



Presentation to the NASEM Committee to Review Long-Term Operations of the  
Central Valley Project and the State Water Project  
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- *Delta smelt: address multiple stressors/avoid cherry picking*

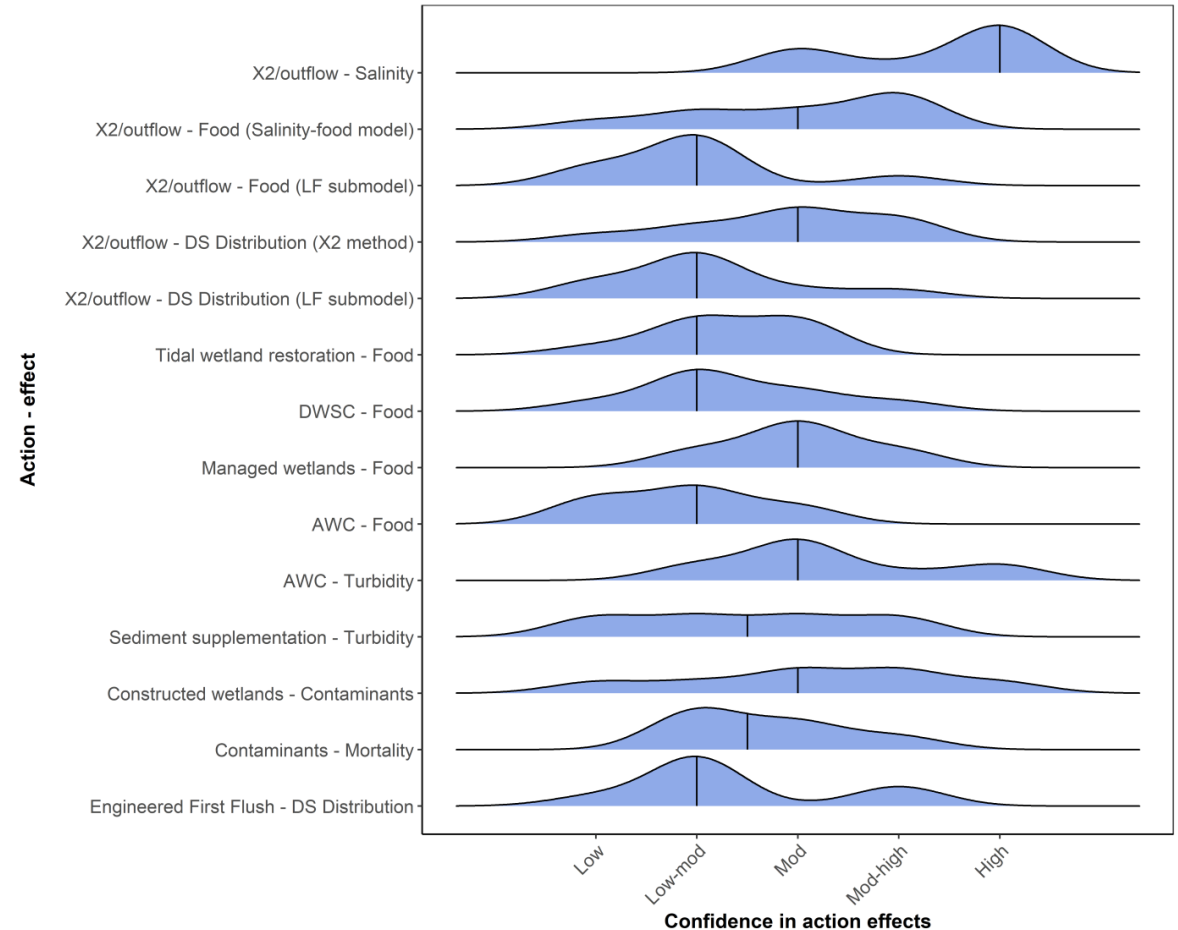
- CSAMP Delta Smelt Structured Decision Making process (final report due 8.31.24) used multiple Delta Smelt life cycle models to test competing hypotheses
- finds that recovery is possible through combinations of actions (i.e., portfolios) with additive and synergistic effects. Portfolios that concurrently target multiple population drivers in multiple regions can achieve higher population growth than single actions
- identifies 7 management actions for next steps:
  - i) pilot managed wetlands projects for food in Suisun Marsh
  - ii) pilot invasive aquatic weed control studies
  - iii) physical point source contaminants reduction at Ulati Creek
  - iv) modeling of outflow actions, esp summer outflow enhancement
  - v) sediment supplementation feasibility studies
  - vi) engineered first flush framework and experimentation; and
  - vii) tidal habitat restoration food subsidy research





