Sierra Valley Groundwater Sustainability Plan Interconnected Surface Water (ISW)

Balance Hydrologics

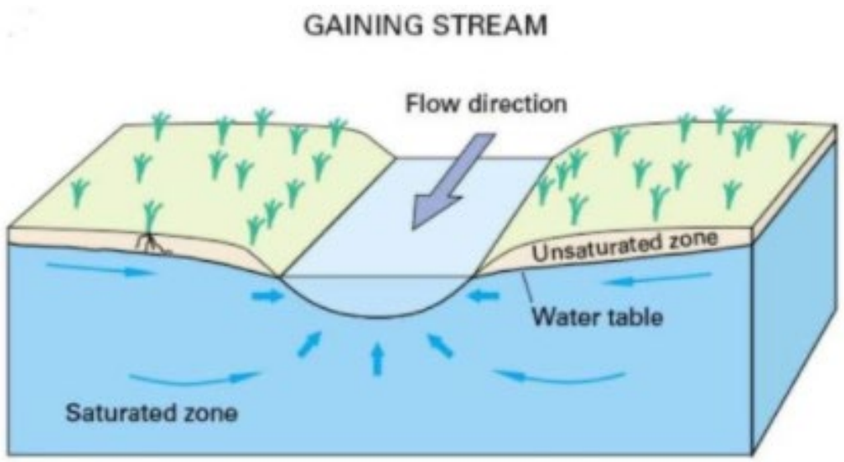
Sierra Valley GSP

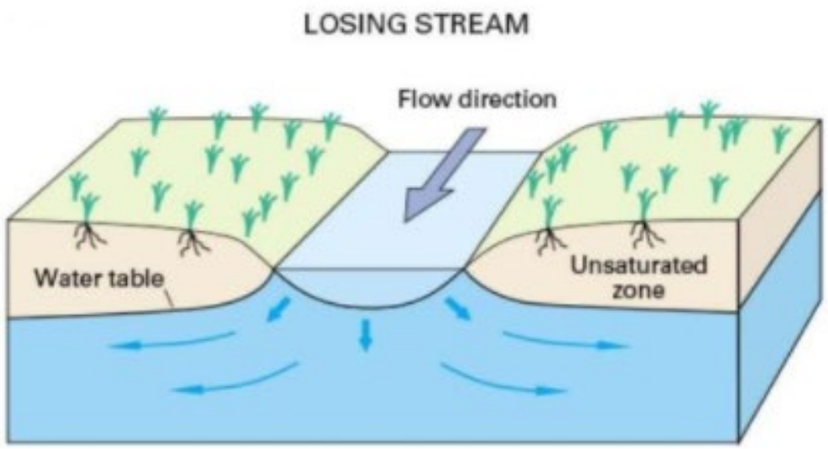
10 May 2021

Outline

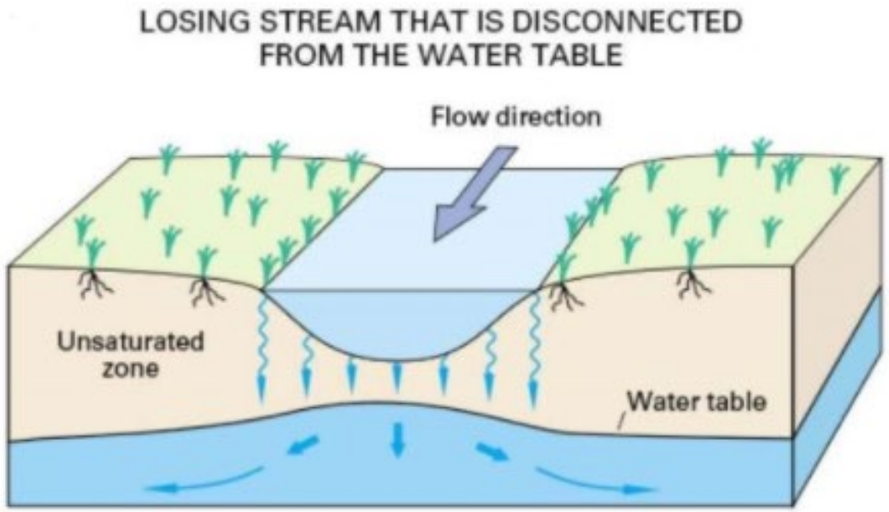
Balance Hydrologics

What is Interconnected Surface Water (ISW)?





Connected surface water



Disconnected surface water

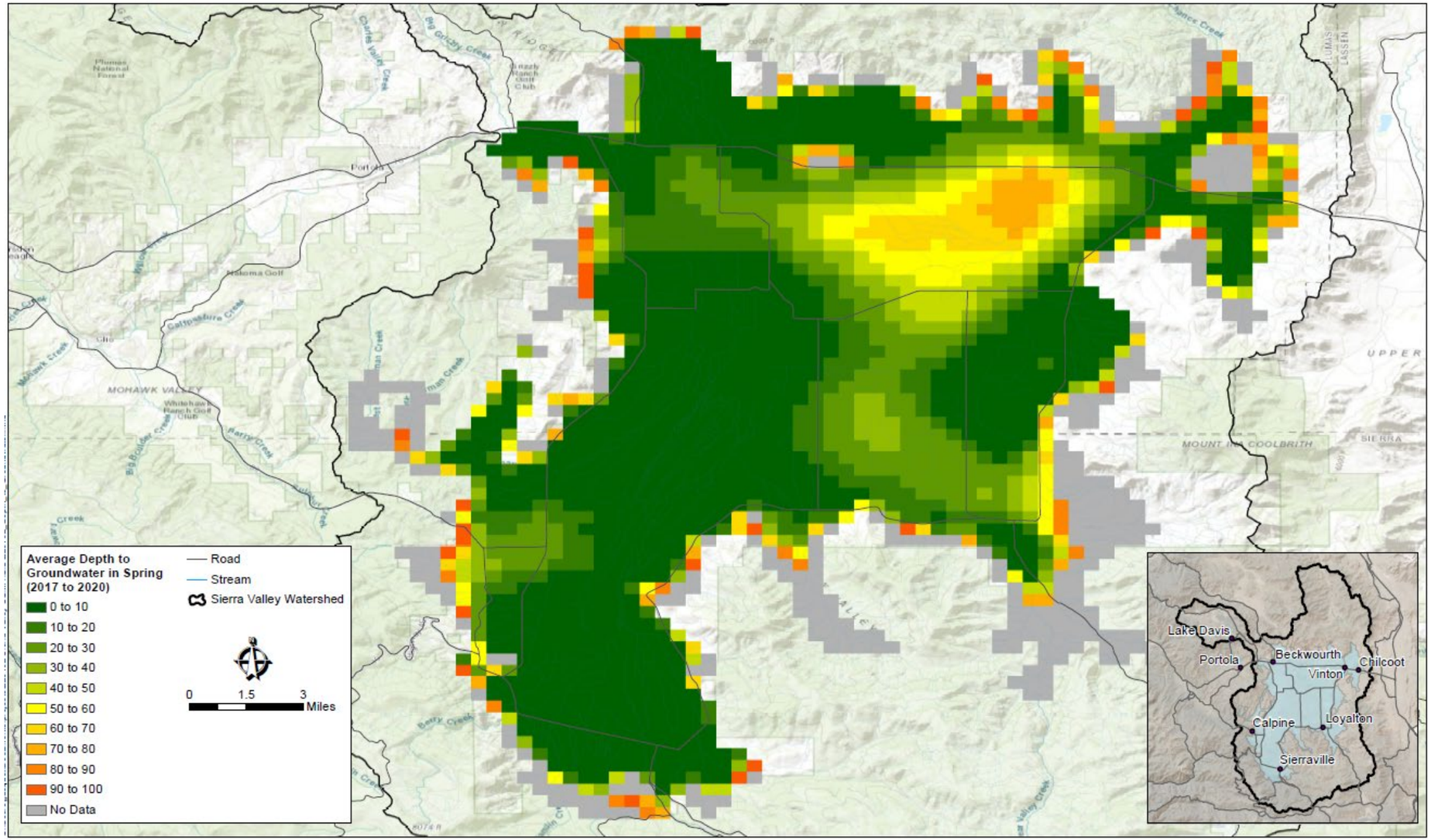
23 CCR § 351(o) "Interconnected surface water" refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted.

01

Existing Available Data: Monitoring Wells

Balance Hydrologics

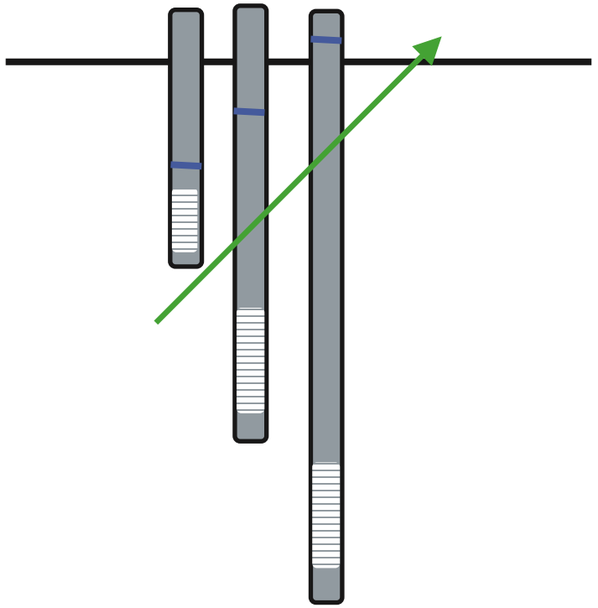
Depth to Groundwater in Monitoring Wells



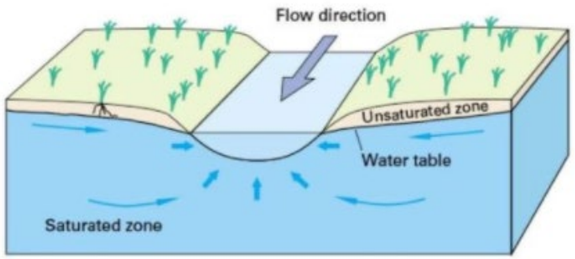
- Average depth to groundwater in the Spring from 2017 to 2020
- A 4-year average provides a statistically significant dataset

