



Monitoring all Hydrologic Compartments in a Small Agricultural Watershed in Central California

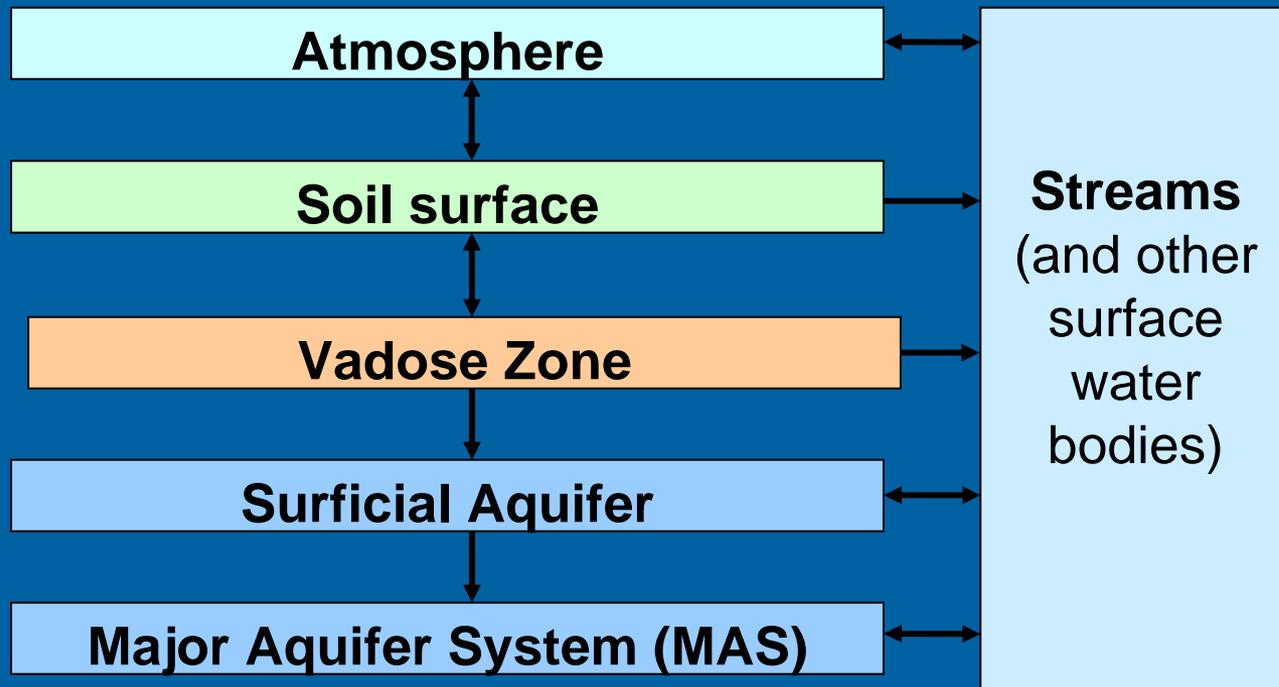
NWQMC Conference
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Charlie Kratzer, Joe Domagalski, Steve Phillips, Peter
Dileanis, Celia Zamora, and Mike Majewski

