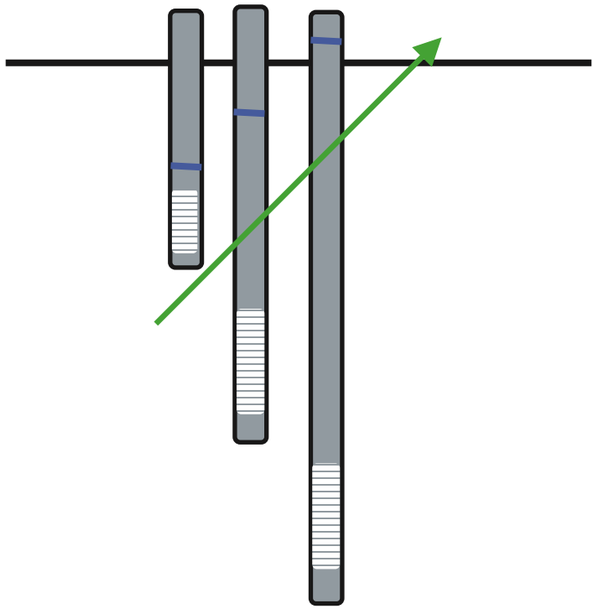
- Average depth to groundwater in the Spring from 2017 to 2020
- A 4-year average provides a statistically significant dataset

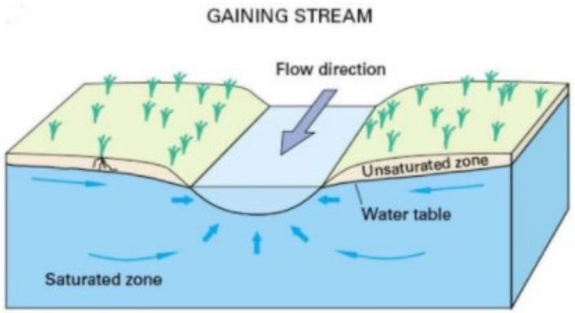
Depth to Groundwater in Monitoring Wells



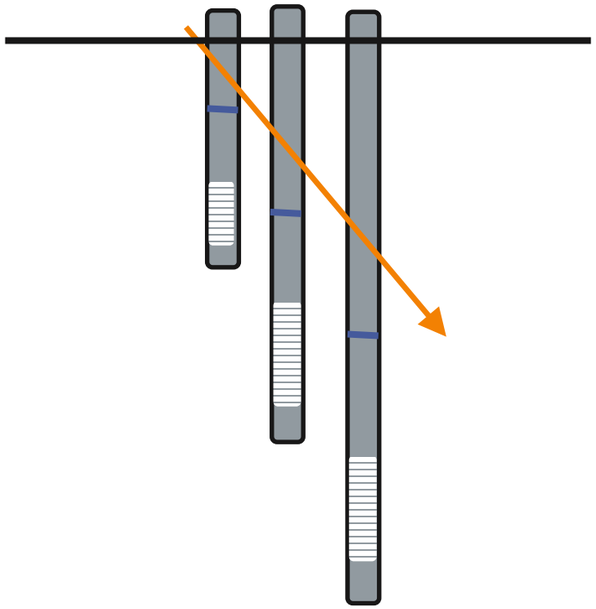
Vertical Hydraulic Gradients in Nested Wells

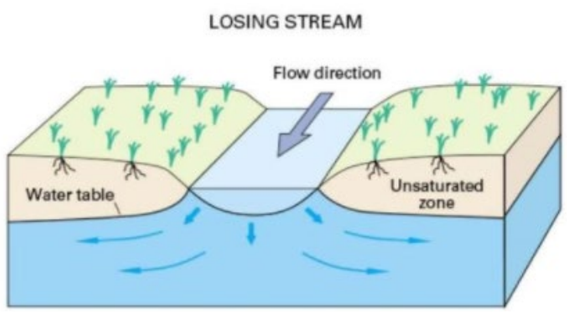
Upward (positive) gradient



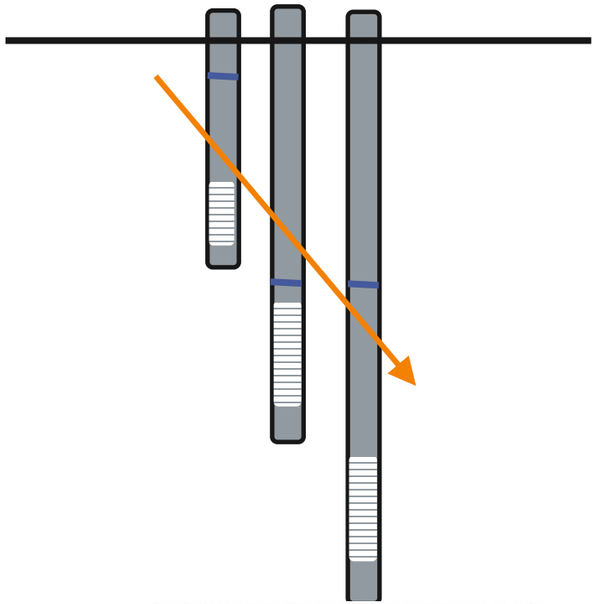


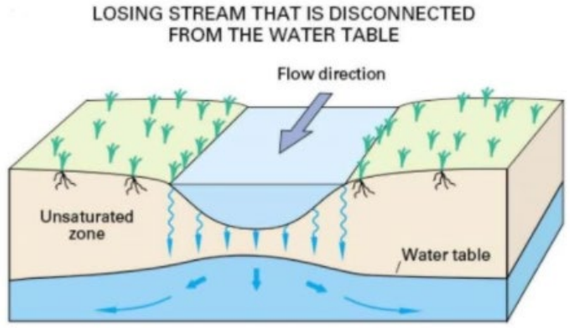
Downward (negative) gradient





Downward (negative) gradient and disconnected



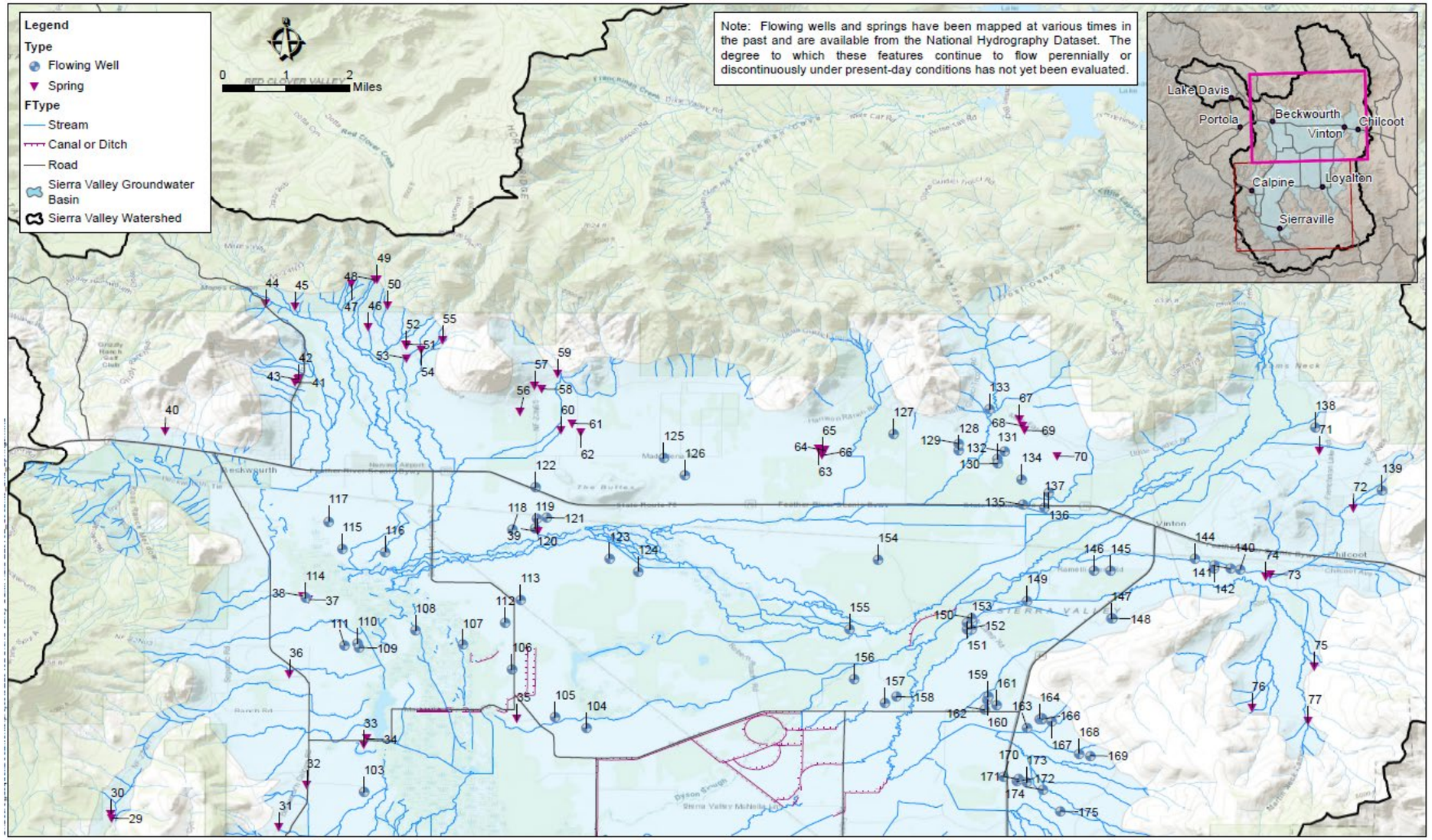


01

Existing Available Data: National Hydrography Dataset (NHD)

Balance Hydrologics

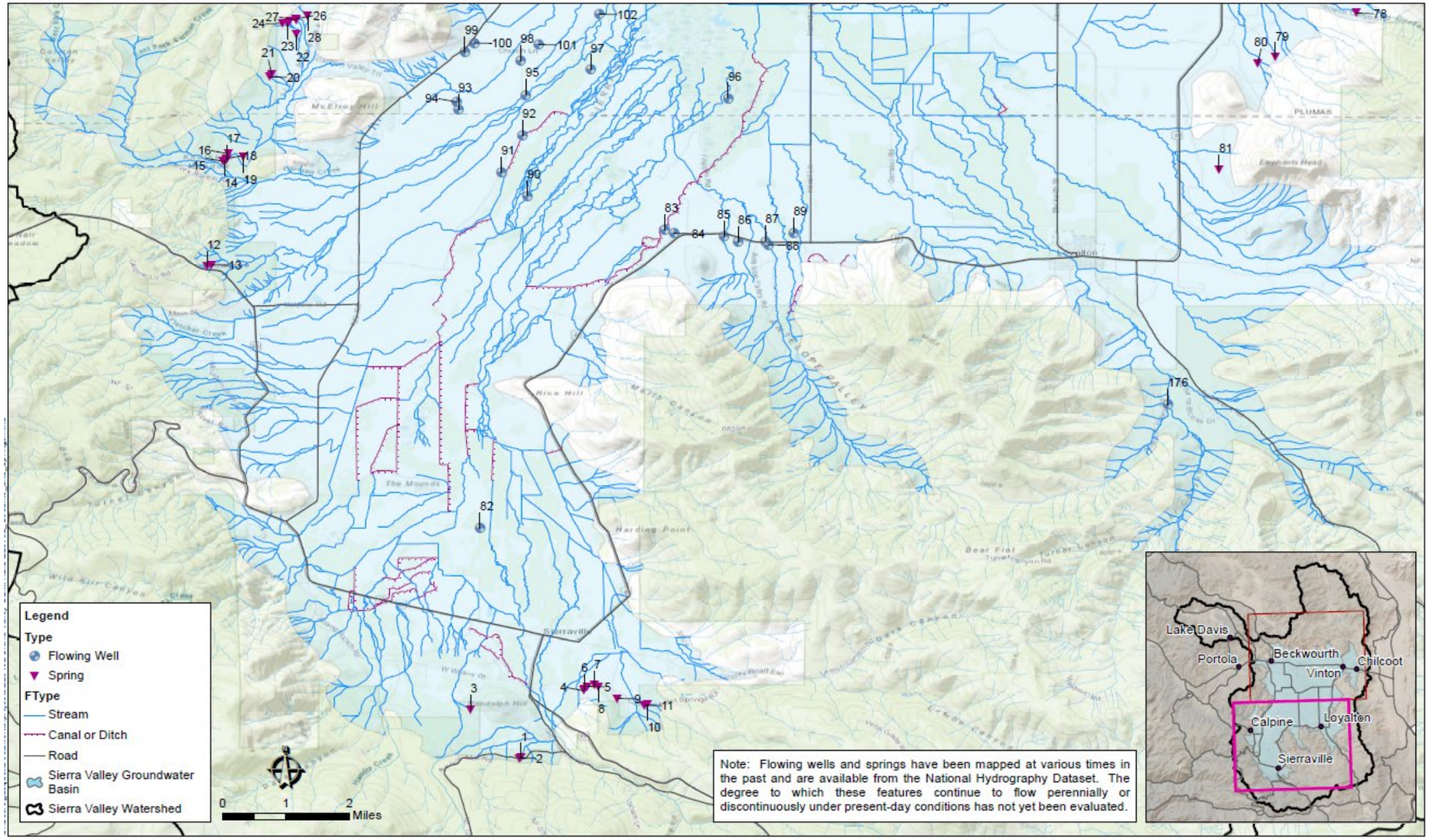
NHD Streams, springs, and flowing wells (North)



Within the groundwater basin

- ❑ 81 Springs
- ❑ 95 Flowing Wells
- ❑ 844 miles of Streams

NHD Streams, springs, and flowing wells (South)



Within the groundwater basin

- ❑ 81 Springs
- ❑ 95 Flowing Wells
- ❑ 844 miles of Streams

Existing Available Data: Summary

- Valley-wide groundwater levels from various time periods, using average spring conditions from 2017-2020
- 7 District Monitoring wells showing vertical hydraulic gradients
- NHD: 176 springs and flowing wells shown, but unverified
- NHD: 844 miles of “blue line” streams in the groundwater basin, but some are diversion ditches

