Forecast-**C**oordinated **O**perations & **F**orecast-**I**nformed **O**perations for Central Valley Reservoirs

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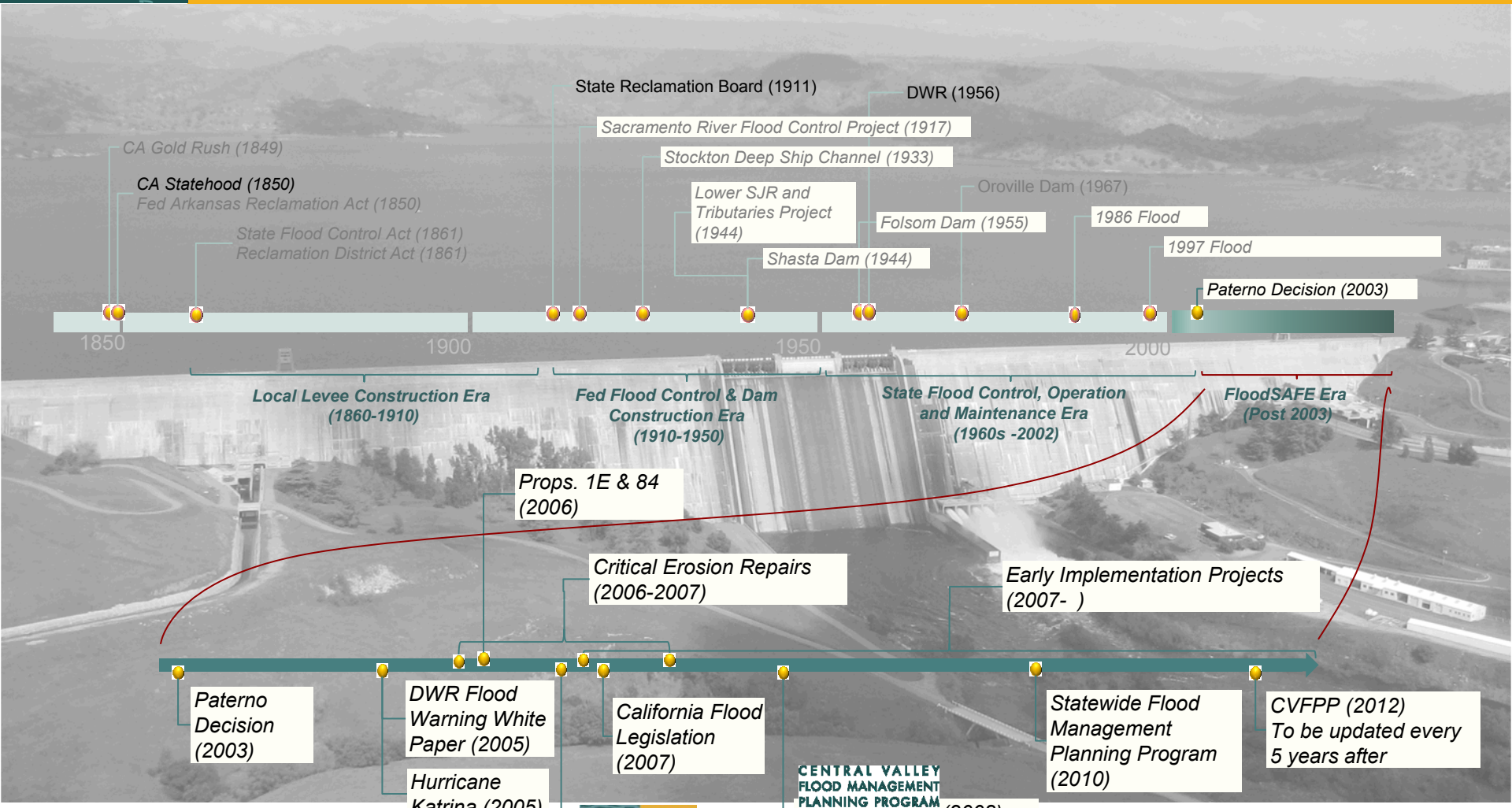
California Department of Water Resources
Division of Flood Management