- *Delta smelt: address multiple stressors/avoid cherry picking*

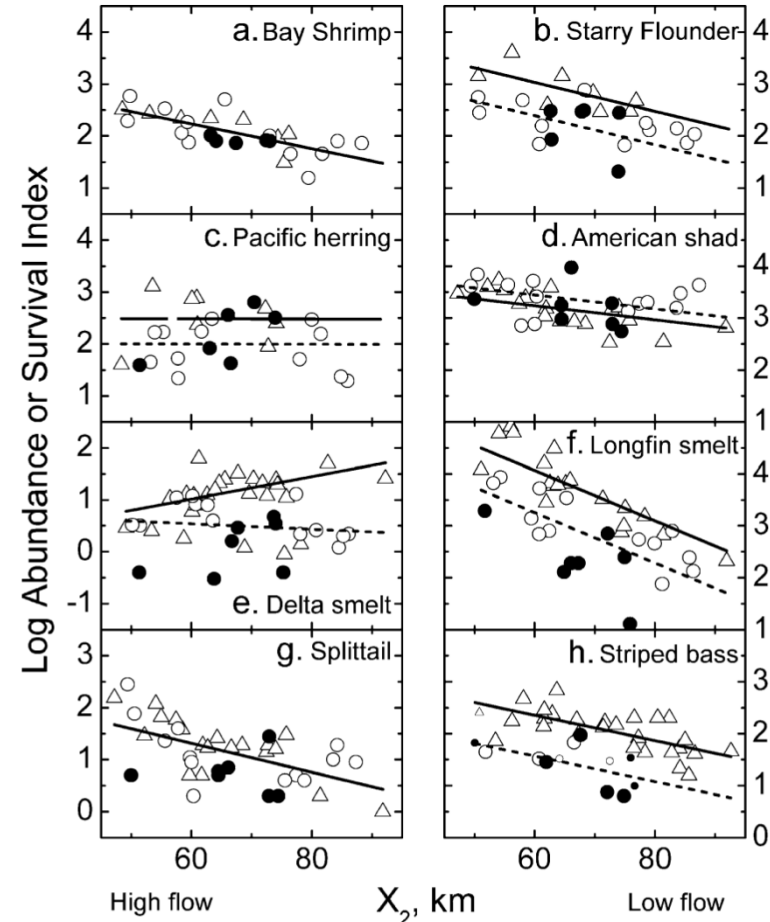
- Tidal marsh (food): high positive pop growth assuming  $\geq 30k$  acres
- Summer outflow: positive pop growth
- Fall outflow: positive pop growth when  $X2 < 80$  km W/AN yrs
- Fall outflow: faster pop decline than historical when  $X2 > 80$  km W/AN yrs
- Positive growth rate, greater uncertainty re food subsidy vs positive growth rate, higher certainty for outflow enhancement





*Ecosystem: potential for positive population growth relies on significant improvements in flow conditions*

