Track 1: Proposed Action Workshop (PAWS)
Notes from Small Workgroup Discussions DRAFT

MEETING DATE & TIME: April 26, 9:00 am - 3:30 pm
MEETING LOCATION: Holiday Inn, 300 J St, Sacramento, CA 95814
MEETING OBJECTIVES: Solicit input and further develop specific ideas for Track 1, Projects to Advance Water Supply; Share existing information and build the scientific basis for possible actions

For each of the breakout tables, notes reflect the conversations over five small group discussions. Table topics included:

- **Studies: Predator Removal, Rapid Genetics, and Smelt Monitoring**
- **I:E Ratio**
- **Barriers**
- **OMR Storm Flexibility**
- **Fall X2**

1. Studies

(a) Predator Removal

- *Opportunities (Advantages)*
  - Reclamation could provide staff to assist DWR as well as permitting support
  - Support for continuing predation removal to reduce pre-screen loss
- *Risks (Disadvantages)*
  - Dangerous (dry ice) and expensive to remove predators more frequently due to manual insertion of the dry ice into secondary channels.
  - DFW doesn't want to approve moving predators to Bethany Reservoir
  - 95% of fish caught in Clifton Court are below the size limits
    - Fishing pier doesn't work, conflicts with CWF and fishermen couldn't keep the predators anyway
    - Currently the size limit is 12"
- *Ways to Refine the Idea*
  - Add automatic CO2 deployment at Tracy fish facility
    - On-going work, funding and engineering design is needed
    - Test the efficacy of CO2 efforts
  - Have public fish at Clifton Court in boats
    - Add boat launches or fishing piers in combination with changing fishing regulations
  - Add exclusive barrier at entrance to Clifton Court
  - Can we move predators and native species in separate tanks when we salvage?

    - Draw water into Clifton Court at night
        - Combined effect with predator removals
    - DWR to use CO2 in main channel after Clifton court before fish screen
    - Why not just let fishing in Delta instead of Bethany?
        - Raise bag limit
- *Additional Science/Background Material*
    - Reclamation currently removes predators in primary lower area once a year, and removes predators in the secondary channels more frequently.
    - DWR stipulation study: exports have better survival than SJR
    - Mike Canes: electrofishing was reducing predators, now they are coming back
    - Scott Hamilton: bottom diversions
    - Rebecca Buchanan's study
- *Additional Ideas*
    - Change fishing regulations
        - Bounties
    - Existing DWR Studies:
        - Interim measures:
            - Clifton Court electrofishing
            - Weed removal
            - Predatory fish removal study
            - Dredging
        - CVP preferential pumping
        - Skinner evaluation and improvements project (pre-screen loss)
    - Bring back fishing pier?
        - Killed because of CWF location would block access, no other access
        - Also, 95% of fish caught were too small to catch
    - Increase SWP pumping to improve survival when radial gates are open
            - Pump a ton, improves survival
    - Additional fishing income offset
        - Migration for striped bass fishing increase
        - And/or DFW funding offset
    - Divert out of bottom of water column
        - Fish have buoyancy, stay off bottom
        - Divert on a delta island
    - DCC replacement with floodplain habitat
        - Bottom diversion for Delta water quality
    - Could pumping be based on fish escapement to incentivize water users

(b) Rapid Genetics

- *Opportunities (Advantages):*
    - Slam dunk
    - Huge water benefit
    - No downside for continuing for 3-5 years
    - Complements SJRRP?

    - Rapid genetics helps to identify SJRRP SR from Feather River SR?
        - Can tell the difference in genetics?
- *Risks (Disadvantages)*
    - Expense
    - DWR cost share
    - Collecting from unmarked Chinook
        - Permitting issue
        - Can we do some programmatic permitting?
        - Difficult to get permit from NMFS/DFW to collect late-fall run and fall-run
    - SJRRP SR are not protected, but cannot be genetically differentiated from Feather River spring run (?)
- *Ways to Refine the Idea:*
    - Length/date existing protocol protects SR too because of errors in spring-run RPA because of reducing WR error
    - If we mark 100% FR releases, would reduce genetic test requirements
    - Do genetic analysis on site
        - Would improve costs- small genetics lab on site
        - Identify costs of this
    - 2% includes 50% error
        - NMFS thinks take limit is too high
        - Might need to change take limit with this idea
    - SJRRP should do rapid genetics and pay for some of it
    - Look at smaller WR outside of length at date windows with rapid genetics to make sure we are capturing all
    - Can we avoid reacting because of multiple false alarms?
- *Additional Science:*
    - Harvey 2014
    - Is it a 5-day running average/14 day?
        - We can increase pumping later in period to make up for an early reduction due to incorrect density trigger
- Additional Ideas:
    - Verify that SJRRP fish can be differentiated from Feather River fish
    - Kevin Reece- invite to rapid genetics tech team
    - Javier-Miranda- DWR
        - Javier.miranda@water.ca.gov