May 29, 2015

A Long History of Flood System Evolution



FloodSAFE CALIFORNIA

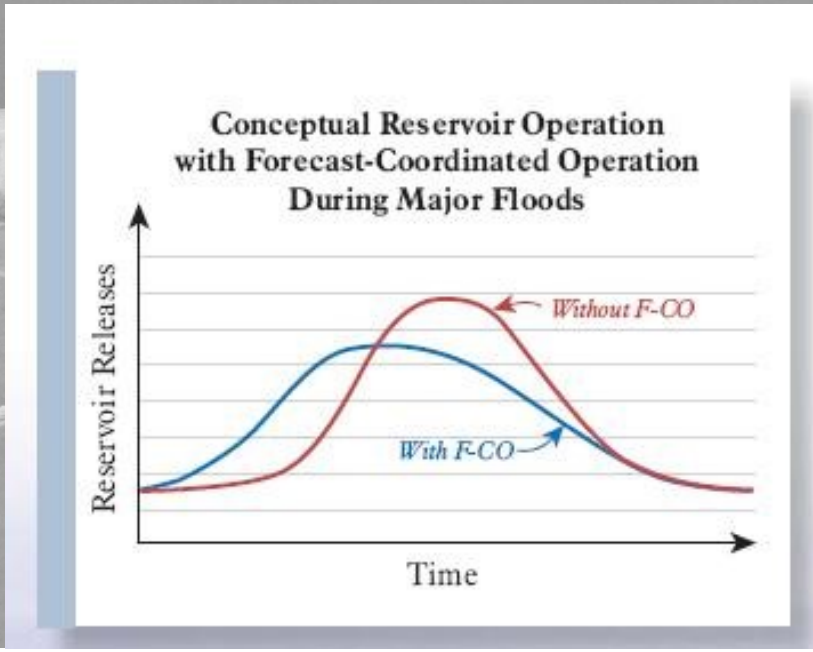
PUBLIC SAFETY ENVIRONMENTAL STEWARDSHIP ECONOMIC STABILITY

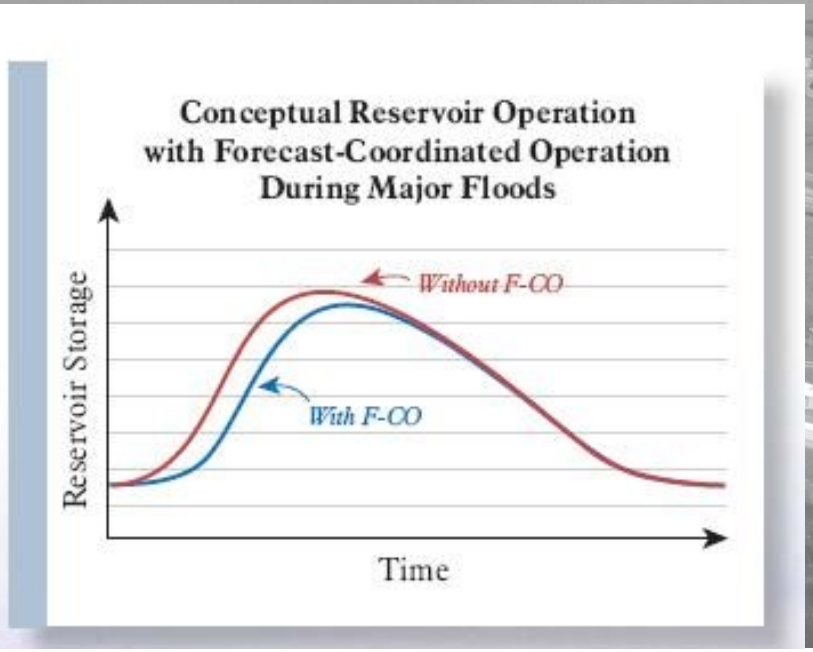
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

Forecast-Coordinated Operations (F-CO)

Goal

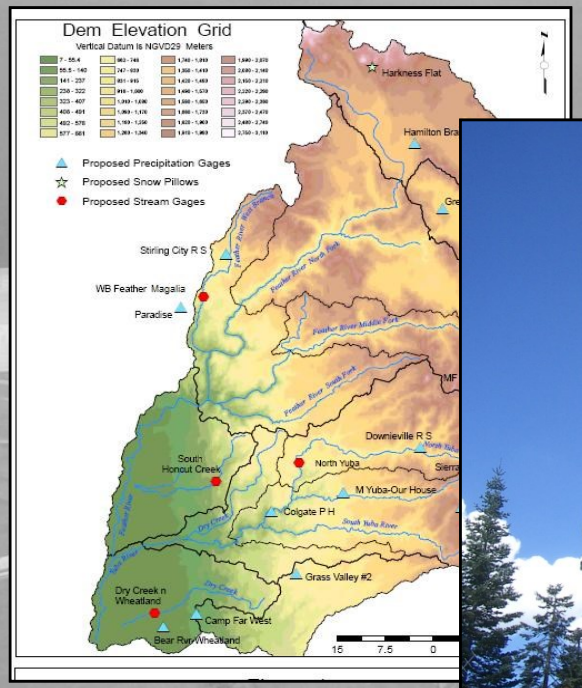
To improve flood protection downstream of reservoirs.

