Fish-centric considerations for Delta conveyance planning

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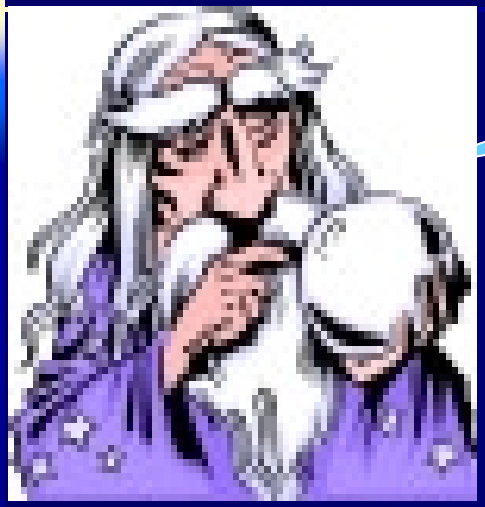
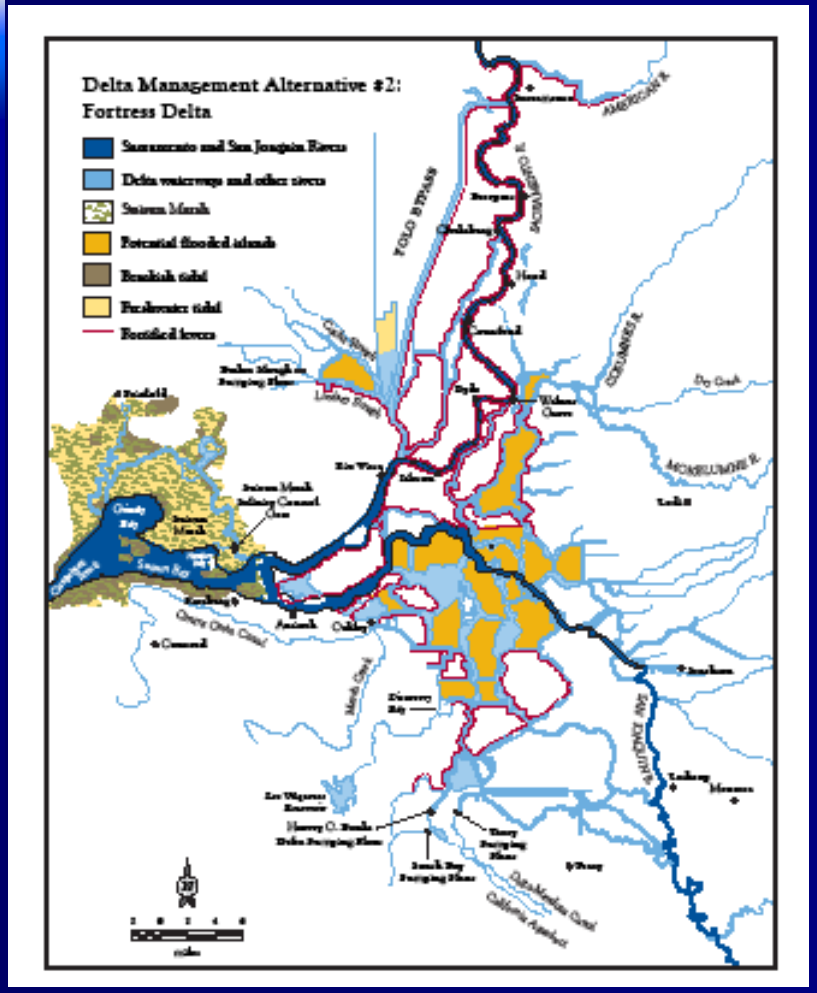
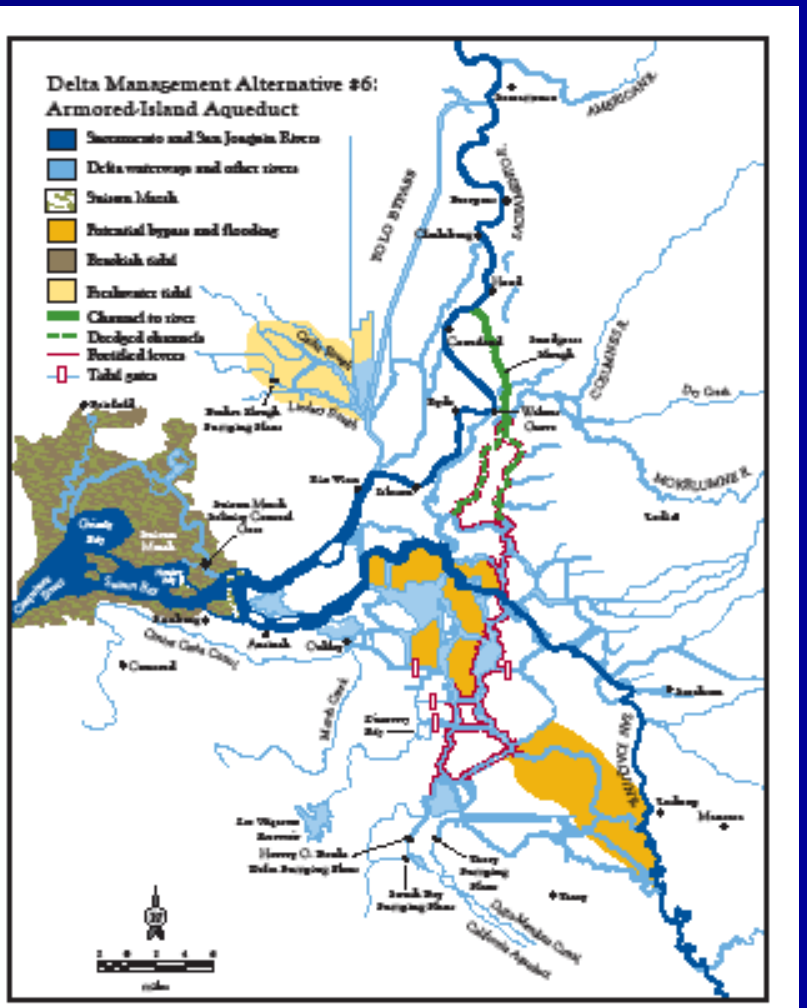
Sea level rise

http://flood.firetree.net/



What ecological considerations cut across conveyance details?





The Cardinal Rule of applied ecology:

The Cardinal Rule of applied ecology:

- If you change the system, the system will change

The Cardinal Rule of exporting water:

Exporting water will change the system…always

“Freshwater flow defines an estuary.” (Kimmerer 2002)

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Is the water quality suitable?