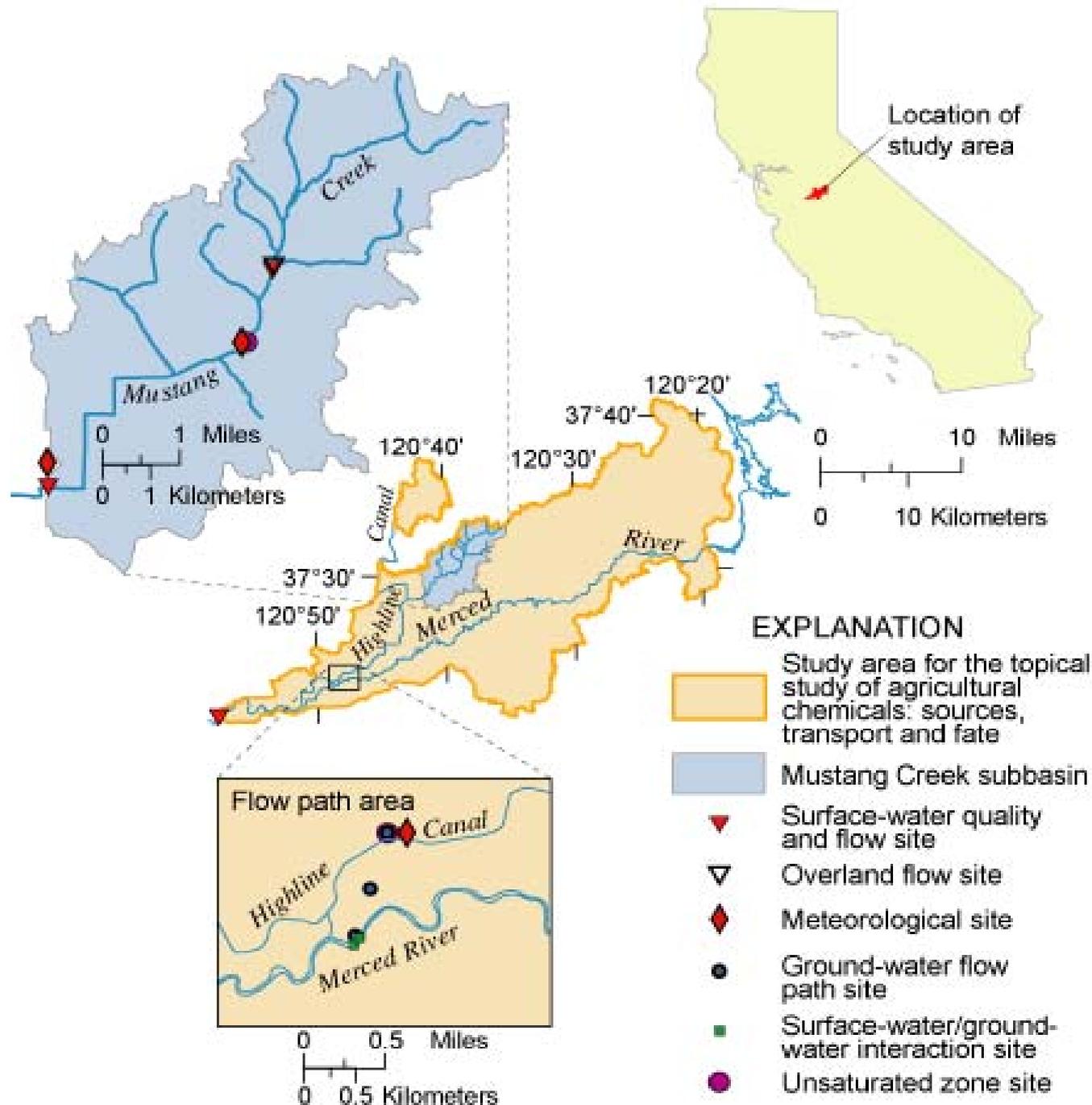
U.S. Geological Survey, Sacramento, CA

Agricultural Chemicals: Sources, Transport, and Fate (ACT)

How do environmental processes and agricultural practices interact to affect the transport and fate of agricultural chemicals in the hydrologic system of nationally important agricultural settings, and what are the effects on water quality and implications for management of water resources?