Vertical Hydraulic Gradients in Nested Wells

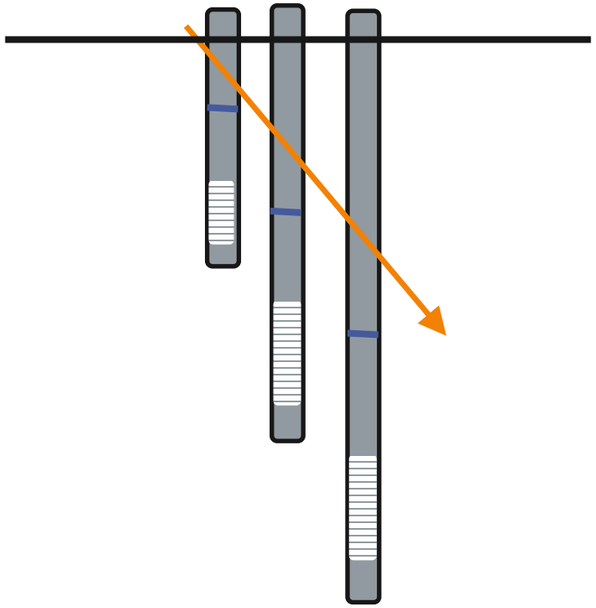
Upward (positive) gradient



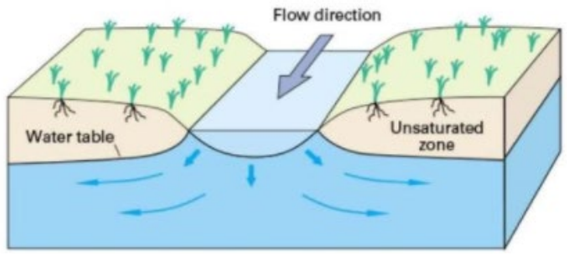
GAINING STREAM



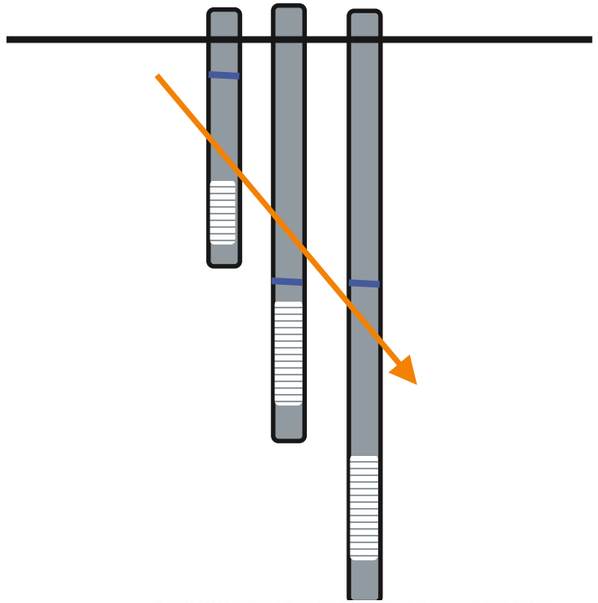
Downward (negative) gradient



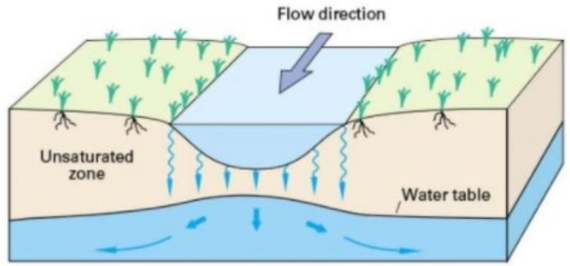
LOSING STREAM



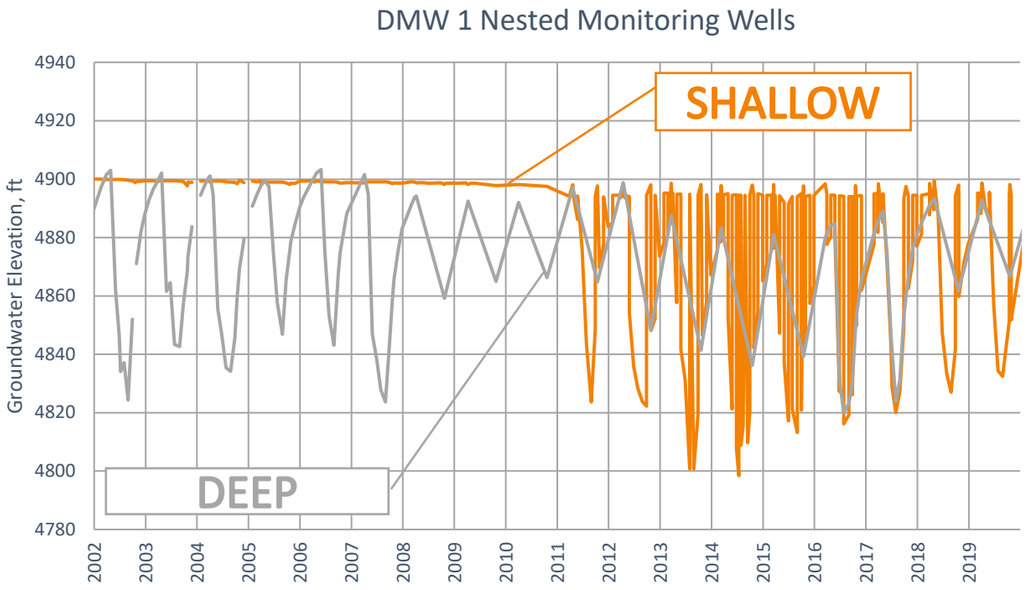
Downward (negative) gradient

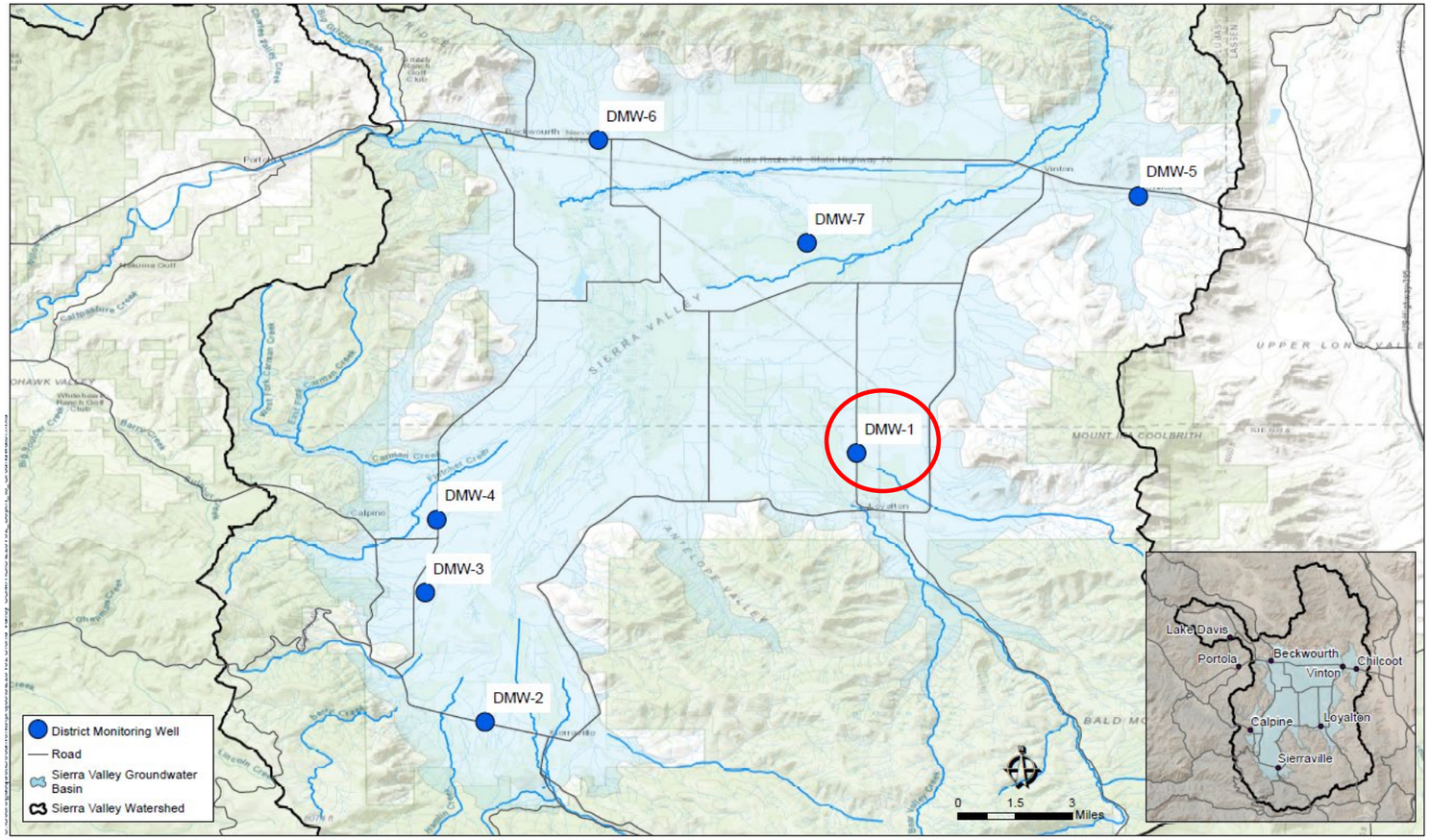


LOSING STREAM THAT IS DISCONNECTED FROM THE WATER TABLE

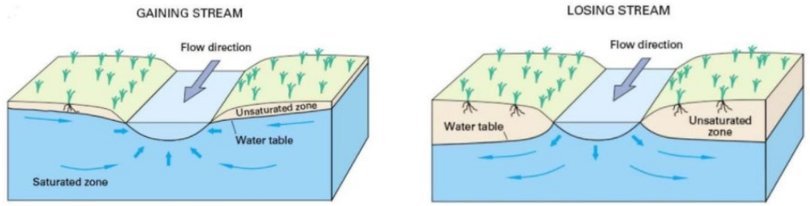


Groundwater Levels in Nested Wells

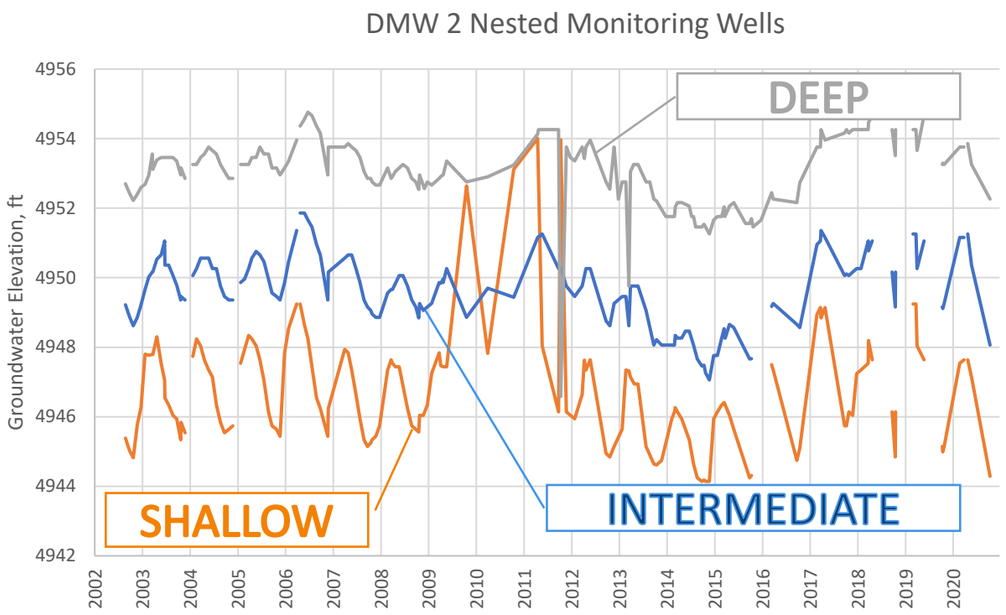




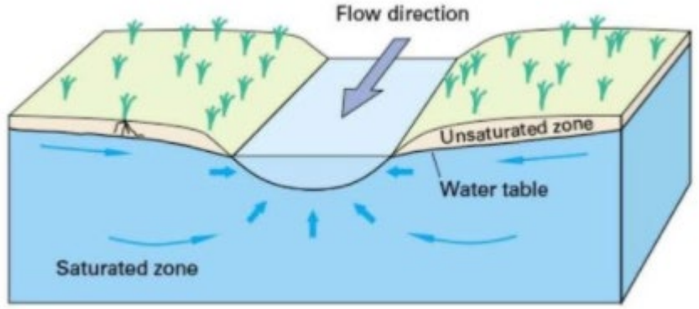
- Mostly downward vertical gradients prior to switching to consistent alternating upward and downward in Spring 2007