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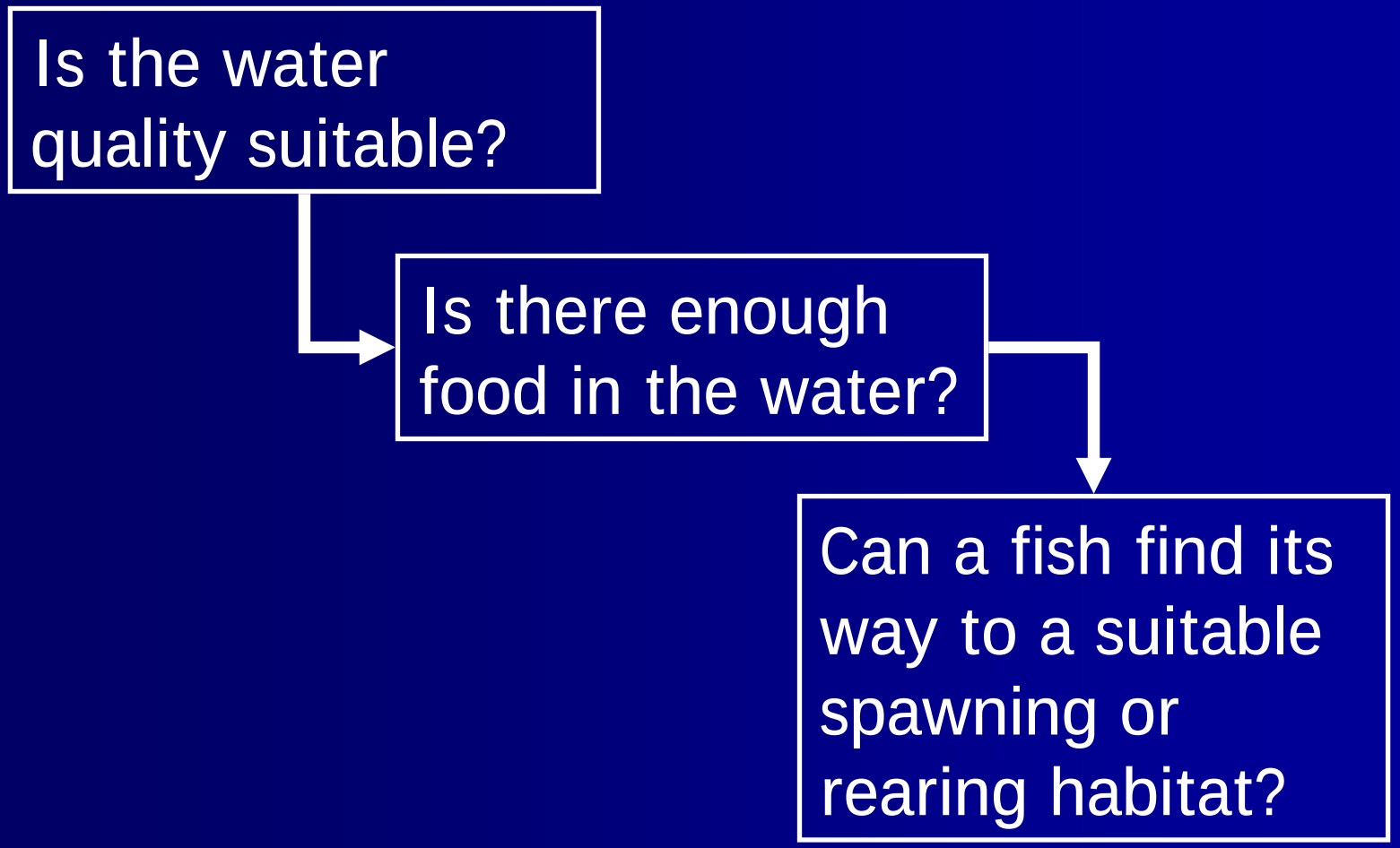
Is the water quality suitable?

Is there enough food in the water?

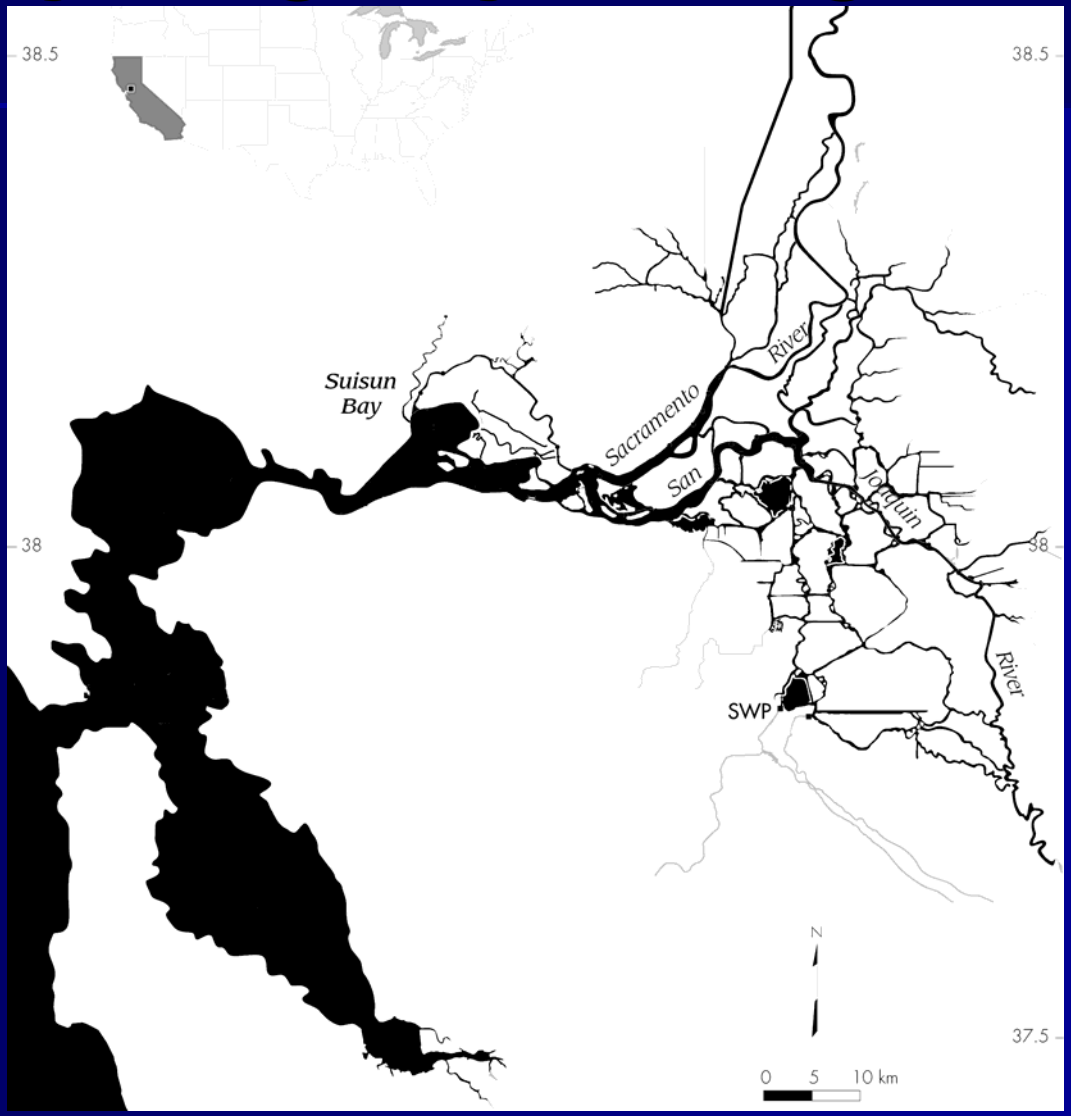
“Freshwater flow defines an estuary.” (Kimmerer 2002)



