Lower Mill Creek surface – groundwater interactions

Mia van Docto, Krysia Skorko and Caitlin Boise
Trout Unlimited, Conservation Hydrology
WCB Russian River meeting – March 21, 2019

Background

- TU (formerly CEMAR) has been monitoring in 5 tributary watersheds in the Russian River since 2010, as part of the Russian River Coho Water Resources Partnership

- Currently operating 23 streamflow gages in the Russian River watershed
  - 17 funded through NFWF
  - 6 funded through WCB grants

- Streamflow data have been used by our partners to study
  - Coho over summer survival
  - The impacts of direct diversions on streamflow
  - The benefits of streamflow enhancement projects
  - The effects of water releases on streamflow conditions

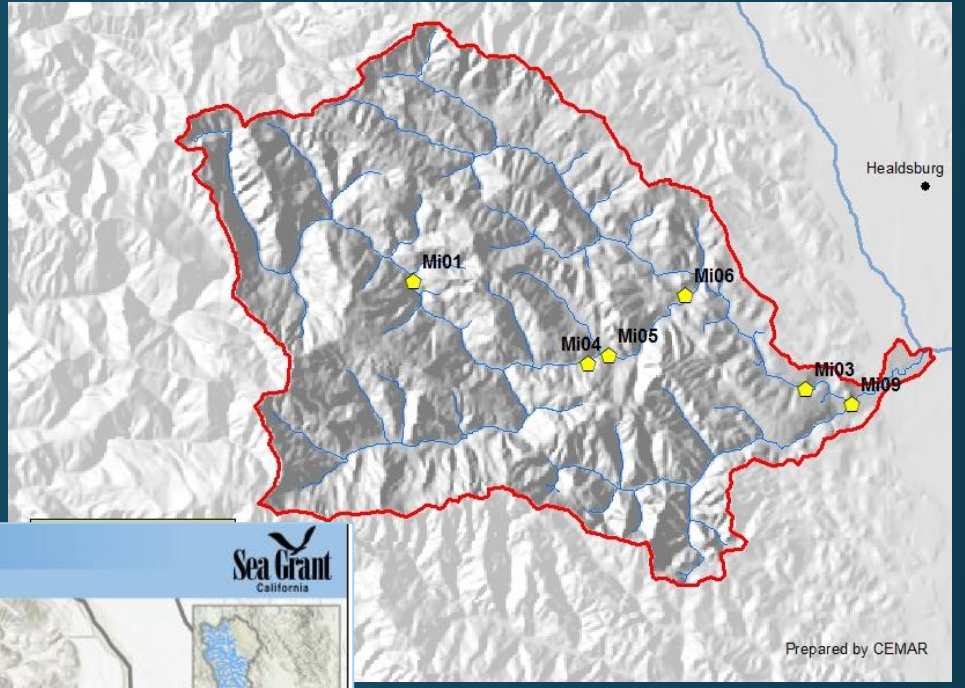
Background

- Need a better understanding of groundwater conditions

- TU in partnership Sonoma RCD and Gold Ridge RCD are now collecting groundwater data to study surface water and groundwater interactions in Lower Mill Creek and Upper Green Valley

Project background

TU (formerly CEMAR) has been monitoring in the upper Mill Creek watershed since 2010



CSG annual redd surveys showed coho redds in the lower reach, where stream dried out every summer

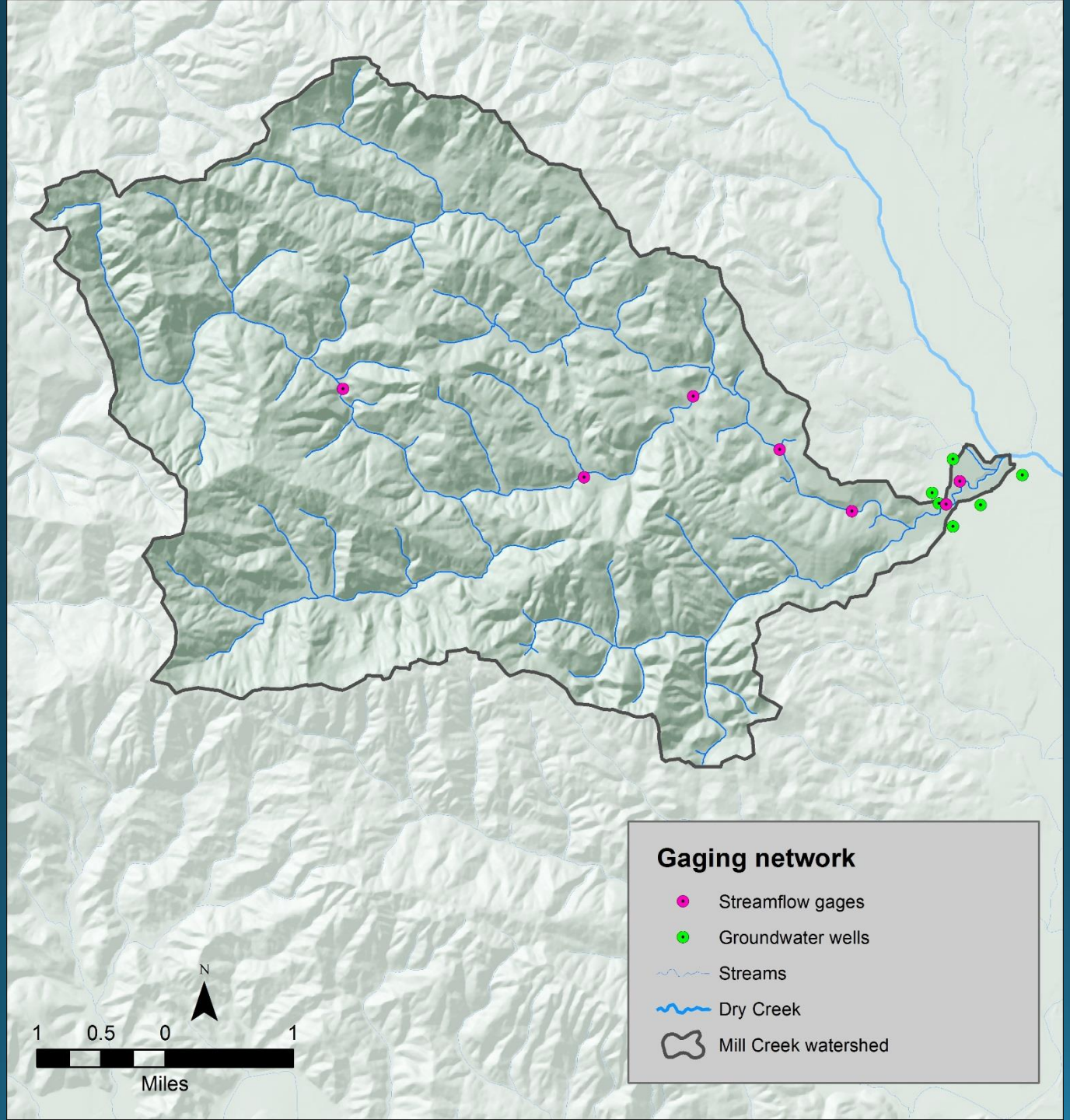
Study Goals for Lower Mill

1. What are groundwater conditions like in Lower Mill Creek?

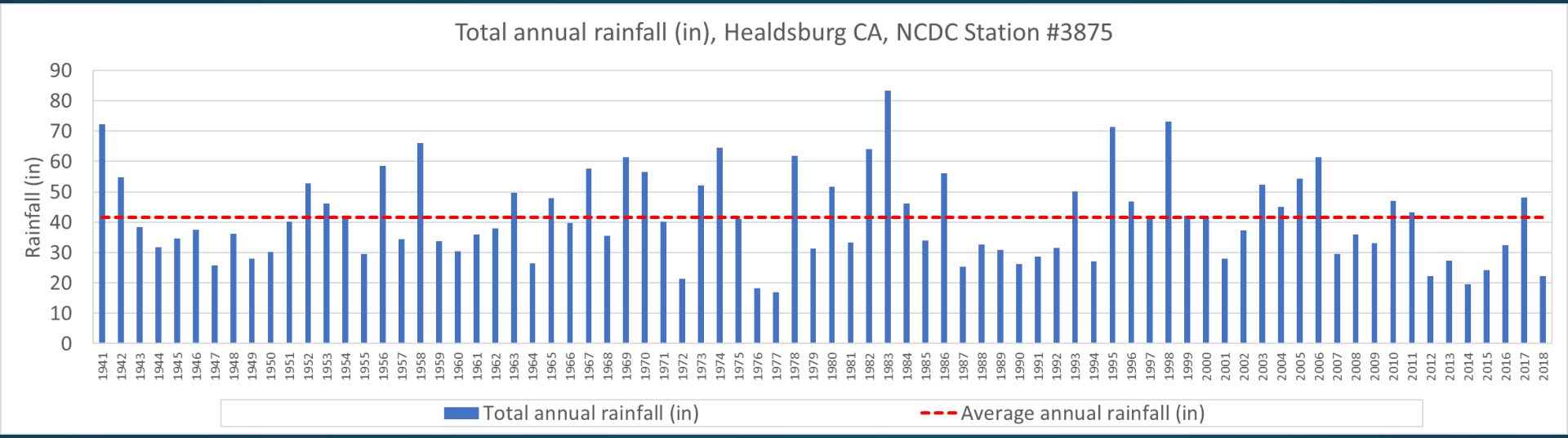
2. Can changes in water management enhance streamflow conditions in the lower reach?