ACT study area in Merced River Basin



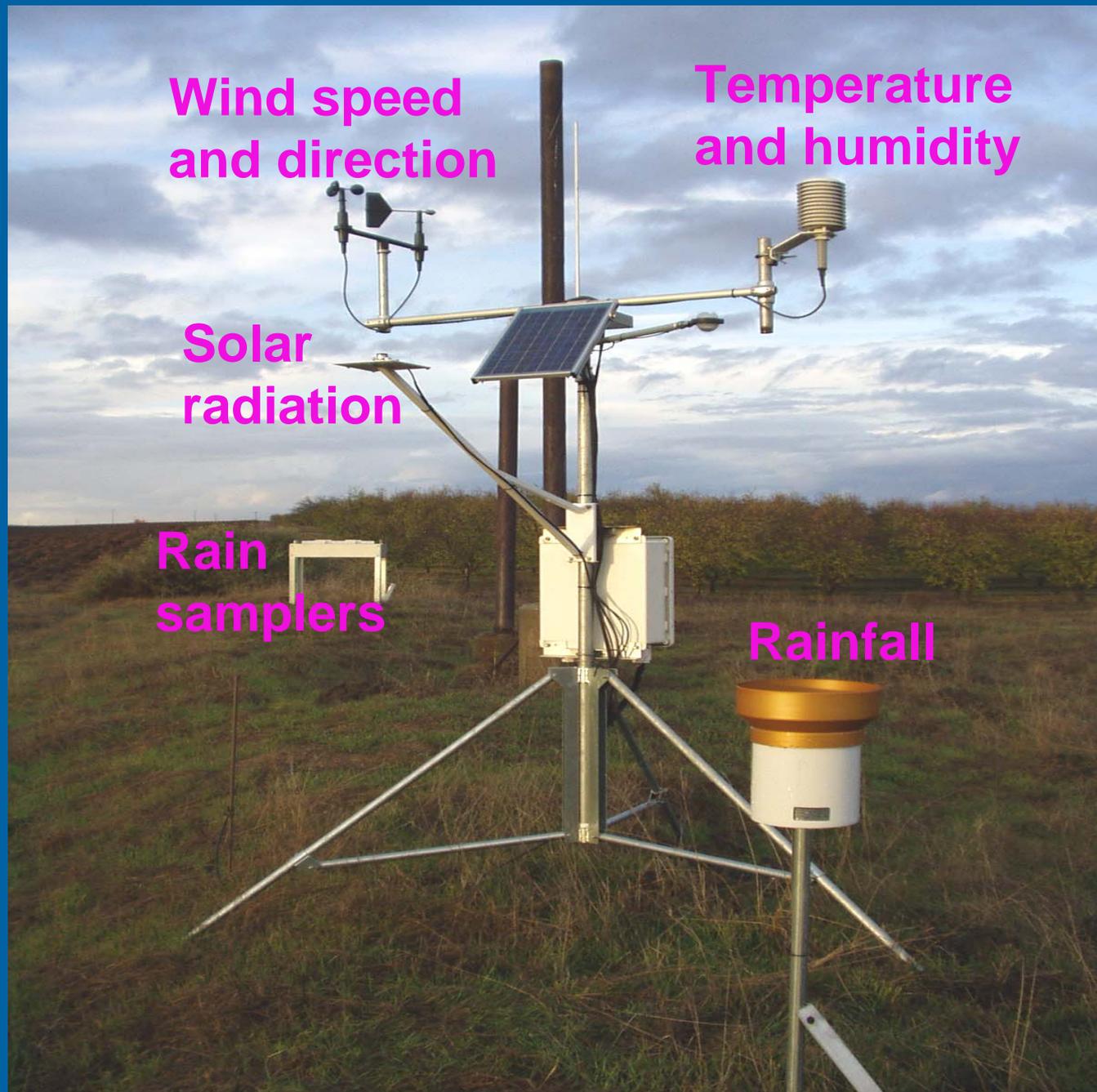


ATMOSPHERE

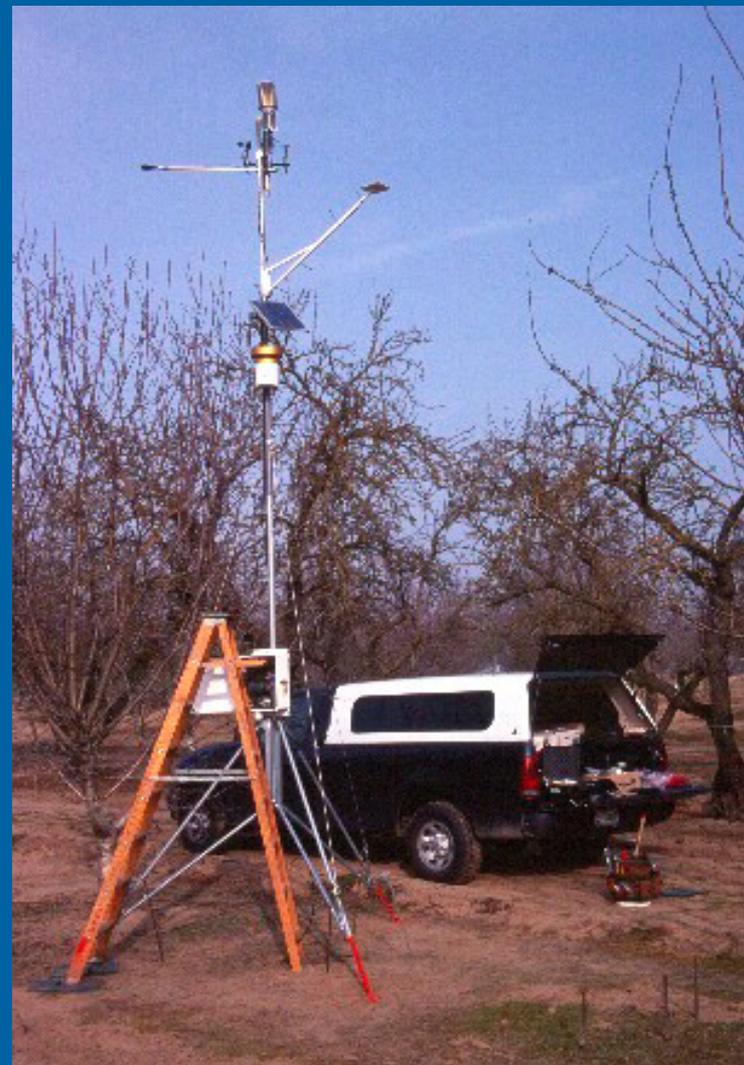
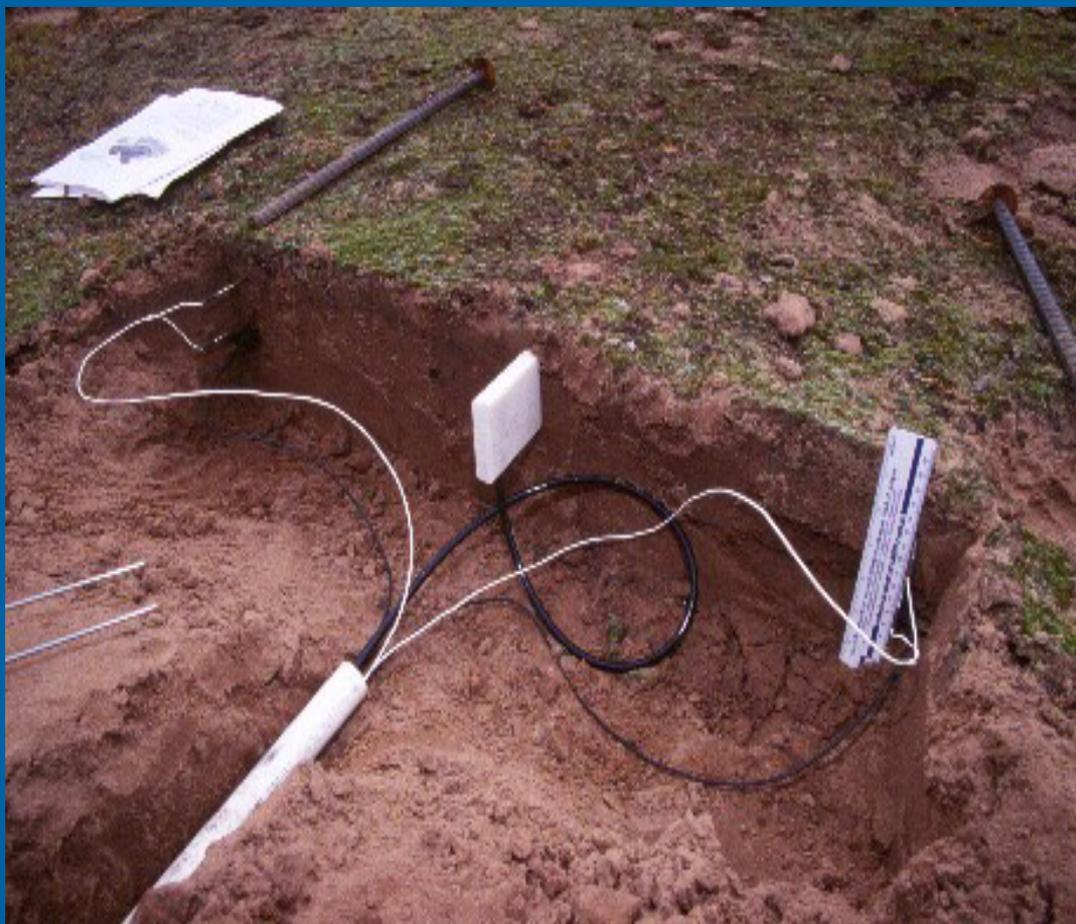
Monitoring

- **Event-based rain sampling**
 - pesticides and nutrients
- **Meteorological station and soil moisture probe**
 - rain, temperature, humidity, wind speed and direction, solar radiation, soil moisture data stored on datalogger
 - data used to calculate ET for water budget
- **Dry deposition (State-funded project)**
 - wet/dry sampler rinsed with solvent
 - soil box (1 sq. meter surface)
 - may be more important than wet deposition for some compounds, especially in dry climates like California