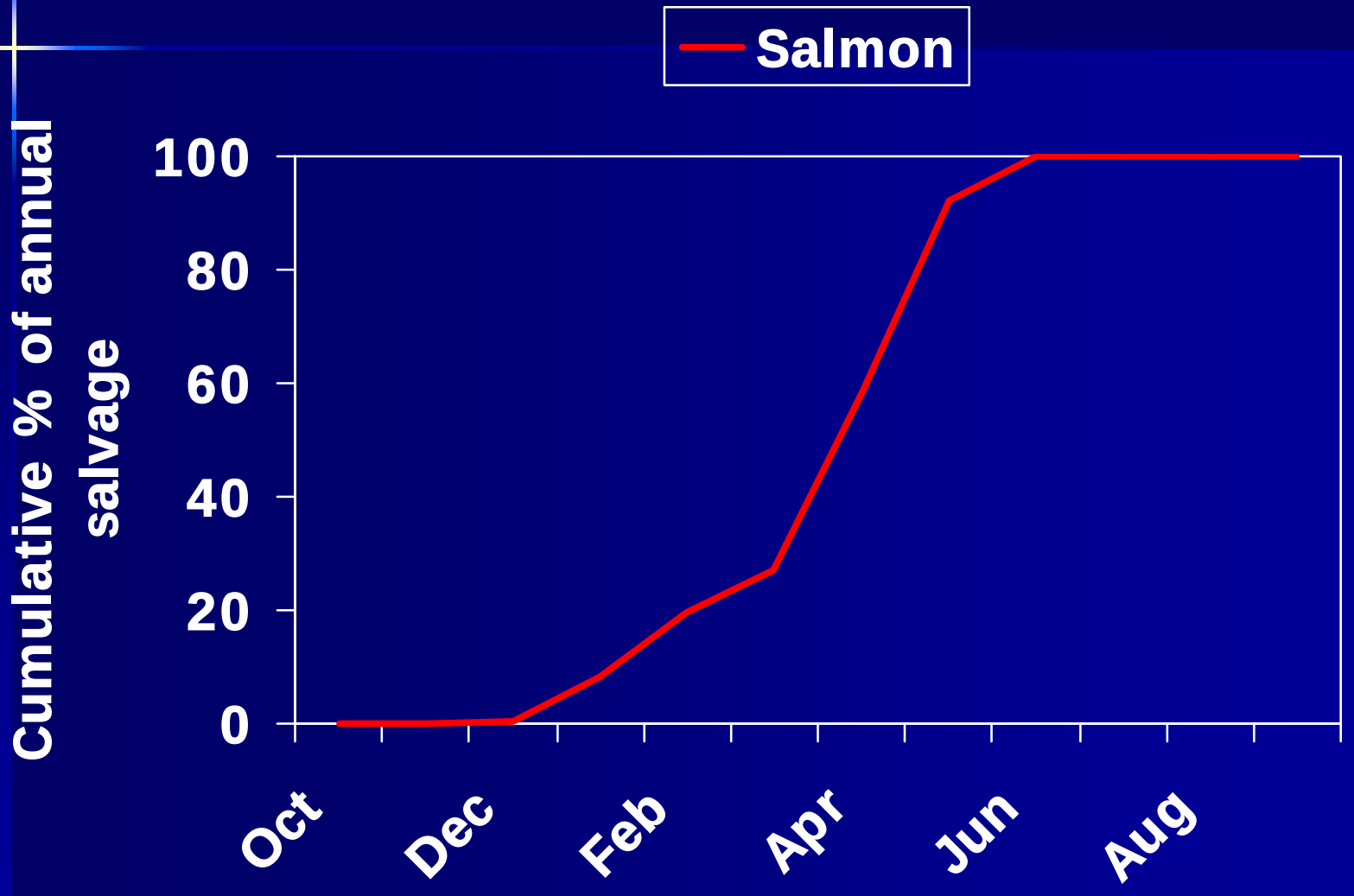
Three over-arching questions

- How does the conveyance option change the abiotic aspects of fish habitat?
- How does the conveyance option change the flow of energy to target species?
- How does the conveyance option affect migratory fish transport and fate?

You got yer resident fish and you got yer migratory fish

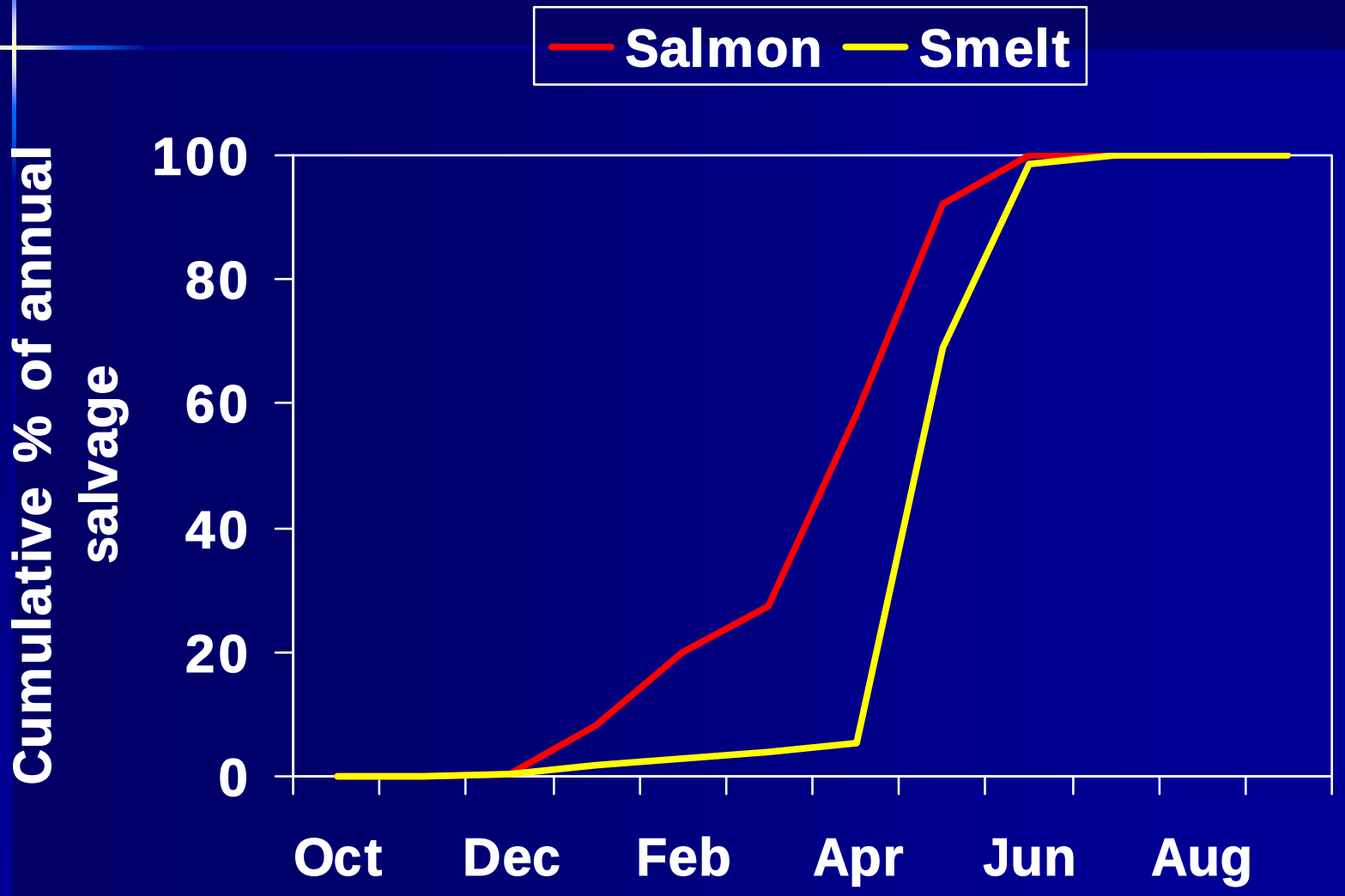


Temporal distributions



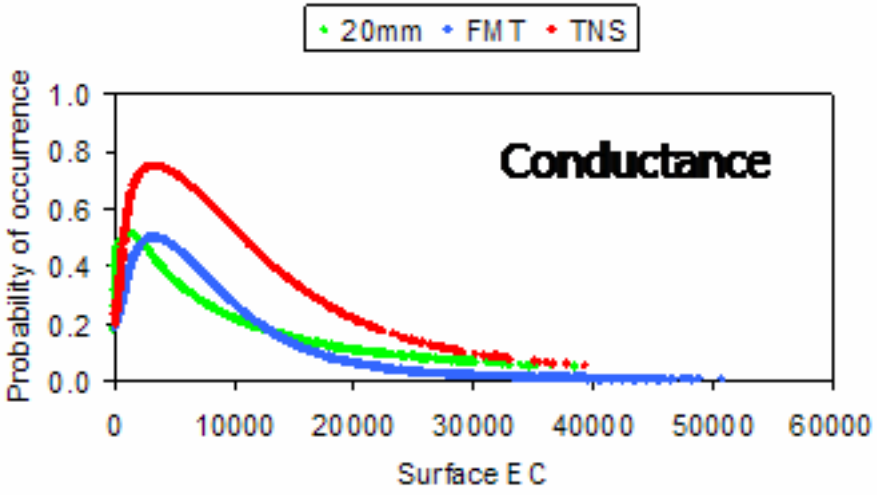
How does the conveyance option change the abiotic aspects of fish habitat?

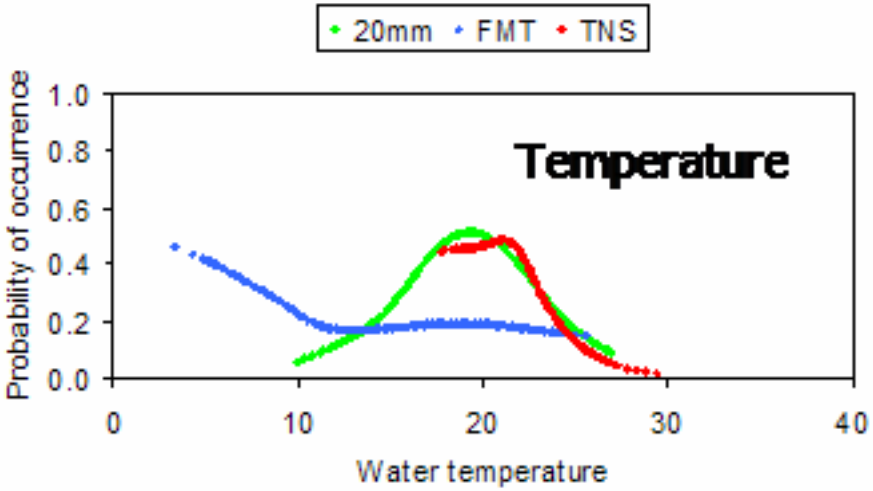
Delta smelt salvage looks like a classic passage issue…

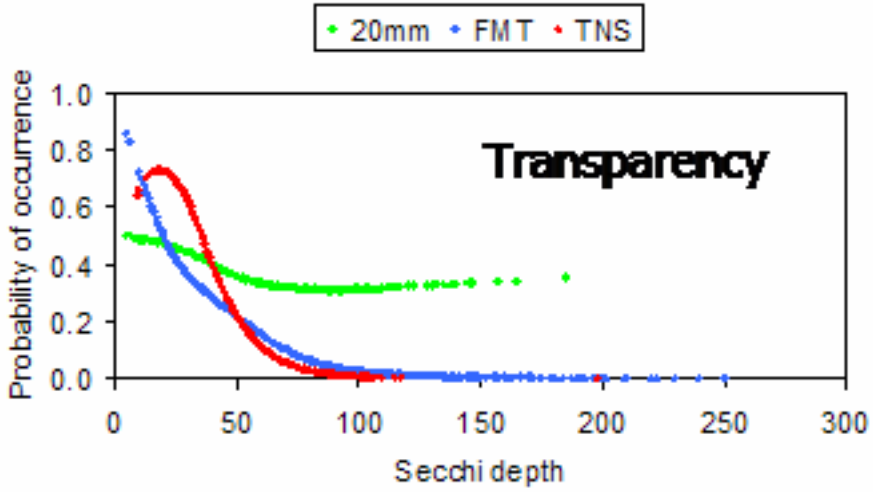


Delta smelt habitat is dynamic

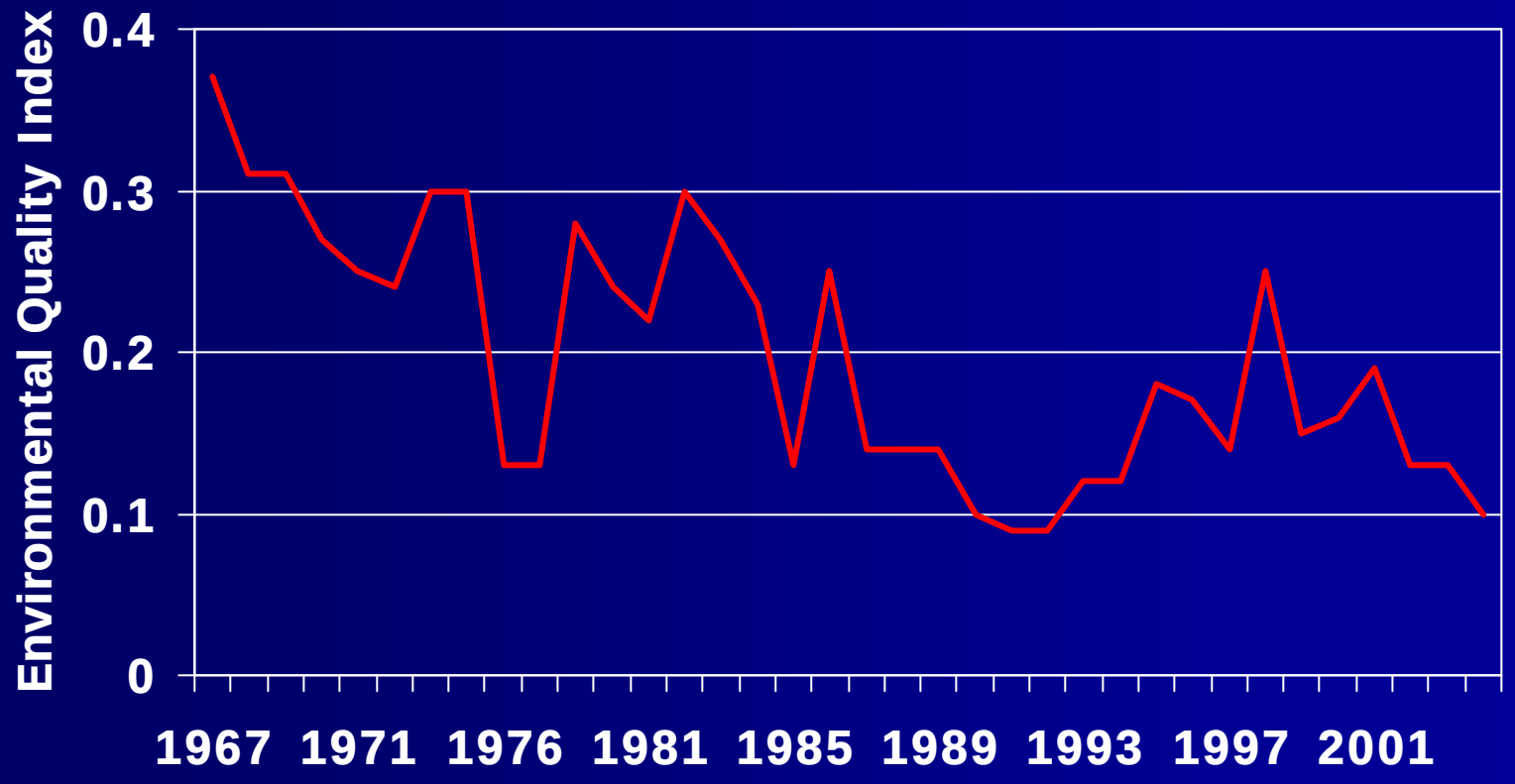
It generally isn't accurately characterizable as "Suisun Bay"







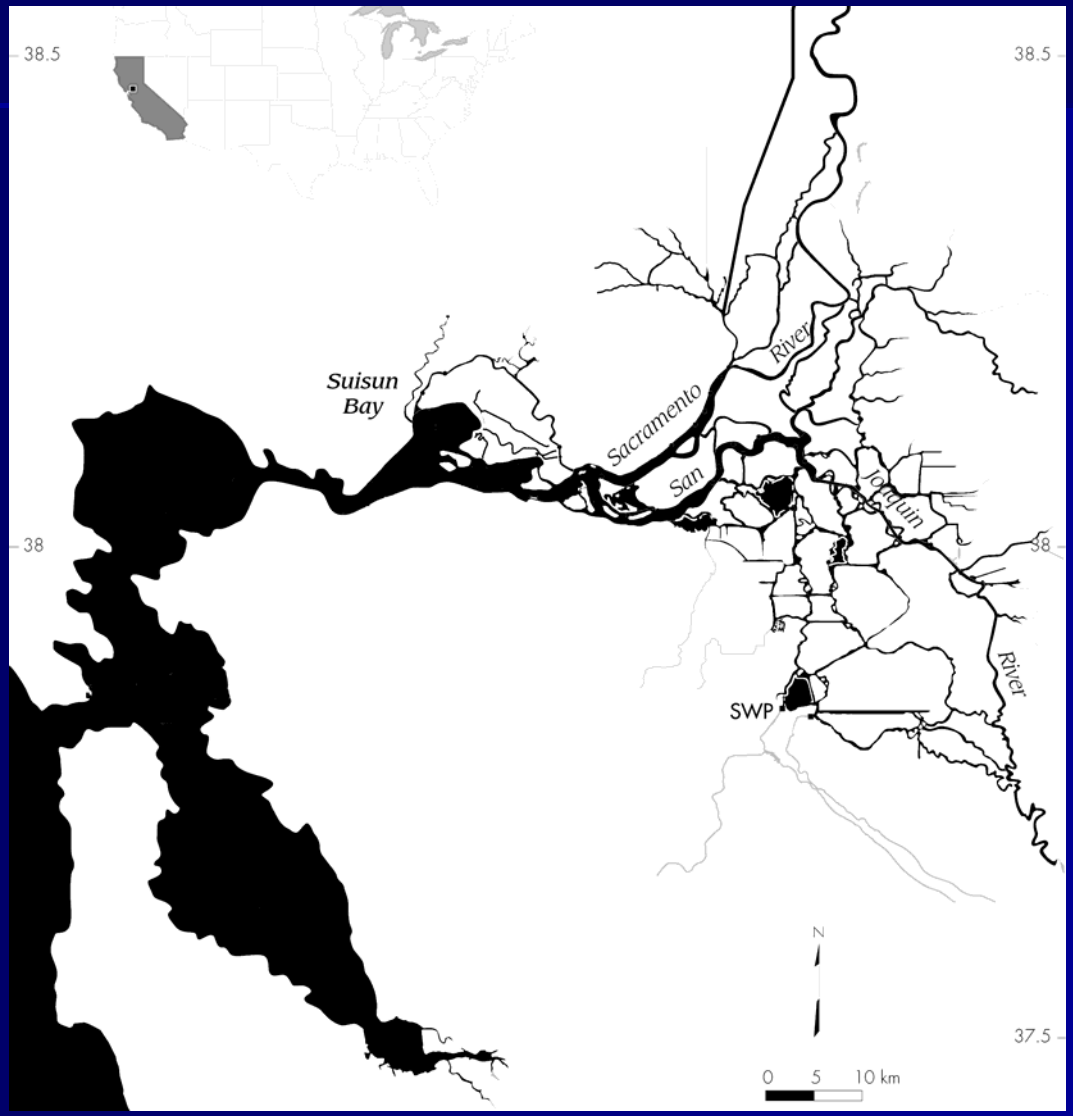
The projects influence habitat suitability for delta smelt



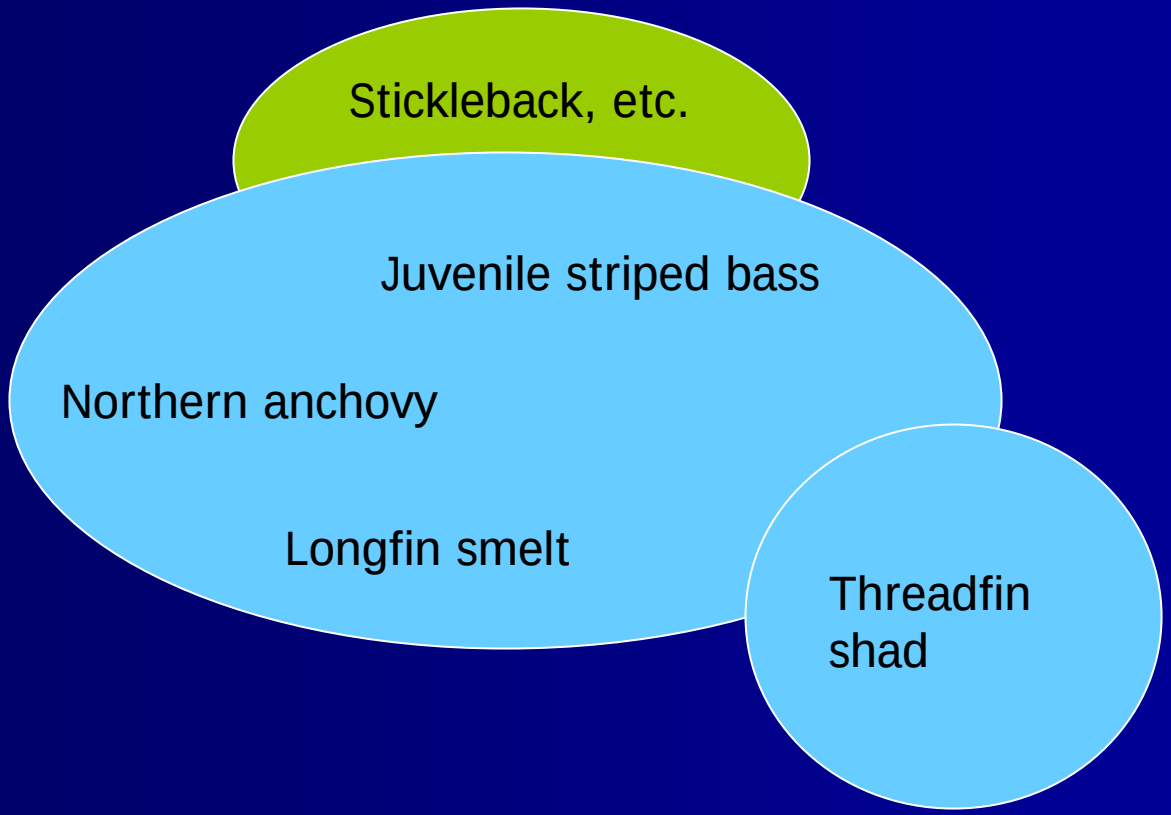
Taken from Feyrer et al. (2007)

How does the conveyance option change the flow of energy to target species?