02

Field Evaluation and Verification

Balance Hydrologics

Field Evaluation – flowing wells (Spring 2021)

Filippini Hot Spring (Artesian Well)

Yellow Barn Flowing Well (Roen Property)

Former Hage Ranch (Roen Property)

Field Evaluation – “Blue line” streams (Spring 2021)

Hamlin Creek at HWY 49

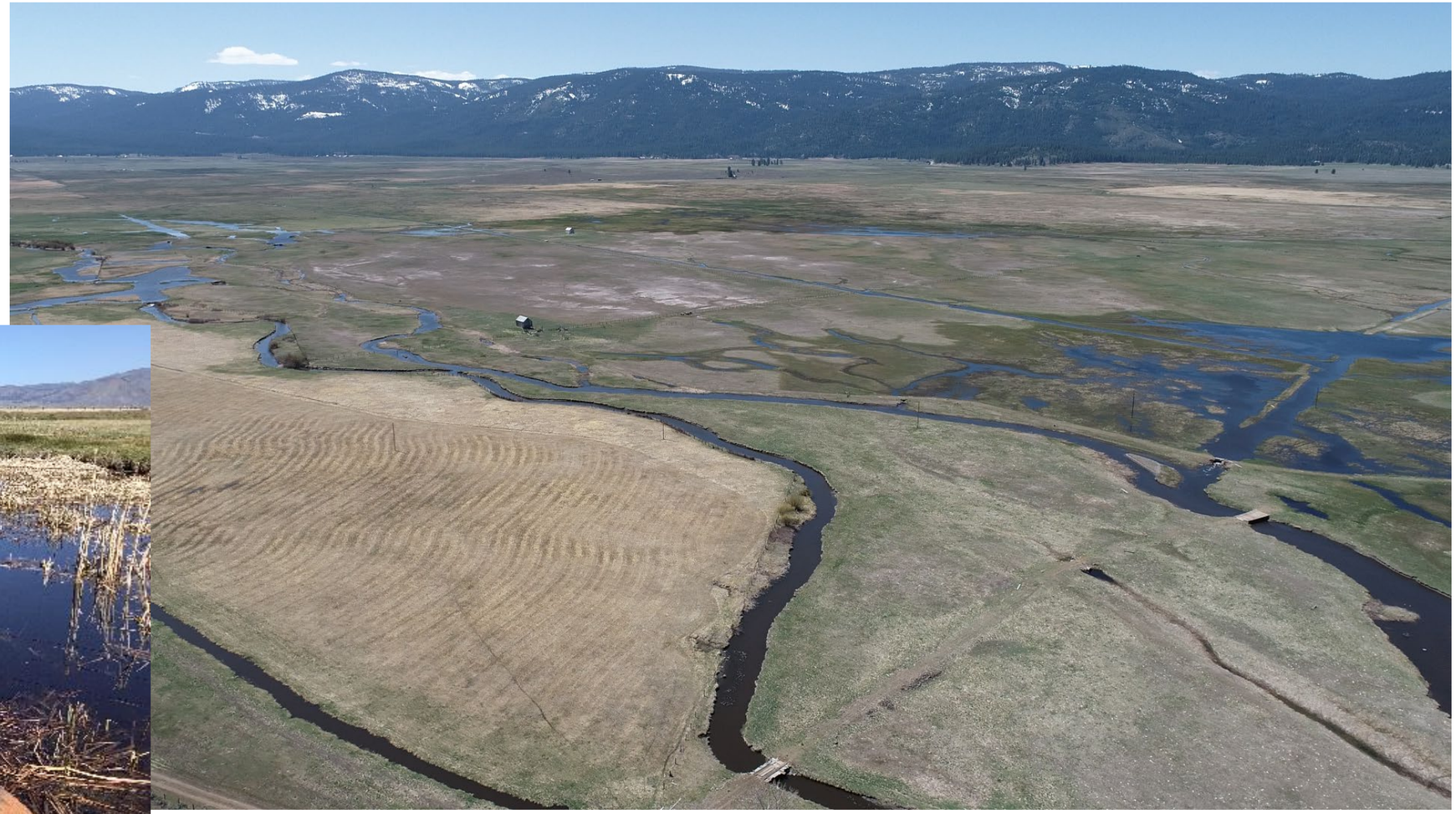
Fletcher Creek at HWY 89

Carmen Creek at Westside Rd

Little Last Chance Creek at HWY 70

Field Evaluation – Irrigation canals and ditches (Spring 2021)

Eastside Canal (Roen Property)



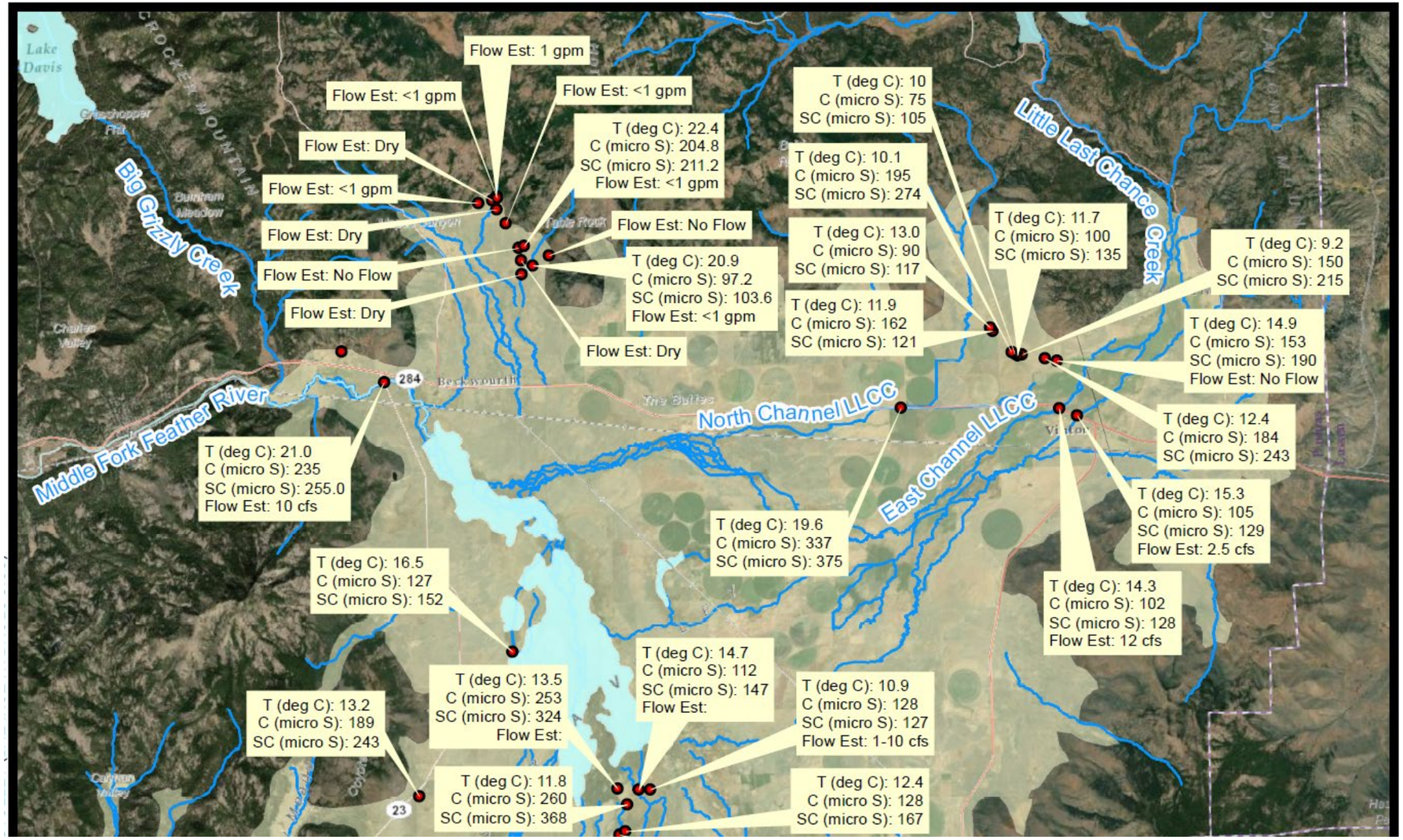
Sierra Valley Irrigation Channels
(Near Rice Hill)

Field Evaluation – Springs

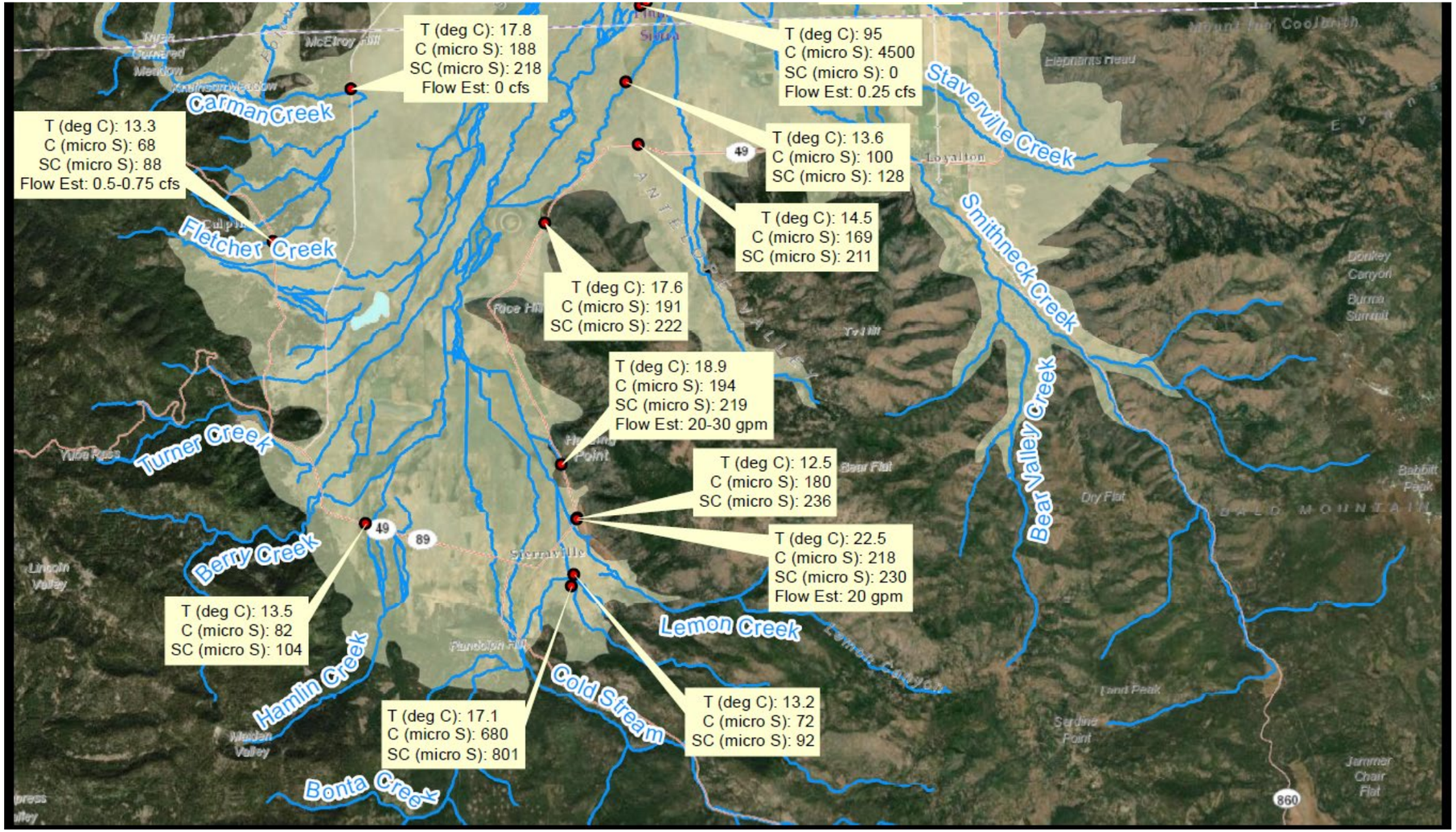
Springs at sand-clay contact near Dotta Guidici Road

Springs at the contact between andesitic flows and granidiorte off Beckwourth Genesee Road

