

# SUSTAINABILITY INDICATOR: LAND SUBSIDENCE

## WHAT IT MEANS FOR SIERRA VALLEY

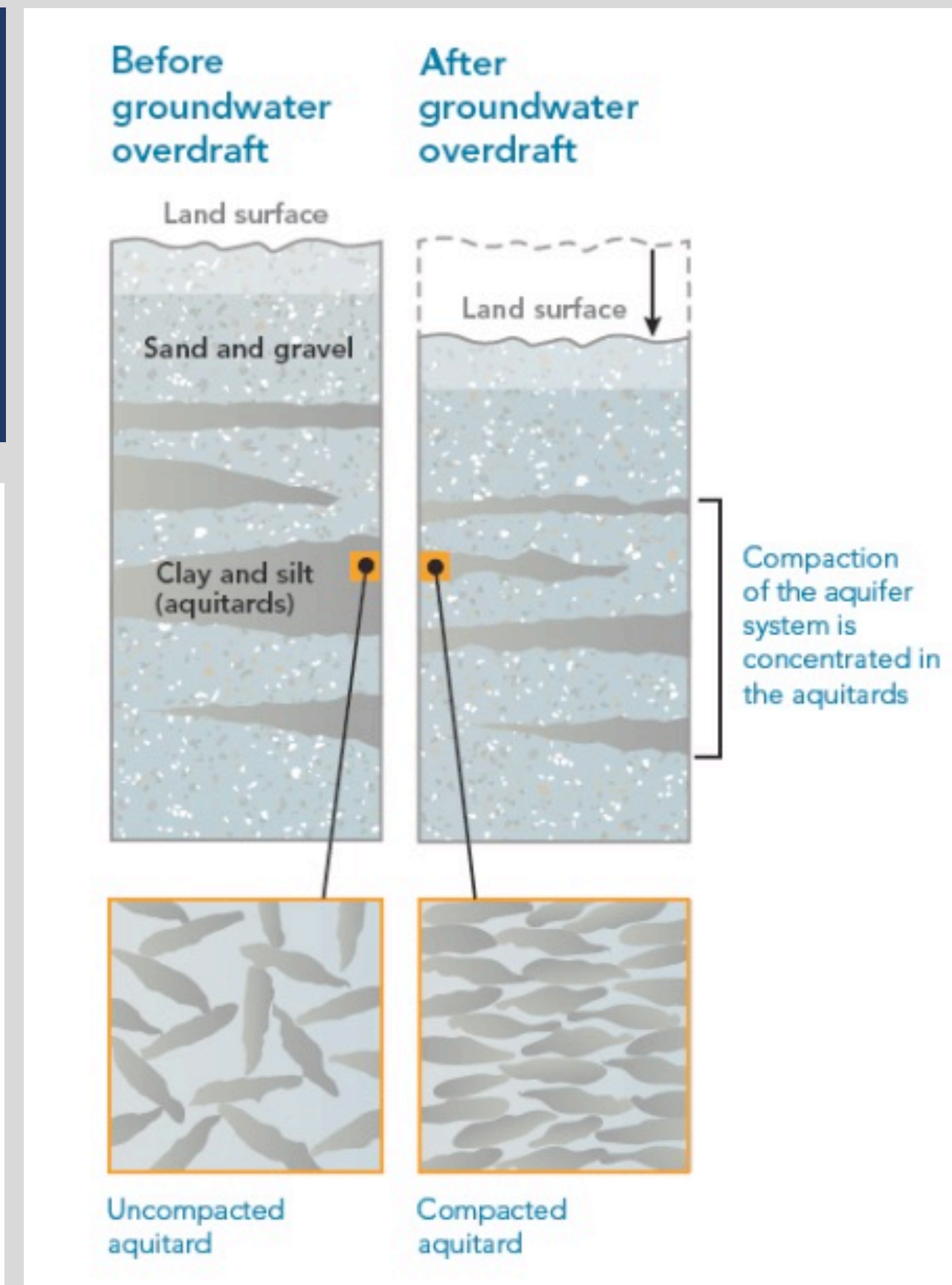
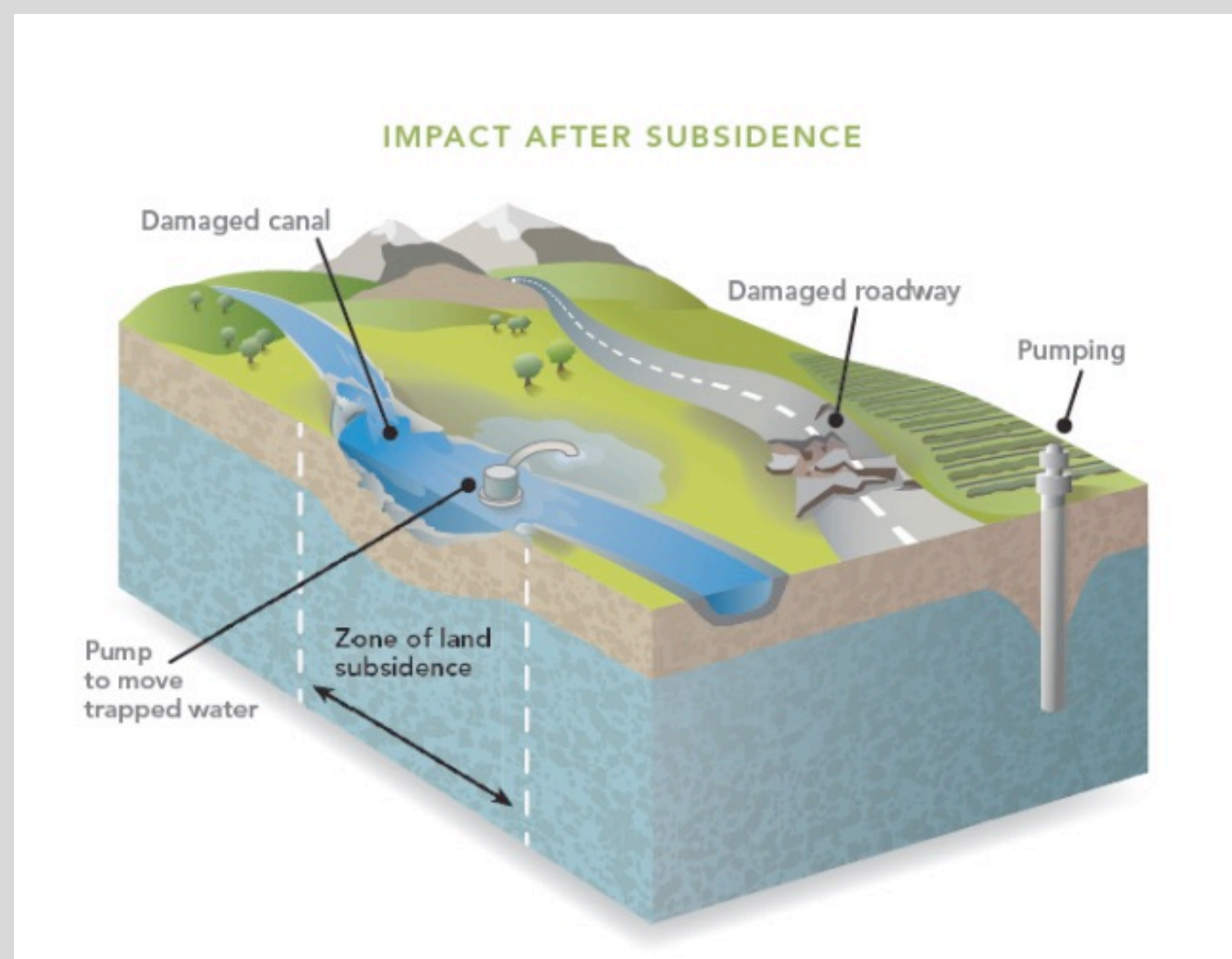
### WHAT IS LAND SUBSIDENCE?