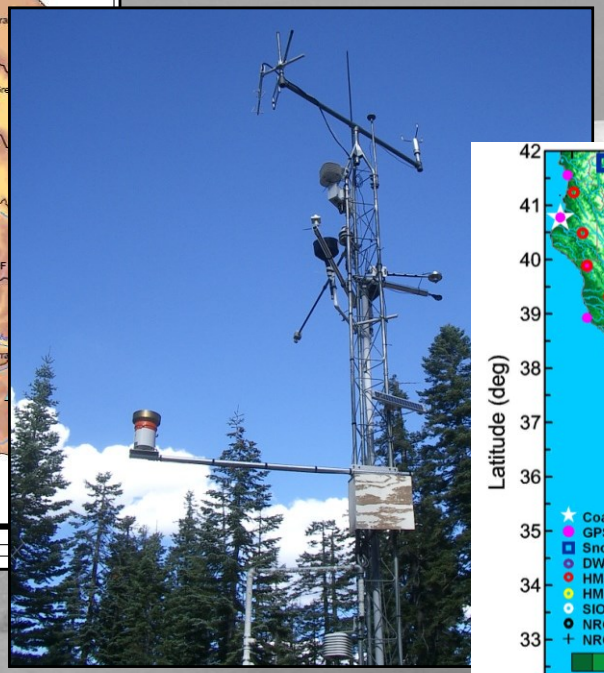


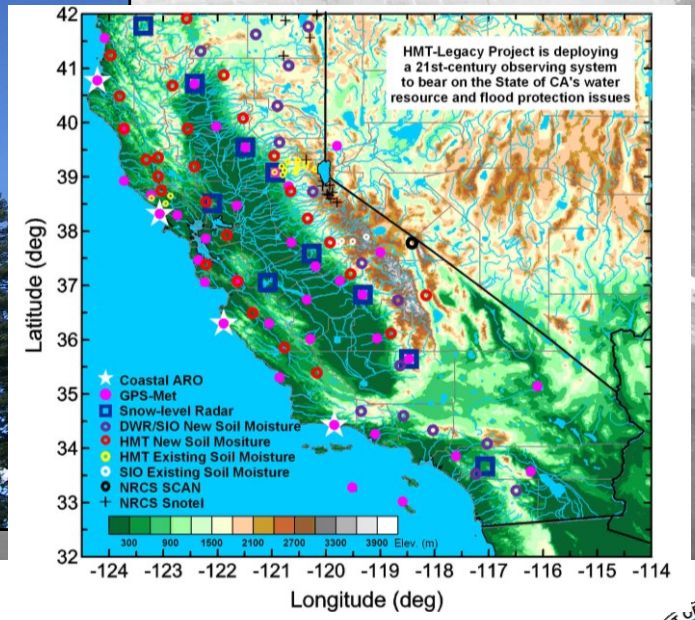


Objectives

Enhance data collection

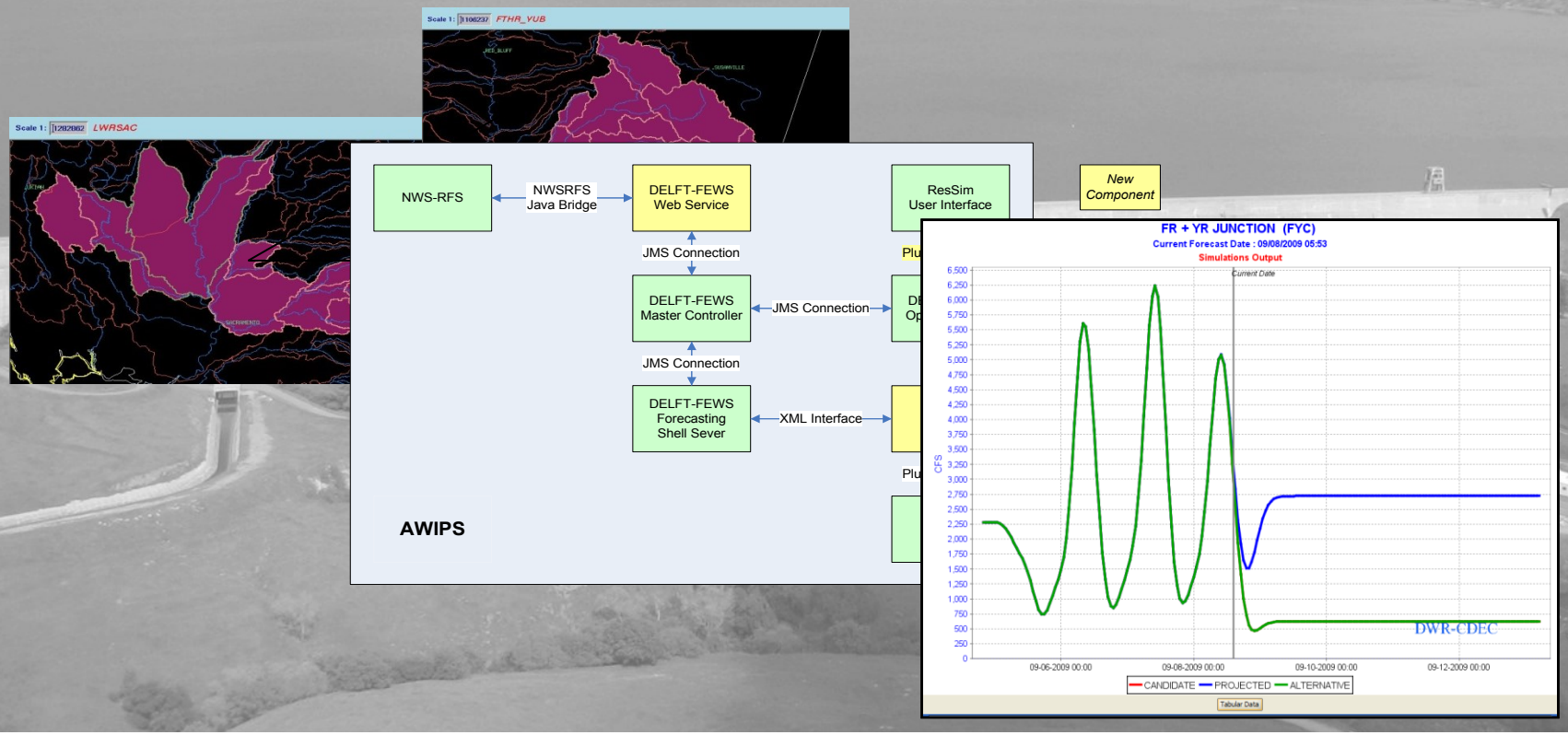






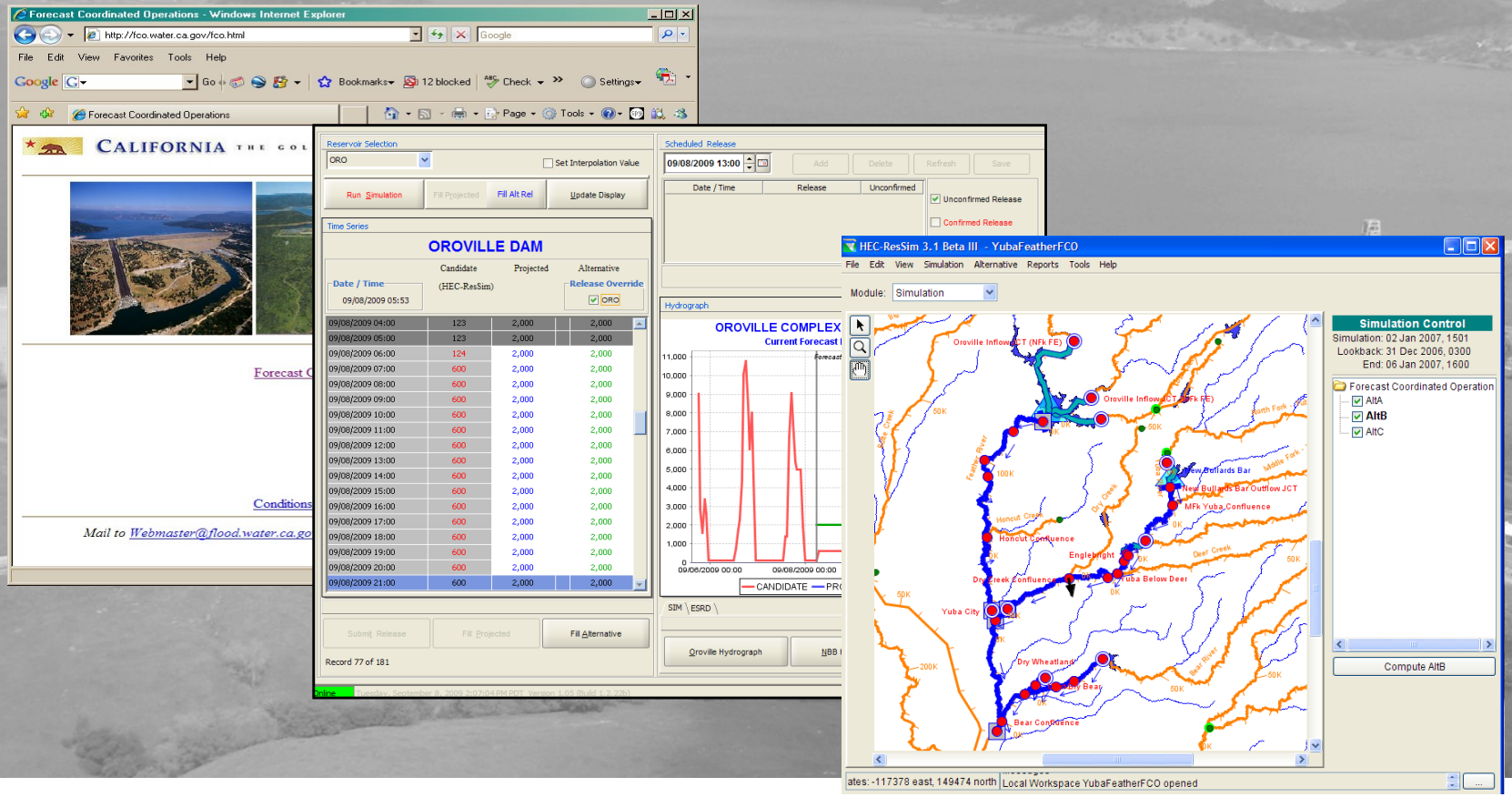
Objectives