Met station and rain sampler platform at site near reservoir

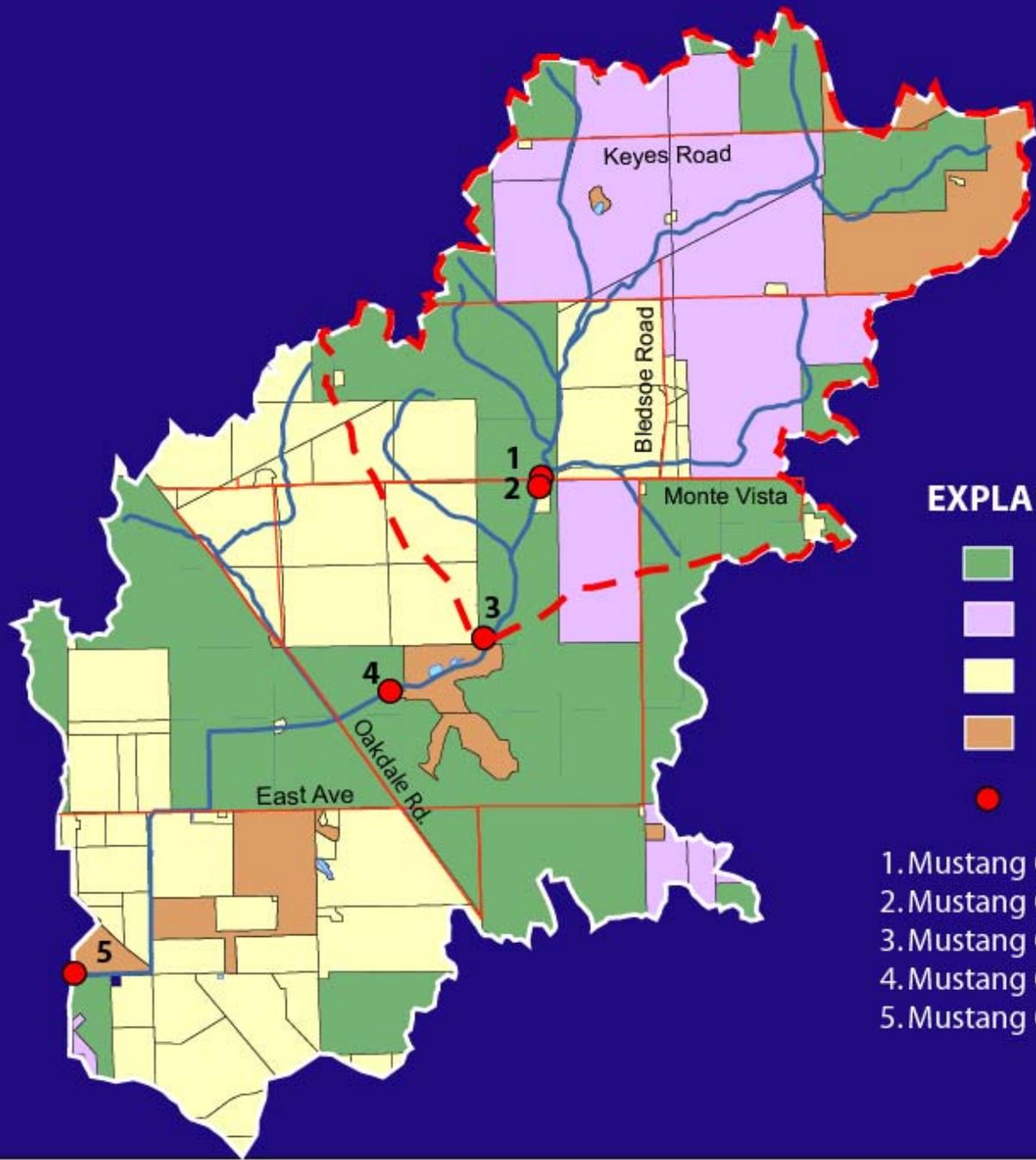


Soil moisture probe and meteorological station at head of flowpath





SURFACE RUNOFF



EXPLANATION

- Almond Orchards
- Vineyards
- Other Agricultural Lands
- Non-Agricultural Lands
- Sites

1. Mustang Cr. at culvert
2. Mustang Cr. at Monte Vista Rd.
3. Mustang Cr. at 1.2 miles below Monte Vista Rd.
4. Mustang Cr. below Reservoir
5. Mustang Cr. at Bifurcation Structure

Monitoring

- **Event-based sampling in Mustang Creek**
 - overland flow site (culvert at site 1, flume)
 - autosamplers (sites 2 and 5, weir gages)
 - pesticides, nutrients, major ions, organic carbon, suspended sediment
- **Time-of-travel dye studies**
 - from upper Mustang Creek to Merced R

Mustang Creek at Monte Vista (site 2)