Field Evaluation – Conditions in Spring 2021



Field Evaluation – Summary

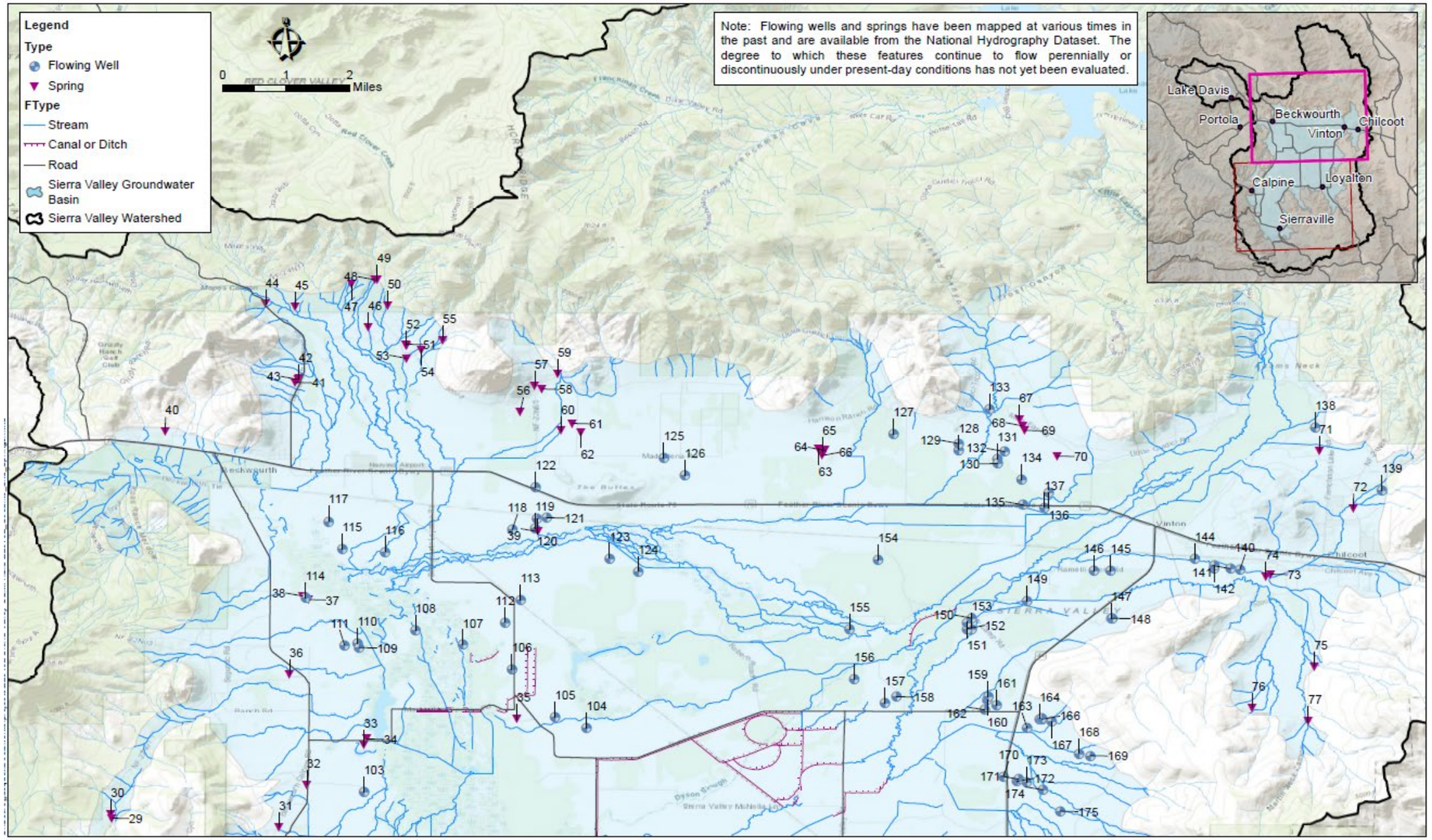


Field Evaluation – Summary of observations and preliminary conclusions

Field Summary

1. The network of channels and ditches is complex.
2. Surface inflows and deliveries play a significant role in supporting valley streams, wetlands, and irrigated pasture, especially in dry years.
3. Springs and flowing wells also provide support.
4. Springs and flowing wells are limited in the central portions of the valley and more common near the valley margins

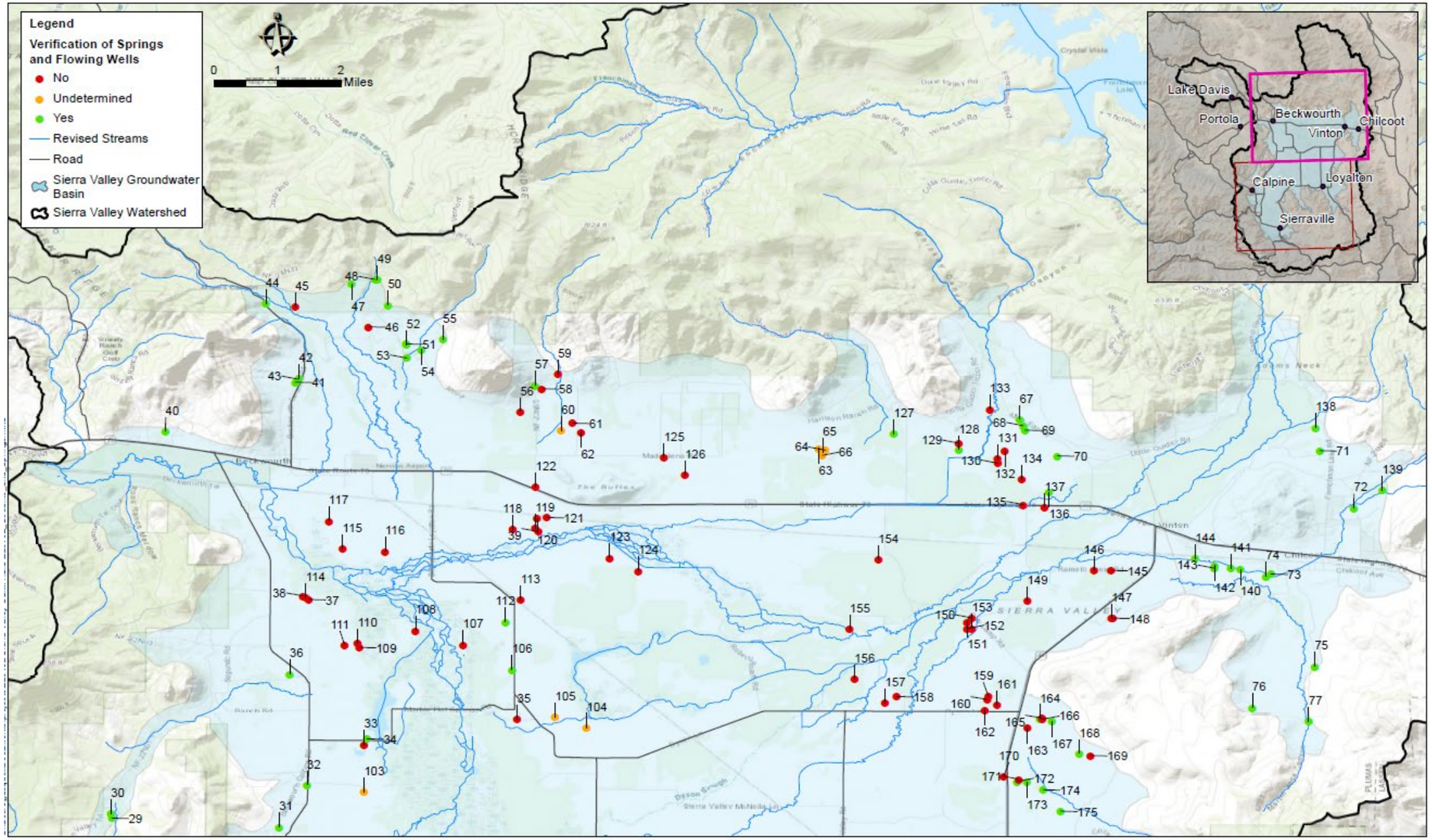
NHD refinement (ongoing)



Within the groundwater basin

- ❑ 61 Springs
- ❑ 32 Flowing Wells
- ❑ 365 miles of Streams

NHD refinement (ongoing)



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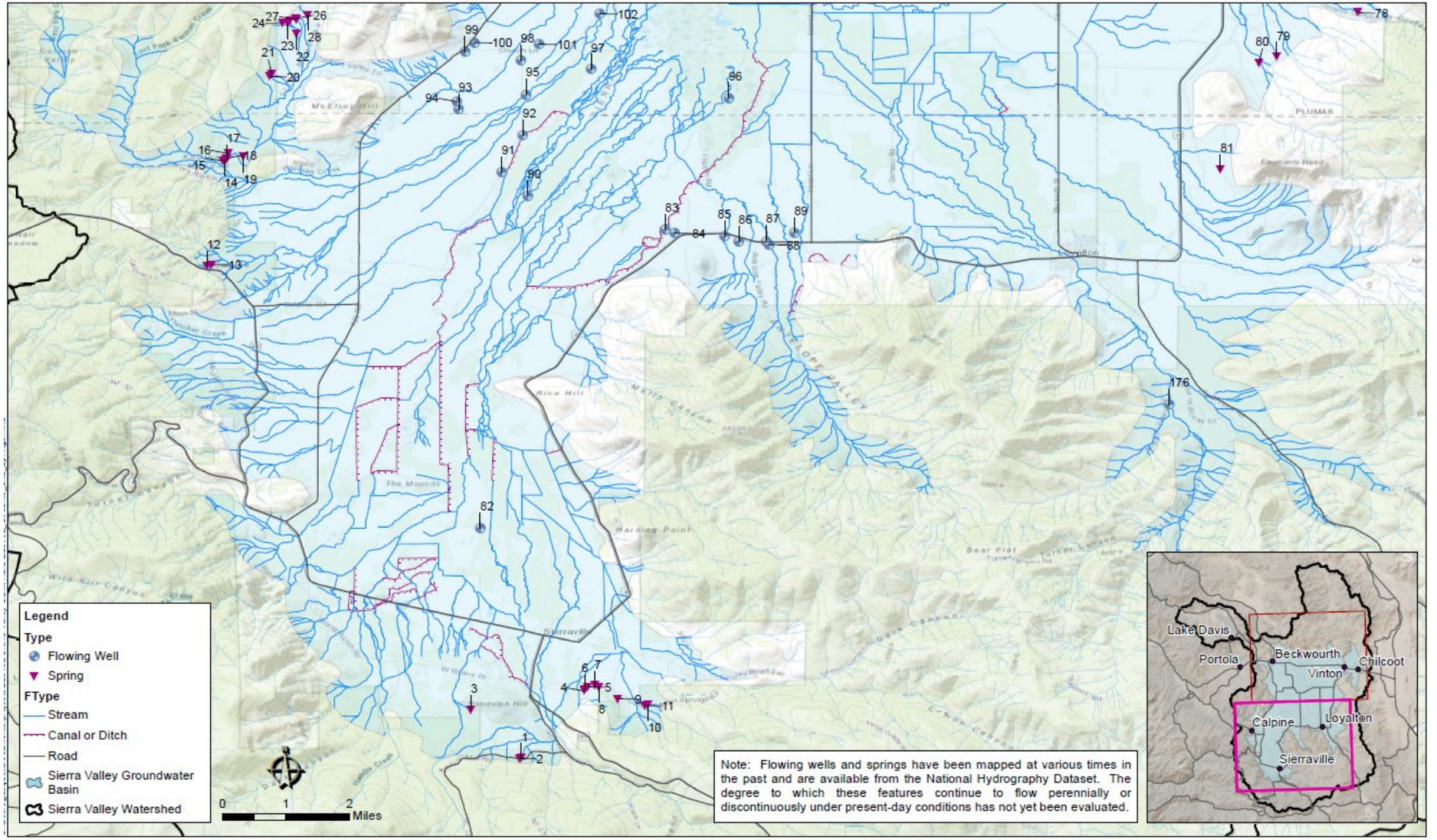

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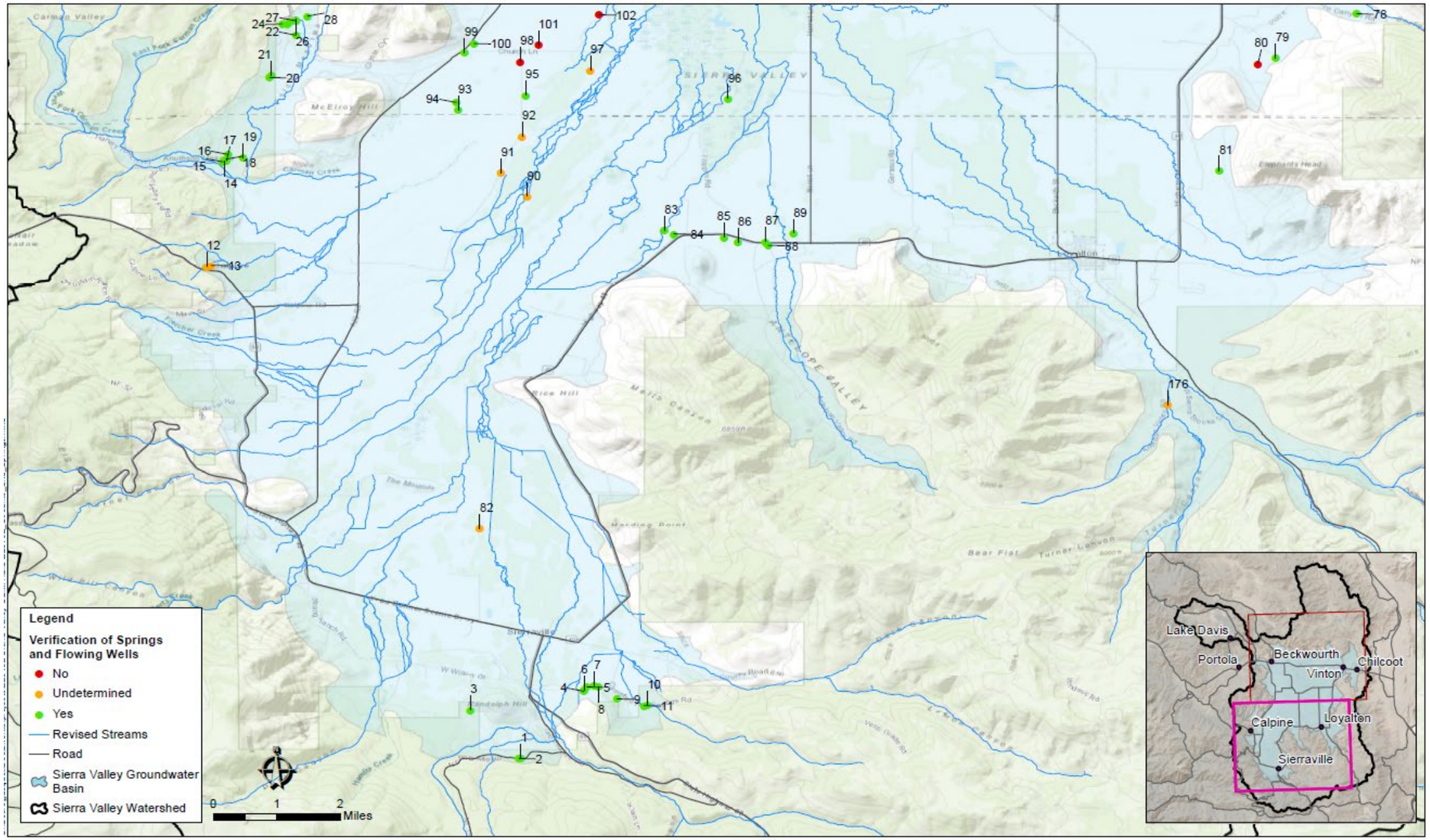