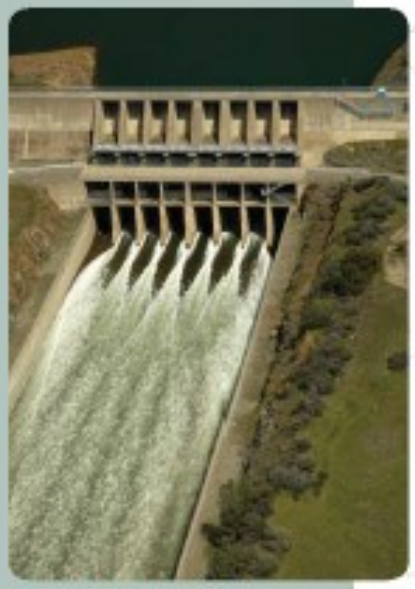
Improve Forecasting



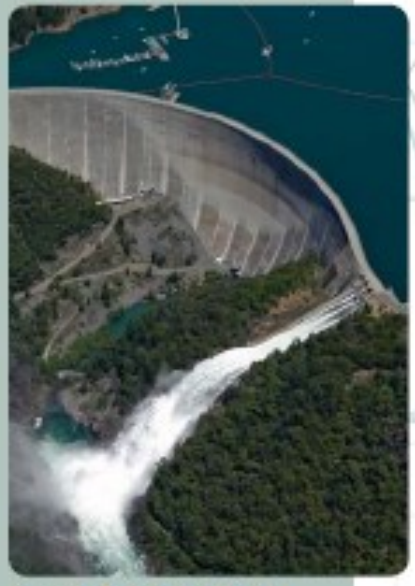
Objectives

Build Common Interface



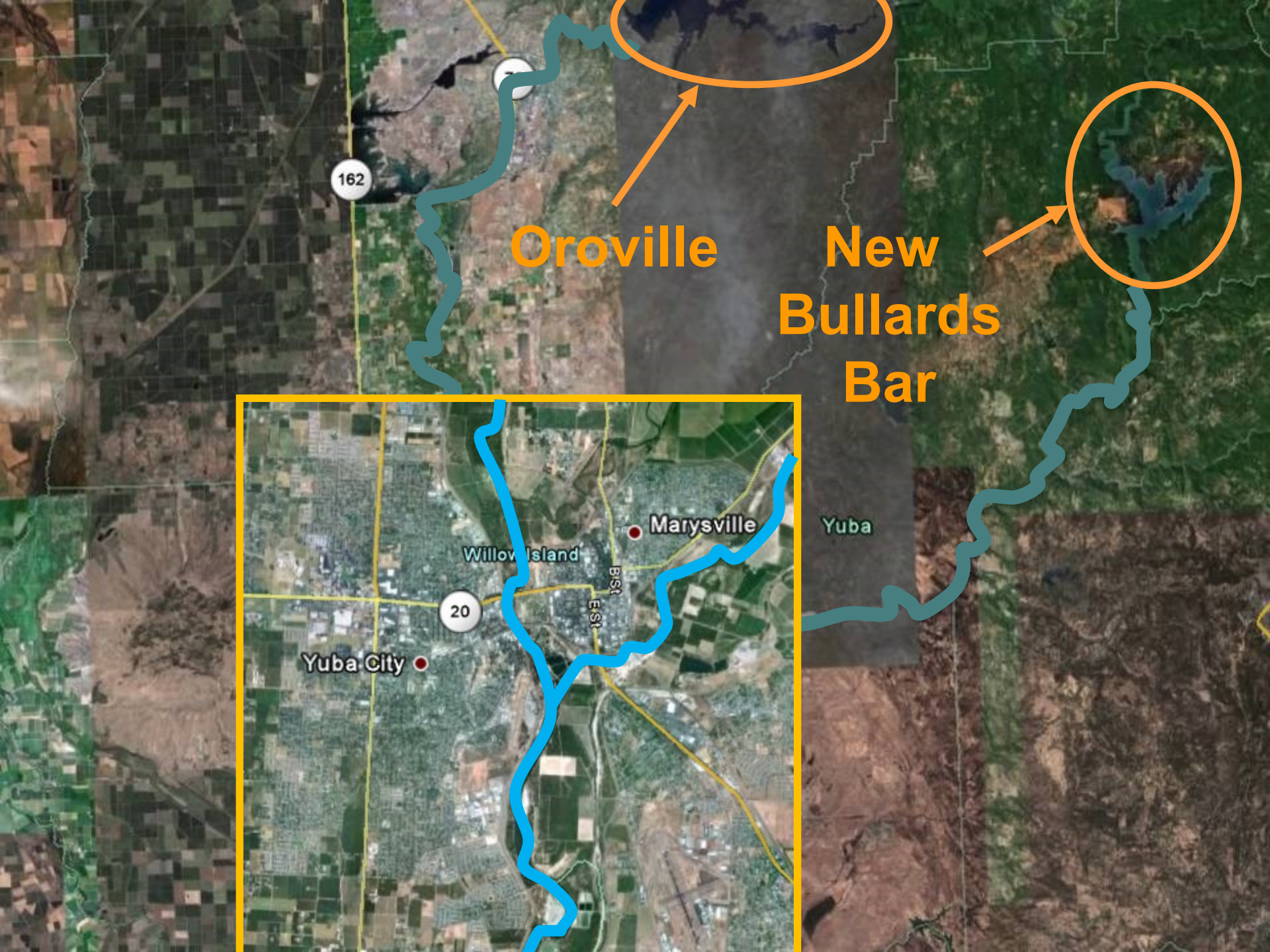


Oroville Dam Spillway high water release

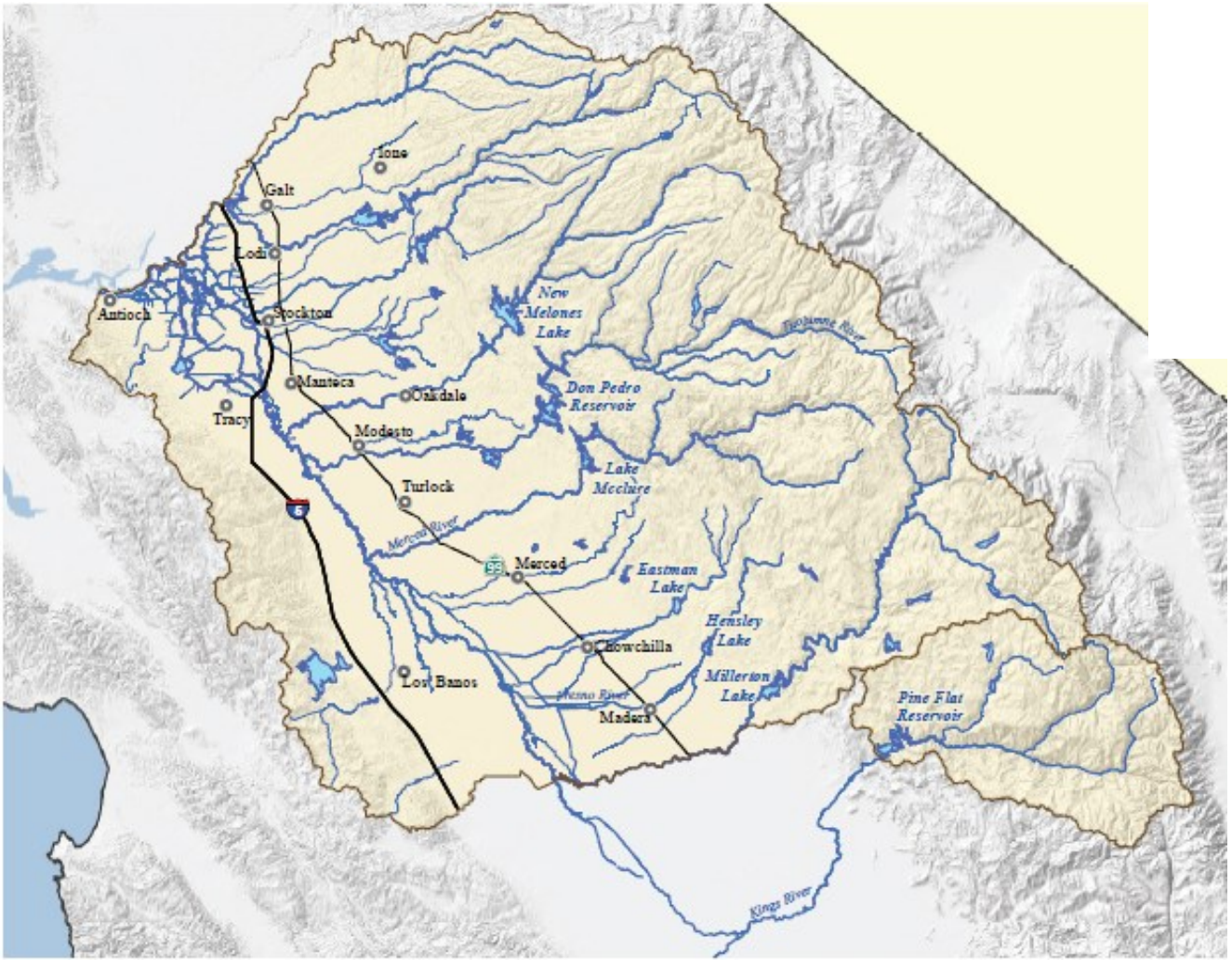