(c) Smelt Monitoring

- *Opportunities:*
    - Dogs might be more real time than eDNA?
    - Could target restoration efforts better with eDNA/dogs?
    - Distribution could help refine OMR limit decisions/SWG
    - Helpful to avoid take
    - Could help focus EDSM
    - Help overall population distribution

    - Monitor restoration effectiveness with these
- *Disadvantage (Risks):*
    - EDNA just presence/absence doesn't get you life stage
    - Scent dogs still need to be trained
    - Technology is too new for water ops
    - Dilution factors- how dilute can it be to detect?
- *Ways to Refine the Idea:*
    - Can you refine eDNA to determine whether the smelt was there recently or not
    - Smelt cam- camera dragged behind boat
    - Include salmonids in studies- eDNA, etc.
    - Does predator eating/pooping listed species trigger eDNA and smelt dogs
    - Couple with modeling
- *Additional Science*
    - Wind speed decreases, turbidity decreases, travel efficiency
        - Dave Fullerton and Jim Peterson- travel efficiency
    - Cramer- existing work in S. Delta/Davis?
- *Additional Ideas:*
    - Can dogs identify different smelt life stages?
    - Smelt cam- where is this?
        - Talk to Don Portz

2. I:E Ratio

- *Opportunities (Advantages):*
    - Increased water supply (30-60 TAF)
    - Small gain (250 CFS) with no further negative effects
    - San Joaquin is preferred route
        - Lower survival that CVP salvage (more than half)
        - This may be a disadvantage
- *Risks (Disadvantages)*
    - OMR: Tidal flows have a greater impact that OMR flows based on provided (Kevin Clark 2014)
    - Hasn't been done before (tested 4:1?)
        - Compare success at 3:3:1, not water supply but fish
        - Study 4:1 effects
    - Doesn't take into account HORB installation
    - Hard to manage
    - Higher survival of fish at Clifton Court Forebay
        - OMR flows had low influence on survival and doesn't incorporate diurnal survival
        - Higher pumping rates, fish get pulled instead of predation
    - Doesn't take into account HORB
    - Limited study data on 4:1
    - OMR flows have less influence

    - Don't know driving factor
        - Flow or exports- don't use combos of OMR and I:E ratios
    - Flow relationship may be deteriorated, may not benefit fish anymore
    - 5,000 and 7,000 CFS at HORB focuses on deep water shipping channel of Stockton
    - HORB sets up a predation habitat
    - Doesn't look at 1:1 And 1:2
    - Doesn't provide range of flows to evaluate rigor of flows
    - Only looks at flow, not temperature
    - Only looks at flows in 1 year
- *Ways to Refine the Idea:*
    - Look at Cal Water Fix (removal of I:E with focus on OMR)
    - Extra data to support different I:E ratios (more than Baker and Mohart)
    - Look at San Joaquin river restoration programs: Don Forks and Gabe Singer
    - If don't install HORB, default to 4:1
    - Instead of a rock barrier, use non-physical barrier for either one
    - Flow is driver, exports actually help survival
    - Protect the pulse as it goes down the system, shaping restriction on exports to match pulsing
    - Look at incorporation of BAF technology at higher flow levels
    - Propose monitoring component (not just 1 system that may not work)
    - Transition (off ramping) to give operators some wiggle room
    - Using allocations based, not I:E ratio or WY (instantaneous)
    - Do away with I:E ratios and salvage as much fish as we can with preferential pumping
    - Predation problem on San Joaquin is bad
    - Evaluate both options (1 year at 5,000 CFS and another year at 7,000 CFS)
    - Increase real-time monitoring as part of this
    - Increase hatchery fish tagging
    - Remove V at old river to remove choice for fish
    - 7,000 CFS to have channel-forming flows
    - Drier years, 5,000 CFS to have some water to help
    - How do the ratios tie into storm flexibility?
    - Analyze interconnection of water flows, throw it from a ratio to a storm flexibility mode
    - How does it play into section 400 of the WIIW act?
    - Reach out to fish bio, talk about Chinook vs Steelhead needs
    - 2E flows cause stress on reservoirs and temperatures downstream
- *Additional Science*
    - Kevin Clark's new proposed study
    - Bucannon 2018
    - Gabe Singer and Don Forks (San Joaquin River Restaurant)
    - Josh Israel Field Study Proposal
- *Additional Issues:*
    - Acoustic tag studies: higher survival is through CVP export facilities preferential through CVP
        - Get them through old river and out of south delta

