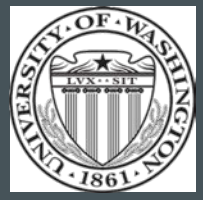
SALMON SCOPING TEAM GAPS ANALYSIS REPORT

PRESENTATION TO CSAMP – OCTOBER 24, 2016

JOHN FERGUSON (Co-Chair)
CHUCK HANSON (Co-Chair)
PATRICIA BRANDES (USFWS)
REBECCA BUCHANAN (UW)
BARBARA BYRNE (NMFS)
SHEILA GREENE (Westlands Water)

BRETT HARVEY (DWR)
RENE HENERY (UNR, Trout Unlimited)
JOSHUA ISRAEL (USBR)
DAN KRATVILLE (DFW)
MICHAEL HARTY (Facilitator)
BRIANA SEAPY (Asst. Facilitator)



PRESENTATION OUTLINE

1. Review the SST's scope and report structure

2. Briefly overview Volume 2 - responses to 8 management questions from CAMT

3. SST's recommendations to CAMT

---

4. Discuss how CAMT is using the information to inform CSAMP

1. SST SCOPE AND REPORT STRUCTURE

Scope:

We focused narrowly on the effects of SWP and CVP operations on salmonid migration and survival in the Delta

- Inflow
- Exports
- Temporary Agriculture Barriers
- Delta Cross Channel
- Head of Old River Barrier