Weir and Flume Installations



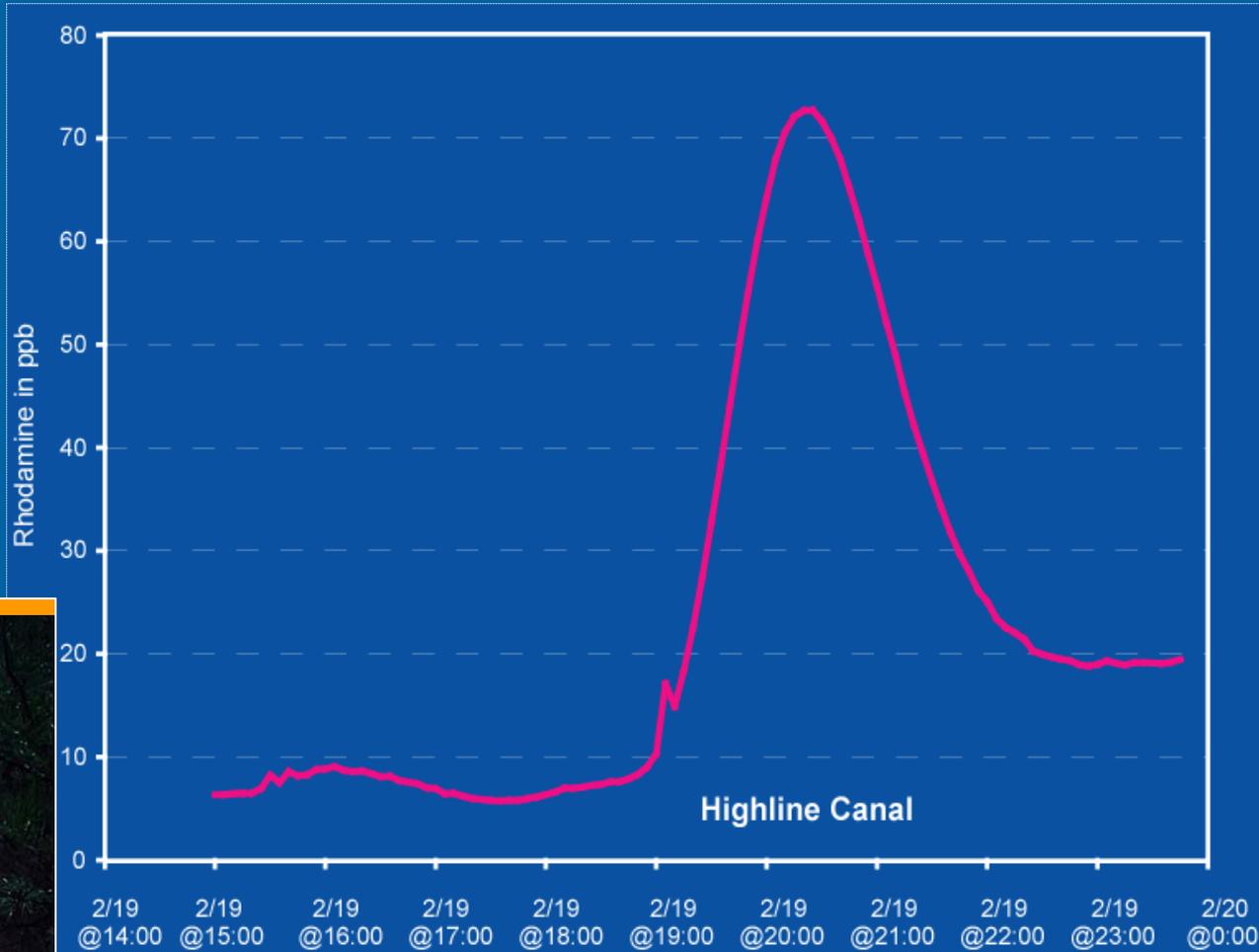
High flows on Mustang Creek at Monte Vista



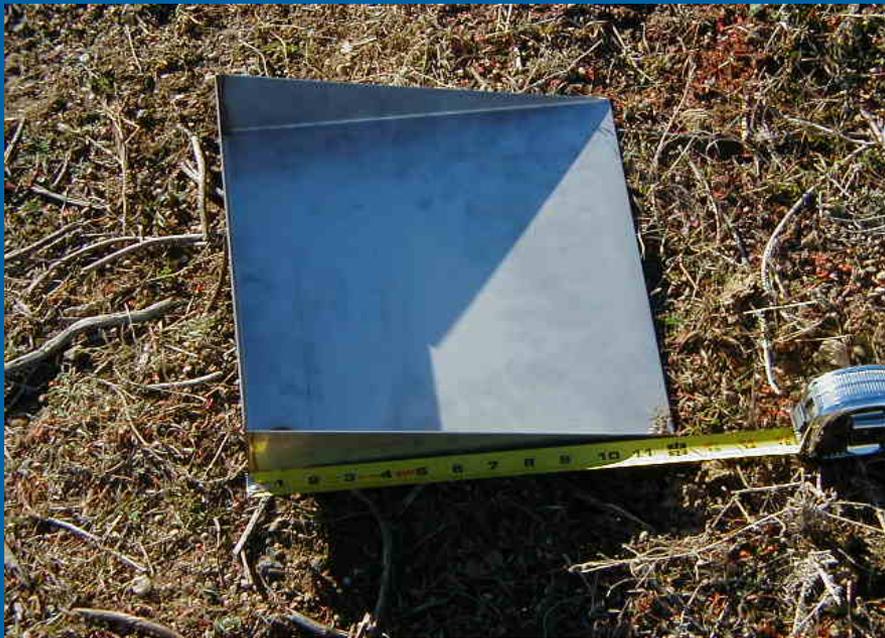


Dye study with manual sampling





**Dye study with
automatic sampler**



VADOSE ZONE



Monitoring

- **Sample suction and pan lysimeters in April, August, and October (and after storms and irrigation as \$ allows)**
 - pesticides, nutrients, major ions, and isotopes
- **Bromide tracer**
 - potassium bromide added to surface to monitor transport of conservative tracer
- **Soil moisture and heat dissipation probes**
 - collect data every 4 hours to measure water flux (stored on datalogger)