New Bullards Bar Dam Spillway releasing water into the Yuba River

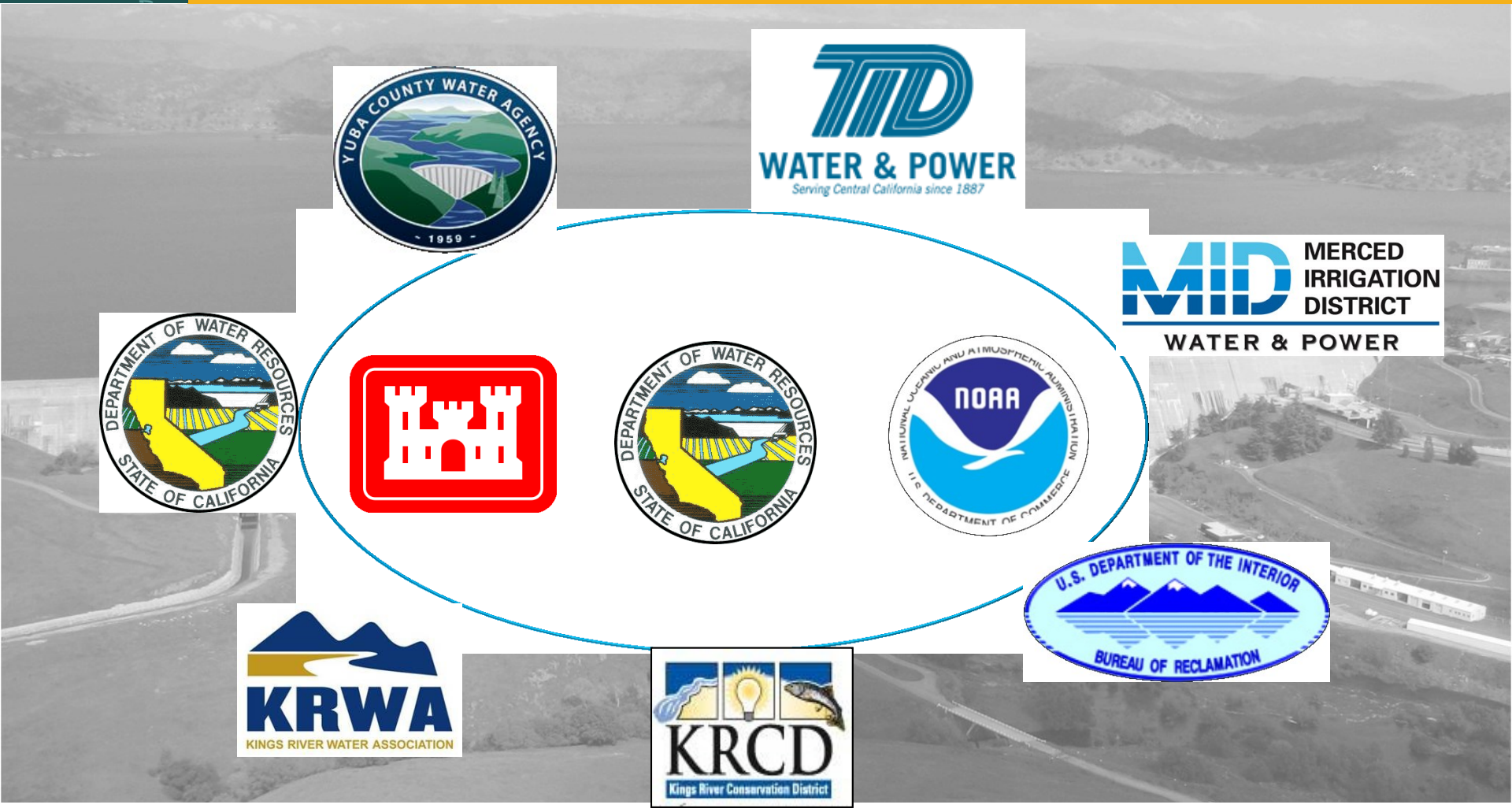
Yuba & Feather Rivers Pilot Project


Oroville
New Bullards Bar
162
Marysville
Yuba
Willow Island
B St
E St
20
Yuba City