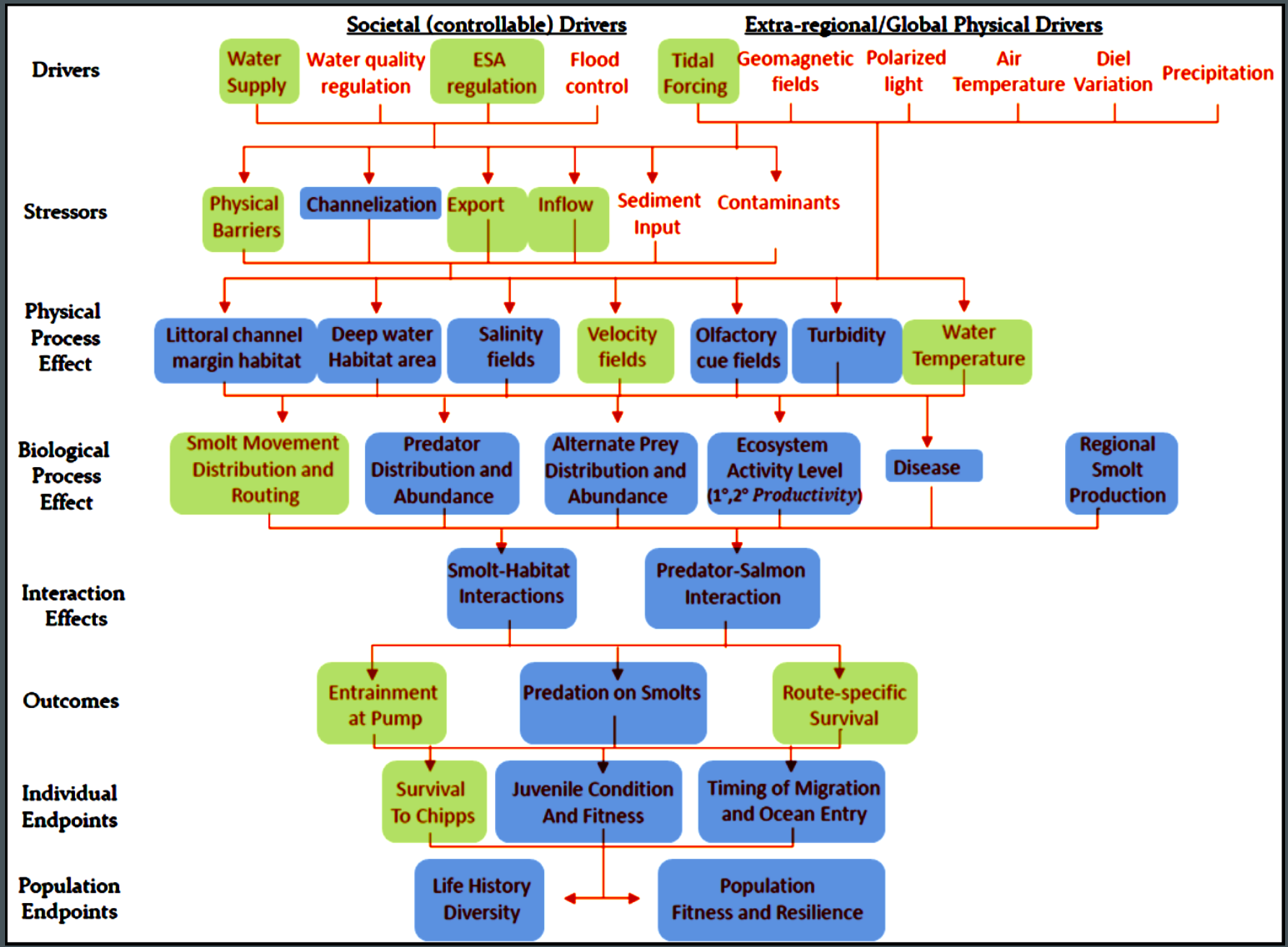
Volume 1

- **FINDINGS AND RECOMMENDATIONS**

Volume 2

- **RESPONSES TO MANAGEMENT QUESTIONS**

CONCEPTUAL MODEL



2. RESPONSES TO 8 MANAGEMENT QUESTIONS

1. EFFECTS OF EXPORTS ON FLOW AND VELOCITY

- Export effects vary with distance from facilities (decrease), export level (increase), inflow, and tides
- Largest export effect was estimated in Old River near the SWP and CVP intakes
- Small effect at distributary junctions

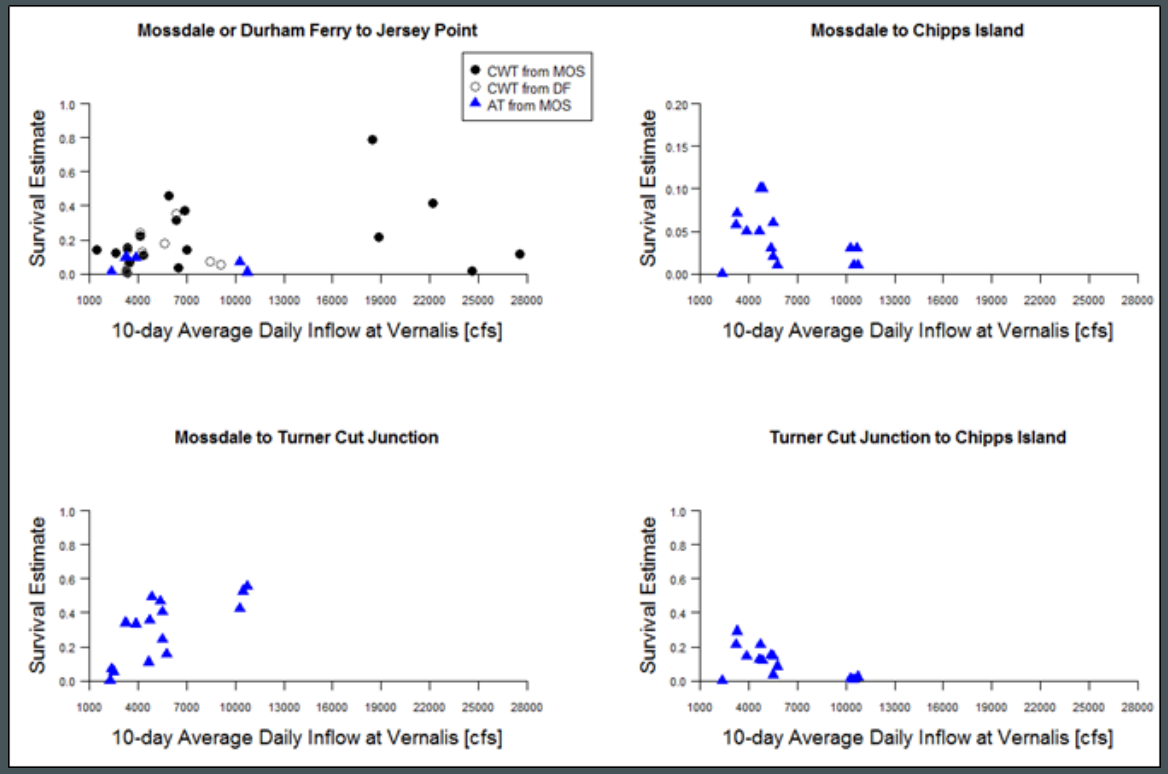
2. USE OF AVAILABLE HYDRODYNAMIC MODELS

- Limitations, common to all models, are related to input data such as outdated bathymetry, Delta consumptive use, Clifton Court radial gate measurements, and hydrologic monitoring station calibration (particularly at high flows), non-validated channels