Head of flow path site

Met station



Cluster of
4 wells



4 suction lysimeters

2 pan lysimeters

5 heat dissipation probes

3 soil moisture probes



Installing suction lysimeters





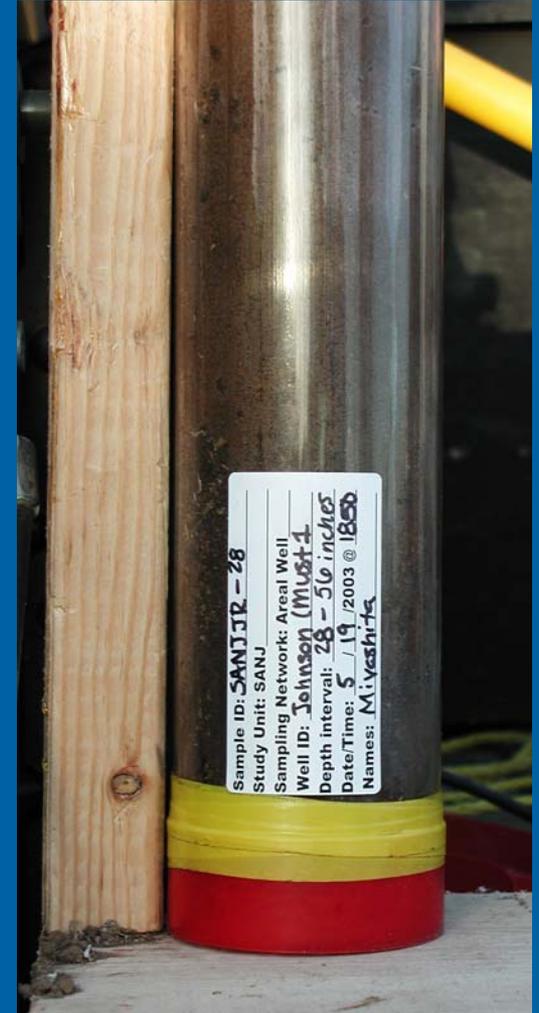
Sampling lysimeters

Heat dissipation probes



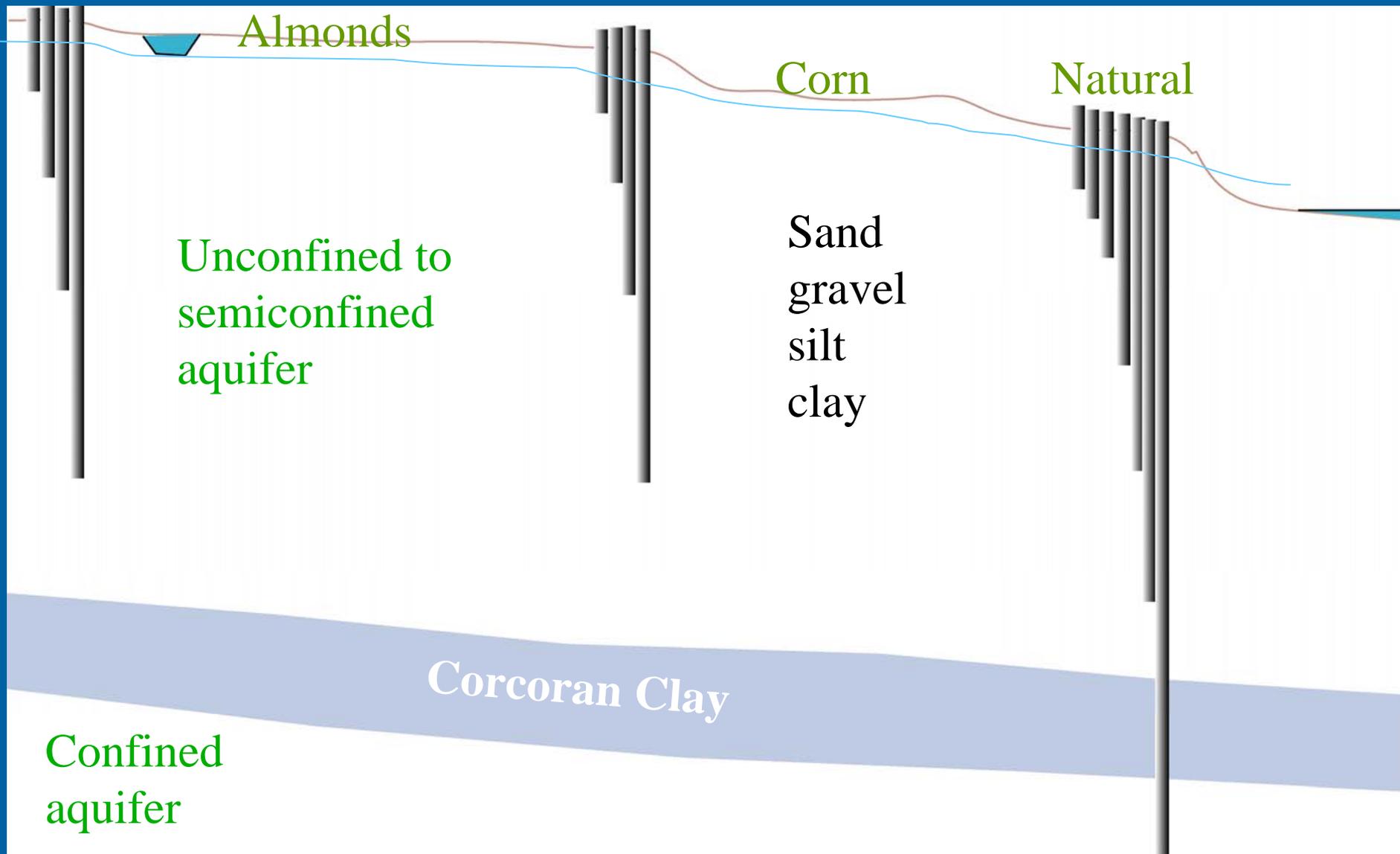


GROUND WATER



Monitoring

- **Water samples from 15 monitoring wells on flowpath and 1 monitoring well off flowpath**
 - April, August, and October
 - pesticides, CFC age dating, and dissolved gases (August only); major ions, nutrients, and isotopes (O, H, N)
- **Core samples from saturated zone (10)**
 - analyzed for bulk density, particle size analysis, iron/sulfide minerals, pesticides and carbon, and mineralogy