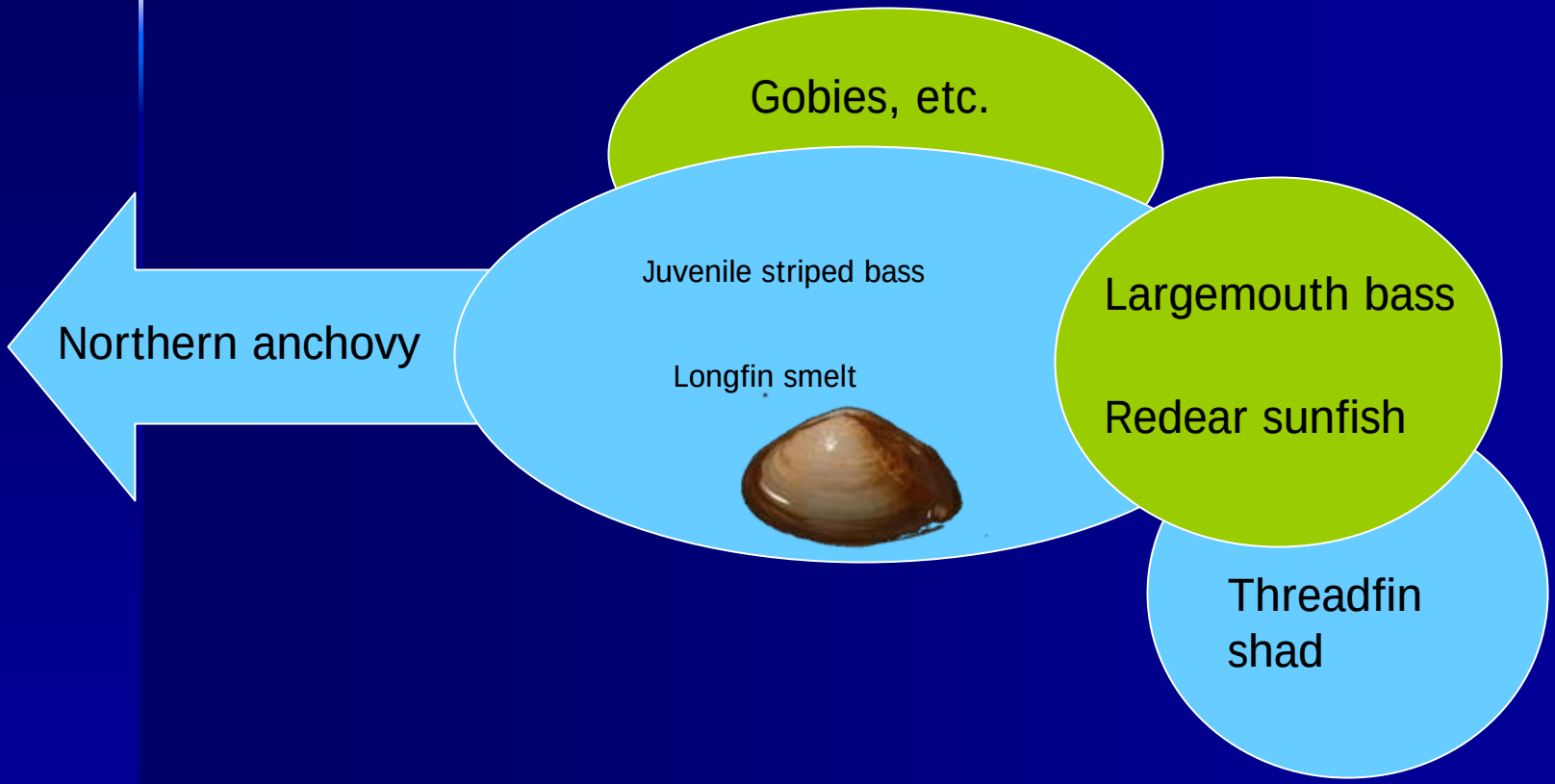
Energy flow matters big time



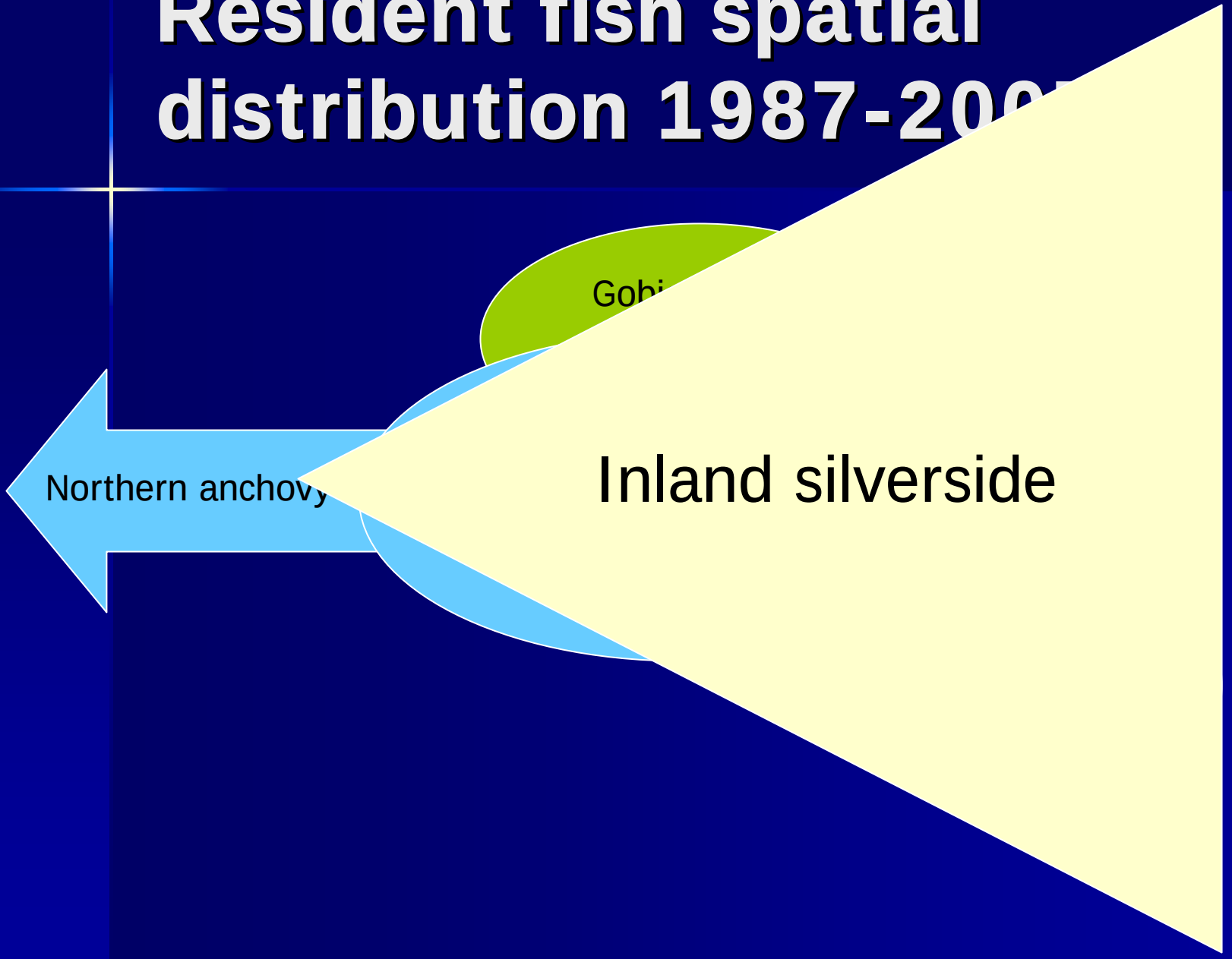
Resident fish spatial distribution 1967-1987



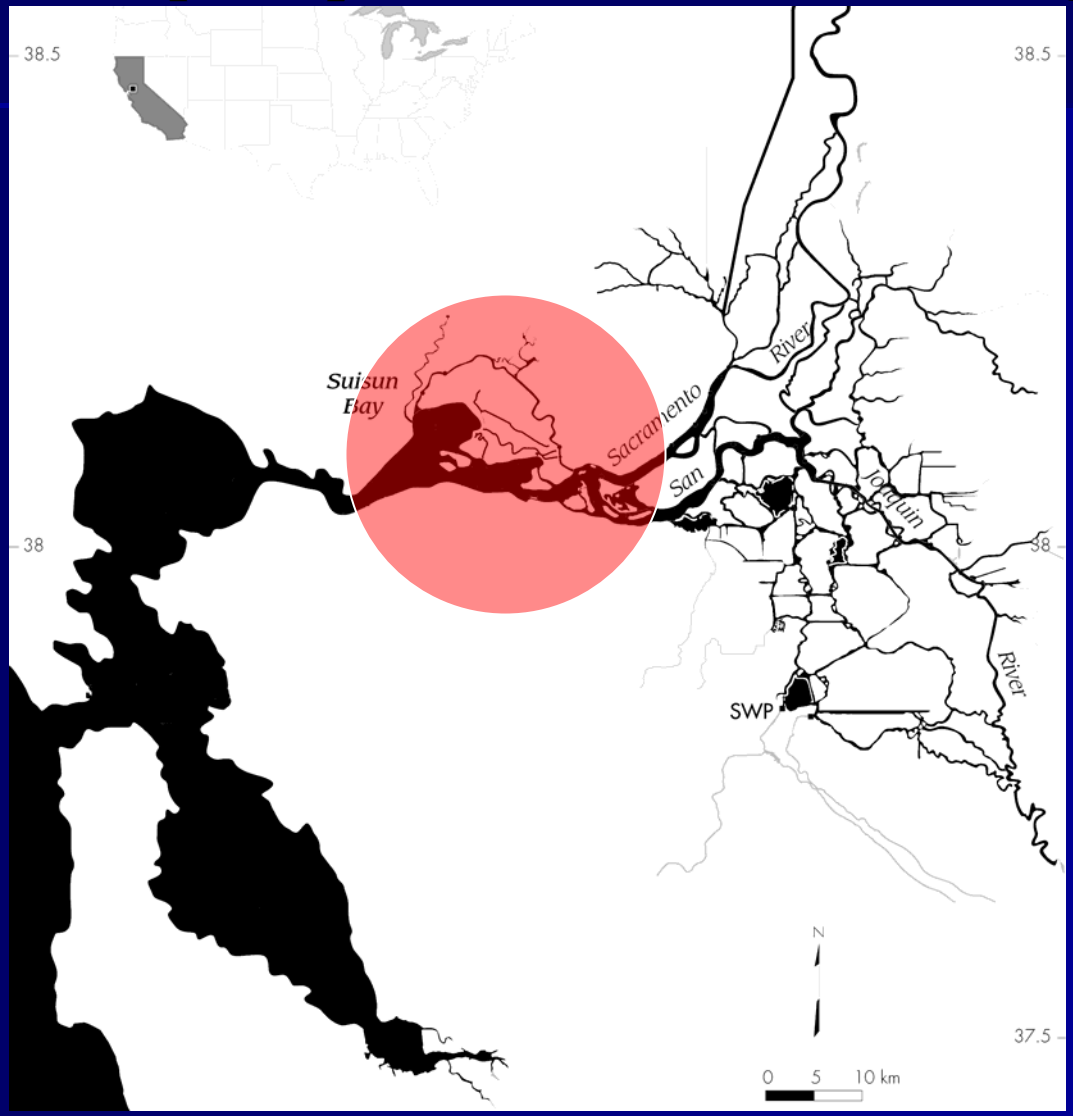
Resident fish spatial distribution 1987-2007