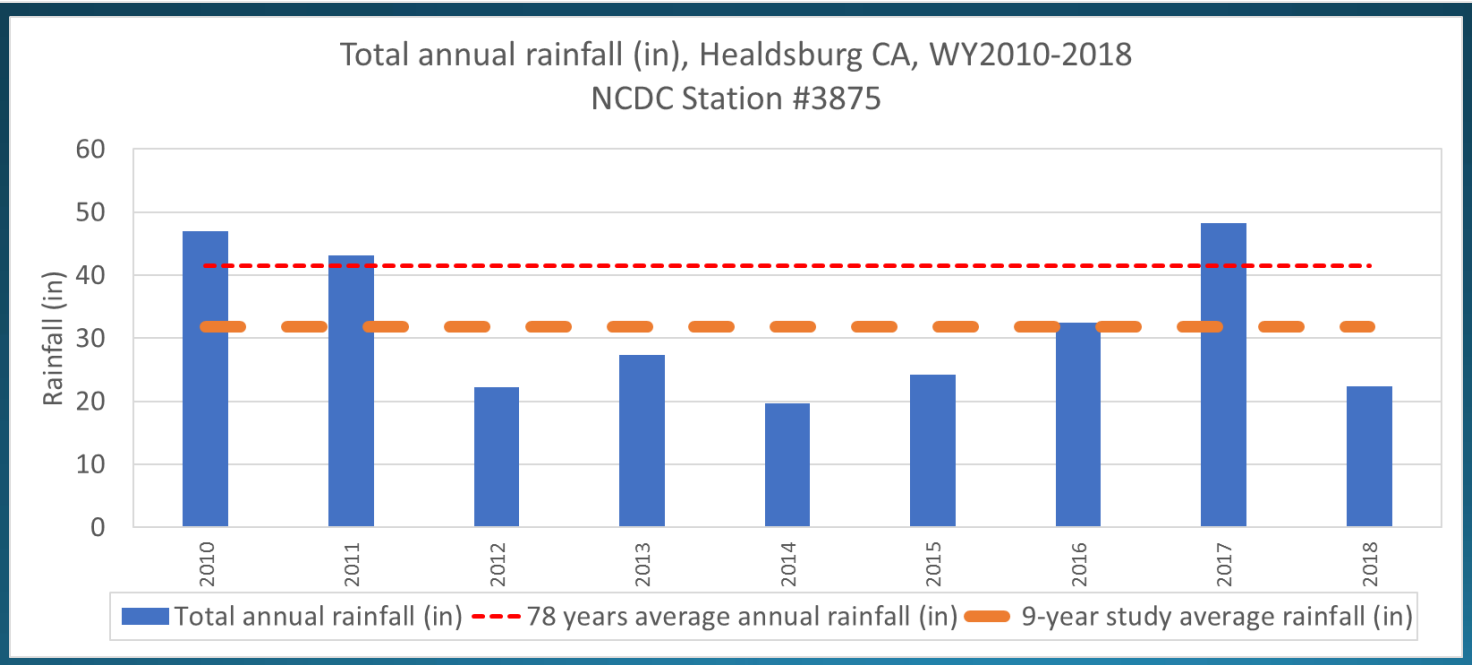
Methods

- 2 surface water gages and 1 groundwater well continuous gage were installed in March and April of 2018.
- Monthly manual GW level measurements were made at 8 area wells by TU and SRCD.
- TU collected monthly streamflow measurements starting in late April 2018.
- A total station survey was conducted by TU to tie the surface and groundwater data together.

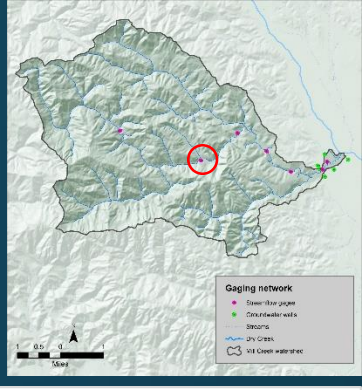

Gaging network
Streamflow gages
Groundwater wells
Streams
Dry Creek
Mill Creek watershed
N
1 0.5 0 1
Miles

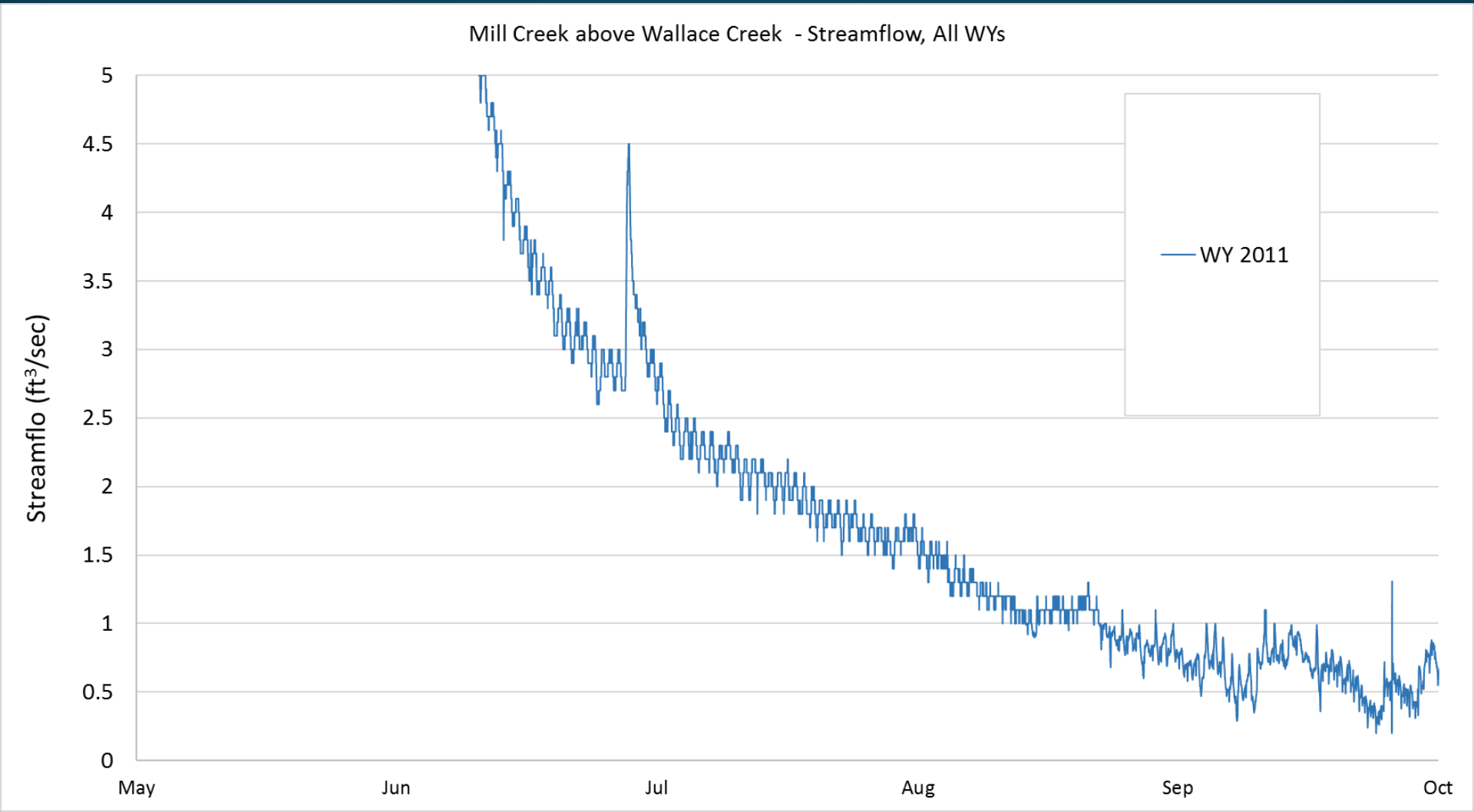
Hydrologic context





Summer streamflow data





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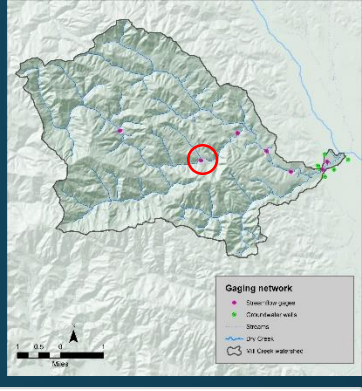


Mill Creek above Wallace Creek - Streamflow, All WYs

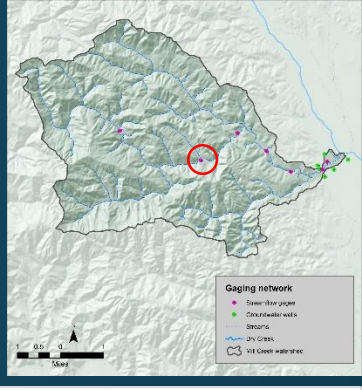
Streamflo (ft^3/sec)