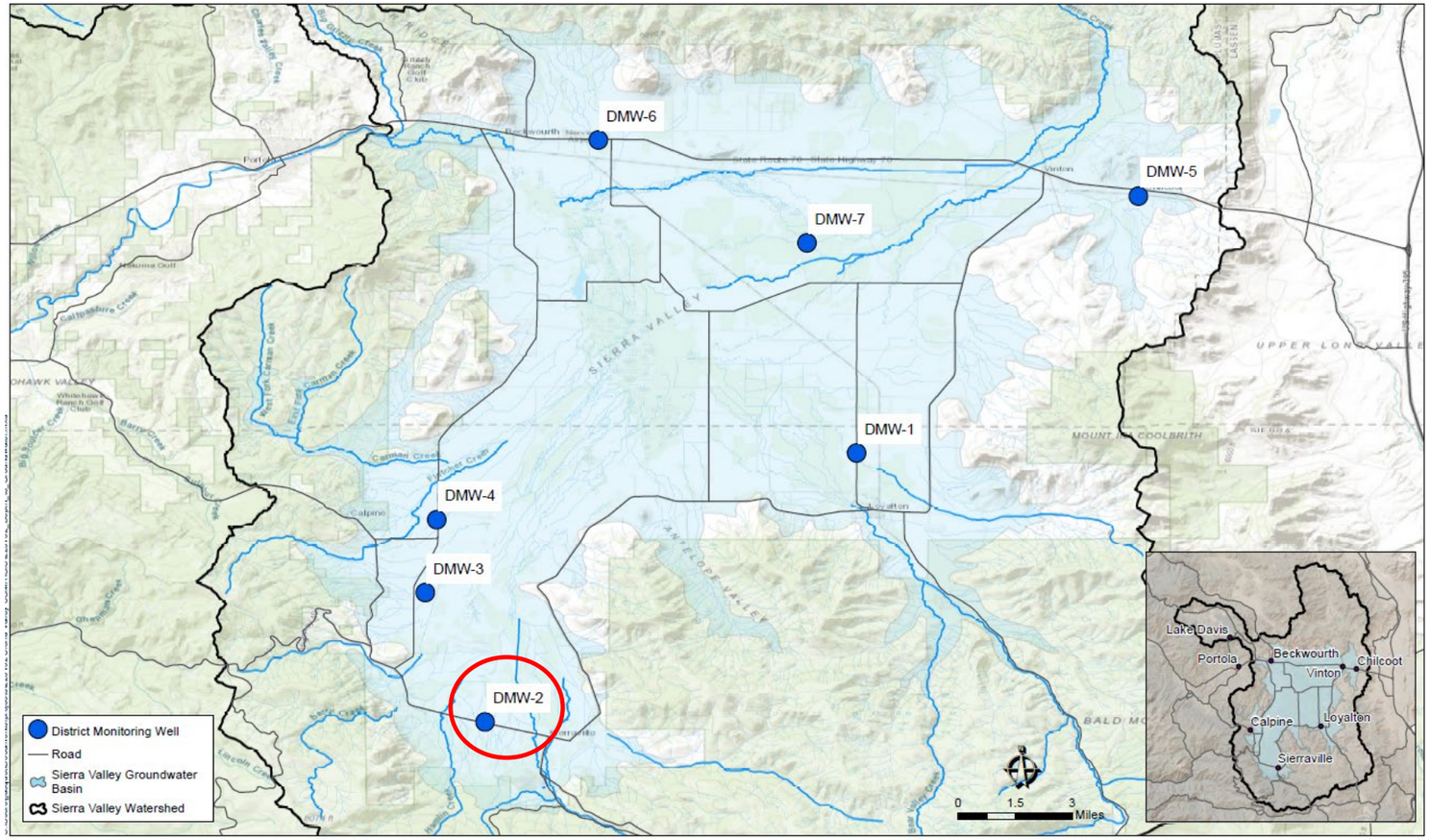


Groundwater Levels in Nested Wells



- Consistent upward vertical gradient





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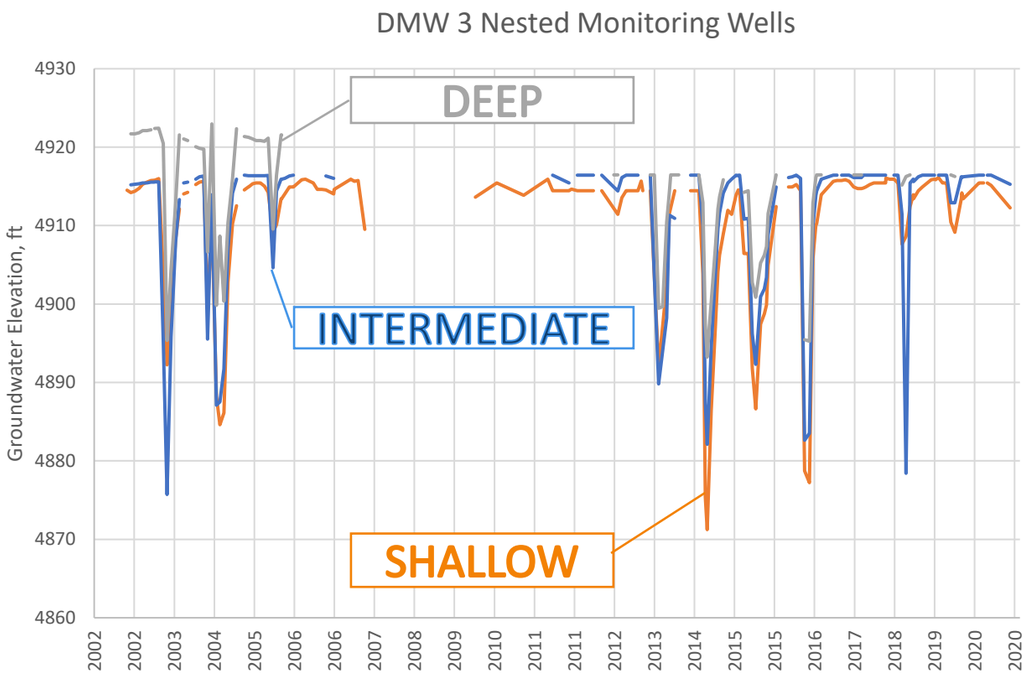
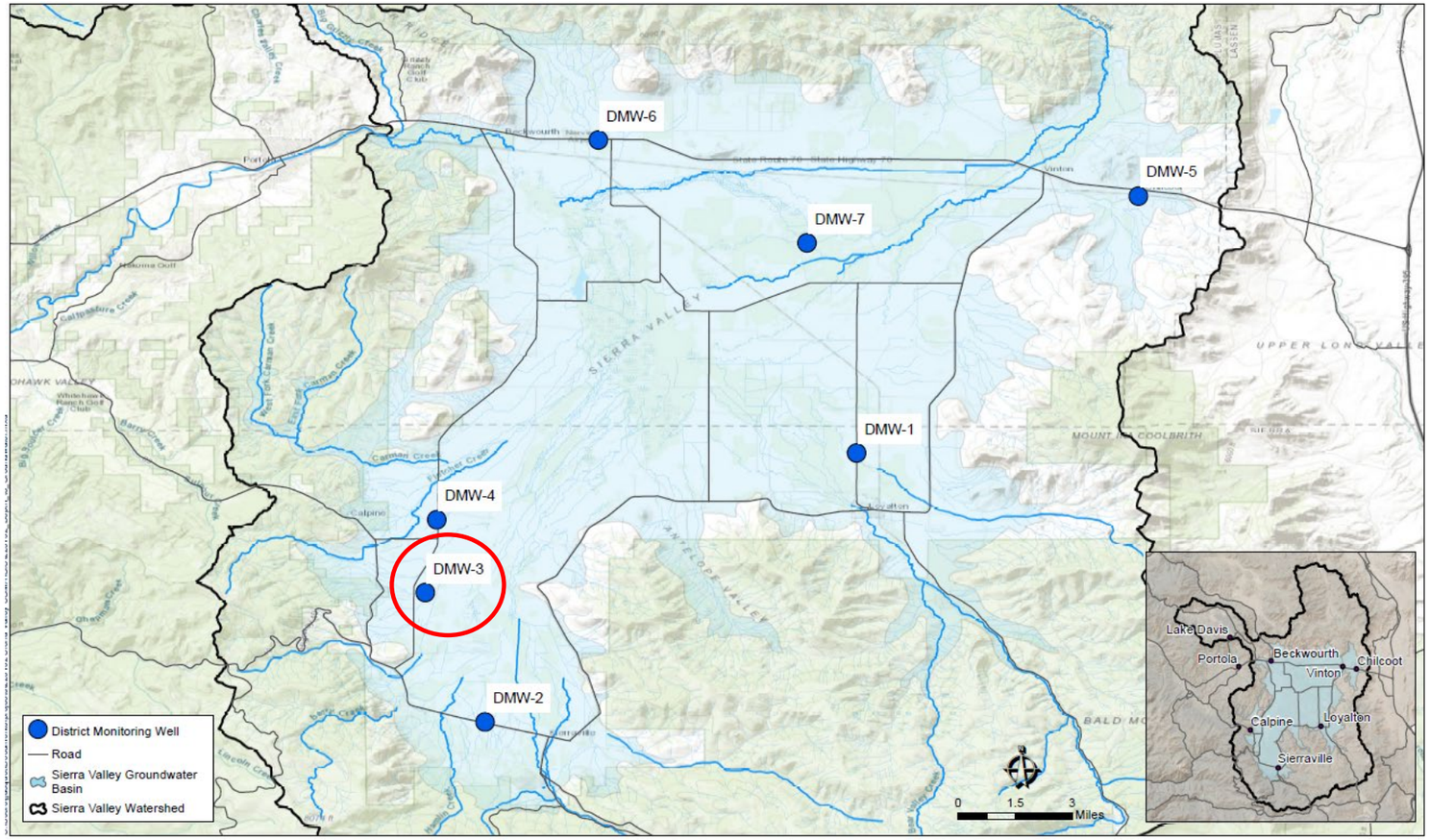
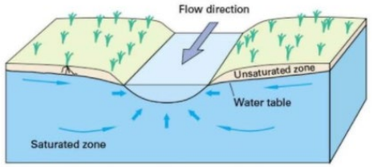
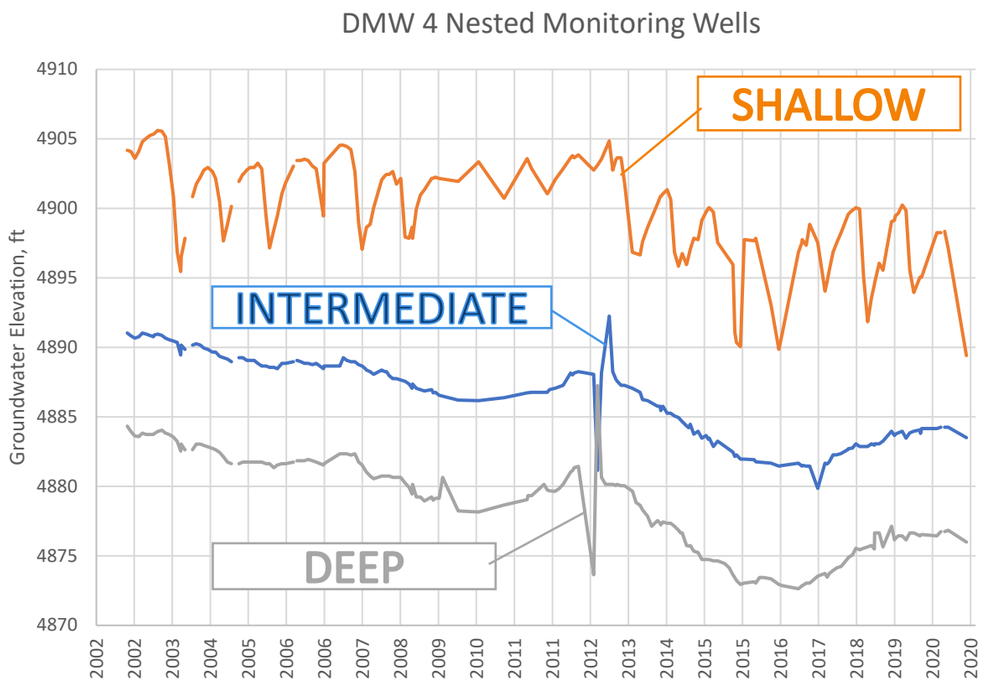


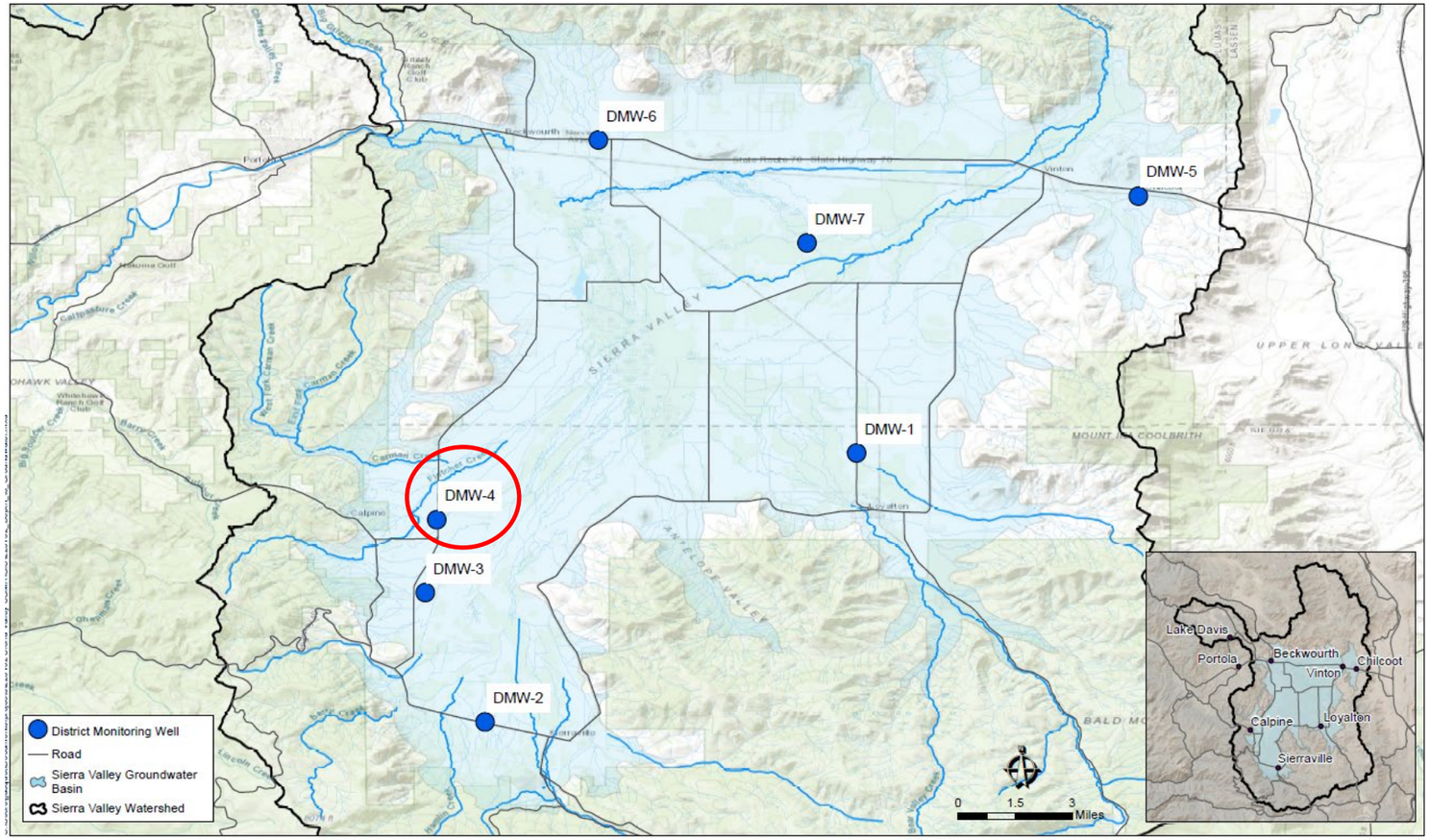


- DMW-3 deep is often flowing and can not be measured
- Consistent upward vertical gradient

