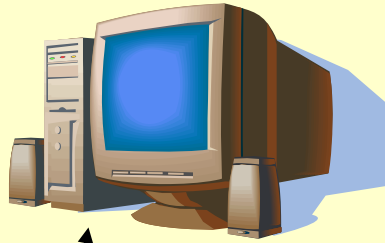




# Automated systems for monitoring weather and soil moisture

Brenna Aegerter  
UCCE San Joaquin County

# PERSONAL COMPUTER

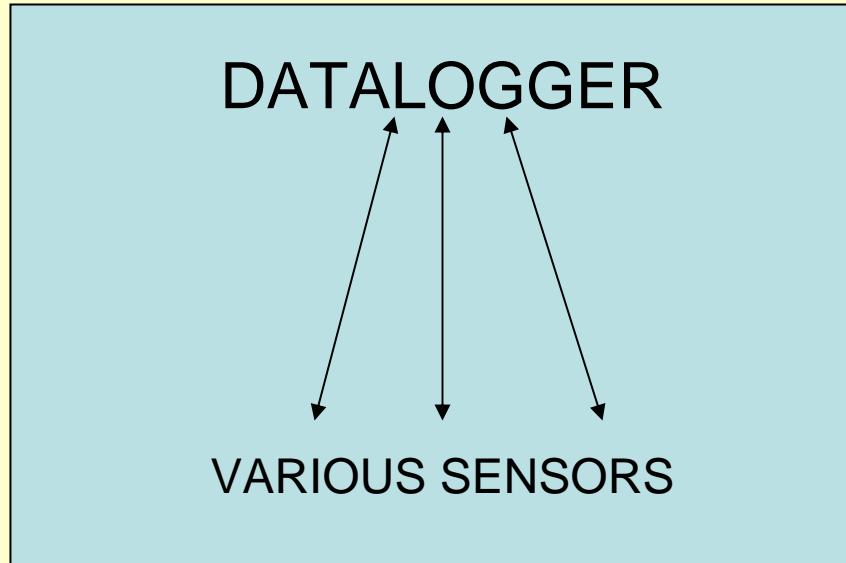


- direct connection
- telephone modem
- data "shuttle"

## COMMUNICATION

- Wireless connection
- radio telemetry
- cellular modem
- satellite

# AUTOMATED WEATHER STATION



# What are your needs?

- What do you want to measure?
- Do you need real-time data or historical data?
  - At end of season only? Once a week? Daily?









## Pros:

- Flexibility (sensors, communication options)
- High quality, durable
- Good product support



## Pros:

- Flexibility (sensors, communication options)
- High quality, durable
- Good product support

## Cons:

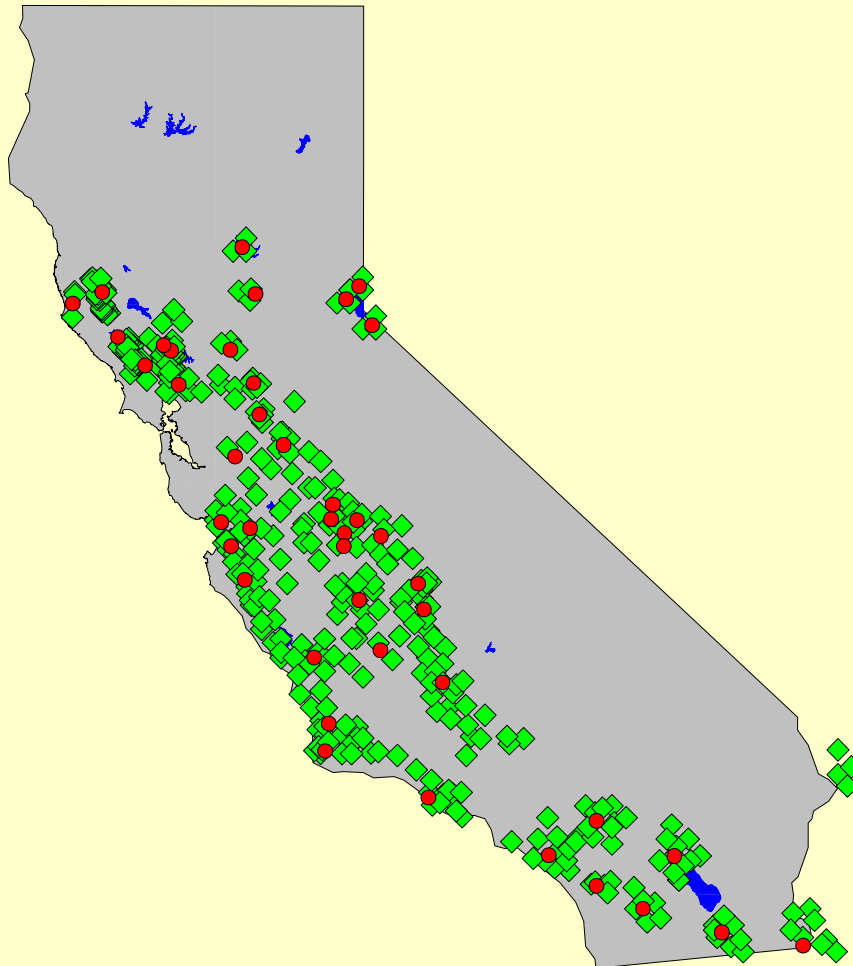
- Somewhat less user-friendly (though improving)

