# Moving Hydromet-Testbed Research into State Flood Management Operations—

*Creating a Legacy Network and Partnership*

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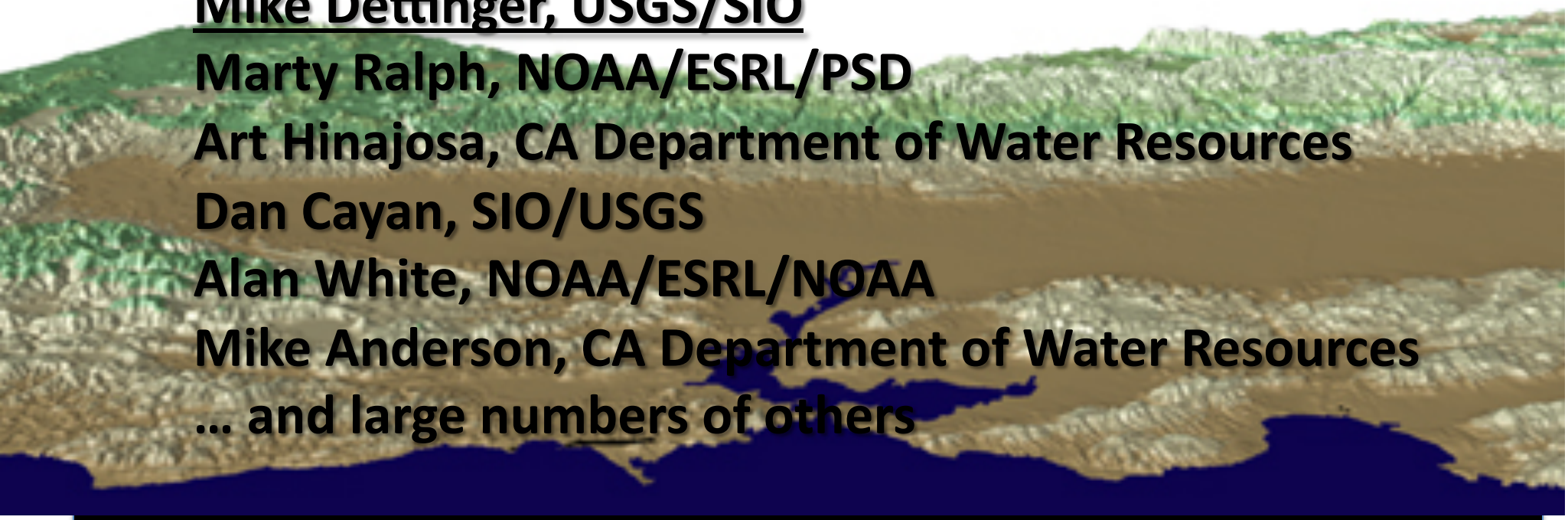
**… and large numbers of others**



# NOAA's Hydromet Testbed Program(s)

**HMT Activity Areas**

QPE (Quantitative Precipitation Estimates)

QPF (Quantitative Precipitation Forecasts)