03

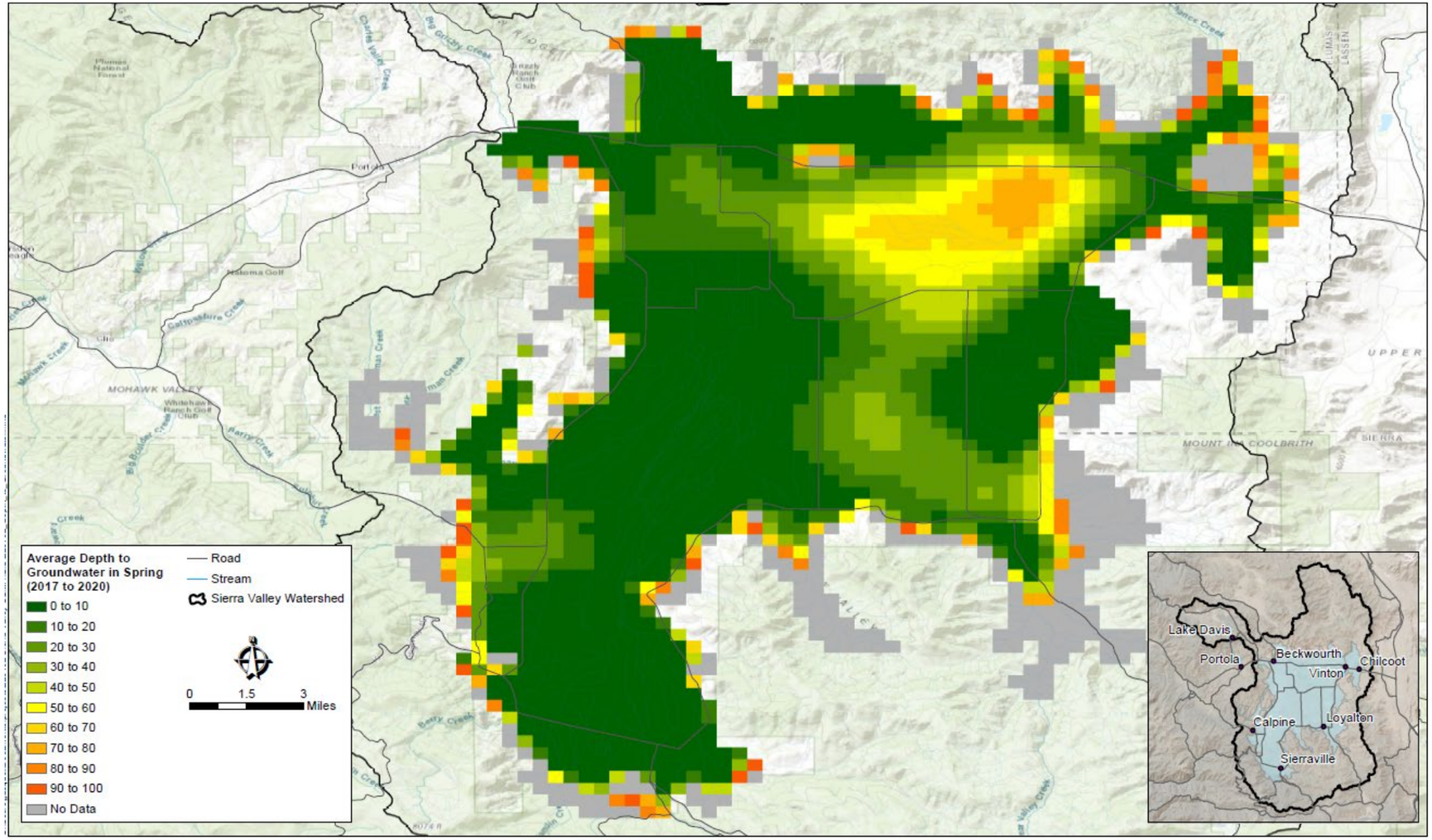
ISW Identification Approach

Balance Hydrologics

ISW Identification Approach

Approach

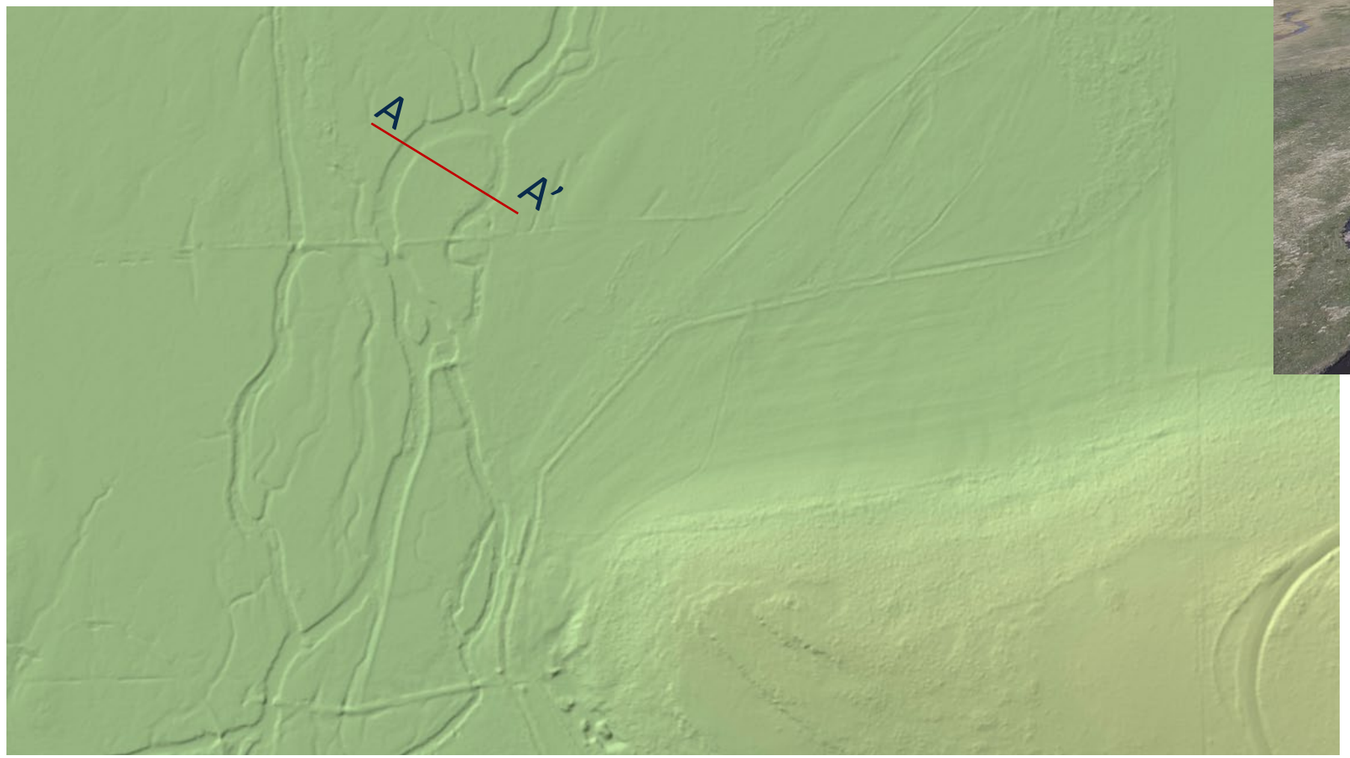
- ❑ Identify surface water bodies
- ❑ Identify where groundwater is within 5-feet of the surface
- ❑ Use vertical hydraulic gradient in nested monitoring wells to verify

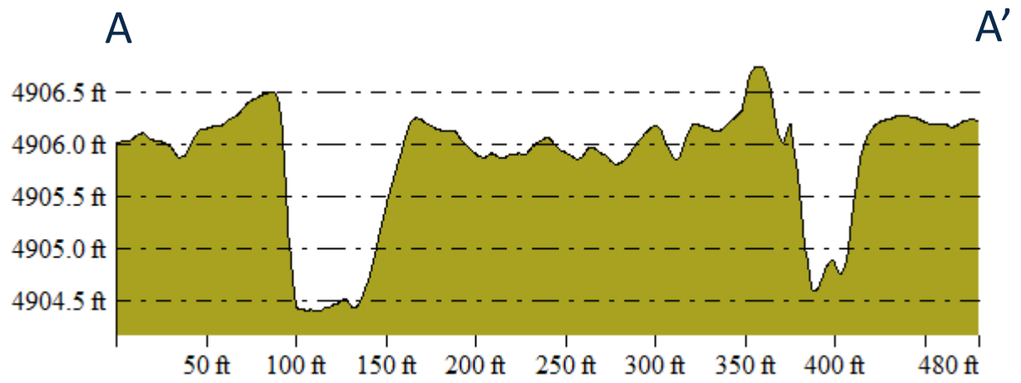


Most channels are relatively shallow and broad

Sierra Valley Channels
(Near Rice Hill)

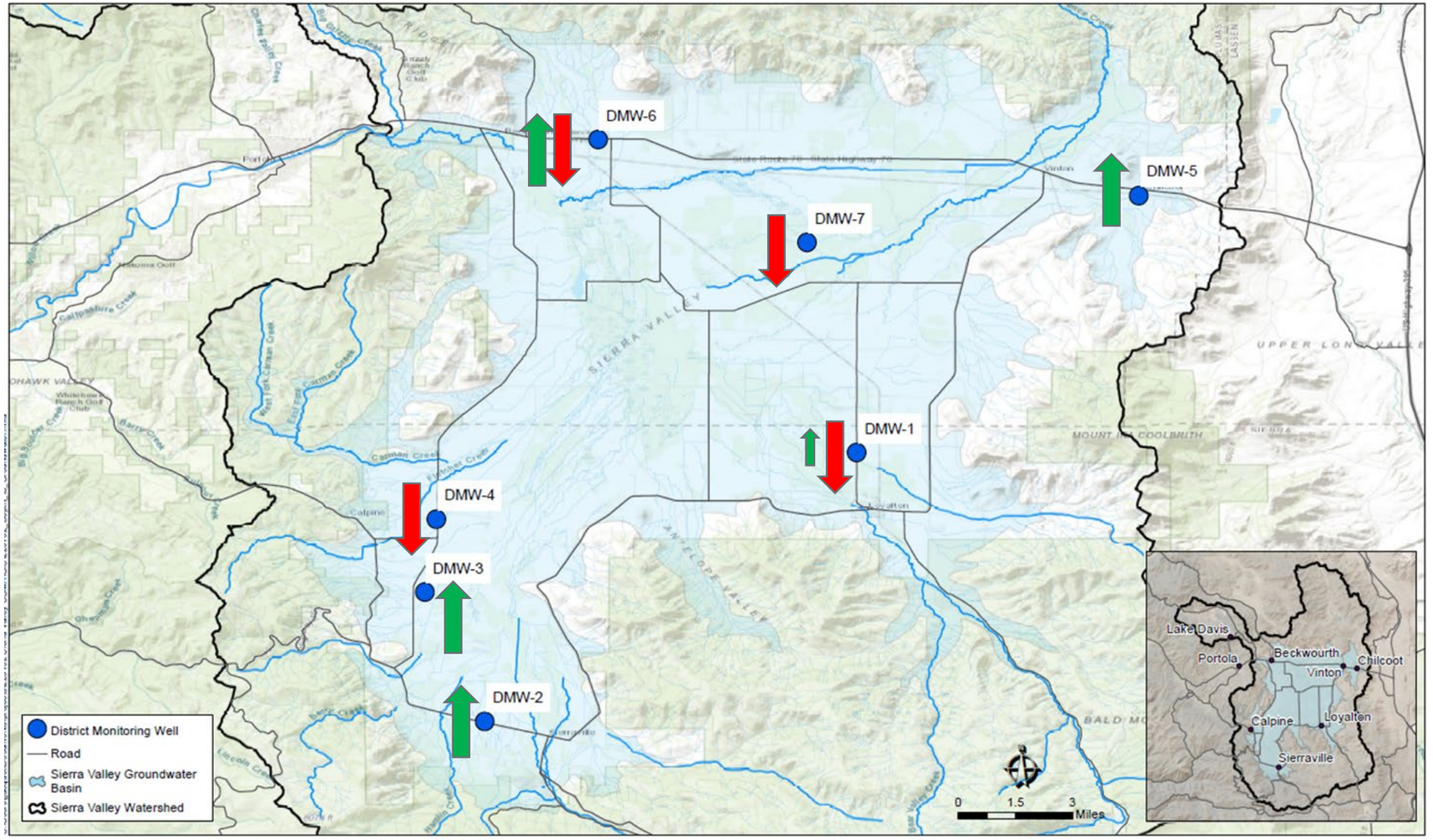
Hillshade from a USGS 1-meter LiDAR based DEM
Survey Date: 07/14/2018 - 08/20/2018





