Napa County Comprehensive Groundwater Monitoring Program

Groundwater Conditions – Part 2

Napa County
Groundwater Resources
Advisory Committee

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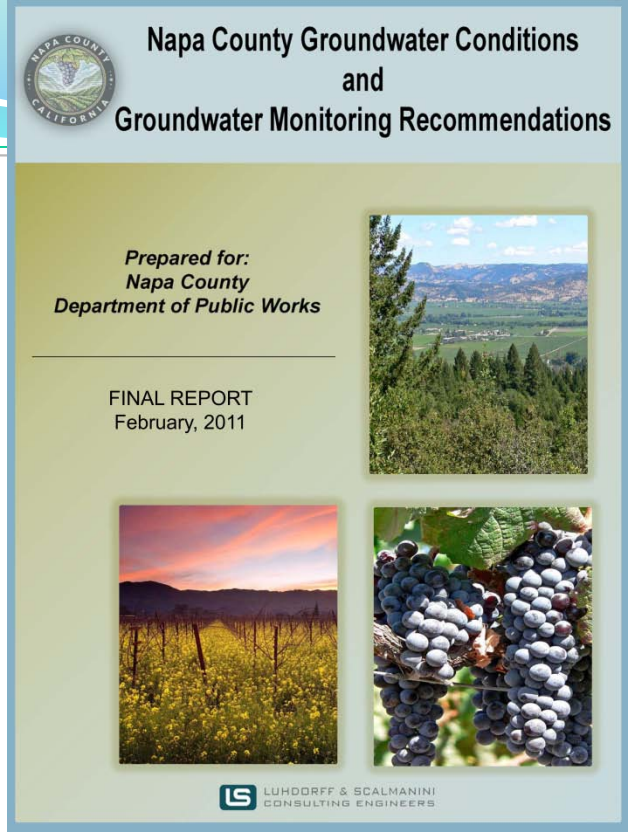
Presentation Overview

- Purpose of Groundwater Conditions Report
- Data Distribution
- Groundwater Conditions
  - GW Levels
  - GW Contours
  - GW Quality
- Monitoring Recommendations

Overall Purpose Groundwater Conditions & Recommendations Report

- **Reconnaissance Level Evaluation**
  - Compile Readily Available Data
- **Evaluate Countywide GW Conditions**
- **Learn: What We Know, What We Don't Know, What We Need to Know**
- **Provide Recommendations Related to GW Monitoring Program**



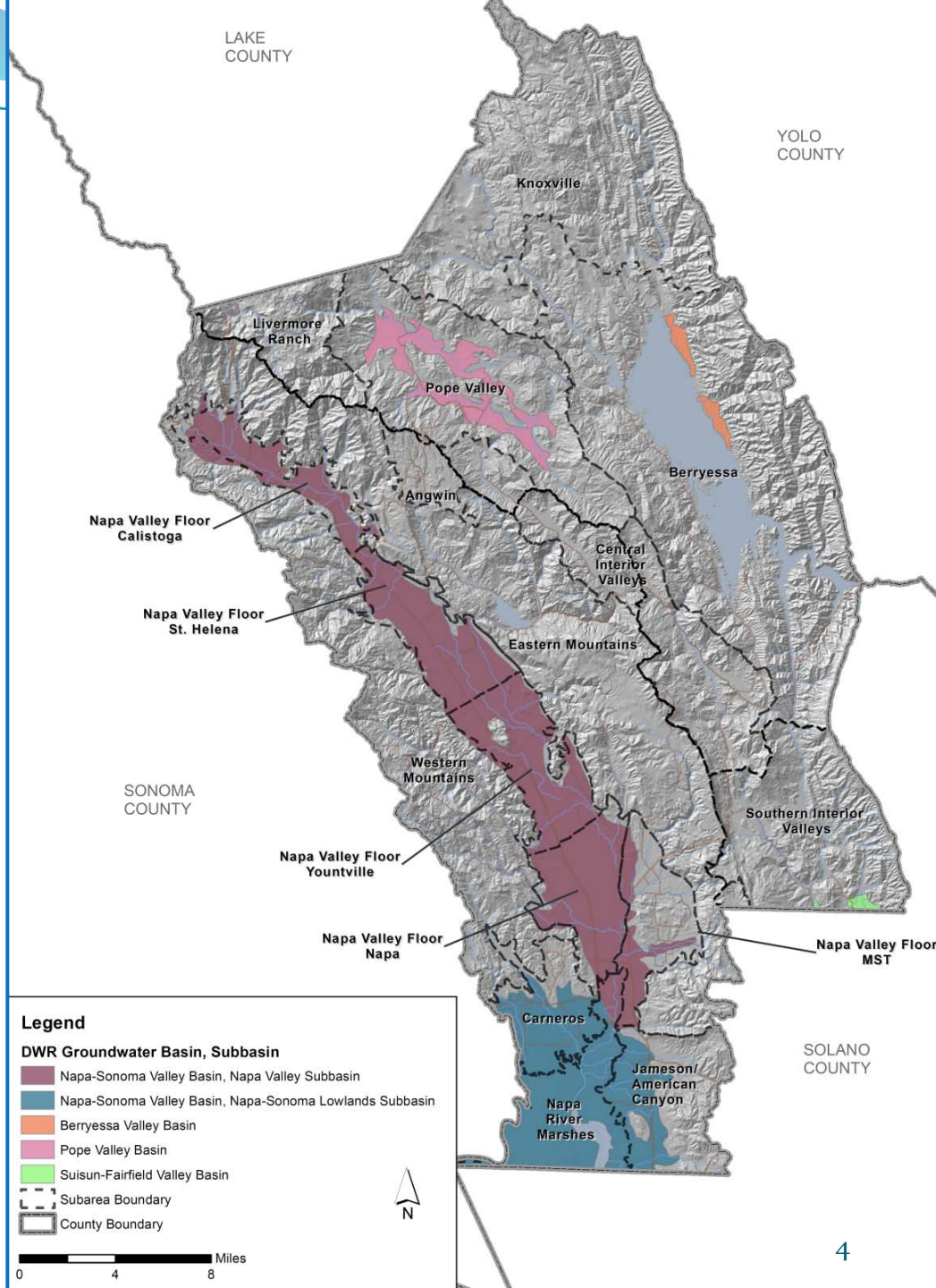
County Subareas and DWR Basins

17 Subareas

- Napa Valley Floor includes 5 Subareas

DWR Groundwater Basins/Subbasins

- Napa-Sonoma Valley Basin
  - Napa Valley Subbasin
  - Napa-Sonoma Lowlands Subbasin
- Berryessa Valley Basin
- Pope Valley Basin
- Suisun-Fairfield Valley Basin

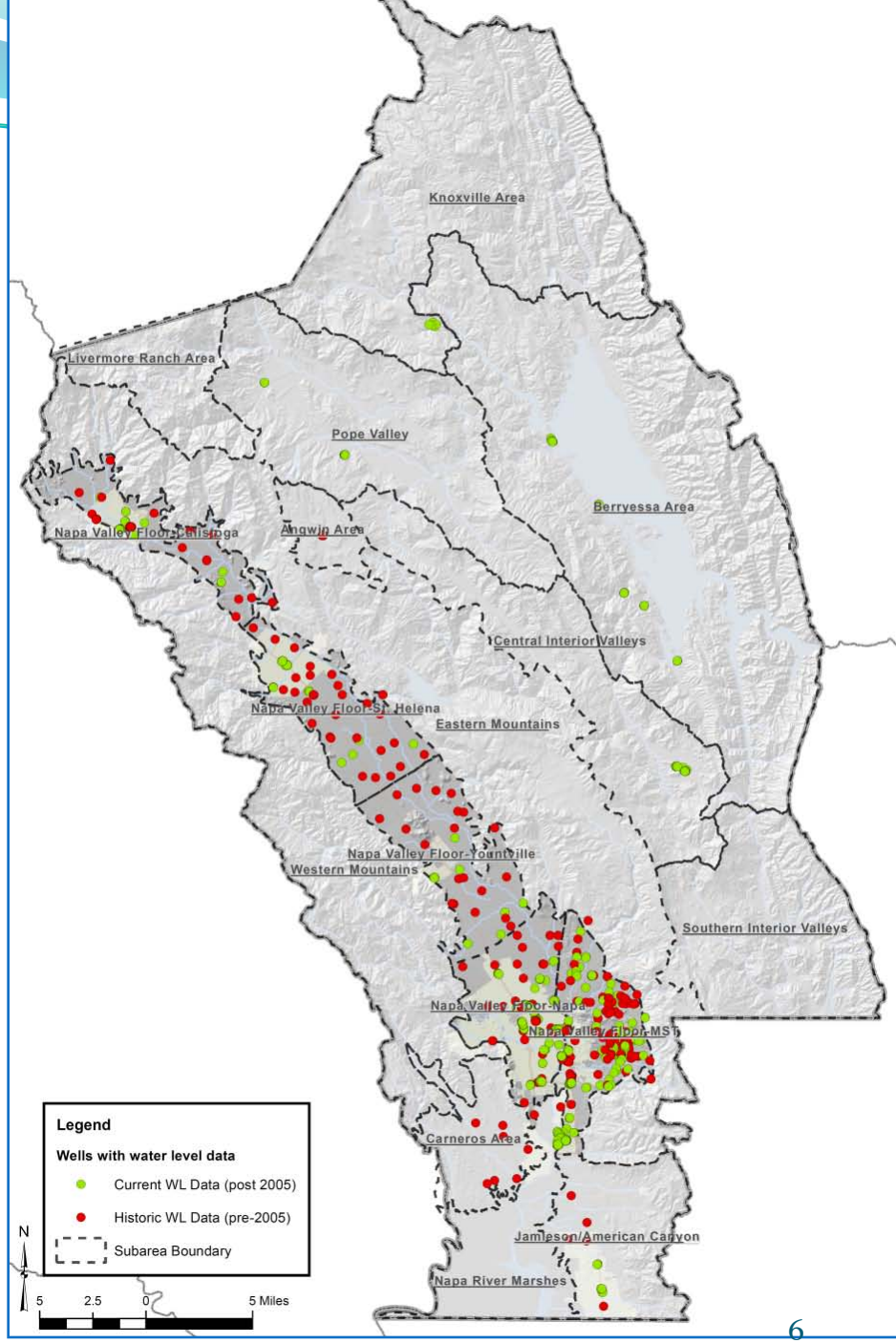


Historical Monitoring Data Distribution

- **Historical GW Monitoring Sites (pre-2005) Exceeds Current (2005 to Present) Sites by 50%**
- **GW Quality Data More Spatially Distributed than Level Data**
- **GW Level Data Primarily Collected from NVF Subareas**