        - Not just 1-time result, capacity issues and operation issues
    - End of process that there is some benefit- that is studied and effective (benefit to cost ratios)
    - No studies on the horizon
    - Update draft
        - 1500 CFS combined exports, only 1 pump
        - Make up difference on the state water side (500 CFS at State)
        - Don't hit 1500 CFS everyday – more of an average
        - Difficult to operate to low level identified
        - Possibly increase to 3000 CFS, which is more operationally feasible- just to push over the hill, it is difficult to overcome gravity

3. Barriers

- *Opportunities (Advantages):*
    - Potential, future habitat restorations in alternative sloughs
    - Infrasound fish fence may be better than BAFF at deterrence
    - RPA compliance
    - Higher survival
    - In theory, OMR could be more regular (if entrainment=less)
    - More habitat options at alternative sloughs
- *Risks (Disadvantages):*
    - Maintenance and cost of barriers
        - BAFF is more susceptible to wear and tear than the FFGS
    - Travel time for salmonids associated with alternative sloughs may be longer
    - Water temp may be different in alternative sloughs
    - BAFF sound projectors tend to fill with sediment and stop working (higher maintenance cost)
    - Predators will remain a major problem still
    - High flow would still push fish across BAFF
    - Encroachment permits/property access will be problematic for alternative sloughs
    - P dap tags technology can be problematic at times
    - Monitoring cost is huge
        - Technologies and long-term effect unknown (predators, etc. may change)
    - Hatchery fish for study may be difficult to attain
    - Complex hydrodynamics in Georgiana Slough
    - Permitting takes a long time and is usually complicated
    - Upper management support
    - Cost
    - Corps (navigation) permit needed or alterations to study will be required (may not be the best option for fish)
- *Ways to Refine Idea:*
    - Pre-barrier upstream above BAFF
    - A BAFF located on the western point as well to direct fish (or 2 locations on mainstream)

- Pheromone from predator as deterrence
- Incorporate the 3-mile slough into study
- Incorporate food and habitat enhancement in alternative sloughs
- Incorporate predation control (predators will still follow/eat salmonids)
    - Work with Fish and Game on changing bag limits (fishing derbies, etc.)
- Monitor the effectiveness of prevention of predation control/monitoring
- Atmospheric rivers to change in the future. As well as other hydrology changes, consider long term changes
    - Adaptive management will be useful for this
- Wild fish tagged vs hatchery fish for study
    - See if other agencies are using either fish upstream and potentially incorporate them into the study.
- Look into addressing predation where necessary (adaptive management)
- Baseline monitoring (electro-fishing, etc.) to understand population
    - Expand study to larger areas
- Pre-assessments (acoustic sonar cameras) in certain areas for predators
- Place receivers in south delta and use strategic fish release points
    - Design the study to show linkage between delta and Sacramento River (showing survival, entrainment, etc.)
- See if fish end up in Clifton Court Forebay (acoustic receivers, pit tags)
- Incorporate habitat restoration at alternative sloughs for study
- Monitoring, incorporate early into study to develop baseline
- Quantify benefits of sloughs (data)
- Mix and match types of barriers (BAFF and FFGS)
- Use cages of bass to deter salmonids
- Change geometry of channels
    - Use rock barriers at bottom of channel to shape flow
- Quantify benefit to water supply and salmon (show less take)
- Consider re-operation of the DCC
- Document the cost/benefit analysis of salmonids entering alternate sloughs and survival rates
- Use a phased approach: study the downstream area first, then move upstream once a cost/benefit is determined
- Non-physical barrier in front of DCC?
    - Have DCC opened partially or to some extent with combination of non-physical barriers

- *Additional Science:*
    - Navy- Bioacoustics studies on swim bladder
    - Meghan Sabal (UC Santa Cruz)
        - Hatch vs wild study
        - Delta smelt afraid of ground up smelt
        - Bioenergy study on shapes of barriers (Discussed at IEP conference in the past?)