Support and service:  
Western Weather Group  
in Chico





# California Coverage



**60 receivers at WFS offices or large growers' offices**

- Central Valley
- Coastal
- Southwest
- Temecula/Riverside
- Napa/Sonoma
- North Sacramento Valley

Not reliant on cellular coverage, but does depend on base station, another weather station, or a repeater being within 12- 15 miles

# Adcon sensors

- Leaf Wetness
- Wind Speed & Direction
- Solar Radiation
- Rain Gauge
- Temperature & Humidity
- C-Probe Soil Moisture
- Watermark Soil Moisture
- Soil Temperature



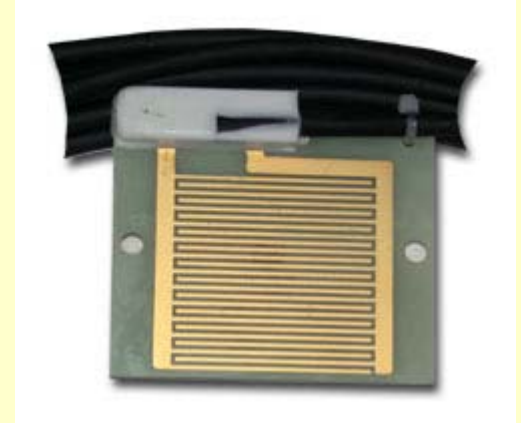


# Adcon software disease models

- Vine Powdery Mildew
- Vine Botrytis Bunch Rot
- Potato Blight
- Walnut Blight
- DSV – TomCAST
- Apple Scab
- Strawberry Botrytis/Powdery Mildew**
- Pistachio Blight



# Leaf Wetness Sensors



- Datalogger reads a resistance measurement
  - recorded as between 0 and 6999 (Campbell)
  - or between 0 and 10 (Adcon)
- You must decide what resistance measurement correlates with wet leaves in your location

