



## ***Lower Tuscan Aquifer***

### ***Monitoring, Recharge & Data Management Project***

***UC Cooperative Extension***

***Water Resource Meeting***

***December 16, 2011***



# Introductions

## ➤ Butte County Staff

- ❖ Paul Gosselin

## ➤ Brown and Caldwell Team

- ❖ Joe Turner, Project Manager

- ❖ John Ayres, Outreach Coordinator

- ❖ Andy Kopania, Public Outreach and Senior Technical Review

- ❖ Tim Godwin, Field Manager



# Presentation Overview

- Project Summary
- Preliminary Findings
- Next Steps



# Project Objectives

- Field Investigation that seeks to improve the scientific understanding of the properties of the Lower Tuscan Aquifer system (LTA).
  - ❖ Physical parameters affecting percolation of surface water to the LTA
  - ❖ Interaction between surface water and groundwater
  - ❖ Recharge contribution from other aquifers to the LTA
  - ❖ Measure standard aquifer properties and their variability
  - ❖ Identify natural recharge areas under current hydrologic conditions
  - ❖ Identify recharge areas under increase utilization
  - ❖ How additional pumping may impact the aquifer and surface water

# Project Scope

- Things this study will do:
  - Improve understanding of infiltration in regions near foothill streams
  - Evaluate surface water and groundwater interaction
  - Improve understanding of groundwater recharge to the LTA from streams, foothill areas, and other aquifers
  - Increase knowledge of hydrogeologic characteristics of the LTA
  - Enhance groundwater monitoring well network
- Develops a sound scientific foundation for understanding of the hydrology of the LTA

# Project Scope

- Things this study will not do:
  - Determine the safe yield of the LTA, locally or regionally
  - Determine the storage capacity of the N. Sacramento Valley
  - Study recharge from the Sacramento and Feather Rivers
  - Update the Butte Basin IWFM model
  - Identify the subsurface extent of the Tuscan Formation
- New production wells will NOT be installed
- Project is not connected to any water transfer programs

## What's Completed

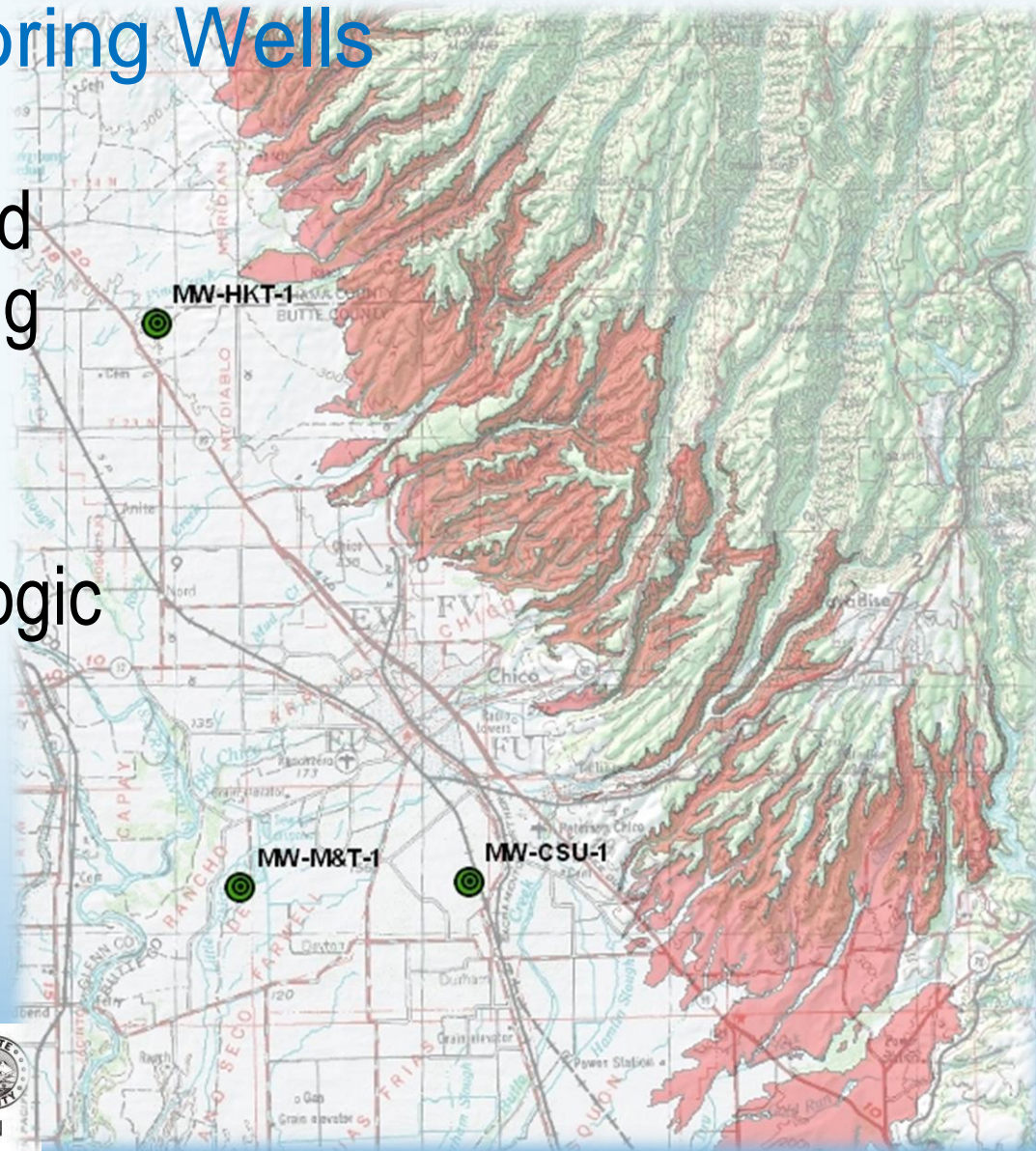
- ✓ CEQA Documentation
- ✓ Installation of Three Nested Groundwater Monitoring Wells
- ✓ Nine of Ten Dual Ring Infiltrometer Tests
- ✓ Stream Gauge Installation and Monitoring of Five Streams
- ✓ Temperature Gradient Well Installation at Mill Creek
- ✓ Aquifer Tests at Esquon Ranch and Hackett Property