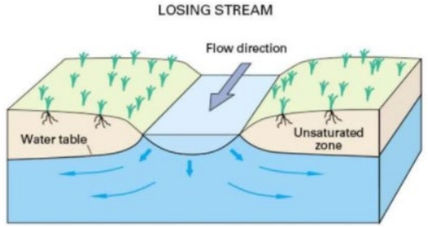


Groundwater Levels in Nested Wells

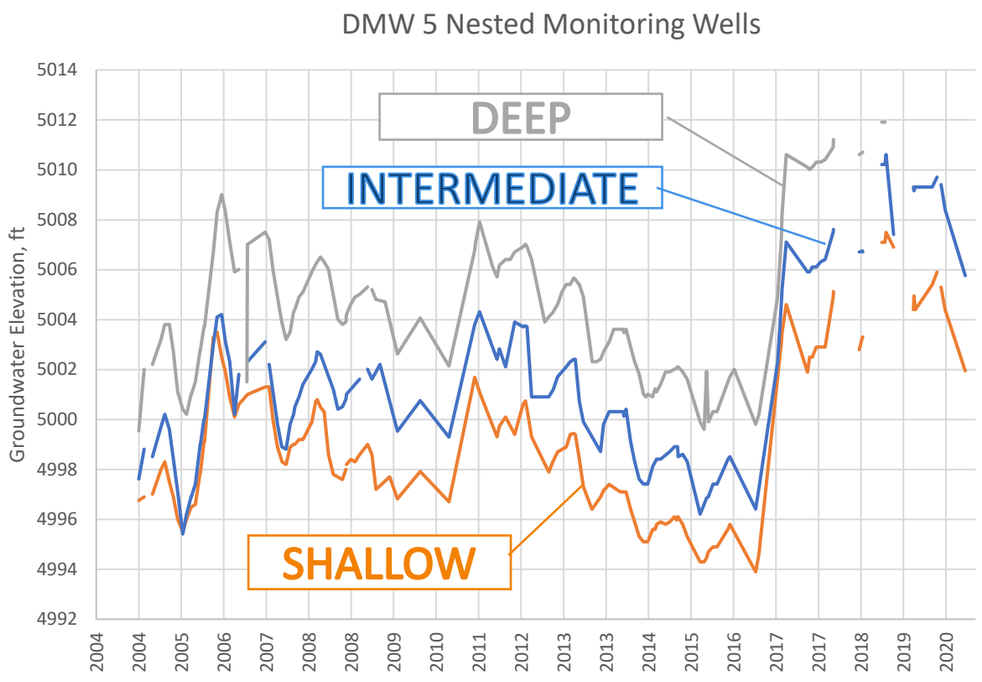


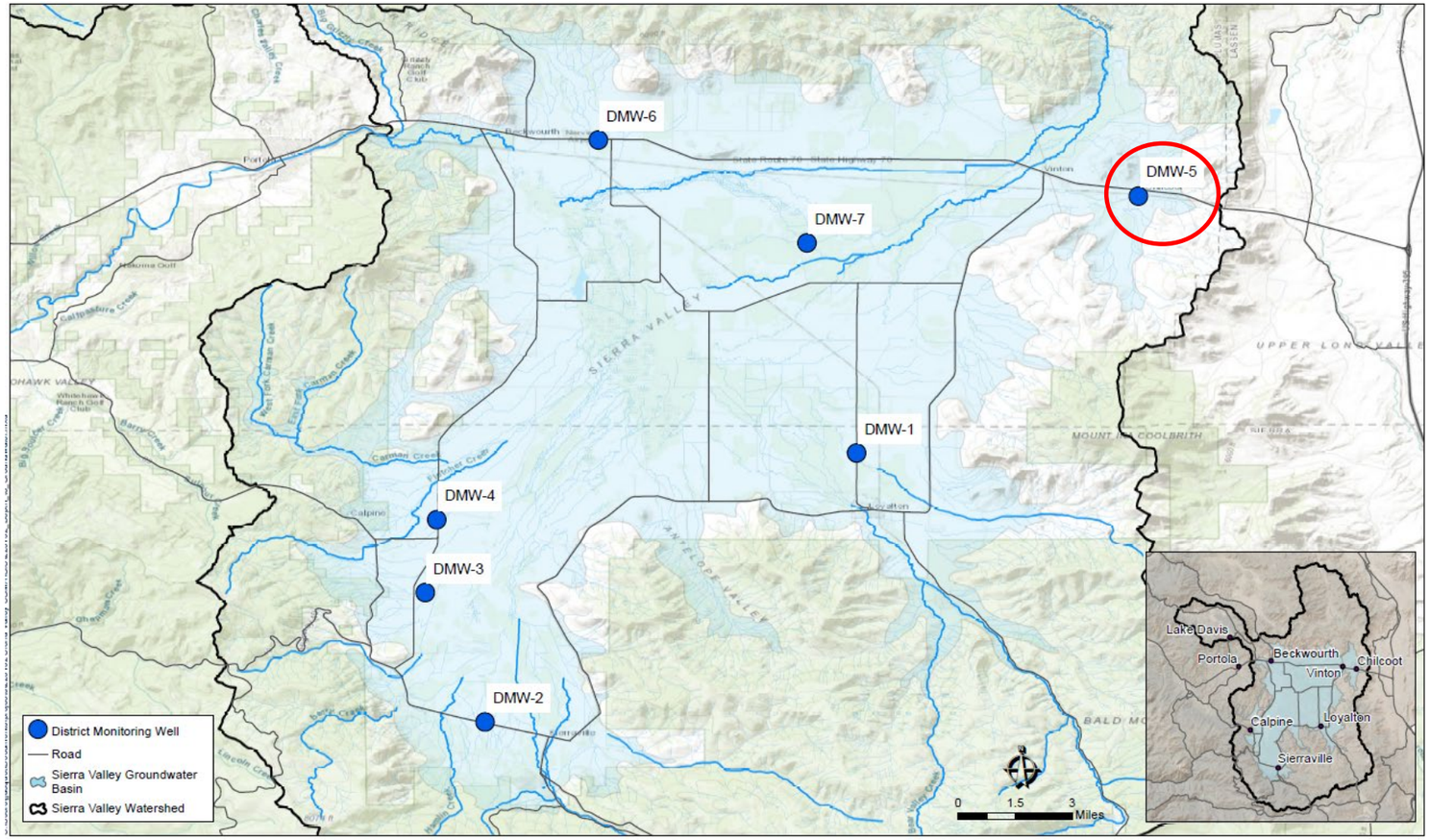


- Consistent downward vertical gradient

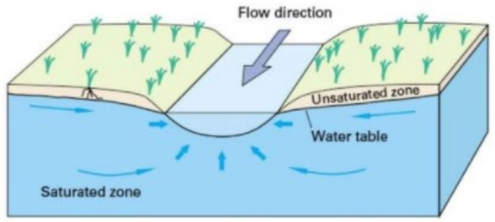


Groundwater Levels in Nested Wells

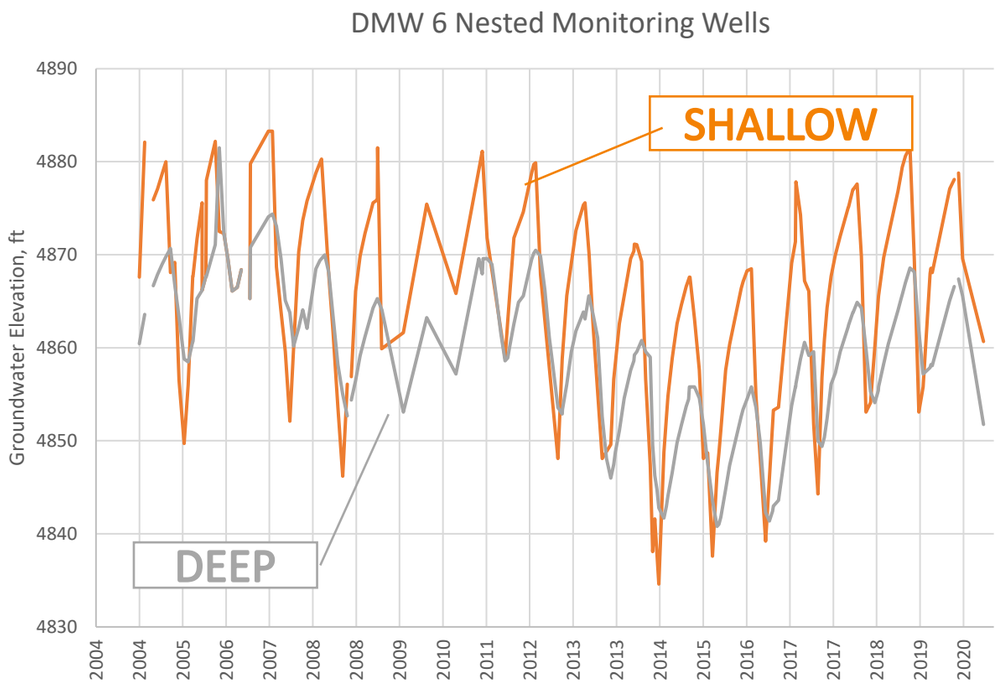


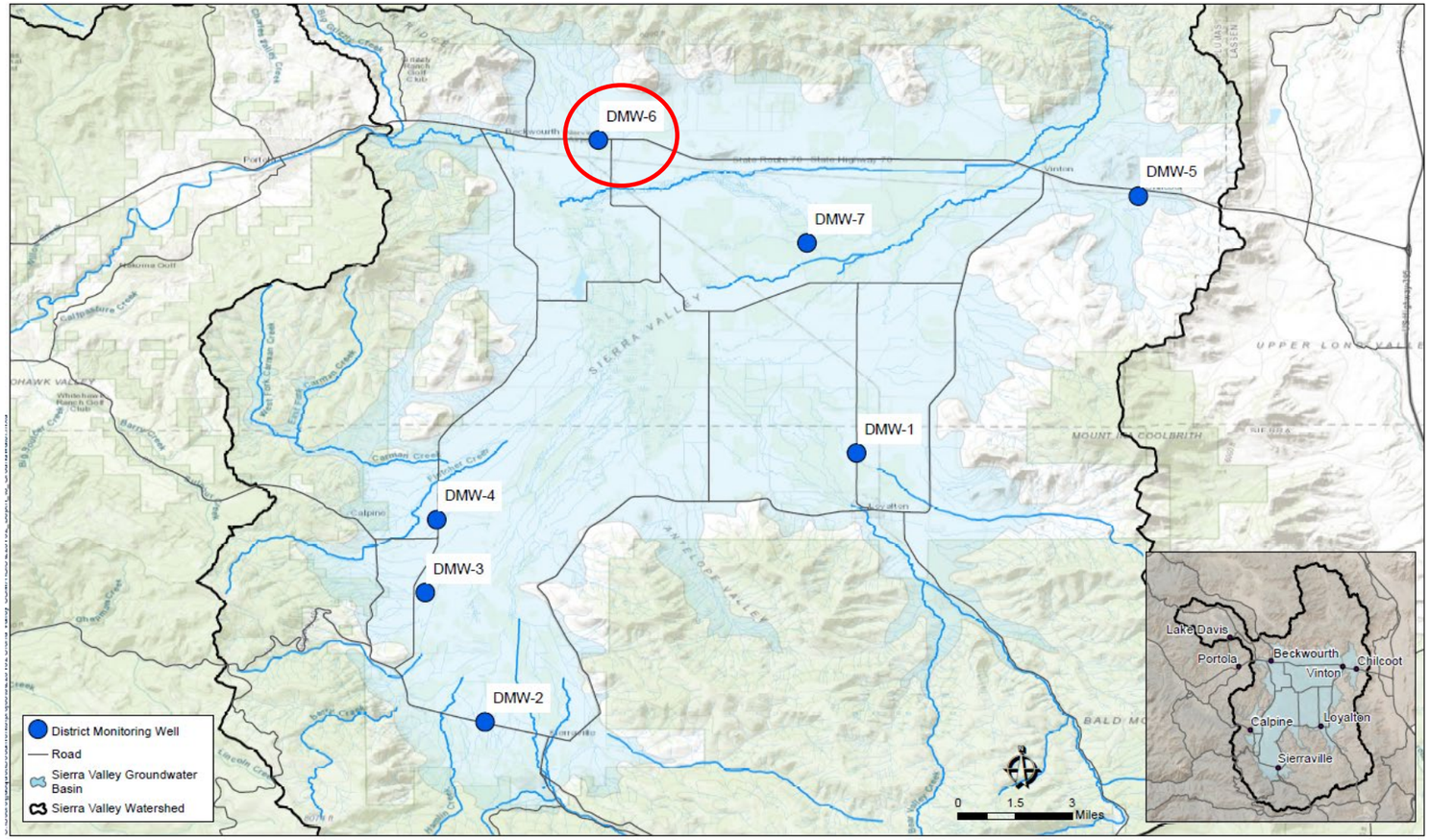


- Consistent upward vertical gradient

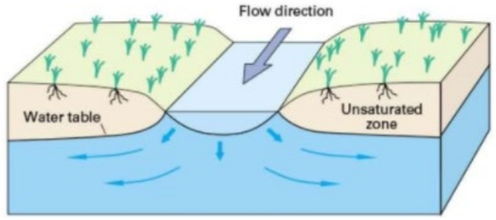


Groundwater Levels in Nested Wells





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



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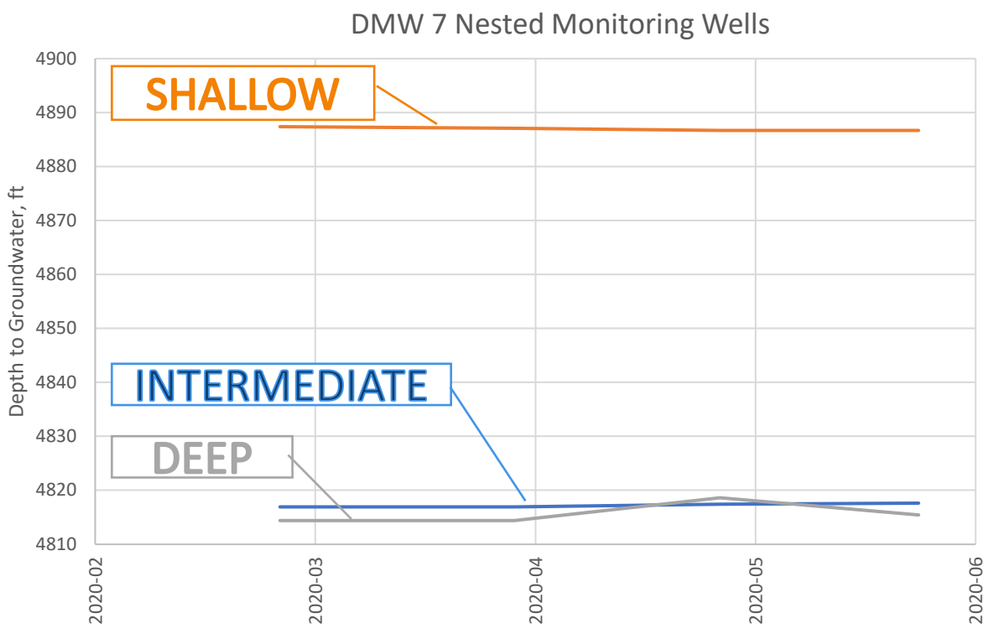
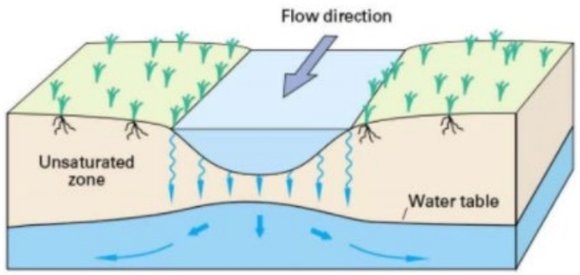
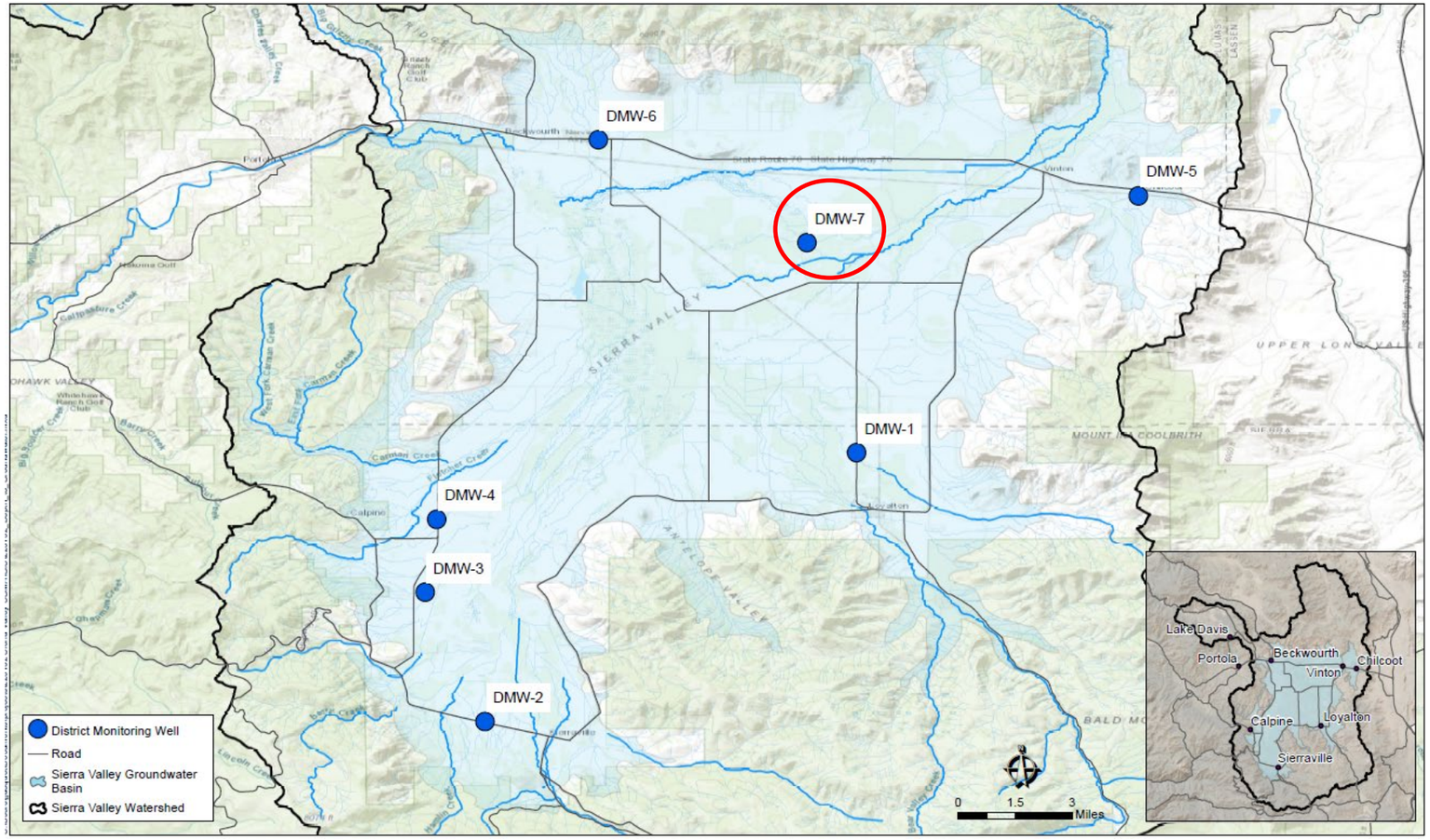


- Consistent downward vertical gradient



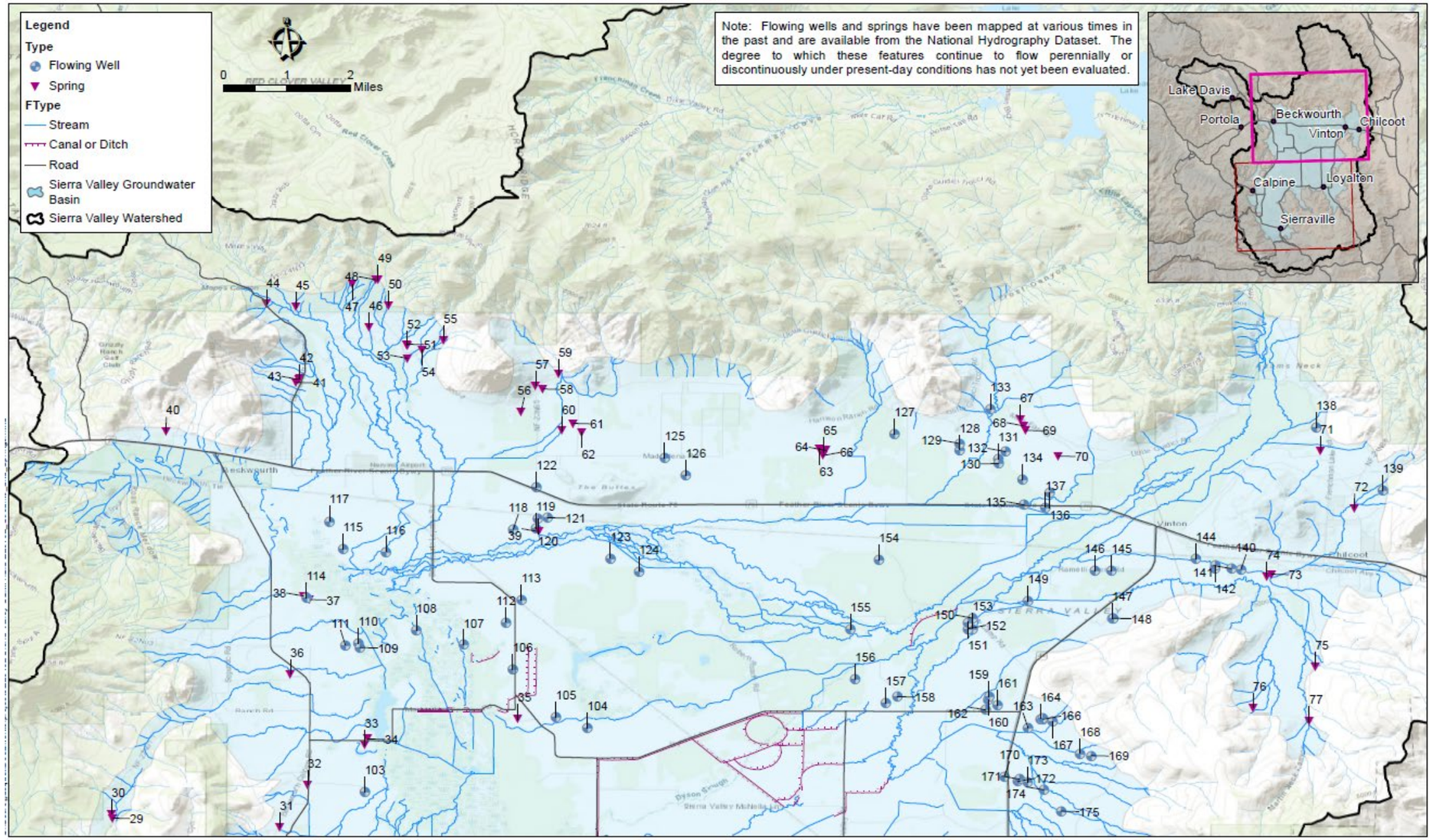


01

Existing Available Data: National Hydrography Dataset (NHD)

Balance Hydrologics

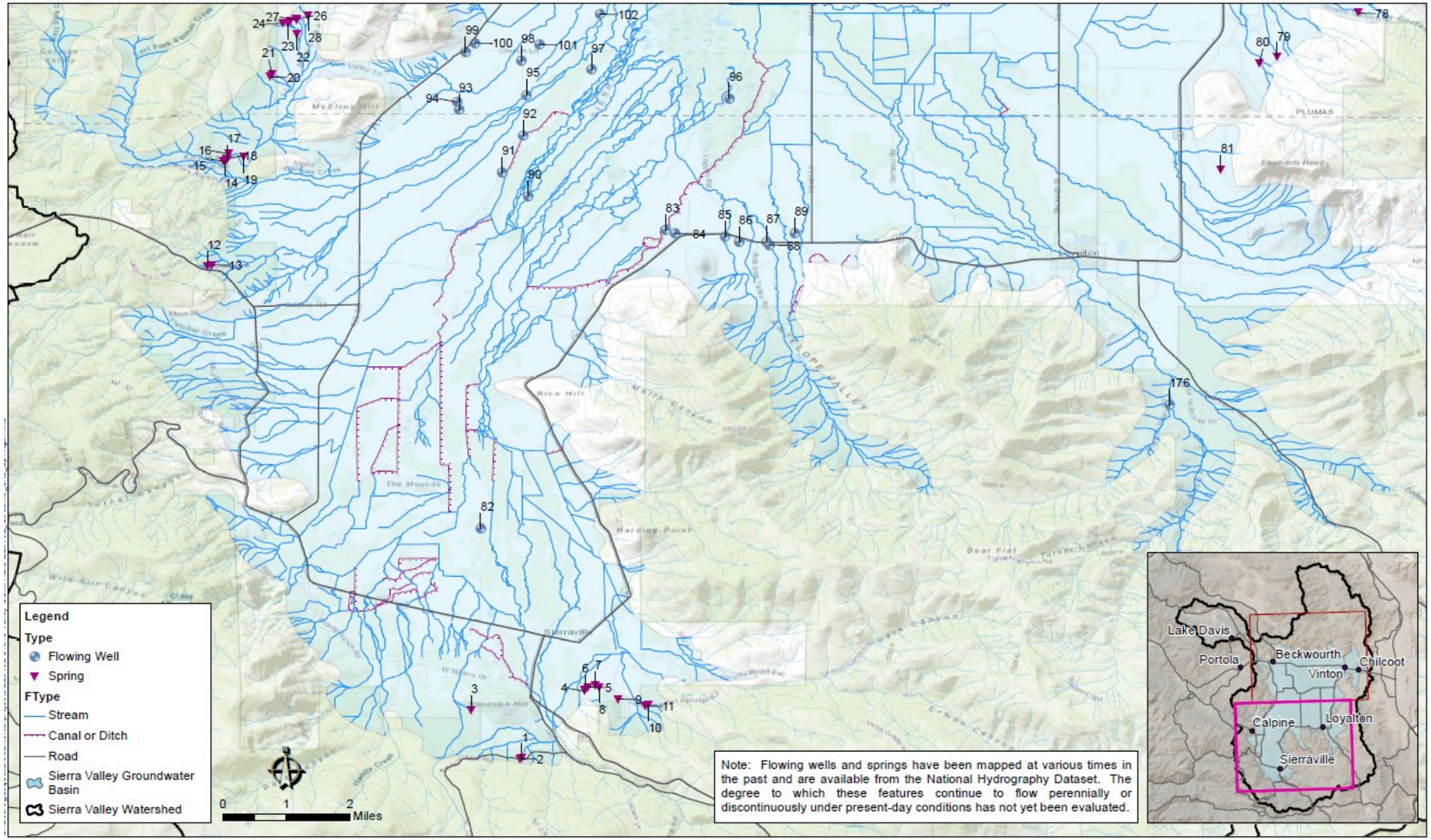
NHD Streams, springs, and flowing wells (North)



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

- Multiple nested wells show an upward (positive) vertical hydraulic gradient at some point in the period of record
- 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

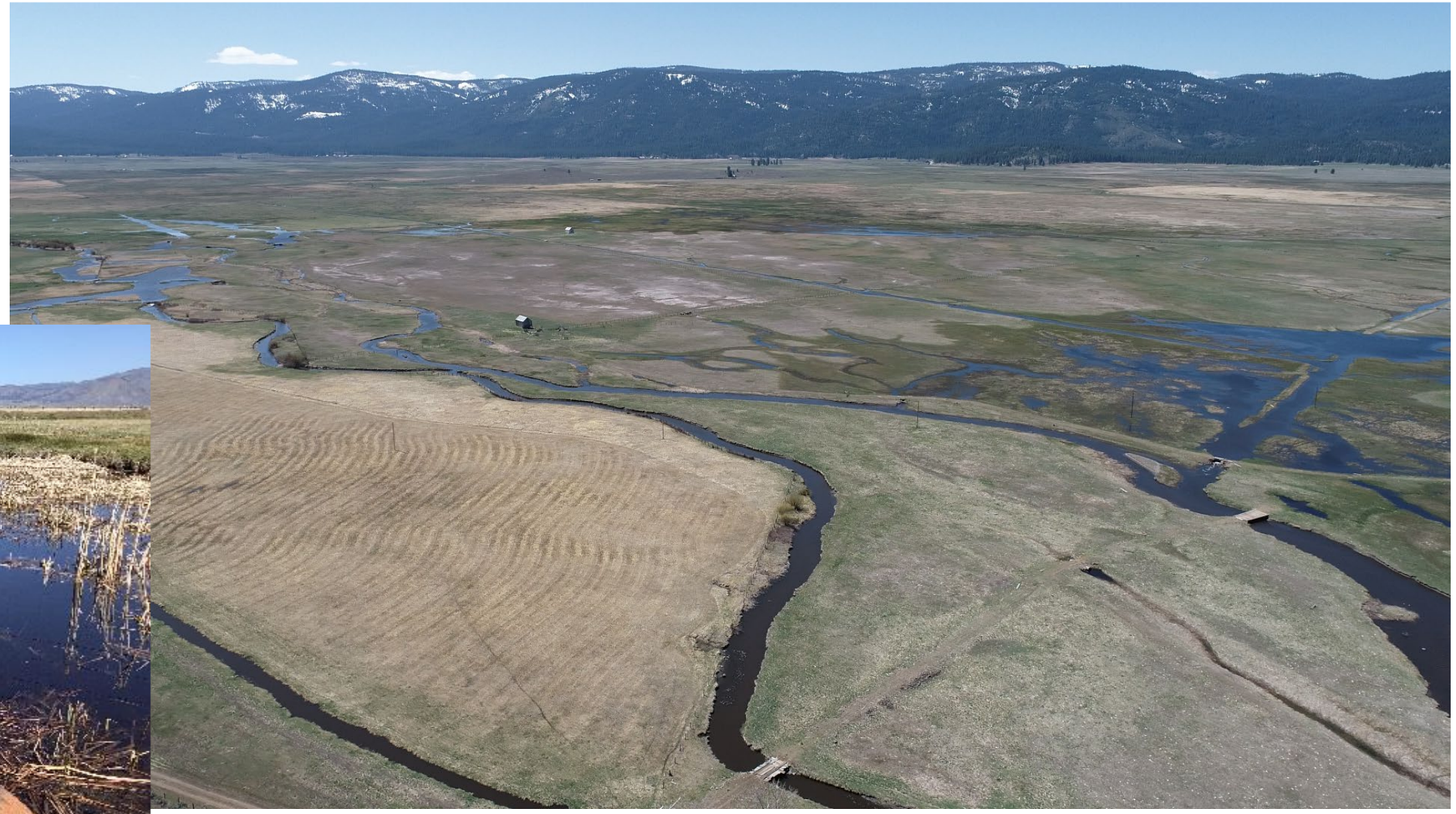
Fletcher Creek at HWY 89

Carmen Creek at Westside Rd

Little Last Chance Creek at HWY 70

Field Evaluation – Irrigation canals and ditches (Spring 2021)

Eastside Canal (Roen Property)



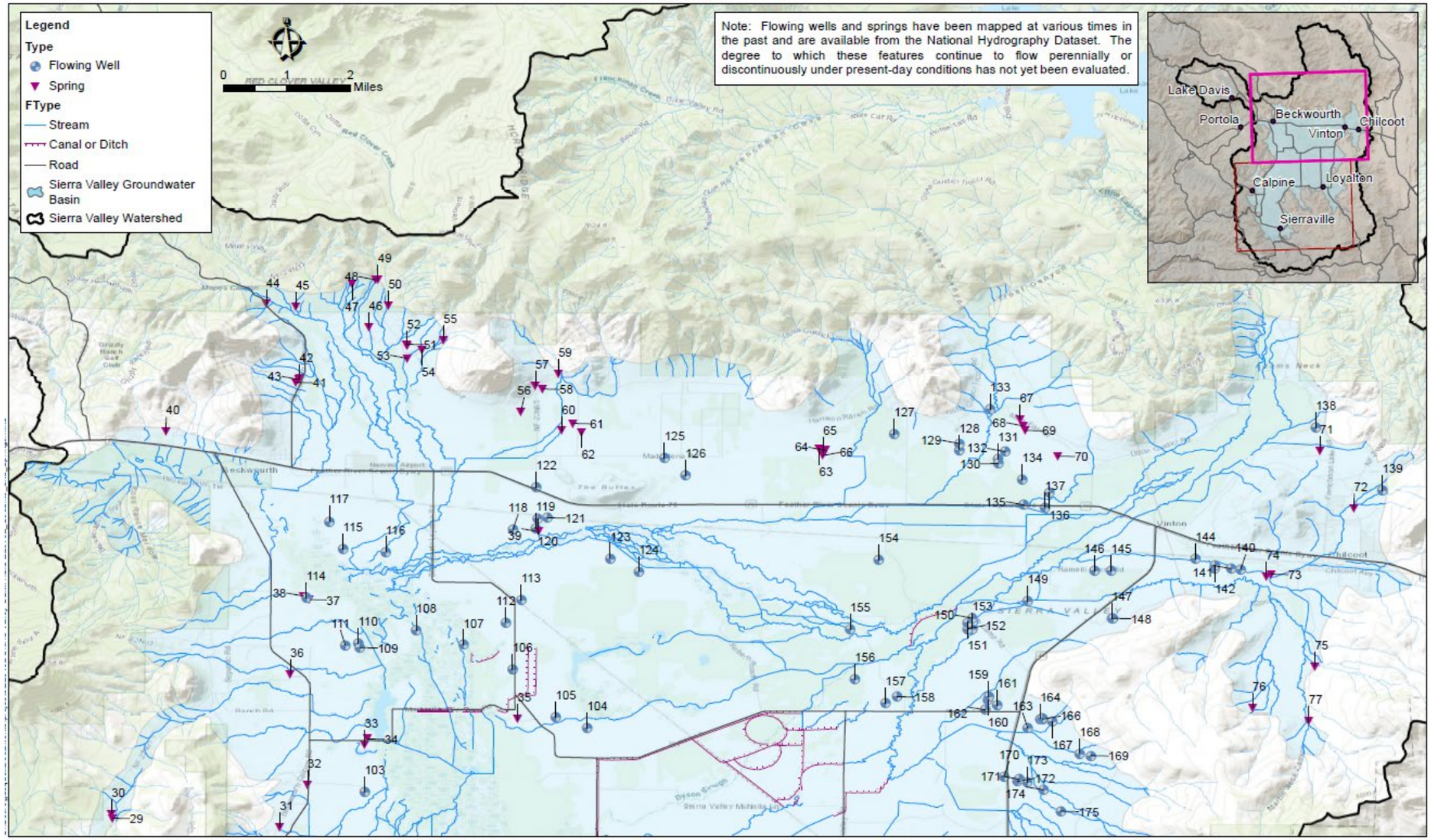
Sierra Valley Irrigation Channels
(Near Rice Hill)

Field Evaluation – Summary of observations and preliminary conclusions

Field Summary

1. The network of channels and ditches is complex; most channels are relatively shallow
2. Surface inflows and deliveries play a significant role in supporting valley streams, wetlands, and irrigated pasture, especially in dry years. Surface inflows and deliveries are often the only hydrologic support to many channels in the valley
3. Springs and flowing wells generally do not contribute large volumes to surface water bodies but do provide some support. Springs and flowing wells used to maintain water in stock ponds and tanks
4. Springs and flowing wells are limited in the central portions of the valley and more common near the valley margins
5. Springs and flowing wells indicate where groundwater is close to the surface

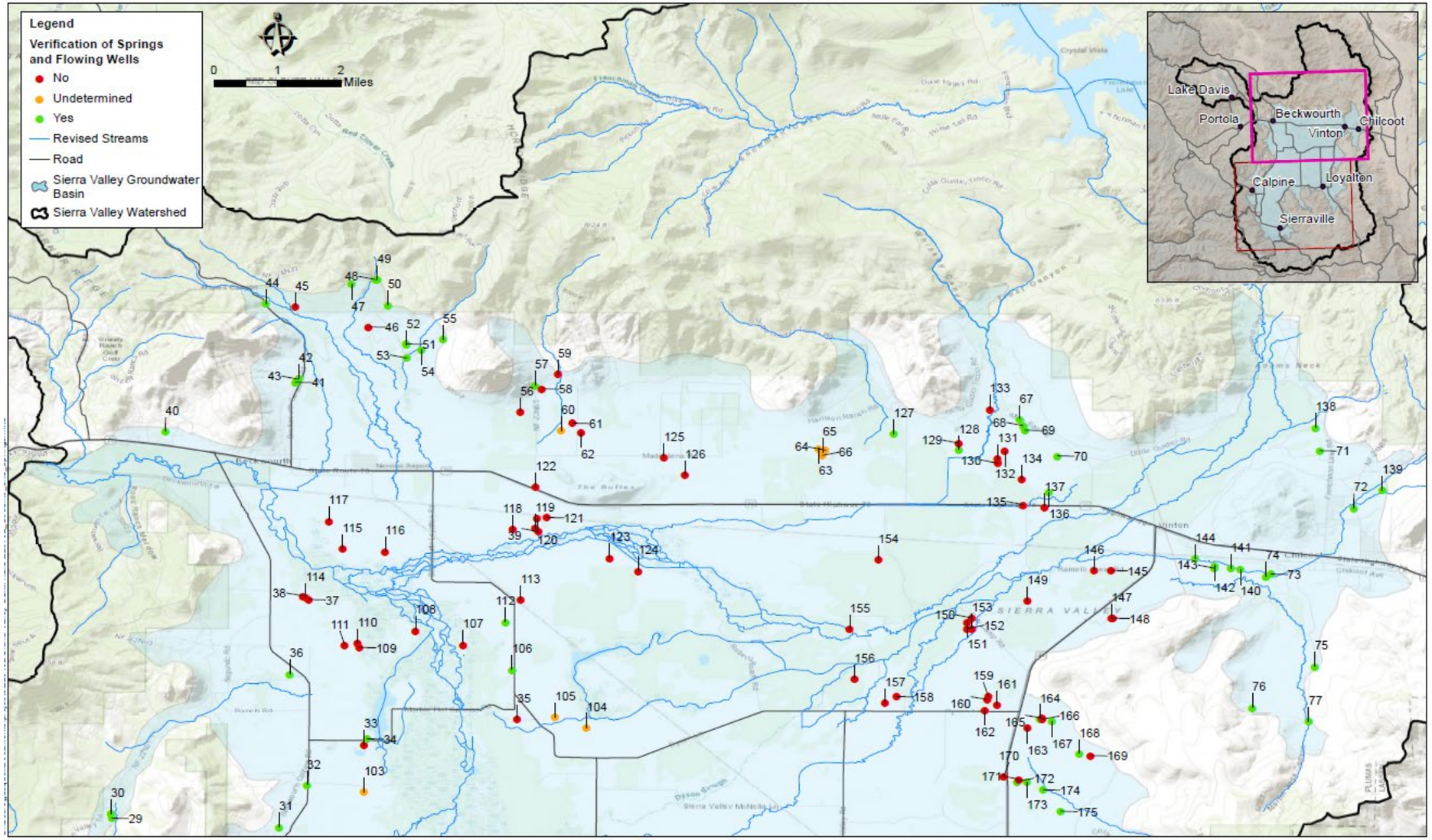
NHD refinement



Within the groundwater basin

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

NHD refinement



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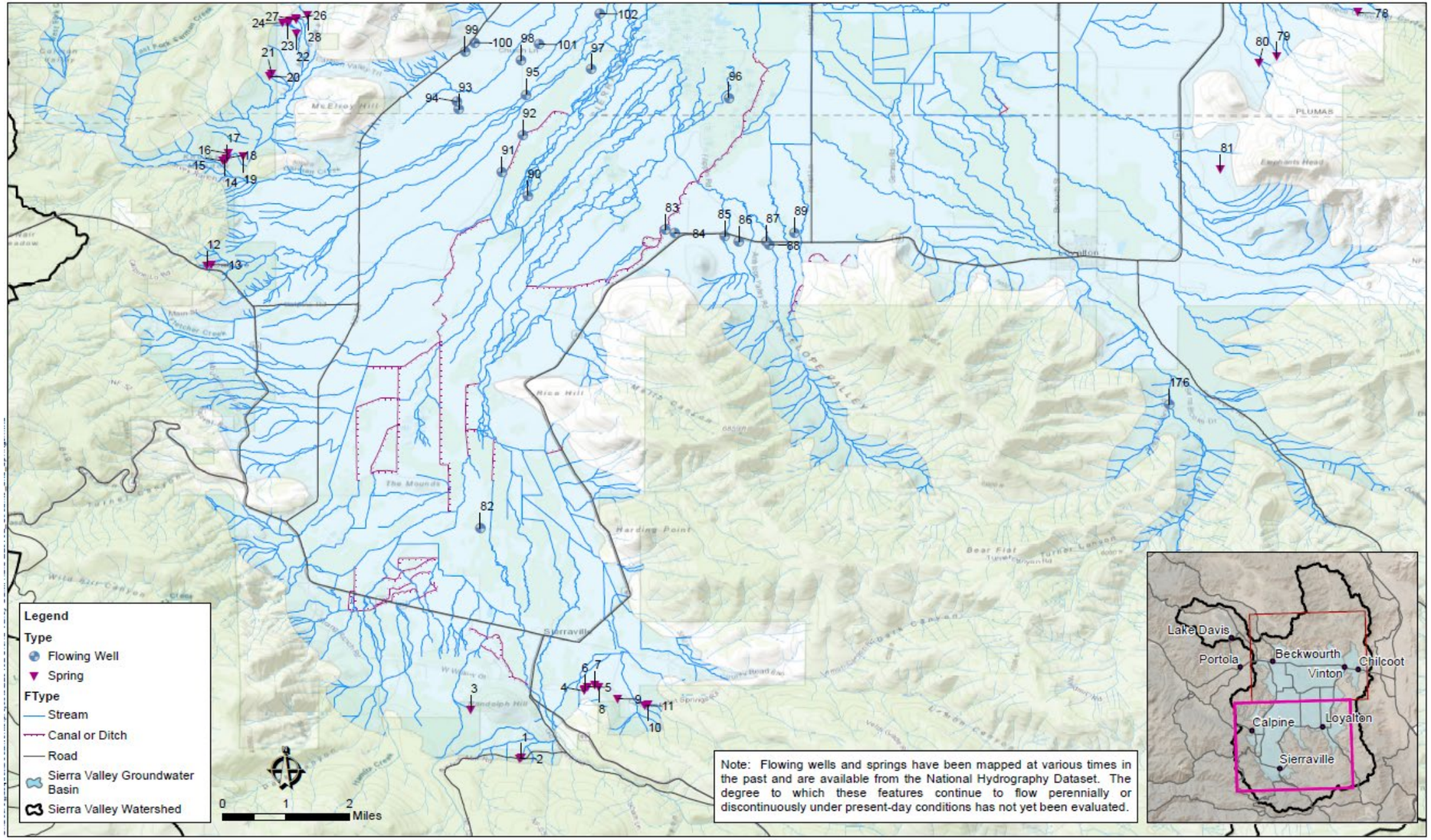
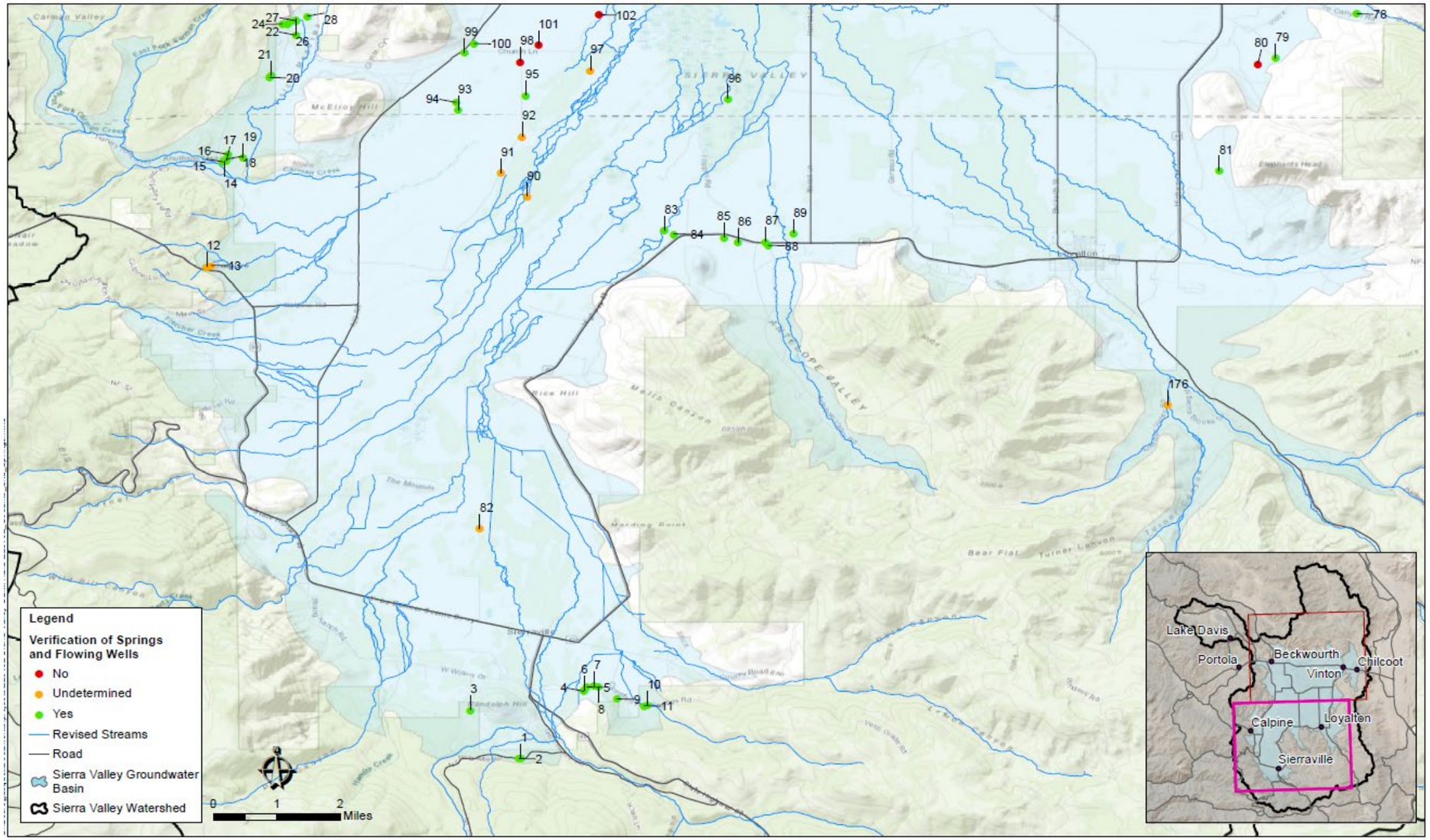
NHD refinement

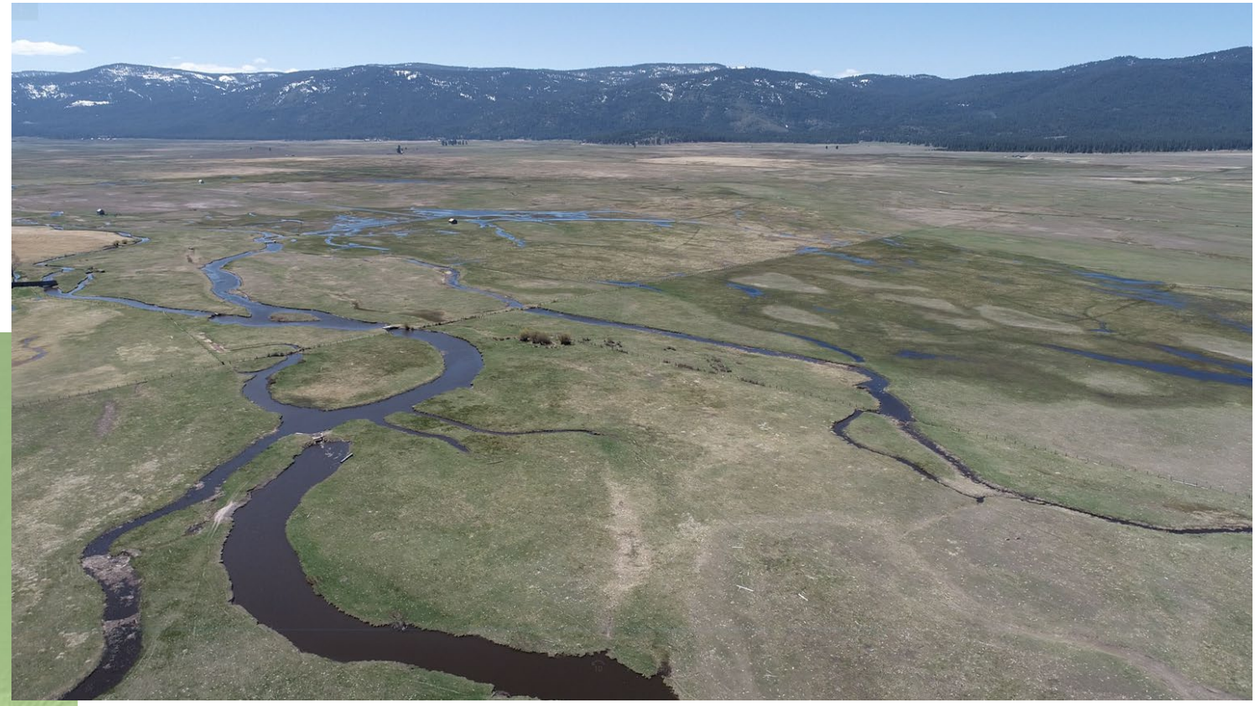


NHD refinement

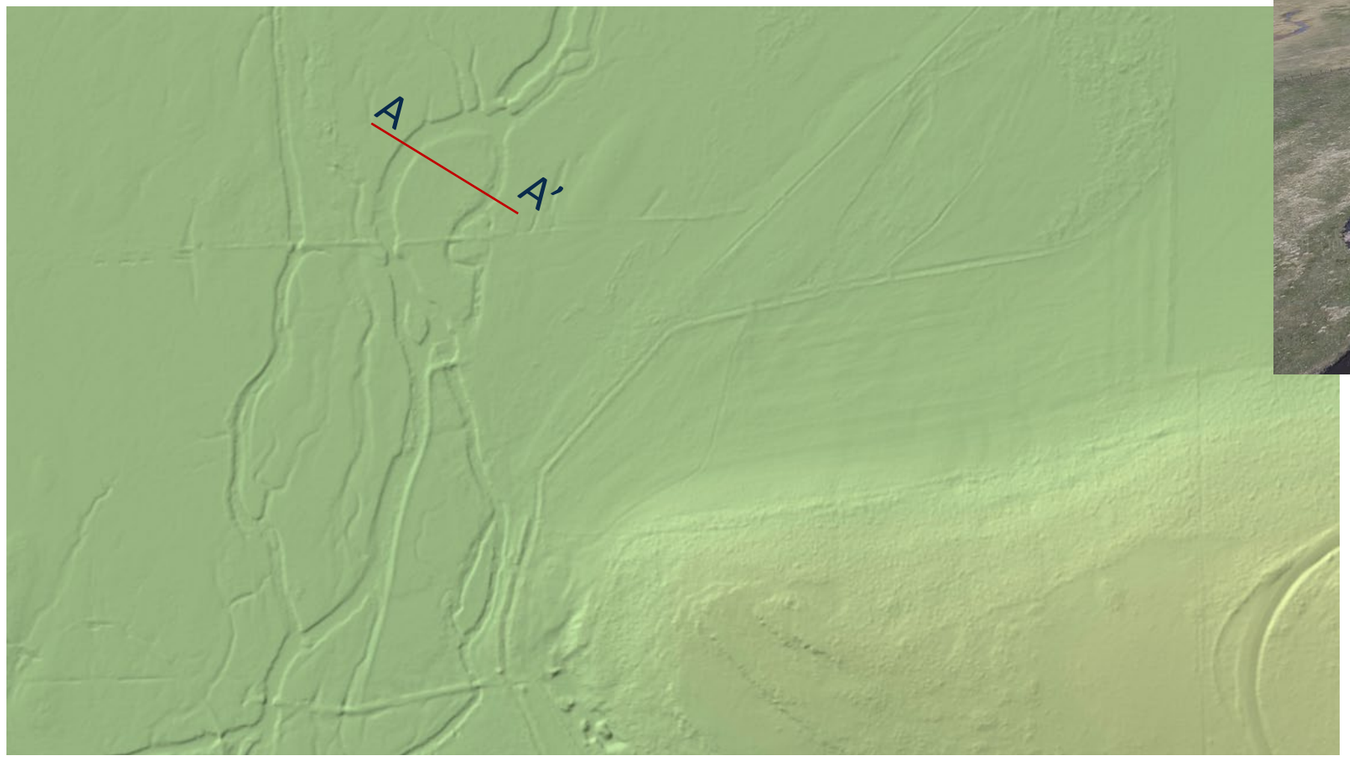


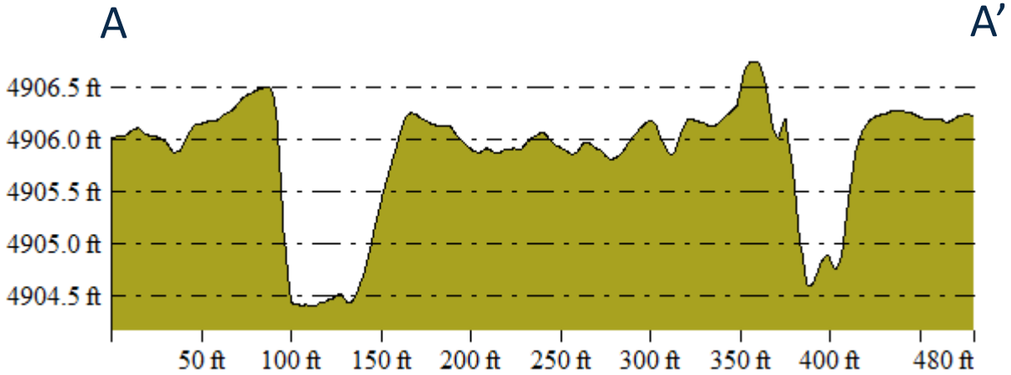
Most channels are relatively shallow

Sierra Valley Channels
(Near Rice Hill)



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





03

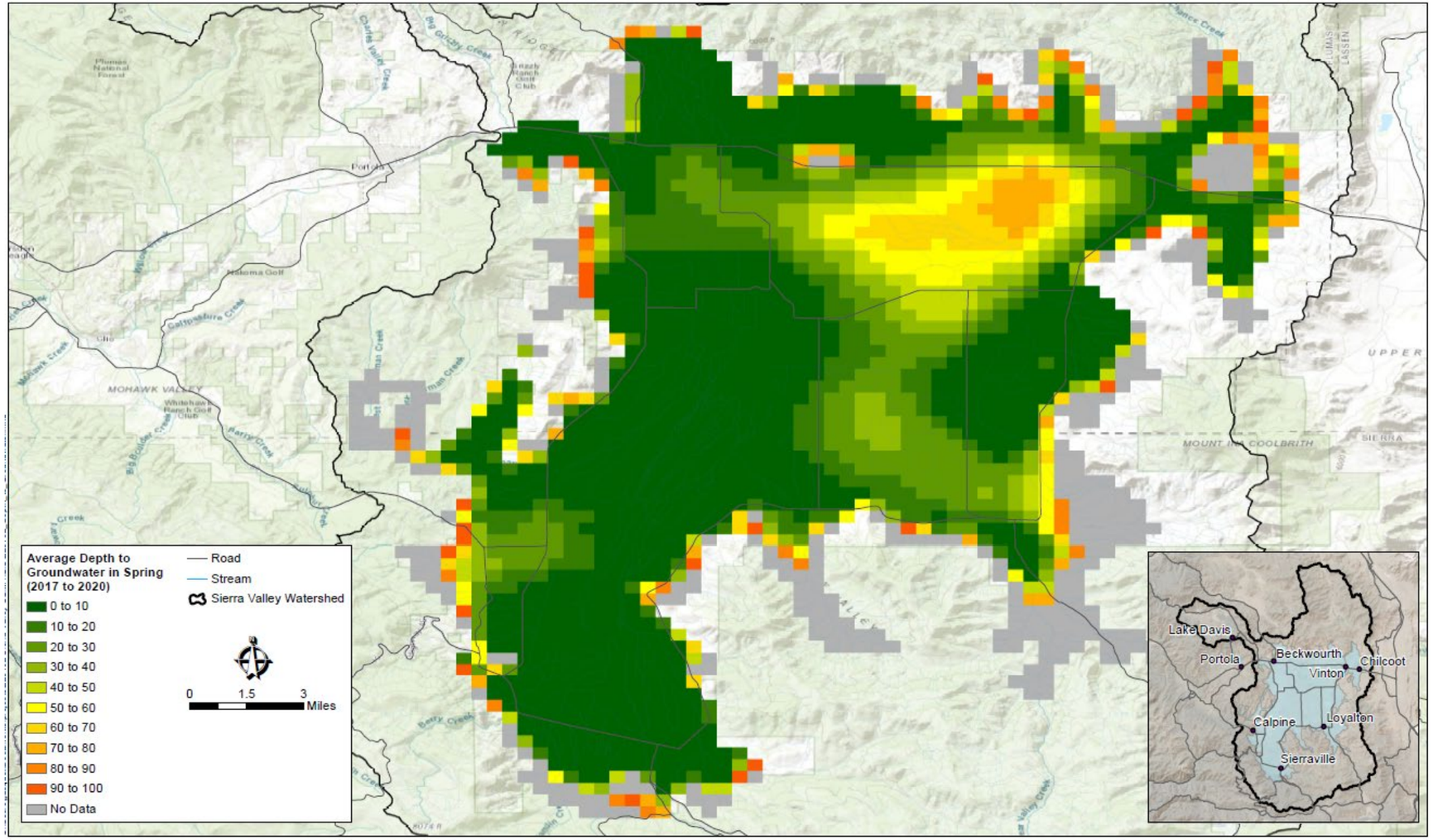
ISW Identification Approach

Balance Hydrologics

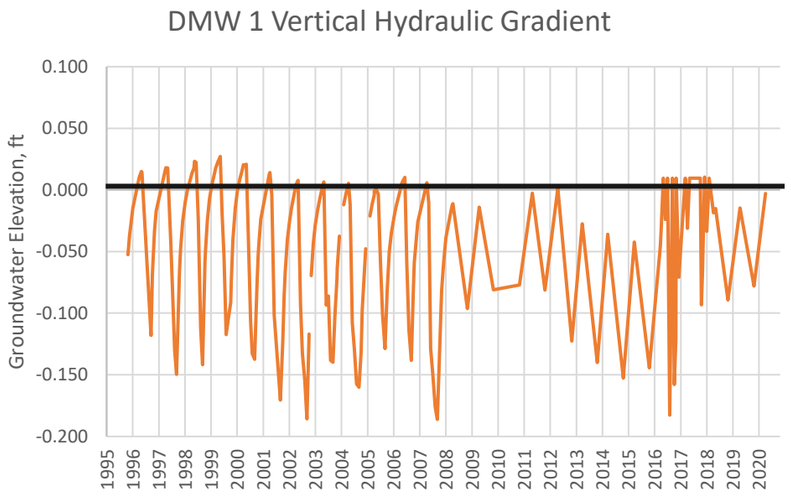
ISW Identification Approach

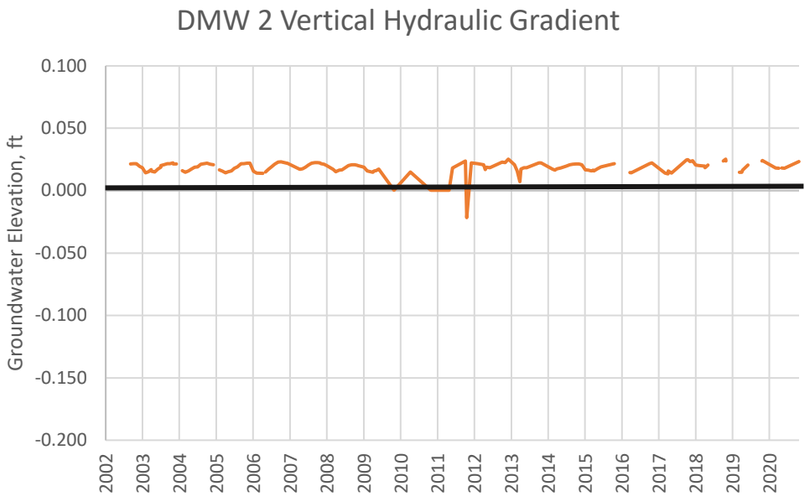
Approach

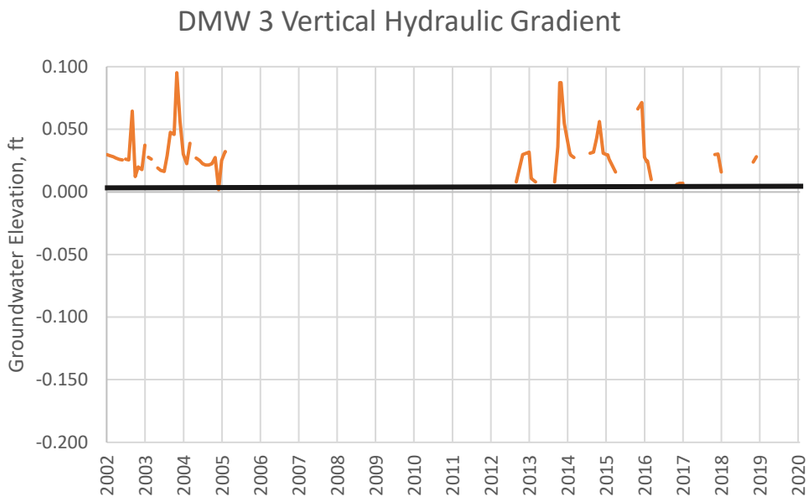
- ❑ Identify surface water bodies
- ❑ Identify where groundwater is within 5-feet of the surface
- ❑ Use vertical hydraulic gradient in nested monitoring wells to verify

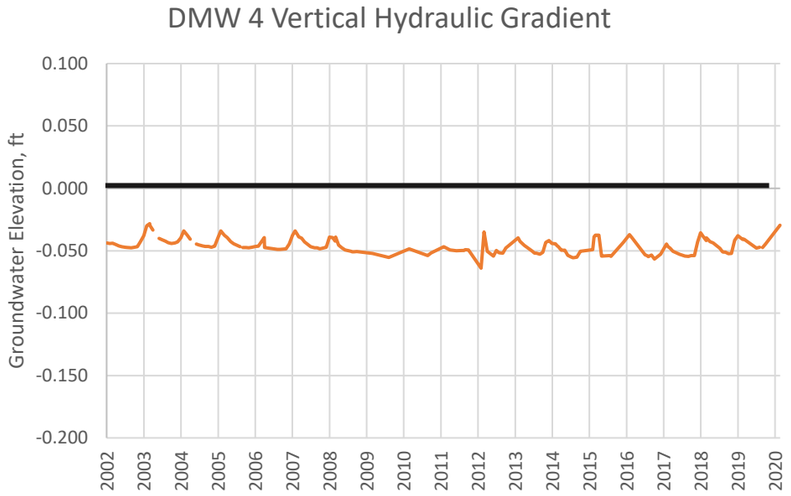


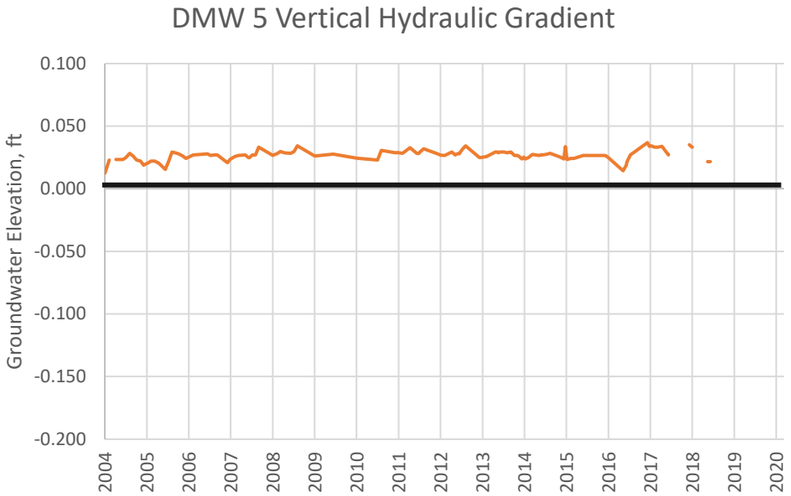
ISW Identification Approach – vertical hydraulic gradients