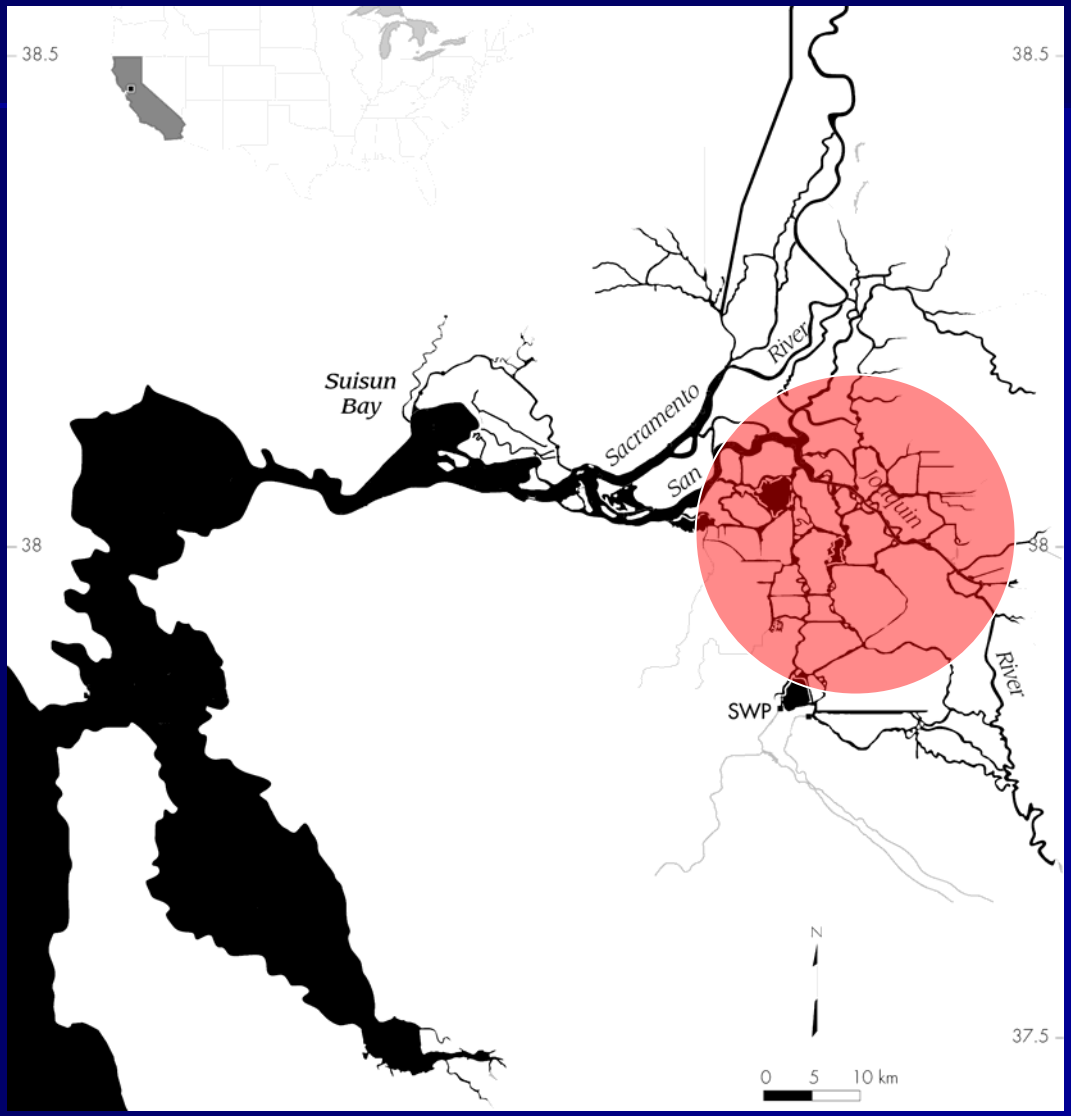
Resident fish spatial distribution 1987-200