## Initial Challenges

- Access To Study Sites – Changed Over Time
- Weather/Climate
  - ❖ Wet Year – Pumping Varied
  - ❖ Runoff – Later and More than Normal
- Local Geologic Conditions

# Groundwater Monitoring Wells

- Expands the Dedicated Groundwater Monitoring Network.
- Establishes a Reliable Baseline of Hydrogeologic Data
- Measures Drawdown During Aquifer Tests

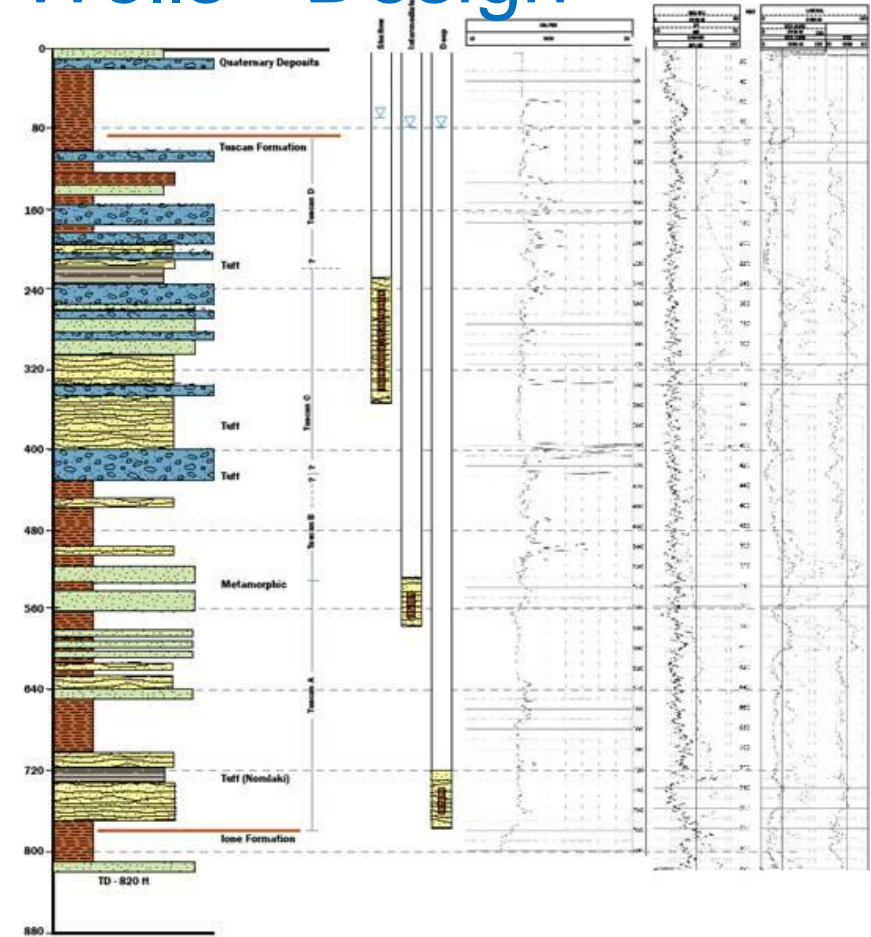


# Groundwater Monitoring Wells - Drilling



# Groundwater Monitoring Wells - Design

- Well Design Based On
  - ✓ Lithologic Data
  - ✓ Water Production During Drilling
  - ✓ Geophysical Logging



**LEGEND**

- Gravel (G)
- Sand (SP)
- Sandstone (SS)
- Siltstone (MS, SM, GM)
- Fines (CL, CS, GC, SC)