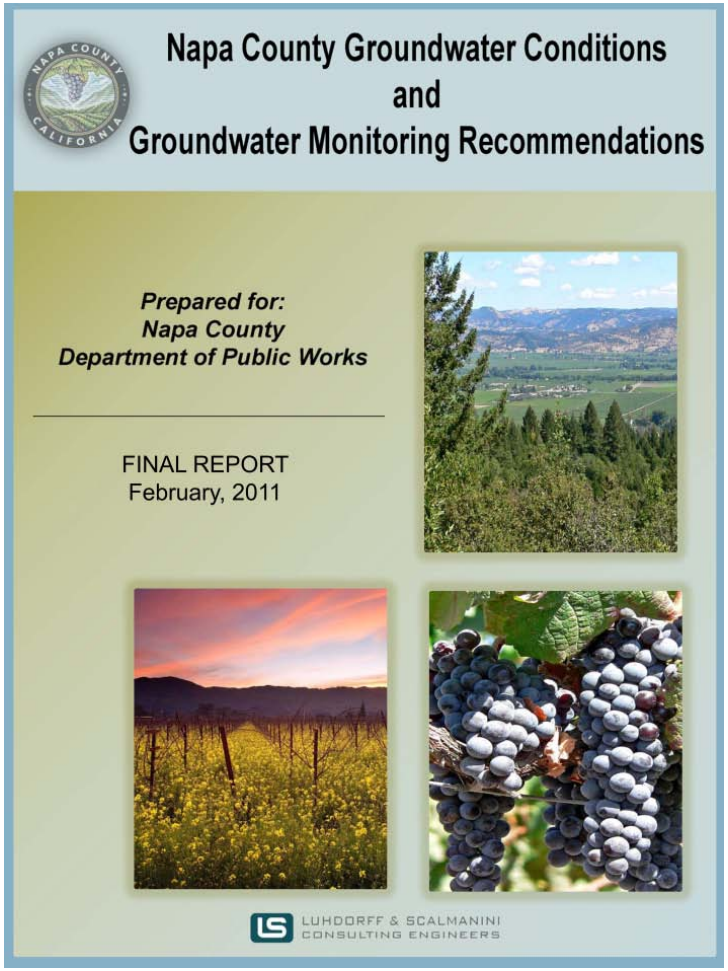
Current Groundwater Monitoring Data Distribution

- GW Level Monitoring at 181 sites (compared to 382 historically)
- GW Quality Monitoring Sites at 182 sites (compared to 211 historically)
- Existing Data are Limited in Assigning Data to Specific Water-Bearing Aquifers



Napa Co. Groundwater Conditions Report

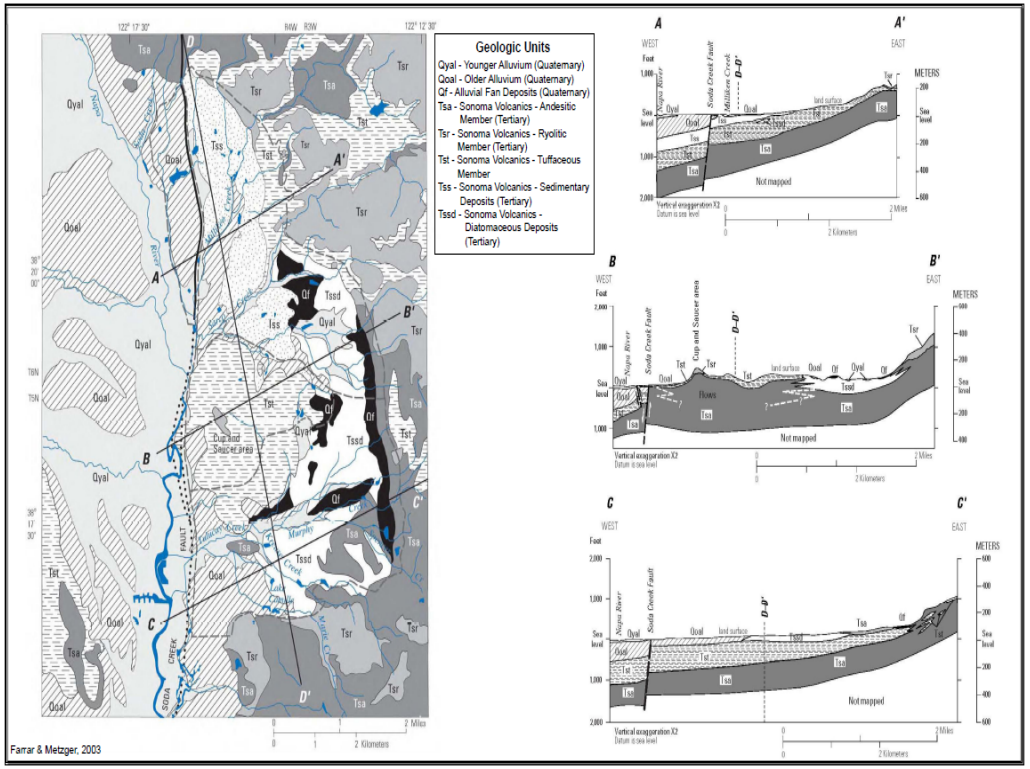
- Groundwater Conditions – Levels
- Groundwater Conditions – Quality

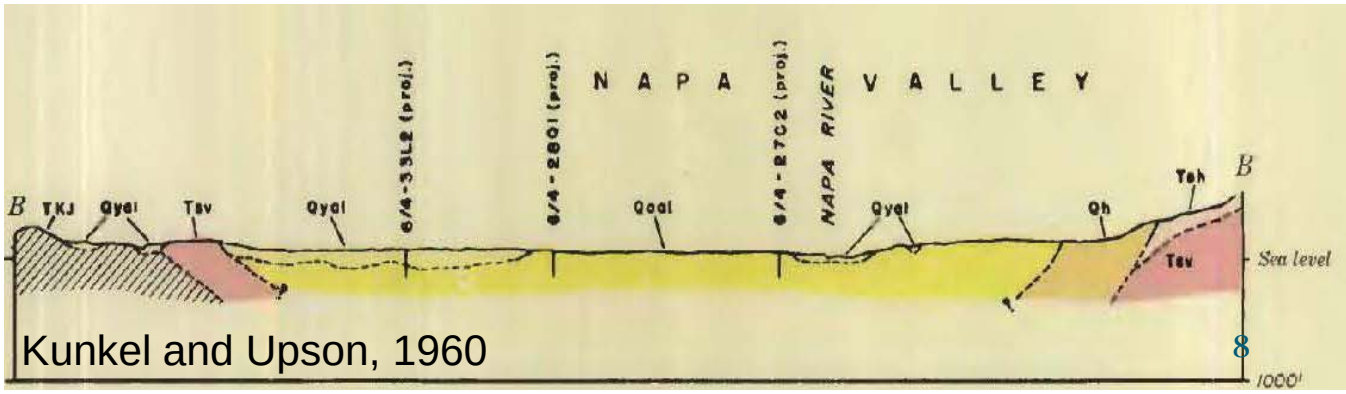


Napa County Geology

Key Water Bearing Units

- **Younger and Older Alluvium** (Primarily in Napa Valley Floor)
- **Sonoma Volcanics** (Underlies Alluvium)





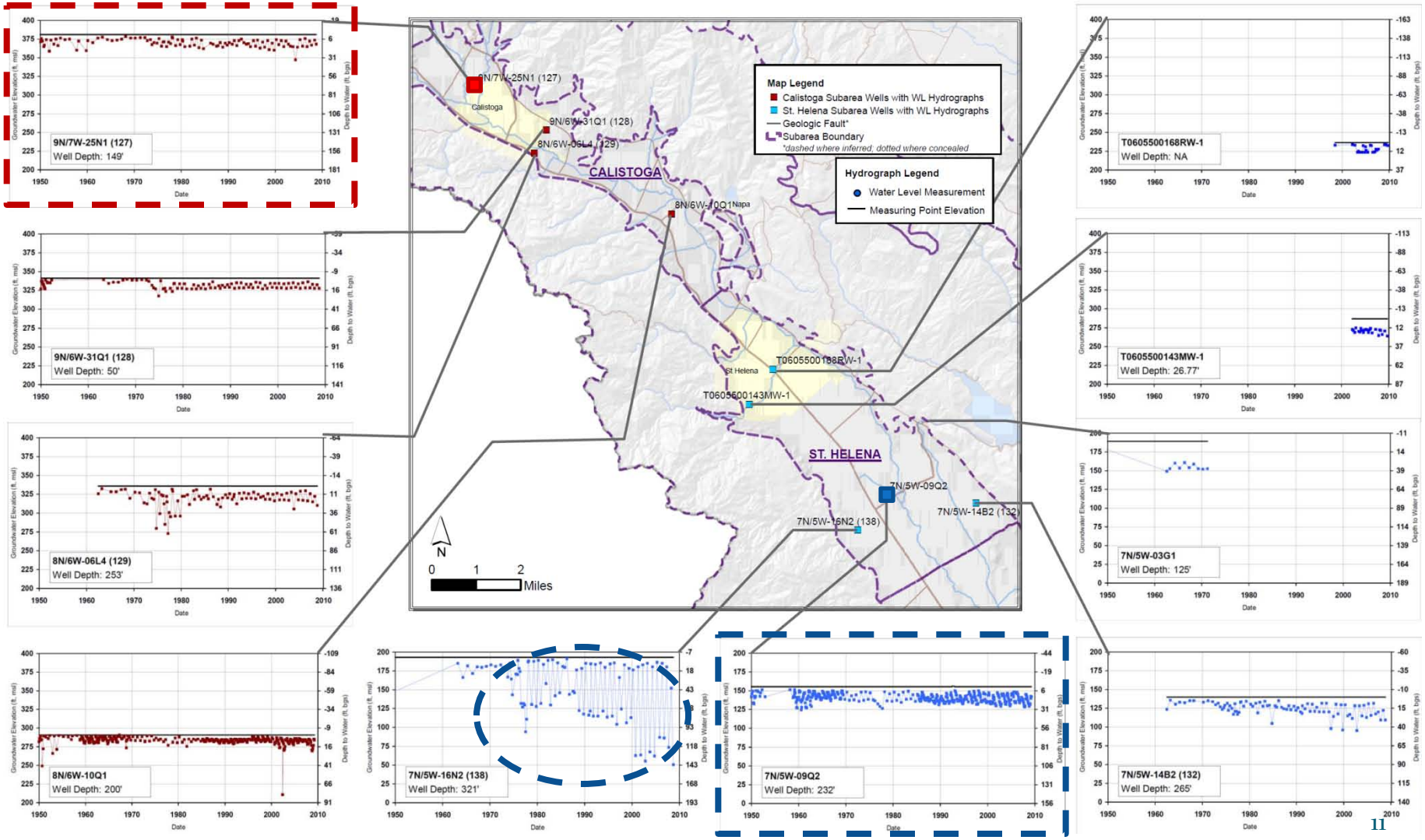
Groundwater Level Conditions

- Levels
  - Napa Valley Floor Subareas
  - Subareas South of Napa Valley Floor
  - Subareas East of Napa Valley Floor
- GW Elevation Contours
  - Napa Valley Floor & MST