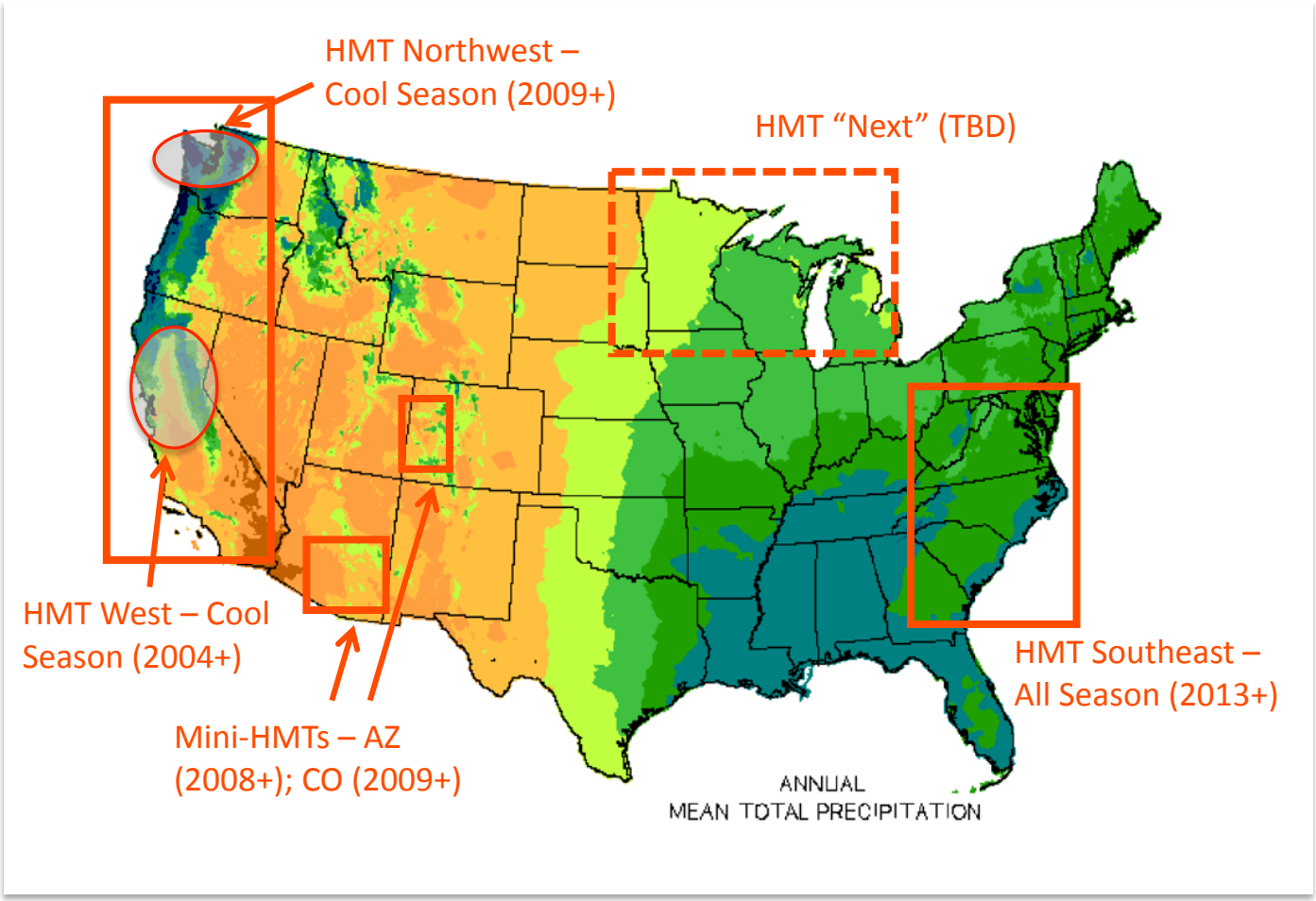
Snow Information

Hydrologic Applications & Surface Processes

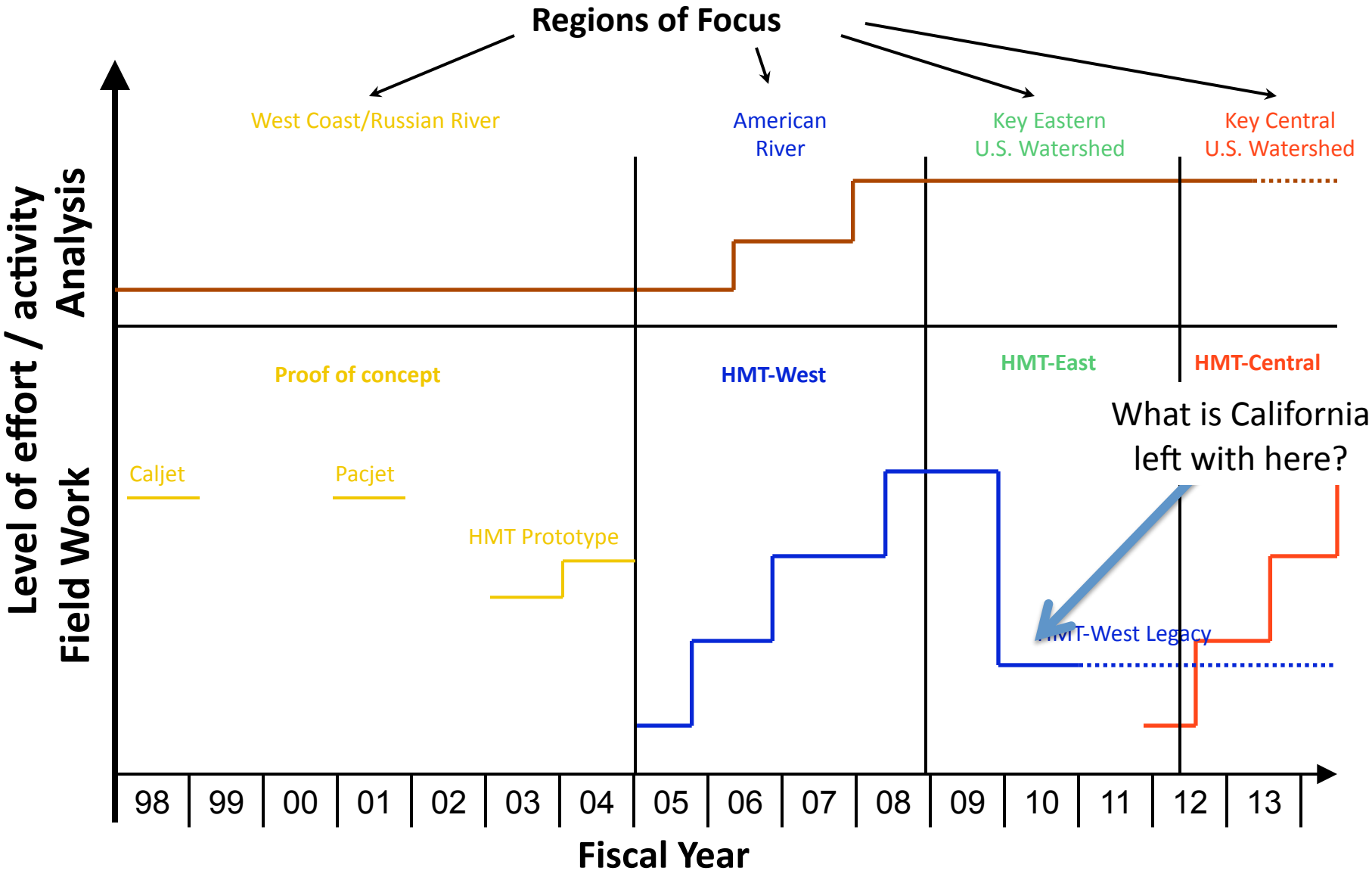
Debris Flow

Decision Support Tools

Verification



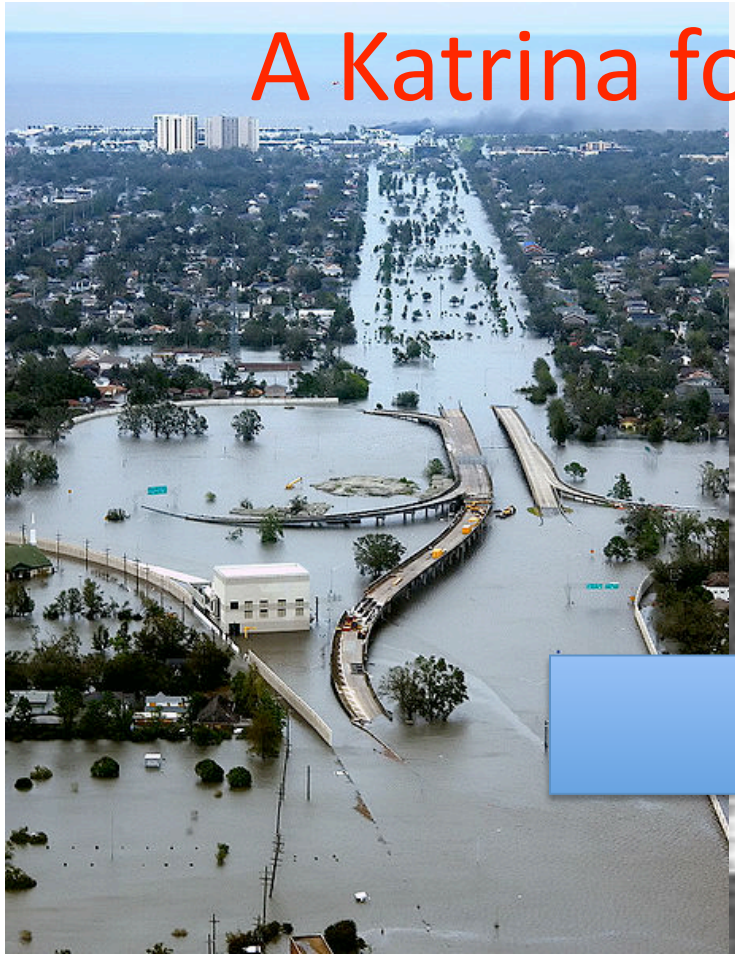
# Hydrometeorology Testbed Timeline




NOAA Hydrology Program
(Water Resources Data Assimilation)

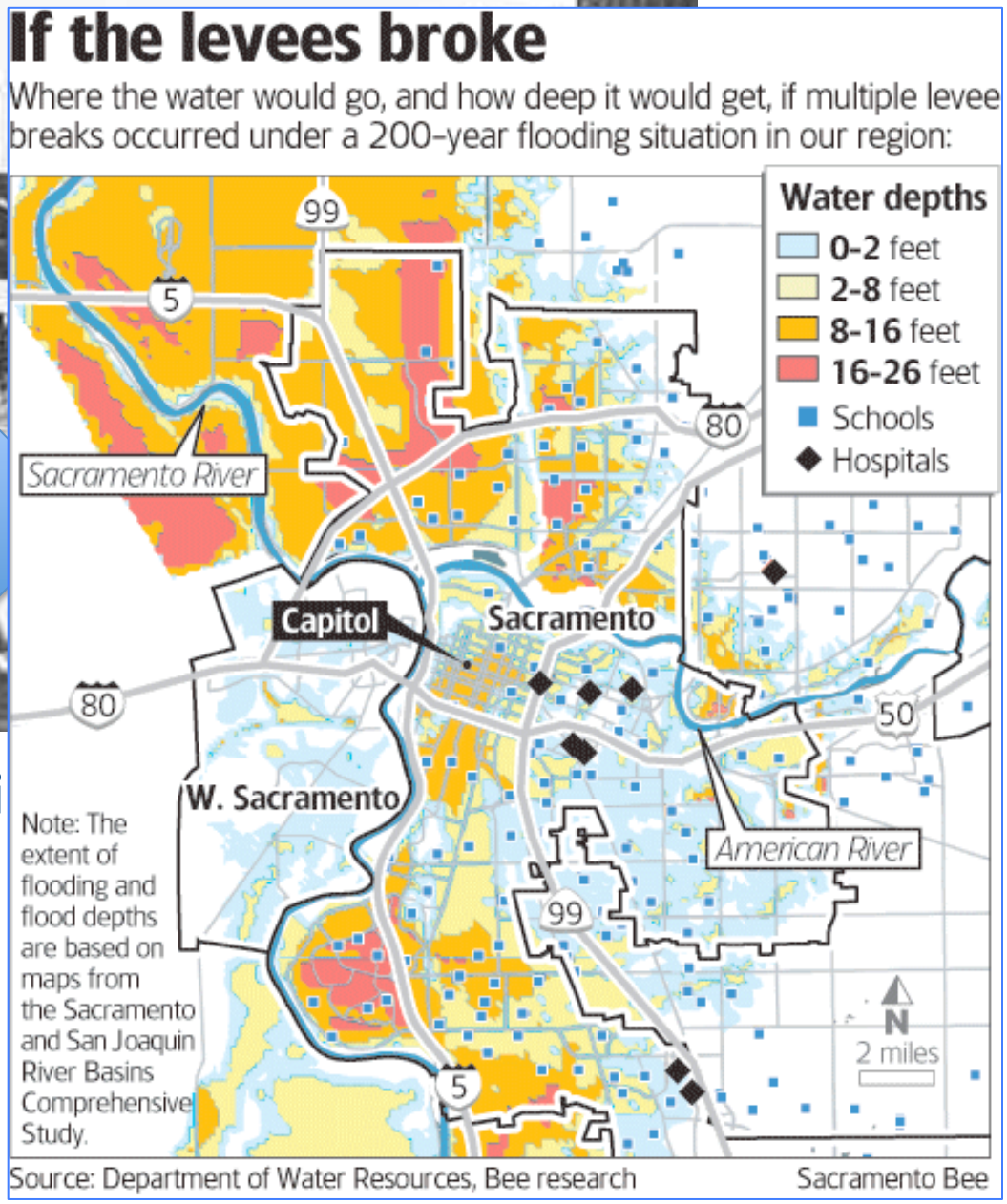
NOAA Science and Technology Infusion Program
(Hydrometeorology Testbed)

# A Katrina for California?



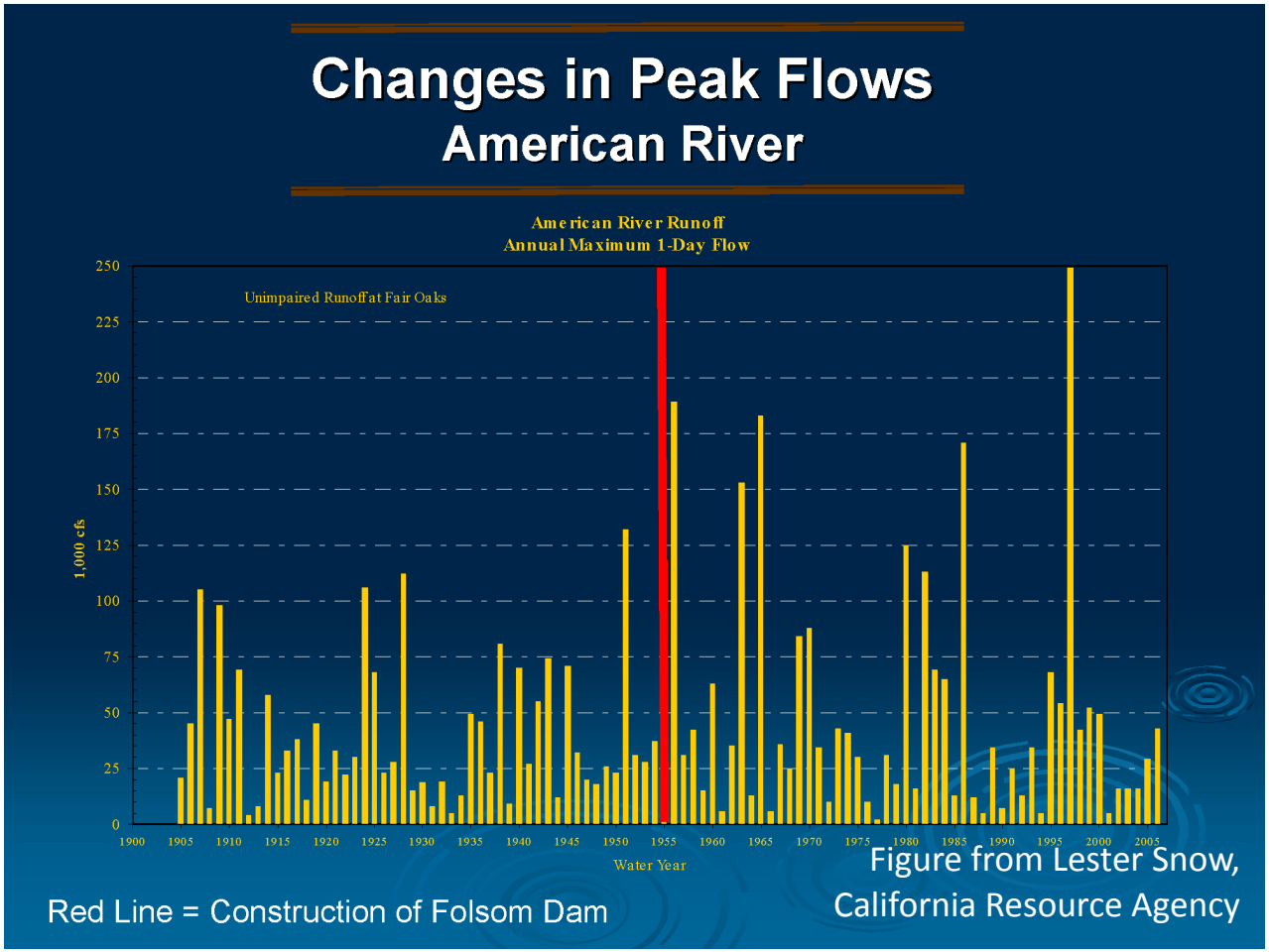
**Northwest New Orleans, 2005**

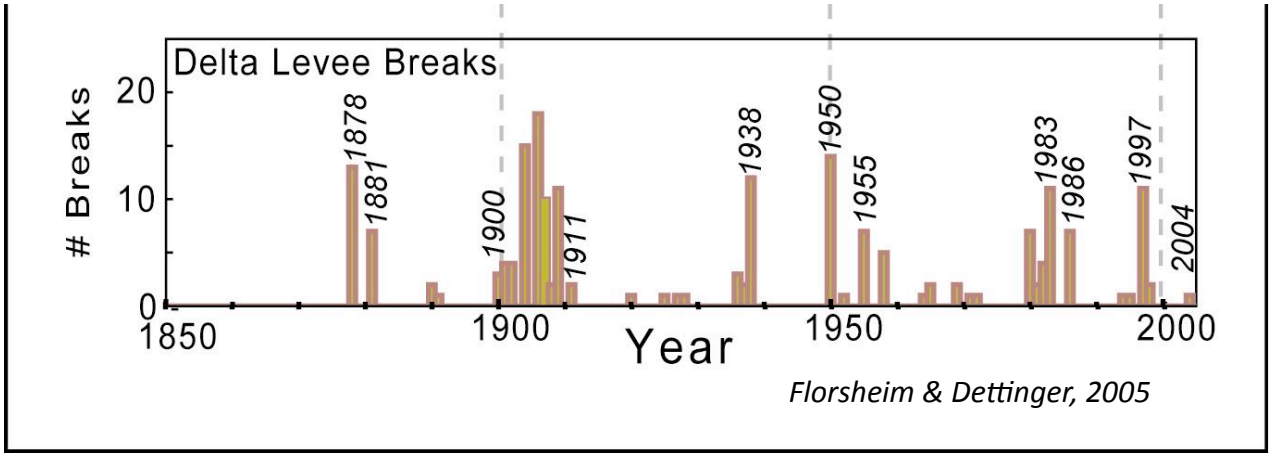
**K St i 1862**




Many levees in Central Valley area cannot be certified for more than 100-yr floods

**The flood vulnerabilities, together with perceived growing flood risks & a continuing history of levee breeches** has motivated Californians to get very serious about flood management, risks and science in recent years.