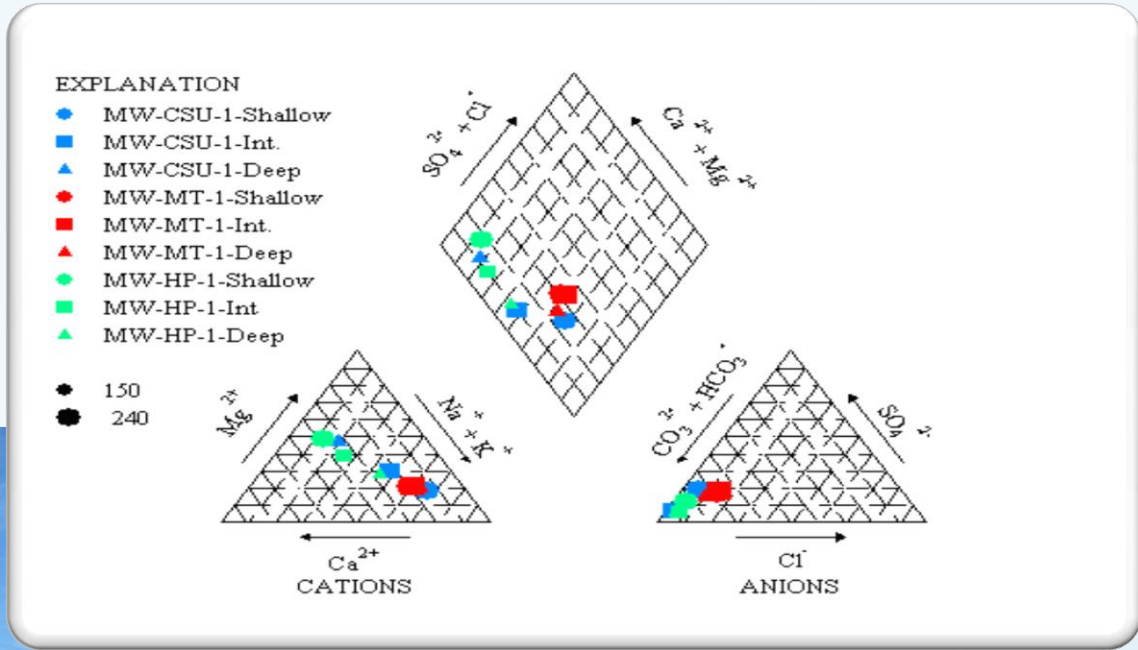
Static Water Level 10/26/2011



# Groundwater Monitoring Wells - Installation



# Groundwater Monitoring Wells – Development and Sampling



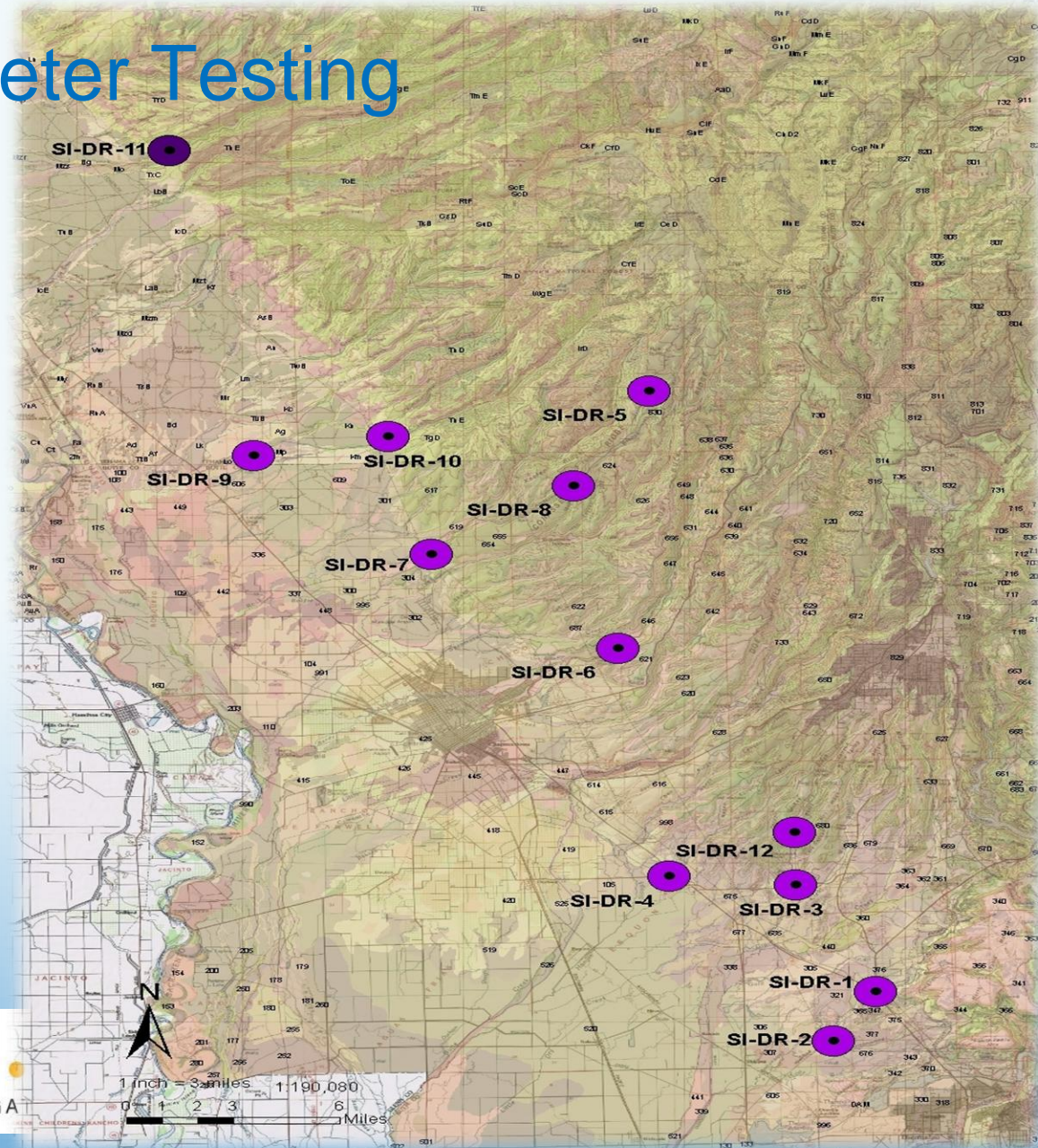
# Aquifer Recharge Assessment

The Aquifer Recharge Assessment is being conducted to assess potential flow pathways by which surface water enters the subsurface and recharges the LTA.