Neomysis and *Eurytemora* bloom(ed) in Suisun Bay



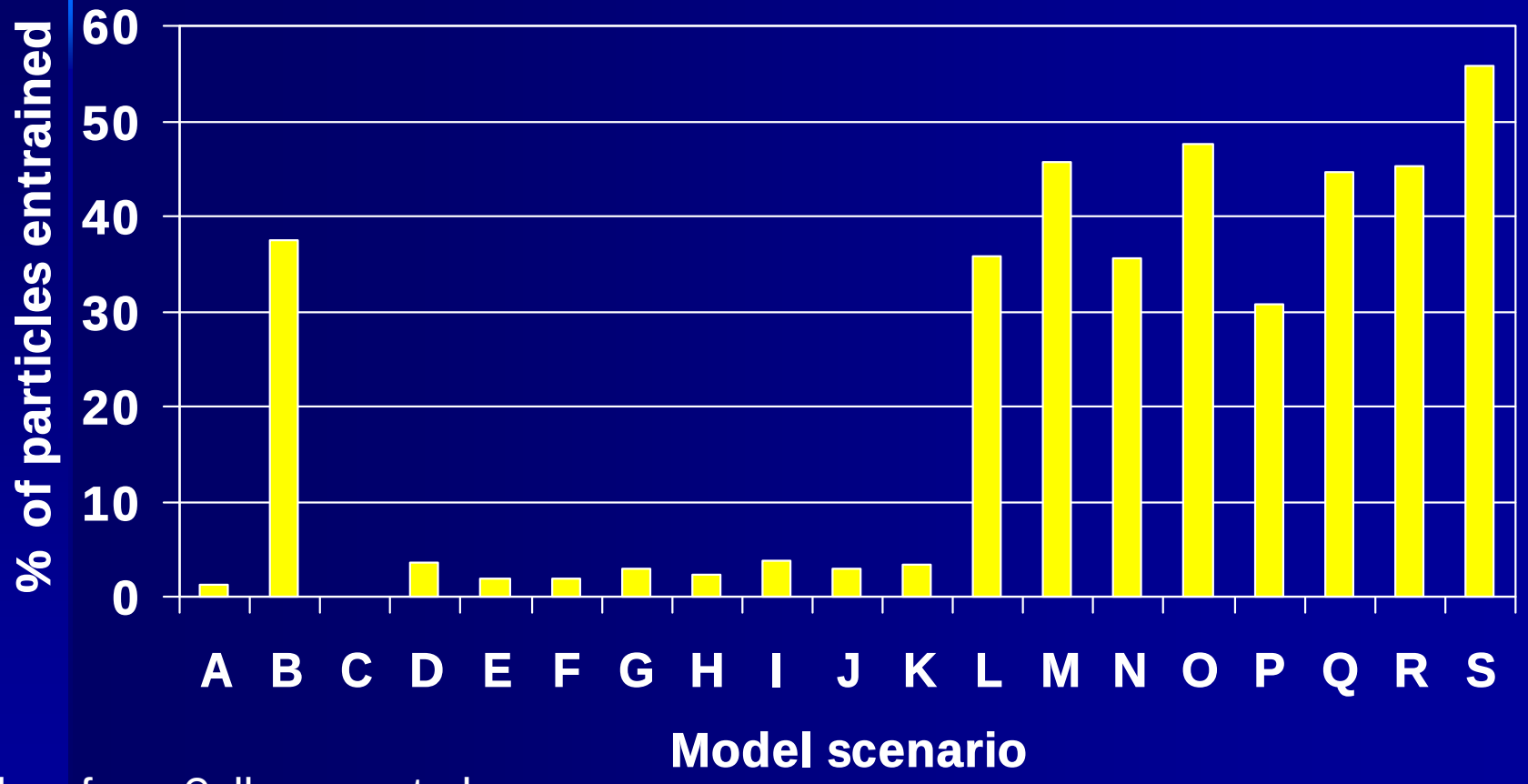
Pseudodiaptomus does not



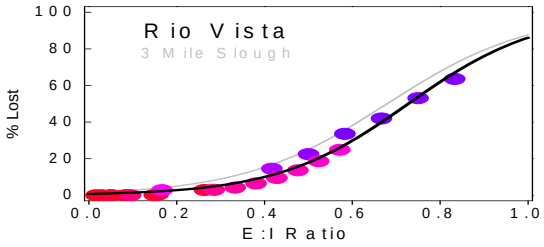
Based on unpublished research by John Durand and Wim Kimmerer

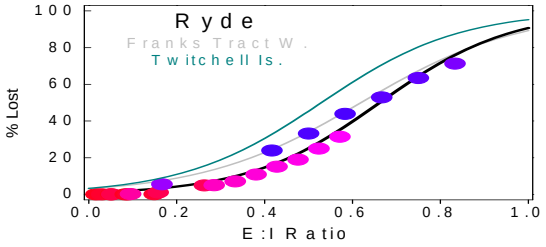
How does the conveyance option affect migratory fish transport and fate?

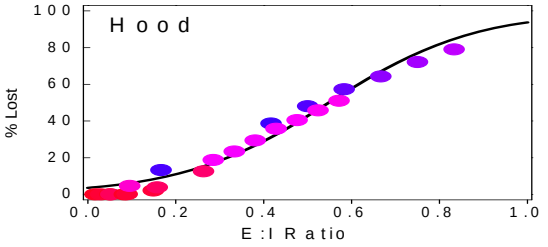
Proximity to a water diversion overwhelmingly influences predicted entrainment risk

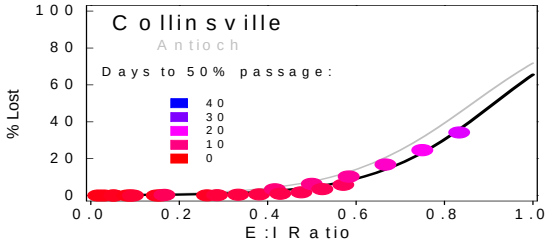


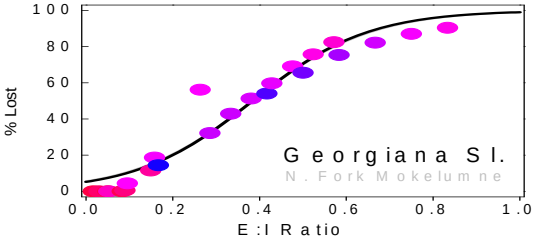
Taken from Culberson et al. (2004)

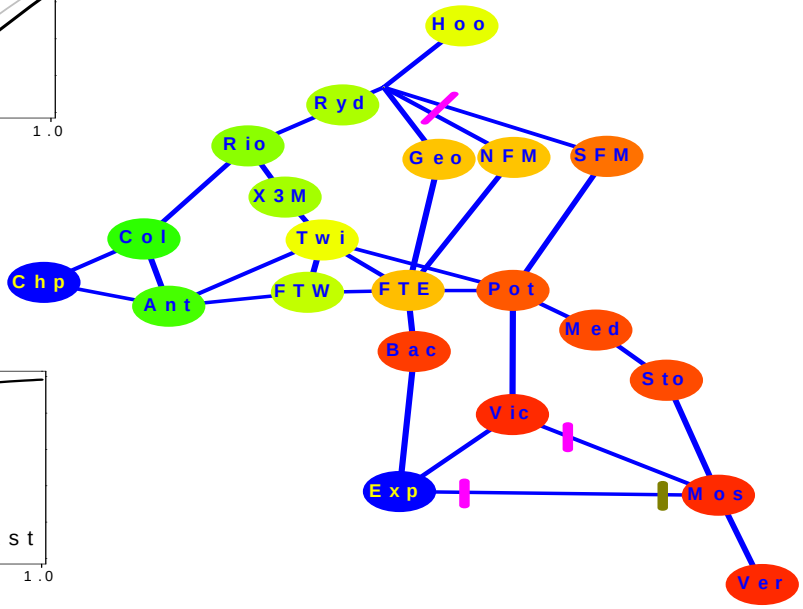


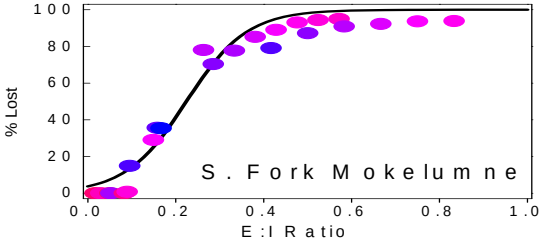


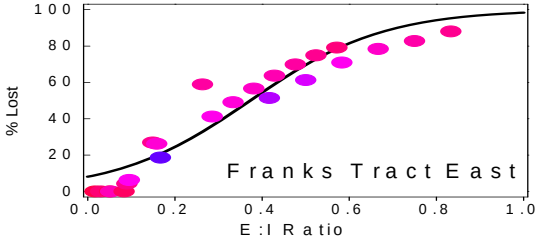


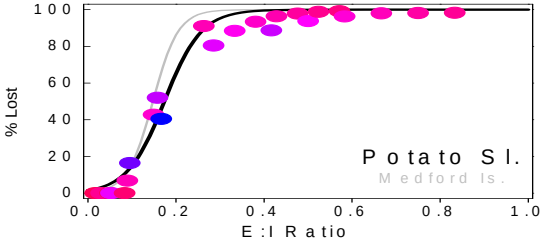


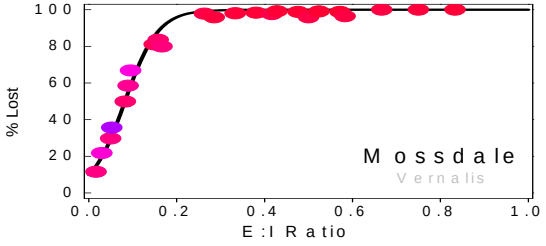


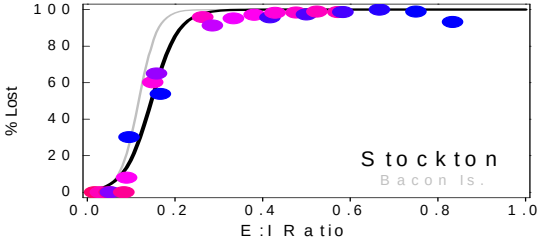












From Kimmerer and Nobriga, San Francisco Estuary and Watershed Science (in press)

Conclusions

1. The system will keep changing

Did you hear the one about the bus with seven drivers of change?

It crashed...

2. Think beyond fish passage

Conceptual model