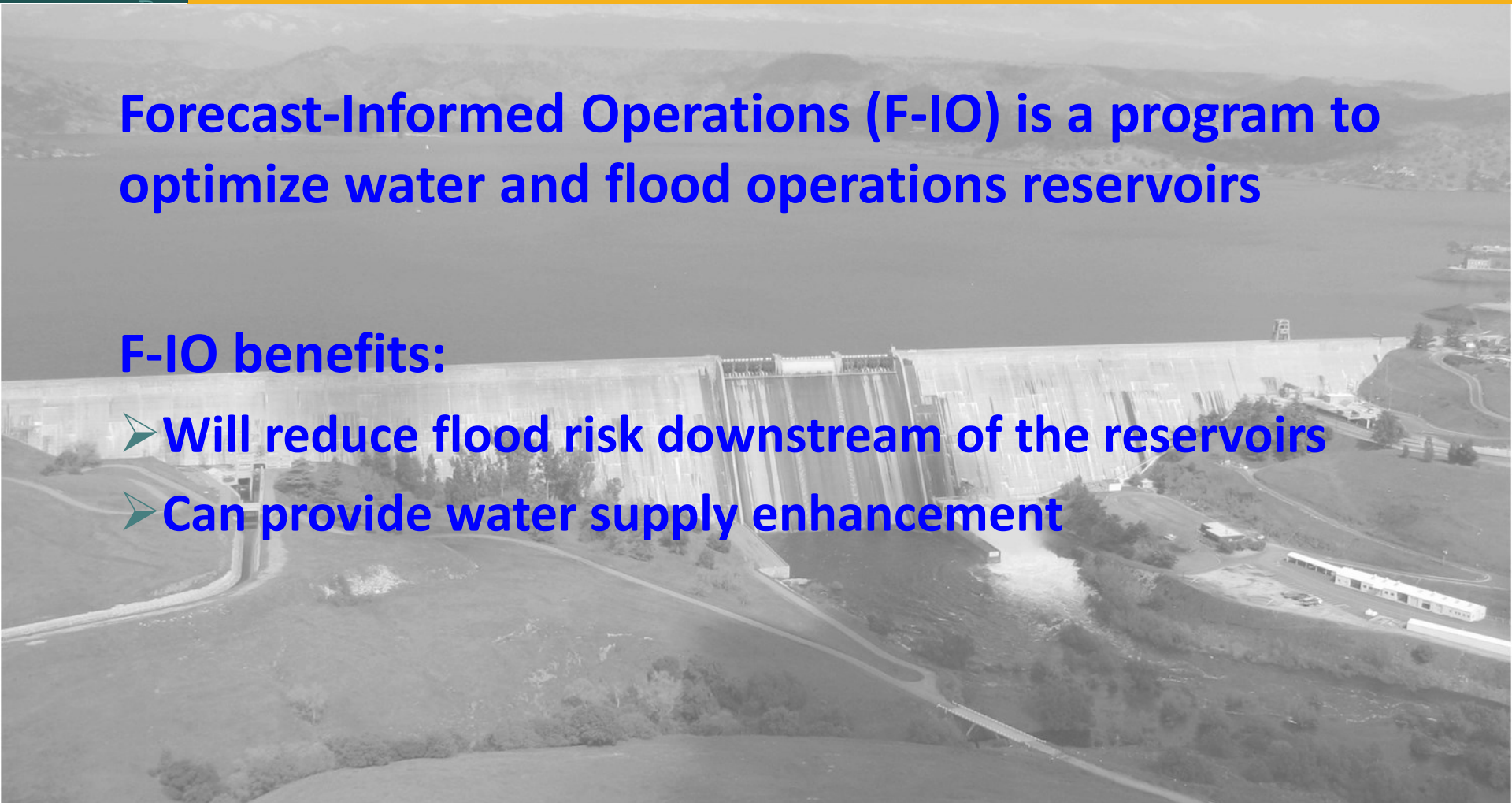
F-CO on the San Joaquin River System



F-CO Program Partners



Forecast-Informed Operations (F-IO)



Forecast-Informed Operations (F-IO) is a program to optimize water and flood operations reservoirs

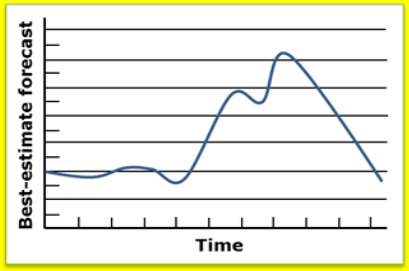
F-IO benefits:

- Will reduce flood risk downstream of the reservoirs
- Can provide water supply enhancement

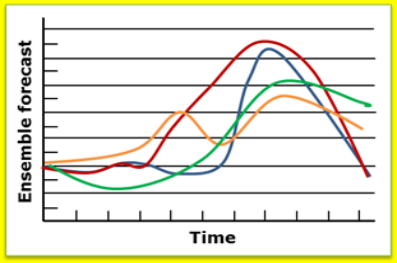
To implement F-IO:

- Improved seasonal reservoir inflow forecasts
- Dynamic/variable reservoir flood control diagram (FCD) that allows pre-releases
- Development and use of ensembles in forecasting
- Detailed engineering analysis to understand & document the potential benefits and feasibility of F-IO
- CEQA and NEPA compliance
- Approval of USACE and Congress to change the FCD

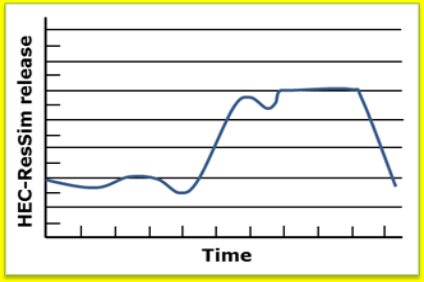
1. CNRFC provides *best estimate* forecast of reservoir inflows and uncontrolled local flows, using current state + QPF.



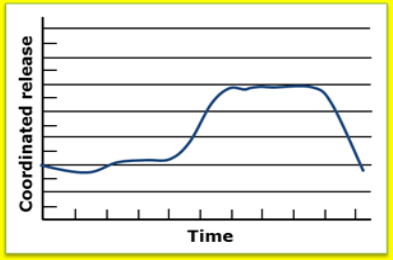
CNRFC also provides ensemble of forecasts of reservoir inflows and uncontrolled local flows. Some forecasts greater and some smaller than best estimate.



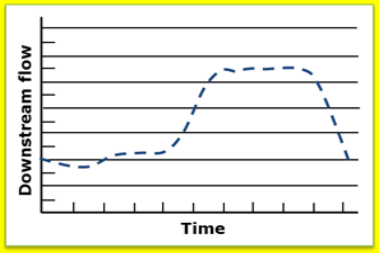
2. Operators run HEC-ResSim (throught F-CO DSS interface) with best estimate forecast to identify recommended release schedule with strict interpretation of rules.