Land subsidence can damage infrastructure and permanently reduce groundwater storage in the aquifer.

Land subsidence is a decline in land surface elevation that can be caused by many factors, including groundwater pumping. Depending on the geology, subsidence can cause permanent deformation (i.e., sinking) of the ground surface that can seriously damage infrastructure, including water conveyance systems, roads, bridges, building foundations, wells, and levees. Subsidence can also cause the permanent loss of groundwater storage capacity. SGMA requires that Groundwater Sustainability Plans (GSPs) include actions to limit “significant and unreasonable” land subsidence in basins where it has occurred or may occur due to groundwater pumping.

Land subsidence can be accurately measured by:

- Ground elevation surveying
- Satellite GPS
- Airborne or Satellite InSAR



## CURRENT CONDITIONS IN SIERRA VALLEY

**California Department of Water Resources (DWR):** Measured approximately **1-2 feet** of subsidence from **1960-1983**

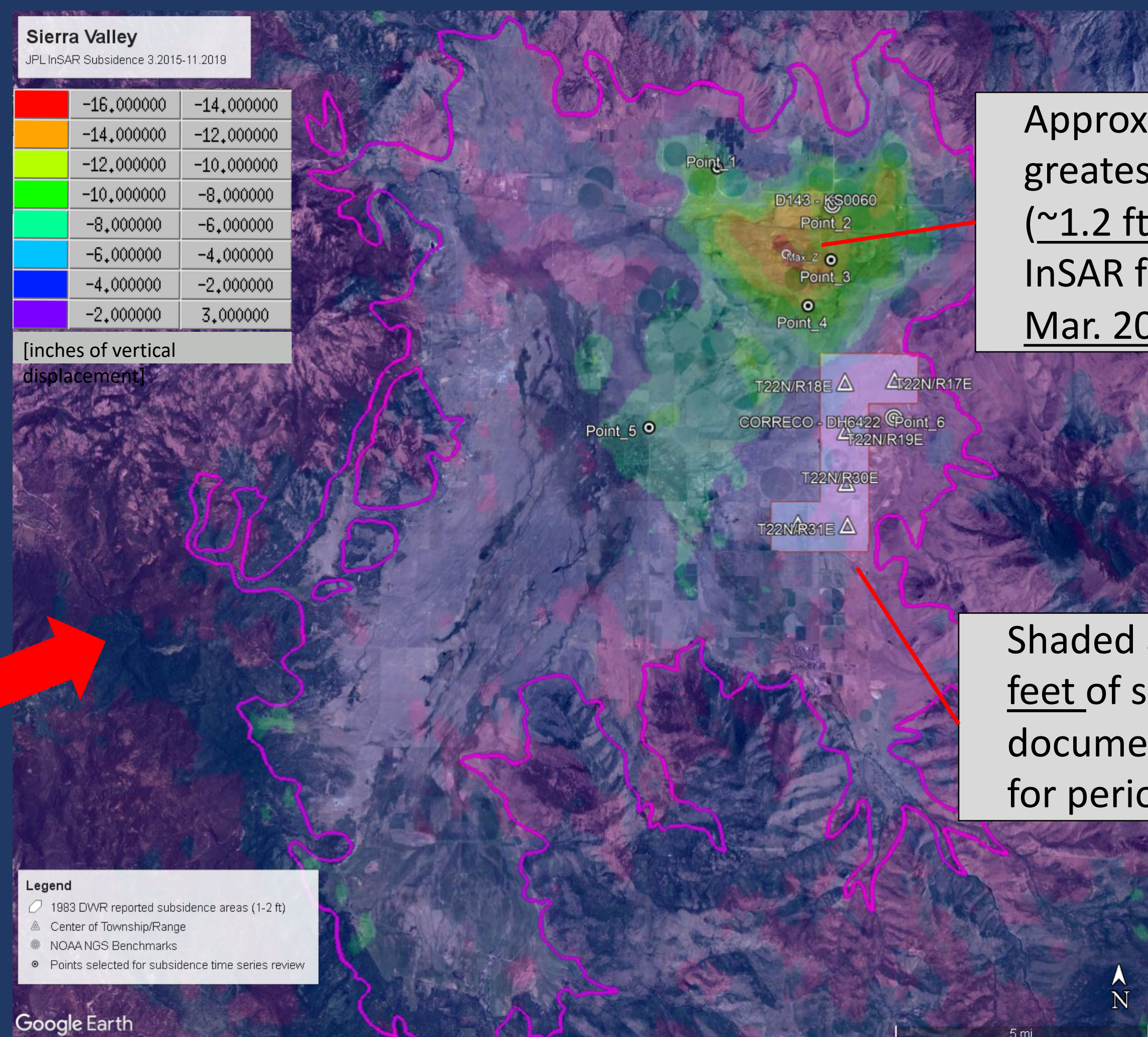
Any subsidence during **1983-2012** is **unaccounted for/ was not being measured** (as far as we know at present)

**CalTrans survey data:** Measured subsidence of **0.3-1.9 feet** during the period of **2012-2016**

**NASA JPL and DWR** analyzed the InSAR data for 2015-2019. Results show:

- Up to 0.6 feet of subsidence for the DWR analysis (Lower resolution)
- Up to 1.2 feet for the NASA JPL analysis (higher resolution)

### NASA JPL InSAR Subsidence Mar. 2015- Nov. 2019



Approximate area of greatest subsidence (~1.2 ft) recorded by InSAR for the period Mar. 2015-Nov. 2019

Shaded area of ~1-2 feet of subsidence documented by DWR for period 1960-1983

## PROPOSED SUSTAINABLE MANAGEMENT CRITERIA

Minimum Threshold (MT): function of groundwater elevation and GPS/survey data when it is available. Initially, the MT will be based on groundwater levels because we do not have a consistently measured historical data record. The criteria will be evaluated in 5 years when more data will be available. Measurable Objectives and triggers are also currently based on groundwater levels as a proxy.

## APPROACHES TO ADDRESSING UNDESIRABLE RESULTS

The GSP will include a detailed monitoring program for land subsidence to gather more data using remote sensing and/or GPS technology to assess subsidence of the land surface in the basin. The monitoring program will assess the success of actions taken to stabilize land subsidence. Those actions may include pumping reduction, managed aquifer recharge, and/or other approaches.

### WHAT DO YOU THINK...

Have you noticed any signs of land subsidence in Sierra Valley?

If so, what were the signs and where did you see them? Do you have any sense of the magnitude of the subsidence?

How much additional subsidence, if any, is too much?

GSAs:

