HEC5Q – Model Representation and Capabilities

- Well stratified reservoirs - vertically segmented and laterally averaged
- Weakley stratified reservoirs – Layered and longitudinally segmented
- Streams – Fully mixed segments typically ½ mile or less in length
- Daily average flows and 6-hour water quality time steps
- Simulation period – 1921 (CALSIMII based) to present
- Inflow temperature algorithm based on meteorology and seasonal tendencies
  - Reservoir specific outlet coding (e.g., TCD, power bypass, submerged dams, etc.)
  - Reservoir releases based on downstream temperature objectives and flow constraints
  - CALSIMII output preprocessor – Provides inputs to HEC5
  - CIMIS data preprocessor – Development / Extrapolation of heat exchange parameters and pool water temperature for thermal assessment and detection of bad data.
- Graphical User Interface.
San Joaquin River Basin
Water Temperature & EC Model

Resource Management Associates & Watercourse Engineering
Sponsors: Water district stakeholders, CALFED, Reclamation & CDFW
Computed and Observed Temperatures
San Luis Reservoir: April – August 2006

(Inflow from California Aqueduct and DMC - Delta Origin)
Computed and Observed Temperature
DMC above the Mendota Pool

(Delta versus San Luis origin)
Computed and Observed Temperatures (Forebay Temperature)
Millerton Lake: January 2006 – August 2006

Impact of Hydrology on Cold Water Resource - Higher Runoff Volume
Impact of Hydrology on Cold Water Resource - Lower Runoff Volume
Computed and Observed Temperatures
San Joaquin River Downstream of Friant Dam
Computed and Observed Temperatures (Multiple observed profiles)
Lake McClure: March - November 2005
Computed and Observed Temperatures - Merced River

Hatchery (mile 52)

Upper Robinson (mile 45)

Gallo Ranch (mile 39)

Hatfield Park (mile 1)
Computed and Observed Temperatures (Above Normal Runoff)
Lake Don Pedro: March – November 2005
Computed and Observed Temperatures (Below Normal Runoff)
Lake Don Pedro: April – November 2008
Computed and Observed Temperature - Tuolumne River

Riffle C1 (mile 50)

Basso Br (mile 47)

7-11 Gravel (mile 38)

Shiloh BR (mile 3)
Computed and Observed Temperatures (Below Normal Runoff)
New Melones Reservoir: March thru October 2010
Stanislaus River – Observed (x) Versus Computed (y) Temperature

**Knights Ferry (mile 55)**

Mean $\bar{x} = 65.037$, Mean $\bar{y} = 65.424$

**Orange Blossom Bridge (mile 47)**

Mean $\bar{x} = 65.023$, Mean $\bar{y} = 65.082$

**Below Oakdale Rec (mile 40)**

Mean $\bar{x} = 57.442$, Mean $\bar{y} = 57.007$

**Caswell RST (mile 9)**

Mean $\bar{x} = 59.004$, Mean $\bar{y} = 59.314$
Computed and Observed Temperatures - San Joaquin River

Stevinson (mile 131)

Two Rivers - abv Stanislaus (mile 73)

below Grason Bridge (mile 84)

Durham Ferry - Vernalis (mile 69)
Reservoir Operation (Outflow) Computed Based on Hypothetical Stanislaus River temperature and flow constraint locations

(Patterning of Monthly CALSIMII Outflow Rate Based on Meteorology)
New Melones Storage, Stanislaus River at Oakdale flows and Temperature With and Without Temperature Operation

- More water released, reset higher
- Less water released, reset lower

Rule curve
Confluence target
Oakdale target
250 +/- cfs period
Makeup period

Oakdale Target
Confluence target