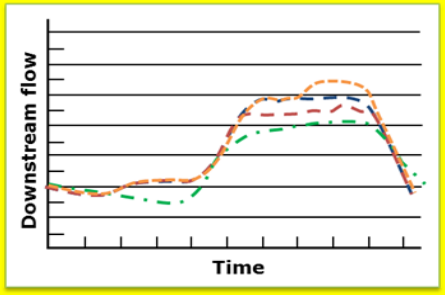
3. Operators review HEC-ResSim results, coordinate, collaborate to select *coordinated release schedule*.



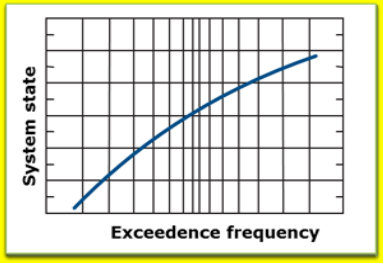
4. Downstream conditions computed with HEC-ResSim, using coordinated schedule.



5. For each ensemble member, HEC-ResSim computes system states with coordinated release schedule from Step 3



6. Frequency of exceedence of critical system states analyzed and reported. If hazard deemed unacceptable, process is repeated starting with Step 3.



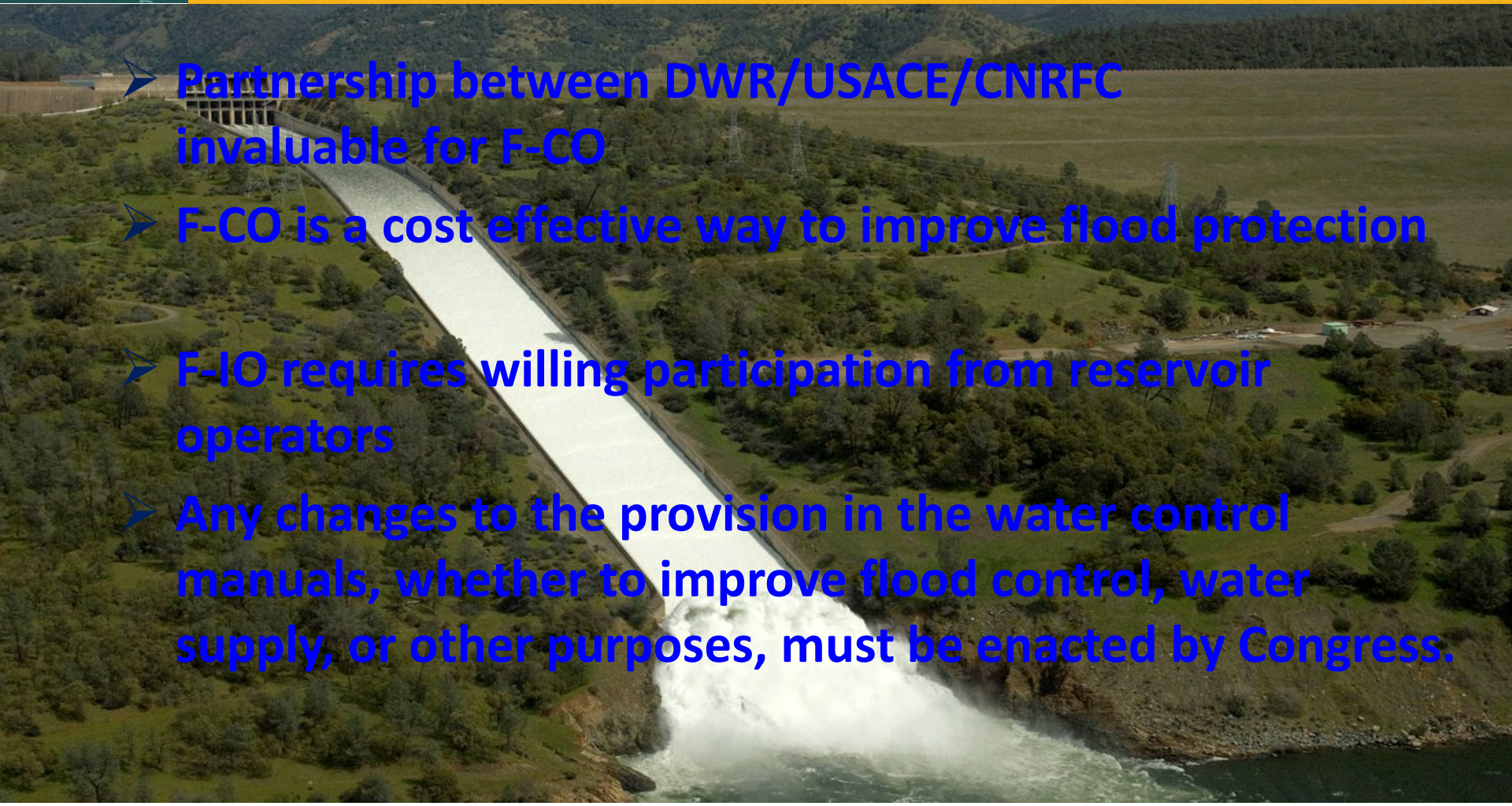
F-IO at Folsom Dam


-Folsom Dam Auxiliary Spillway
-$900M
-late 2017 completion date


March 2011


December 2014

Closing remarks



- Partnership between DWR/USACE/CNRFC invaluable for F-CO
- F-CO is a cost effective way to improve flood protection
- F-IO requires willing participation from reservoir operators
- Any changes to the provision in the water control manuals, whether to improve flood control, water supply, or other purposes, must be enacted by Congress.

QUESTIONS?