Napa Valley Floor – Calistoga & St. Helena

- Generally Stable Long Term Trends
- Shallow Depth to Groundwater (<10’ bgs)
- Minor Seasonal Declines (~10’) in Calistoga & northern part of St. Helena
  - Other locations in St. Helena ~25’ seasonal fluctuation
  - SW boundary of St. Helena has seen ~100’ seasonal fluctuation

Representative Hydrographs – Northern Napa Valley



Napa Valley Floor – Yountville & Napa

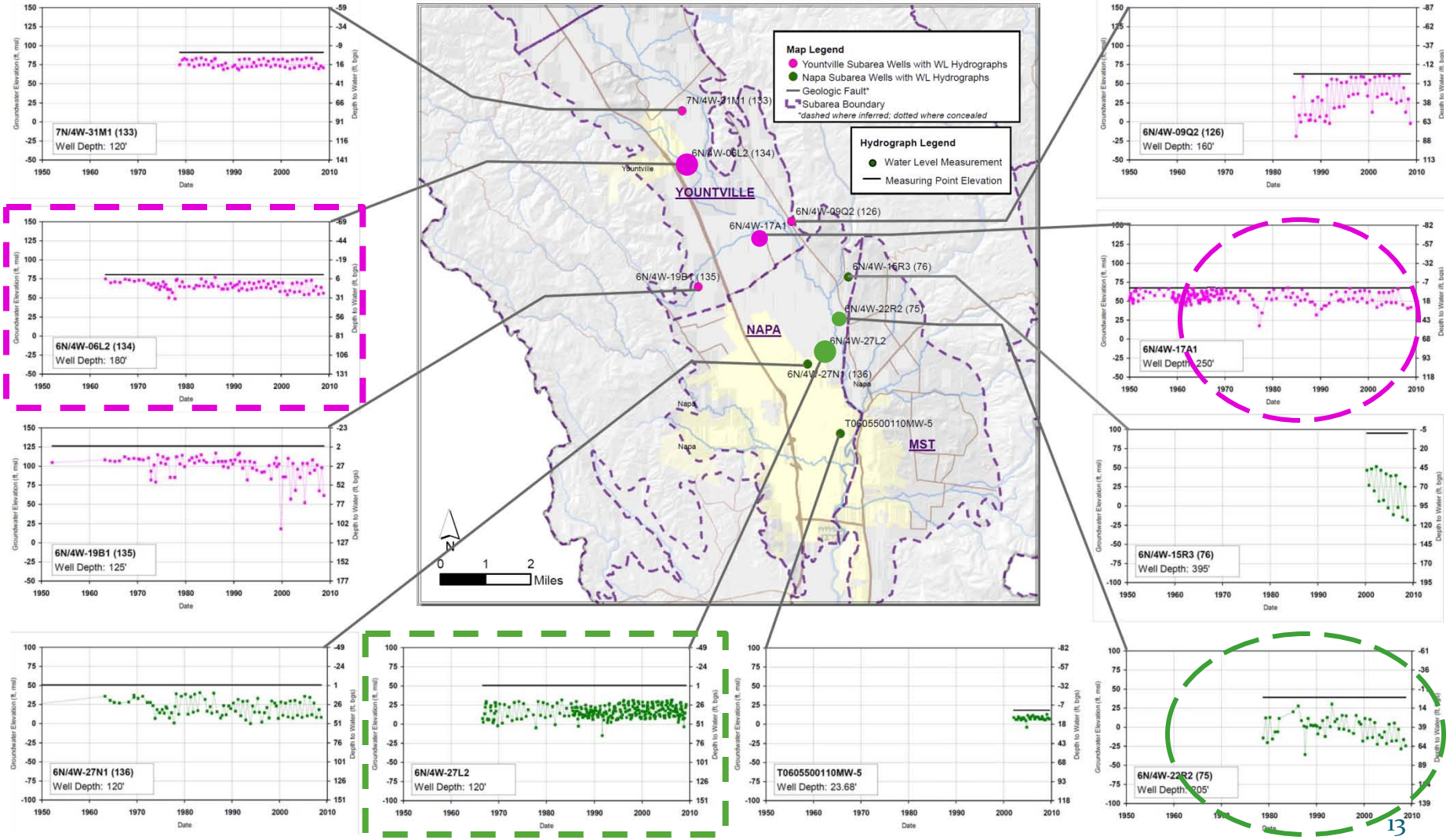
Yountville

- Stable except in the SE where declines in 2007 & 2008 occurred due to dry water years
- Depth to GW <10' bgs
- Seasonal fluctuations greater along the west and east edges of the subareas
  - Center of the Valley Floor fluctuates 10-25'
  - Near Valley edge: 25-35'

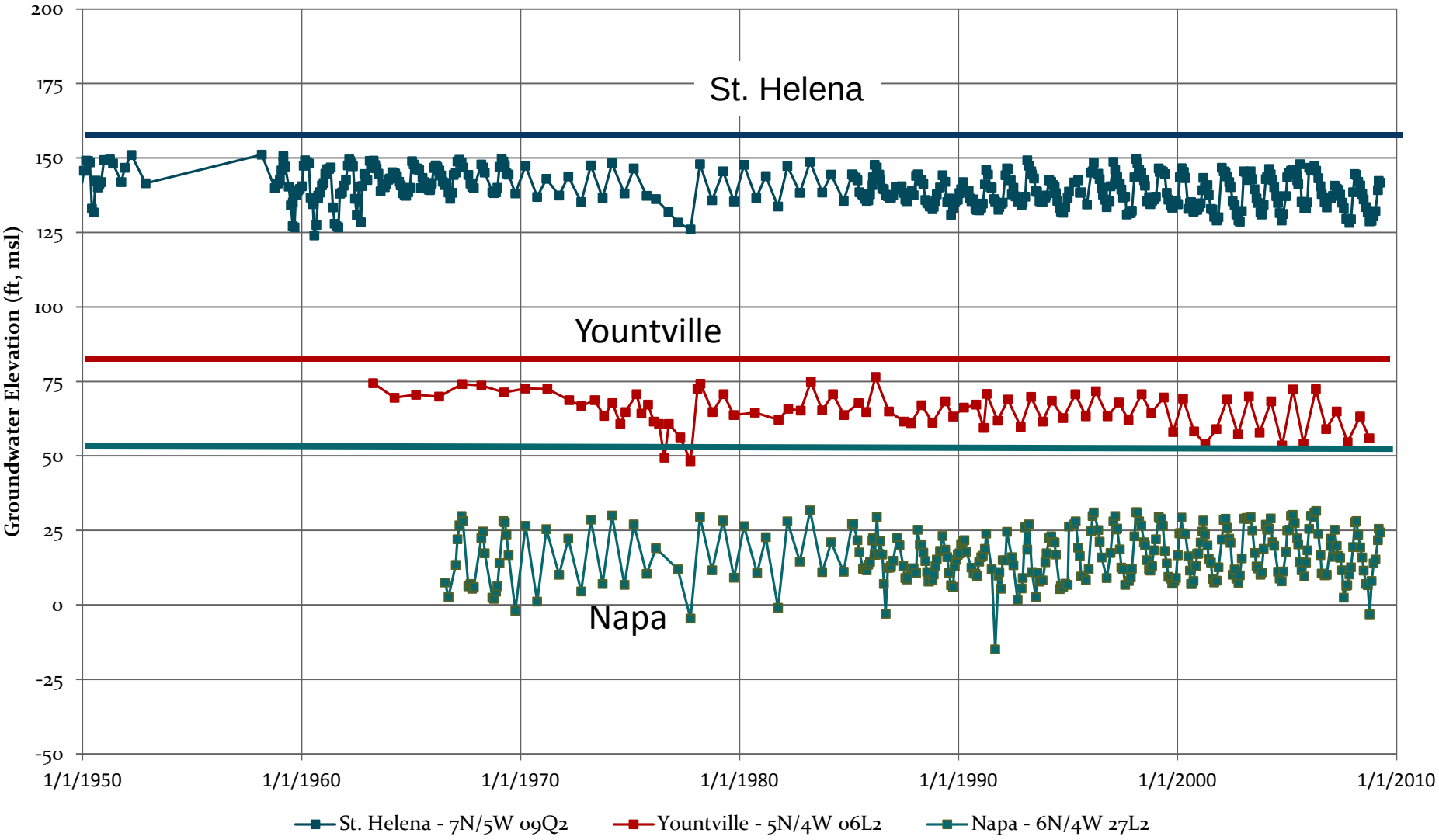
Napa

- Stable except in NE where 10-30' declines have occurred over the past 10 years
- Slightly deeper depths to GW of ~20-50'
- Seasonal fluctuations between 10-40 feet
- Possible hydraulic connection to MST Subarea; declines on NE border of subarea