## Consists of Three Tasks

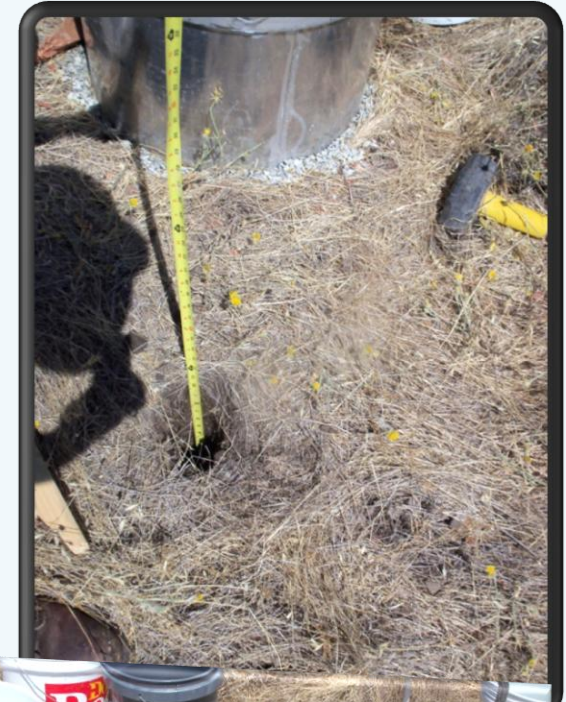
- Soil Infiltration Testing
- Stream Gauging
- Stream-Aquifer Temperature Gradient Measurements

# Dual-ring Infiltrometer Testing



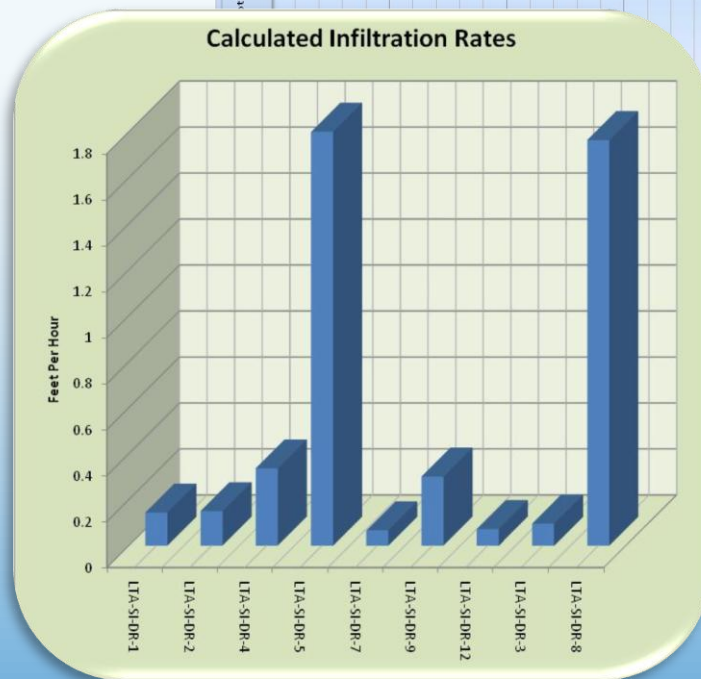
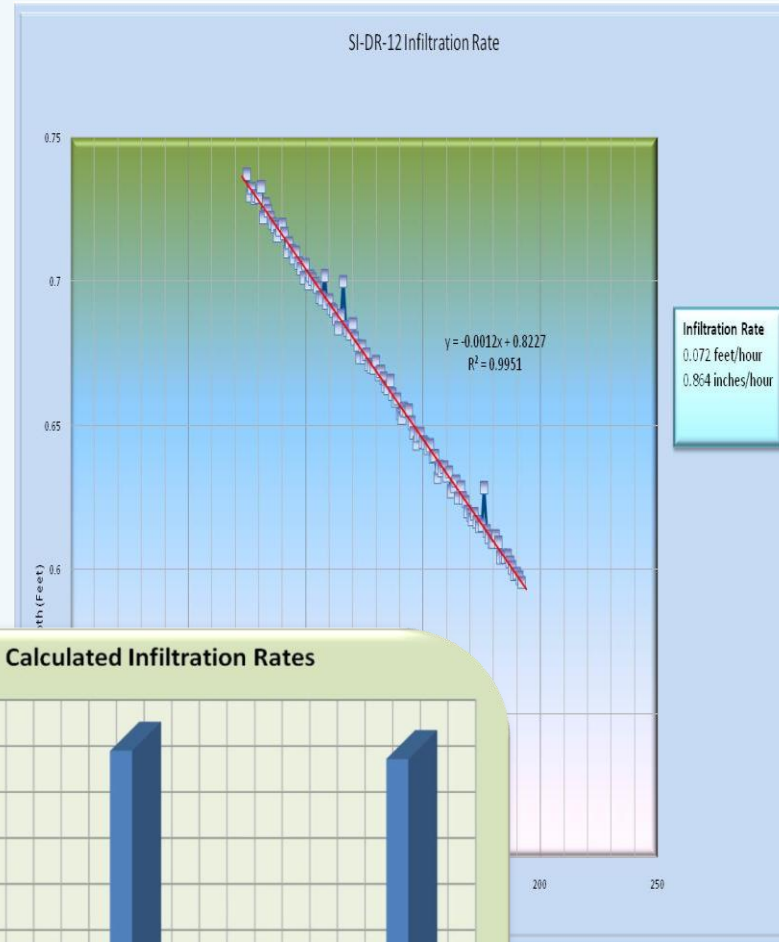
# Dual-ring Infiltrometer Testing

