

# Introduction to the Winter-run Chinook Life Cycle Model

Steve Lindley

23 January 2017

# Salmonid Integrated Life Cycle Models Workshop

## Report of the Independent Workshop Panel

### Panel members:

Kenneth Rose (Louisiana State University), Chairperson

James Anderson (University of Washington)

Michelle McClure (NOAA, Northwest Fisheries Science Center)

Gregory Ruggerone (Natural Resources Consultants, Inc.)

Workshop Organized by the Delta Science Program

June 14, 2011

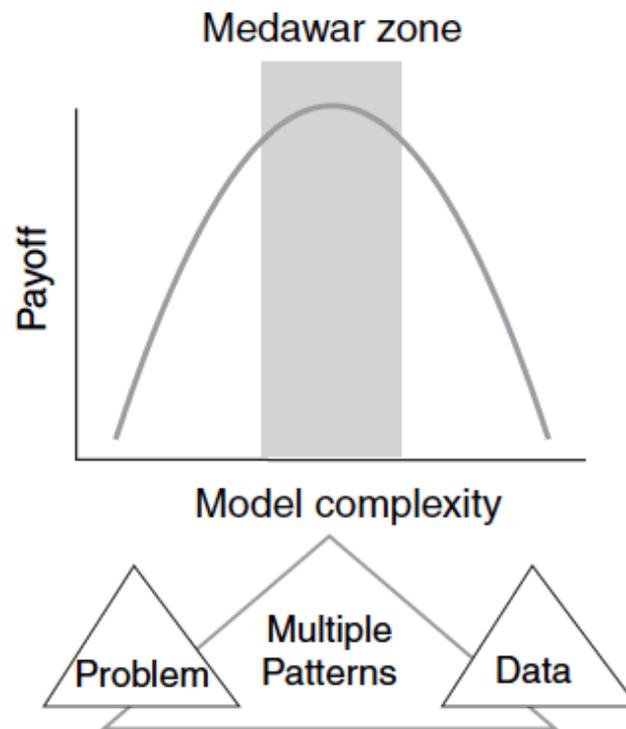


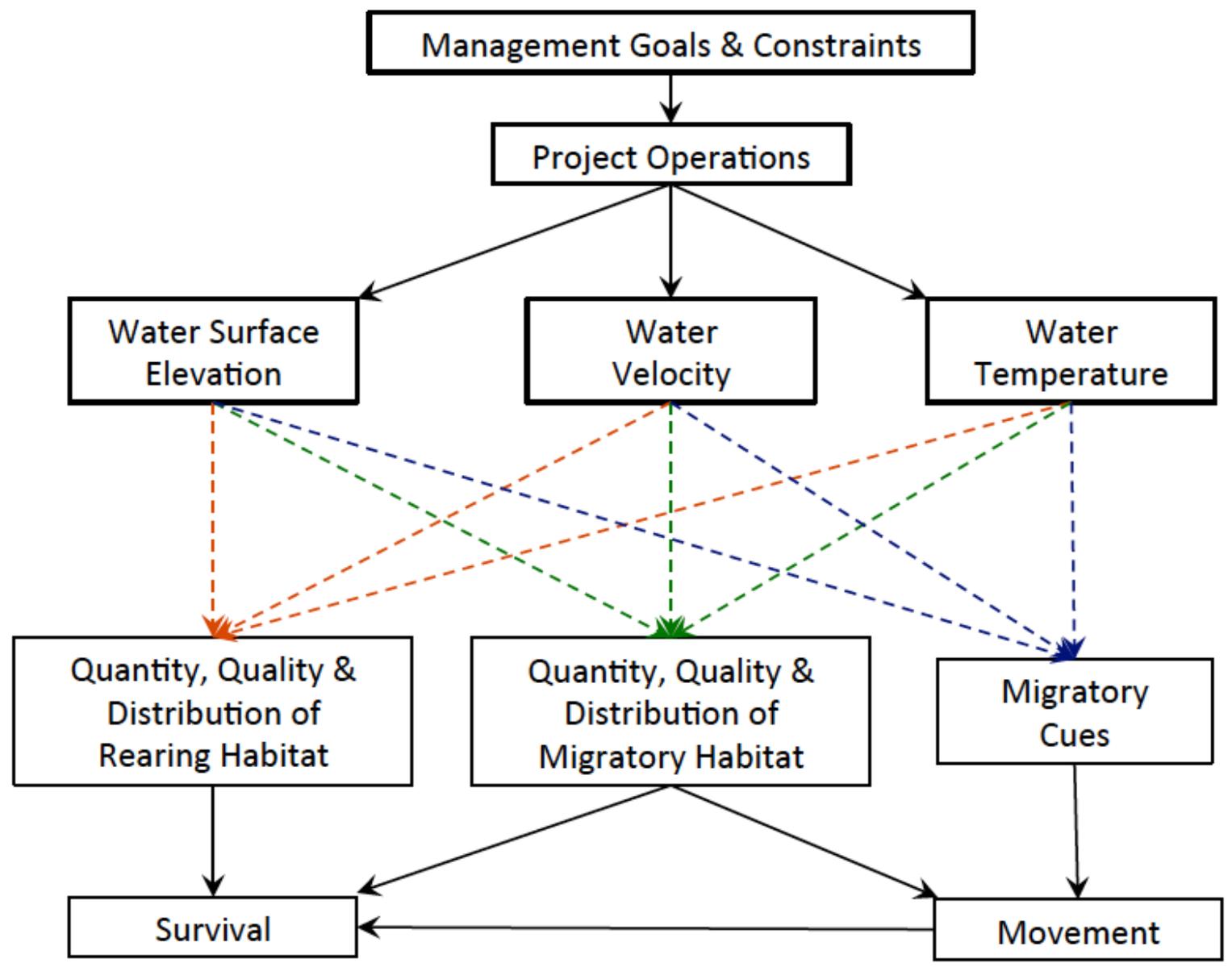
Fig. 1. Payoff of bottom-up models versus their complexity. A model's payoff is determined not only by how useful it is for the problem it was developed for, but also by its structural realism; i.e., its ability to produce independent predictions that match observations. If model design is guided only by the problem to be addressed (which often is the explanation of a single pattern), the model will be too simple. If model design is driven by all the data available, the model will be too complex. But there is a zone of intermediate complexity where the payoff is high. We call this the "Medawar zone" because Medawar described a similar relation between the difficulty of a scientific problem and its payoff (41). If the very process of model development is guided by multiple patterns observed at different scales and hierarchical levels, the model is likely to end up in the Medawar zone.