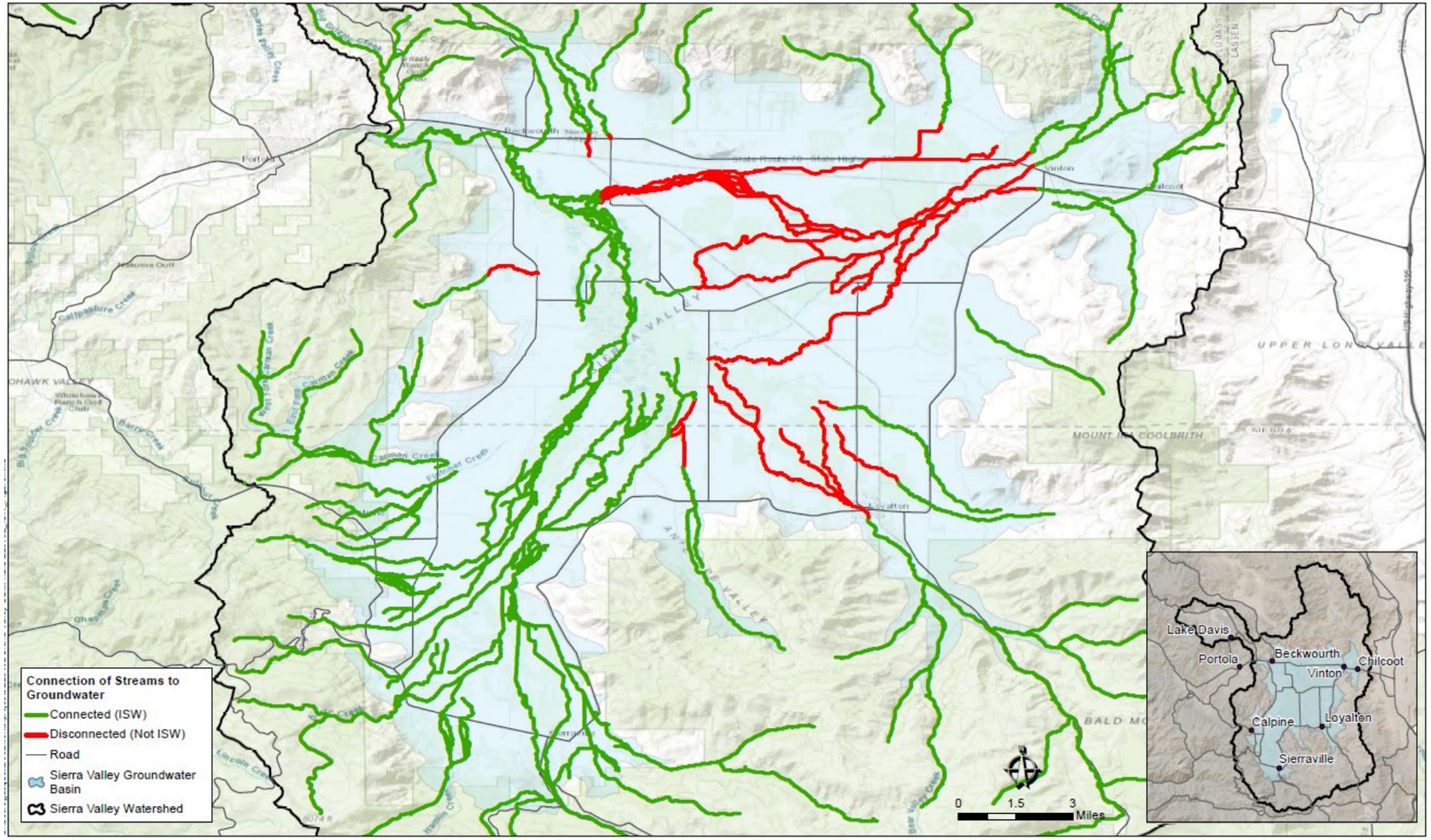
ISW Identification Approach

- Upward (positive) vertical hydraulic gradient indicates areas of potential groundwater upwelling
- Recharge of the shallow aquifer is likely not just from surface water deliveries but also upwelling from the deeper aquifer



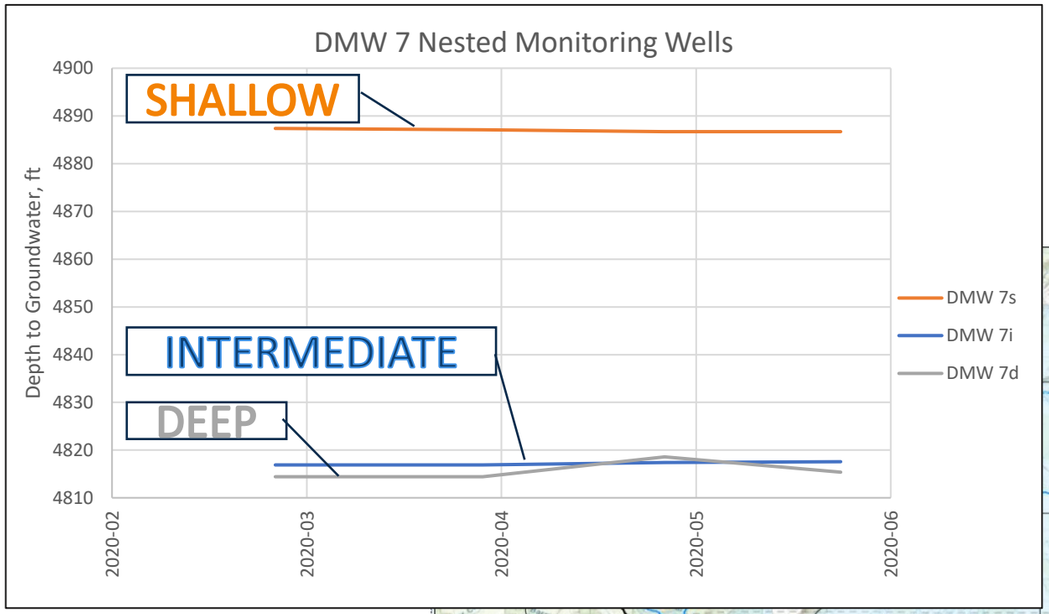
Preliminary ISW Identification - DRAFT

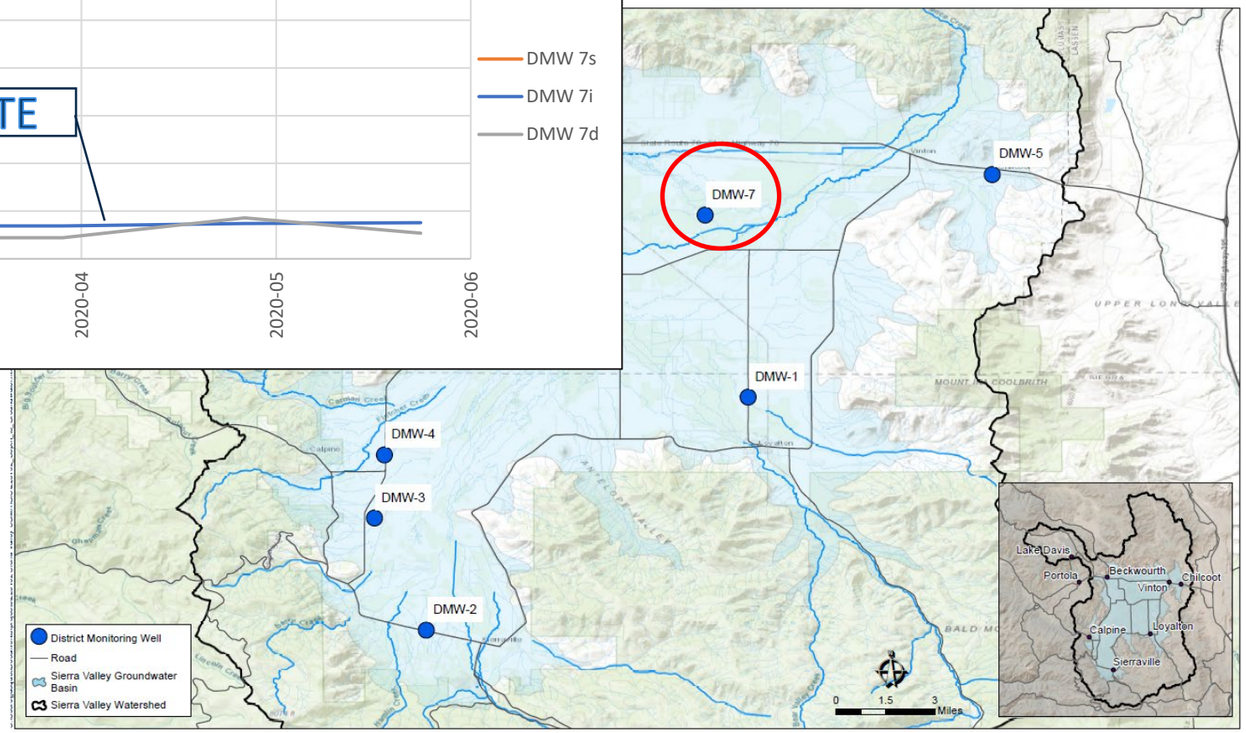
- Next step: Refine and combine with GDE Mapping
- Decide whether shallow water table ‘aquifer’ interconnectedness with surface water should be considered in GSP and SMCs



Groundwater Levels in Nested Wells

- Evidence exists that shallow groundwater can be ‘perched’ in some places.
- Both shallow and deep groundwater have beneficial users, and therefore both should be included in the monitoring network, with associated SMC



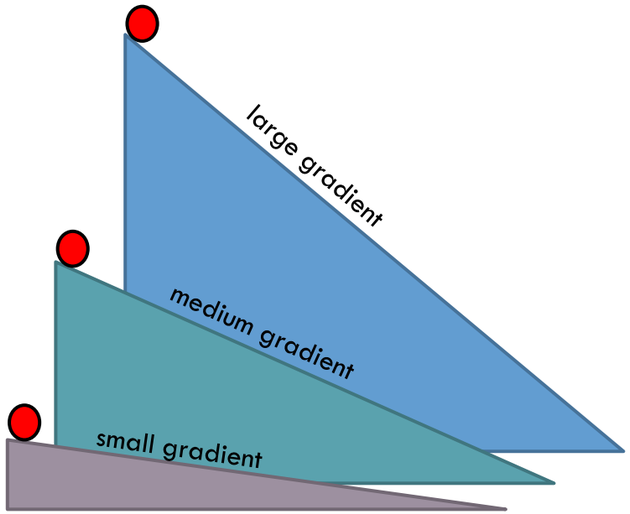


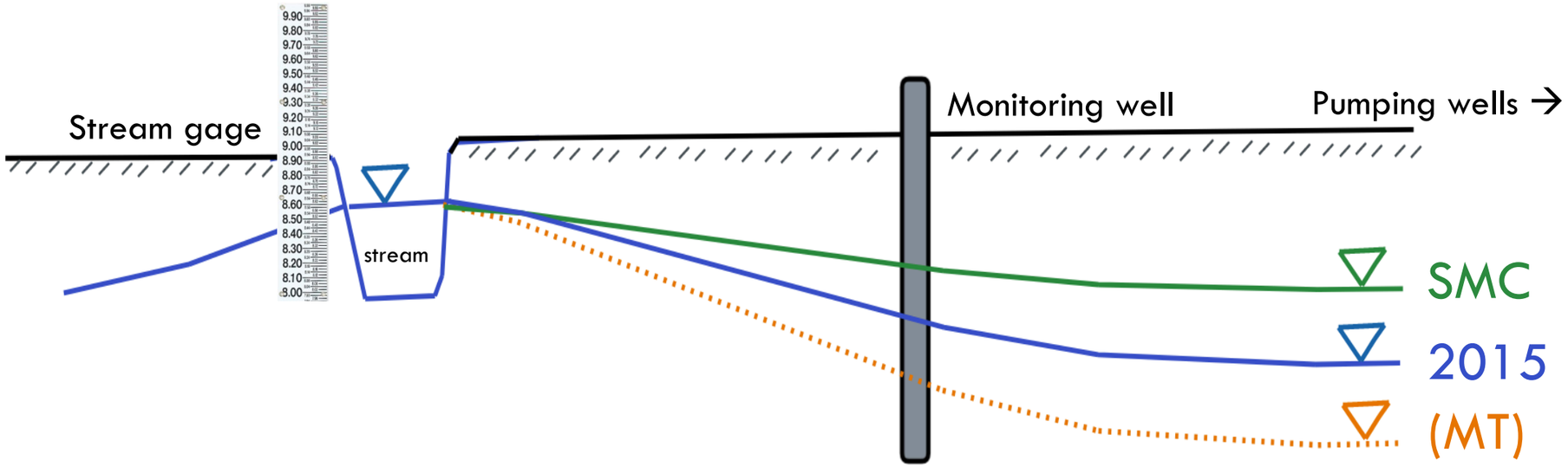
04

ISW Monitoring Approach

Balance Hydrologics

ISW Monitoring Approach

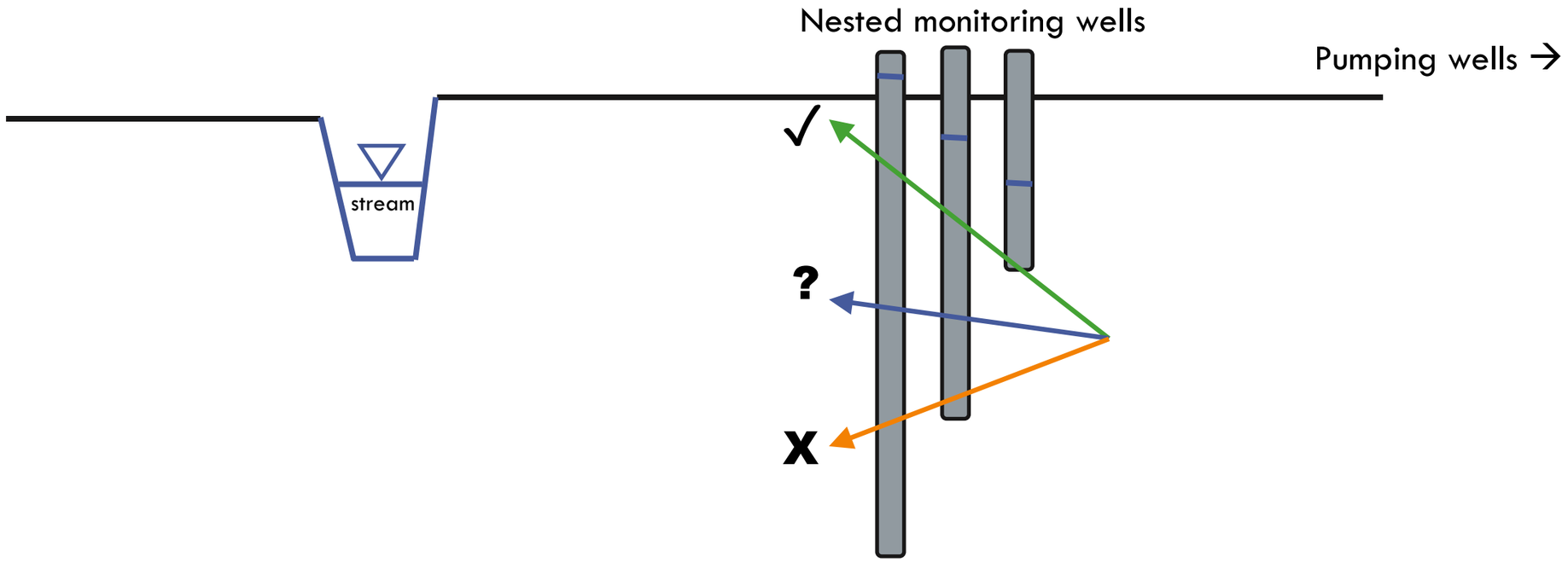




Approach #1:

1. Identify specific critical ISW reaches
2. Identify existing or strategically site new stream gages and monitoring wells to measure horizontal hydraulic gradient (groundwater level)
3. Monitor for changes in horizontal hydraulic gradient indicative of increased depletion

ISW Monitoring Approach

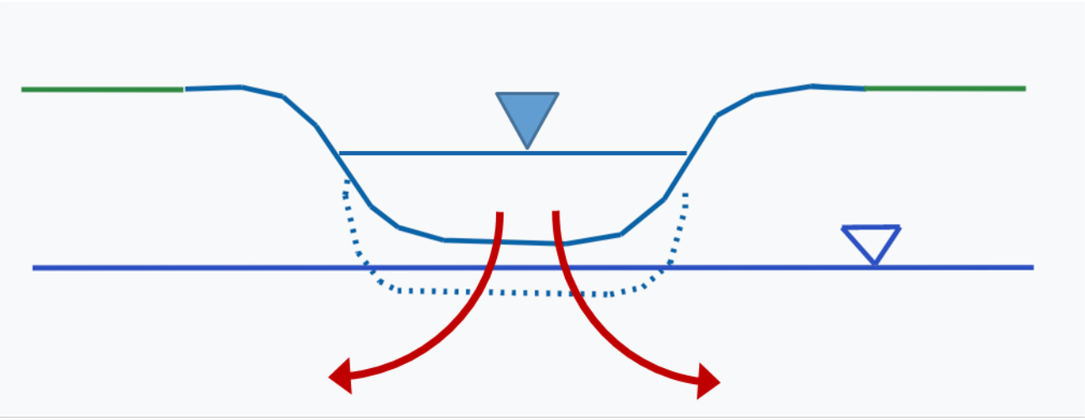


Approach #2:

1. Identify critical/significant ISW reaches
2. Use existing or install new nested monitoring wells to measure vertical hydraulic gradient
3. Monitor for changes or reversals in vertical hydraulic gradients

ISW Modeling Opportunities

- Calculate ISW depletion rate in modeled surface water nodes (seepage loss, acre-feet/month)
- Are depletion rates significant and unreasonable?



- Assume ISW depletion in excess of that experienced since 2015 is significant and unreasonable
- If lower Minimum Thresholds are established, the GSP has burden of proof to demonstrate no additional significant and unreasonable ISW depletion

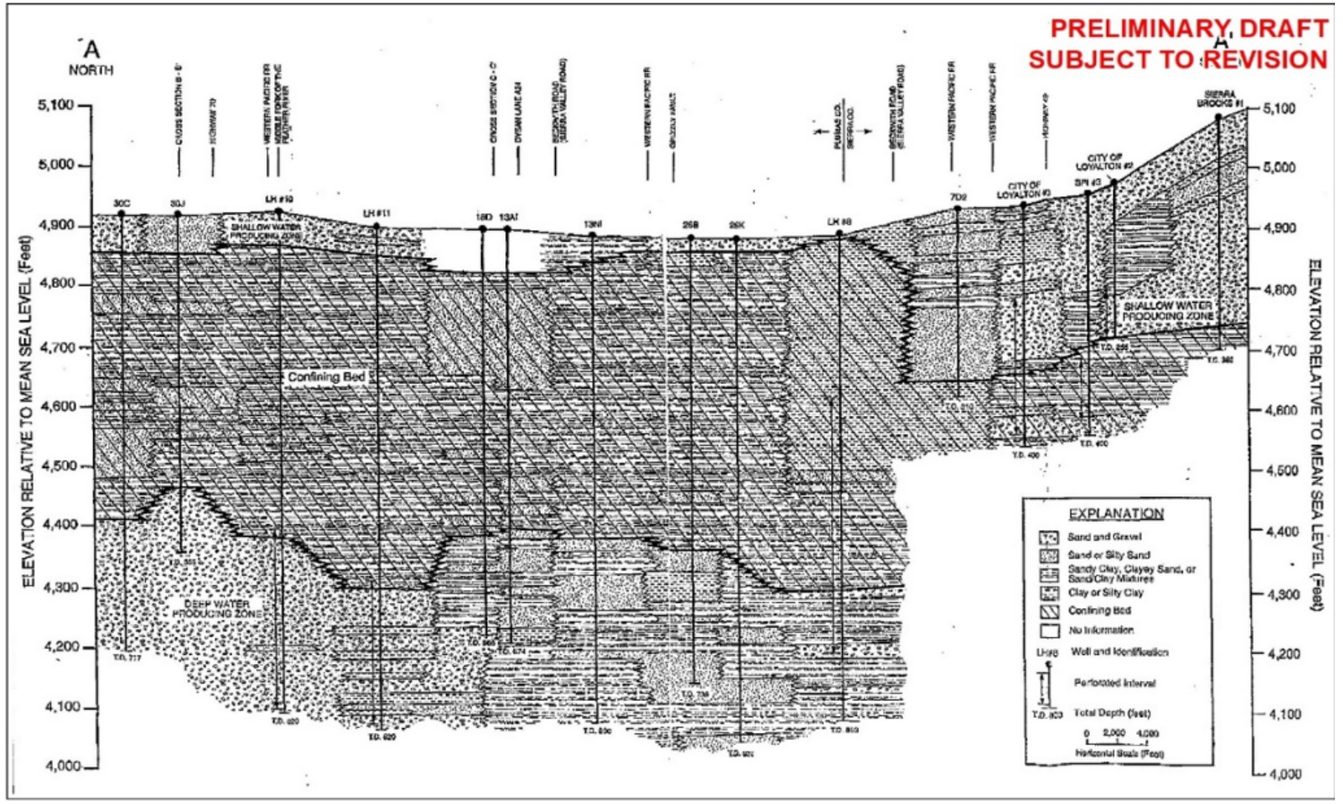
05

Initial Summary of Data Gaps

Balance Hydrologics

Initial Summary of Data Gaps

- Distribution of confining clay beds and interconnections between the shallow and deep aquifer is not well understood.
- Edges of the basin are lacking in monitoring data



Initial Summary of Data Gaps

- ❑ Stage and streamflow data are lacking for wetlands and channels in the center of the valley
- ❑ Monitoring wells are lacking near sensitive areas

Questions?

Balance Hydrologics

Balance Hydrologics
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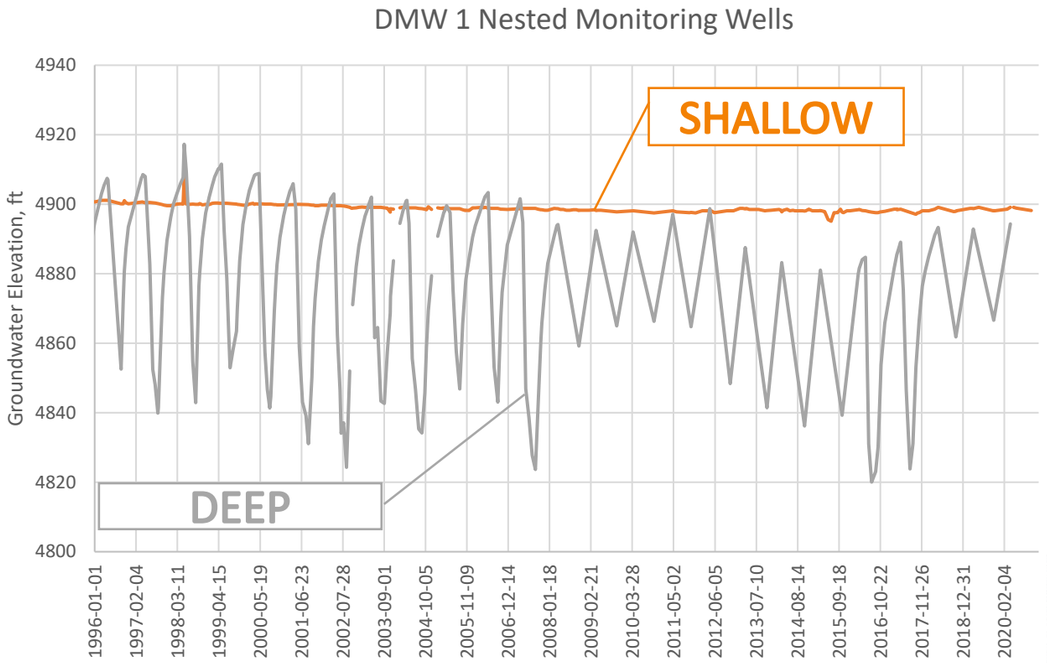
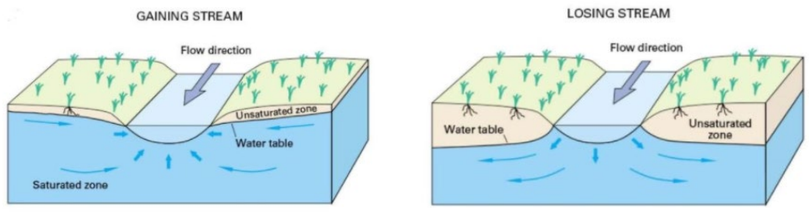
Truckee, CA 96161
(530) 550 9776

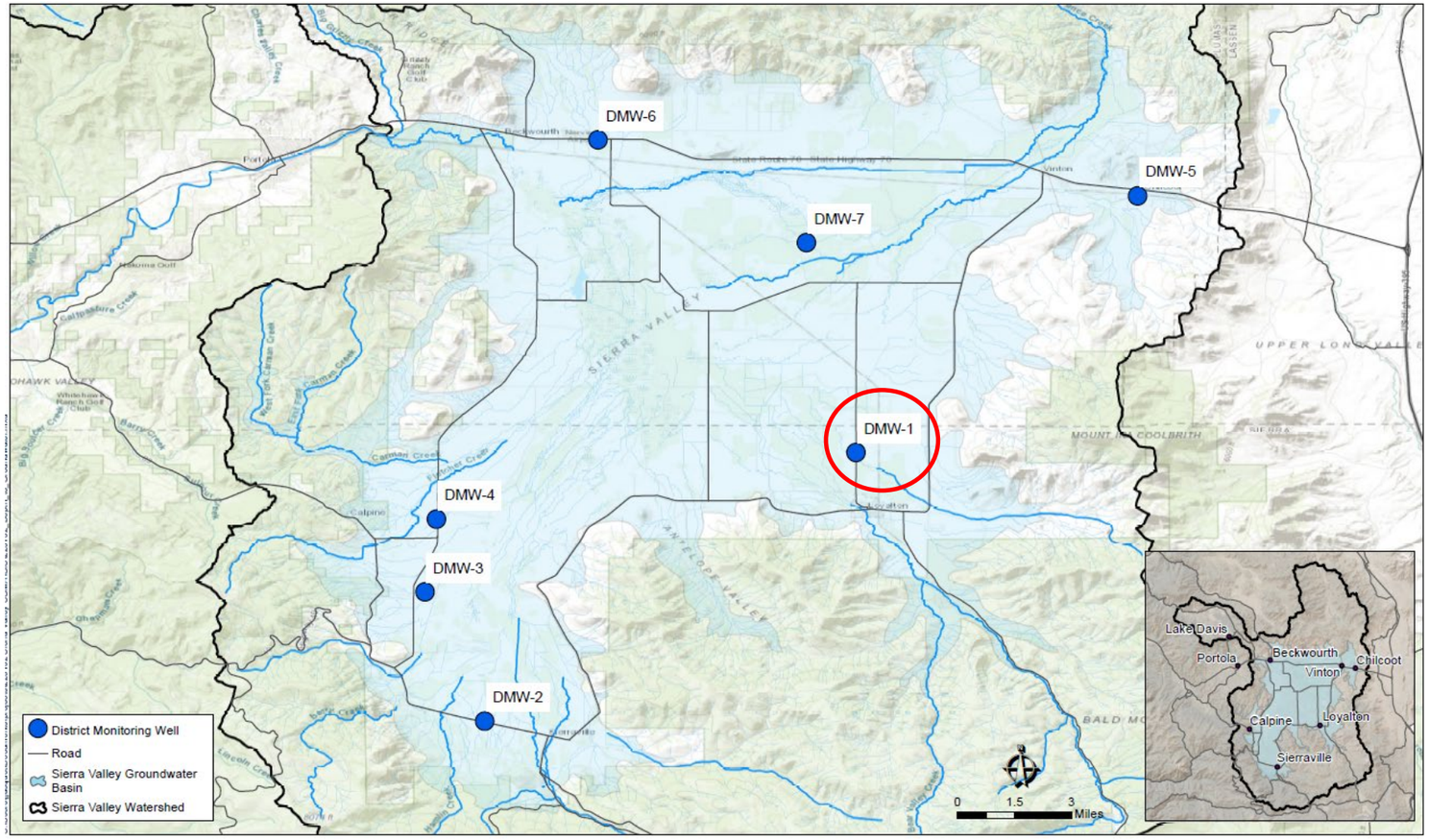
dshaw@balancehydro.com
jjacquet@balancehydro.com