5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0

May
Jun
Jul
Aug
Sep
Oct

WY 2011
WY 2012
WY 2013
WY 2014
WY 2015

Summer streamflow data



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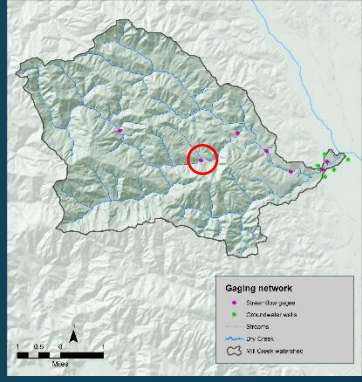
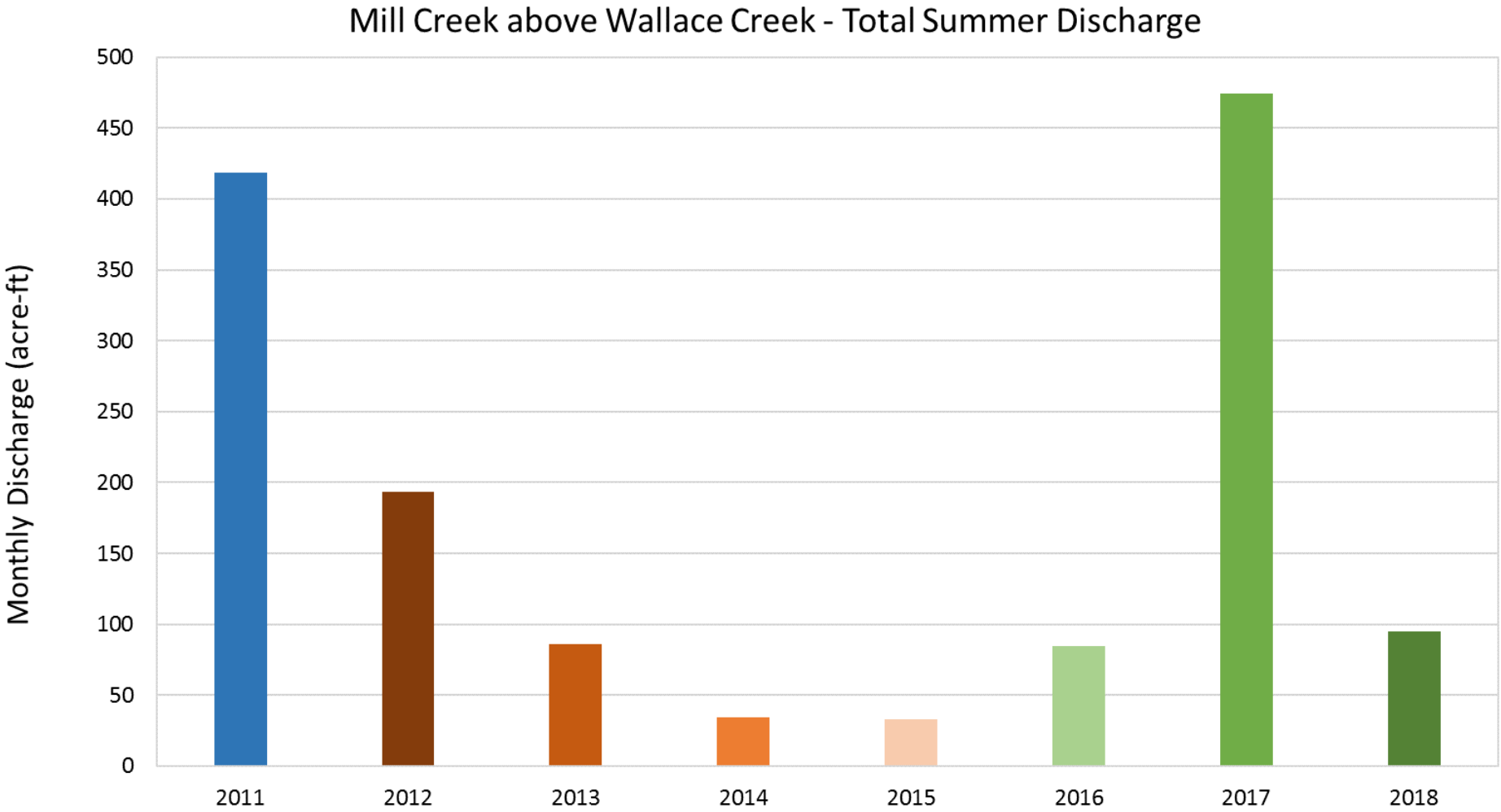
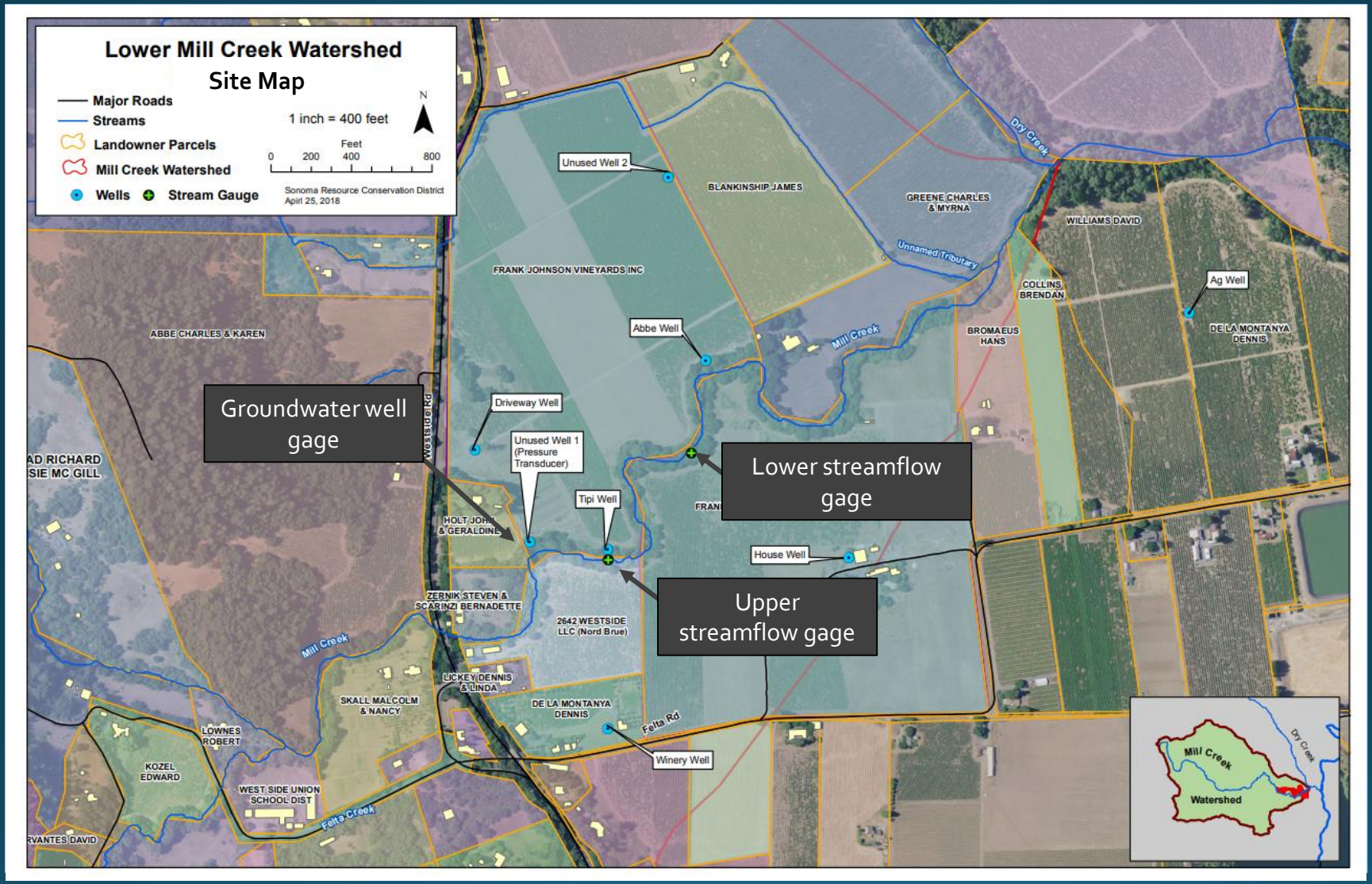
Jul
Aug
Sep
Oct