Representative Hydrographs – Southern Napa Valley



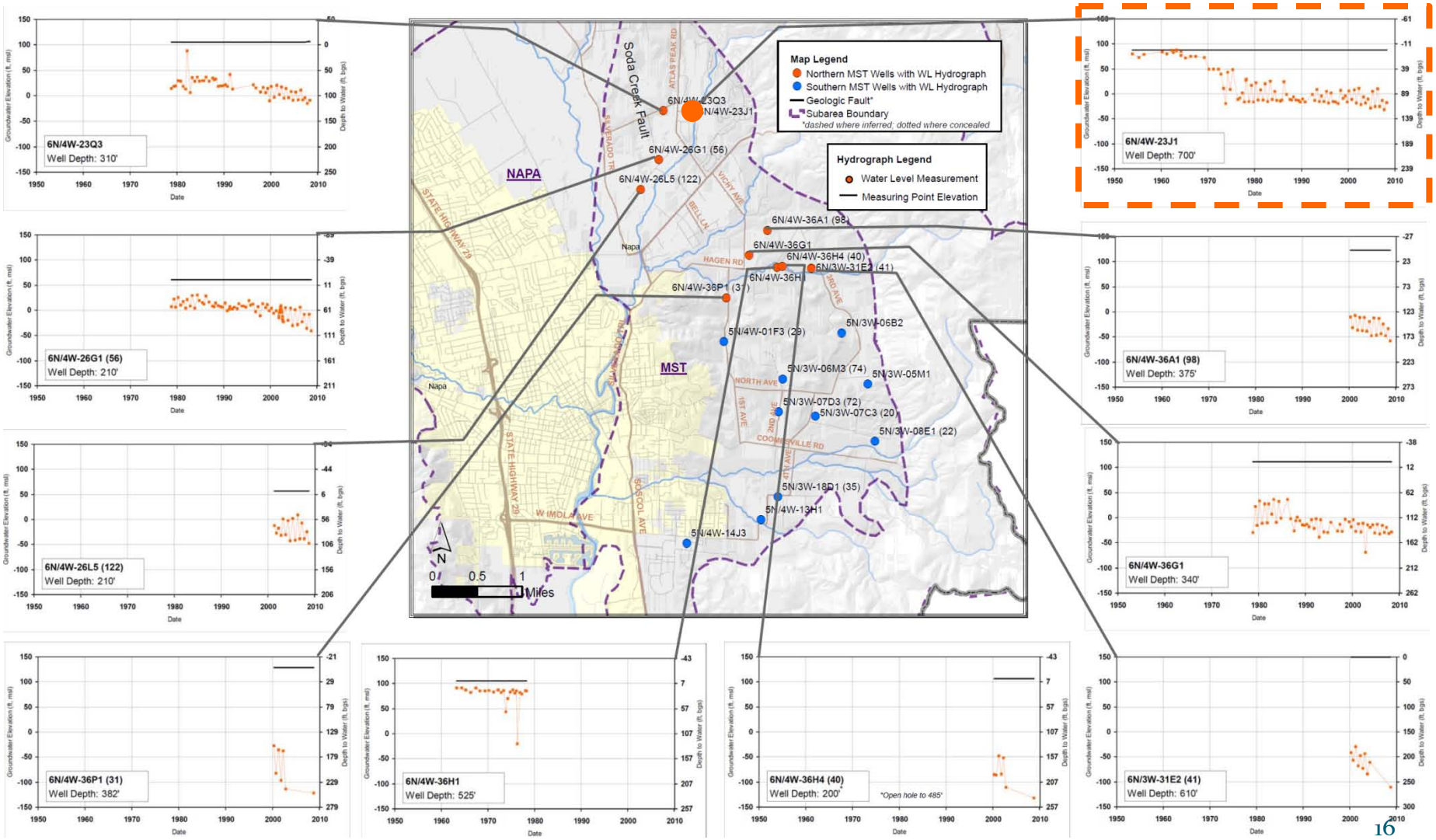
Napa Valley Floor – St. Helena to Napa



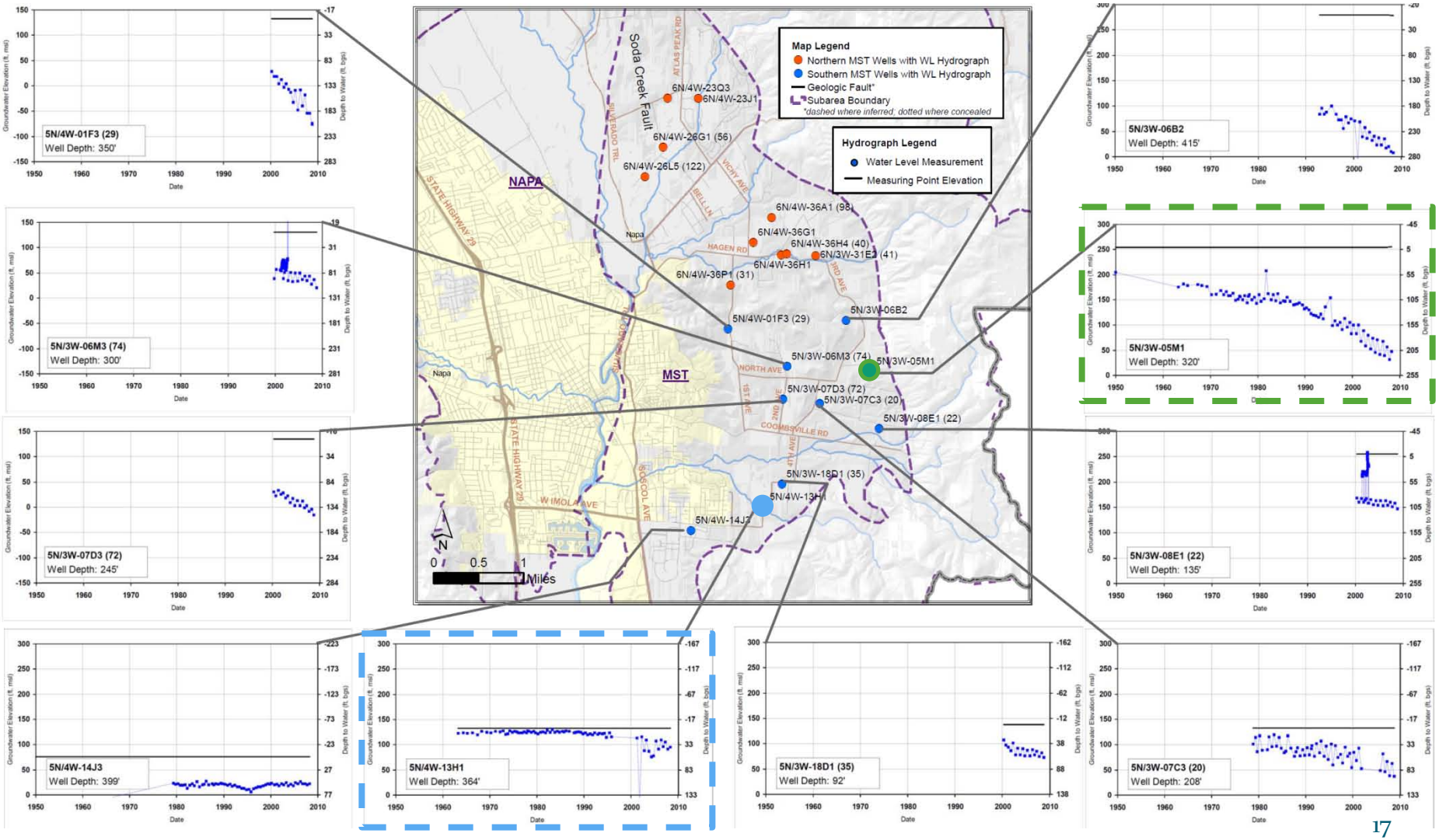
Napa Valley Floor - MST Subarea

- **Northern Area**
  - Decline in Late 1960s to 1970s, then Stable
- **Central Area**
  - General Long-Term Decline, Increase in Decline Since the 1990s
- **Southern Area**
  - Shallow Depth to Groundwater, Historical Stable Trends with Recent Decline

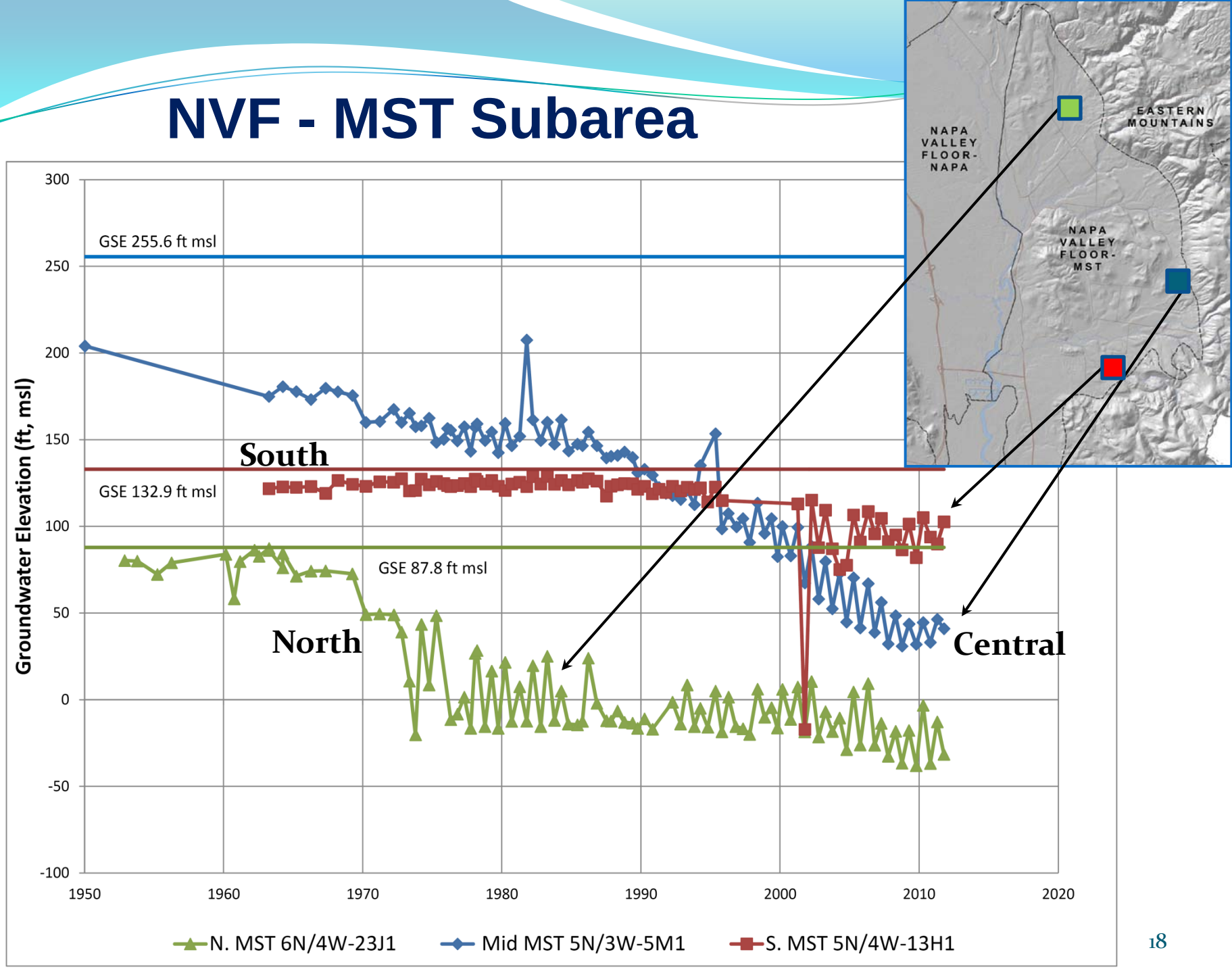
Representative Hydrographs – Northern MST Area