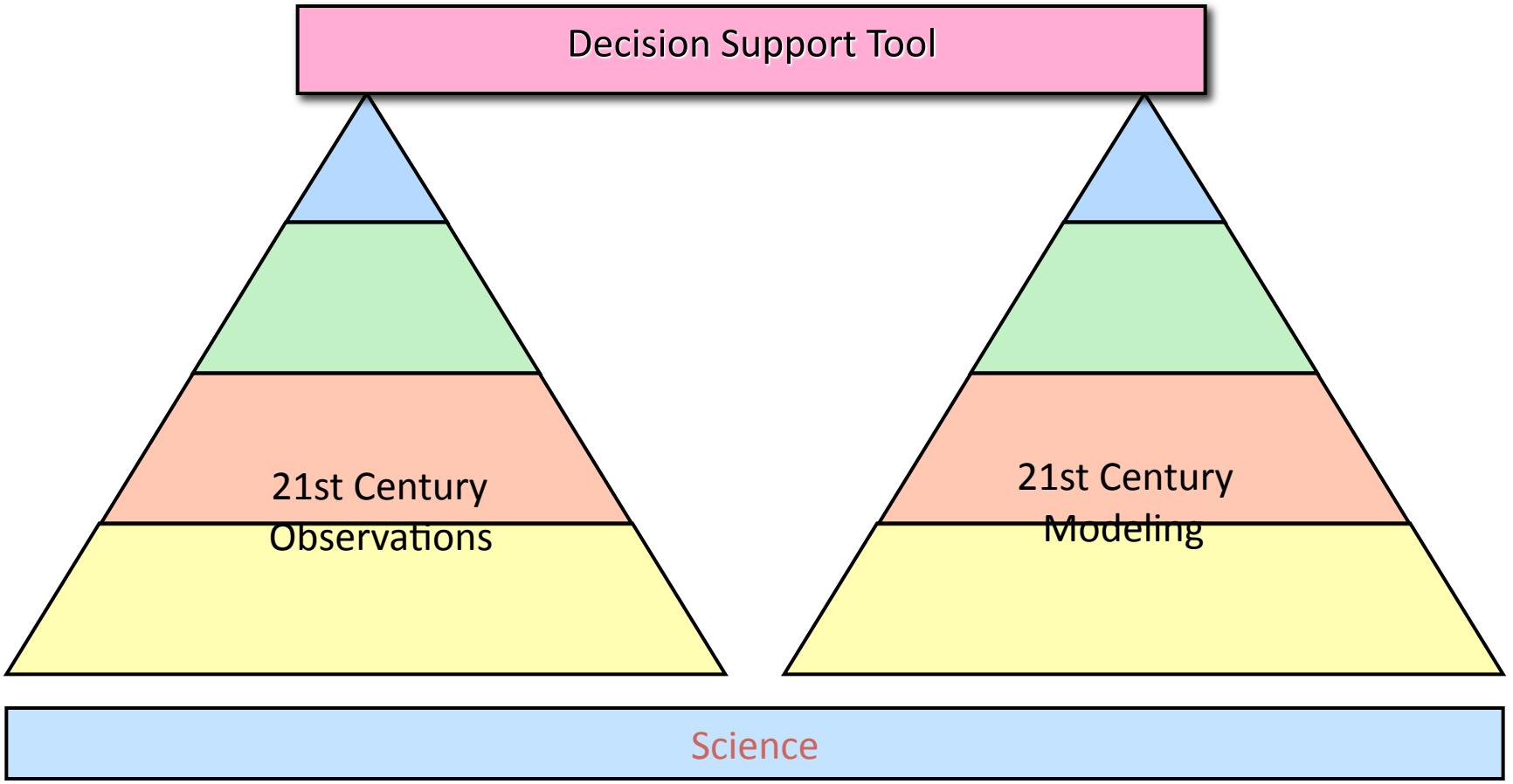



# Proposition 84

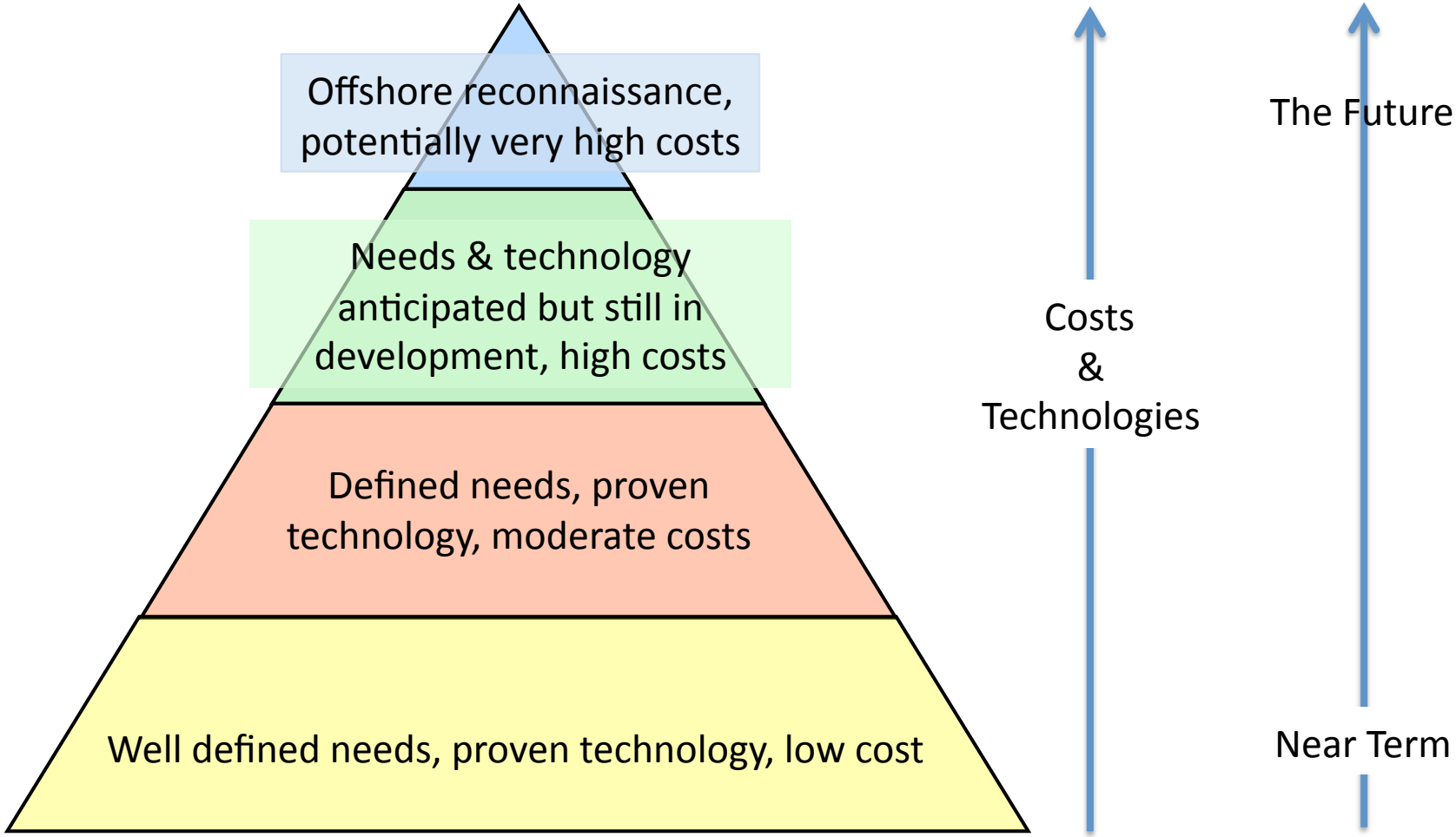
- Passed by Californians with 54% vote in 2006
- $5.4 billion dollars in bonds to fund programs for safe water supply and quality, flood control, park improvements and natural resource protection

- Perceived needs for operationalization of recent & ongoing flood meteorology/hydrology research by key managers at DWR has led to $7.5 million funding (matched by NOAA) of joint NOAA/DWR/ Scripps network-enhancements effort

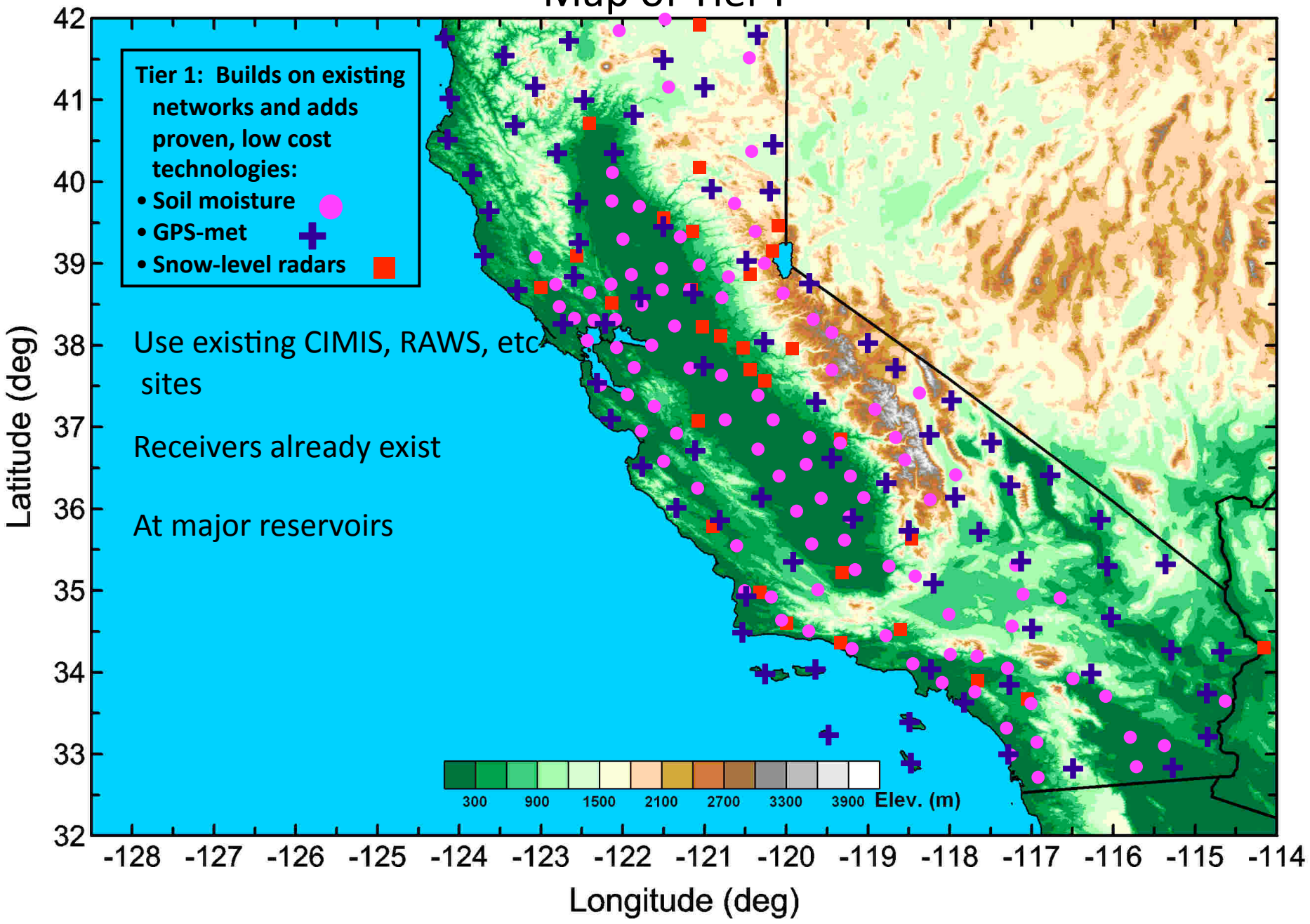
# A Tiered Proposal for HMT Legacies & California Flood Science