WY 2011
WY 2012
WY 2013
WY 2014
WY 2015
WY 2016
WY 2017
WY 2018

Total summer discharge

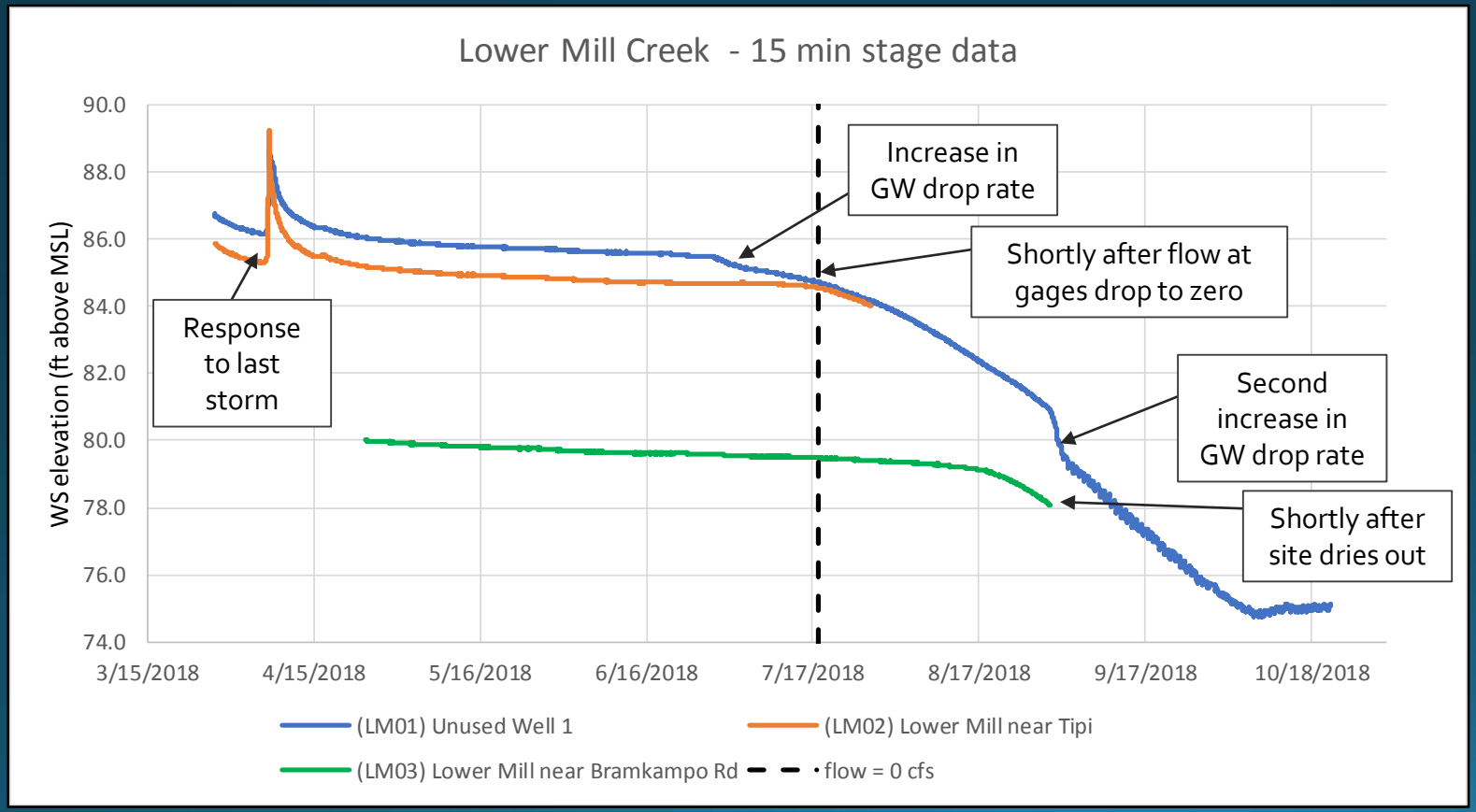




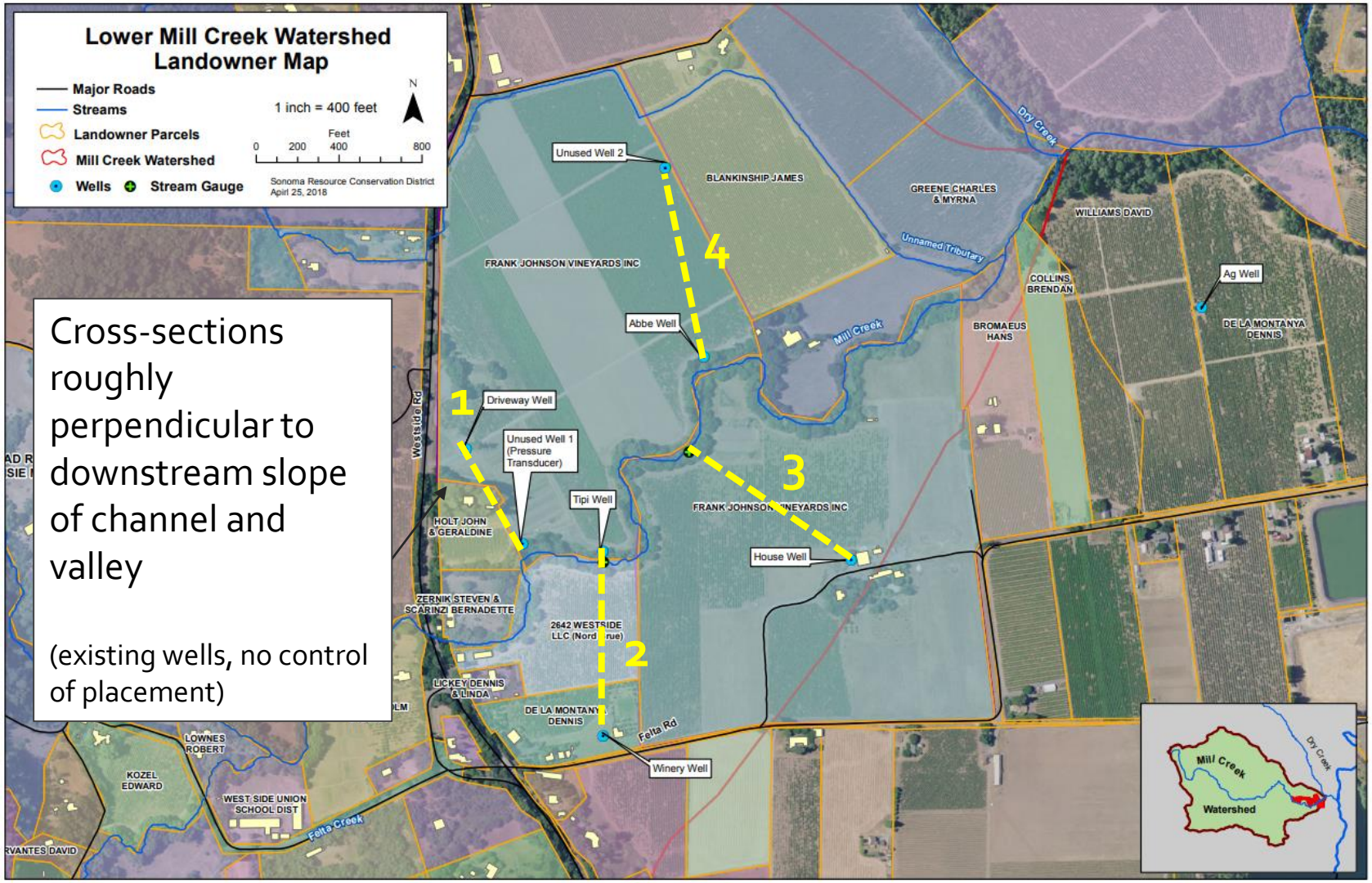


- TU collects monthly streamflow measurements
- TU or Sonoma RCD collects monthly measurements at the other well stations

15 minute stage data

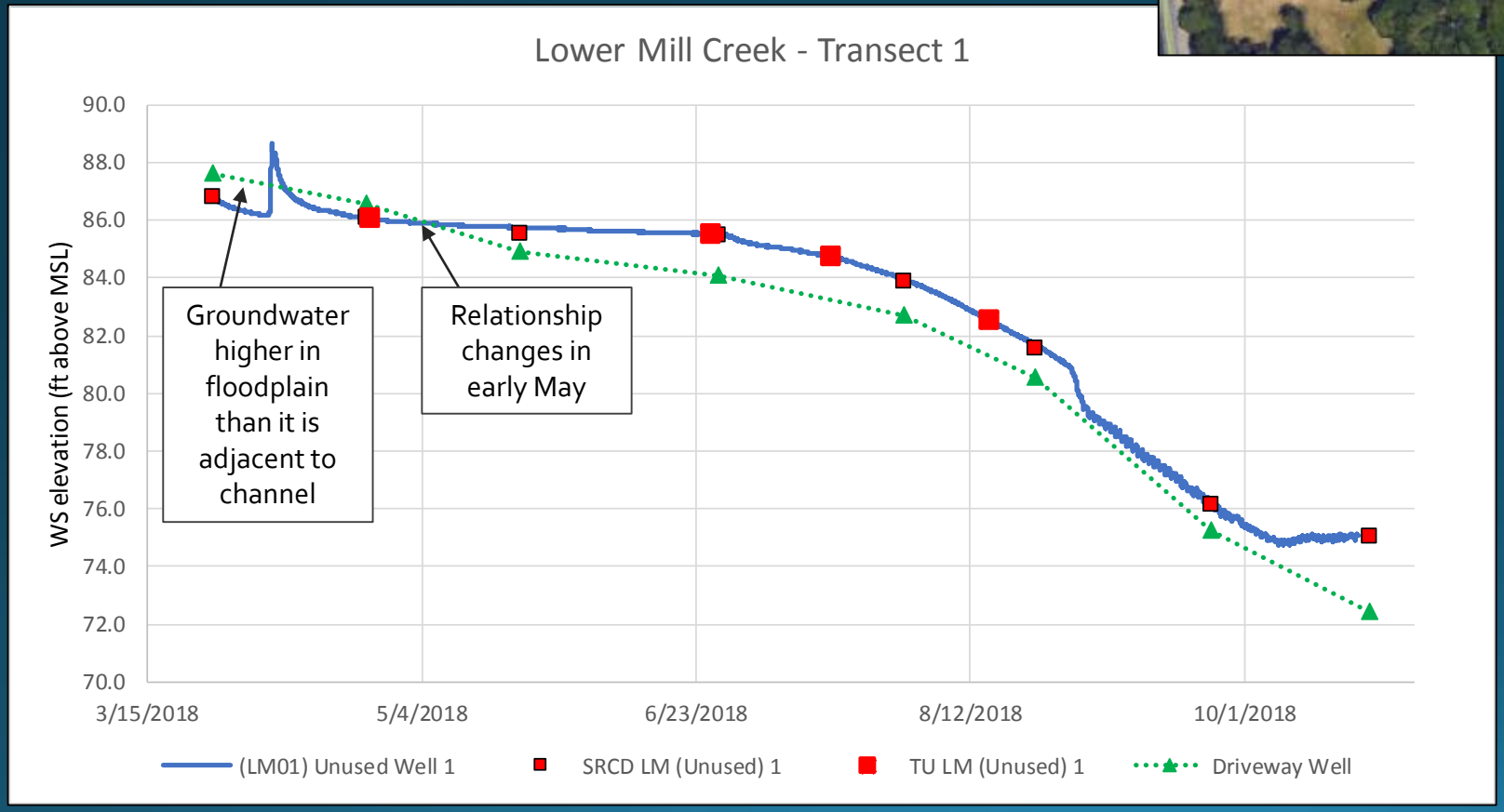


Comparing continuous data to wells on floodplain



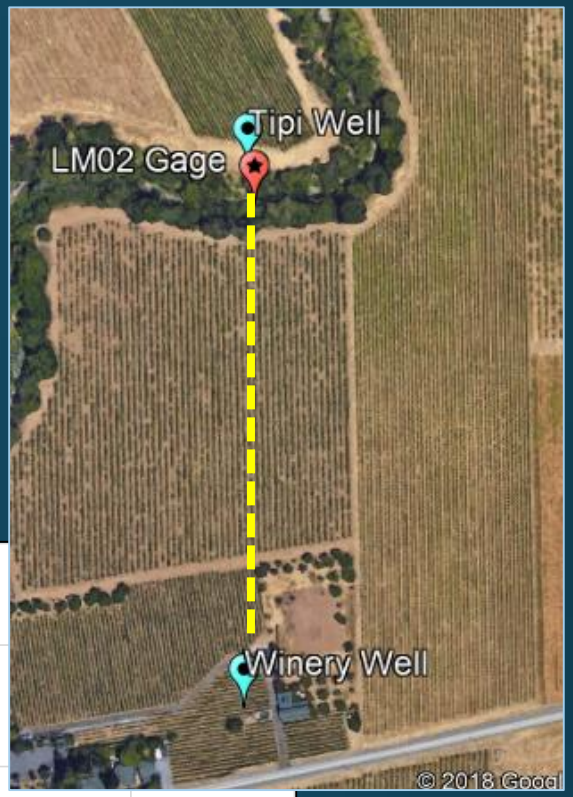
Upstream sites – Transect 1

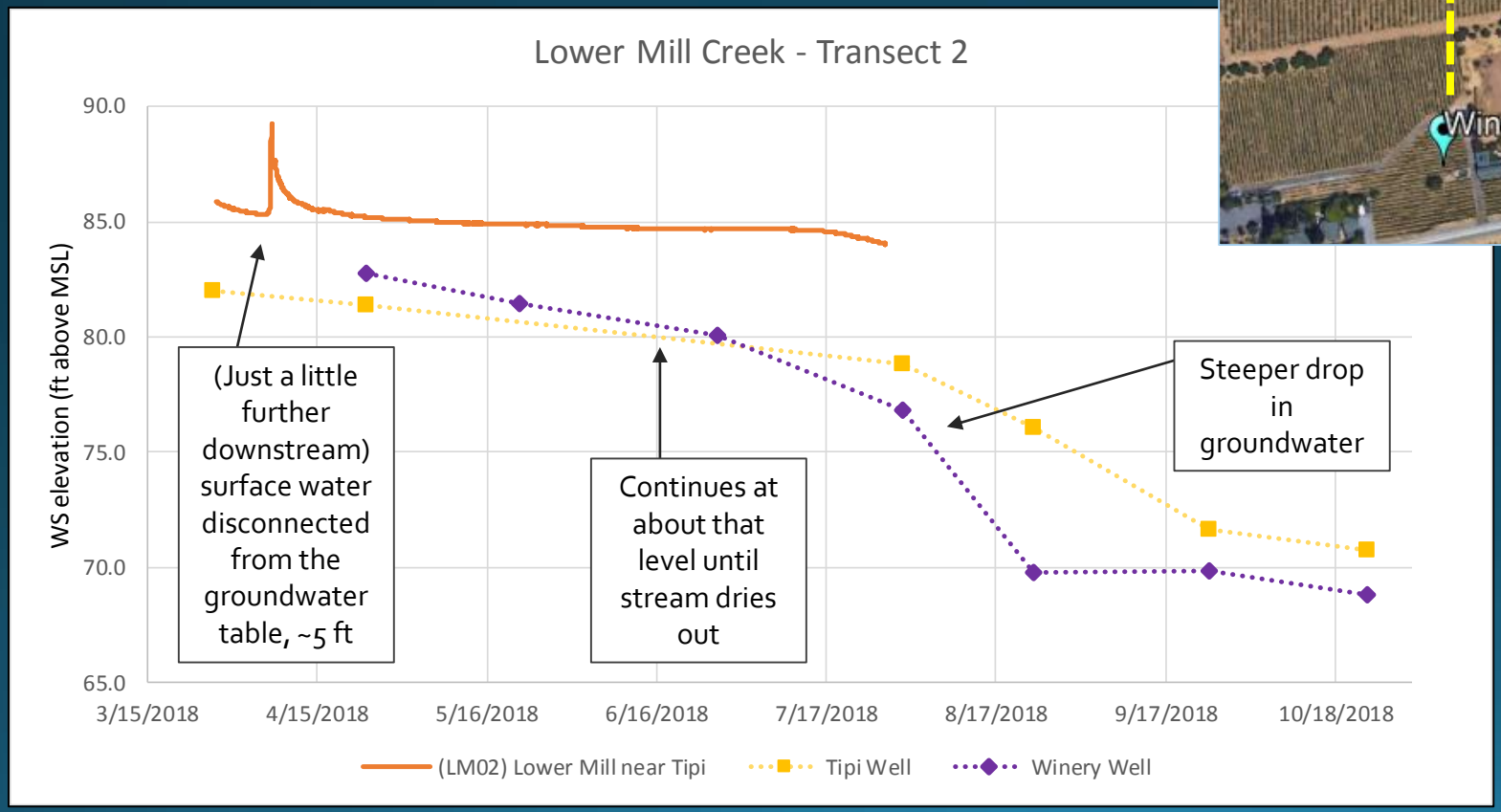
- 15 min groundwater well
- driveway well