Representative Hydrographs – Central and Southern MST Area



NVF - MST Subarea



Subareas South of Napa Valley Floor – Carneros, Napa River Marshes, & Jameson

Carneros

- Generally stable long-term trends but some decline in mid-1970s of 20-40’
- Lack of recent GW level data

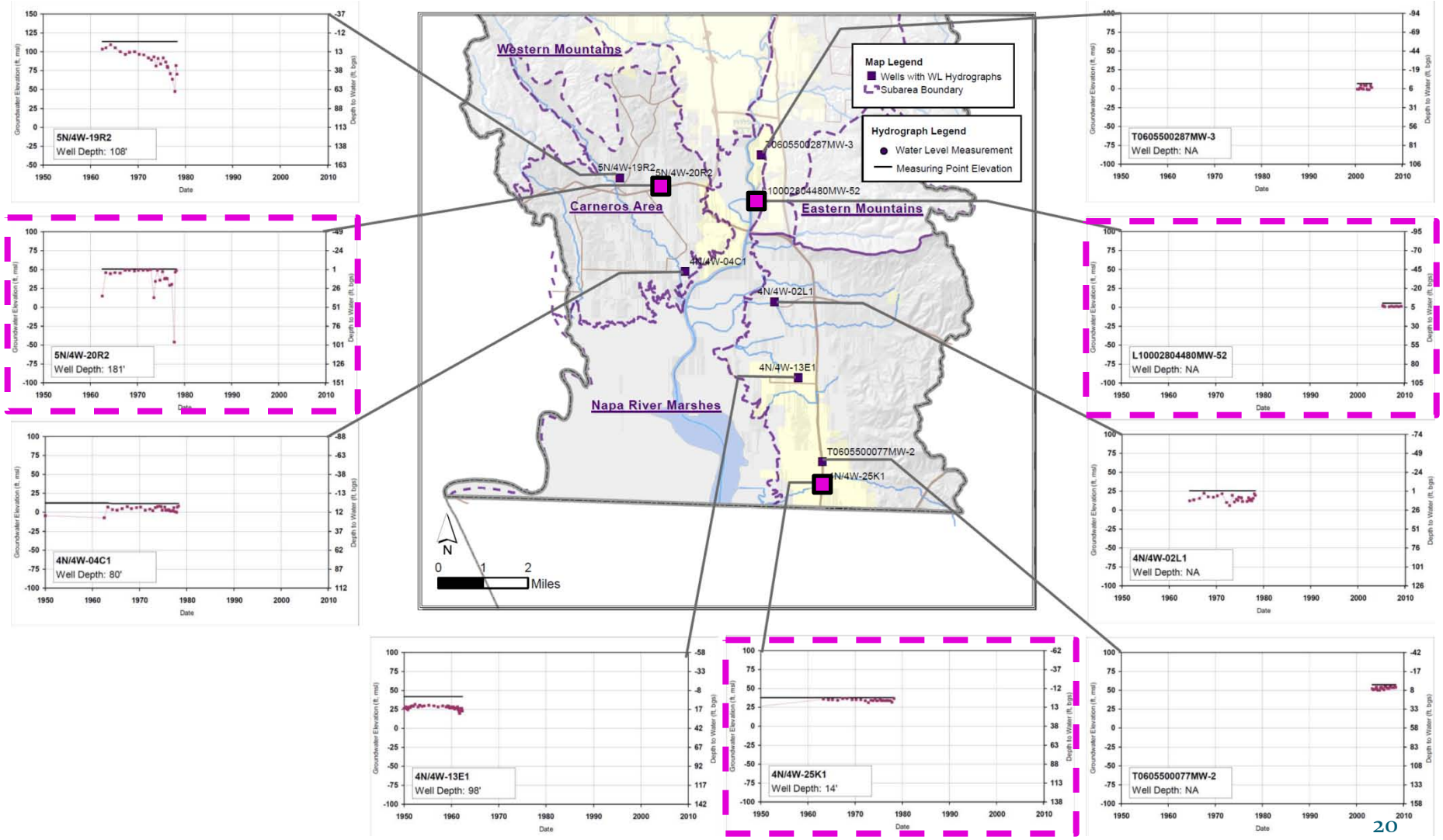
Napa River Marshes

- Limited data, most data in north part
- Generally stable levels
- Levels a few feet above sea level

Jameson

- Data covers long period but not continuous
- Very stable
- Fluctuations <10’

Representative Hydrographs – South of NV Floor



Subareas East of Napa Valley Floor

- Limited sites with data
- Some Data: Eastern Mtns, Angwin Area, Pope Valley, Central Interior Valleys, Knoxville Area, Berryessa Area
  - Livermore Ranch Area & Southern Interior Valleys have NONE
- Water levels mostly from regulated facilities
- Little continuous data, but mostly stable
  - One well <u>east of MST</u> in Eastern Mtns shows WL declines (Napa Co. 92)

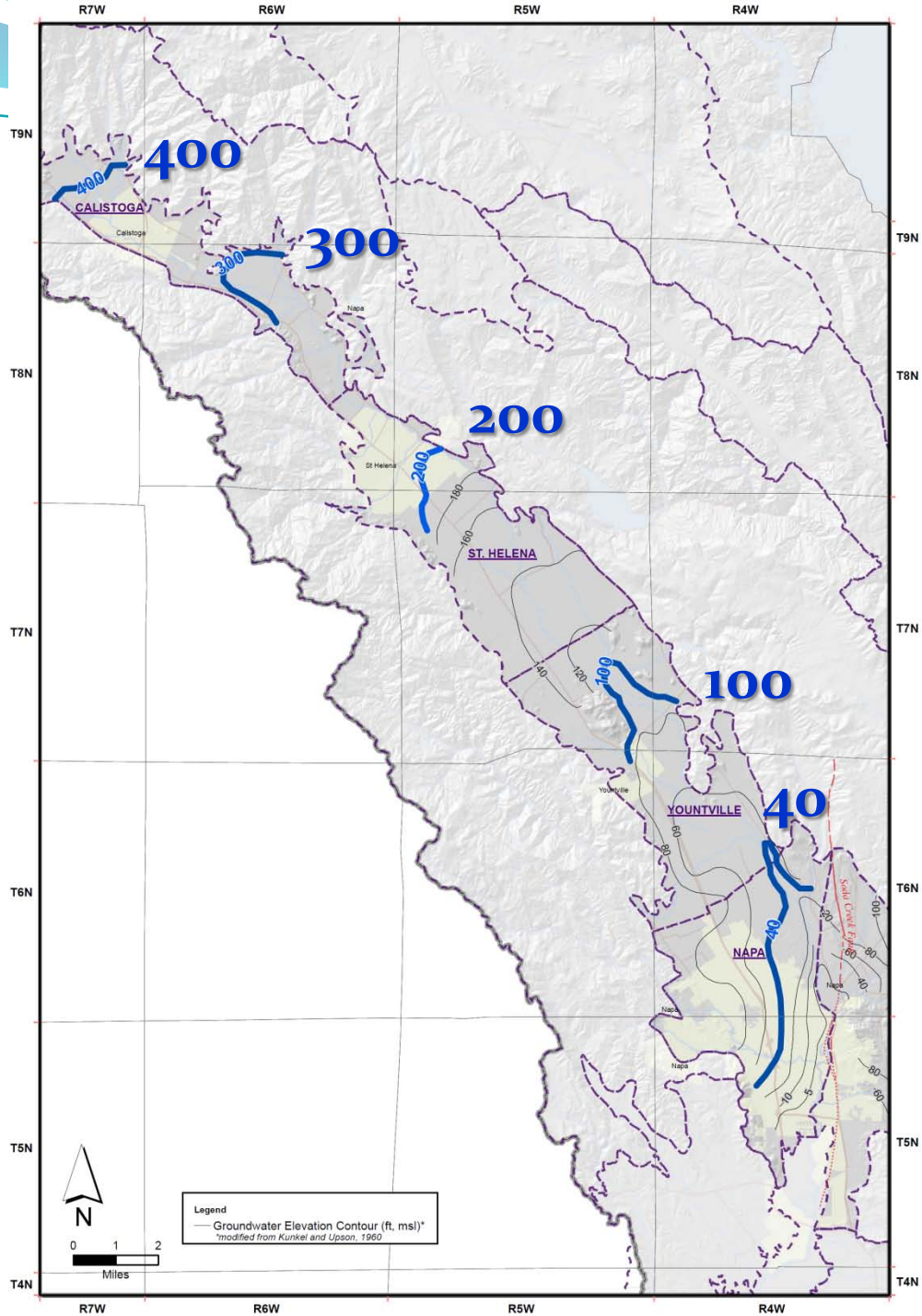
Groundwater Elevation Contours

- **Napa & MST Subareas Contoured**
  - **Kunkel & Upson (1949/1950; NVF & MST), Faye (1930, 1931, 1963; NVF), Johnson (1975; MST), Farrar & Metzger (2001/2002; MST)**
  - **LSCE 2011 report does not connect NVF & MST subareas – need to further characterize GW level data (well completion/formation relationship)**

