Corning Subbasin

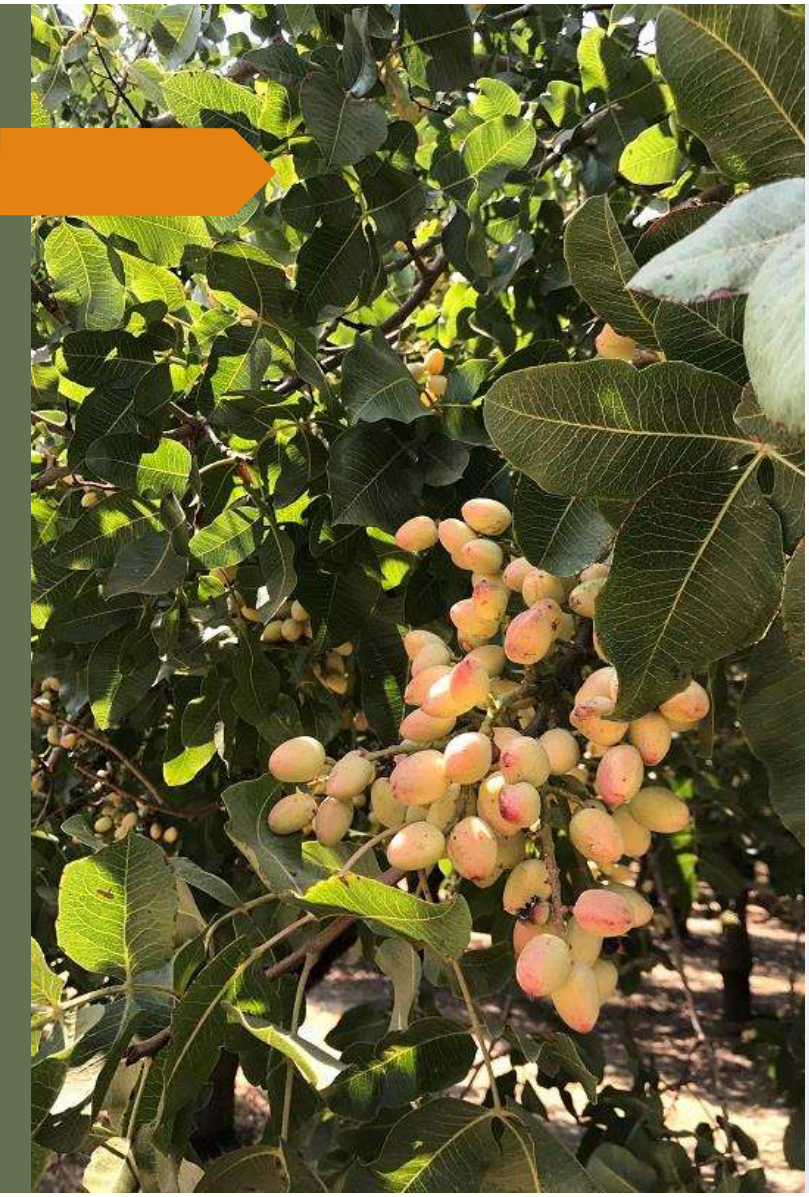
Groundwater Sustainability Plan

Technical Presentation

Presented to Corning Subbasin Advisory Board
09/02/2020 | Teleconference

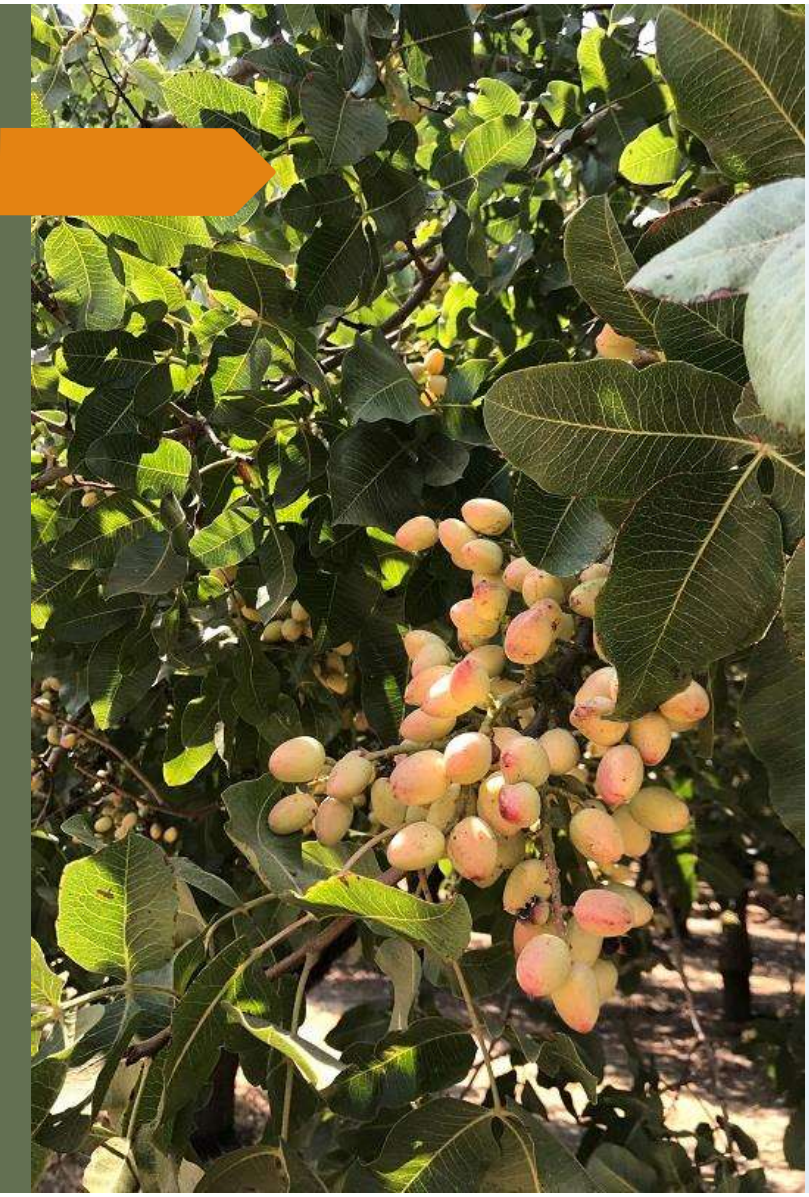
Prepared by

MONTGOMERY & ASSOCIATES



Presentation Overview

- Follow up on Action Items from Meeting #4 (August 5)
- Chronic Lowering of Groundwater Levels SMC
  - Background
  - Review Significant and Unreasonable conditions
  - Review Current Conditions and applicability of County triggers
  - Potential approaches for Minimum Thresholds and Measurable Objectives
  - Review effects on beneficial users and other Sustainability Indicators
- **Discussion throughout – ask questions!**



Action Items from Meeting #4

- Revise Sustainability Goal based on input received and bring back to CSAB for review.
- Review and report back regarding the Allan Fulton groundwater level analysis for establishing management thresholds in Glenn County, and related technical documentation.
- Search for and summarize available salinity data for wells on the west side of the Subbasin.
- Utilize the revised well completion information available in the Glenn County DMS for future well density and depth mapping.

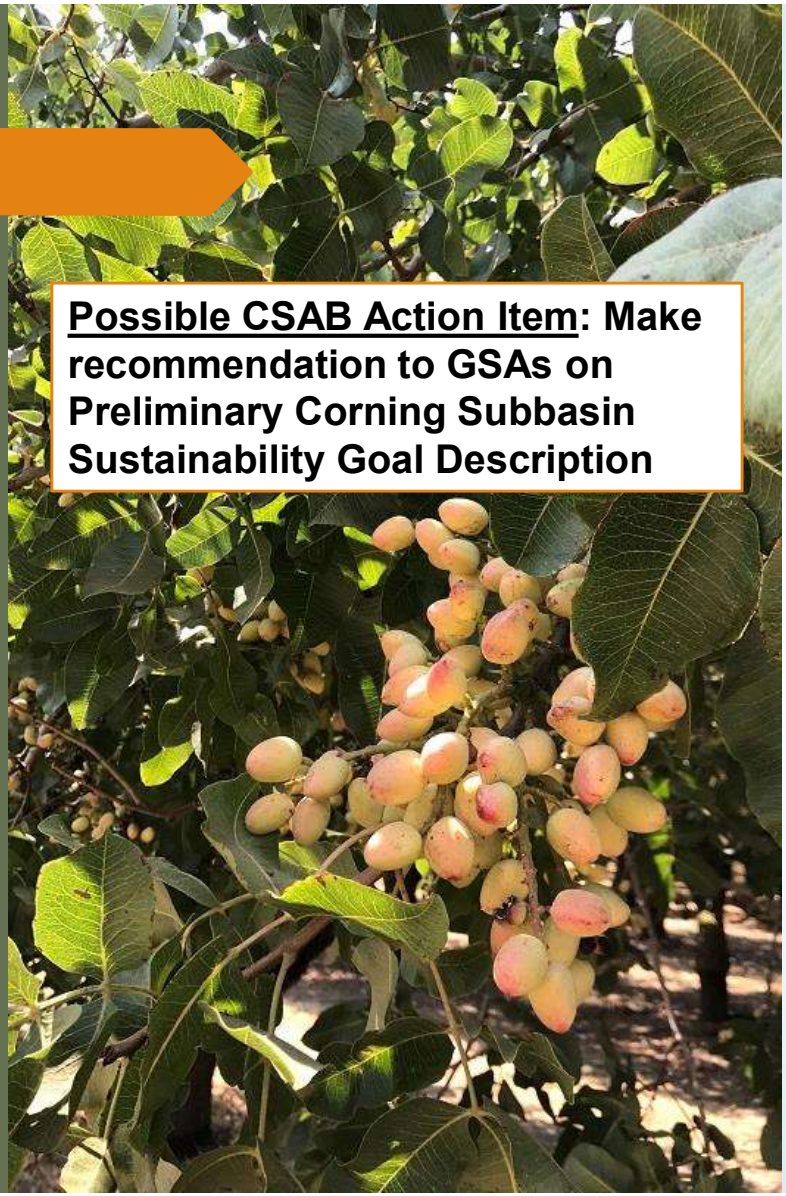
Sustainable Management Criteria – Review Basin Sustainability Goal

MONTGOMERY & ASSOCIATES

Identify the Subbasin's Sustainability Goal

Sustainability Goal

- Per Section §354.24 of the SGMA regulations, the sustainability goal for the Subbasin has three parts:
  - A description of the sustainability goal;
  - A discussion of the measures that will be implemented to ensure the Subbasin will be operated within sustainable yield, and;
  - An explanation of how the sustainability goal is likely to be achieved.



Possible CSAB Action Item: Make recommendation to GSAs on Preliminary Corning Subbasin Sustainability Goal Description

Revised Draft Sustainability Goal Description- Review and Propose a Recommendation

Current Draft:

The goal of the Groundwater Sustainability Plan is to ensure sufficient and affordable water of good quality be available on a sustainable basis to meet the unique needs of agricultural, residential, municipal, industrial, recreational, and environmental users within the Corning Subbasin, both now and in the future. The GSAs recognize that sustainability can only be possible with the support and coordination of local, state, and federal agencies and the utilization of both surface and groundwater resources.

Sustainable Management Criteria – Review Basin Conditions and Interrelationships of SMC

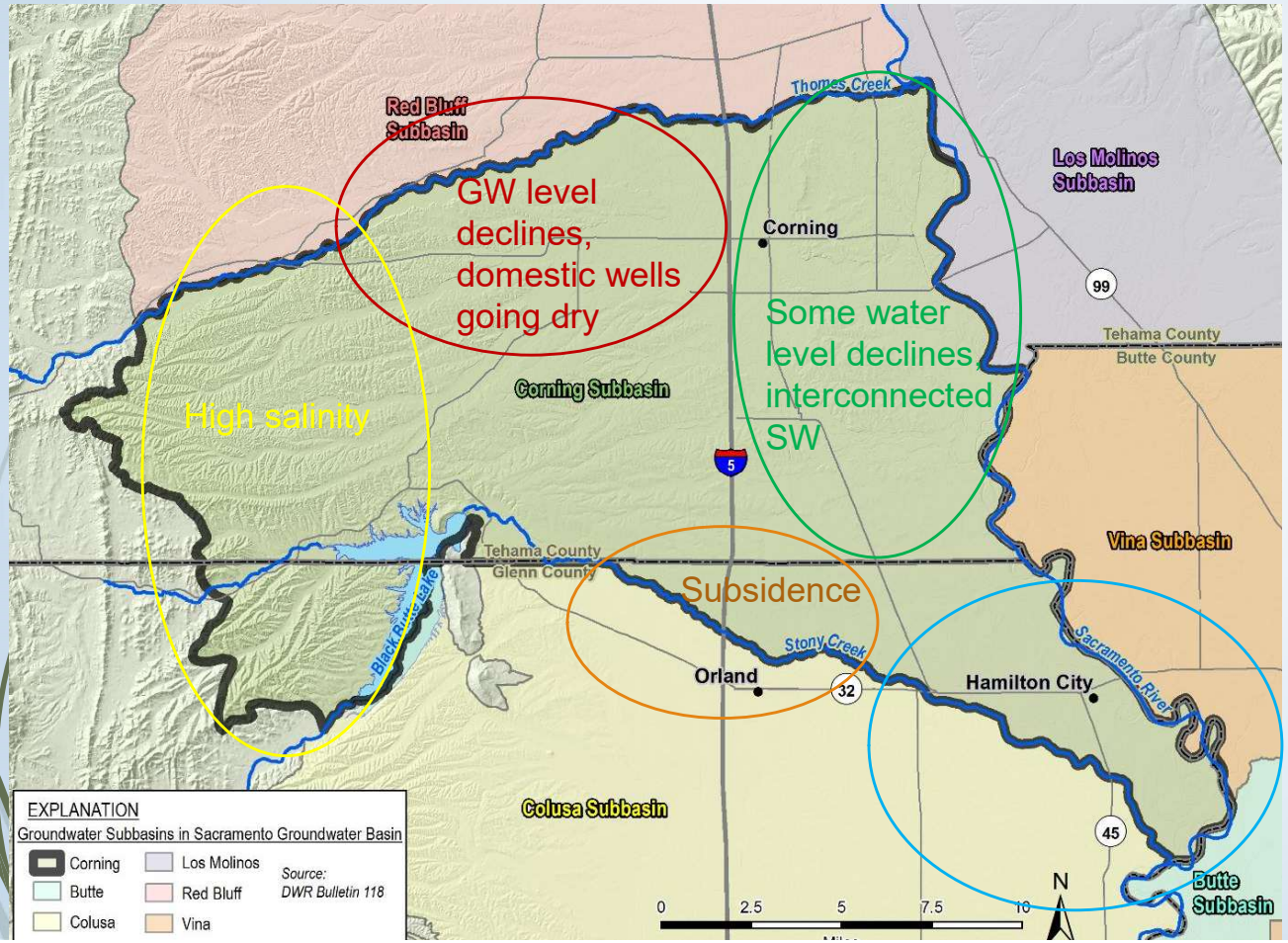
MONTGOMERY & ASSOCIATES

Remember – we have 5 Sustainability Indicators to work through

Chronic Lowering of Groundwater Levels	Land Subsidence	Degraded Groundwater Quality	Depletion of Interconnected Surface Water	Decreased Storage
• Domestic well users • Ag well users	• Pumping • Local geology	• Movement of constituents of concern • Existing programs	• Protection of Groundwater Dependent Ecosystems • Beneficial users	• Water budgets • Sustainable yield • Pumping

- All are related to groundwater pumping
- Most can be linked back to declining groundwater levels one way or another
- That is why we start with groundwater levels SMC
- All SMC are interrelated
- Conjunctive use of both surface water and groundwater is key
- Projects and actions need to focus on sustainability of the Subbasin **as a whole**

Recap of Basin Conditions in Different Areas

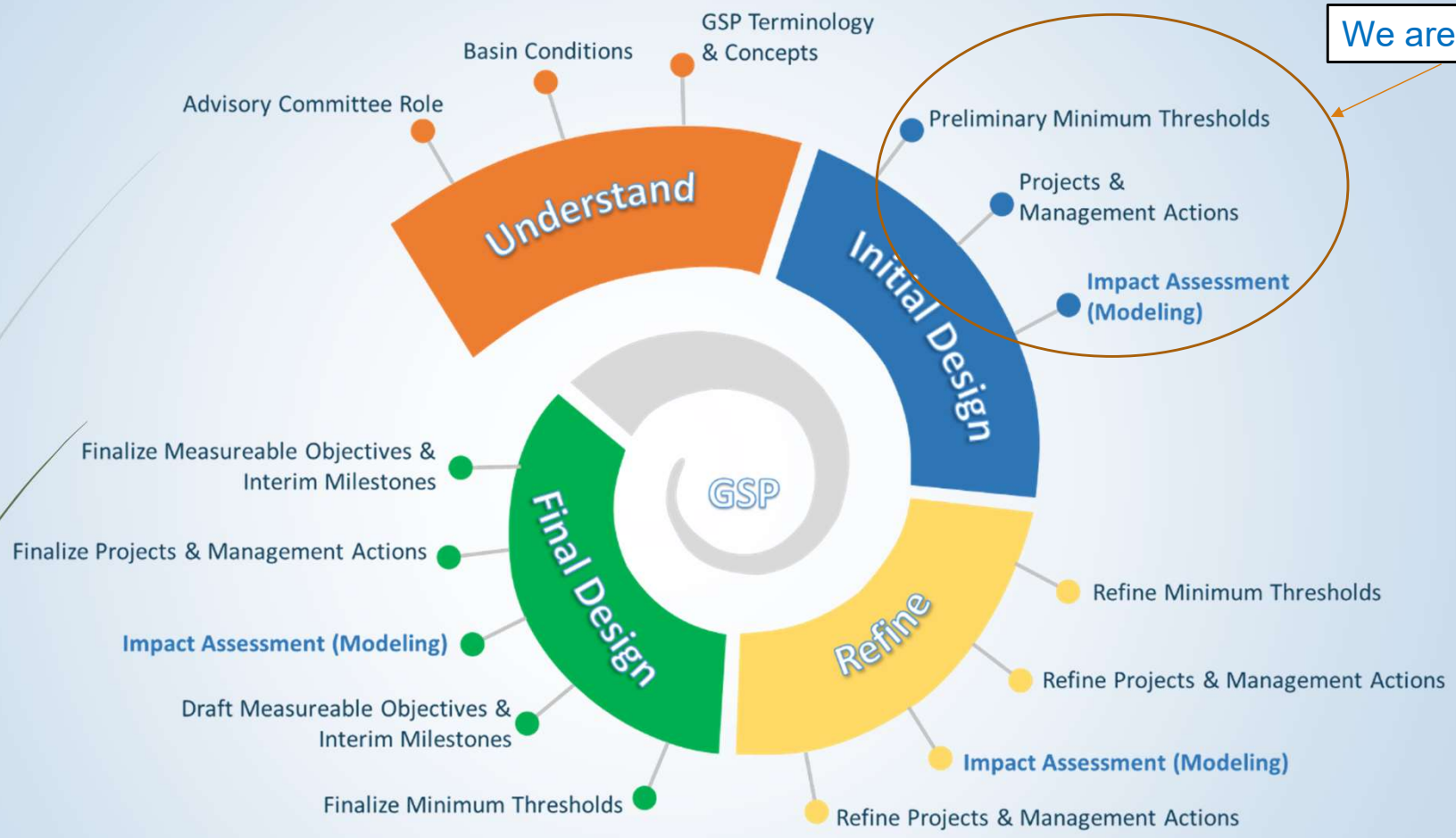


Shallow water levels, interconnected surface water

Review General Requirements of SMC

What does a GSP SMC Chapter look like?

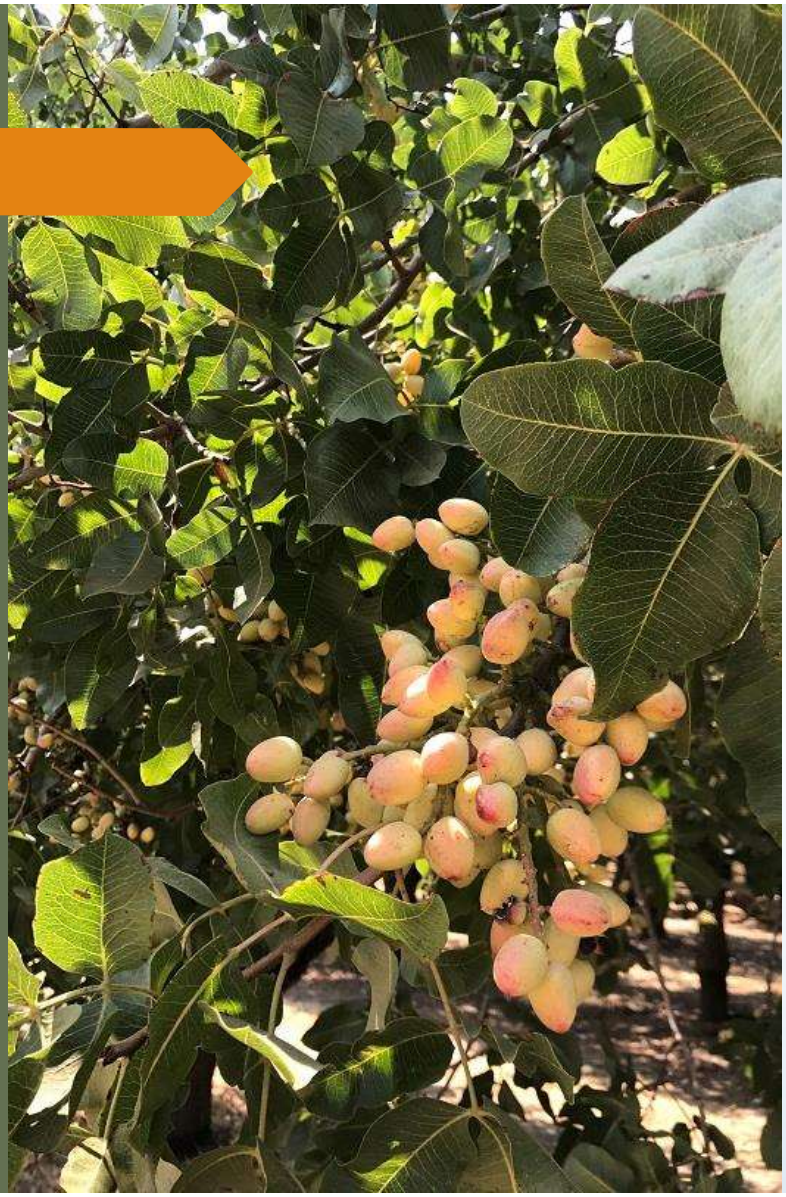
- Locally Defined Significant and Unreasonable Conditions
- Minimum thresholds
  - Brief background/recap of basin conditions/challenges
  - Information and Methodology Used to Establish Minimum Thresholds
  - Relationship Between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators
  - Effect of Minimum Thresholds on Neighboring Basins and Subbasins
  - Effect on Beneficial Uses and Users
  - Relation to State, Federal, or Local Standards
  - Method for Quantitative Measurement of Minimum Thresholds
- Measurable Objectives
  - Method for Setting Measurable Objectives
  - Interim Milestones
- Undesirable Results
  - Criteria for Defining Undesirable Results
  - Potential Causes of Undesirable Results
  - Effects of Beneficial Users and Land Use



MONTGOMERY & ASSOCIATES

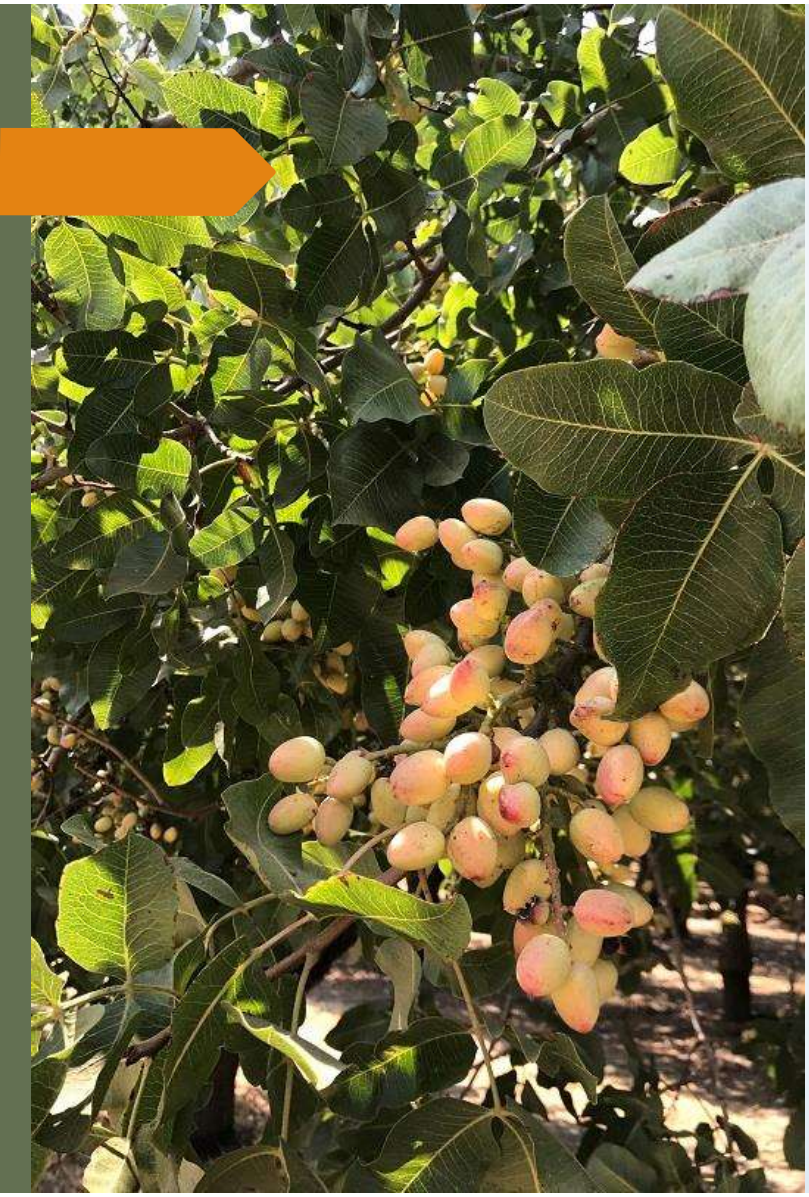
Sustainable Management Criteria – Chronic Lowering of Groundwater Levels

MONTGOMERY & ASSOCIATES



GSP Regulations Requirements

- Undesirable results occur when significant and unreasonable effects for the chronic lowering of water levels sustainability indicator are caused by groundwater conditions occurring throughout the basin.
- **The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.**
  - **BMP**: The GSP must include an analysis and written interpretation of the information, data, and rationale used to set the minimum threshold. For instance, if a groundwater level minimum threshold is set to protect shallow domestic supply wells, the GSA should investigate information such as the depth ranges of domestic wells near the representative monitoring site, aquifer dimensions, groundwater conditions, and any other pertinent information.
- Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, periods of drought, and be commensurate with levels of uncertainty.

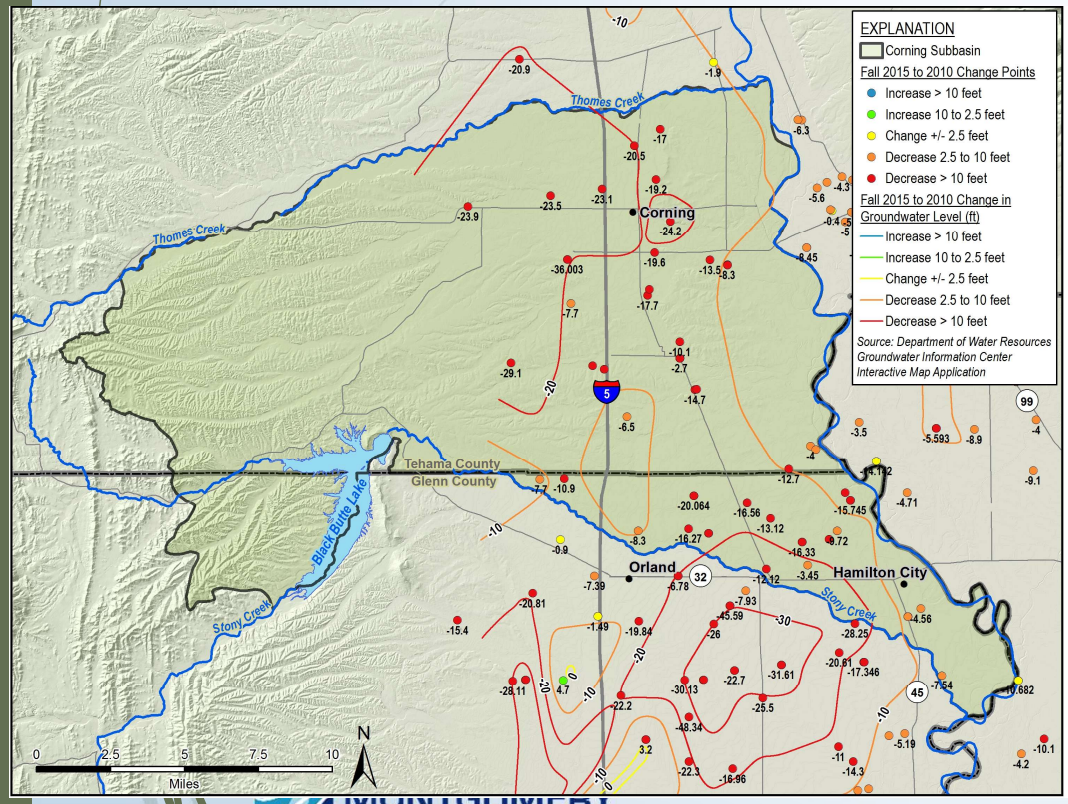


Groundwater Levels Background

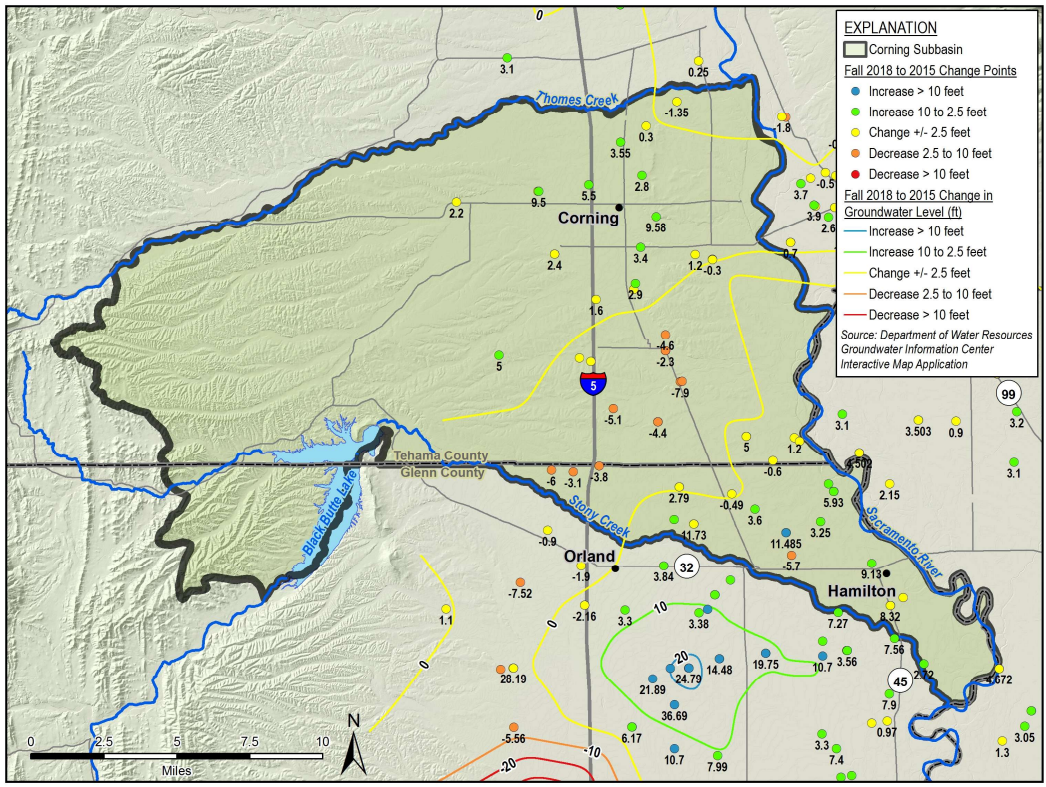
- Annual water level cycle with highest levels in spring and lowest in fall
- Declining long-term water level trend in many wells in Tehama County portion of Subbasin since 2006
- Stable long-term water level trend in many wells in eastern Glenn County portion of Subbasin
- Concerns about domestic wells going dry in some of the north and western portions of Subbasin
- Likely reasons for declining water levels:
  - Cropping conversion trend from pasture to fruit and nut orchards
    - Orchards are groundwater irrigated and are relatively water intensive
    - Grazing and pasture can be surface water irrigated or dry-land farmed and are generally less water intensive
  - Less surface water availability in Subbasin as Central Valley Project water has not been as reliable since the last big drought

Groundwater Levels

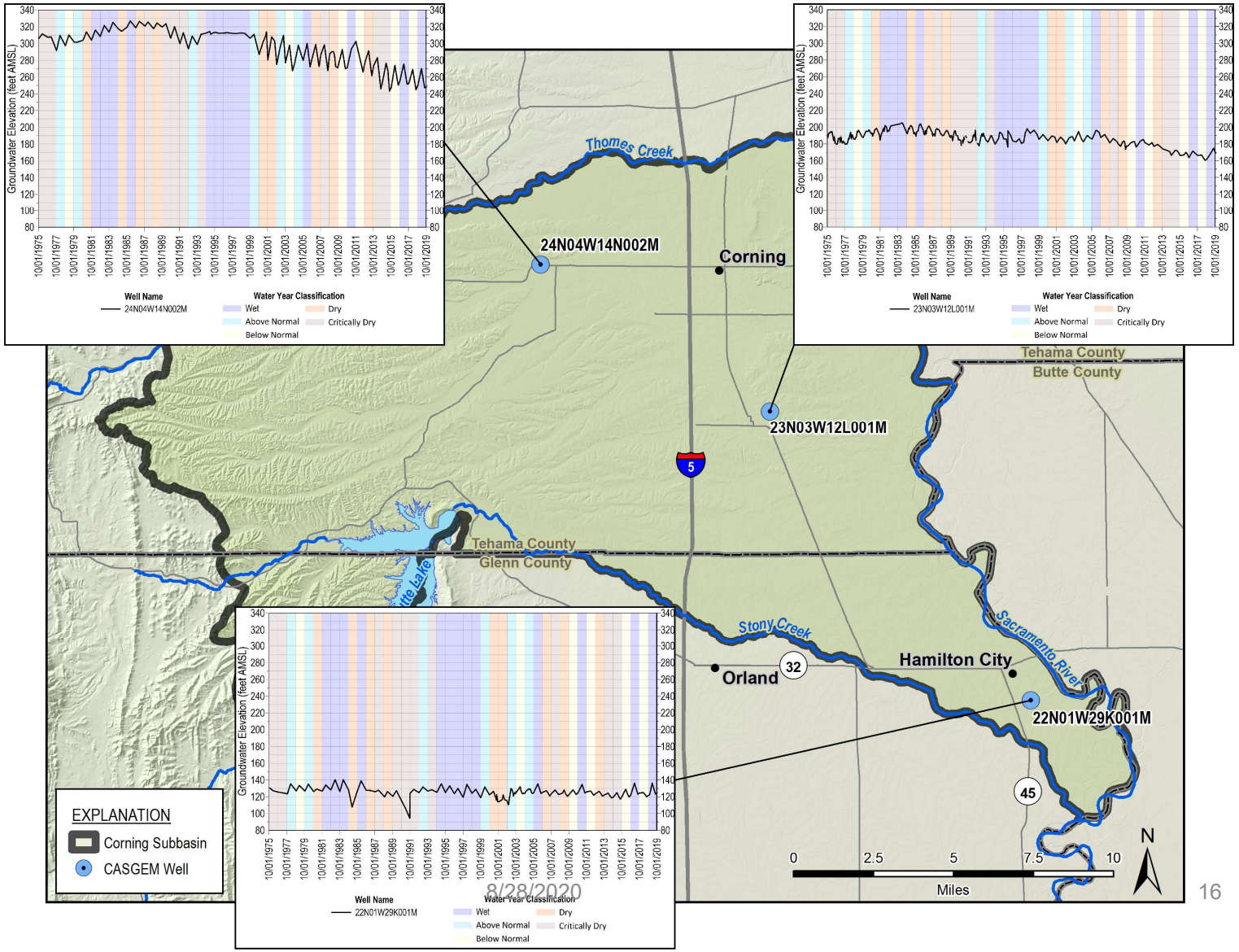
Fall 2015 to 2010 GW Level Decrease



Fall 2018 to 2015 GW Level Change

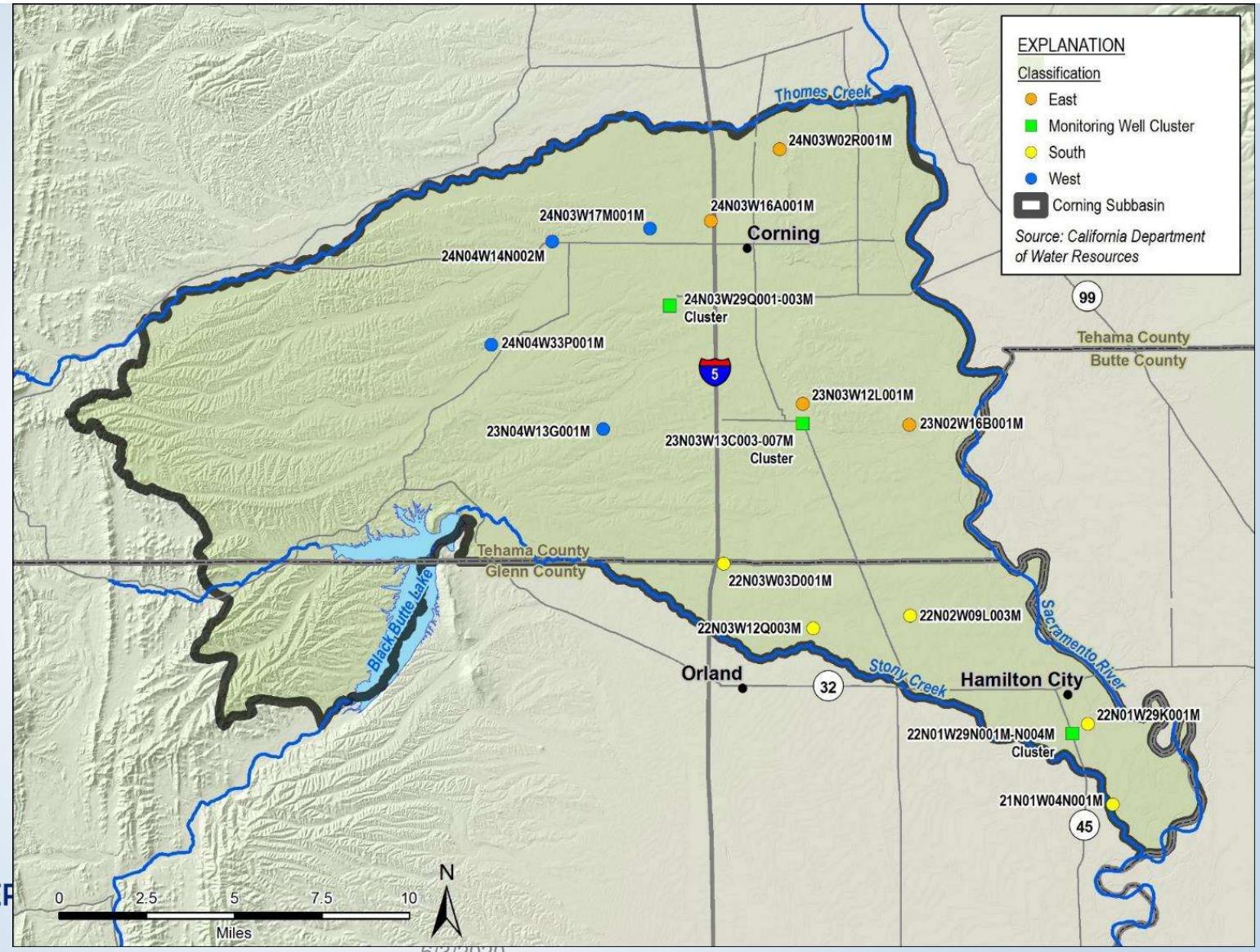


Groundwater Levels



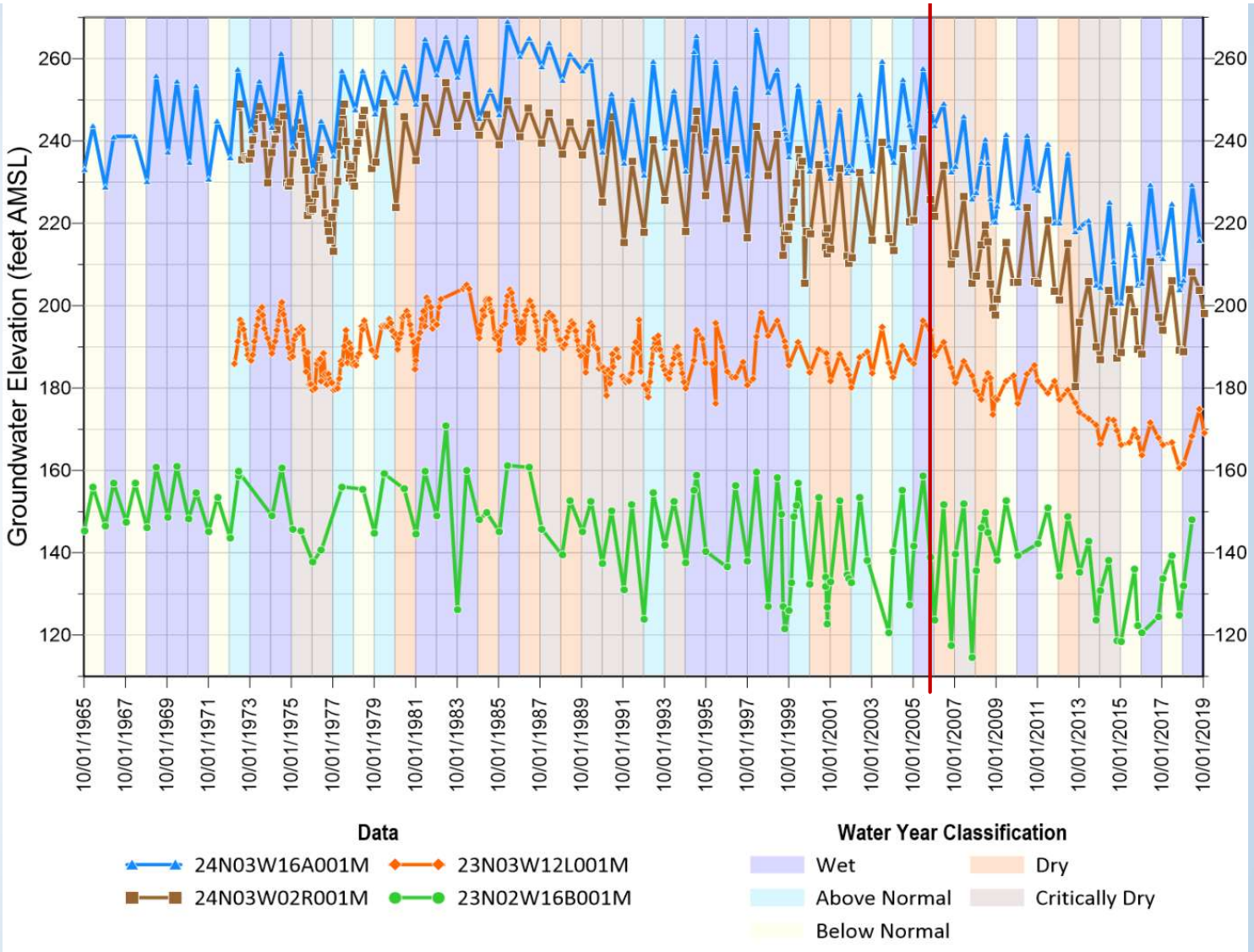
Key Wells for Water Level Analysis

- Dispersed across Subbasin
- Variety of well depths
- Clusters for measuring vertical gradients



Water Level Trends - East

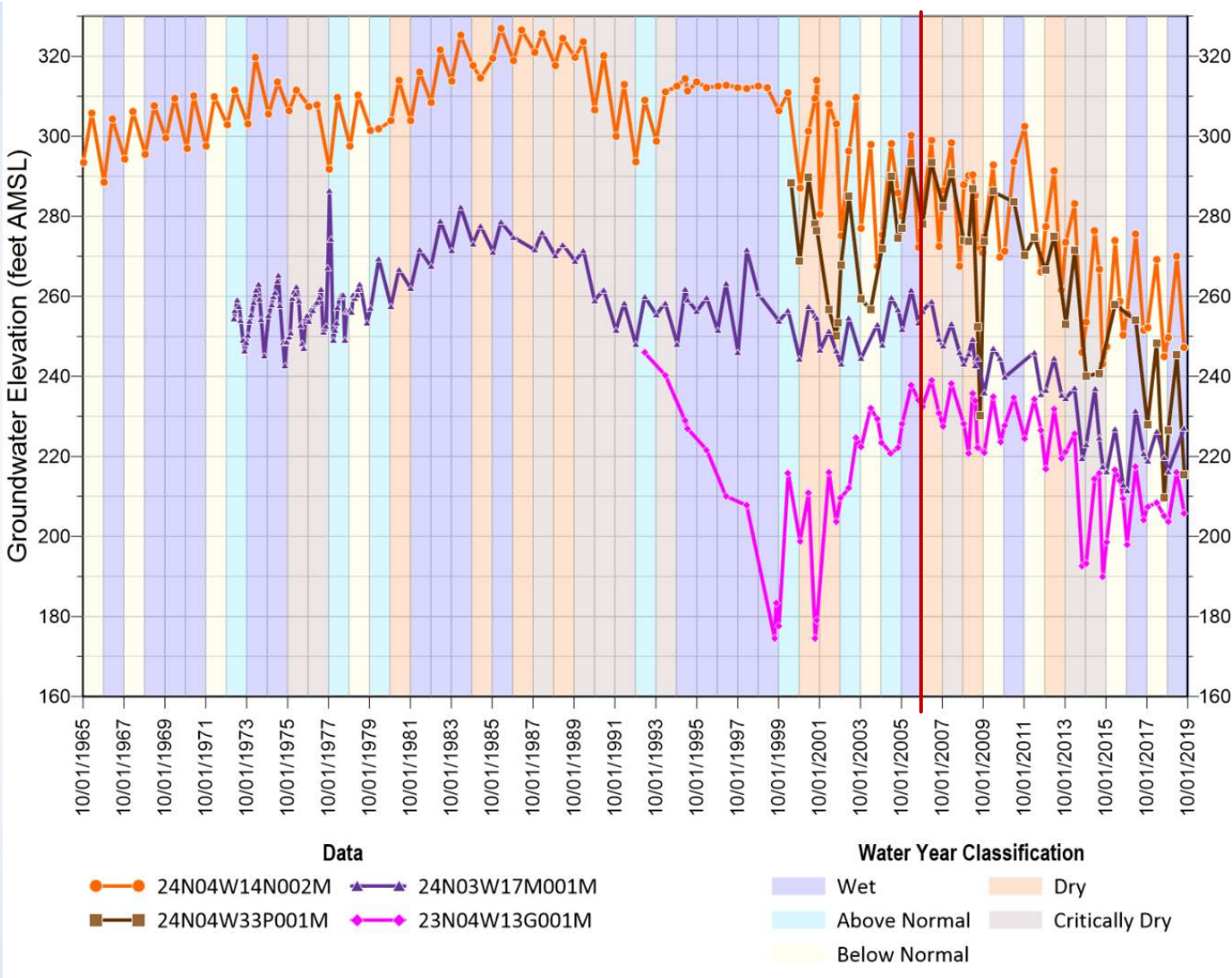
- Seasonal and annual response
- Declining water level trend in many wells since 2006



MONTGOMERY & ASSOCIATES

Water Level Trends - West

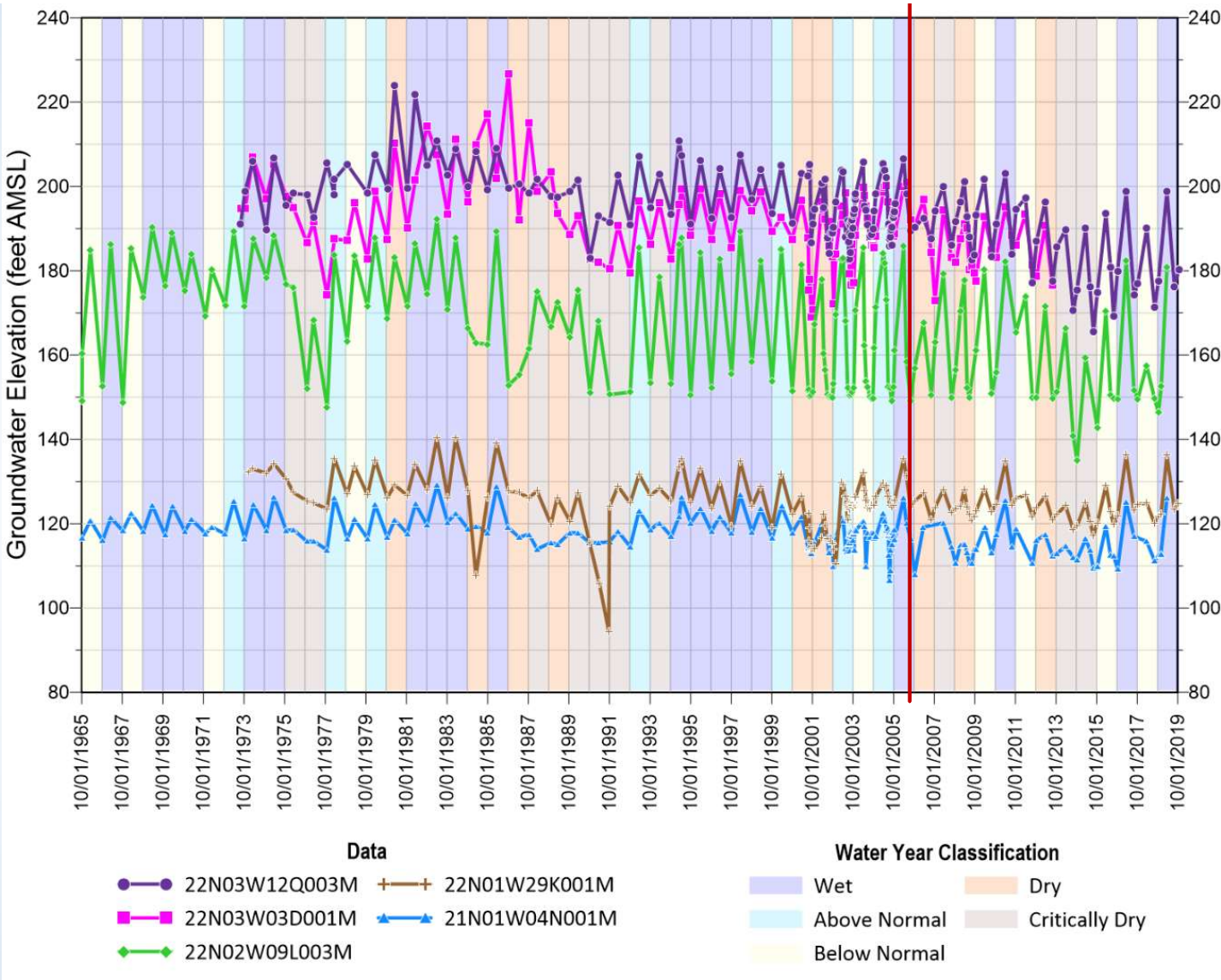
- Seasonal and annual response
- Declining water level trend in many wells since 2006



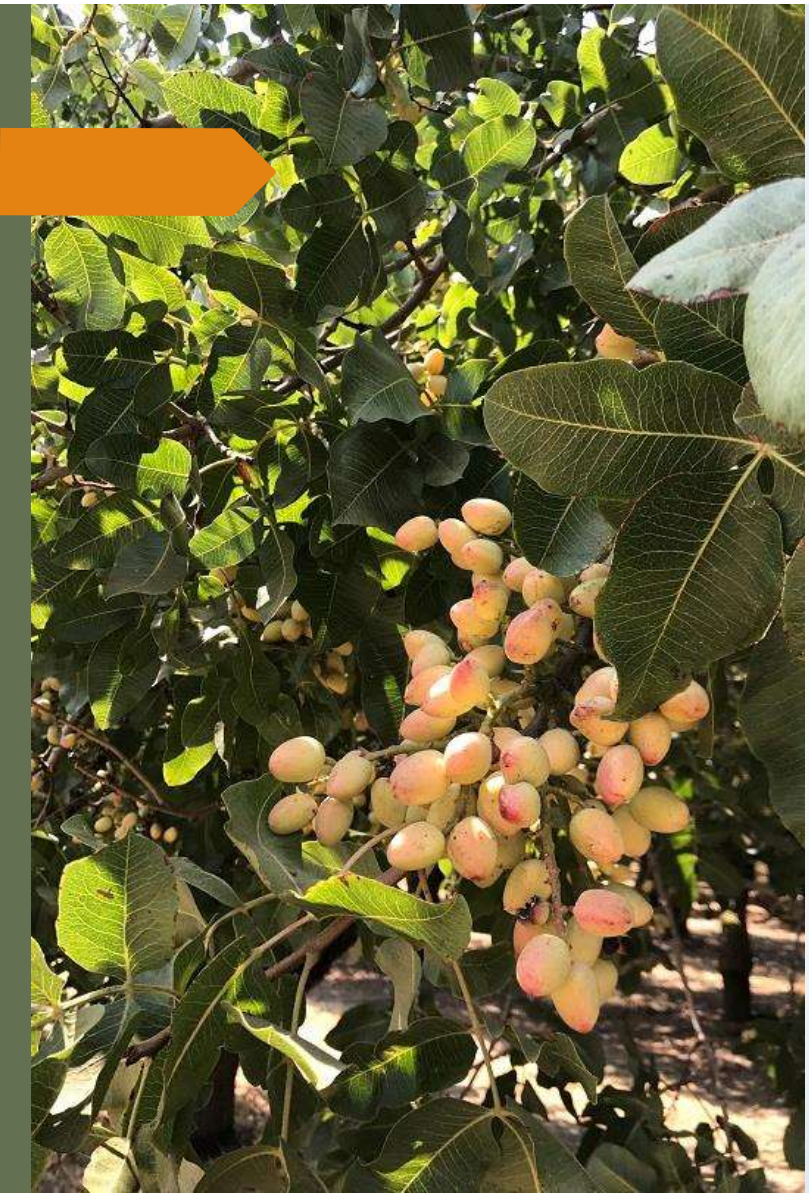
MONTGOMERY & ASSOCIATES

Water Level Trends - South

- Seasonal and annual response
- Relatively stable water levels – availability of surface water, proximity to streams

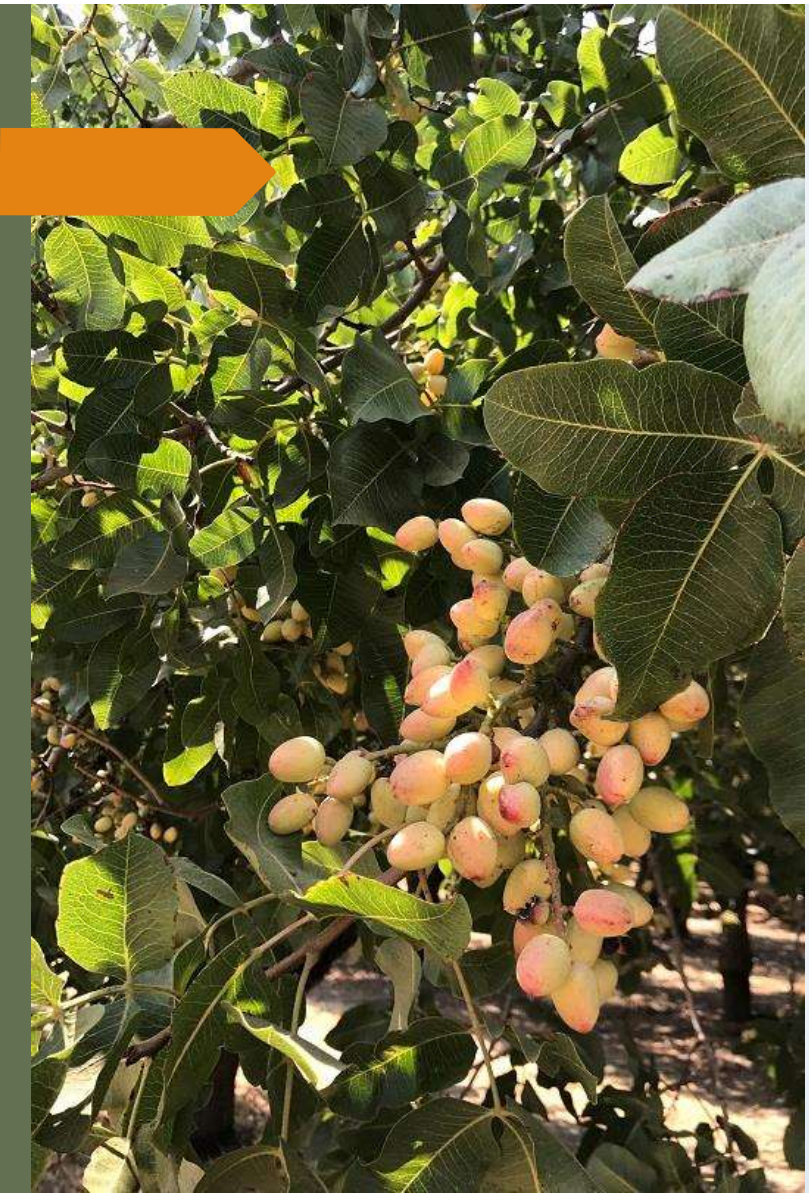


MONTGOMERY & ASSOCIATES



Recap of Steps to Develop SMC

1. Develop a draft description of what is significant and unreasonable (narrative description)
2. Set minimum thresholds at each representative monitoring point to reflect what locally is significant and unreasonable
3. Set measurable objectives with safety factor on minimum thresholds
4. Determine undesirable results, as a combination of minimum thresholds



Review Iterative Process of SMC Development

- Start somewhere!
- There is no wrong approach
- Consider historical water levels
- What are the impacts on beneficial users?
- Set initial Minimum Thresholds (MTs)
- Identify potential projects and actions that can help remedy the issues
- Use model to evaluate if these projects help
  - Look at the simulated water levels and compare to MTs
  - Adjust MTs if necessary

1. Significant and Unreasonable Statement

- **Locally Defined Significant and Unreasonable Conditions**
- A narrative statement that describes what the GSAs don't want to see happen in the Subbasin
- Sets the stage for developing quantitative SMC metrics
- For example, for lowering groundwater levels SI, significant and unreasonable conditions may be defined as:
  - Causing domestic water supply wells to go dry
  - Causing significant financial burden to local agricultural interests due to increased pumping costs

Considerations for Significant and Unreasonable Conditions

- Lowering of groundwater levels:
  - Who is impacted?
  - Relative amount of users impacted
  - What kind of impact?
  - Over what time period?

Example Statements from Other GSPs

- **Cuyama Valley Basin**

Significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

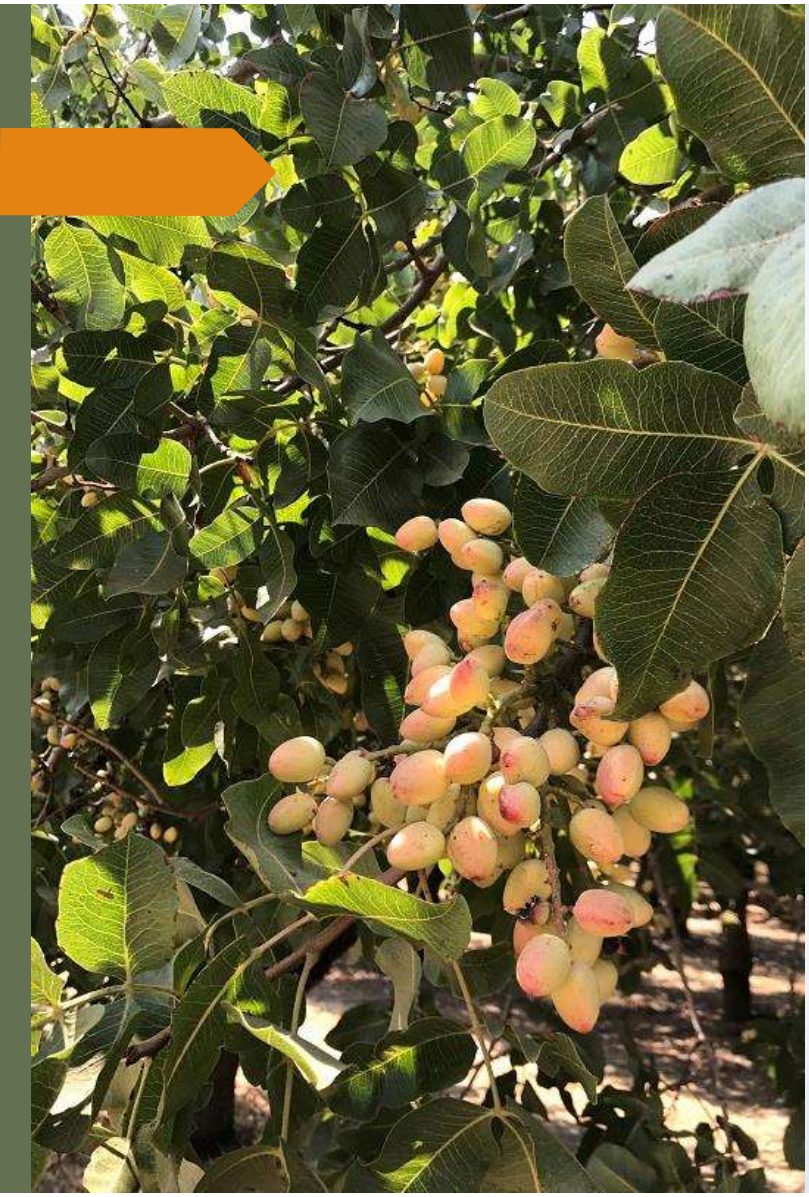
- **Salinas Valley Basin – 180/400 ft Aquifer**

Public and stakeholder input identified historically low groundwater elevations as significant and unreasonable.

- *Are at or below the lowest observed groundwater elevations.*
- *Cause significant financial burden to local agricultural interests.*
- *Interfere with other sustainability indicators.*

- **Santa Cruz Mid-County Basin**

A significant number of private, agricultural, industrial, and municipal production wells can no longer provide enough groundwater to supply beneficial uses.



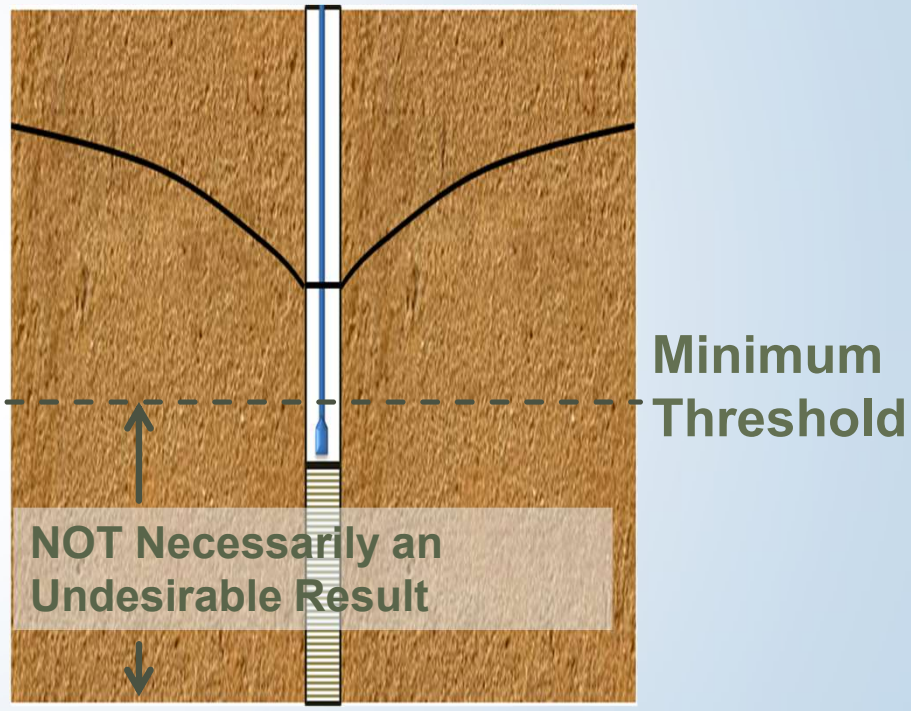
Feedback on Significant and Unreasonable Statement Considerations

- Thoughts from staff and the CSAB?

2. Set Minimum Thresholds

The value you do not want to cross

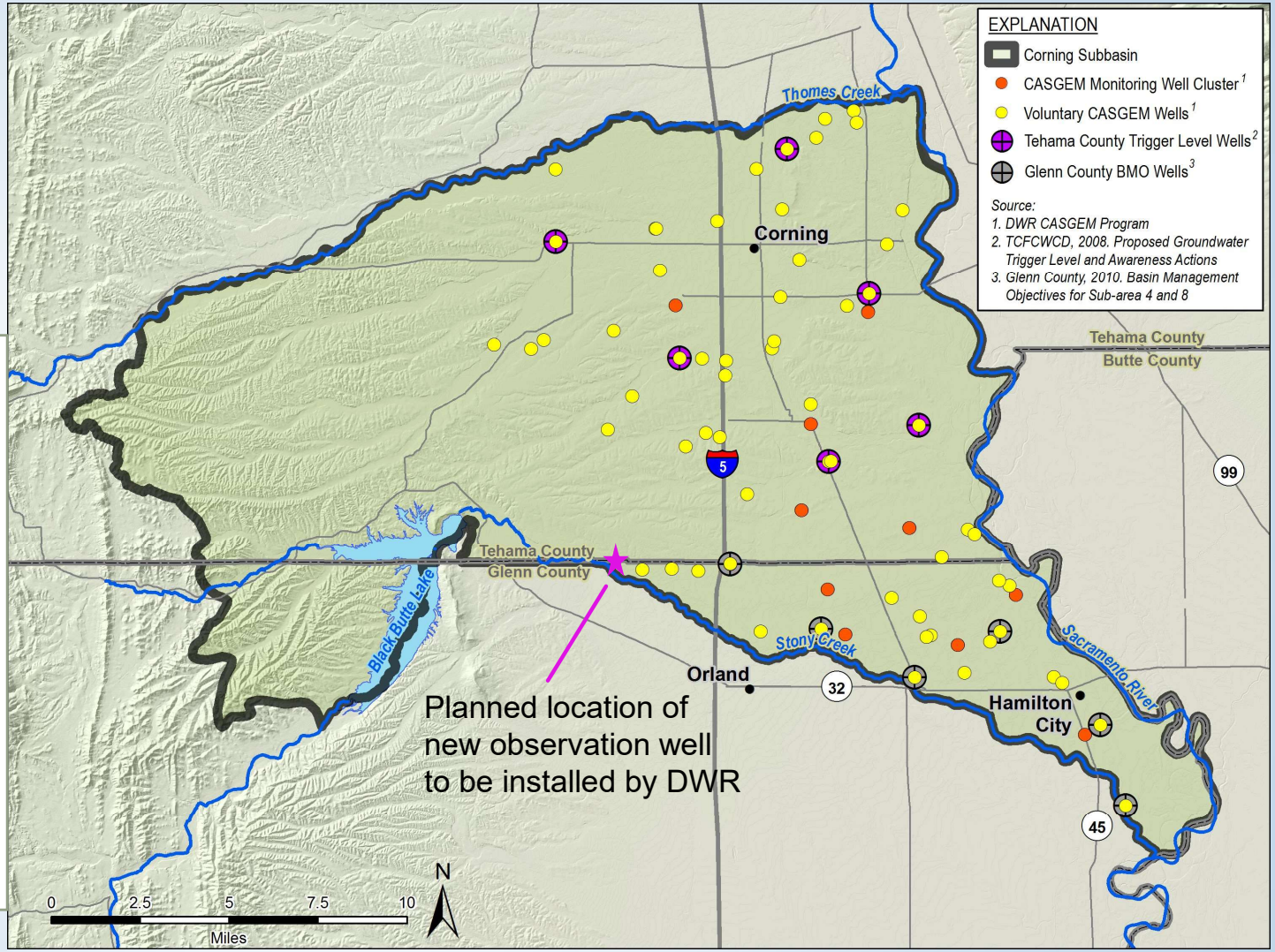
- Quantitative value that is used to define an undesirable result
- Set at each representative monitoring point (e.g., well)



Minimum Thresholds based on what is *Significant and Unreasonable*

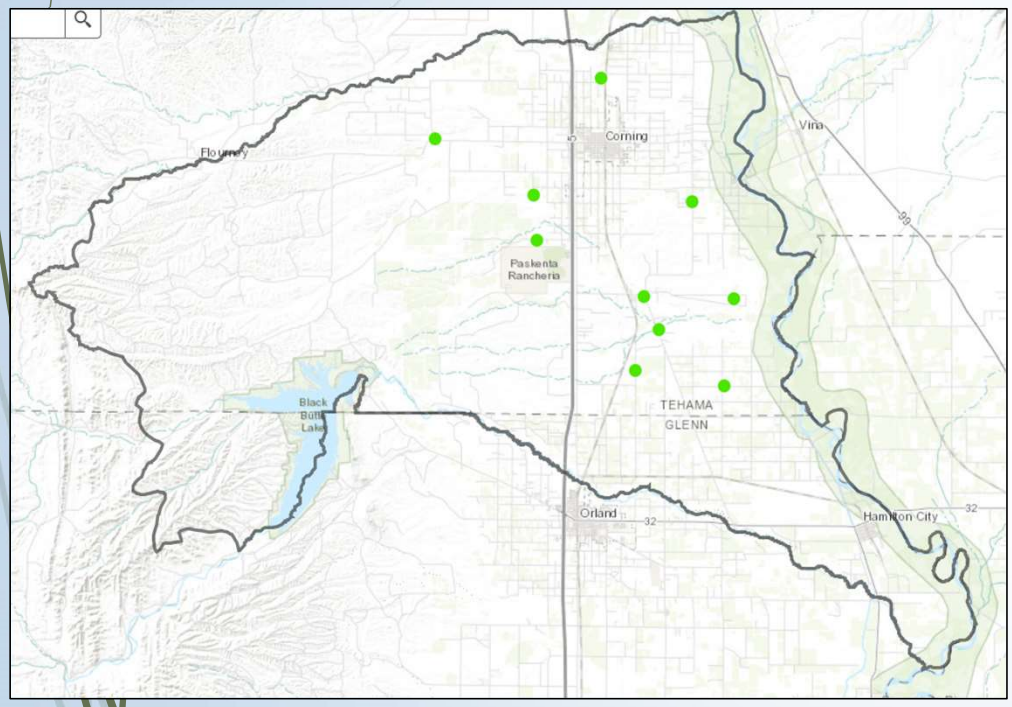
Potential Water Level Monitoring Network

- One principal aquifer monitored
- 99 total wells in CASGEM network
  - 37 CASGEM observation wells in 10 clusters
  - 62 Voluntary CASGEM wells
- Locations of Glenn and Tehama Co compliance wells shown for reference



MONTGOMERY & ASSOCIATES

Tehama County Trigger Levels

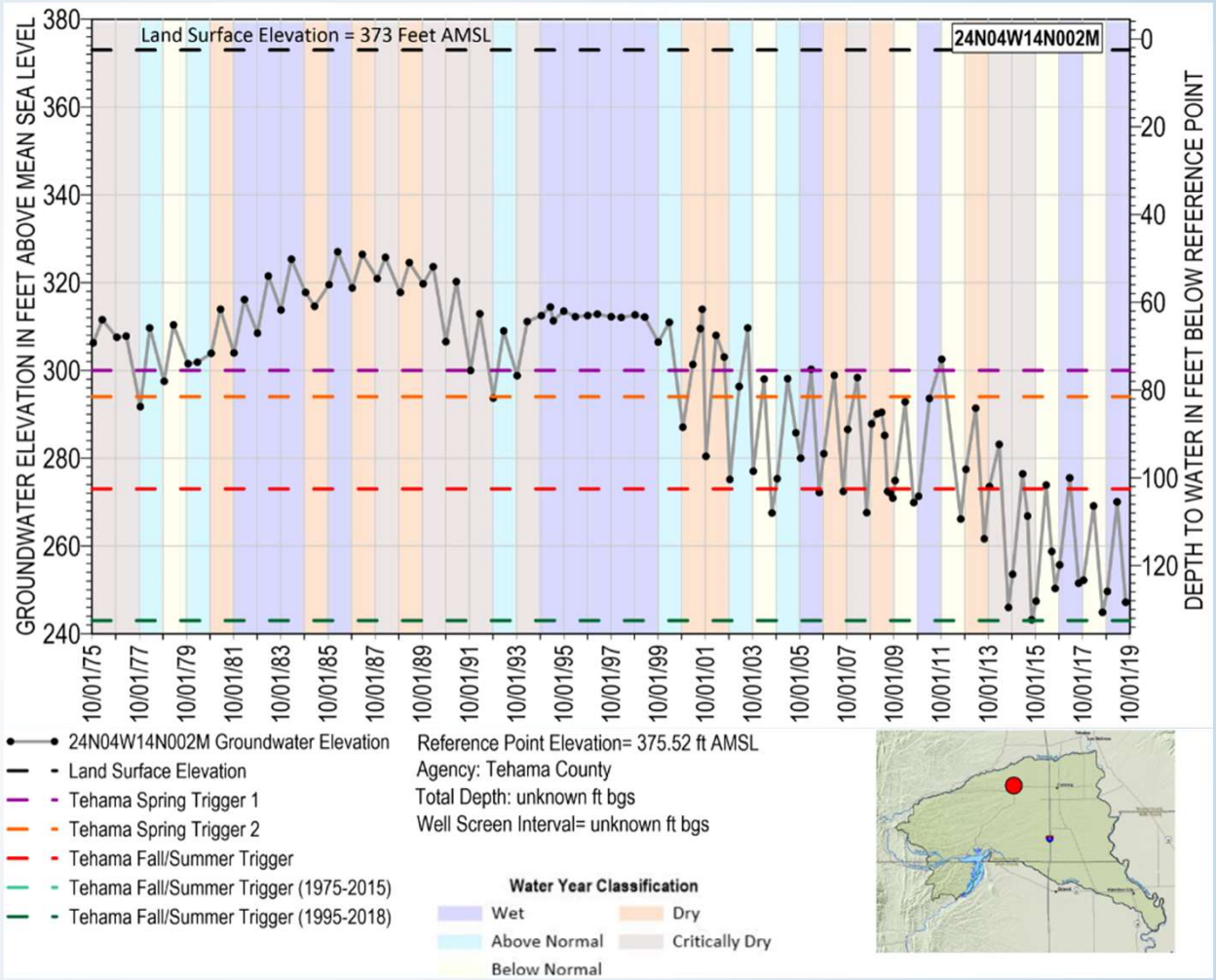


- Trigger Level management goals were adopted at **ten wells in Subbasin** in the 2012 Tehama County Groundwater Management Plan
- Trigger Levels established using spring or fall data from 1970-2008
  - Spring Trigger 1 = Spring Min + 0.2 * (Spring Min – Spring Max)
  - Spring Trigger 2 = Spring Min
  - Fall/Summer Trigger = Fall Min
- Per the 2012 GWMP, "When groundwater levels in key wells reach these Alert Levels, various awareness actions may be undertaken and may involve public notification, information and education, additional monitoring and investigation, and consideration of a variety of possible management actions."

Example Tehama County Trigger Well Hydrograph

- Spring Trigger 1
- Spring Trigger 2
- Fall/Summer Trigger
- Updated Fall/Summer Triggers

(1974-2015 and 1995-2018 min)

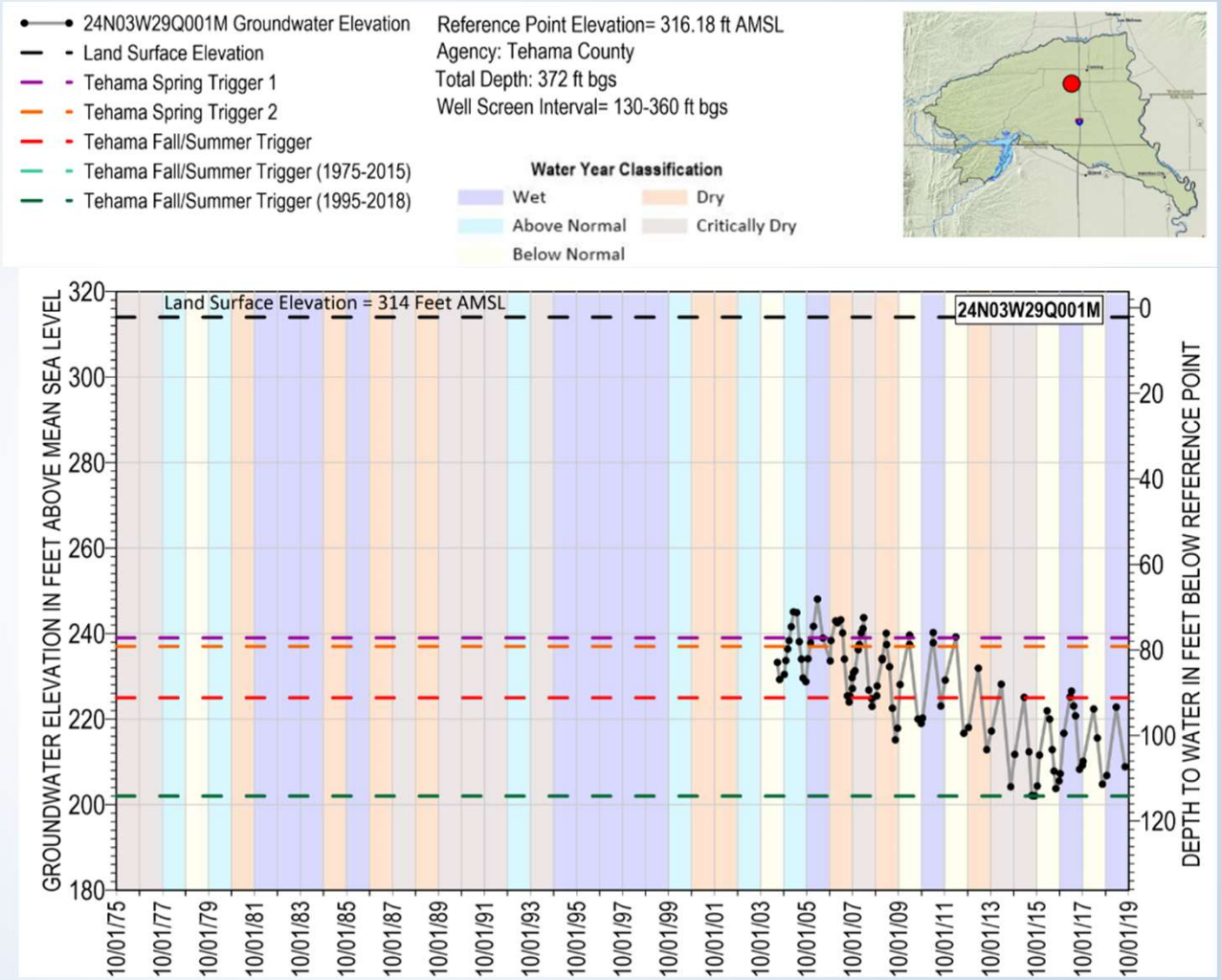


MONTGOMERY & ASSOCIATES

Tehama Trigger Well Hydrographs

- Spring Trigger 1
- Spring Trigger 2
- Fall/Summer Trigger
- Updated Fall/Summer Triggers

(1974-2015 and 1995-2018 min)

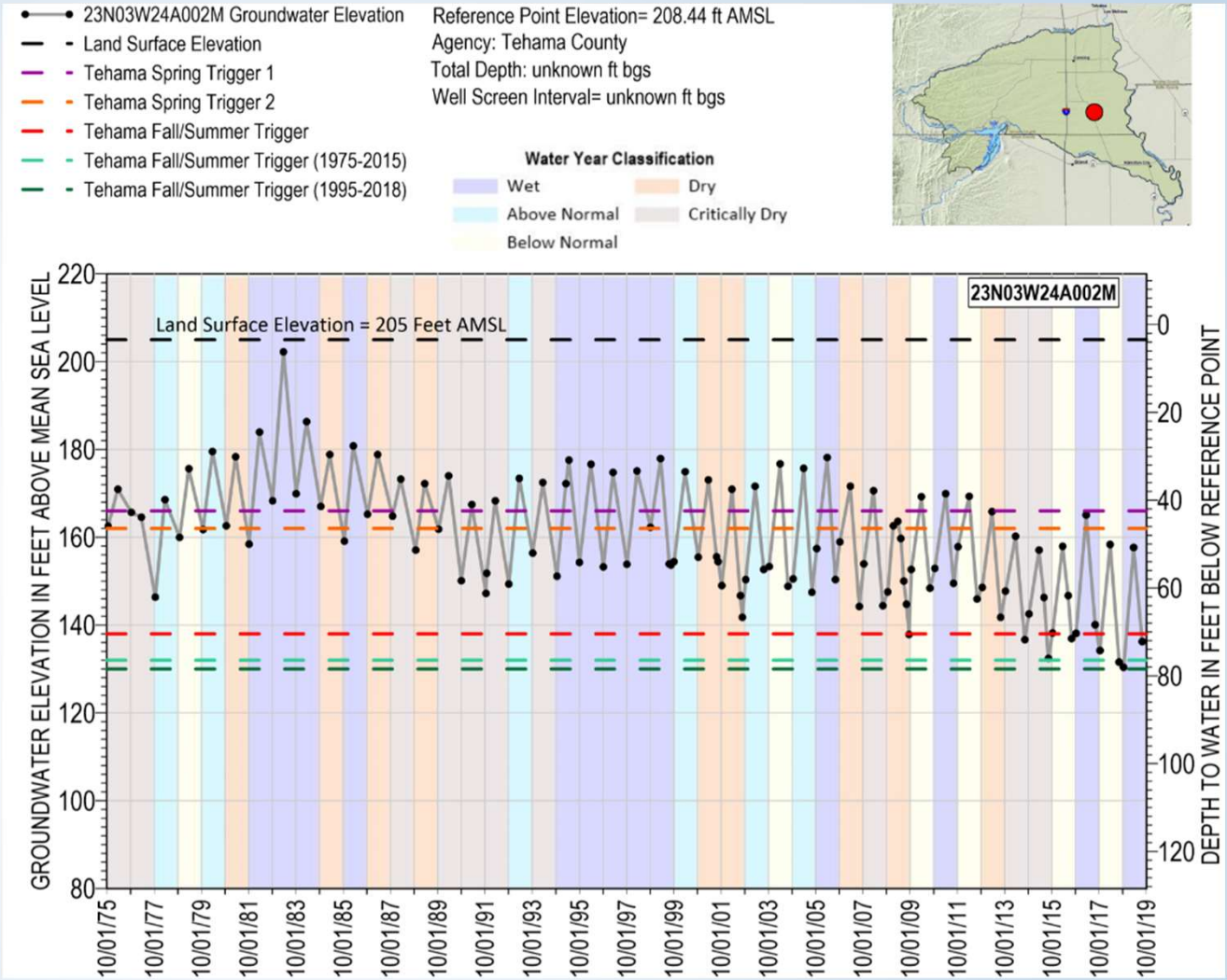


MONTGOMERY & ASSOCIATES

Tehama Trigger Well Hydrographs

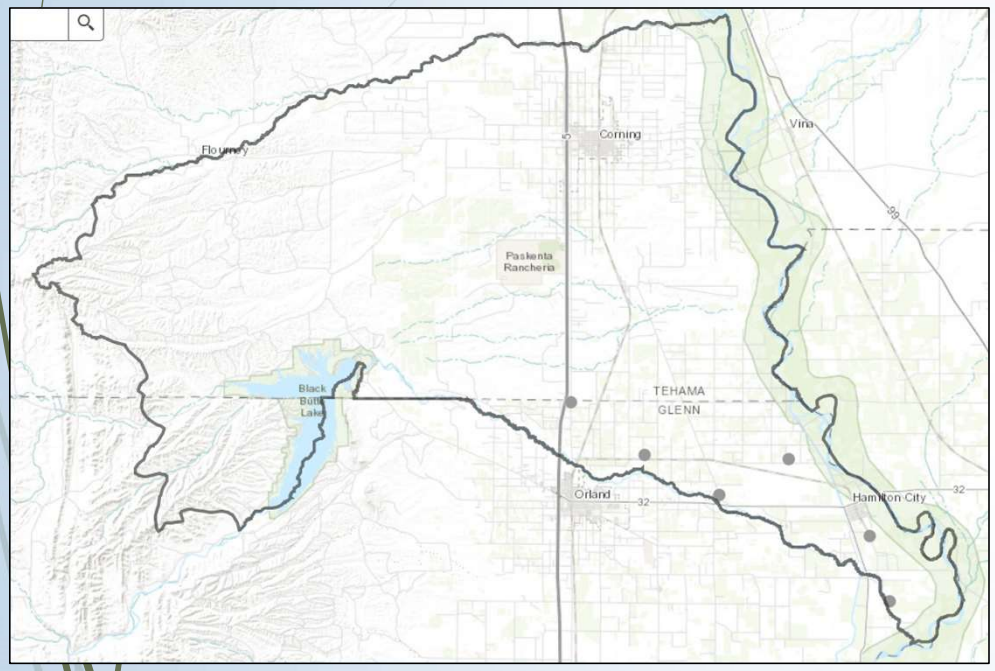
- Spring Trigger 1
- Spring Trigger 2
- Fall/Summer Trigger
- Updated Fall/Summer Triggers

(1974-2015 and 1995-2018 min)



MONTGOMERY & ASSOCIATES

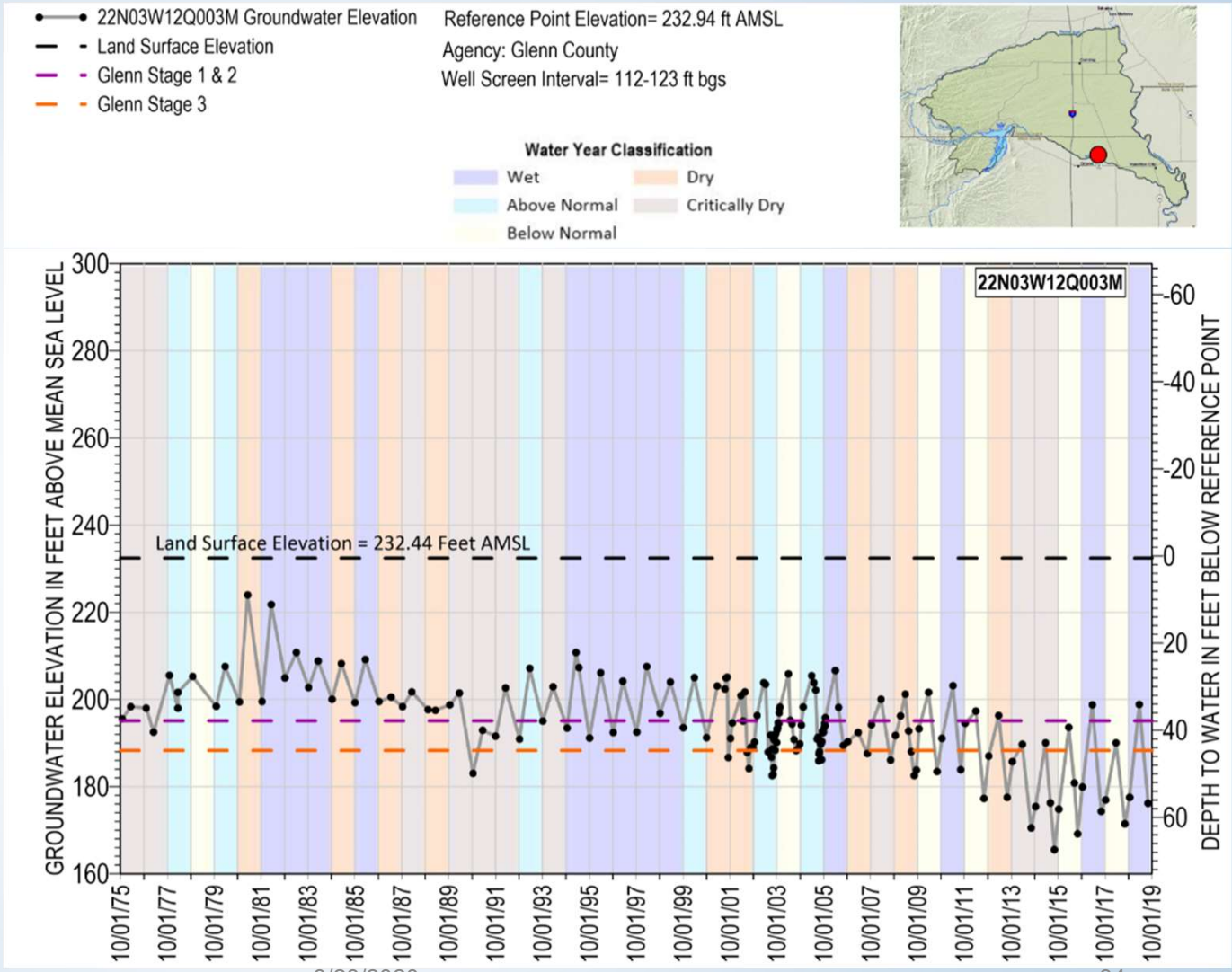
Glenn County Initial BMO Levels



- The 2001 and 2010 Glenn County Basin Management Objectives (BMOs) established water level goals (Alert Levels) with Alert Stages defining management actions for the county to take to address overdraft.
- BMO water levels established for **six** wells in the Glenn County portion of the Subbasin.
- Two Alert Levels and three Alert Stages were established using spring water level data from 1976 to 2009:
  - Stage 1: Avg spring value – 1 std deviation of spring values
  - Stage 2: Consecutive years of water levels at Stage 1
  - Stage 3: Avg spring value – 2 std deviation of spring values