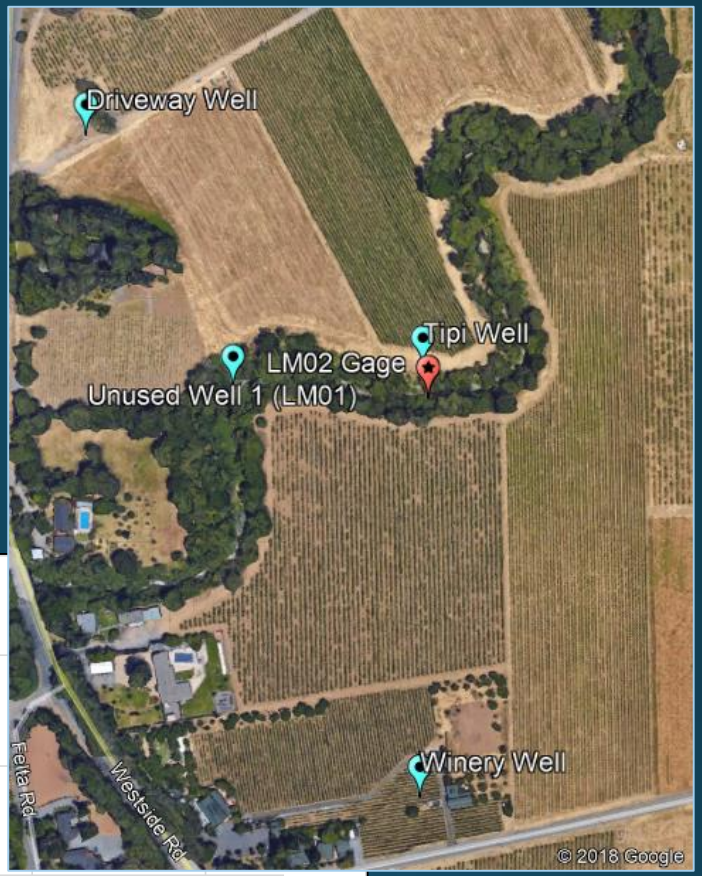
Upstream sites – Transect 2

- Upper streamflow gage
- Tipi well (next to streamflow gage)
- Winery well (on floodplain)