**SURFACE WATER AND
GROUND WATER
INTERACTIONS**

Equipment Installed

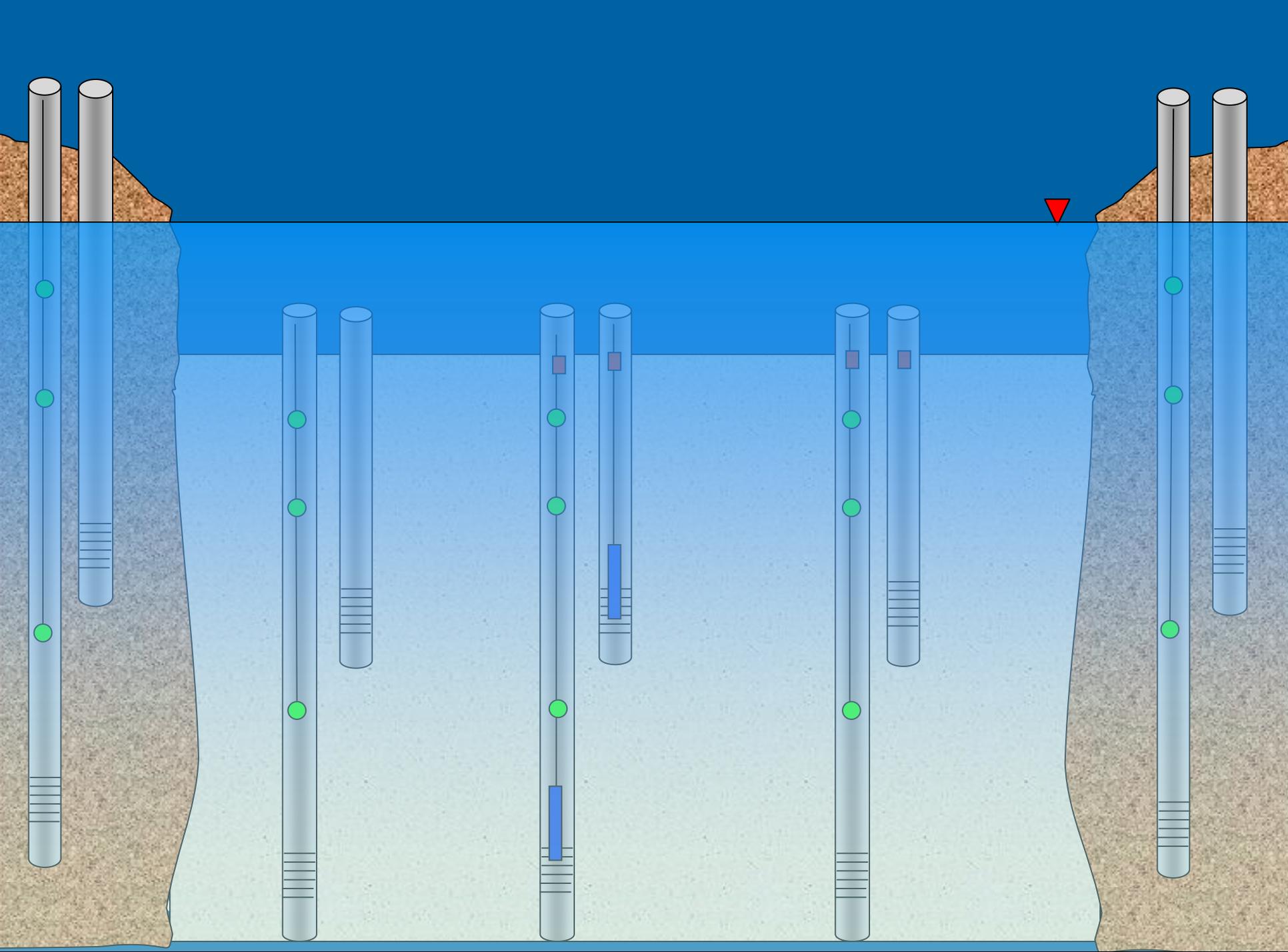
- 20 screened piezometers
- 32 temperature loggers
- 20 drive point tips
- 10 pressure transducers
- 3 multi-parameter meters
- 12 seepage meters (temporary)

Monitoring

- **Sample drive point tips (April, Aug, and Oct)**
 - pesticides, dissolved gases, and CFC age dating (August only); nutrients, major ions, and isotopes
- **Drive point synoptics (April and October)**
 - hydraulic, temperature, and dissolved oxygen gradients; samples for nitrate and sulfide below streambed
- **Seepage meters (April, Aug, and Oct)**
- **Continuous water quality and temperature**
 - download data from temperature loggers below streambed and water quality monitors in river and below streambed every 2 months
- **Sediment core samples (6)**
 - analyzed for same constituents as flowpath cores