- ✓ Nine sites completed
- ✓ Completed in Variable Soil Types



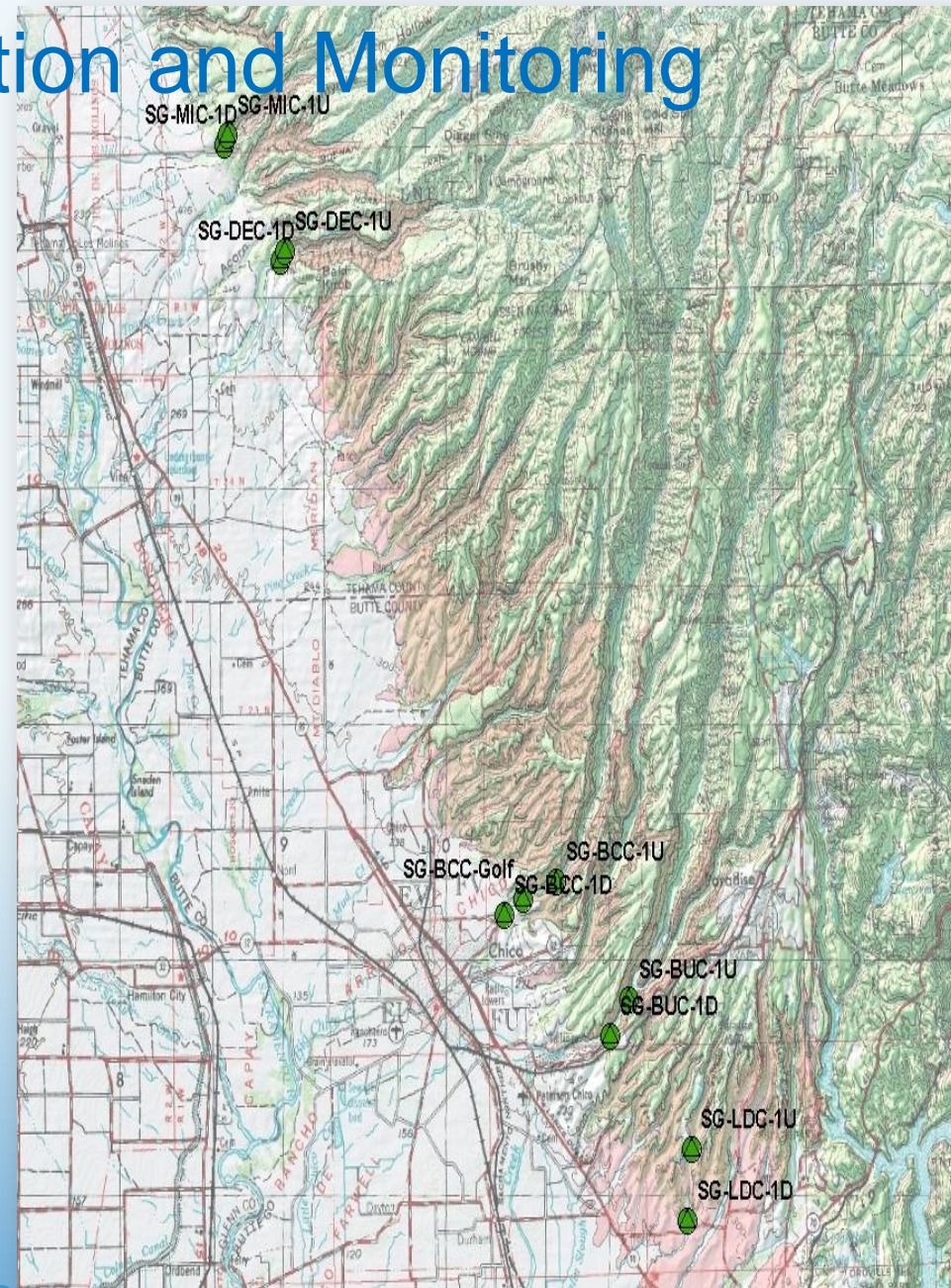
# Dual Ring Infiltrometer Testing

- Variable Results
- Will Compare to Published soils data for each site
- Flow is not Necessarily Vertical
- Difficult driving
- Variable soil thickness