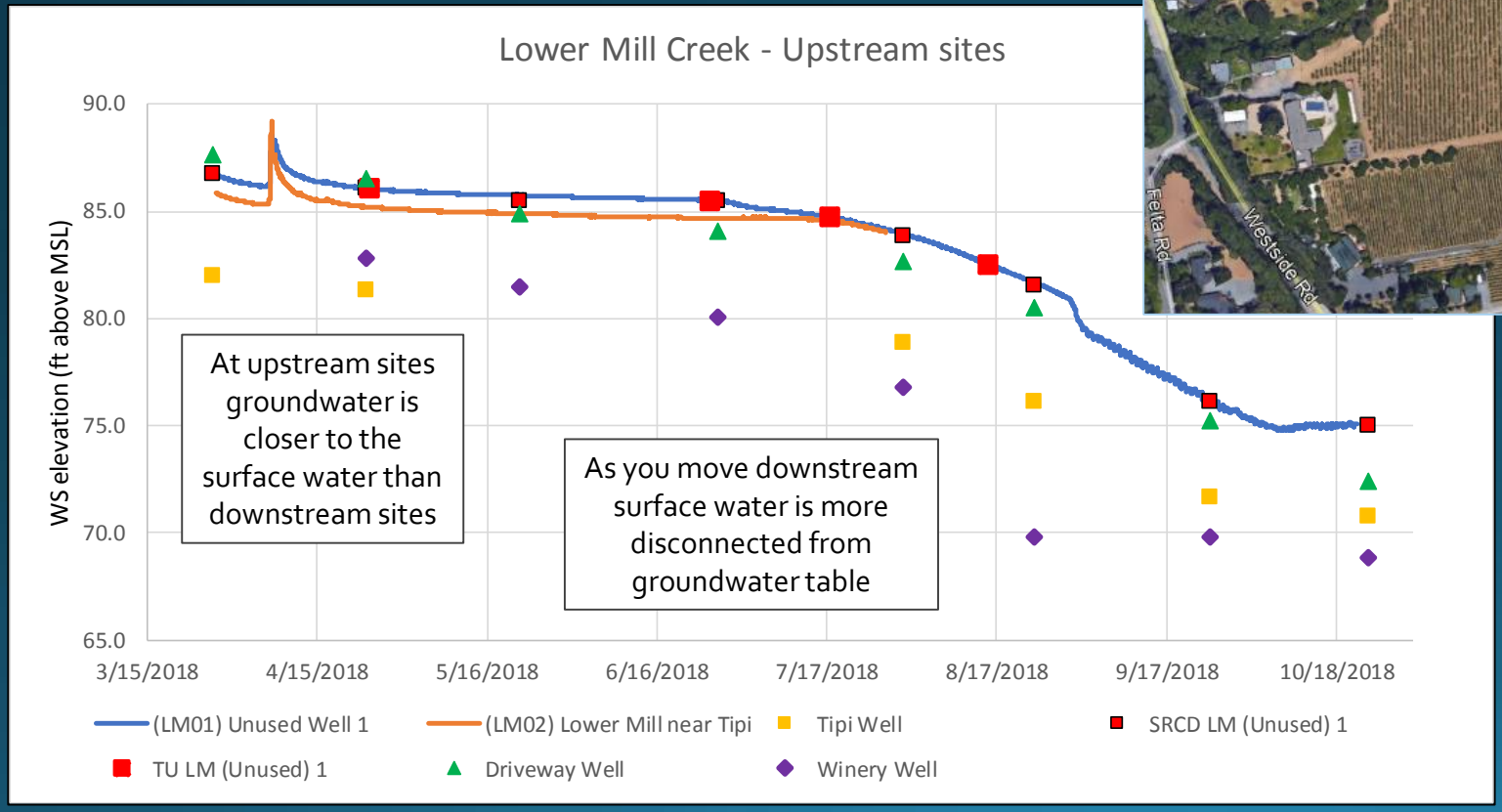




Upstream sites – Transects 1 and 2

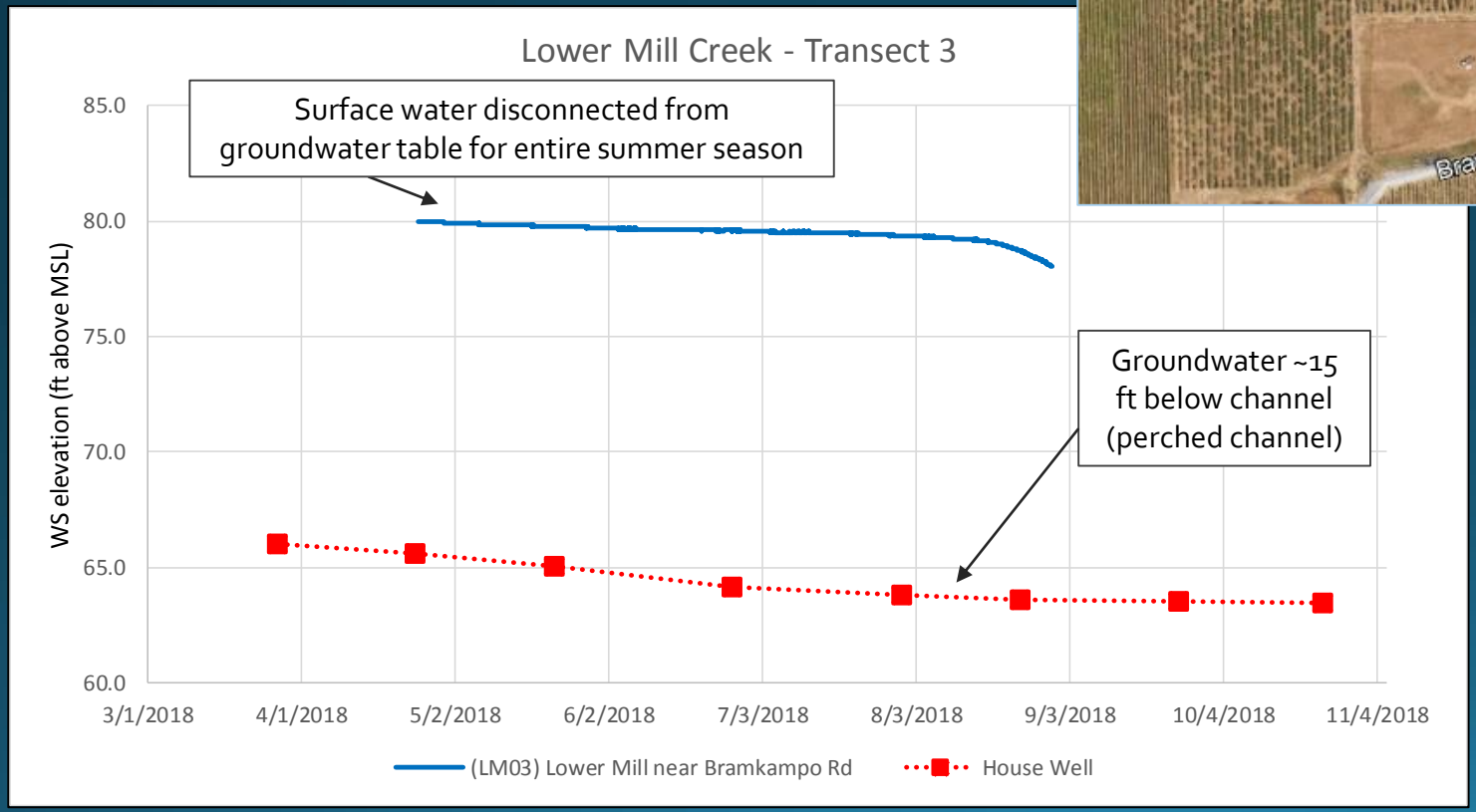


0.1 km



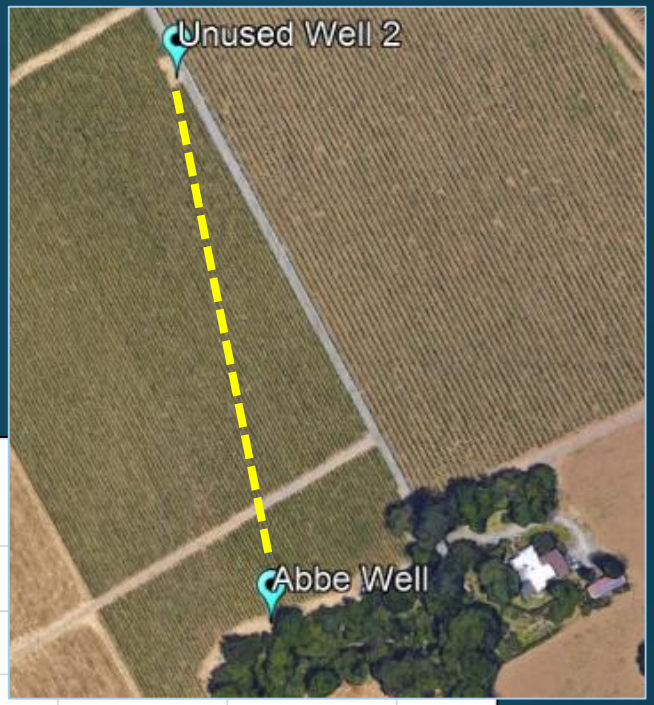
Down stream sites – Transect 3

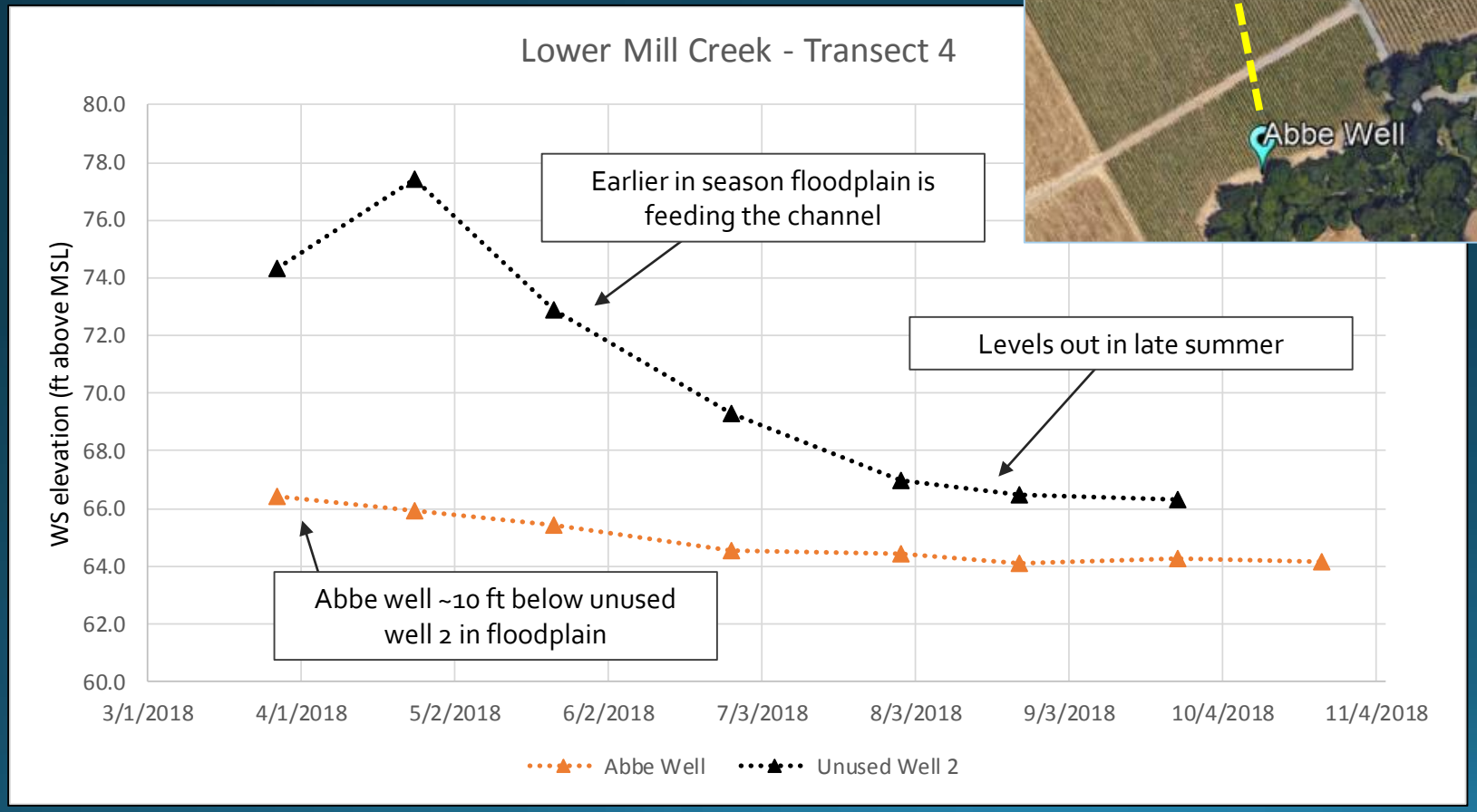
- Lower surface water gage (LMO3)
- House well



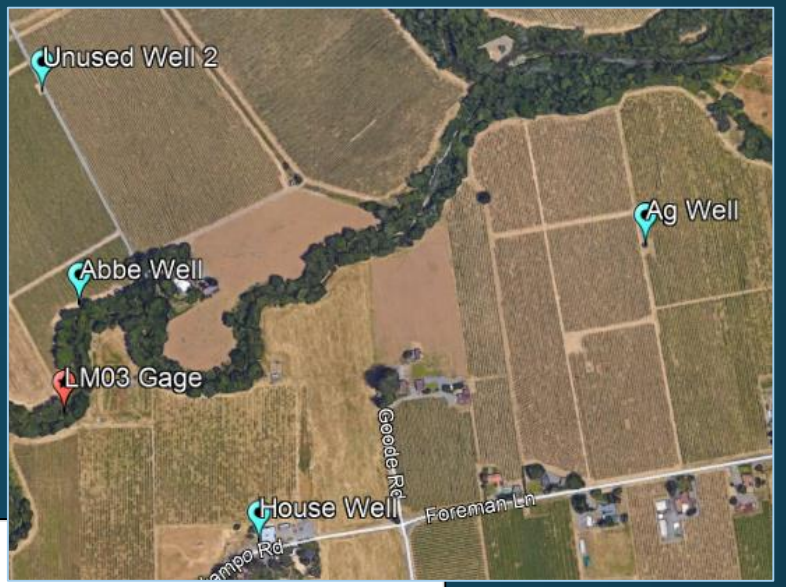
Down stream sites – Transect 4

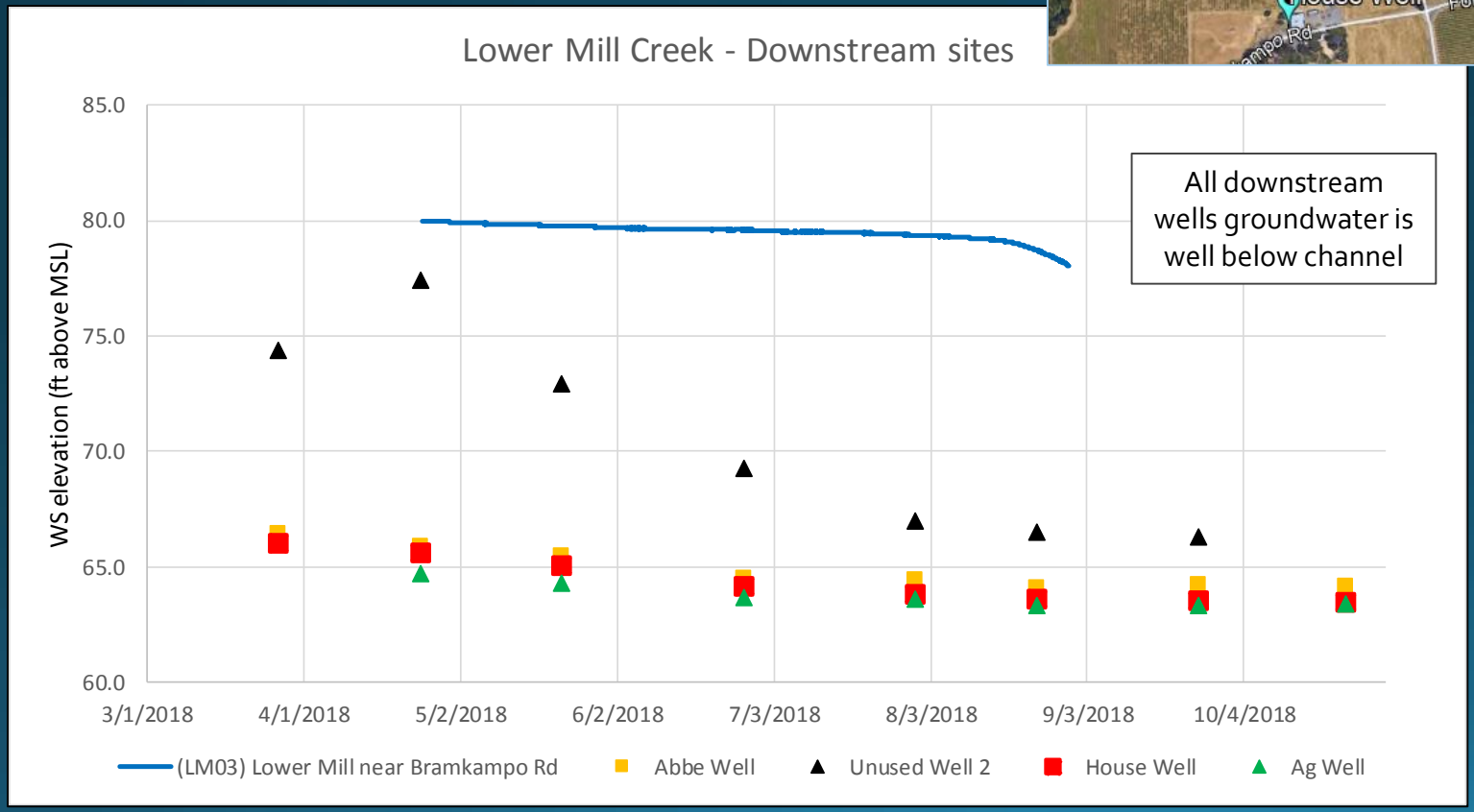
- Abbe well (next to channel)
- Unused well 2 (floodplain)