4. OMR Storm Flexibility

- *Ways to Refine the Idea:*
    - Look at data
    - Ways to translate data to decisions
    - Information vs professional judgement
    - How the roles of the decision groups have evolved?
    - Identify high risk and low risk circumstances for delta smelt
        - No reactive actions, rather have a pre-approved plan to tackle risks
    - Pump conservatively in the 1st two weeks after the initial flush
        - Have increased turbidity
    - OMR can be higher than what it is now
    - What environmental factors would impact high risk?
    - What conditions led to high risk scenarios in the past?
    - There's no improvement since 2008. What's causing this?
    - What is the duration of BO legally? Do we/BOR need to get a solicitor's opinion?
    - Operations action plan are based on projected outcomes vs what is actually measured during the storm season
        - Have an off-ramp criteria to adapt operations in line with actual conditions
        - Manage pumping according to current conditions vs action plans developed/based on forecasted data
    - Look at before and after the storm distribution to determine of the parameters/operational action plans are working
    - Need agreed upon onramp and offramp criteria.
    - Potential criteria for eligible storm could include: Vernalis Flow, Combined Exports, Net Delta Outflow.
    - Back decisions/professional decisions with science-based studies as well as current conditions
    - Use telemetry to track the smelt
    - Define the actions, procedures put in place in advance to get it signed in DC in a short time frame
    - Depending on event nature, amount of rain, snow melt, etc. The action must follow
        - Develop range for actions to be taken
    - Can actions be triggered by a different method of contribution of excess water?
        - Ex: releases
    - Look at FERC projects
        - How assumptions/actions discussed here impact downstream projects (hydrogeneration)
            - Would the downstream projects requirements influence the actions?
    - Modify existing monitoring programs for better distribution estimates
    - Compare risk forecasts from working groups (DOSS, SWG, etc.) to what was occurred in reality, then build model to predict outcome based in risk forecast.
    - Have adverse effects been defined?
    - How does COIIN Act, COA, BO, tie together for this idea?

    - Seek assistance/input from USGS (for modeling)
    - Consider using the CAMT entrainment model.
    - Criteria need to be evaluated and settled on prior to the storm year
    - Are there any streamlined processes at other locations (Colombia River Basin) that can be looked at?
    - Set up criteria that puts us in a particular risk category
        - Ex: salvage quantity, change in condition
- *Additional Science:*
    - Life cycle model for delta smelt – paper by Scott Hamilton

5. Fall X2

- *Opportunities (Advantages):*
    - Does September need less water to meet October (as opposed to Oct->Sept)?
    - Ops pay hope for Oct storm
    - What's the hazard of Suisun Marsh Salinity Control Gates (SMSCG) operation? Why not do it?
    - Focus on Grizzly Bay (GB)/Honker Bay (HB)
    - Ability to know amount of habitat areas-models
    - Study opportunities
    - Straight forward compared
    - Freshens up slough itself
    - Grizzly Bay avoids Suisun Bay- clams
    - Cycle operations for foodweb
    - May be able to inform future changes/ops
    - Good potential for salinity habitat
    - RRDS food through Western drain
    - Current requirements hurt
    - Focus on residence time appropriate use of gates
    - More often possible, even after a dry year
    - Current X2 has implications, M&I power
    - Not worry about below min pool/vortex
    - More accurately place water
- *Risks (Disadvantages)*
    - Shifting away f/km huge deal (need data)
    - Doesn't go into spee (?) habitat Sept/Oct req info (not one over the other)
    - Primary Constituent Elements (PCE)- flow, velocity, outflow etc
    - Temperature- too shallow? Lethal temp?
    - Maybe not track 1, 10 year review next year (not relevant)
    - Fish may benefit more in specific months- depends on life history
    - Not uniform benefit
    - Where does additional 30 TAF come out of to meet?