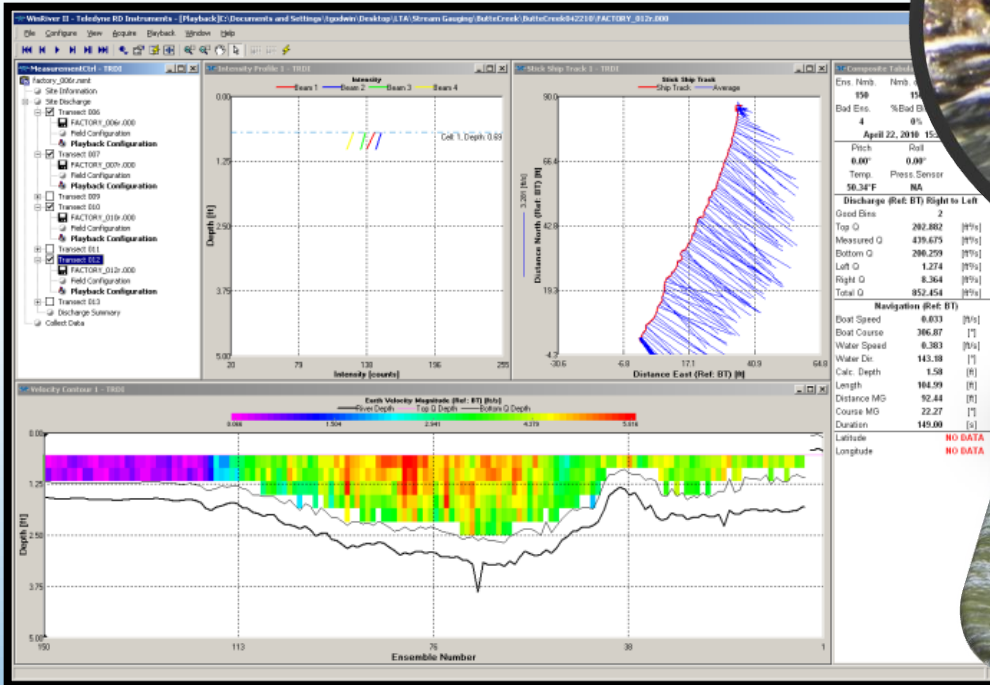
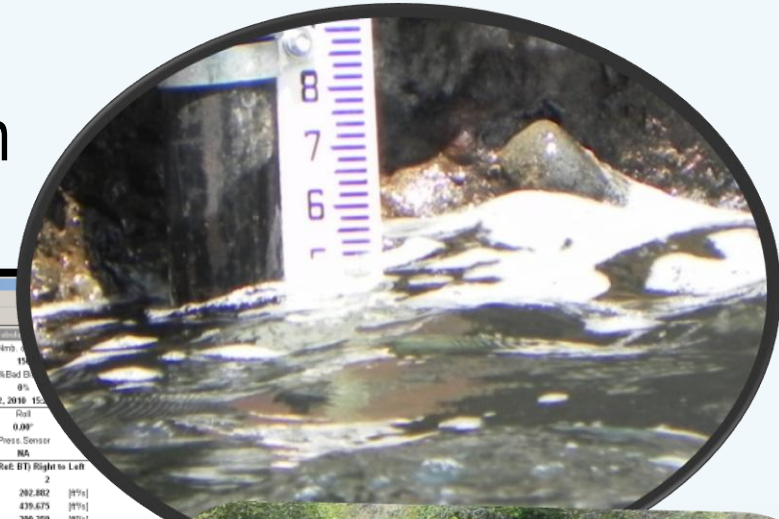
# Stream Gauge Installation and Monitoring

- Will Characterize the Stream-Aquifer Interactions Through Monitoring Surface Water Stage and Surface Water flow



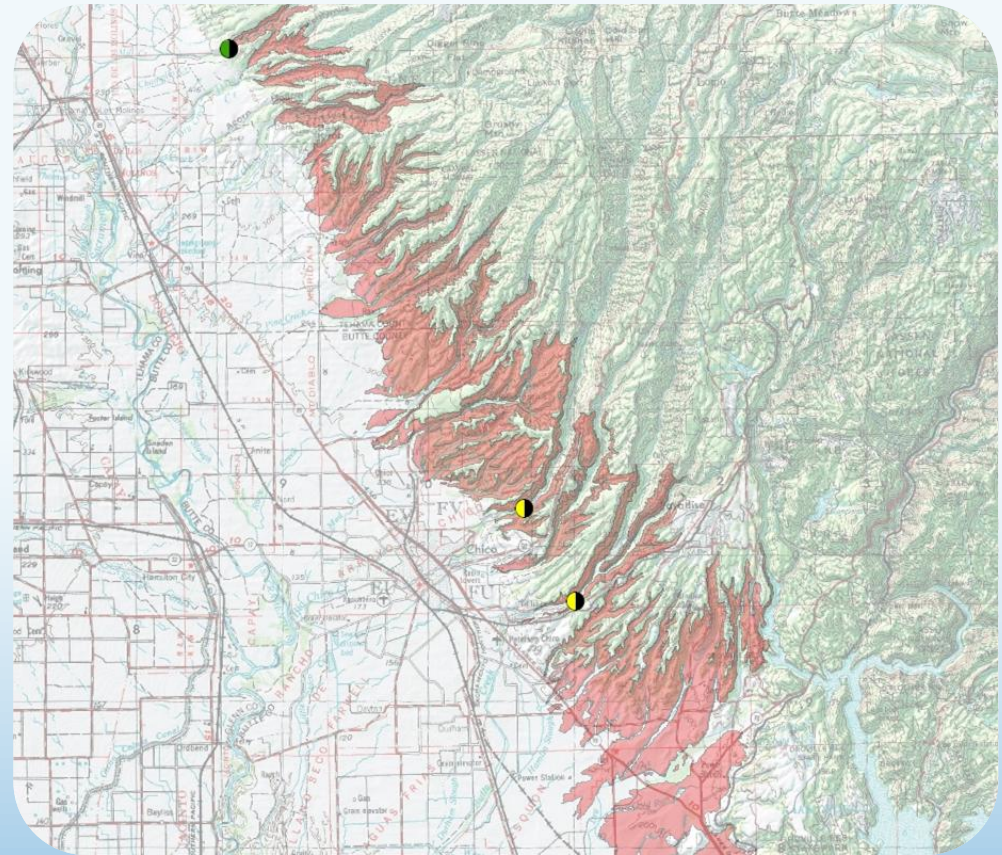
# Stream Gauge Installation and Monitoring

