Shasta management questions

1. Temperature optimization: How can we best stretch cold water during temperature management season when it is limited?
    A. What is the effect of the proposed revised temperature management values, locations and metrics [per RPA action I.2.4] relative to operations described by the 2011 amended RPA?
    B. Are there certain thresholds and temperature tolerances that would allow for better optimization to reduce temperature dependent mortality when cold water is limited?
    C. How can optimization be done during times of high air temperatures? Are buffers in the modeling needed to get predicted outcomes?
    D. What is the relationship between storage and available cold water (cold water pool)?
        a. Are storage targets, (e.g. EOS, the April 1 – May 31 period [per RPA action I.2.3], or end-of-November flood control limits) effective means of ensuring there is enough cold water during temperature management season?

2. Forecasting: How can we minimize the number of years where we need to stretch the cold water pool, which creates tradeoffs of adverse effects at different life stages, run diversity (timing) and temperature tolerances?
    A. How can we appropriately assess risk in the spring, prior to any irretrievable expenditure of resources/allocations of water, in order to maximize the likelihood of an adequate cold water pool in end of June, without unnecessarily curtailing allocations/deliveries?
    B. Is it possible to create a decision support tool that could display these risks and uncertainties and allow managers to then choose the risk tolerance level?
    C. Are there spring metrics that can predict the stability of lake stratification, or lack thereof?
    D. What is the relationship between carryover storage levels and likelihood of adequate cold water the next spring.
    E. Are there certain conditions/thresholds where it is so unlikely that adequate cold water will be available that temperature management is not reasonable to attain in any circumstance/operation?

3. Species Viability and variability: Can this very endangered species be managed to have temperature dependent mortality that would lead to recovery years, versus protection only years, per the Australia model, and still allow for recovery?
    A. Can the life cycle model be run to get at this?
    B. (using the WRLCM) What is the effect of multiple Critically Dry years (targeting no more than 30% temperature-related mortality) on the population?
        a. How many CD years are too many? Combination of CD and D years? (Or, how long can just “protection” last?)
    C. What variables in temperature management (e.g., Shasta storage, cold water pool volume, EOS carryover storage, EOA storage, reduced early season diversions, etc.) are most necessary to sustain the WR population through multiple CD years?

4. Climate: How to effectively develop tools that manage for recent conditions, and don't rely on past averages

5. Interactions: temperature and pathogens; temperature and predation, temperature/food/energy

6. Operations: TCD, Whiskeytown, Trinity, power peaking, power bypass, etc. Are any of these knobs effective?

7. Structural modifications or adjustments:
    a. Establish permanent temperature logger at Shasta Reservoir and tailwaters below dam
    b. Permanently seal leaks in the TCD?
    c. Elephant trunk in Shasta to tap into cold water currently unavailable/unreachable?

Shasta management core-monitoring

1. Enhanced Winter-Run Redd Monitoring: dewatering, rescues and temperature logger/DO monitoring efforts ($500,000 per annum). [*Central Valley Project and State Water Project Drought Contingency Biological Monitoring Plan for Water Year 2015 and Beyond* (Interagency 2015 Drought Strategy)]
2. Recalibrate Sacramento River Temperature Forecasts: incorporate the use of the CVTEMP (formerly RAFT) decision support tool (DST) ($450,000 to $525,000 per annum). [*Central Valley Project and State Water Project Drought Contingency Biological Monitoring Plan for Water Year 2015 and Beyond* (Interagency 2015 Drought Strategy)]
3. LiDAR bathymetry mapping of winter-run spawning grounds: Accurate accounting of the effect of flow changes on the relative water height would require the collection of high resolution (10 centimeter scale) bathymetry data for the Sacramento River. (est. $100,000)
4. Post-2017 funding for Airport road bridge sensor: a permanent temperature monitoring station at Airport Road Bridge was identified as a key action to monitor water temperatures closer to the downstream extent of winter-run spawning (unsure of current funding? DWR may have agreed to fund and operate?). [*Winter-run Drought Contingency Plan for 2014* (Central Valley Project and State Water Project Drought Operations Plan and Operational Forecast April 1, 2014 through November 15, 2014)]

Other core-monitoring (not directly Shasta related?):