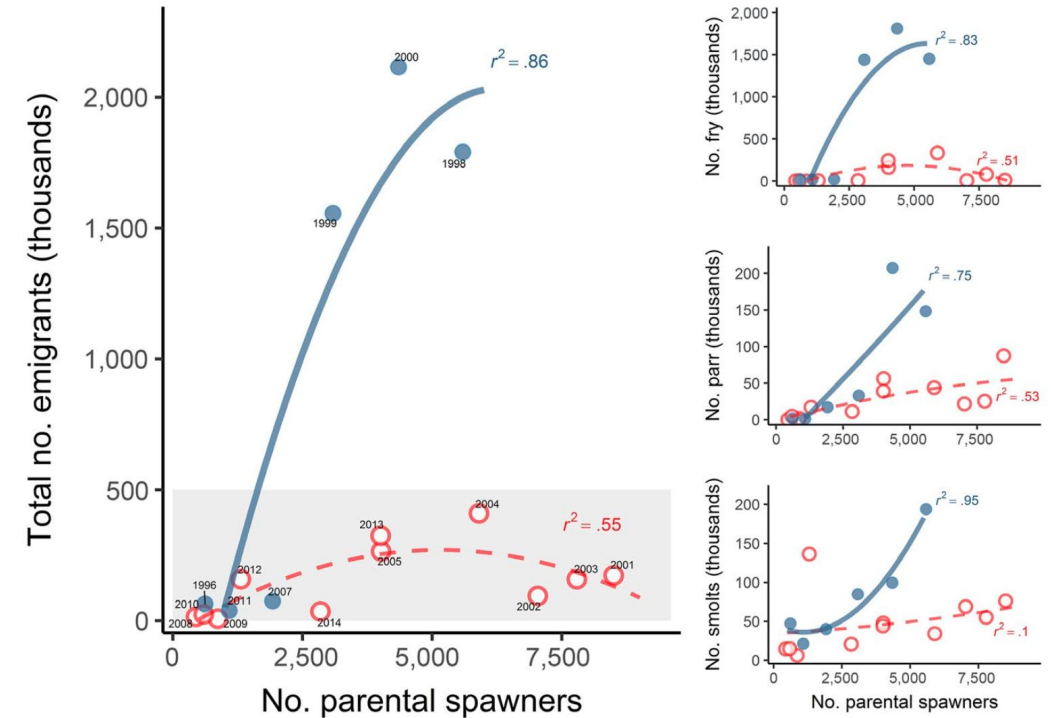
- Flow is a driver of biological response. Many Bay-Delta species exhibit strong, persistent and significant flow-abundance relationships. For some, flow and abundance increase in a relatively continuous curve (from Kimmerer 2009)





*Ecosystem: potential for positive population growth relies on significant improvements in flow conditions*

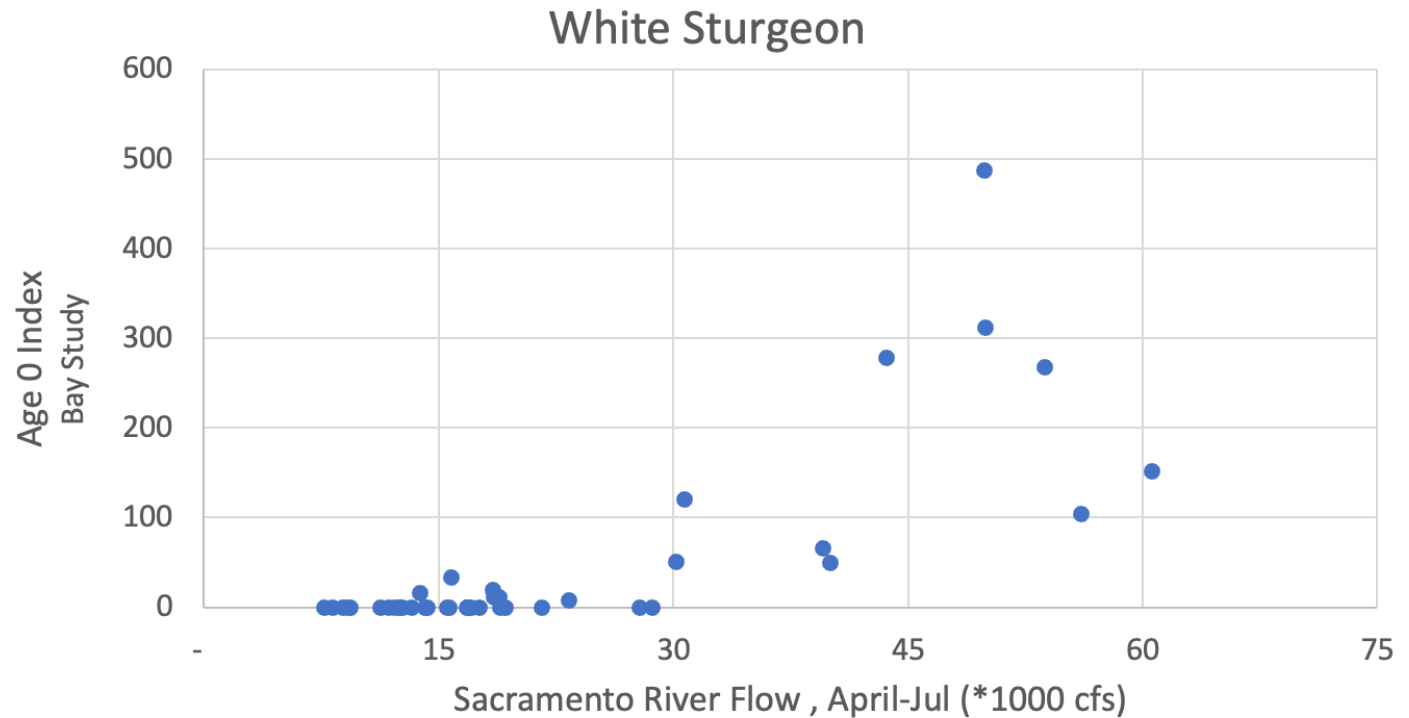
- For other species, like Chinook salmon (in this example, Stanislaus R fall run), the potential for positive pop growth increases dramatically when flow thresholds are exceeded (>987 cfs Jan-June avg), with much greater abundance in wetter years, underlining the function of flow as a driver of biological response (from Sturrock et al 2019)