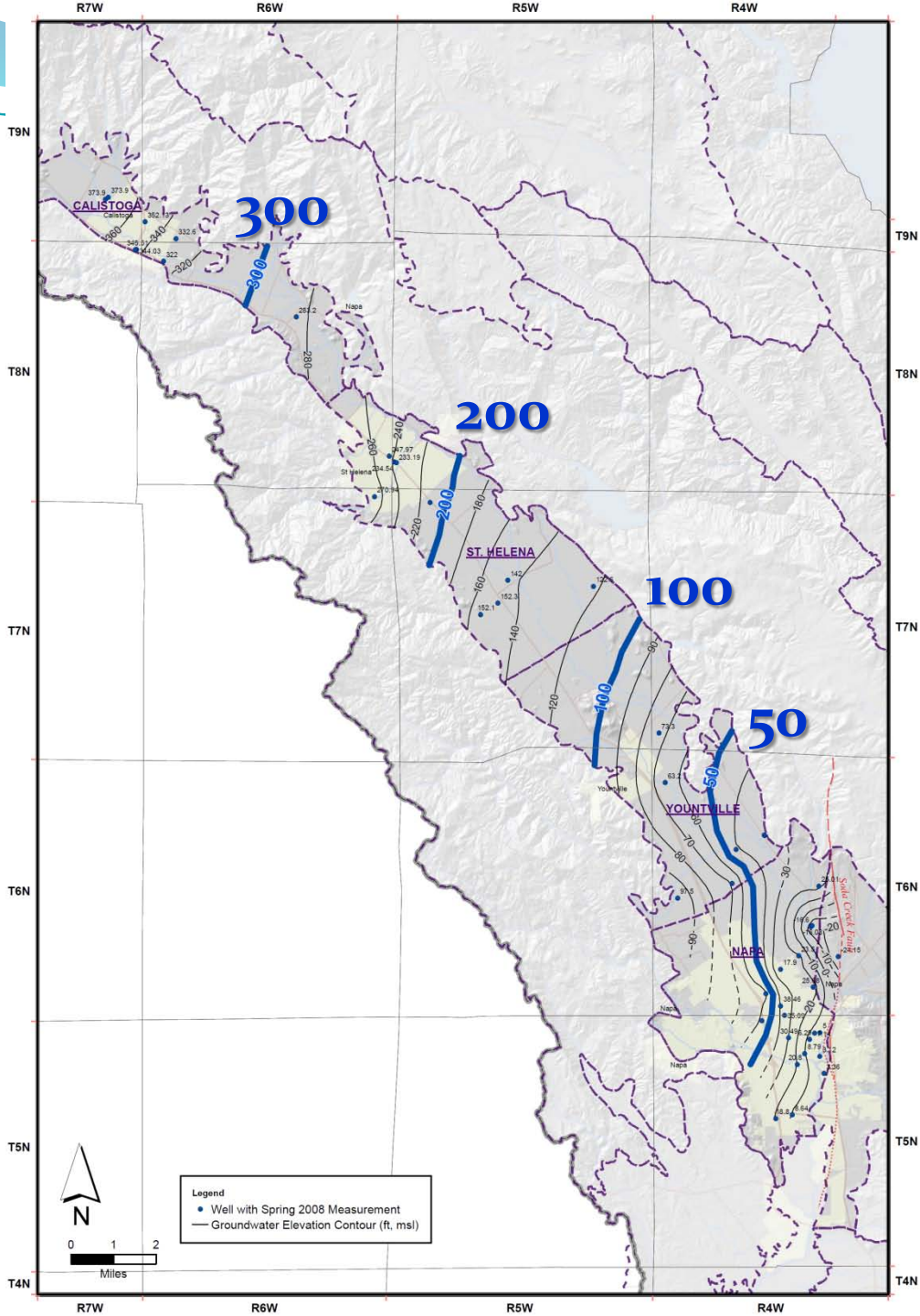
NVF Groundwater Elevation Contours

- **Flow directions mostly unchanged over the last 60 years**
- **Spring 2008 flow toward the San Pablo Bay *except* near MST where local pumping depressions alter flow**
- **1950s & Spring 2008 contours show mostly unchanged levels in Calistoga, St. Helena @ Rutherford**
  - **Yountville & Napa flow south and east toward Napa River**
  - **Coverage in ’08 insufficient to determine if stretches of Napa River have changed from gaining to losing**

Napa Valley Floor
GW Elevation Contours
1949/1950



Napa Valley Floor GW Elevation Contours Spring 2008

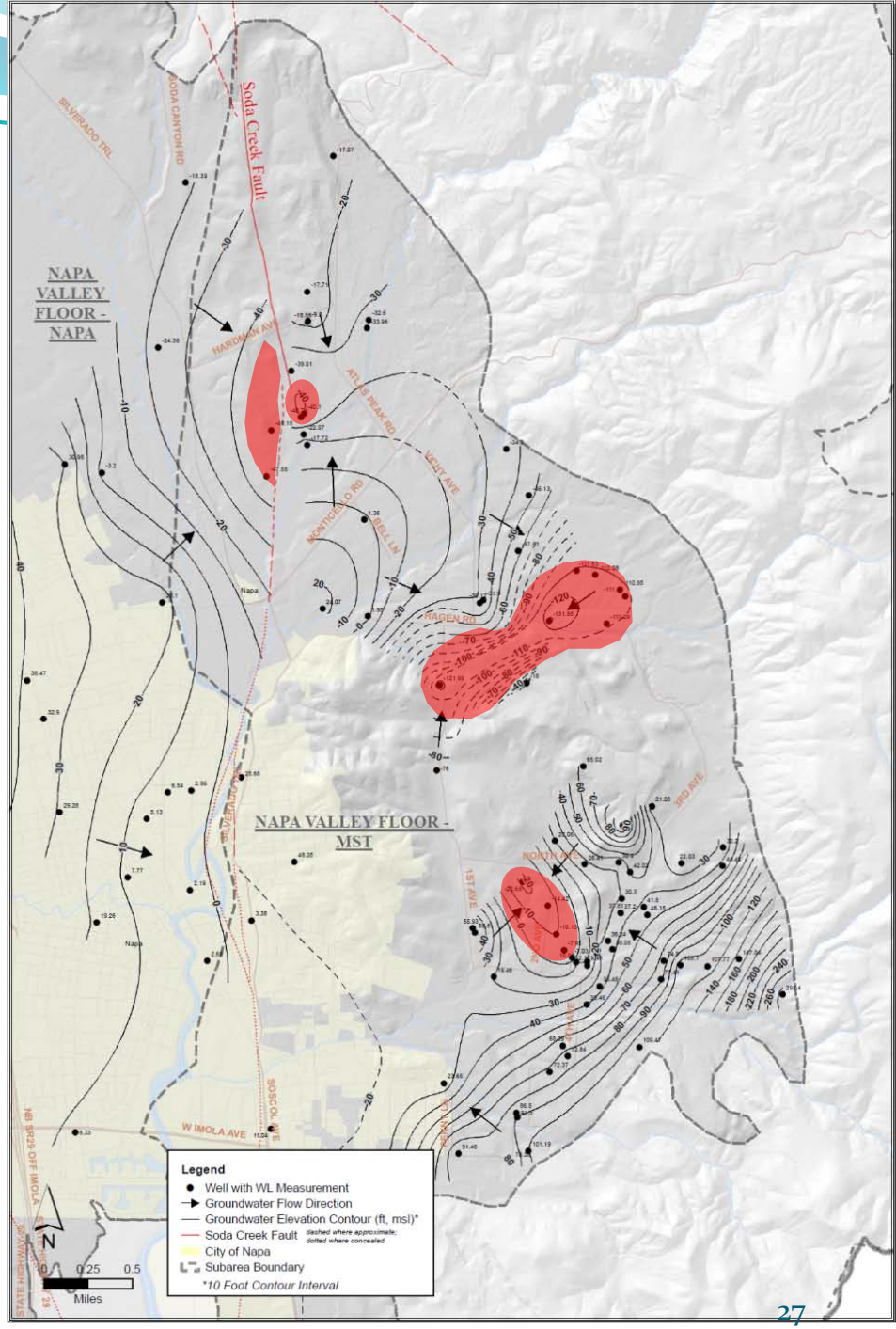


MST Groundwater Elevation Contours

- **Problem contours for *composite* GW system**
  - **Johnson: Spring/Fall 1975 >140 wells, without considering well construction info**
  - **Farrar & Metzger: >120 wells incorporated, well construction info**
- **Continued GW level decline in varying degrees**
- **Existence of pumping depressions**
- **Well coverage Spr & Fall '08 lack for contouring (data gap)**

MST Area
GW Elevation Contours
Fall 2008

- 3 local pumping depressions and a 4th depression found west of Soda Cr. Fault in Fall 2008
  - Depression continues to deepen nearest fault along McKinley Rd



Summary of Groundwater Level Conditions

Napa Valley Floor (Except for MST Subarea)

- **Generally Stable Long Term Trends**
  - St. Helena, Yountville, and Napa areas
- **Shallow Depth to Groundwater**
  - 10 to 30 feet Below Ground Surface

MST Area

- **Pumping depressions common and worsening in some areas**
- **Importance of correlating levels with portion of aquifer system**

Elsewhere – generally insufficient data

Questions from GRAC

- Is the County still taking water level readings twice a year at the 30 or so wells?
  - Yes. Currently County monitors 15 wells in the MST and 28 in Valley/MST
- How many wells have continuously been monitored over the last 10 years?
  - About 45 throughout the County
- Is there evidence of GW extraction at unsustainable rates?
  - Localized areas in MST
- Sufficiency of GW for urban/res/ag use?
  - 2011 report recommendations geared toward answering this question in future

Questions On Groundwater Level Conditions?