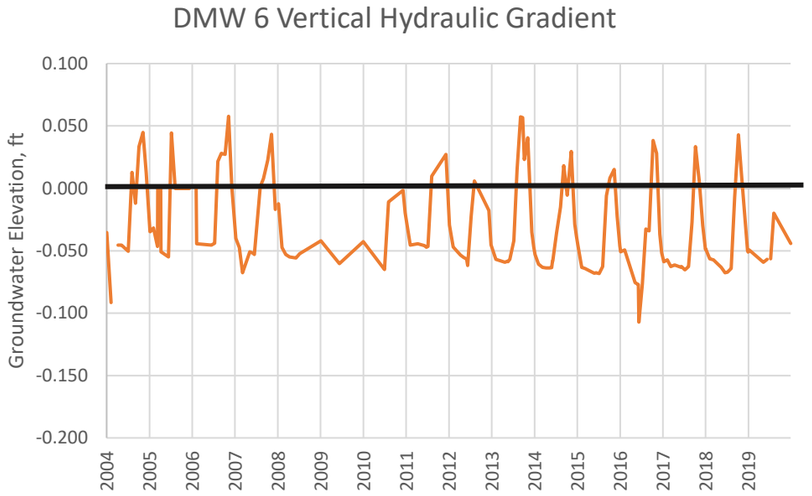






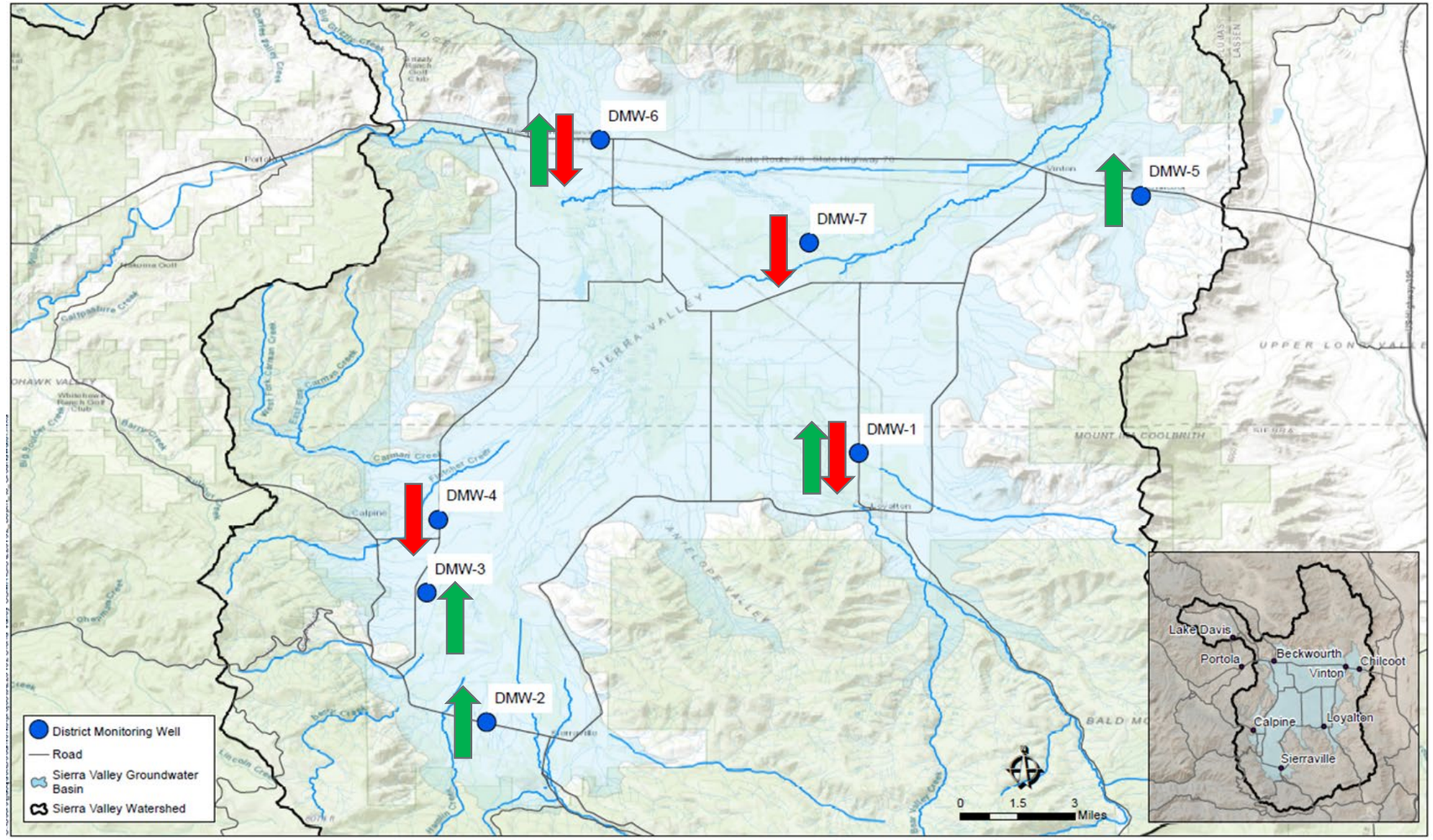




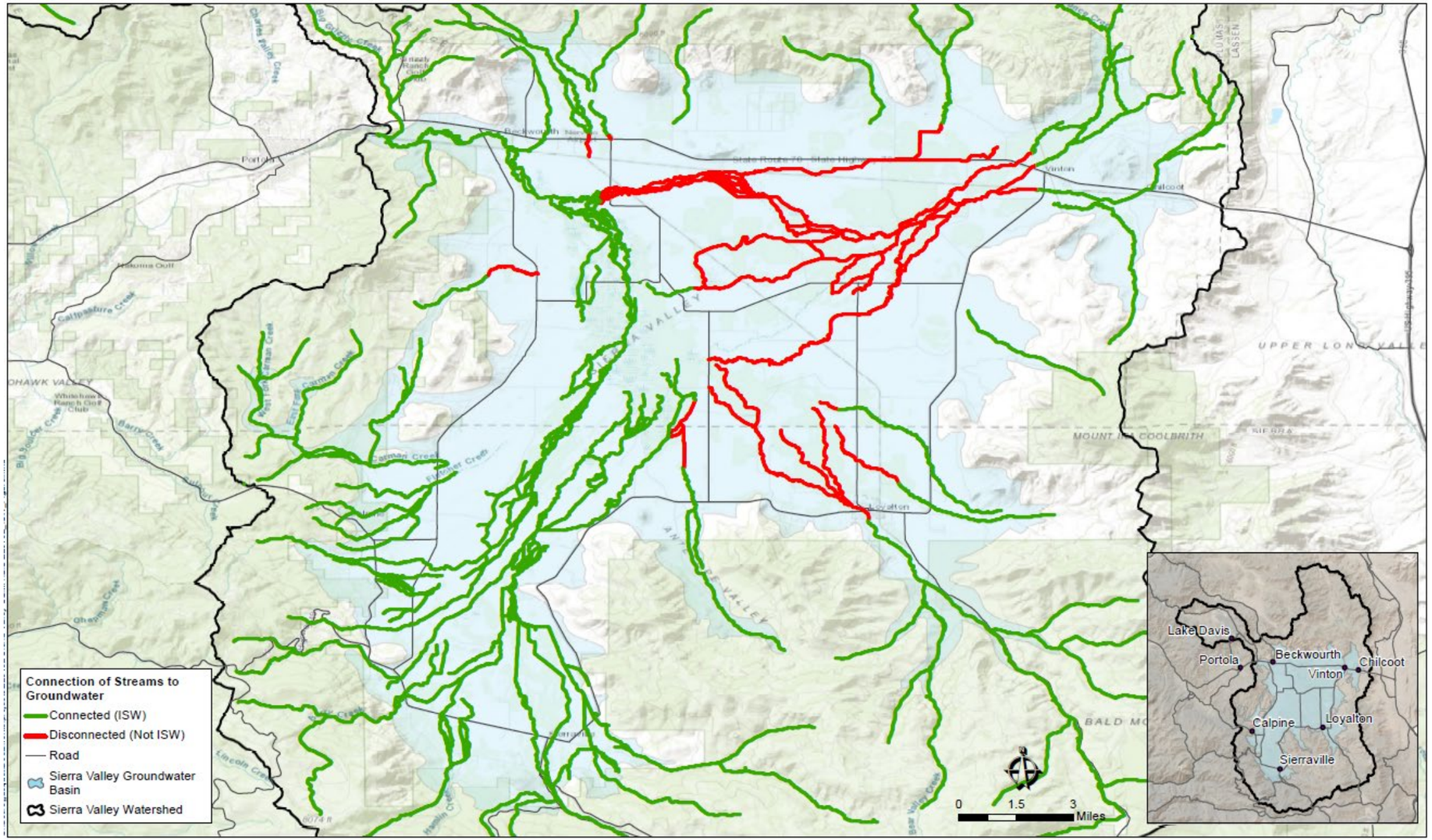


ISW Identification Approach

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



Preliminary ISW Identification - DRAFT



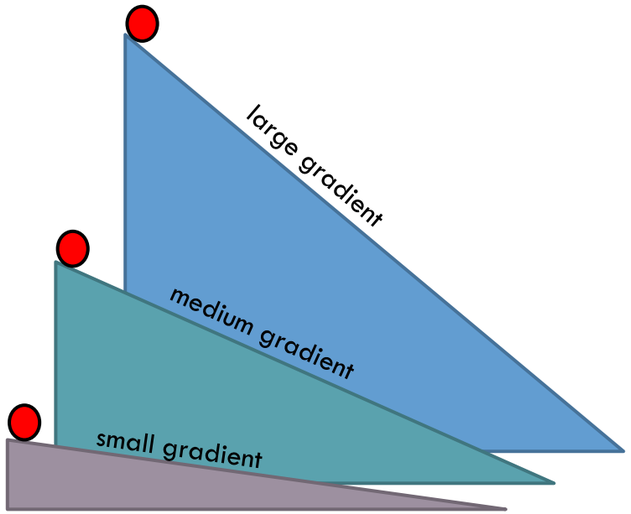
- Next step: Refine and combine with GDE Mapping

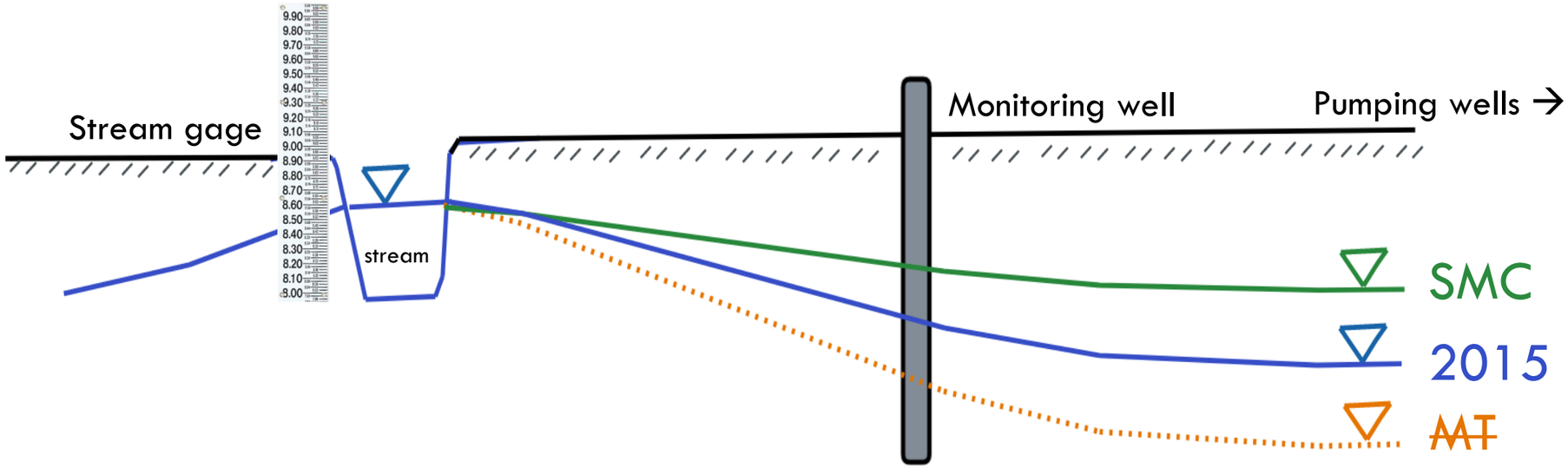
04

ISW Monitoring Approach

Balance Hydrologics

ISW Monitoring Approach

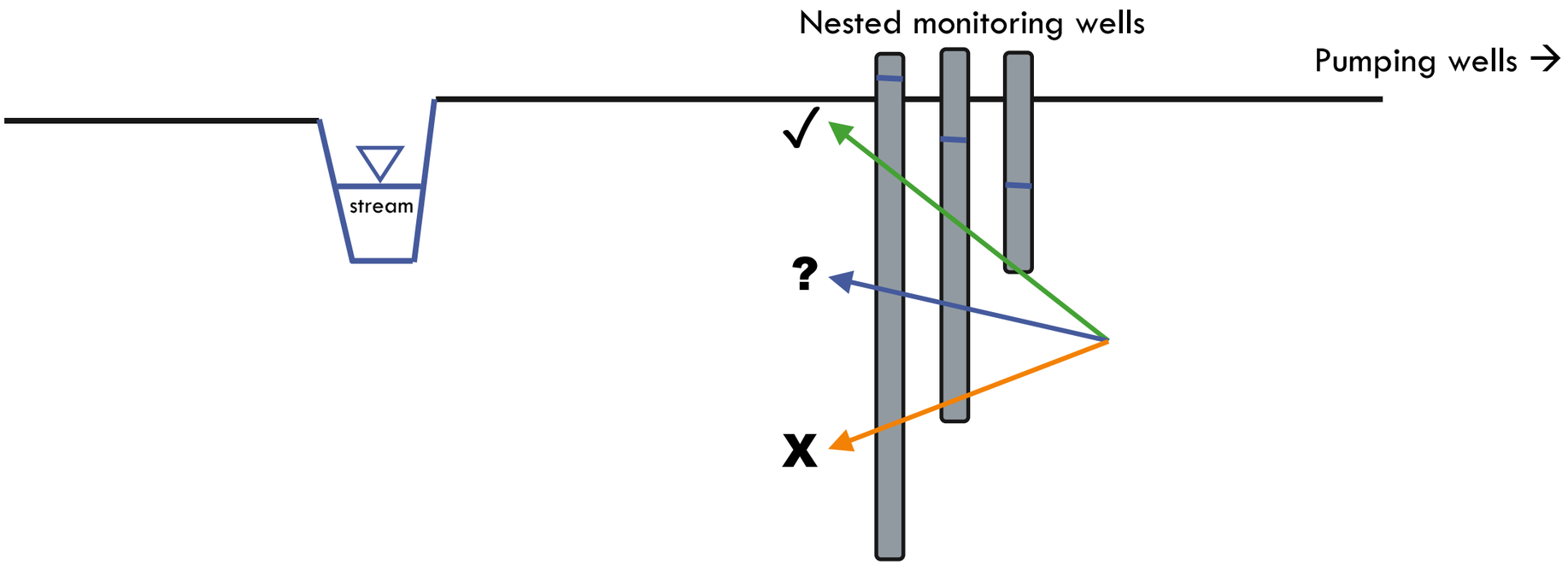




Approach #1:

1. Identify 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

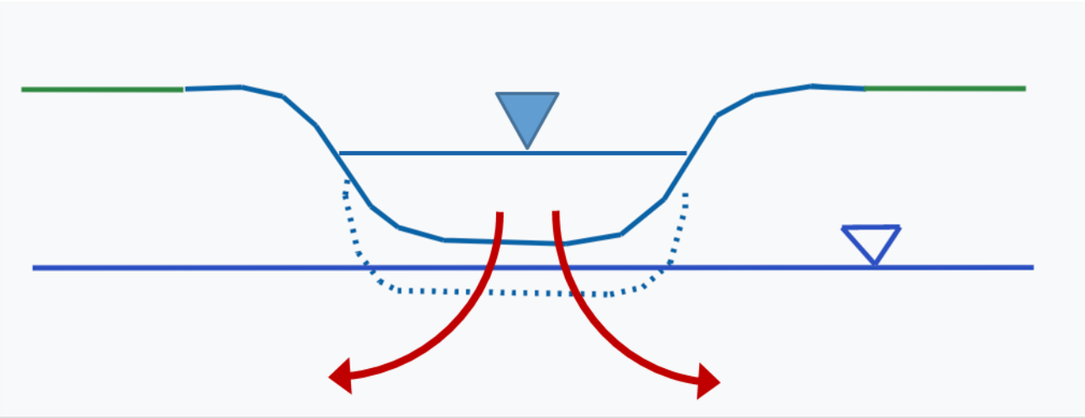


Approach #2:

1. Identify critical ISW reaches
2. Use existing or install new nested monitoring wells to measure vertical hydraulic gradient
3. Monitor for changes in vertical hydraulic gradient indicative of increased depletion by maintaining and not reversing gradient

ISW Modeling Opportunities

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



Depletion rate

- ❑ Assume ISW depletion in excess of that experienced since 2015 is significant and unreasonable
- ❑ If lower MTs are indicatged, the GSP has burden of proof to demonstrate that those lower MTs will not cause additional significant and unreasonable ISW depletion

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Initial Summary of Data Gaps

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Initial Summary of Data Gaps

- ❑ Edge of the basin is lacking in monitoring data
- ❑ Stage or streamflow data are lacking for wetlands and channels in the central portion of the valley
- ❑ Monitoring wells are also lacking near some sensitive areas
- ❑ Automated and near continuous nested monitoring and water level instrumentation is not in place

Questions?

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