Glenn County BMO Well Hydrographs

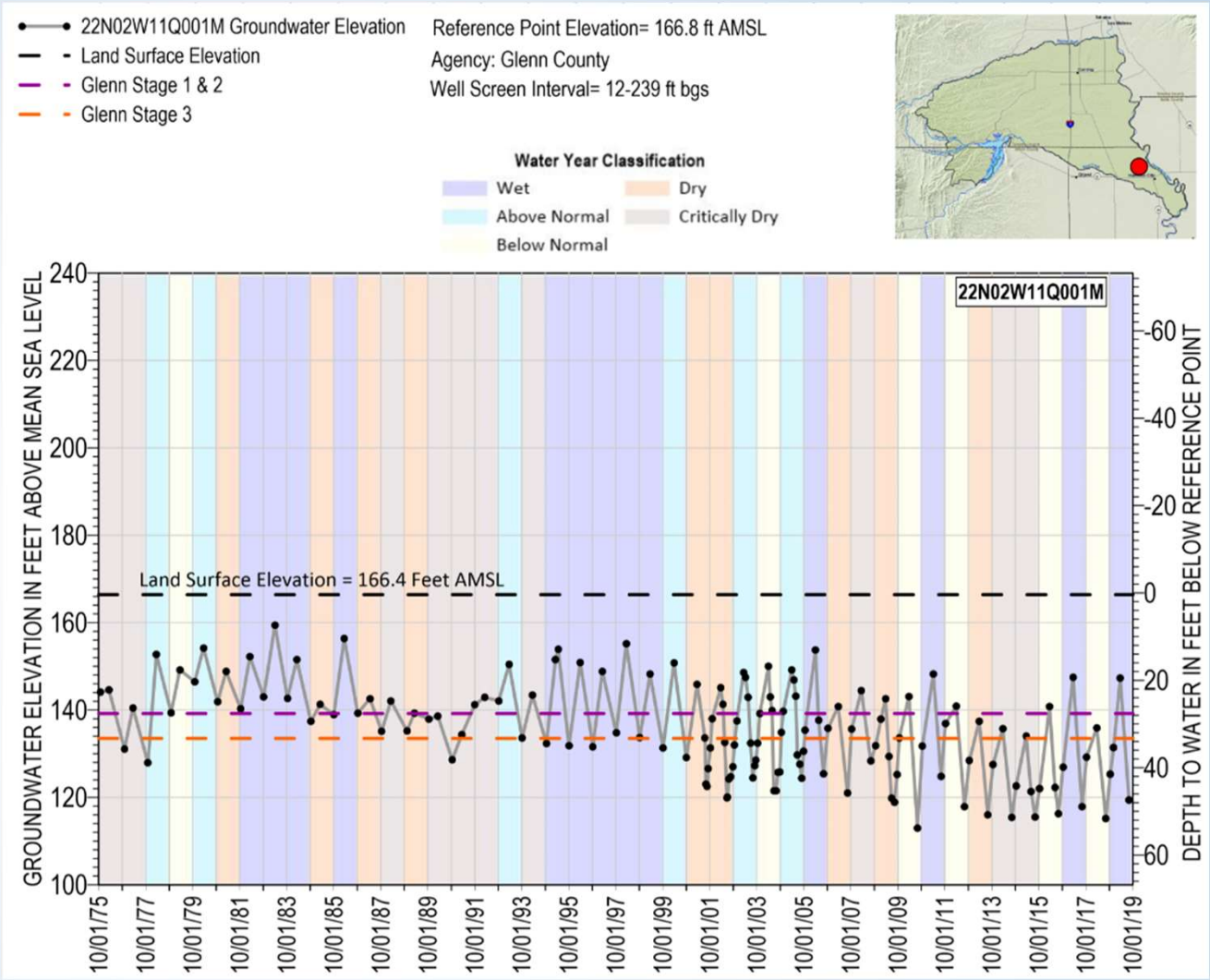
- Stage 1 and 2 Alert Level
  - Stage 3 Alert Level



MONTGOMERY & ASSOCIATES

Glenn County BMO Well Hydrographs

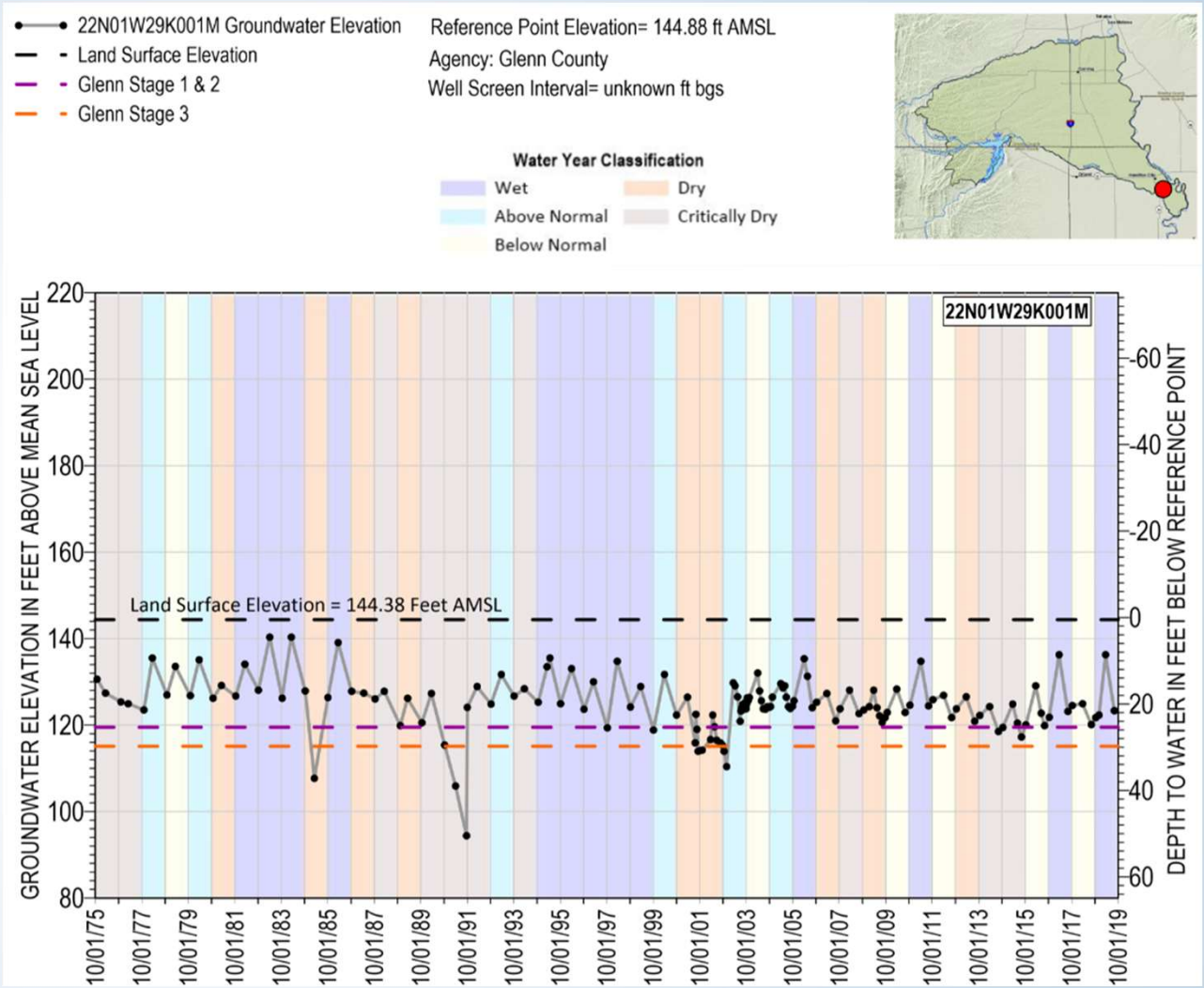
- Stage 1 and 2 Alert Level
  - Stage 3 Alert Level



MONTGOMERY & ASSOCIATES

Glenn County BMO Well Hydrographs

- Stage 1 and 2 Alert Level
  - Stage 3 Alert Level



MONTGOMERY & ASSOCIATES

Glenn County BMP Revisions Process

- Allan Fulton worked with Glenn County WAC and TAC to revise the BMO process with additional technical analysis of water level trends, well depths, geology
- Work was not fully completed, as SGMA started
- We are reviewing this and assessing applicability to water level SMC
- May review with Allan Fulton

Considerations to Set Minimum Thresholds

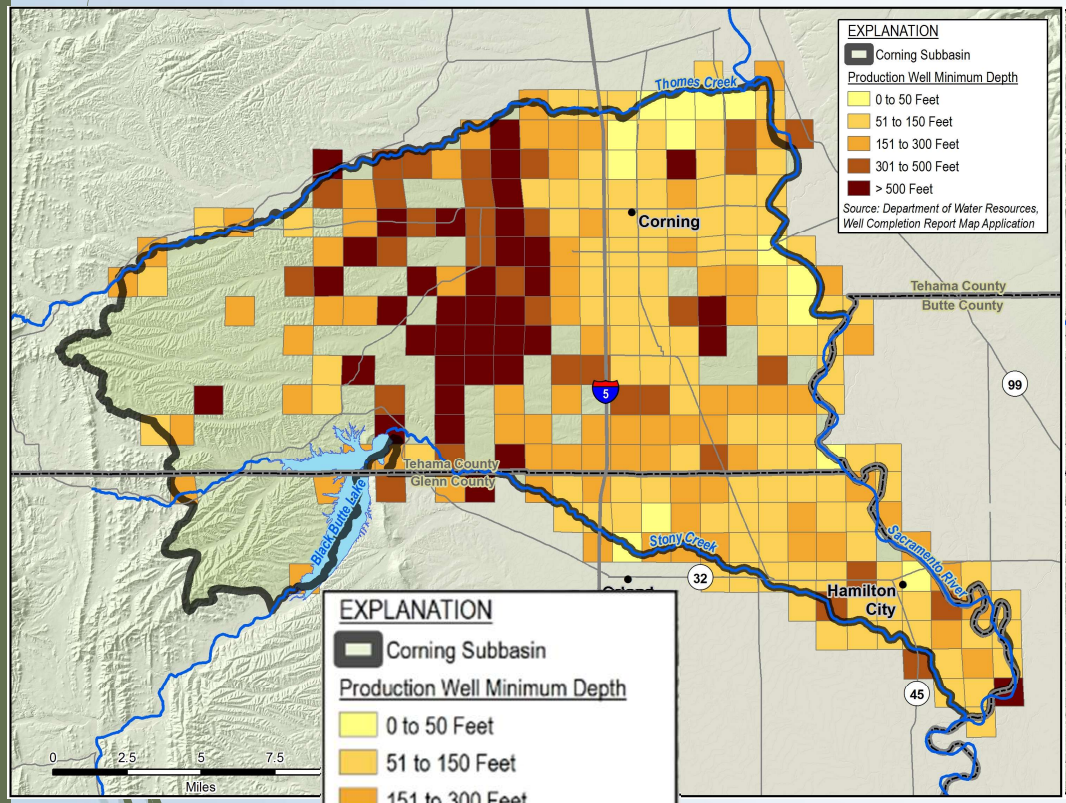
- Use Spring levels or Fall levels?
- Use historical minimum levels? Or other statistical approach?
  - In Tehama County the minimum levels appear to be the most recent drought
- Do we want to keep the levels at or above 2015 levels (last drought and start of SGMA) or do we want to get the level back up to early 2000s?
  - This means we will need to include some projects and actions to get the levels back up
- How does this all impact domestic well users?
  - If levels are set too low, they will be impacted – is the solution to provide deeper wells?

Chronic Lowering of Water Level Impacts on Beneficial Use

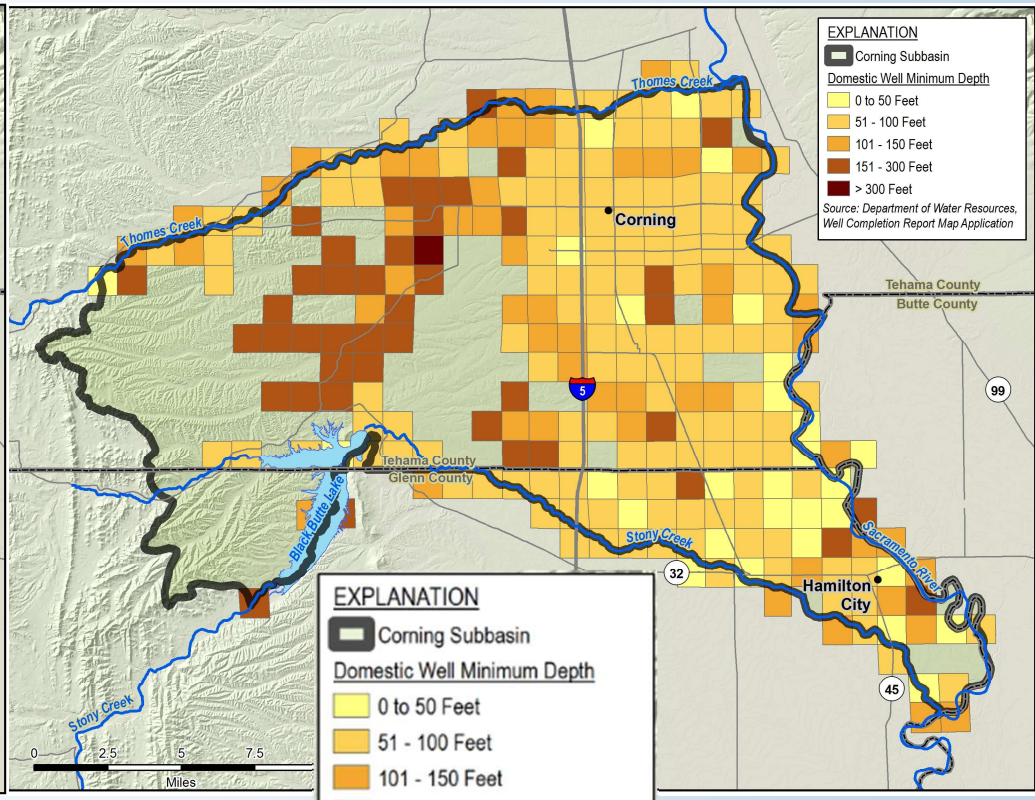
Example Beneficial Users	Potential Impact
Agricultural Domestic Municipal Paskenta Reservation Small Water Systems Industrial (ag production facilities)	• Reduced well yield • Well and pump deepening because wells go dry • Increased pumping costs • Changing groundwater quality • Reduced land costs because of higher cost to access groundwater
Groundwater Dependent Ecosystems	• Groundwater level drops below root zone and plants die off • Reduced baseflow in creeks that reduces aquatic habitat

Minimum Well Depths by Section

Production Wells

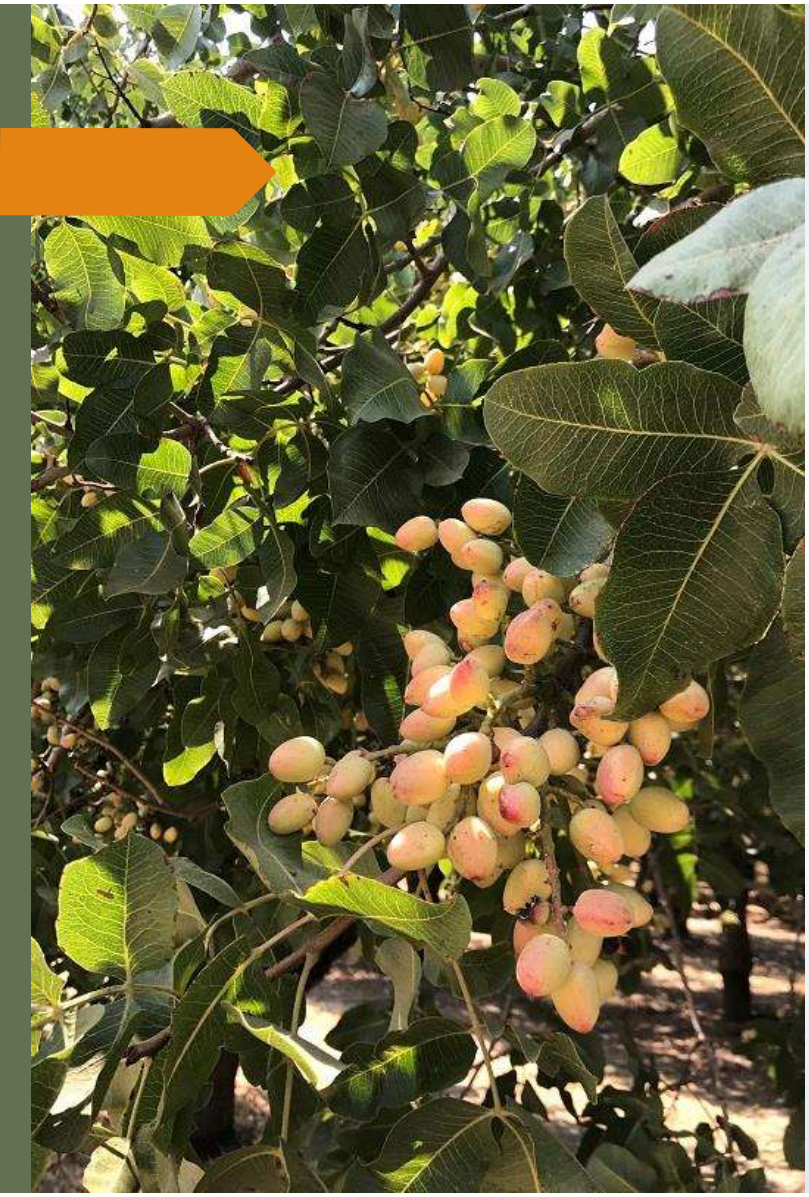


Domestic Wells



Known Impacts on Wells

- Westside domestic wells going dry – historical conditions?
- Land use changes
- Issues with high salinity
- Other domestic well areas with challenges