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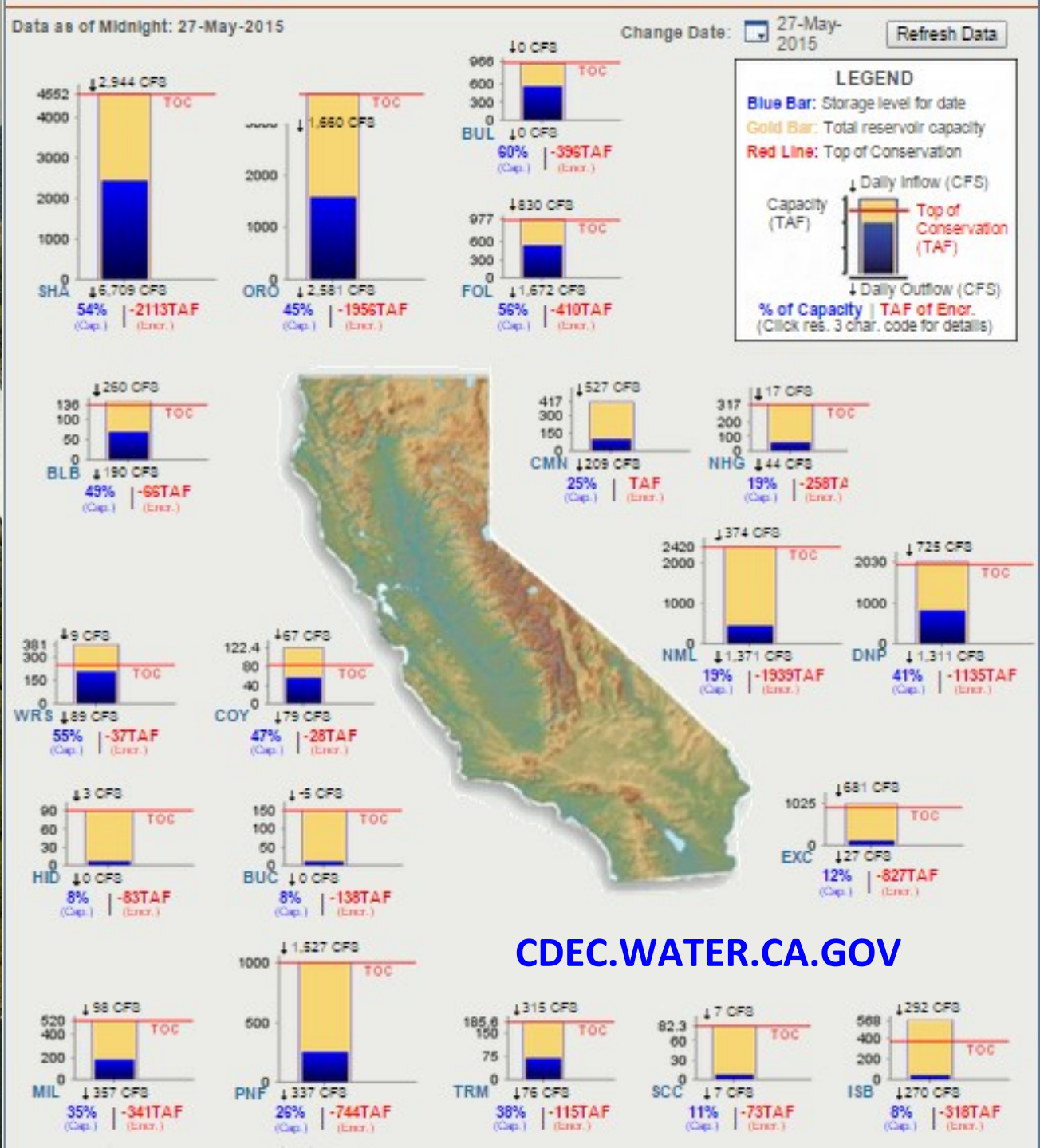

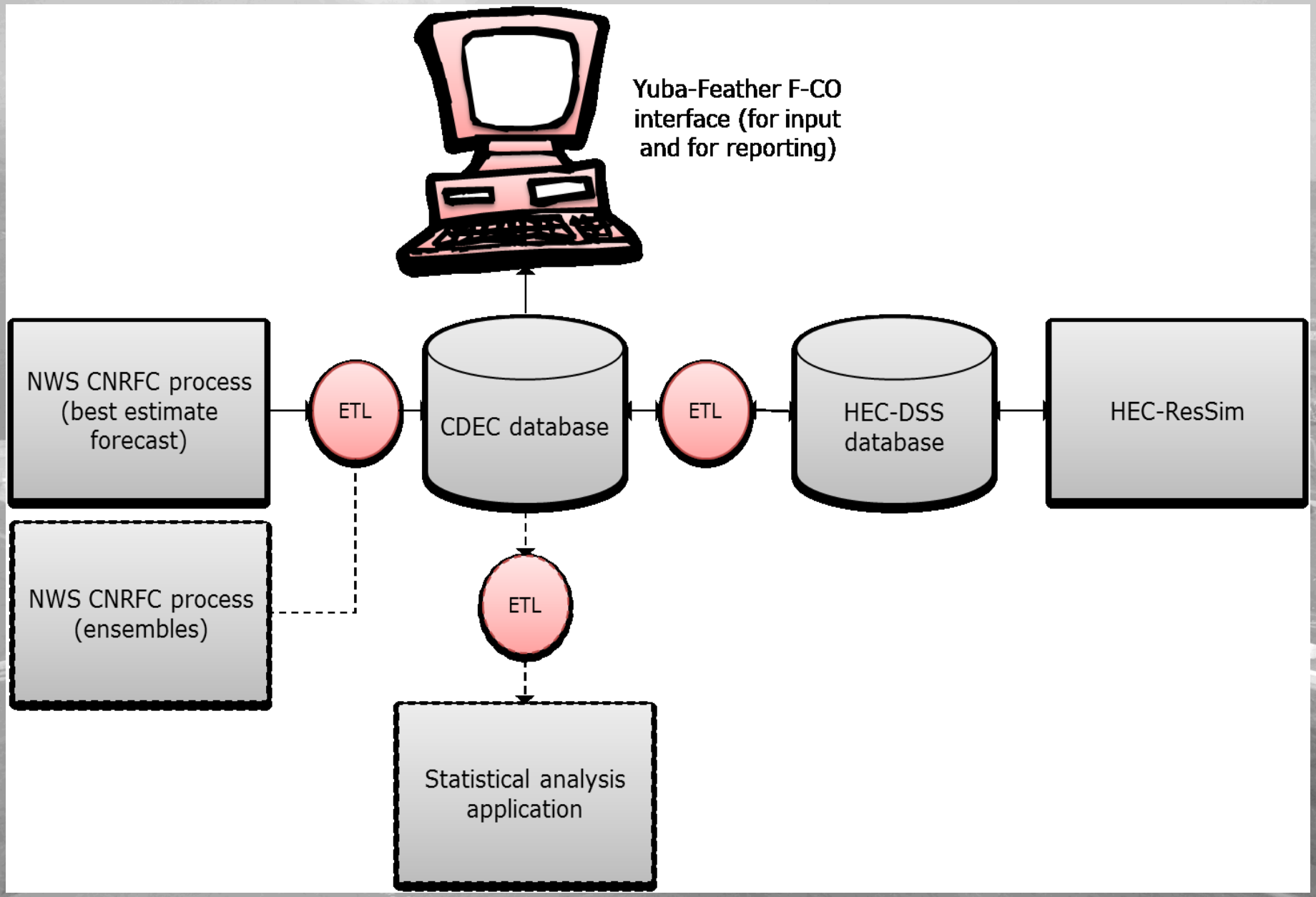
Yuba-Feather F-CO interface (for input and for reporting)
NWS CNRFC process (best estimate forecast)
ETL
CDEC database
ETL
HEC-DSS database
HEC-ResSim
NWS CNRFC process (ensembles)
ETL
Statistical analysis application