- Their application for biological monitoring depends on the question, spatial/temporal resolution needed, and required accuracy for the location

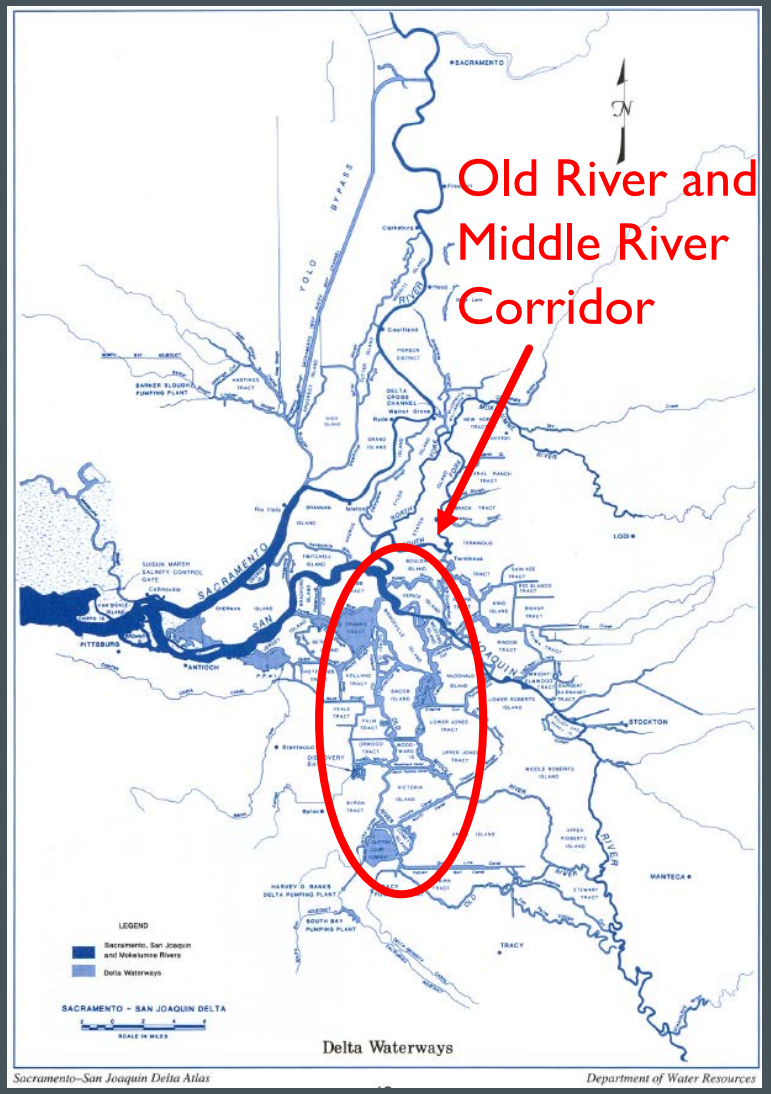
3. EFFECTS OF EXPORTS AND INFLOWS ON SAN JOAQUIN RIVER JUVENILE SURVIVAL

- Varies in space & time
- Limited data over entire flow range
- Uncertainties remain