Discussion on Minimum Thresholds

- Staff comments
- CSAB comments
- Public comments

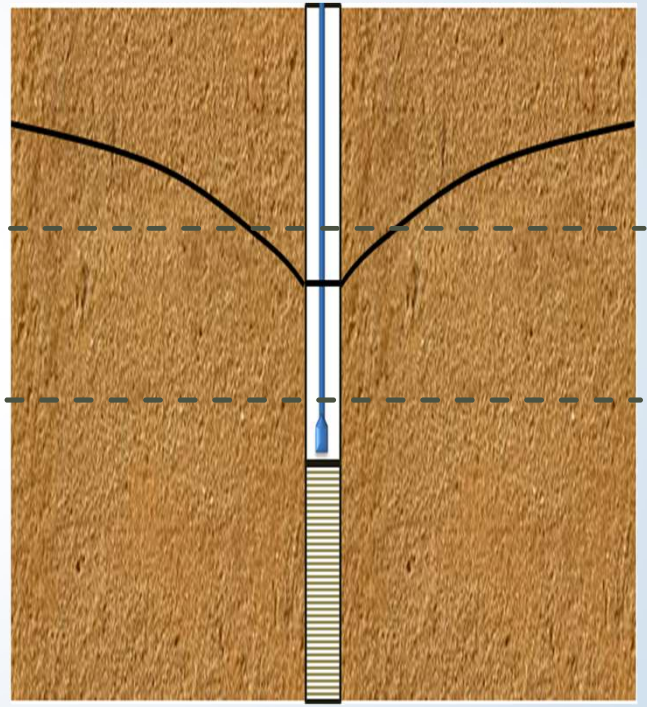
3. Set Measurable Objectives

The "safety factors" for operational flexibility

- Quantitative target or goal that allows operational flexibility above the Minimum Threshold
- Must be set in the plan, but are NOT enforceable during implementation

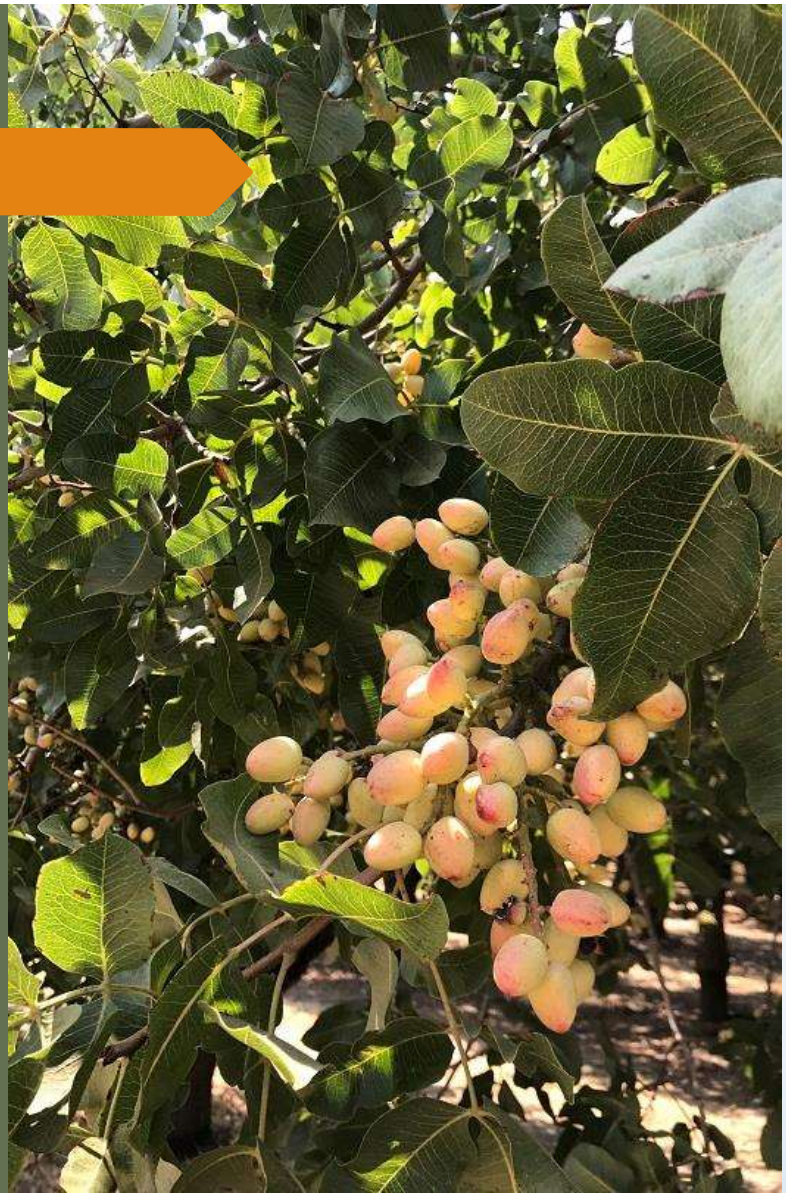
Set Measurable Objectives, based on the agreed-to Minimum Thresholds

- ❑ Quantify a margin of operational flexibility to each Representative Monitoring Point
- ❑ Goal is to ensure that meeting the Measurable Objective safely avoids Minimum Thresholds



Considerations to Set Measurable Objectives

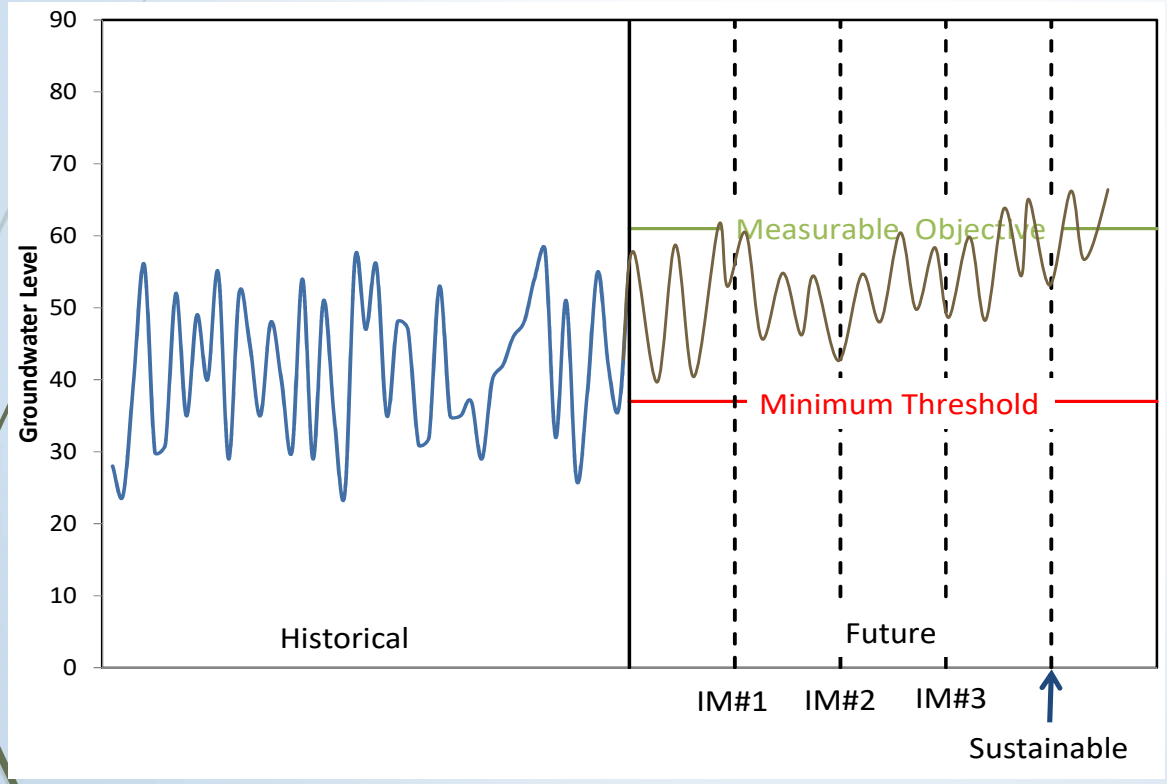
- What are some goals for water levels that feel like the basin is “healthy”?
- What operational flexibility needs to be incorporated to account for seasonal and climatic cycles?



Thresholds and Interim Milestones

- Minimum Thresholds set at every RMP
- Measurable Objectives are set with safety factor on Minimum Thresholds
- Interim milestones are (loose) targets, set at five-year intervals, that show how you plan to be headed towards your Measurable Objectives
  - Interim milestones likely set from modeling results of how projects change future groundwater conditions
- Thresholds can be modified during 5-yr updates based on new data
- **Adaptive management over 20 years until sustainability is reached at 2040**
- Then maintain sustainability over 30 years at set thresholds

Combining Minimum Thresholds, Interim Milestones, and Measurable Objectives at a Single Well



Maintain Sustainability for next 30 years

3. Determine Undesirable Results

> *"The description of undesirable results … shall be based on a quantitative description of the **combination of minimum threshold exceedances** that cause significant and unreasonable effects in the basin."*

Reminder: Avoiding Undesirable Results is how you prove sustainability

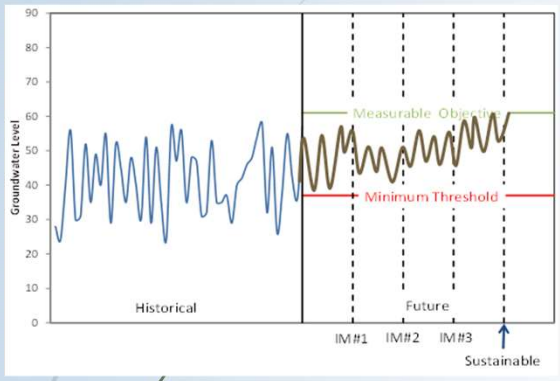
Undesirable Results are a Combination of Minimum Thresholds

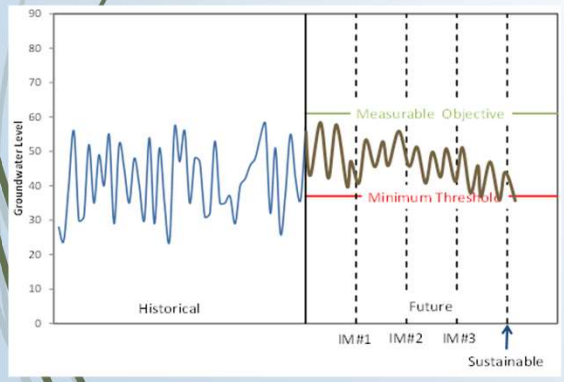
Example: An undesirable result occurs when 10% of your groundwater elevations, measured at Representative Monitoring Points, drop below the associated Minimum Thresholds

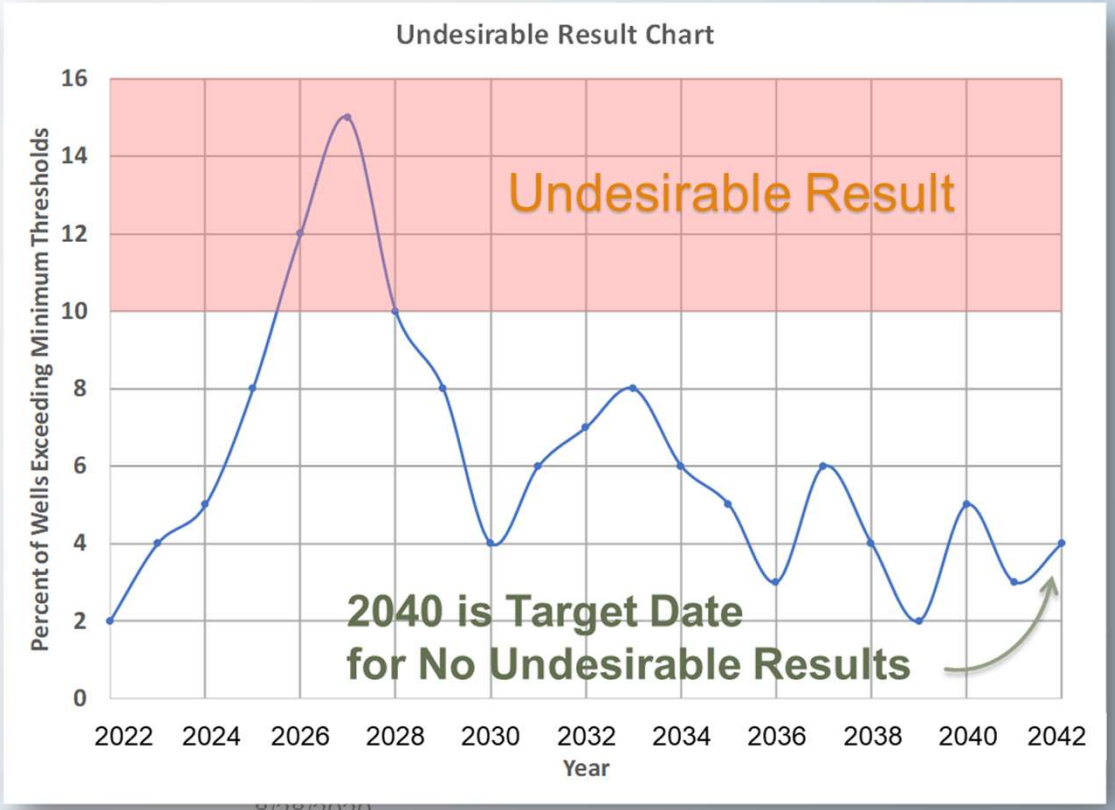
This might be an example definition of Undesirable Results for groundwater levels

How you define Undesirable Results is how you can accommodate flexibility

Example


Groundwater Level
Measurable Objective
Minimum Threshold
Historical
Future
IM#1
IM#2
IM#3
Sustainable


Groundwater Level
Measurable Objective
Minimum Threshold
Historical
Future
IM#1
IM#2
IM#3
Sustainable

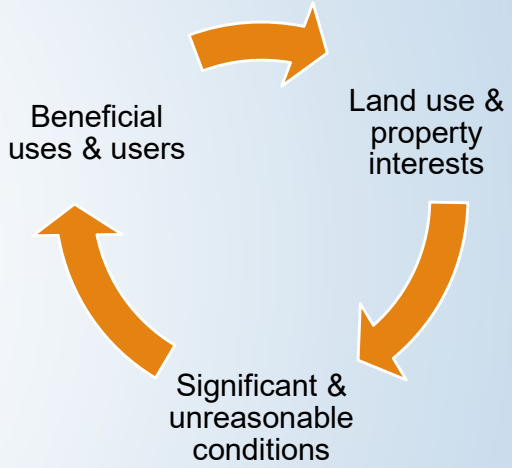

Undesirable Result Chart
Percent of Wells Exceeding Minimum Thresholds
Undesirable Result
2040 is Target Date
for No Undesirable Results
Year

Considerations for Determining Undesirable Results

- Consider impacts on beneficial users – e.g. as they relate to droughts
- What are the types of mitigations that can be enforced?
- What projects and management actions will be needed?

How Is This Implemented?

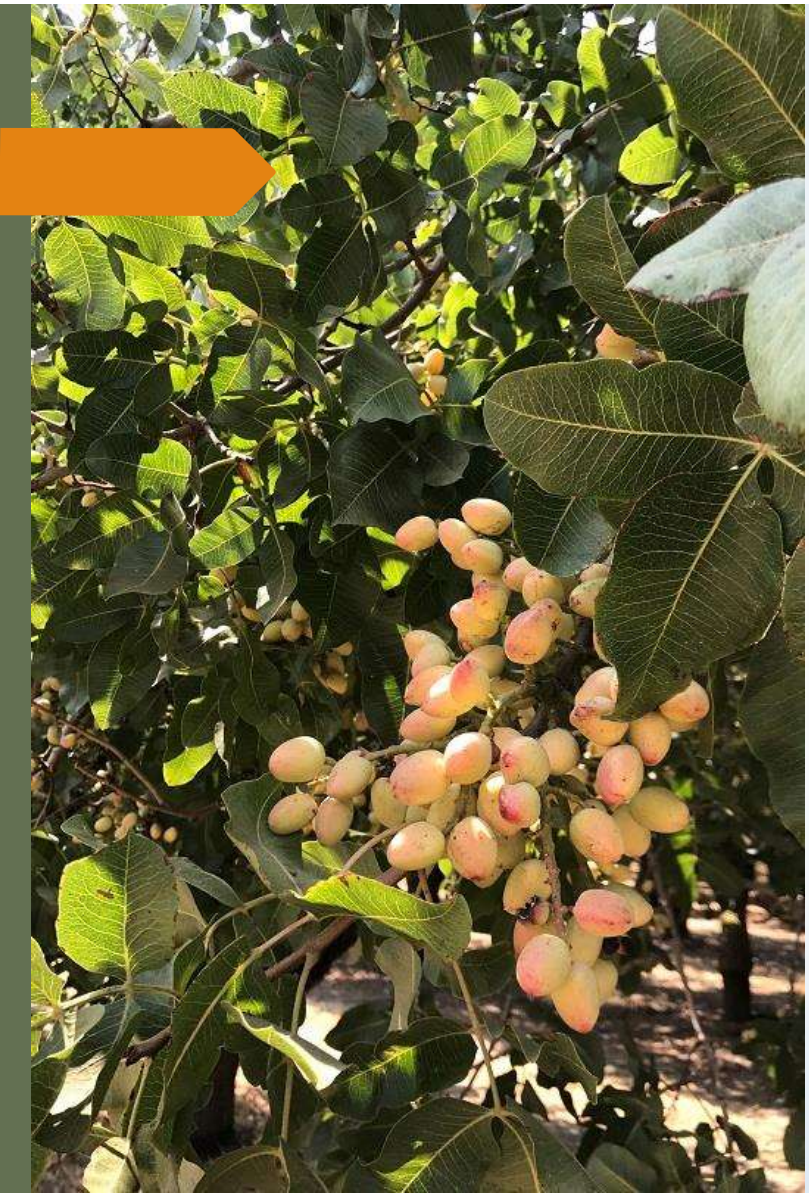
- Decide how to combine Minimum Thresholds into Undesirable Results
- Iterative process:
  - How does this undesirable result affect beneficial uses and users of groundwater?
  - How does this undesirable result affect land uses and property interests?
  - Does the undesirable result adequately characterize conditions that are significant and unreasonable?