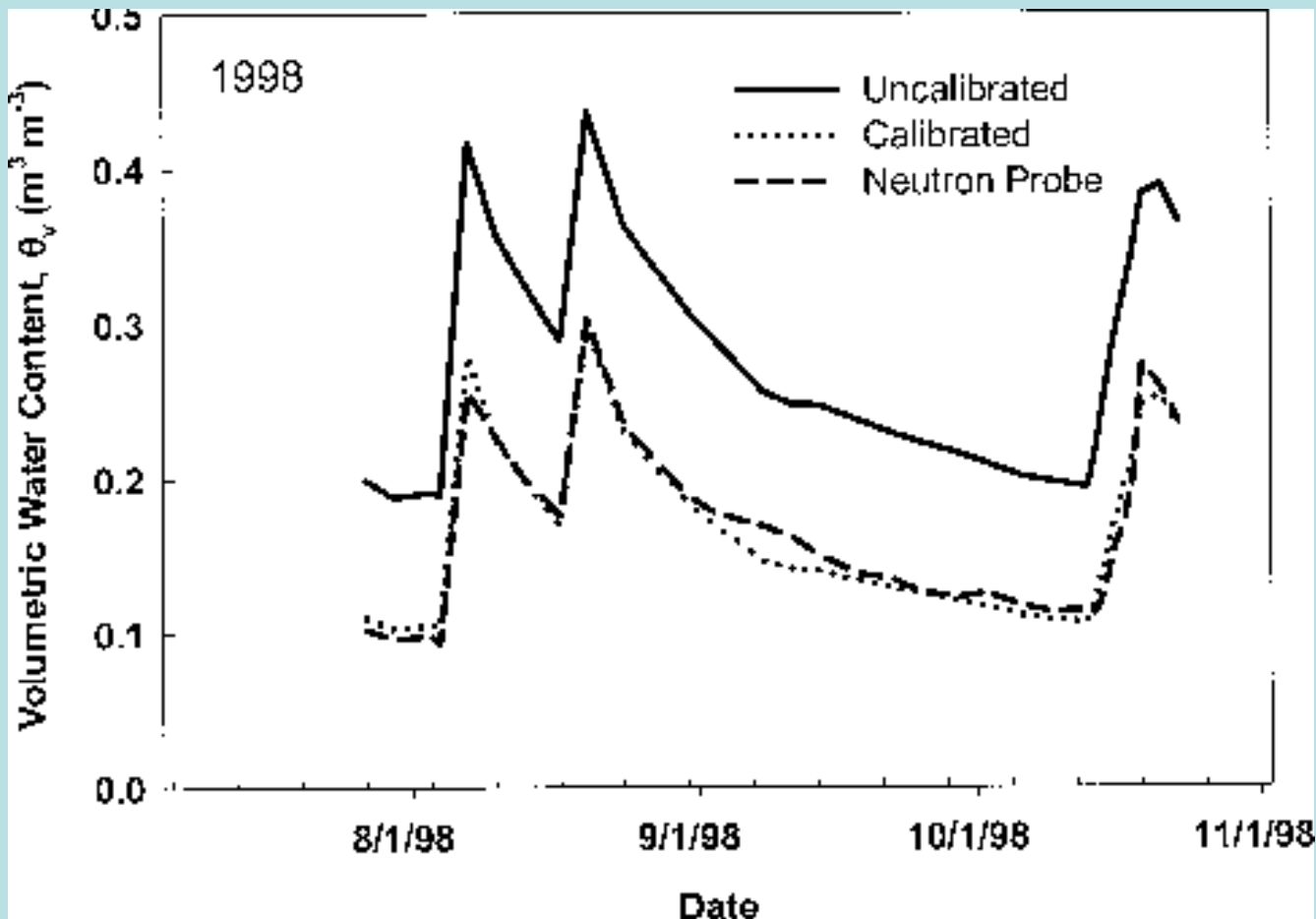
# Measuring soil water status

- Soil Water Potential (Centibars suction – measurement of soil moisture tension)
  - ✓ Tensiometer (with pressure transducer)
  - ✓ Gypsum or granular matrix (Watermark™) blocks
- Volumetric Water content (% , in/ft)
  - ✗ Volumetric soil sampling
  - ✗ Neutron probe
  - ✓ Dielectric sensors
    - ✓ Capable of being automated
    - ✗ Cannot be automated

# Dielectric soil moisture sensors

- Use an oscillating voltage to measure the capacity of a non-conducting material to transmit electromagnetic waves or pulses
- Mostly affected by water content, though also by other factors, soil-specific calibration required

# Dielectric soil moisture sensors must be calibrated to your soil



# IRROMETER CO.



8 sensors capacity:

Watermark soil moisture sensors  
RSU-equipped irrometer tensiometers  
Irrometer soil temperature sensors  
On/Off Switches – irrigation events

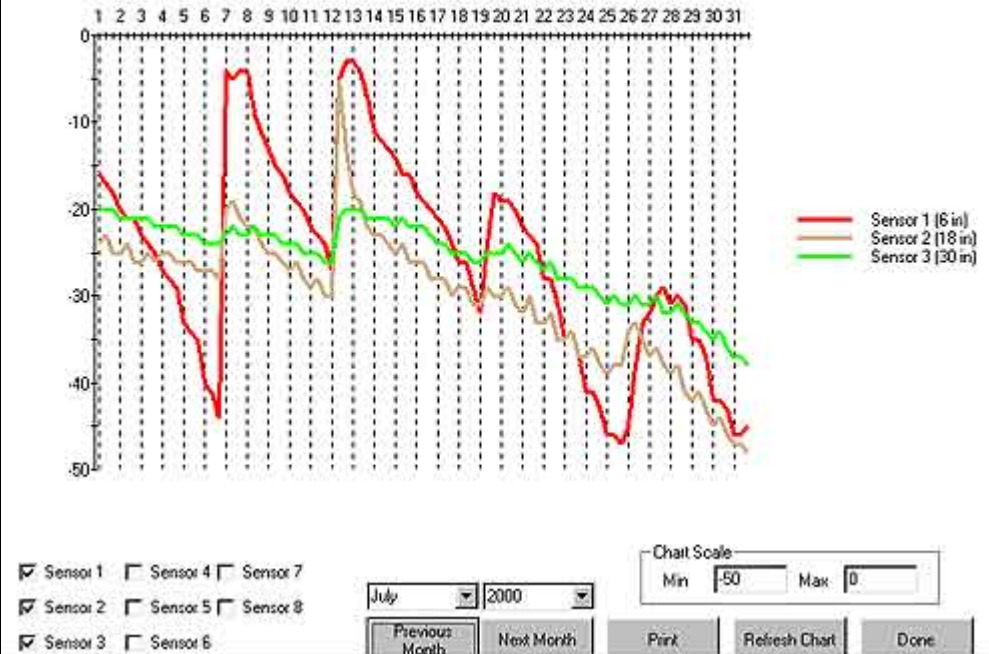
Communications options







## Smith Orchard - July, 2000



# Communications Options

	Campbell Scientific	Adcon Telemetry	Spectrum/ Watchdog	Onset/ Hobos	Hansen	Watermark monitor
IN-FIELD DISPLAY	X opt		+/-		X	X
DIRECT CONNECTION	X		X	X	X	X
PDA CONNECTION					X	X
RF TELEMETRY (distance)	various, up to 60 miles	1 mile or 12- 15 miles	1,000 ft or 2 miles	5 miles	---	14 miles
unlicensed radio modems	X	X	X	X		X
900 MHz	X					X
2.4 GHz	X					
licensed radio modems (UHF/VHF)	X					
CELLULAR MODEMS	X	X	X	X		X
SATELLITE MODEMS	X			X		
TELEPHONE MODEM	X			X		
SHORT-HAUL MODEM	X					
ETHERNET	X					

# Things to consider...

- Logging interval
- Sensor placement
- Set-up (wiring, programming, initial sensor calibration)
- Maintenance (sensor manufacturer calibration, battery replacement)\*