Piezometer Installation

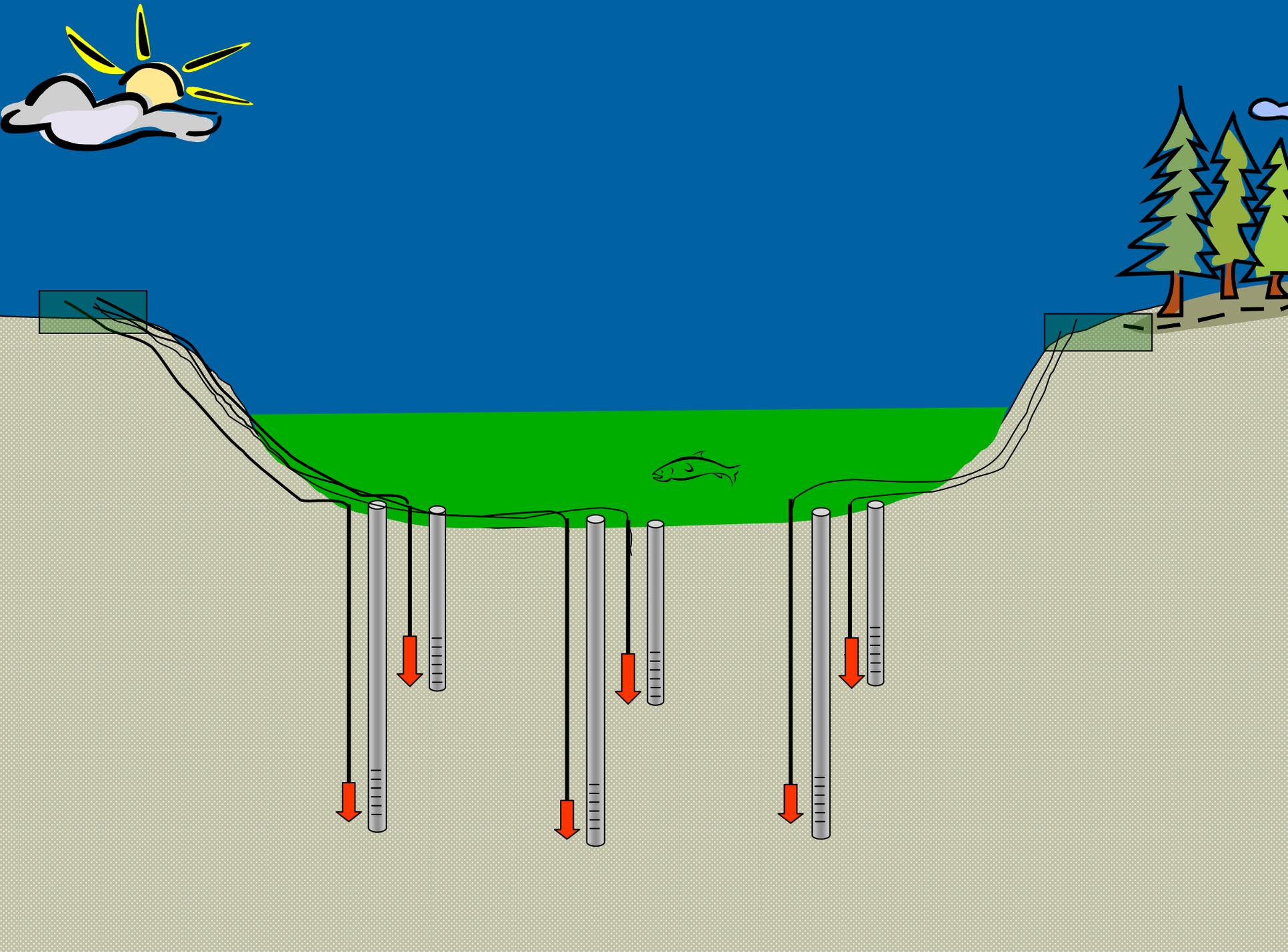






Drive Points



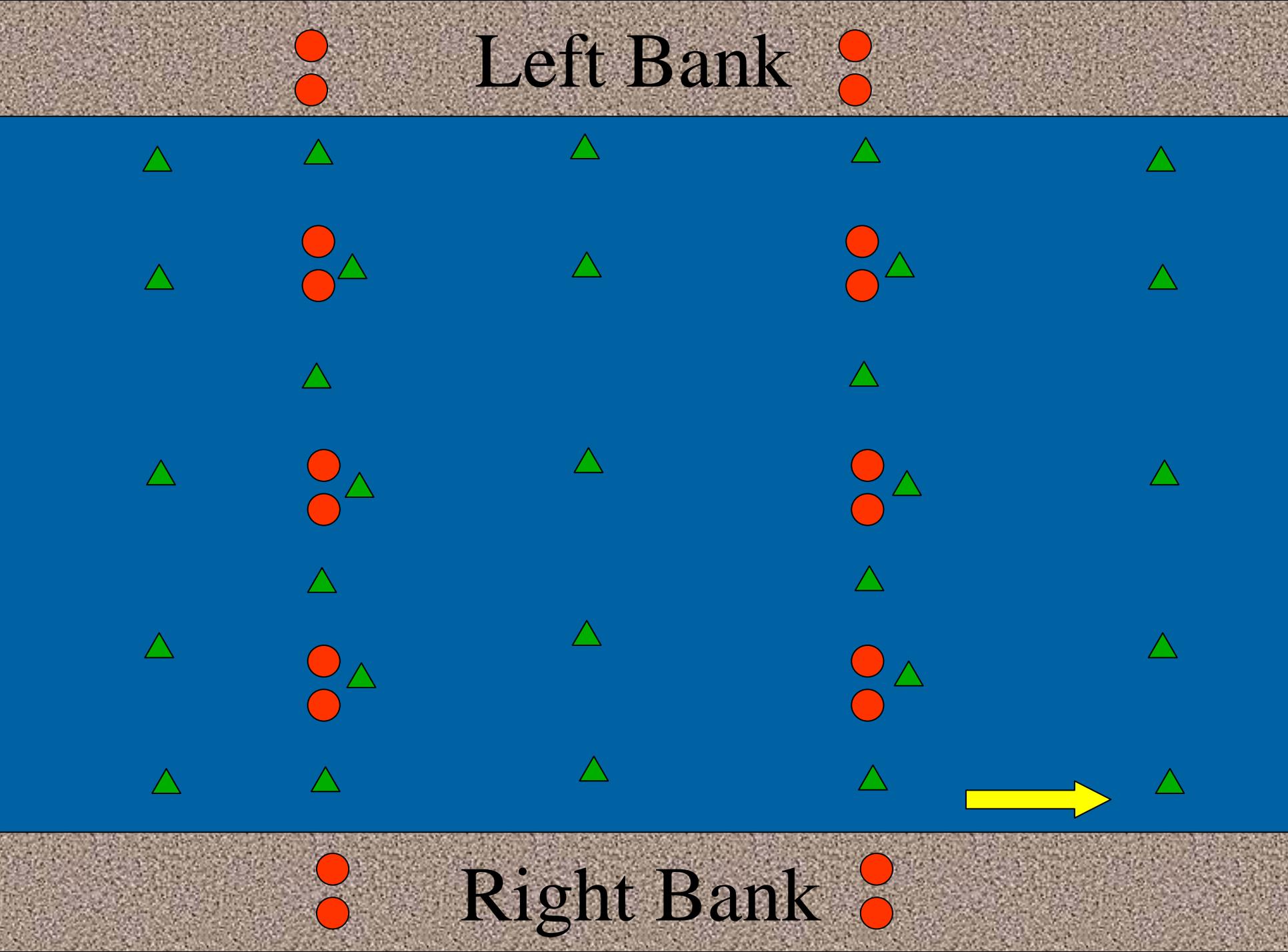






Drive point synoptic in Merced River





Left Bank

Right Bank

Seepage Meter (a direct measurement method)