Groundwater Levels in Nested Wells

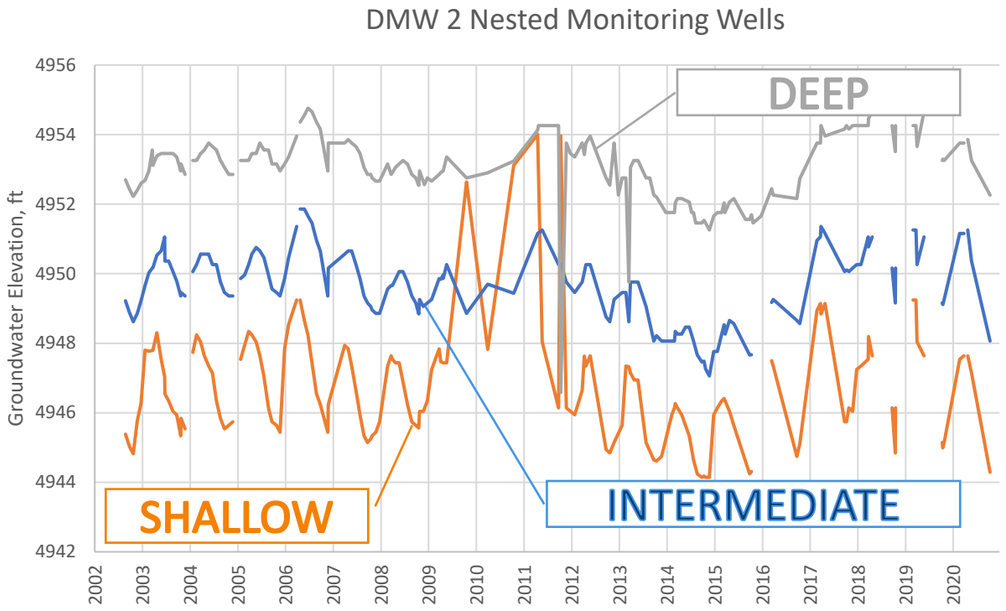


- Alternating seasonally upward and downward vertical gradient prior to switching to mostly downward gradient in Spring 2007