- Multiple Stream Gauging Events have Occurred on Each Stream



# Temperature Gradient Well Installation

- Measures Stream-Aquifer Temperature Gradients



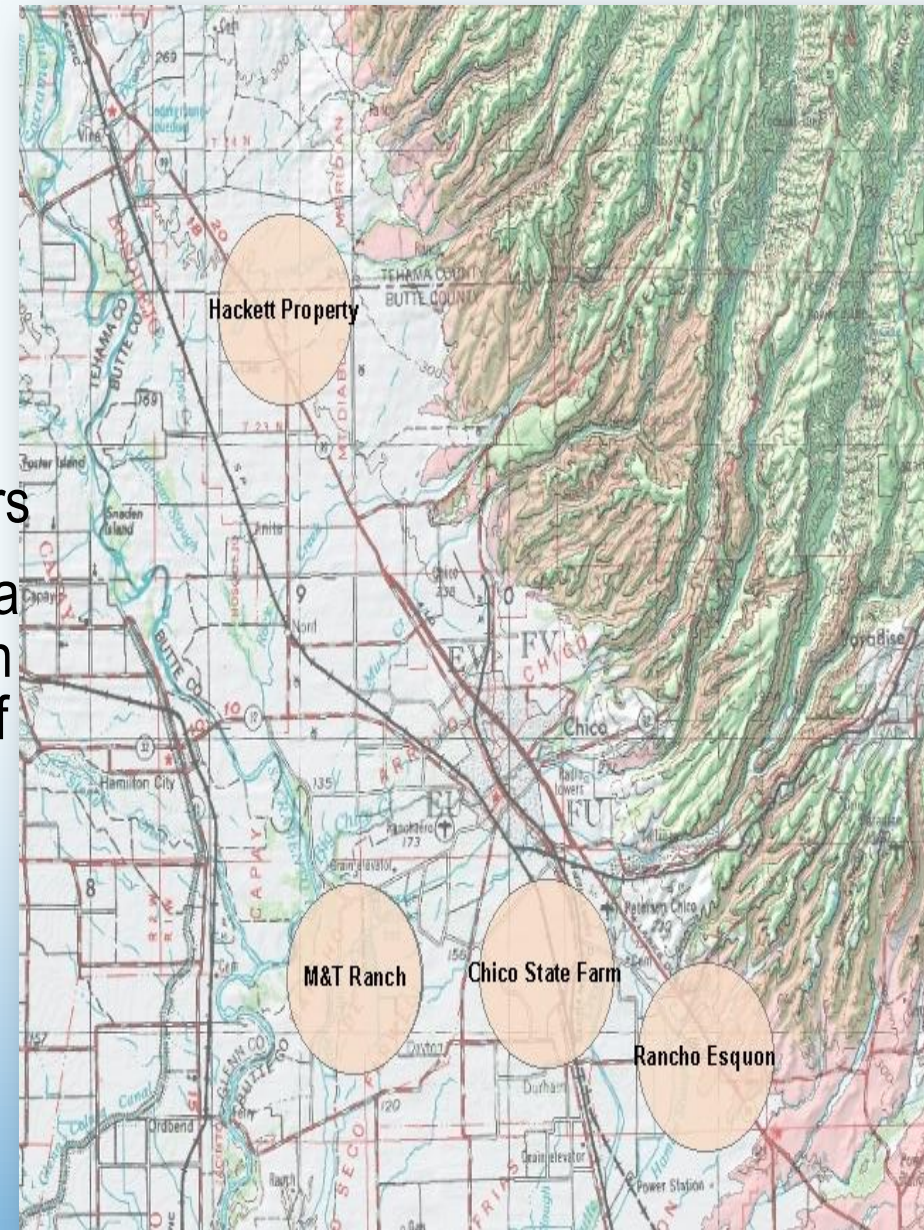
# Temperature Gradient Well Installation

- Groundwater temperature profiles adjacent to streams
- Temperature data logger installed at Mill Creek.
- Drilling refusal at Big Chico Creek
- Will attempt to install wells within Alluvium at Butte Creek



# Aquifer Performance Tests

- Uses existing agricultural wells
- Measures groundwater level data with pressure transducers
- Collected groundwater samples to assess groundwater quality parameters
- Conducted to collect basic aquifer data regarding transmissivity and storage in order to gain a better understanding of the vertical interformational leakage between the LTA and other hydraulic units.