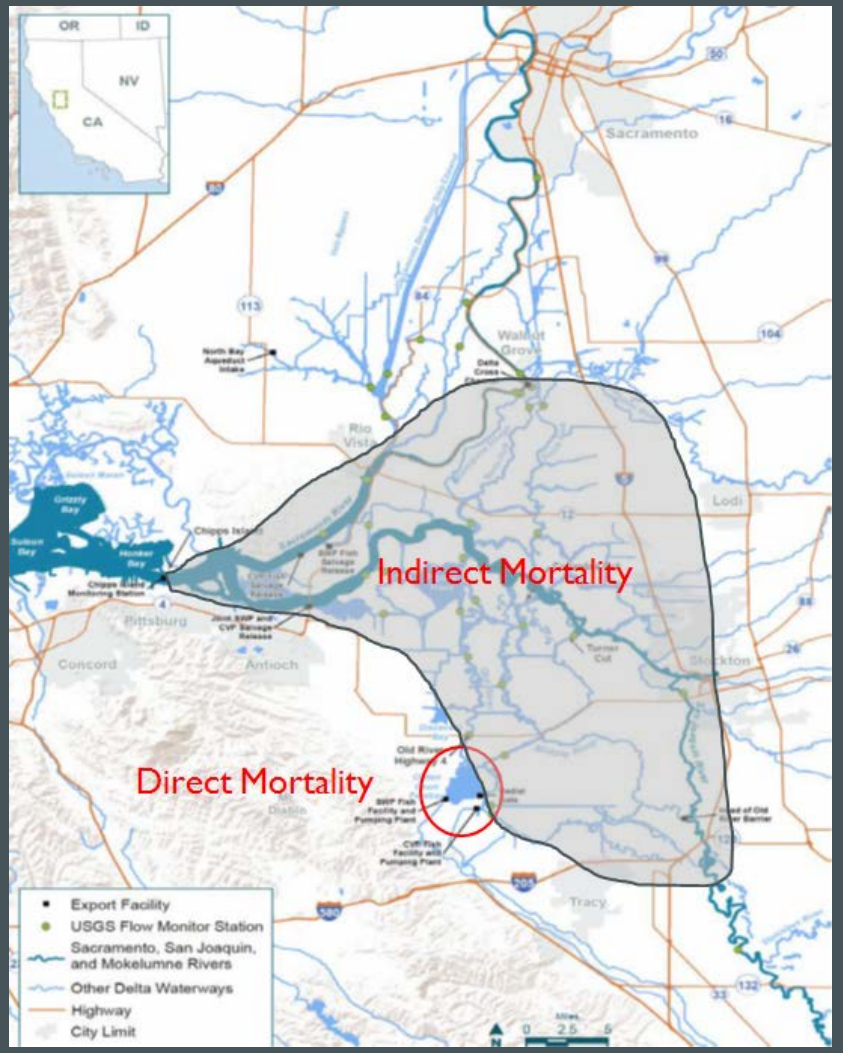
4. OMR FLOW MANAGEMENT: JANUARY 1st ONSET

- Coincides with juvenile presence in Delta of ESA-listed species in most years
- If based on first detection in Delta, would usually begin earlier



5. OMR FLOW MANAGEMENT: SALVAGE-DENSITY-BASED EXPORT RESTRICTIONS

- OMR restrictions likely reduce direct mortality
- Effects on indirect mortality are hypothesized; data are limited



6. ALTERNATIVE FLOW METRICS

- 5 metrics identified that could be developed and tested to potentially refine water project operations to improve juvenile salmonid survival:
  - Net flow in the lower San Joaquin River (QWEST)
  - Hydraulic residence time in the South Delta
  - Percent positive flow in the OMR Corridor
  - Relative proportion of CVP exports
  - Proportion of Sacramento River water in exports

7. BIOLOGICAL RESPONSE METRICS

- 8 metrics identified that could be developed and tested for assessing management actions to improve juvenile salmonid survival:
  - Fish routing into Interior Delta
  - Survival at the route and reach scale
  - Survival at the Delta scale
  - Condition of fish entering and leaving Delta
  - Contribution of fry rearing to survival and adult production
  - Probability of export facility entrainment
  - Direct (salvage) mortality relative to population abundance
  - Juvenile abundance exiting Delta

8. ADDRESSING CONCERNS ABOUT SURROGATES

- **Few studies using wild salmonids are available to evaluate surrogate relationships**
- **Development of correction factors will require additional study**

- Use of surrogates and questions about their use will continue until target populations are abundant or permitted for use in studies
- Surrogacy issue is best addressed on a case-by-case basis during study design development

3. SUMMARY AND OVERARCHING CONSIDERATIONS

- The Delta is a very complicated environment
- The Delta should not be perceived as a singular region, but a suite of regions defined by different physical forcing factors.
- Numerous key questions remain and will require new analyses and experimental approaches
- Questions should be integrated and shift to:

  What can be tested (science)

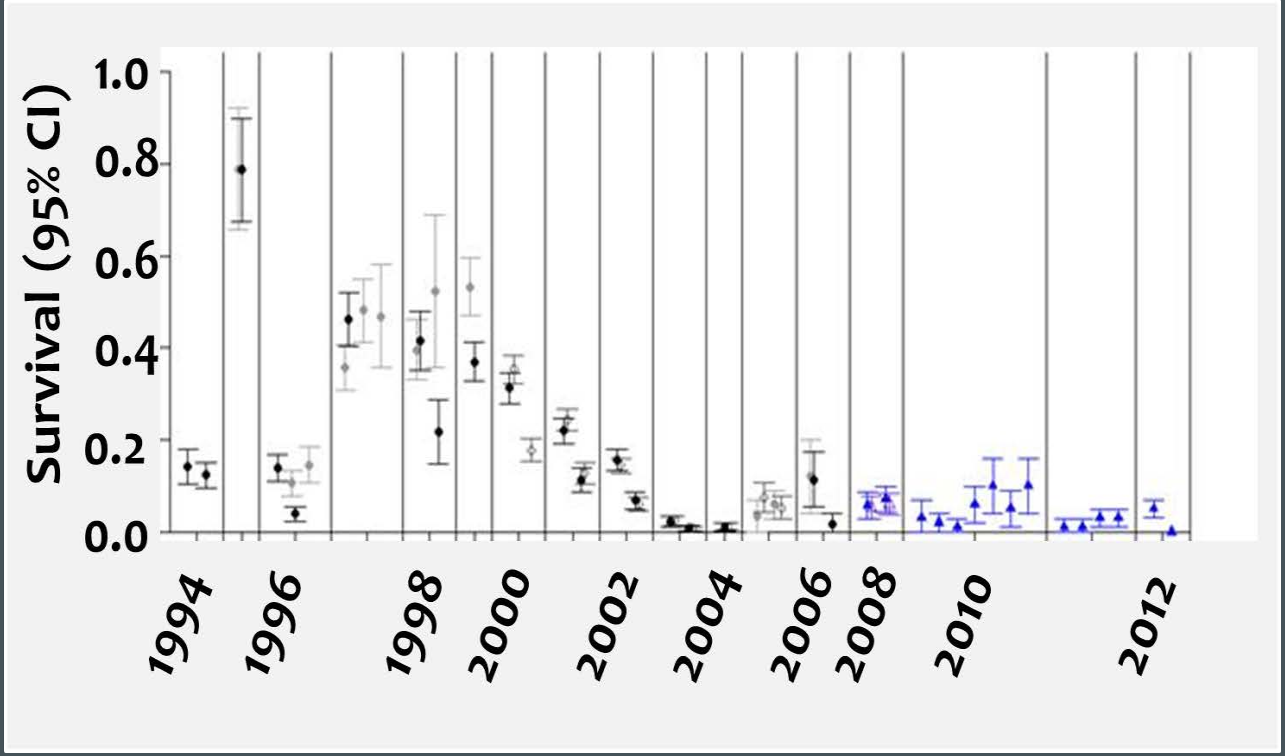
  What needs to be tested (management)

  What can be put into place for testing (operations)

- Future decisions will have to be made with uncertainty; need to develop tools to help

THROUGH-DELTA SURVIVAL

- Through-Delta survival has been consistently low for San Joaquin River Chinook salmon



San Joaquin River Fall-Run Chinook Salmon

RECOMMENDATIONS

- 1. Continue existing survival studies, monitoring, and analysis of data (foundation for expanded, future studies)
  - Current studies provide information about survival and junction-specific routing
  - Continuing to estimate through-Delta survival will provide continuity for assessing current status, inter-annual variability and long-term trends
  - Additional analyses of present data to further improve understanding of linkages between water project operations and migration and survival

RECOMMENDATIONS

- 2. Implement short-term actions to improve salvage facility operations (disagreement on whether to recommend short term actions or premature to do so)
  - Determine if current operations at salvage facilities could be improved to reduce losses
    - Actions to reduce direct mortality
    - Other actions to reduce facility loss