Groundwater Conditions - Quality

- Napa Valley Floor
  - Calistoga
  - St. Helena
  - Yountville
  - Napa
  - MST
- Subareas South of Valley Floor
- Subareas East and West of the Valley Floor

Groundwater Quality Conditions Napa Valley Floor

Overview

- Elevated levels of arsenic, iron, manganese, and pH in all NVF Subareas
- Elevated levels of NO_3, sulfate, EC, and TDS are also prevalent in many NVF Subareas
- Key constituents: Cl, EC, NO_3, TDS
  - Available data from ~1940's to 2009

Groundwater Quality Conditions Napa Valley Floor – Calistoga Subarea

- Data from 38 wells
- Volcanic and geothermal geologic setting
  - Temperatures increase with depth
- Levels of boron, arsenic, chloride, TDS, sulfate, and fluoride exceed drinking water standards (dws)
- Poorer quality GW exists in the northern part of the subarea and along the flanks of the valley

Groundwater Quality Conditions
Napa Valley Floor – St. Helena Subarea

- Data from 44 wells
- GW quality generally good
- A few wells have exceeded dws for arsenic, boron, chromium, EC, iron, manganese, nickel, nitrate, sodium, lead, pH, antimony, and sulfate
- Generally no spatial pattern tying elevated values to a specific area, although higher NO_3 values where ag dominates land use

Groundwater Quality Conditions Napa Valley Floor – Yountville Subarea

- Data from 25 wells
- Generally good WQ
- A few wells have exceed dws for the following constituents: arsenic, boron, EC, fluoride, iron, manganese, nitrate, sodium, pH, antimony, vanadium, and TDS
- Generally no spatial pattern relating elevated levels of these constituents and not enough record to determine trends

Groundwater Quality Conditions Napa Valley Floor – Napa Subarea

- Data from 42 wells
- Groundwater quality is generally good
- Few exceedances of dws in arsenic, iron, manganese, nitrate, lead, pH, sulfate, and TDS
- Higher levels of nitrate and boron found outside the city of Napa
- Arsenic exceedances mostly occur near subarea boundaries

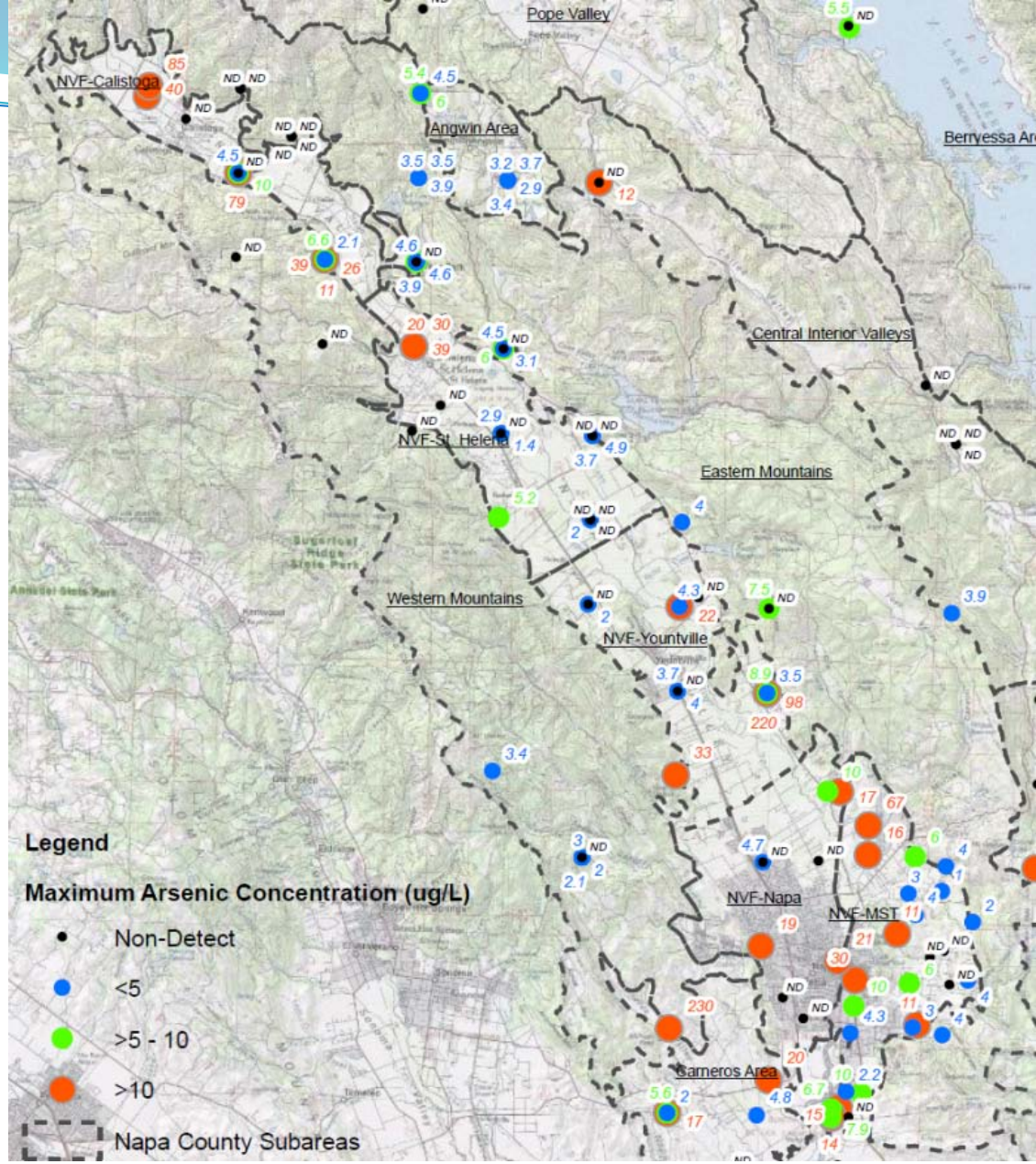
Groundwater Quality Conditions Napa Valley Floor – MST Subarea

- Data from 46 wells
- Volcanic and geothermal geologic setting
  - Temperatures increase with depth
- A few wells exceed dws for EC, TDS, sulfate, arsenic, chromium, fluoride, pH, and barium
- GW with elevated concentrations of these constituents are scattered throughout the subarea

Selected GW Quality Constituents Napa Valley Floor

Maximum Arsenic Concentration (ug/L)

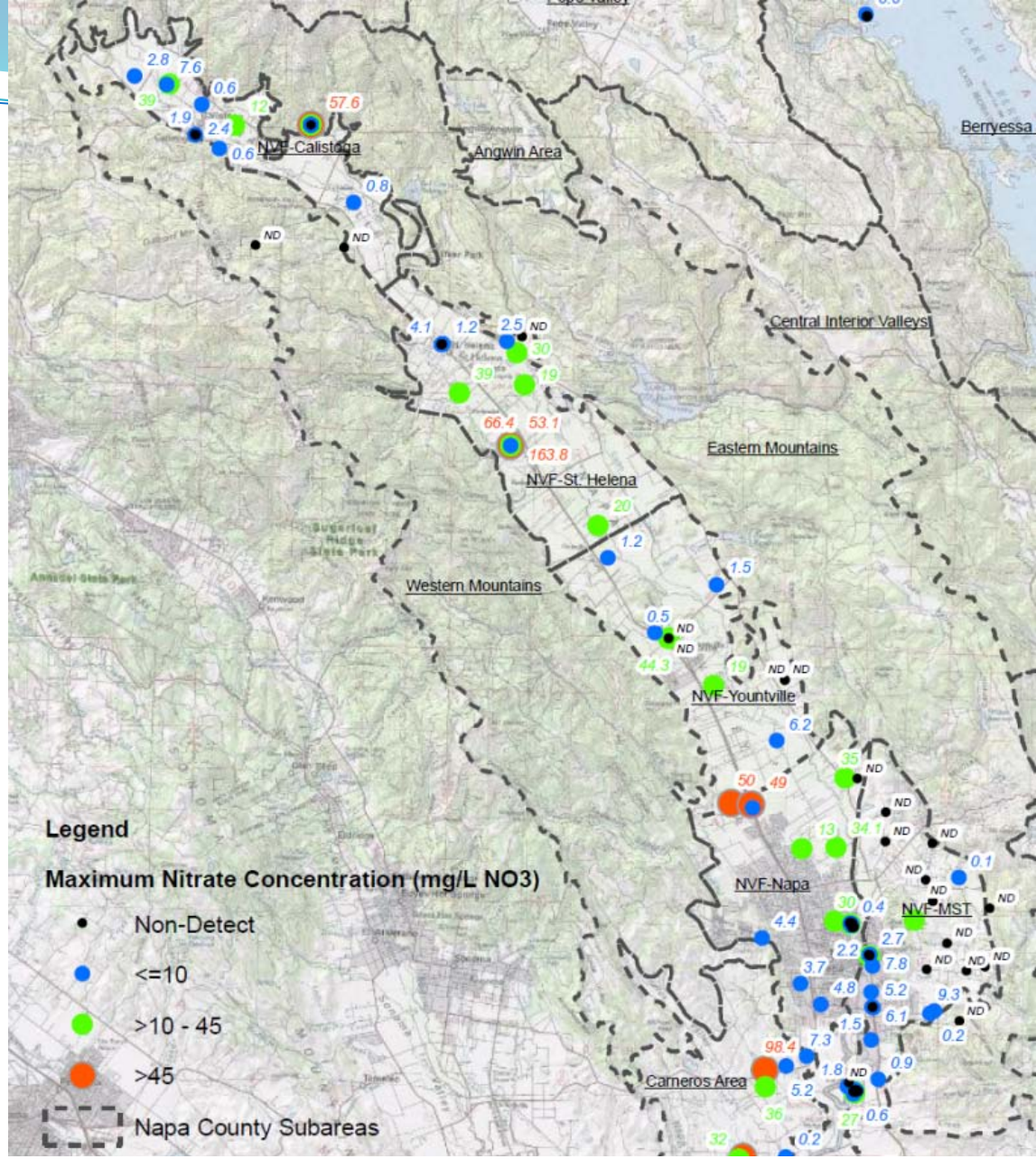
MCL = 10 ug/L



Selected GW Quality Constituents Napa Valley Floor

Maximum NO_3 (mg/L)