# Aquifer Performance Tests Data Collection



# Aquifer Performance Tests

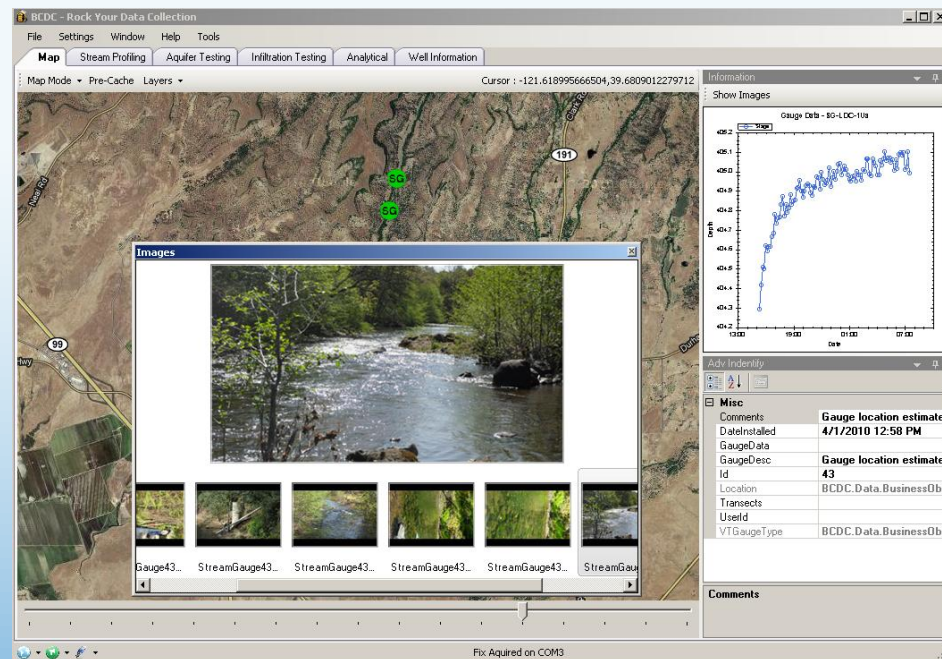
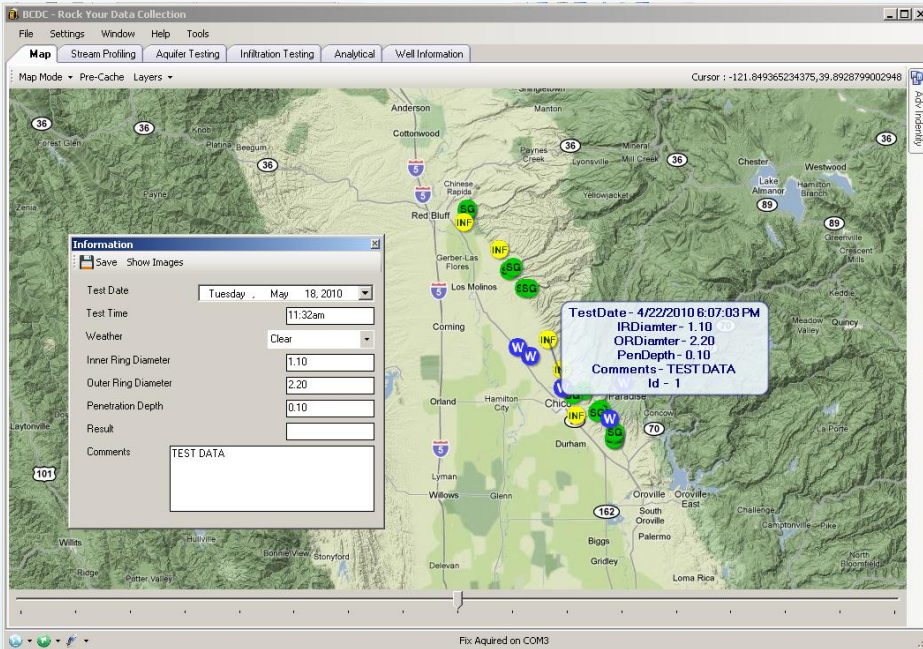
- Tests Completed
  - ✓ Esquon Ranch – May 2011
  - ✓ Hackett Property – June 2011 and September 2011
  
- M&T Ranch Test
  - ✓ Need several days of hot weather
  - ✓ May switch test to CSU site



# Aquifer Performance Tests Analysis

- Analysis Will Include:
  - ✓ Aquifer Conceptualization
  - ✓ Visual assessment of drawdown and recovery curves
  - ✓ Curve matching and analytical analysis for T and S
  - ✓ Assessment of results

# Data Collected and Entered into Database



# Next Steps

## Winter 2011 Schedule

- Continue aquifer analysis of Esquon and Hackett Tests
- Complete aquifer test at M&T Ranch, if possible
- Review Other Aquifer Tests Conducted in Region
- Continue stream gauging and temperature profile assessments
- Begin Initial Comparison of Study Results with Existing Model Input
- Install temperature wells at Butte Creek

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