CALSIM II

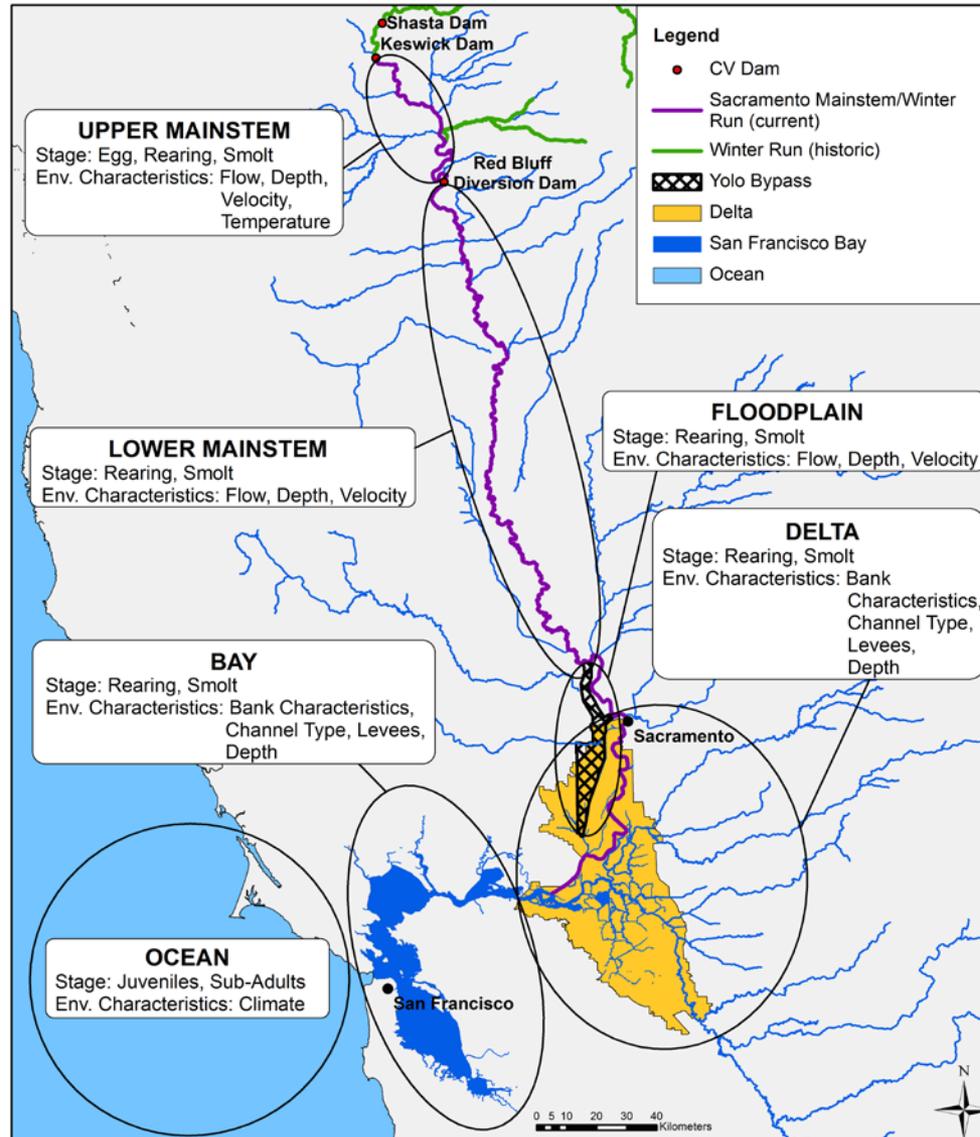
DSM2,  
HEC-RAS  
& SRWQM

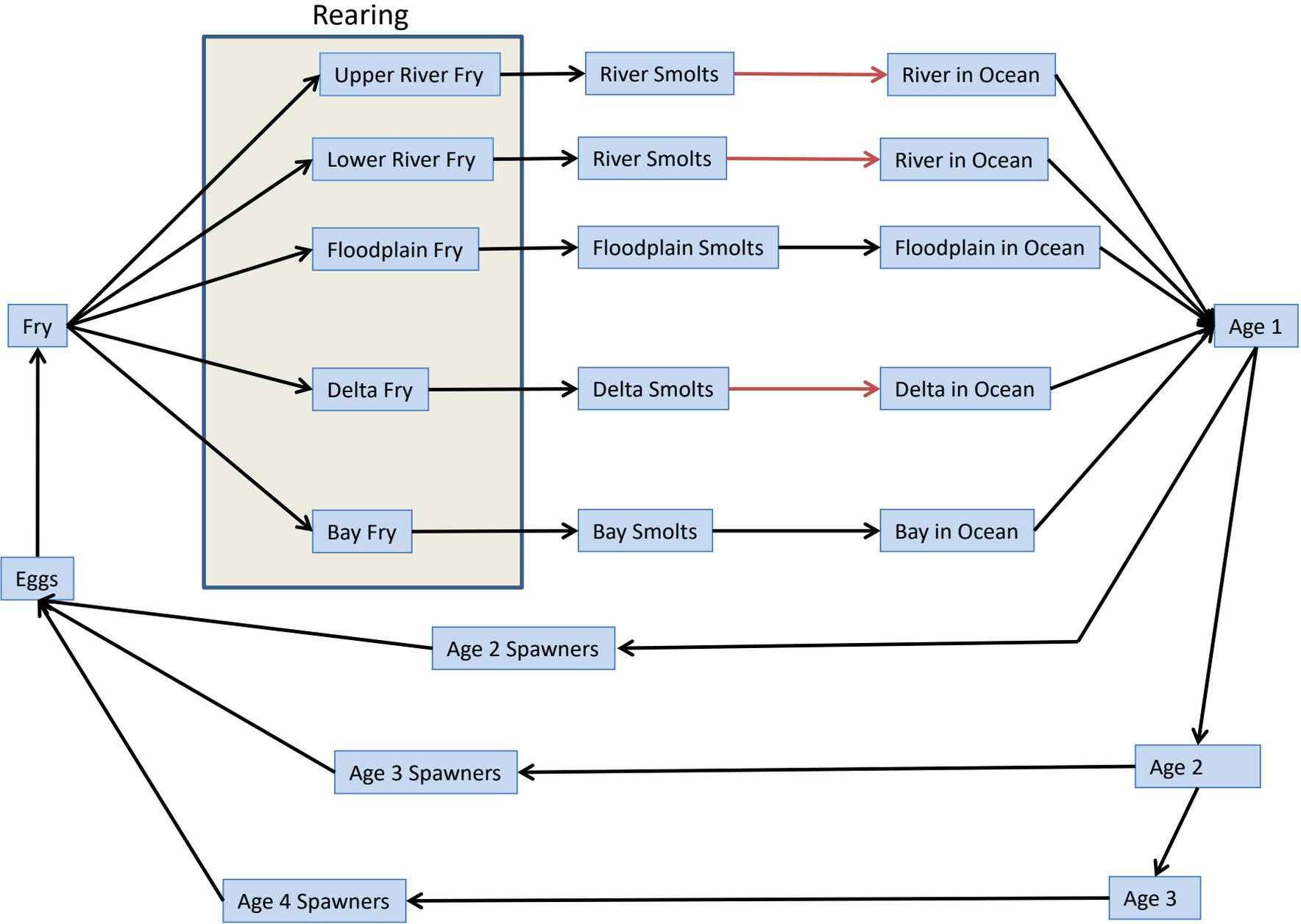
Biophysical  
Coupling

CVC-LCM



# Spatial Structure





# Key physical drivers

- Temperature at Keswick
  - Egg to Fry Survival (Apr – Oct)
  - Spawn timing (Apr)
- Fremont Weir Spill
  - Yolo entrance probability
- Flow at Hood
  - Smolt survival
- Flows throughout river and Delta
  - Rearing capacity
- Flow at Wilkins Slough
  - Movement Lower River to Delta
- Delta Hydrodynamics
  - Smolt survival

## **Investigating Particle Transport and Fate in the Sacramento-San Joaquin Delta Using a Particle Tracking Model**

Wim J. Kimmerer, San Francisco State University\*  
Matthew L. Nobriga, CALFED Science Program

*“To the extent that fish behave passively, this model is probably suitable for describing Delta-wide movement”*

## **Report of the 2012 Delta Science Program Independent Review Panel (IRP) on the Long-term Operations Opinions (LOO) Annual Review**

Prepared for: **Delta Science Program**

**December 1, 2012**

### Panel Members:

**James J. Anderson**, Ph.D., University of Washington

**James A Gore**, Ph.D., (Panel Chair) University of Tampa

**Ronald T. Kneib**, Ph.D., (Lead Author), RTK Consulting Services & Univ. of GA (Senior Research Scientist Emeritus)

**Mark S. Lorang**, Ph.D., University of Montana

**John M. Nestler**, Ph.D., Fisheries and Environmental Services & USACE Engineer Research and Development Center (Retired)<sup>1</sup>

**John Van Sickle**, Ph.D., U.S. Environmental Protection Agency Western Ecology Division (Retired)

*“It was emphasized by the 2010 OCAP IRP (Anderson et al. 2010, p 24) and confirmed by the Acoustic Tag Study conducted in April-May 2012 that steelhead smolts do not behave like passive particles and it was simply inappropriate to rely on the PTM to direct water operations intended to protect out-migrating juvenile steelhead”*

## Modifications of DSM2-PTM to increase biological realism

Particle Features	DSM2-PTM	e-PTM
Swimming behavior	Goes with flow	Selective tidal transport with possible navigation error
Route selection	Proportional to flow	Proportional to flow*
Mortality	Immortal	Survival depends on distance travelled and time