Importance of outreach to Basin water managers and groundwater pumpers

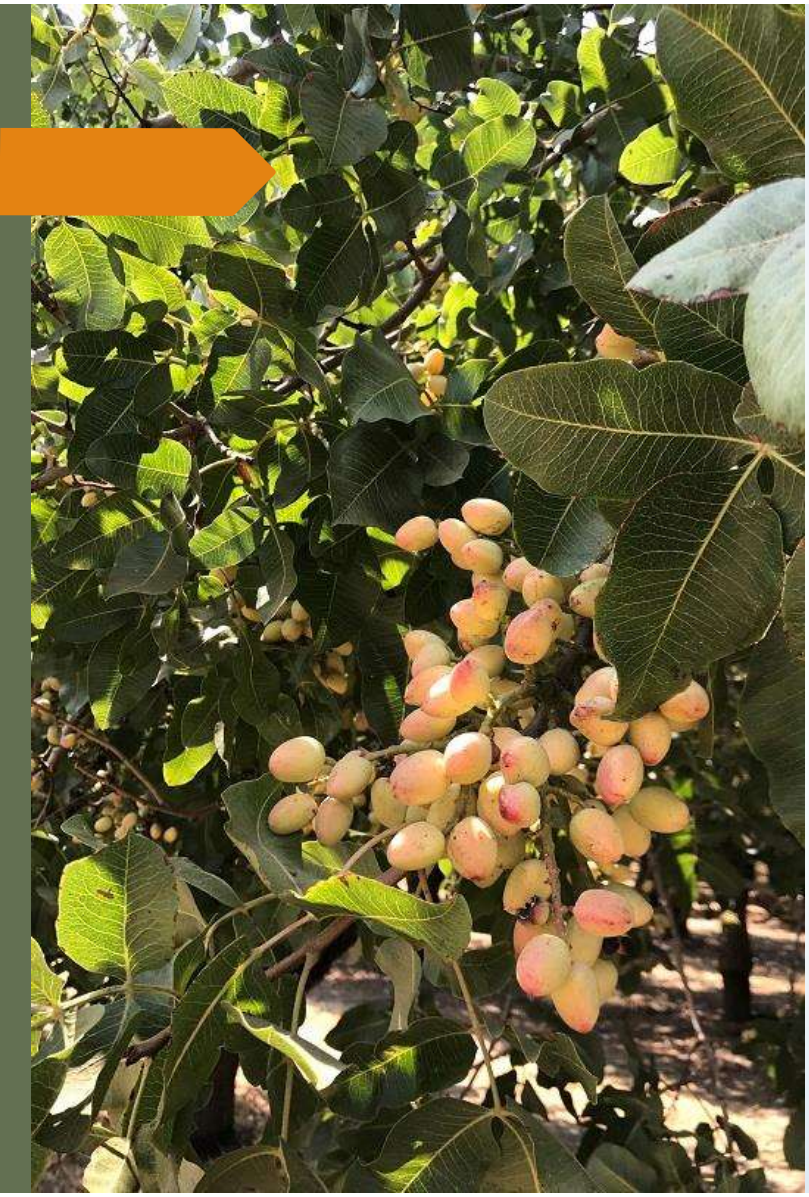
Next Steps

- Make sure everybody understands existing basin conditions
- Receive ideas on what is significant and unreasonable for each of the sustainability indicators, as applicable
  - Significant and unreasonable concepts need not be perfect!
  - We DO need guidance from GSA, CSAB and members of the public
  - We will review each Sustainability Indicator and SMCs at upcoming CSAB meetings



Sustainable Management Criteria – Questions and Comments?

- CSAB comments
- Public comments



Meeting Wrap-Up

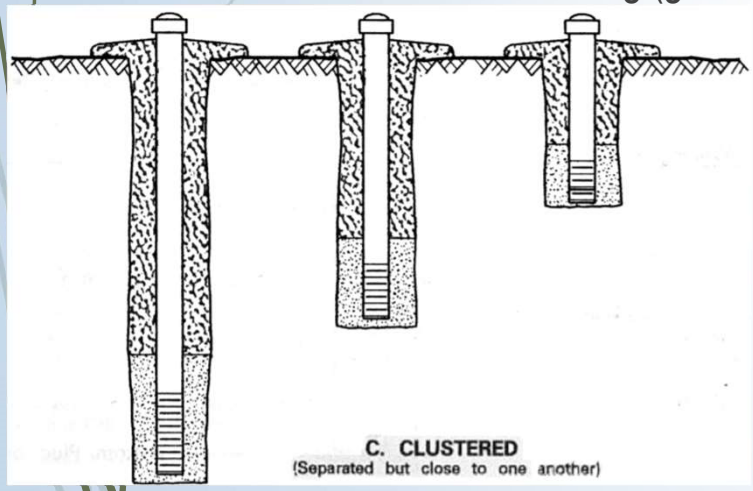
- Final throughs and comments?
- Action items and next steps
- Preview for next month:
  - Groundwater Level SMC discussion #2
  - Proposed approaches for MT and MO
  - Proposed approaches for Undesirable results
  - Potential Action Items

ADDITIONAL SLIDES
Chronic Lowering of Groundwater Levels – Available Monitoring Network

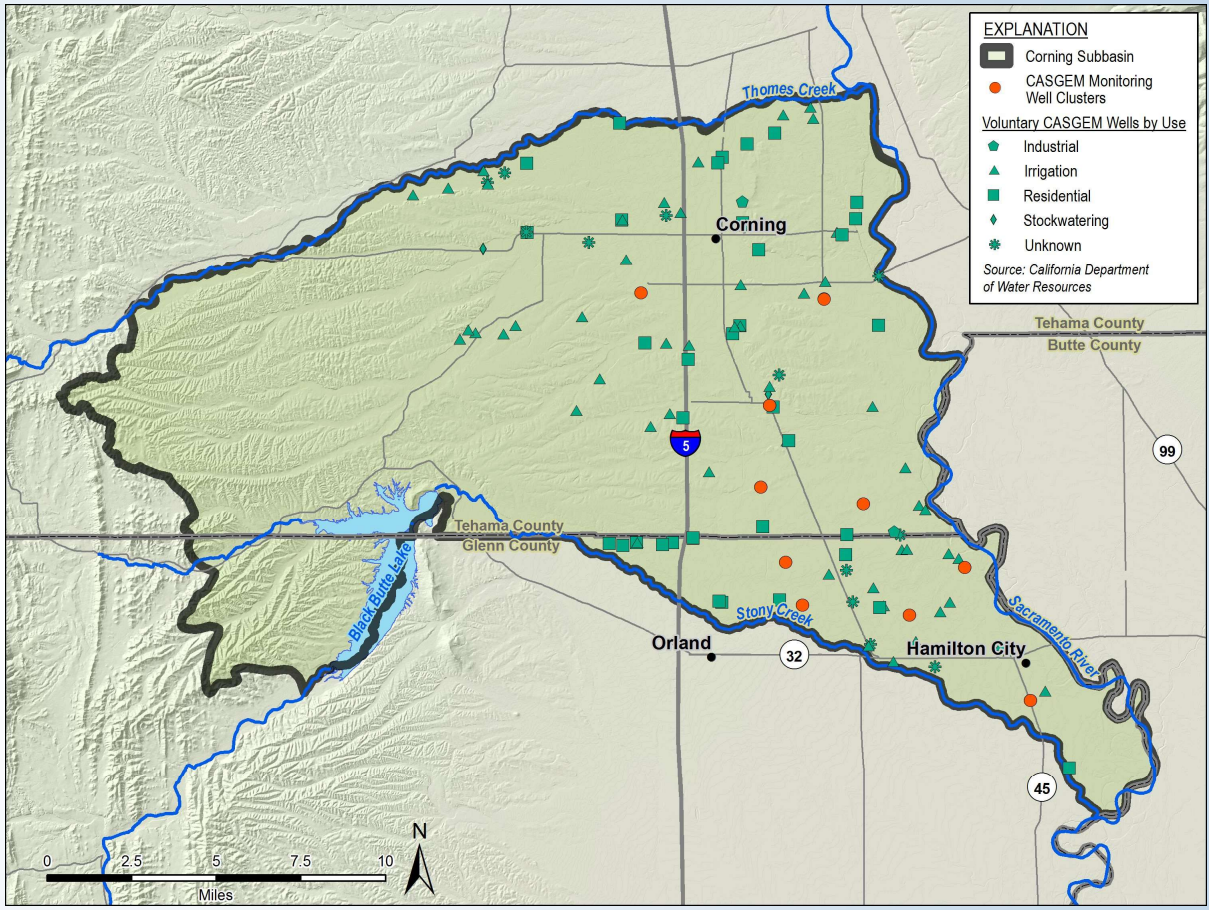
MONTGOMERY & ASSOCIATES

CASGEM Water Level Monitoring Network

- Clustered observation wells (orange)
- Production wells volunteered by owner for monitoring (green)



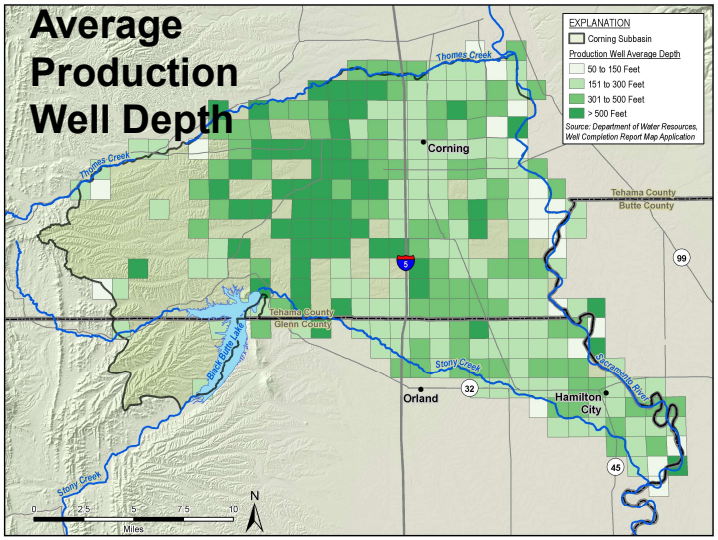
California Well Standards Bulletin 74-90

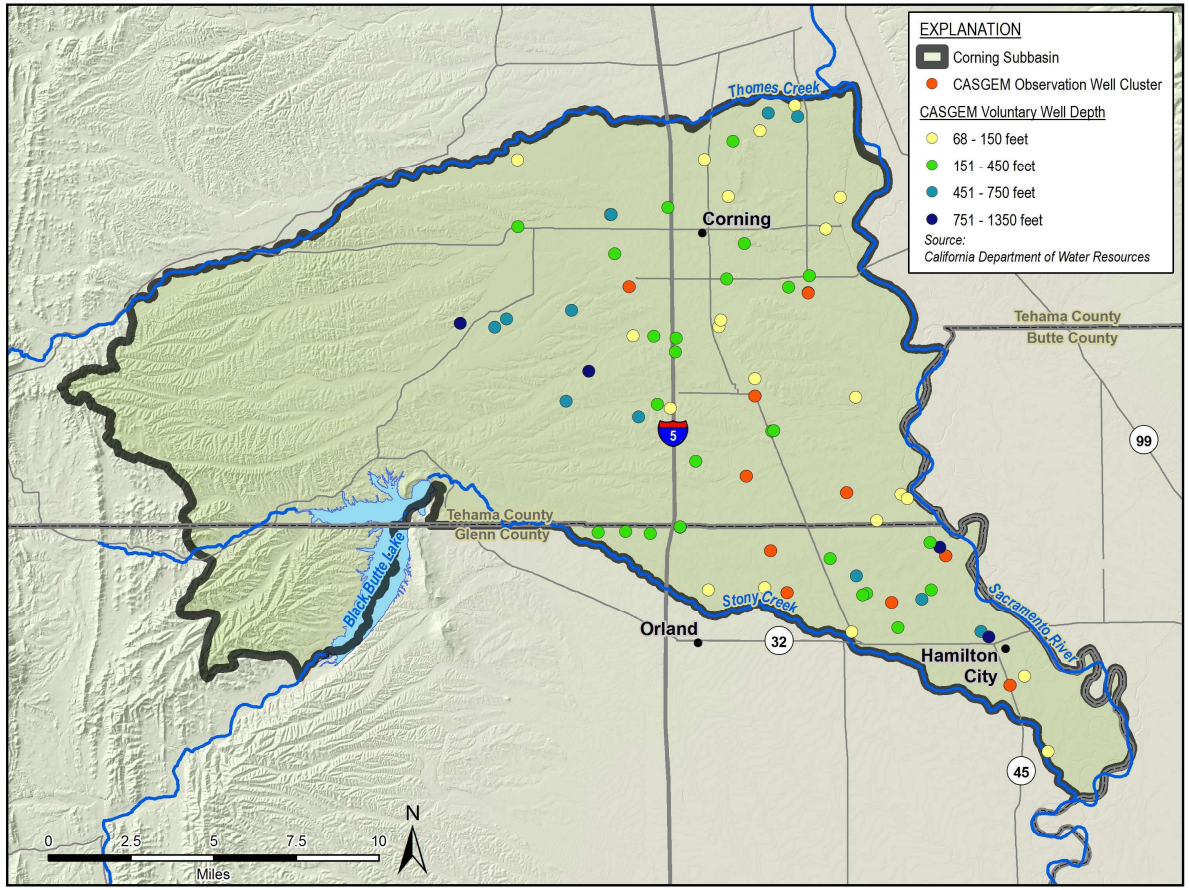


MONTGOMERY & ASSOCIATES

Well Depth

- 10 observation clusters include 3 to 5 wells in shallow and deep portions of aquifer (max depth of clusters ranges from 500 to 1,200 ft)
- Wells in network are generally less than 450 ft deep (66% of wells)
- Wells are mainly deeper in western Subbasin and five locations northwest of Hamilton City





50 – 100 ft

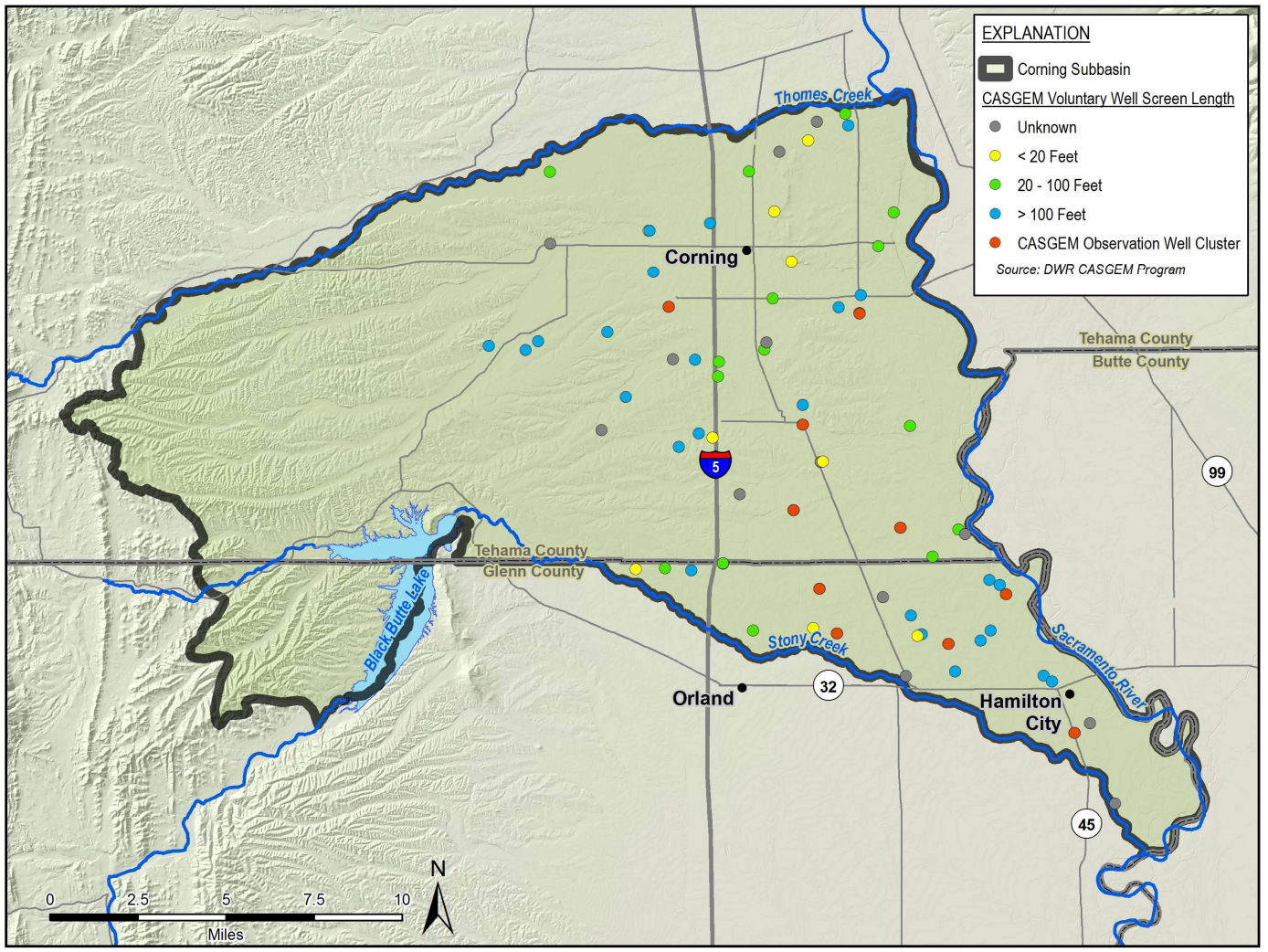
151 – 300 ft

301 – 500 ft

>500 ft

Well Screen Interval

- 50% of observation cluster wells have discrete screen lengths of 20 ft or less
- Deeper wells typically have longer screens
- Screen length typically longer and variable in voluntary wells as these were built for pumping



MONTGOMERY & ASSOCIATES

Potential Water Level Data Gaps

- Potential spatial data gaps:
  - Southeast of Corning / Sac. River
  - Northwest of Corning / Thomes Creek
  - West Subbasin