# A Strategy of Next Generation Observations



# Map of Tier I


Tier 1: Builds on existing networks and adds proven, low cost technologies:
• Soil moisture
• GPS-met
• Snow-level radars
Use existing CIMIS, RAWS, etc sites
Receivers already exist
At major reservoirs
300
900
1500
2100
2700
3300
3900
Elev. (m)
Latitude (deg)
Longitude (deg)
42
41
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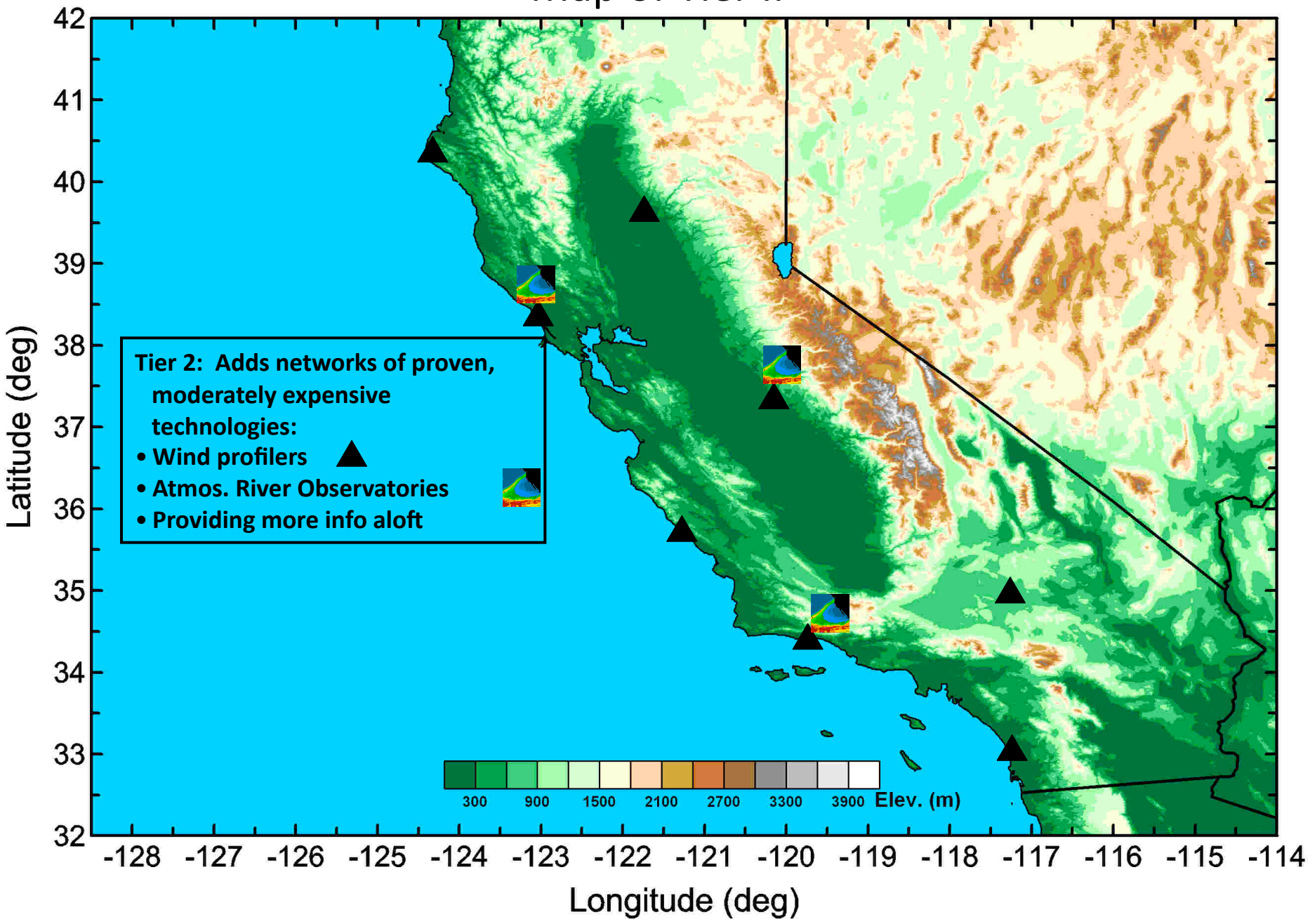
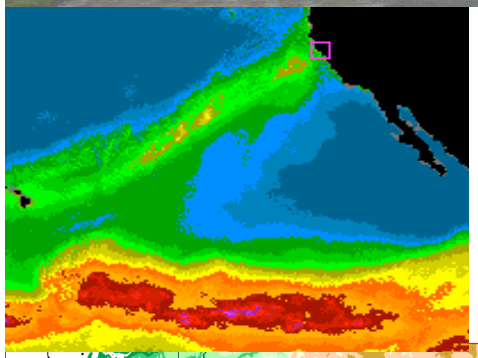
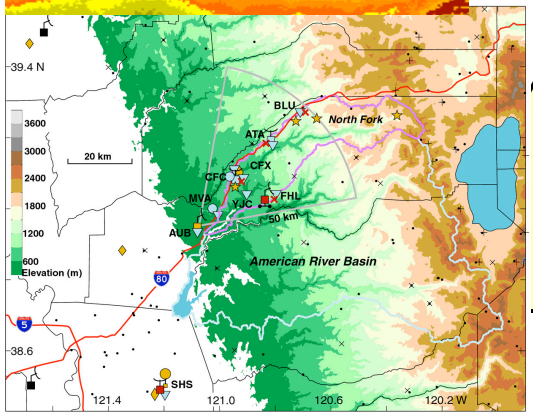
-114

# Map of Tier II



# A long-range tiered approach for future obs






IV: Off-shore recon.

Tier III: Newer technology
Ex: Gap-filling radars, Buoy-mounted WPs

Tier II: Expand on well-defined needs with proven technology
Ex: Wind profilers, Coastal Atmospheric river observatory

Tier I: Address well-defined needs with proven technology
Ex: Soil moisture sensors at CIMIS sites, GPS receivers of opportunity, snow-level radars

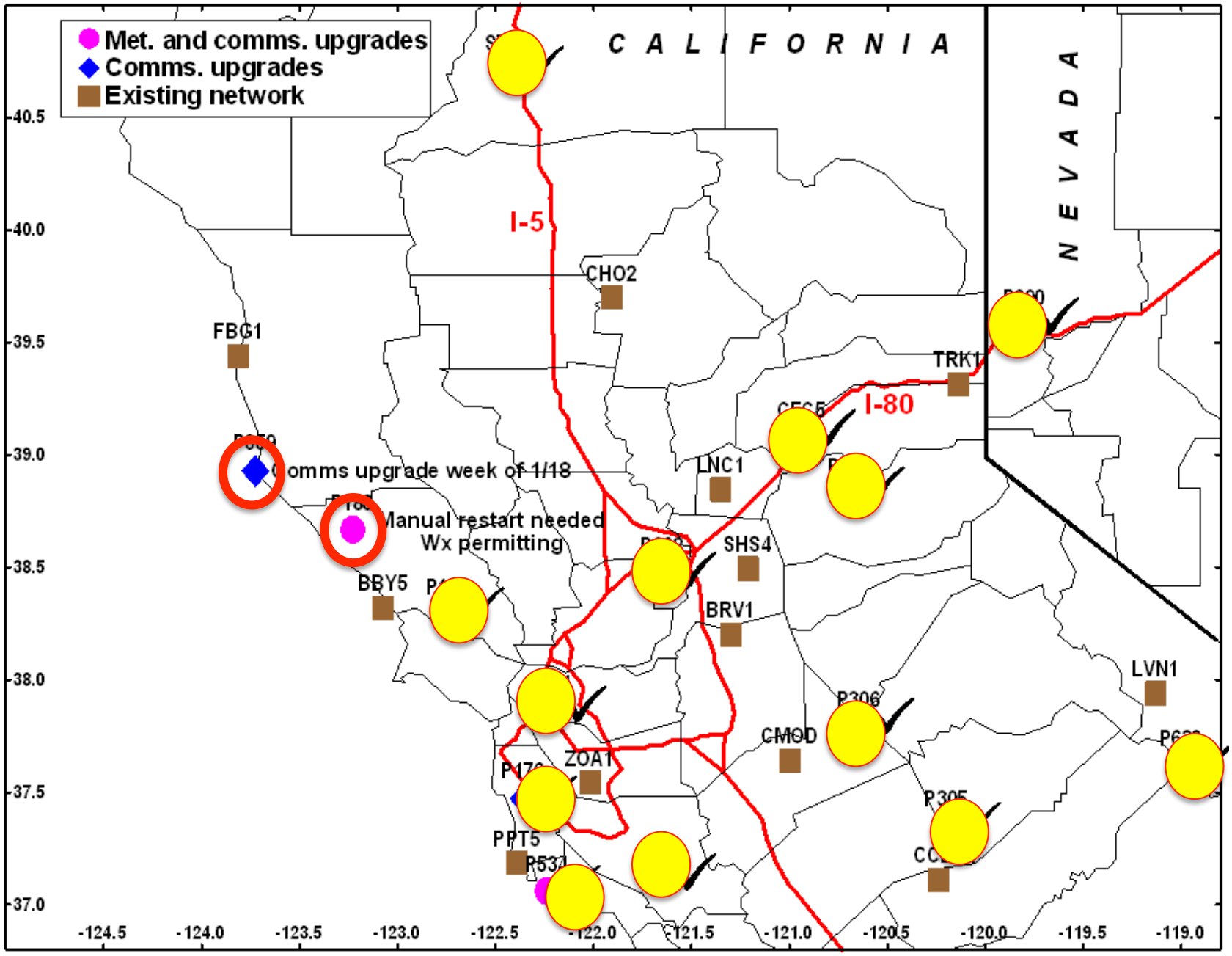
# A Federal – State Partnership to Develop HMT-Legacy Networks & DSTs