MCL = 45 mg/L



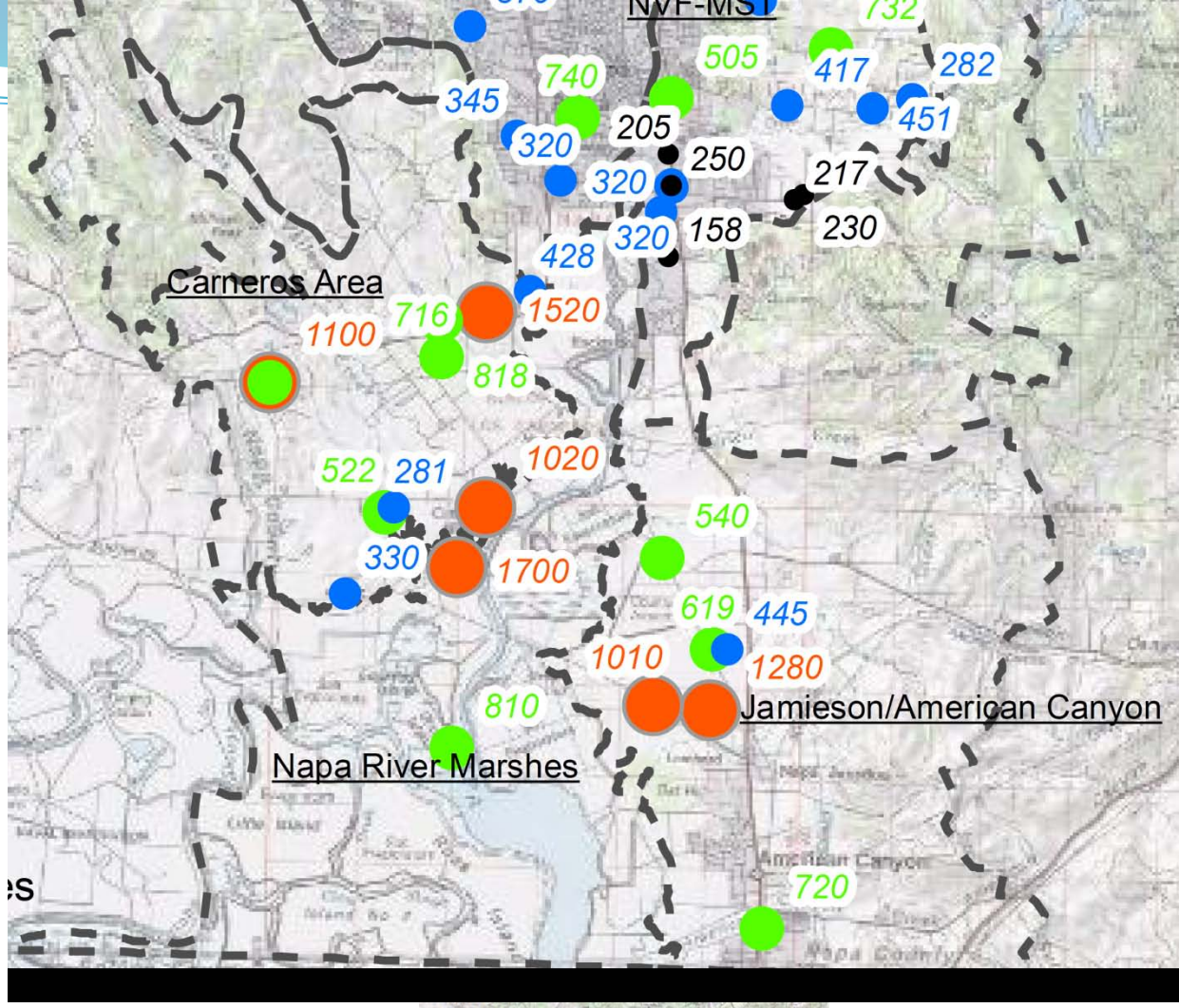
Groundwater Quality Conditions Subareas South of the Valley Floor

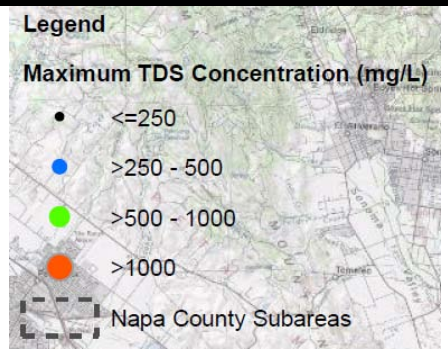
- Data from 47 wells
- May be susceptible to seawater intrusion originating from San Pablo Bay
  - Elevated chloride, EC, and TDS levels
- EC and TDS levels much higher on average than those in the Valley Floor

Selected GW Quality Constituents Subareas South of the Valley Floor

Maximum TDS (mg/L)

Secondary MCL= 500/1,000 mg/L

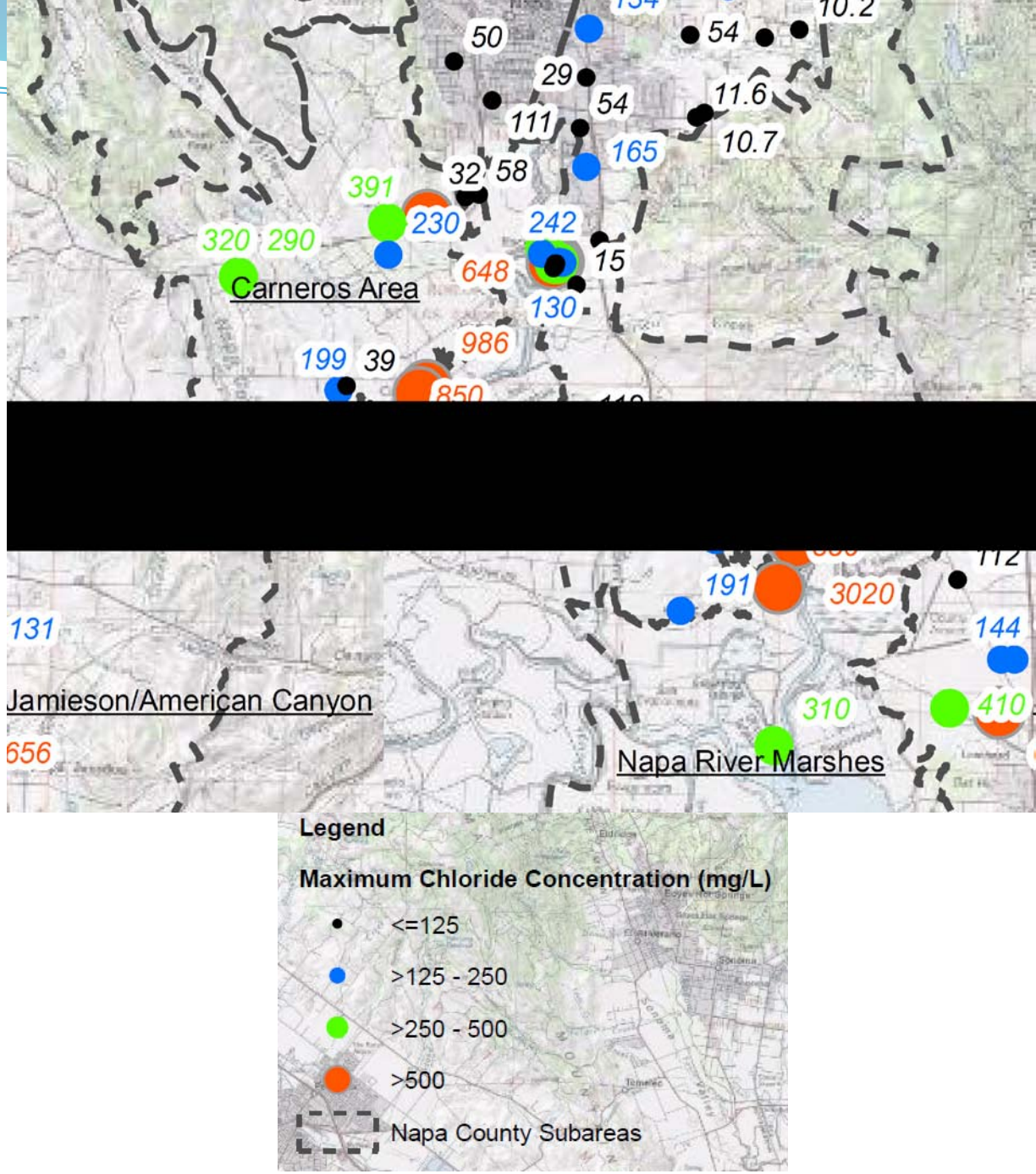




Selected GW Quality Constituents Subareas South of the Valley Floor

Maximum Chloride (mg/L)

Secondary MCL= 250/500 mg/L



Groundwater Quality Conditions Subareas East and West of the Valley Floor

- Limited data
  - 3 out of 9 subareas have >12 wells with data
  - No data for Livermore Ranch Subarea
- Records indicate generally good quality
- Elevated levels of iron and manganese occur

Summary of Groundwater Quality Conditions

- **Generally Good GW Quality**
- **Selected Areas of Elevated Constituents**
- **Calistoga Area of the Napa Valley Floor**
  - Geothermal Influences
- **Southern Napa County**
  - Elevated TDS and Chloride
- **Napa Valley Floor**
  - Scattered Nitrate

Questions On Groundwater Quality Conditions?

Future Recommendations – GW Levels

- GW Level Monitoring Objectives
  - Refine understanding GW occurrence/movement
  - ID factors that affect GW conditions/trends
  - ID & address monitoring data gaps
  - Develop/refine water budgets for key subareas
  - GW conditions, including availability
- GW Level Network Priorities
  - High Priority Subareas and Monitoring Needs
    - NVF-Calistoga/MST/Napa/St. Helena/Yountville, Carneros, & Pope Valley
    - Improved spatial distribution; subsurface geologic conditions for aquifer ID; improve understanding of SW/GW relationships

Future Recommendations – GW Quality

- GW Quality Monitoring Objectives
  - ID spatial variation
  - ID and address monitoring data gaps
  - ID factors attributable to constituents of concern
- GW Quality Network Priorities
  - High Priority Subareas and Monitoring Needs
    - NVF-MST, Carneros, Jameson, Pope Valley
  - Aquifer-specific data

Overall Groundwater Monitoring Program

- **Optimize and/or Expand GW Level and Quality Monitoring**
  - Identify and Address Data Gaps in Priority Subareas
  - Aquifer-Specific Monitoring
- **Ongoing Evaluation of GW Conditions**

Thank You

Discussion
&
Questions