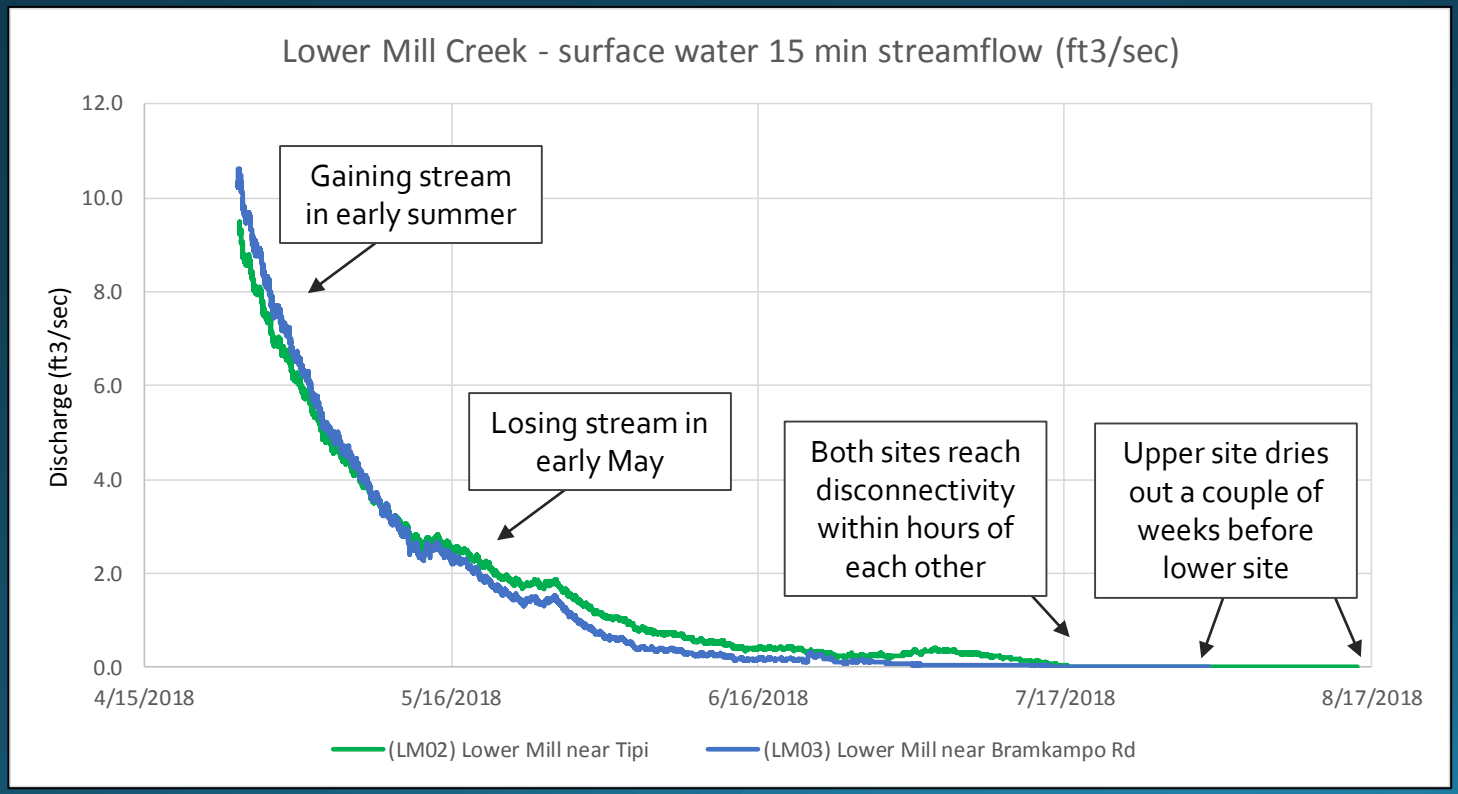


Downstream sites– Transects 3 and 4

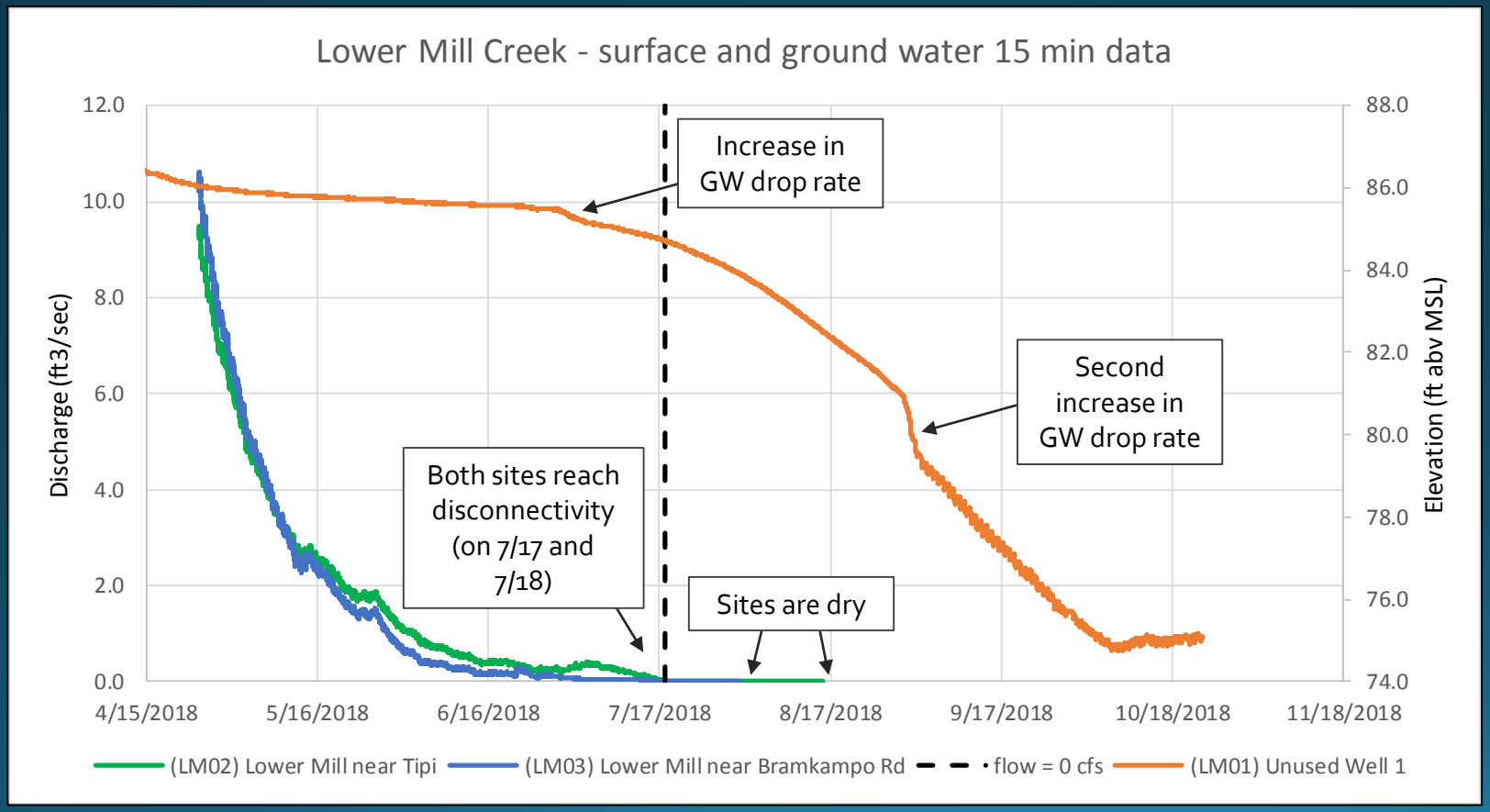




15 minute streamflow data



15 minute streamflow and well level data



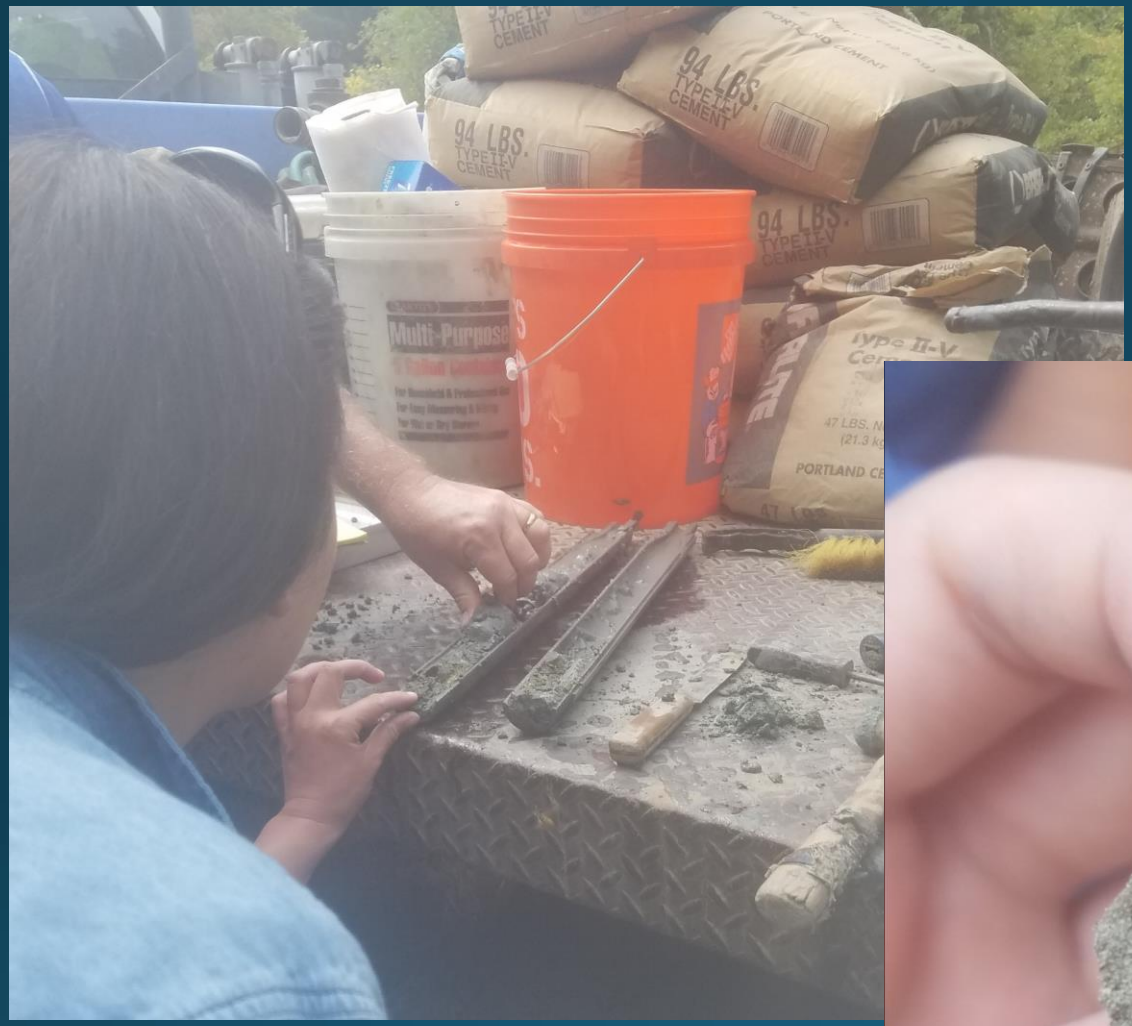
Takeaways

- Early in the season, GW adjacent to the channel gain from the floodplain, relationship reverses later in season.
- The channel is perched above the GW table throughout the study period
- Surface flows are about 10 cfs in late April, disconnect on July 17-18 – pools hold water in following weeks
- GW drop accelerates in late June, surface water dries out soon after
- Groundwater levels in lower reaches are about 15 ft below channel bottom
- Upper reach pools may be maintained with improvement projects, lower reach is likely too perched to reconnect

Goals for next 2 years of monitoring

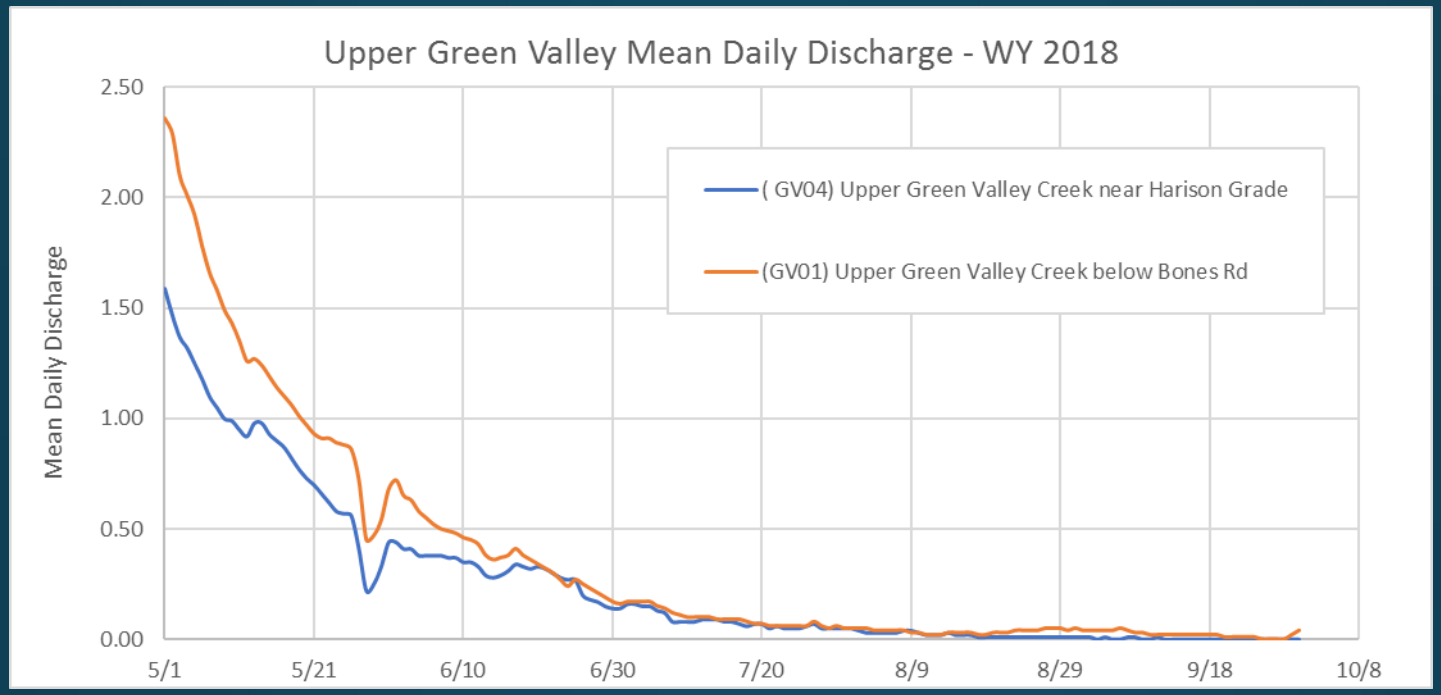