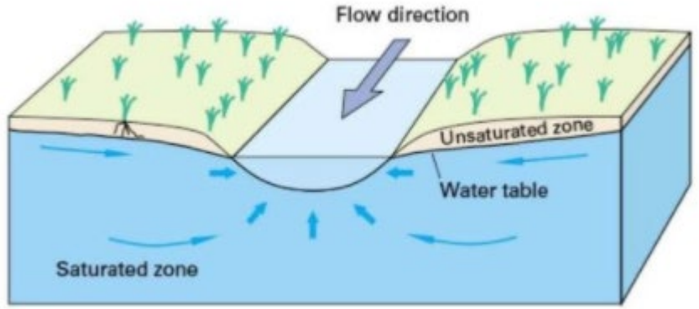


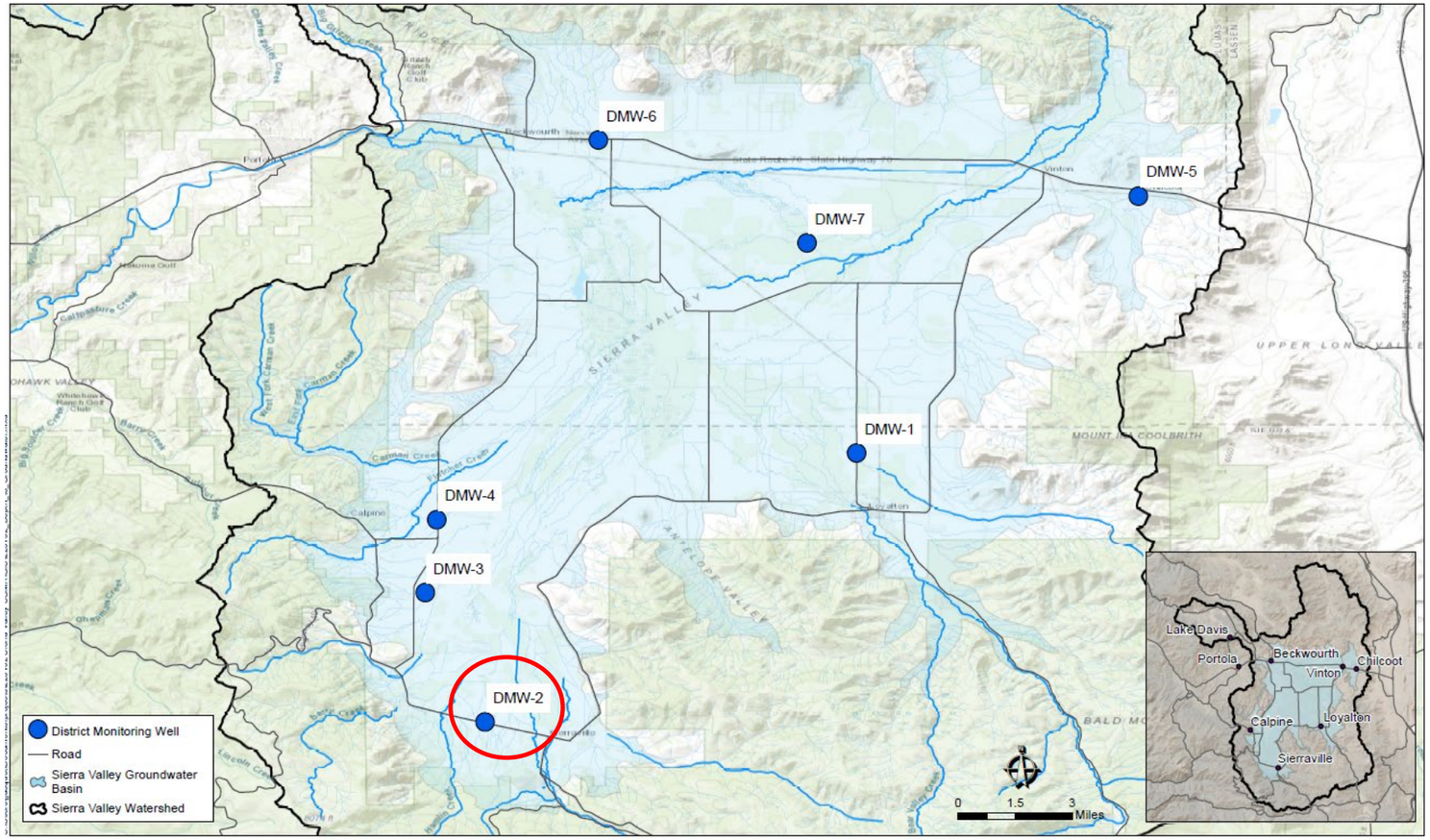


Groundwater Levels in Nested Wells

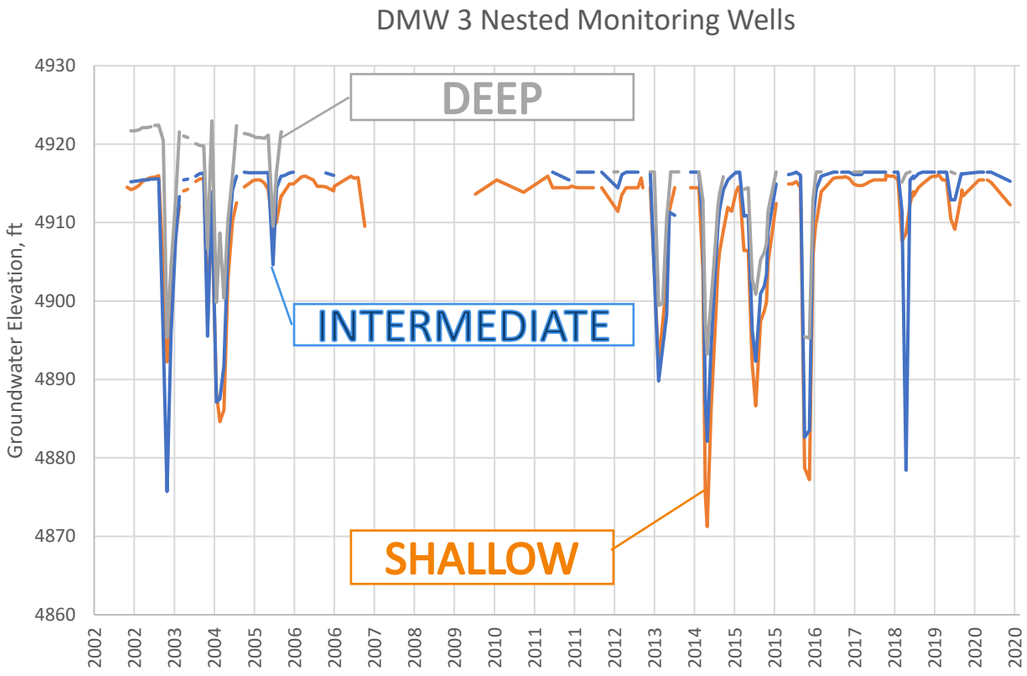


- Consistent upward vertical gradient

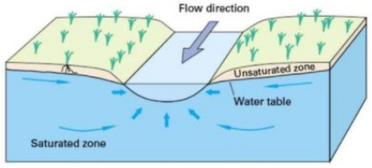


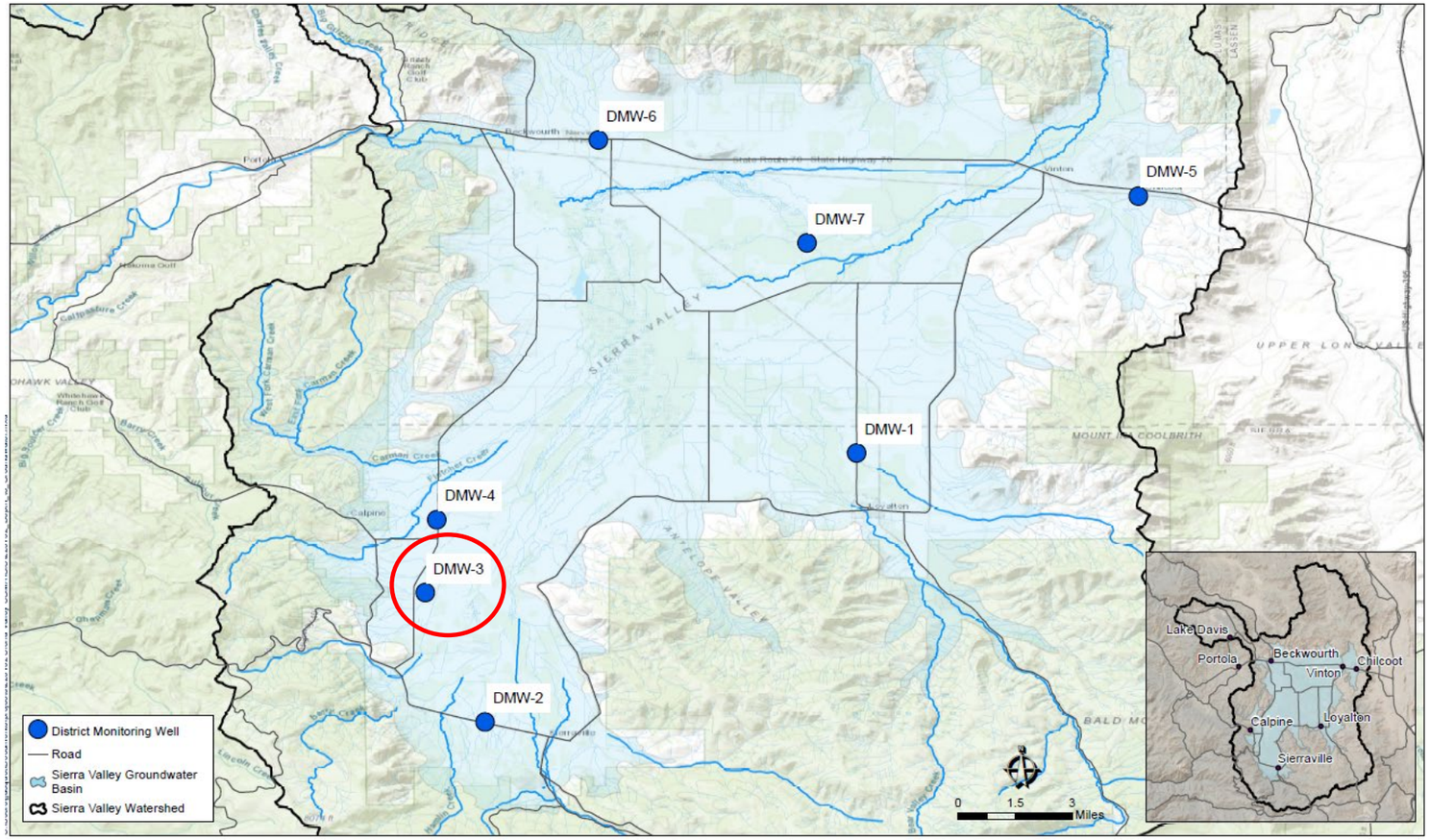


Groundwater Levels in Nested Wells

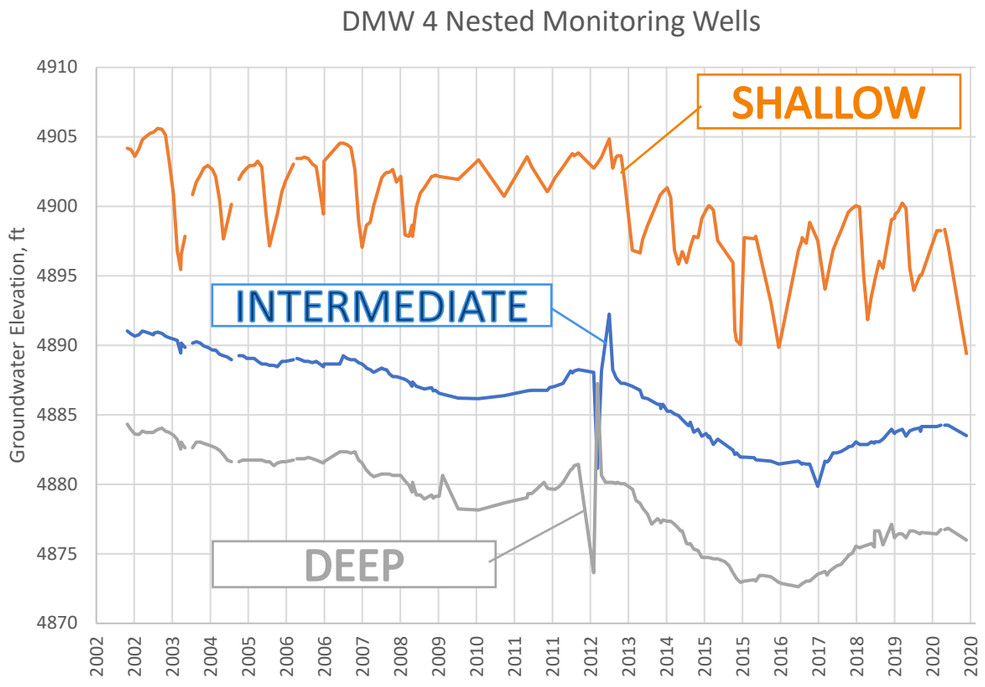


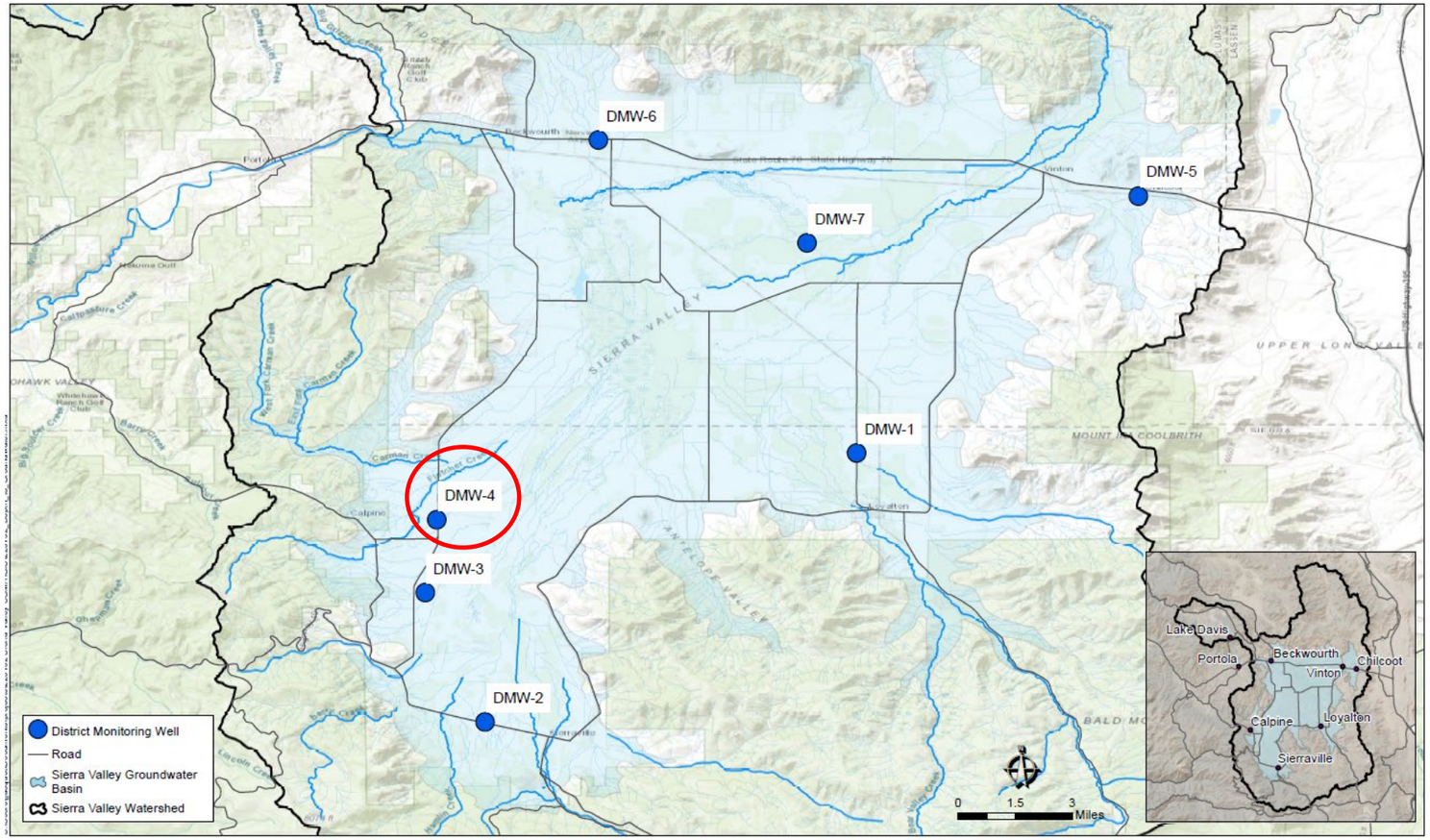
- DMW-3 deep is often flowing and can not be measured
- Consistent upward vertical gradient



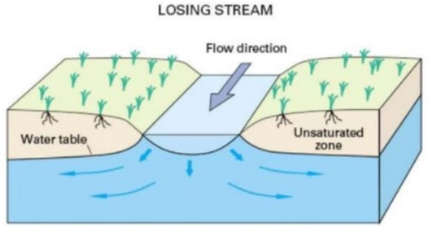


Groundwater Levels in Nested Wells

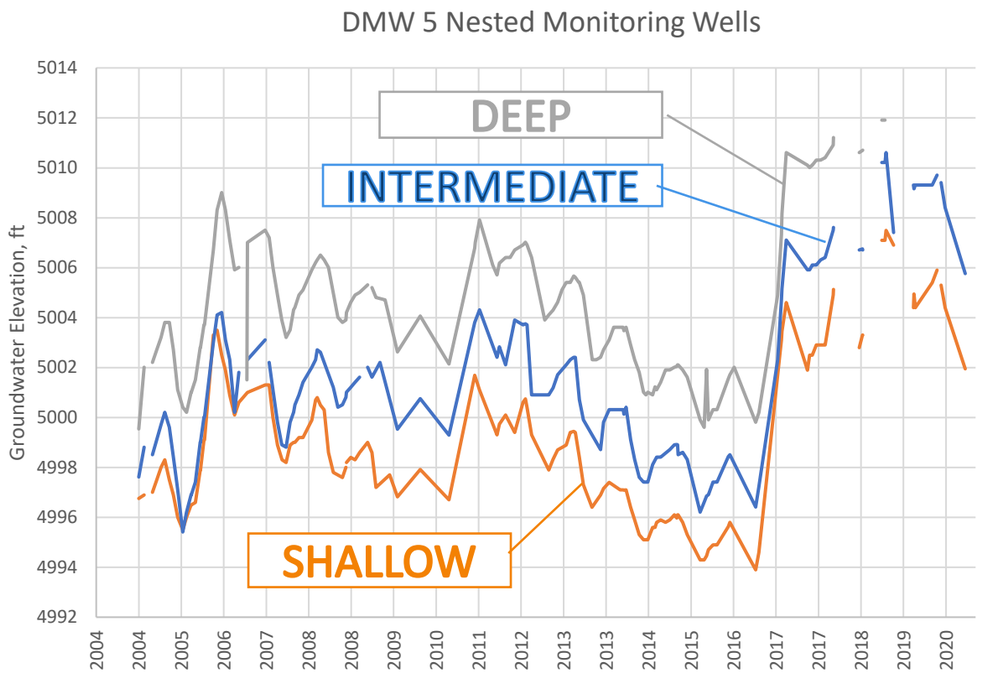


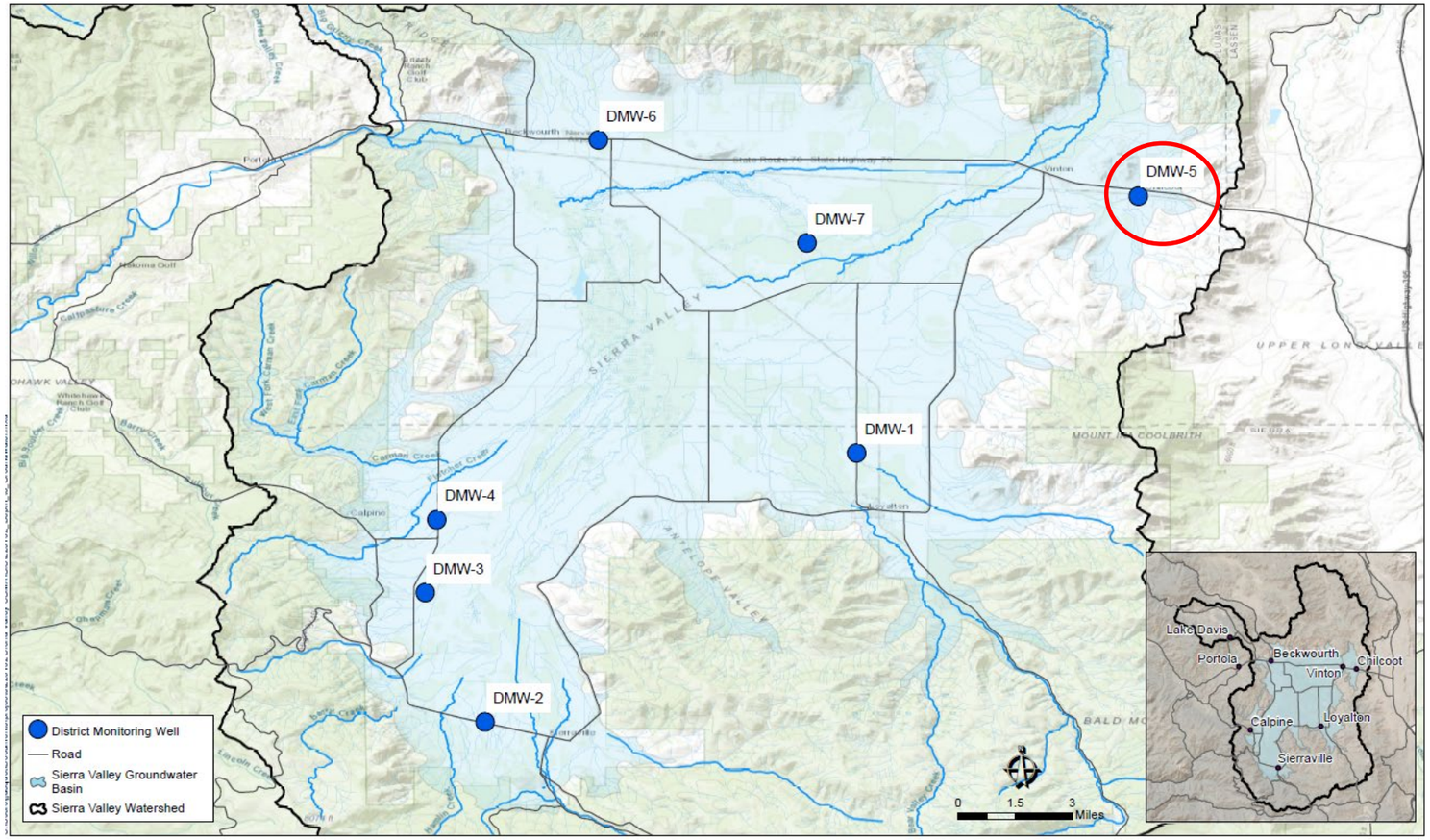


- Consistent downward vertical gradient

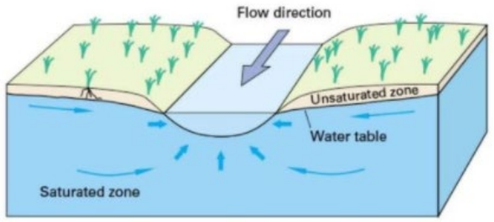


Groundwater Levels in Nested Wells





- Consistent upward vertical gradient



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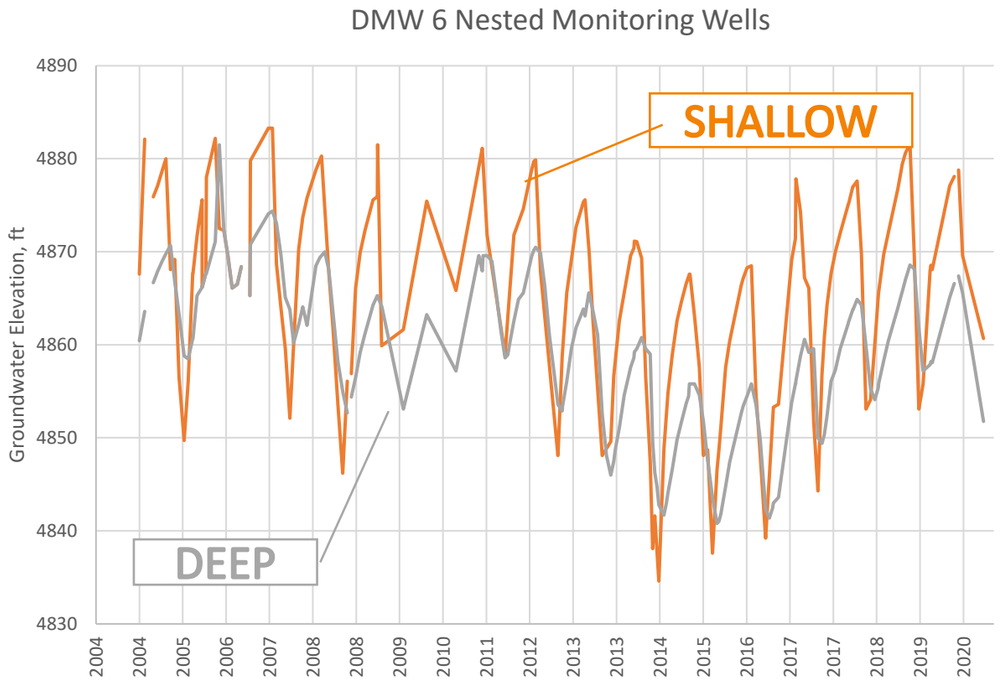

- Seasonally downward gradient in the spring and becoming flat in the late summer