*Key parameters:*

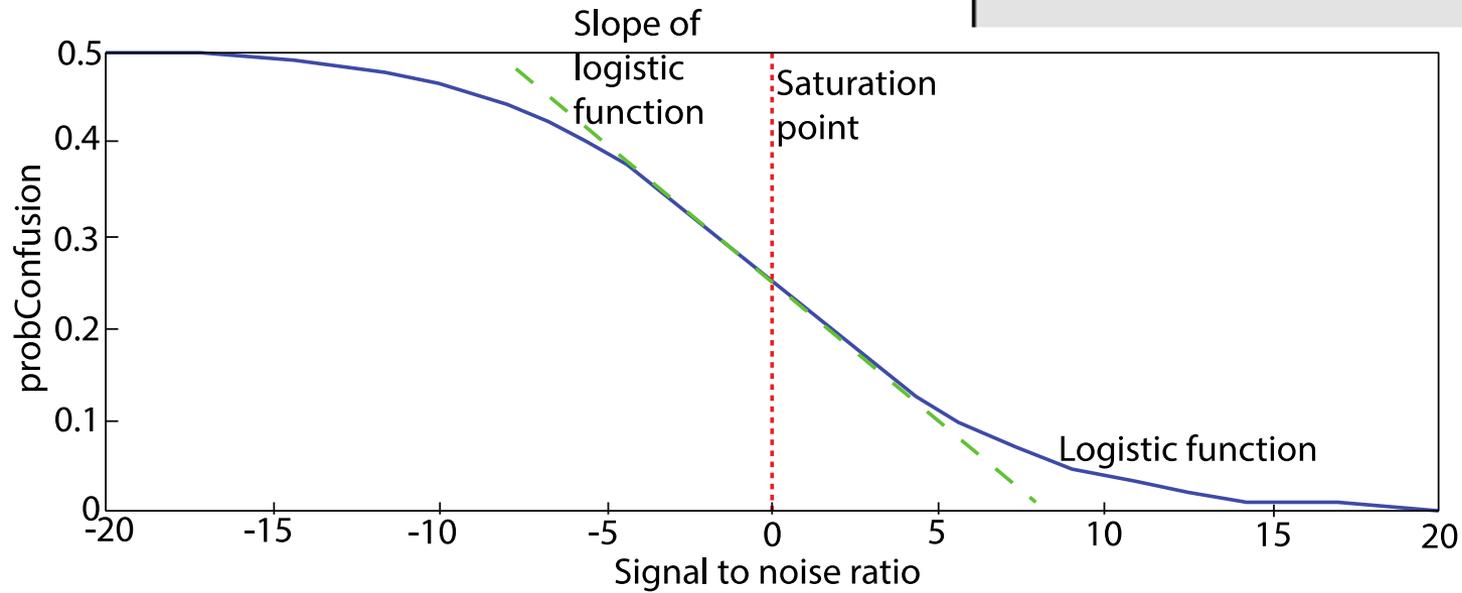
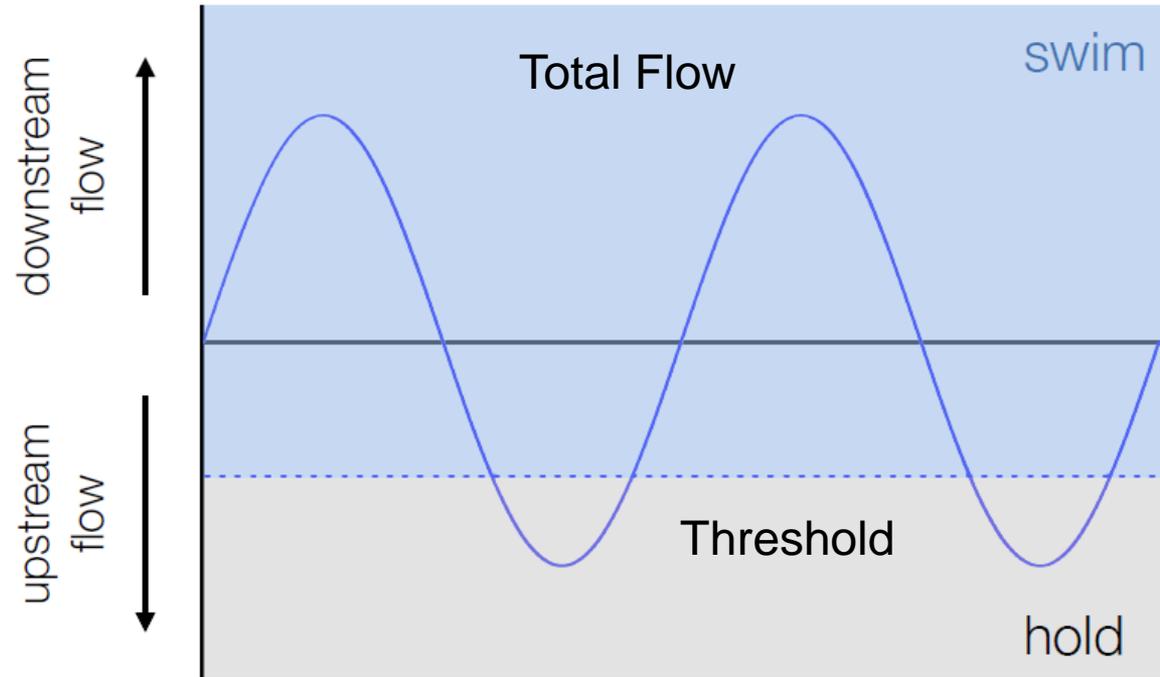
- Predator density
- Predator-prey random velocities
- Swimming speed
- Velocity threshold
- Probability of confusion



# Swimming behavior in the estuary

## Behavior:

- Swimming speed
- Temporal swimming pattern: selective tidal stream transport & diel activity
- Confusion



# Acknowledgements

## Funding:

USBR

NMFS WCRO

## Team:

Noble Hendrix, Anne Criss, Russell Perry, Eric Danner, Ben Martin, Sara John, Amy Smith, Cathy Marcinkevage, Vamsi Sridharan, Mike O'Farrell, Doug Jackson, Andrew Pike, Correigh Greene, Hiroo Imaki, Tim Beachie , Lisa Crozier, Xiaochun Wang