**California DWR** – Funding, planning & management, aspects of O&M, eventual data management -- > $7.5M over 5 yr

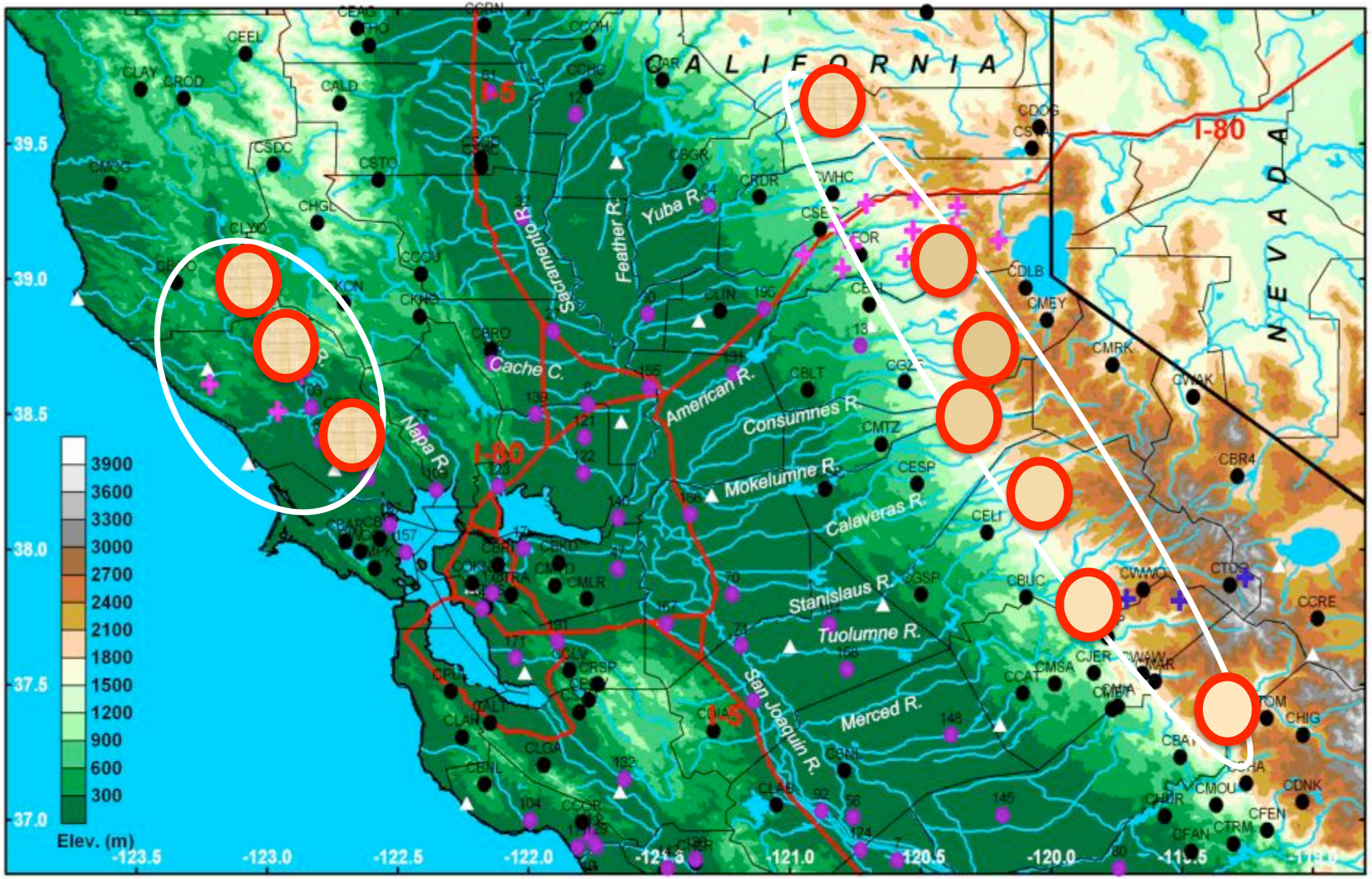
**NOAA ESRL & CNRFC** – Funding, planning & management, primary installations, technology development, O&M, immediate data management, forecast improvements, DSTs -- > $7.5M+ over 5 yr

**SIO/CAP RISA** – Planning & management, aspects of O&M, some installations

**Status --** Initial NOAA/DWR MOUs in place; SIO/DWR arrangements held up in California budget issues; year-one efforts highly successful

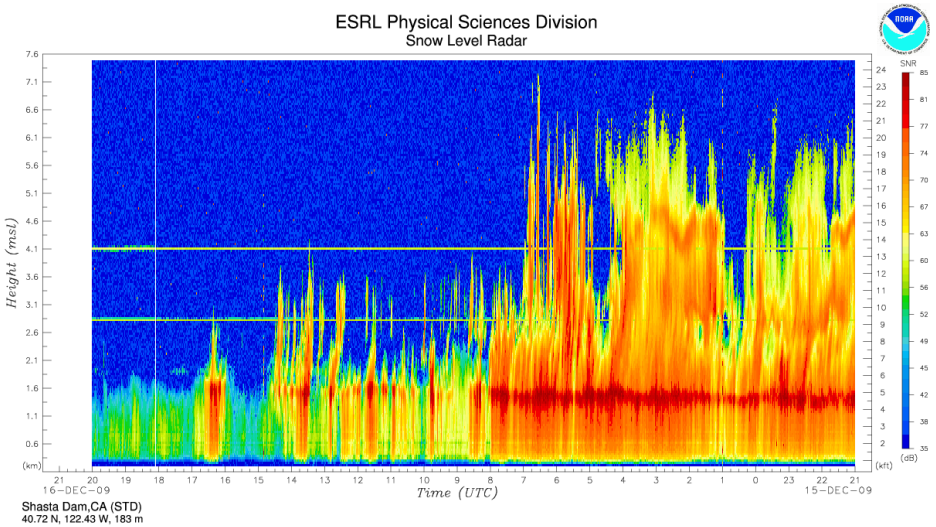



**Year 1** GPS Network: 13 out of 15 new sites installed and reporting data



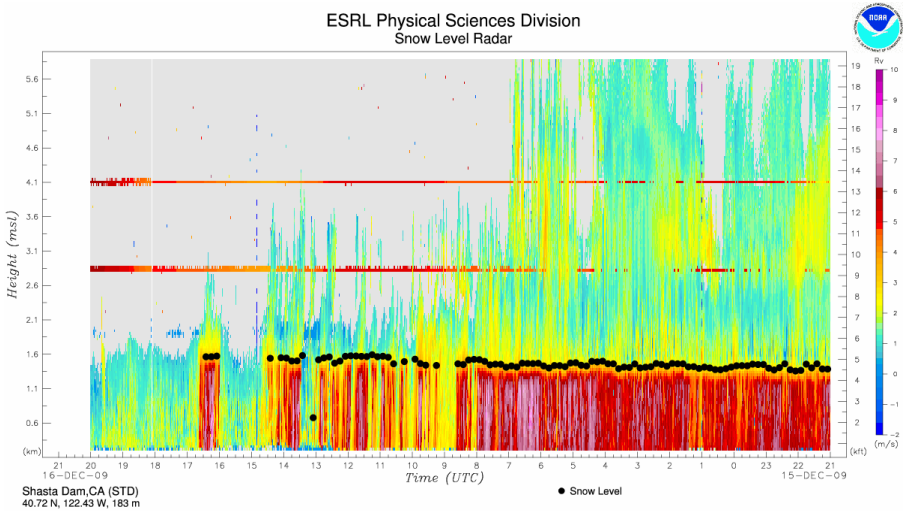

**Year1** Soil Science Network

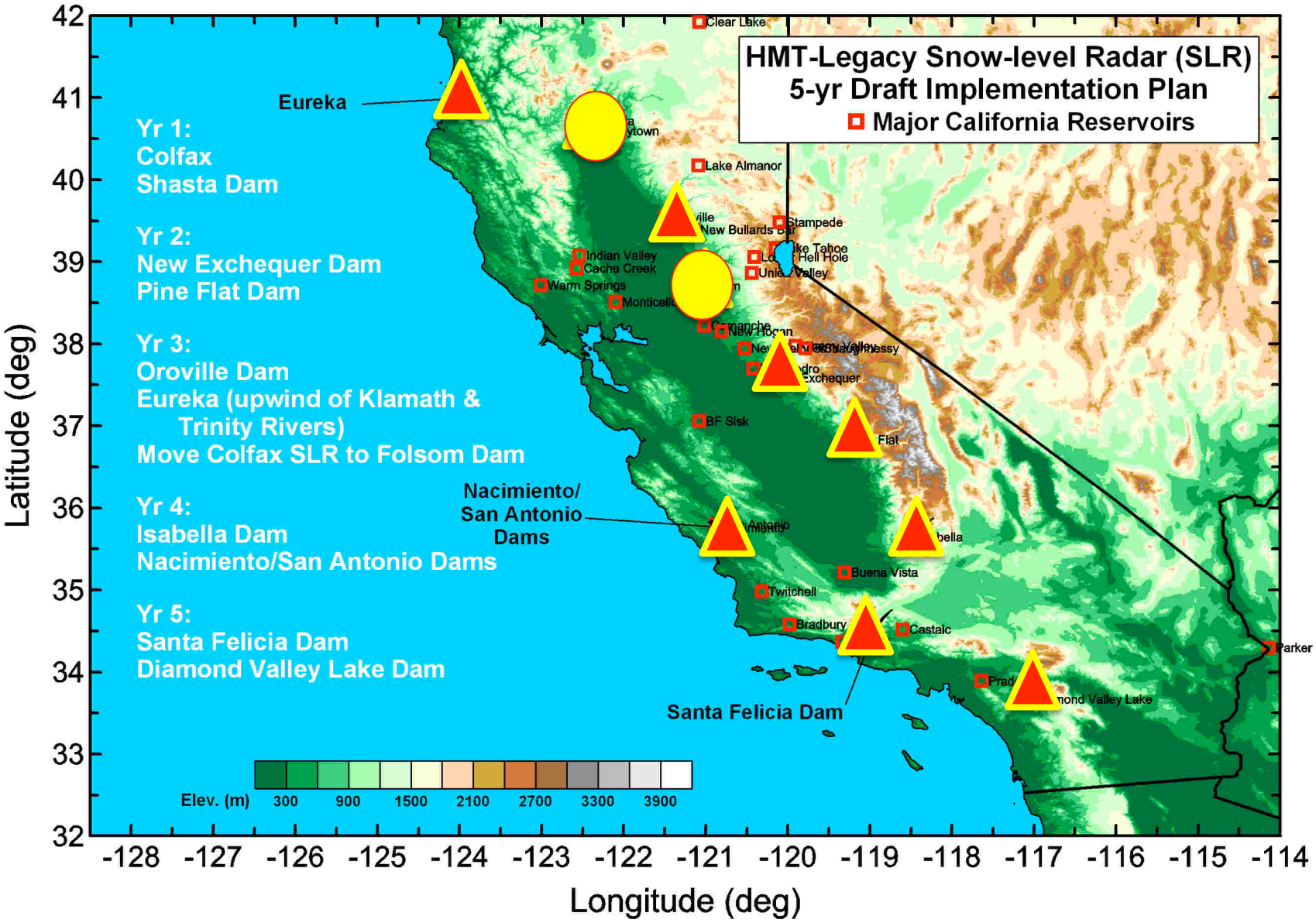
Black dots = RAWS sites
Purple dots = DWR rain gauge sites
Pink plus symbols = HMT soil science sites
Blue plus symbols = SIO soil science sites
White triangles = Year 1 and existing GPS-met sites