*Ecosystem: potential for positive population growth  
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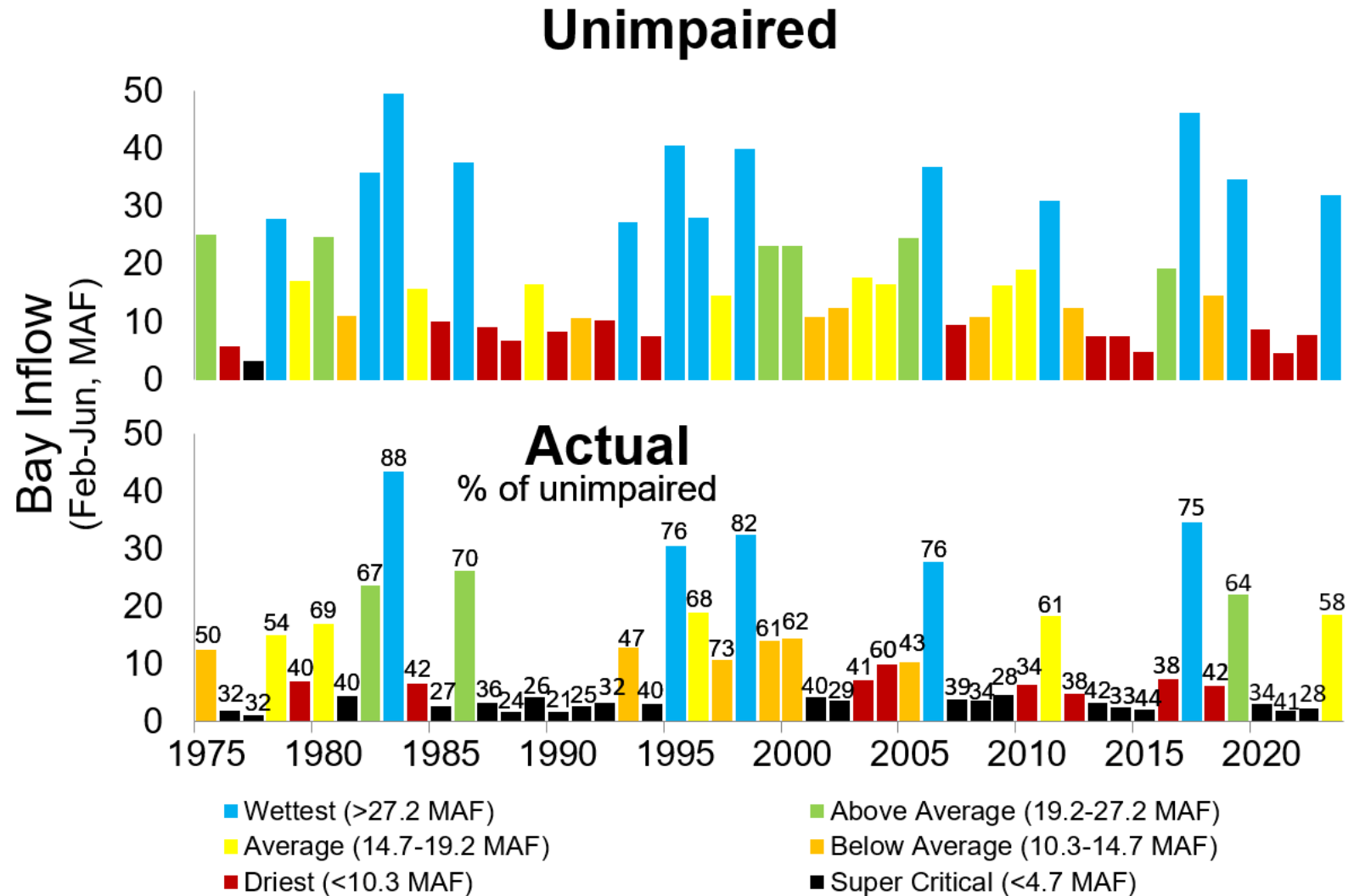
- Another example of flow as a driver of biological response is white sturgeon (state candidate and proposed federal ESA listing) - recruitment is low or zero when spring-summer Sacramento River flows are < 30k cfs (from Baykeeper et al 2023)