    - Not okay to replace- unknowns
    - Temp issues
    - Not found population response to X2
    - Freshwater invasions-freshwater clams
    - Duck club agreements somewhat dictate ops of gates
    - CCWD intakes- any concerns
    - Unknown if good
    - Marsh hard to survey (depth)
    - Temperature issues
        - Would Montezuma warm it?
        - Model?
        - Air temp cooler in Bay? (than sea)
    - Unknowns- what balance
    - Update lookup table with new habitat area
    - Habitat more complicated than salinity
    - Suisun food limited
    - Not all fish going to move there
    - No studies, habitat space limited
    - Historically, used too high saline in Fall
    - Does water need to be from North or south too?
        - Montezuma Slough may need water from North
- *Ways to Refine the Idea*:
    - DSM2-2017- prop compared to actual 2017 ops
    - Additional modeling this summer for more refinement
    - Sept/Oct same or different benefits?
    - Critical Habitat species requirements to avoid adverse modification
    - More water available in Sept than Oct
    - Releasing in Oct to meet hurts Salmon requirement
    - High/low average - will far west X2 require more at Chipps Island
    - Expand studies- other months/WY types
    - Translate info learned from RPA into operations
    - Monitoring protocol plan
    - Surrogate info- zooplankton to benefit DS
    - Boat drones with cameras
    - Operation model
        - With and without X2 modeling
    - Summer temps- different between 11" and 17"
    - Salinity is habitat because not pop benefit
        - Maybe not best- clams live there
    - Monitor food in Suisun and Confluence
    - Look at whole area together

    - What do we truly want
    - Calenoid density certain numbers/targets/triggers
    - Monitor other sloughs off Montezuma
    - Food index/stations
    - AM Adjustment- with habitat fine tune standard
    - Building SITES may increase flex in operations (more storage)
    - More certainty in amount of habitat
- *Additional Science:*
    - Directed outflow- results- Fall X2 2017
    - Otoliths, grow/survival
    - Anka's study- good conditions in Marsh
    - New info on DS locations
    - Summer Townet- 3 survey locaitons in Montezuma Slough
    - Scott Hamilton’s draft paper on limiting factors
    - Clams and flow/water
    - Cooler water
    - Suisun lowest levels of food
    - 1931 salinity data, pre-project
        - CVO may have it
        - What times of year
        - Maybe main channels
    - Pre-CVP data salt intrusions 1930's
        - Sept '79, Oct '83
- *Additional Ideas:*
    - Concerns (FWS) of improvement
    - Prior- went eastward historically
    - December requirement is to keep November honest
    - Otter trawl, modified Kodiak trawl, smelt cam, etc
    - Check with Fred Feyrer if there is tech for shallow area
    - Utilize technology that is currently used for salmon floodplain monitoring
    - Start meeting objective early, like August, to meet benefits into Sept/Oct
    - Pulse more benefit- push food in conjunction with Yolo Bypass ramping/routing
    - Track 1 vs 3- habitat focus instead of food
    - Director (FWS) a lot of flexibility
    - Does flow have an effect on food?
    - How do we measure food/influence?
    - Monitor food- actions now?
    - Increase frequency monitor
    - Get recipe right for flow, salinity, food, rest time, etc.
    - Does flow, with the right salinity, kill clams?
    - Flows now move out/back

        - How much habitat are you creating vs. Huge mistake- Fall X2
        - Maps salinity
        - No maps where fish are confluence etc.
        - Suisun- lowest levels of food, diluted food
    - Flat hydro in delta- don't see diversity variability in Fall
    - UC Davis- Fish Lab to raise more
        - Release to make up losses –HGMP, genetic concerns
        - Probably not track 1
    - Folsom/Oroville
        - Who takes?
    - Power Concern- X2 driving reserve below min pool
    - Summers too hot
    - Reluctant to do more in Sept because Oct storm possible
    - Where is Critical Habitat? Is Montezuma Slough included in Critical Habitat?
    - How to approach analysis for Critical Habitat?
        - Need to look at quantity and quality of Critical Habitat
        - Focus on Primary Constituent Elements (PCEs) in Biological Opinion
        - Critical Habitat is not life-stage specific
    - What effects to other standards? What are the other standards?
    - Delta Smelt are there distinctions between two months, is one better?
    - What's the bio justification for Dec? Dry Dec?
    - Is there a benefit to starting higher and move lower vs lower move higher?
    - Historical food/habitat data - what's missing?
    - How likely FWS to approve?
    - Are they paired? SMSCG/Avg
    - What would FWS consider adequate surrogate?