## Snow-level Radar at Colfax

## Snow-level Radar at Shasta Dam




HMT-Legacy Snow-level Radar (SLR)
5-yr Draft Implementation Plan
Major California Reservoirs
Yr 1:
Colfax
Shasta Dam
Yr 2:
New Exchequer Dam
Pine Flat Dam
Yr 3:
Oroville Dam
Eureka (upwind of Klamath &
Trinity Rivers)
Move Colfax SLR to Folsom Dam
Yr 4:
Isabella Dam
Nacimiento/San Antonio Dams
Yr 5:
Santa Felicia Dam
Diamond Valley Lake Dam
Eureka
Nacimiento/
San Antonio
Dams
Santa Felicia Dam
Clear Lake
Lake Almanor
Stampede
Indian Valley
Cache Creek
Warm Springs
Monticello
Hell Hole
BF Sisk
Flat
Buena Vista
Twitchell
Bradbury
Castaic
Parker
Elev. (m) 300 900 1500 2100 2700 3300 3900
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Longitude (deg)
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# **Data access:** http://www.esrl.noaa.gov/psd/data/obs/sitemap/California

U.S. Department of Commerce | National Oceanic & Atmospheric Administration | NOAA Research

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- S-Band Precipitation Profiler
- Surface Meteorology

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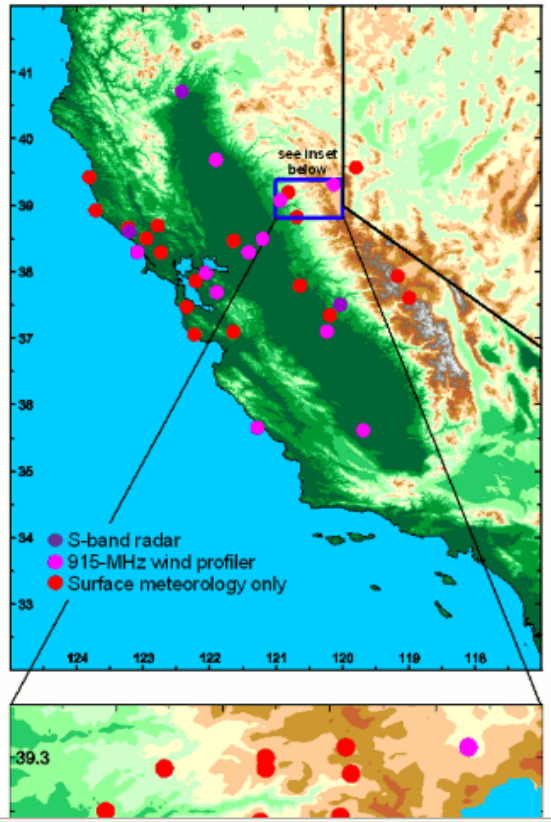
- Hydrometeorological Testbed
- Weather/Climate Connection

## California

Click on site dots to display images, or use text access

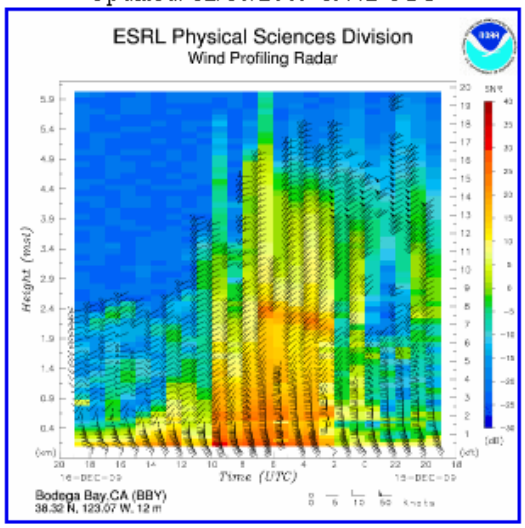



## Bodega Bay, CA

915 MHz Signal to Noise Ratio | 915 MHz Wind Barb | 915 MHz Snow Level | Integrated Water Vapor Flux | Virtual Temperature | Virtual Potential Temperature | Surface Meteorology

Click on thumbnail image to display full size.

Updated: 12/16/2009 19:42 UTC

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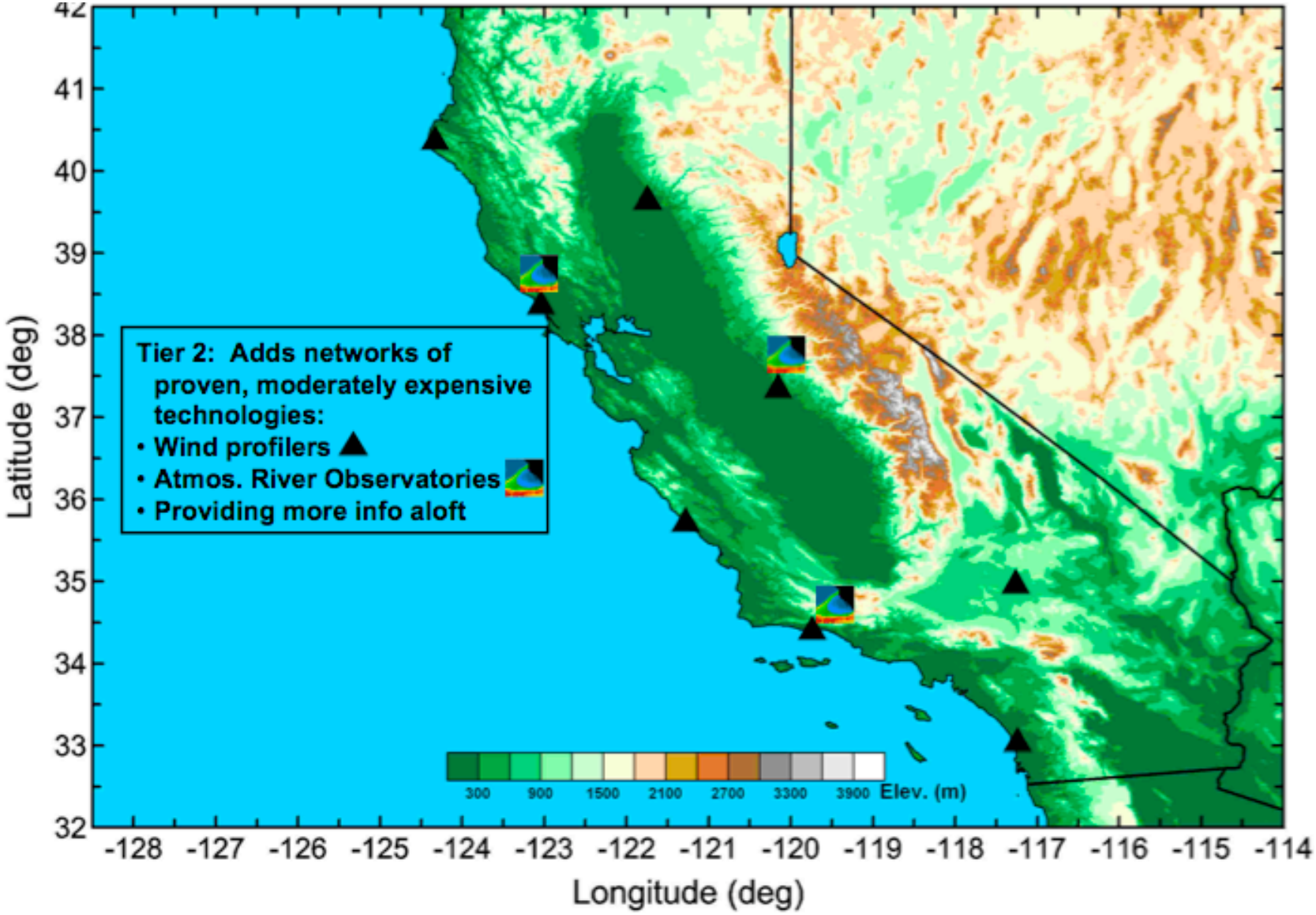
# Deliverables from a Functioning HMT-Legacy Partnership (Tiers 1 & 2)