*Ecosystem: potential for positive population growth relies on significant improvements in flow conditions*

The problem: positive pop growth is not currently possible except in wettest years because the Bay-Delta ecosystem experiences extreme drought conditions (the driest 2%) almost half the time as a result of unsustainable diversion levels in almost all years (figure from TBI 2023)





*Drought cycles: baseline assumptions about drought protections are misleading, because the rules are routinely waived*

- The existing baseline for managing drought cycles is insufficient:
  - Current critically dry year flows universally acknowledged to be inadequate
  - Little or no critical year flow enhancement in proposed VAs
  - No assurance that potential Voluntary Drought Toolkit actions will be implemented
  - No assurance that “meet and confer” adaptive management regimes will result in real world actions



*Drought cycles: baseline assumptions about drought protections are misleading, because the rules are routinely waived*

But it's even worse than it looks because:

- Temporary urgency change petitions filed by USBR and DWR were approved - and baseline protections waived - in 6 out of 10 previous years (2014, 2015, 2016, 2021, 2022 and 2023); in some of those years:
- >95% mortality for winter- and spring-run Chinook salmon eggs and larvae
- Record or near-record low abundance numbers for Delta smelt and longfin
- Increased occurrence of Harmful Algal Blooms
- Increased non-native species abundance
- Increased likelihood of new non-native species invasions





## *Takeaways*

- No one action pathway is likely in and of itself to reverse the decline and promote the recovery of Delta smelt: implement a strategy to address multiple stressors (including increasing habitat targets and improving both summer and fall outflows).
- Recovery of listed species - and protection of the broader ecosystem - is impossible without positive population growth. Positive population growth is impossible without improved flow conditions in most years, but flows in almost all years are increasingly constrained by diversion levels. Support higher flows and more natural flow patterns at levels based on meeting thresholds for positive population growth in most years and other ecological factors.
- Protections in drier years and drought cycles are critical to preventing extinction, but are grossly inadequate. Plus, the rules are routinely waived in drier years, and that needs to be taken into account when considering ESA requirements. Specify drought year management decision pathways and resources and ensure that federal default requirements are in place in case baseline is waived by state.



# Sources

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