RECOMMENDATIONS

- 3 and 4. Develop and implement a long-term monitoring, research, and adaptive management plan
  - To more fully assess the effects of water project operations
  - With stable and reliable funding for implementation for a period of at least 15 years.
  - Base it on monitoring, modeling, and direct manipulation of factors

RECOMMENDATIONS 3 AND 4

- Develop and implement a long-term monitoring, research and adaptive management plan
  - Requires a policy commitment to a range of management actions to be tested
  - Requires agreement on the level of precision needed
  - Requires agreement that operational experimental conditions can be achieved

RECOMMENDATIONS 3 AND 4

- Develop and implement a long-term monitoring, research and adaptive management plan
  - Plan should augment and expand the scope of current studies in terms of breath, depth and number of analyses, monitoring studies and experiments conducted
  - A suite of integrated studies organized in hierarchical structure that is adjusted as new information is obtained
  - Focus on causal mechanisms at appropriate time and space scales

4. CO-CHAIRS PERSPECTIVE -- WHAT'S DIFFERENT?

- Biological goals and objectives
  - Not specified vs identified by species, life stage, watershed, route
- Thresholds for significance
  - Not specified vs identified
- Experimental design
  - Monitoring to Chipps vs experimental manipulation
- Study duration
  - 1-6 six years vs 15-20 years
- Integration among disciplines
  - Not systematic vs increased
- Water project operations
  - Unspecified vs prescribed

CAMT ACTIONS AND NEXT STEPS (VERY PRELIMINARY)

- CAMT is discussing the scope of potential actions and how to proceed, including:
  - Pursuing near-term actions to improve salmonid survival
  - Identifying key management questions and developing juvenile salmonid survival objectives for the Delta
  - Accelerating data processing and analysis of existing tagging data
  - Acknowledging the challenges associated with testing the full range of I:E ratios and exploring alternative management tools/metrics (based on SST report)
  - Working with, and within CVPIA program to improve modeling and implement actions in the Delta to improve juvenile survival

REFERENCE SLIDES

SUMMARY

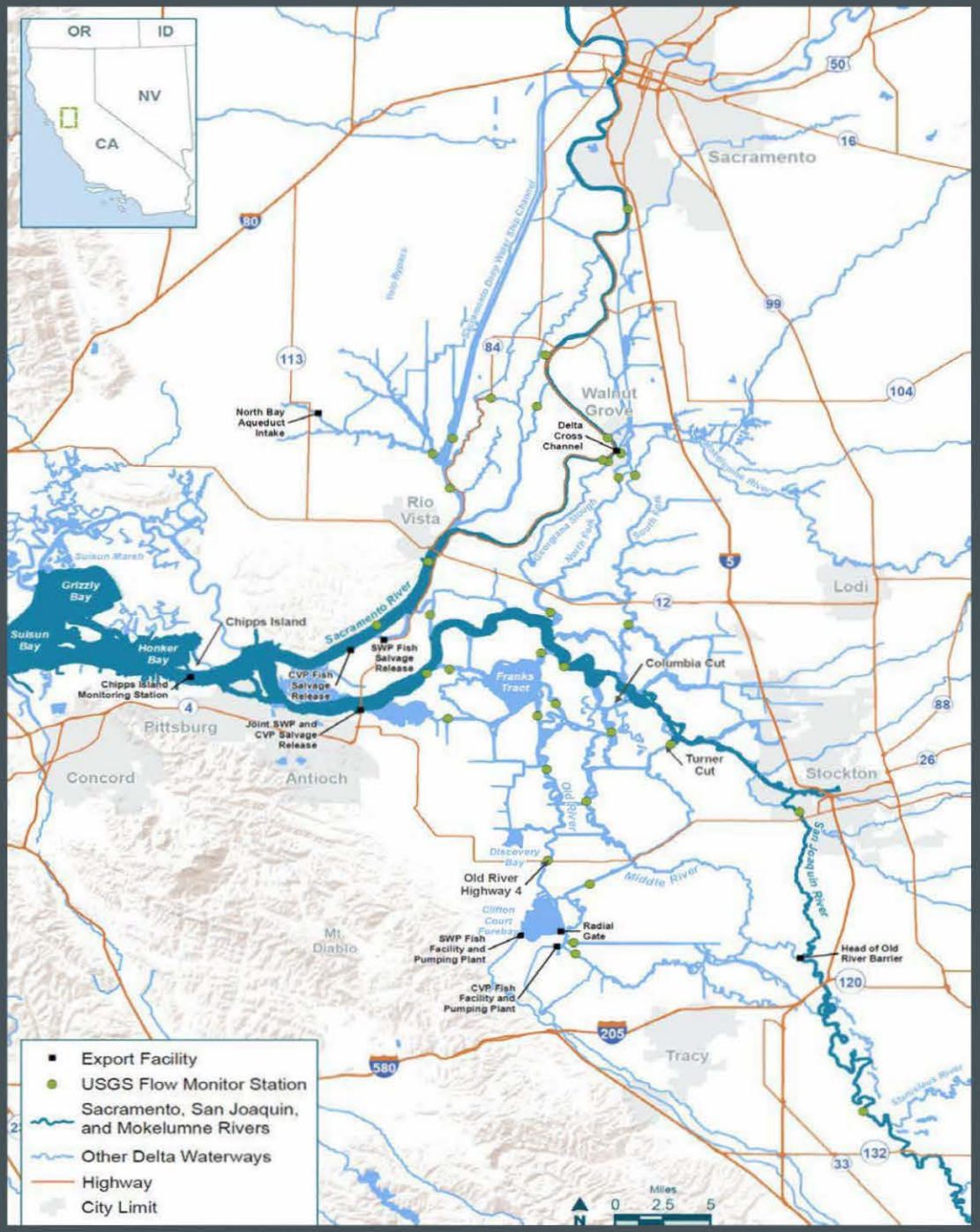
- Salmon survival in the South Delta is low
- A number of gaps have been identified
- The performance of various management actions on salmonid survival is uncertain
- The SST recommends:
  - Implement actions to improve survival at the SWP and CVP export facilities
  - Continue to monitor salmonid survival in the south Delta while completing additional analyses of existing data to provide a foundation for developing a long-term, hypothesis-based adaptive management program to experimentally assess salmonid migration, survival, underlying mechanisms, and management action performance
  - Develop and implement a long-term monitoring, research and adaptive management program