- A fully integrated GPS-Met network (84 sites)
- A fully integrated soil moisture network (100 sites)
- Strategically placed network of snow level radars (24 sites)
- Nested Global/Regional Modeling System Established
- Multi model runs (ensembles) for assessment of uncertainty
- Advanced probabilistic forecasts
- Advanced workstation display systems deployed to NWS and other locations
- A core DST system integrating Tiers 1 and 2 components and latest science
- Atmospheric river observatories (3 sites)
- Additional wind profiler observing systems besides those at AROs (5 sites)

*TIER 2 & LONGER TERM O&M DETAILS NOW BEGINNING NEGOTIATION*

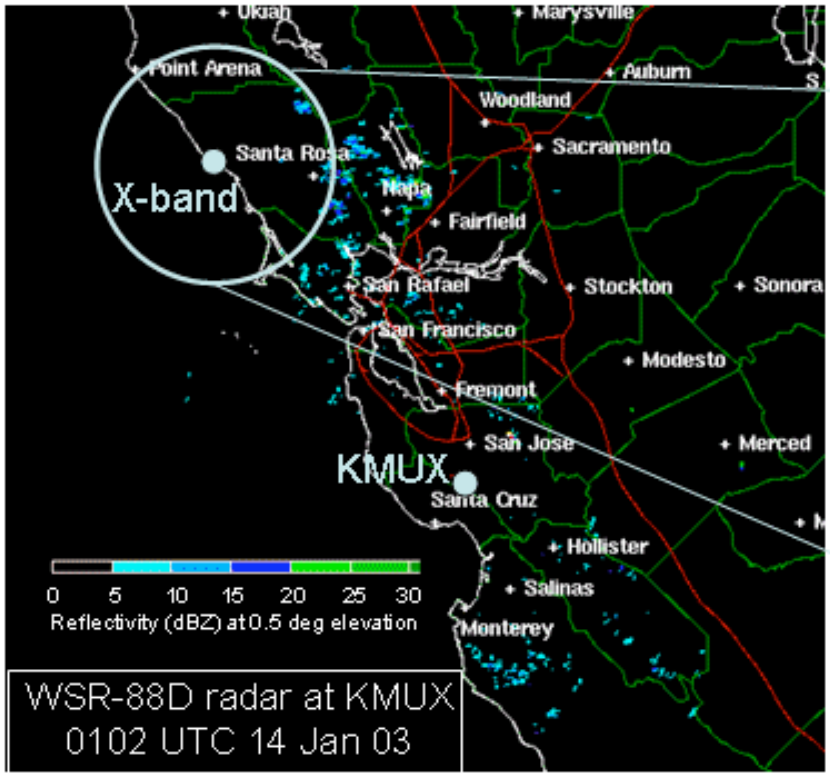
# Tier-II Basemap

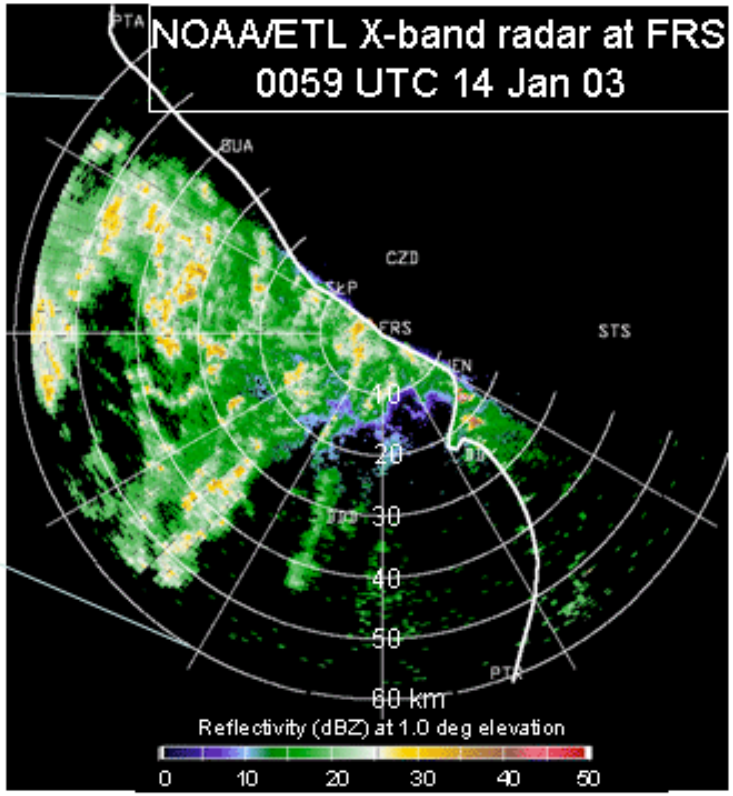
*(actually, several different location plans are on the table currently)*



# Tier 3: Gap Filling Scanning Radars

## PACJET-2003: NOAA/ETL Gap-Filling X-band Radar



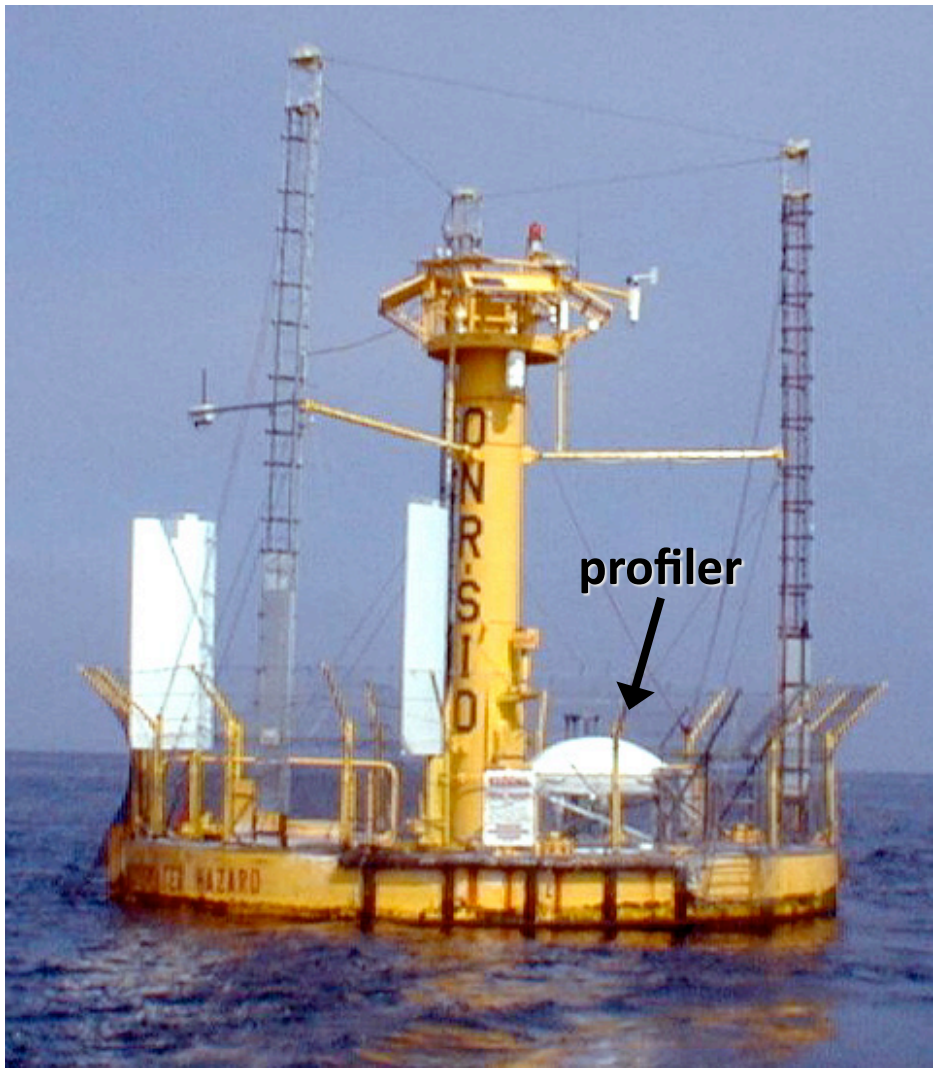




- Nearest NEXRAD radar sees no significant echoes approaching flood-prone watershed

- NOAA/ETL's Coastal X-band radar fills NEXRAD gap

# Tier 3: Buoy-mounted wind profilers

- Coastal and marine weather prediction suffers from a relative sparseness of coastal and offshore observations.
- USWRP Report No. 2 noted that "the most serious gap in the current observing system for 1-5 day forecasts is the absence of wind profiles, especially over the northeast Pacific Ocean."
- A formal BMWP technology evaluation is part of the FY09-FY13 program plan in NOAA.



# Tier IV – Offshore Reconnaissance Program