- New hydrologic context – WY2018 was a dry year, WY2019 is a wetter year
- Rewetting data
- Wet-dry mapping

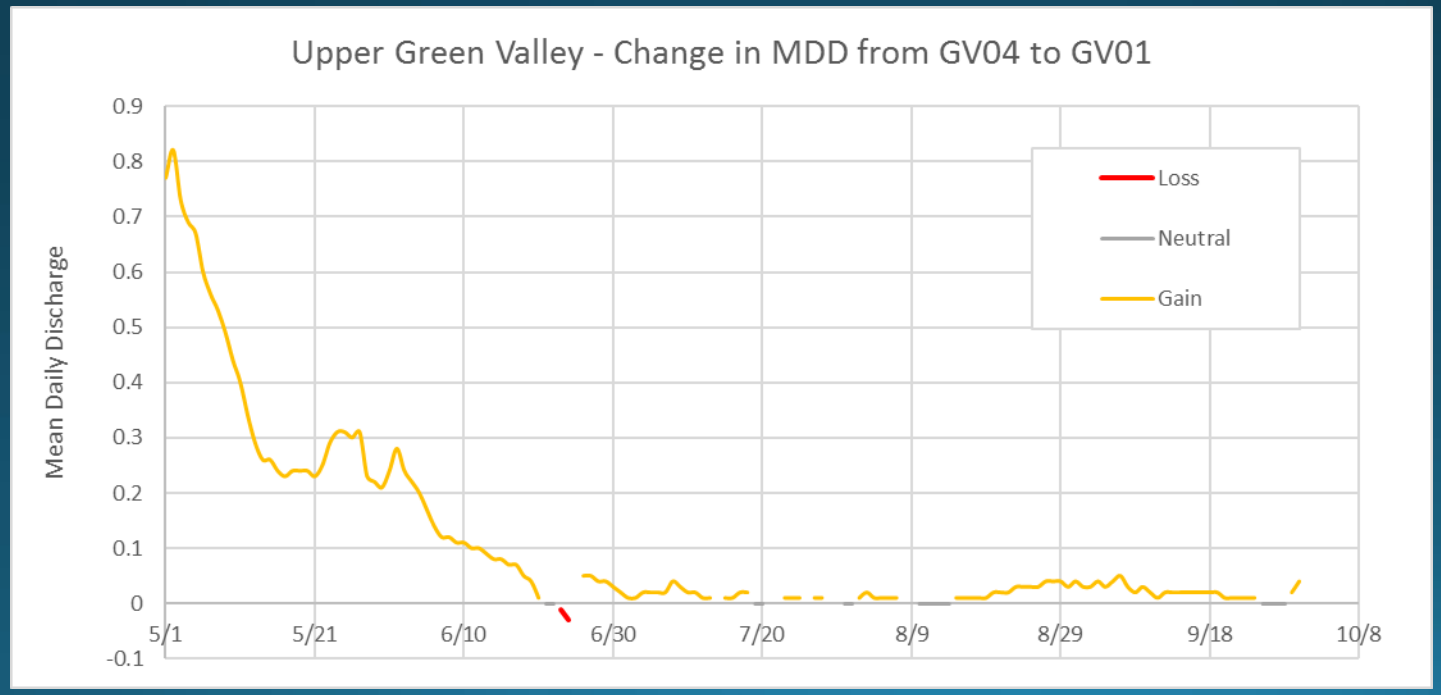
Upper Green Valley groundwater and surface water study


94 LBS.
TYPE I-V
CEMENT
Multi-Purpose

Upper Green Valley groundwater and surface water study

- 3 continuous groundwater data loggers
- TU and GRRCD collecting spot measurements at other existing wells
- Data will be compared to streamflow data
- Data will update OEI's groundwater model


Upper Green Valley Mean Daily Discharge - WY 2018
Mean Daily Discharge
2.50
2.00
1.50
1.00
0.50
0.00
5/1
5/21
6/10
6/30
7/20
8/9
8/29
9/18
10/8
(GV04) Upper Green Valley Creek near Harison Grade
(GV01) Upper Green Valley Creek below Bones Rd


Upper Green Valley - Change in MDD from GV04 to GV01
Mean Daily Discharge
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
5/1
5/21
6/10
6/30
7/20
8/9
8/29
9/18
10/8
Loss
Neutral
Gain

Thank you!