ACTIONS TO REDUCE DIRECT MORTALITY

- Control predator populations (CCF and CVP trash racks);
- Control secondary louver efficiency (control of bypass velocities)
- Keep primary and secondary louvers free from debris; reduce time when they are inoperable for cleaning
- Improve salmon passage within the CVP, and decrease predator passage within the CVP
- Consider alternate truck release locations of salvaged fish to prevent large predator assemblages
- Verify the assumption that pre-screen losses at the CVP intake are 15% and substantially lower than losses at the SWP
- Test using the CVP for export instead of the SWP to reduce losses of salmonids in CCF.

OTHER ACTIONS TO REDUCE FACILITY LOSS

- Test how CCF radial gate openings affect velocities and fish entrainment
- Evaluate filling the scour hole inside the CCF radial gates reduce predator habitat and predation
- Review and potentially adjust the fish facilities design and operational criteria
- Review past studies and evaluate truck transport release alternatives


OR
ID
NV
CA
Sacramento
Walnut Grove
Rio Vista
Lodi
Stockton
Pittsburg
Concord
Antioch
Mt. Diablo
Discovery Bay
Tracy
North Bay Aqueduct Intake
Delta Cross Channel
Chipps Island
Chipps Island Monitoring Station
SWP Fish Salvage Release
CVP Fish Salvage Release
Joint SWP and CVP Salvage Release
Columbia Cut
Turner Cut
Old River Highway 4
Radial Gate
SWP Fish Facility and Pumping Plant
CVP Fish Facility and Pumping Plant
Head of Old River Barrier
Grizzly Bay
Suisun Bay
Honker Bay
Suisun Marsh
Franks Tract
Middle River
Old River
San Joaquin River
Sacramento River
Miles
0 2.5 5
N
Export Facility
USGS Flow Monitor Station
Sacramento, San Joaquin, and Mokelumne Rivers
Other Delta Waterways
Highway
City Limit

PROJECT EFFECTS ON MORTALITY

- Direct mortality contributes to salmonid mortality in the Delta
- … But direct mortality does not account for the majority of the mortality experienced in the Delta
- The mechanism and magnitude of indirect effects on Delta mortality is uncertain