Model Revisions in Response to Workshops 1-4

Workshop 1 (June 21, 2017) – Project overview and scenarios worksheets

Workshop 2 (August 18, 2017) - Enhanced Particle Tracking Model (ePTM)

Workshop 3 (Sep 26, 2017) - Habitat Capacity

Workshop 4 (Oct 19, 2017) - Management Questions

Workshops 1- Project Overview

June 21, 2017

980 9th street, Sacramento

Topic	Focus	Presenter
LCM overview	Goals and objectives of the model Model assumptions	Steve Lindley
	LCM overview	Noble Hendrix
	ePTM overview	Steve Lindley
	Habitat Capacity overview	Correigh Greene
Life cycle model static runs to understand model behavior	Base model Temperature effects on egg to fry survival Modifications of smolt survival by region Modifications of capacity by region Combinations of survival and habitat capacity	Noble Hendrix

Workshops 1- Project Overview

June 21, 2017
980 9th street, Sacramento

Alt vs Base: An interactive modeling exercise

We have a series of alternatives to the base model

For each alternative:

1. Predict how it affects equilibrium abundance
2. Predict how it affects equilibrium habitat of origination
3. Describe the mechanism

Workshops 1- Project Overview

June 21, 2017

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Alternative	Description	Prediction			WRLCM Response			Notes
		Abundance	Distribution	Mechanism	Abundance	Distribution	Mechanism	
Baseline	Baseline physical driver and coefficient values							
T13.5	Egg incubation temp is 13.5 C							
T14.0	Egg incubation temp is 14.0 C							
T14.5	Egg incubation temp is 14.5 C							
S Delta	Reduce survival of smolts originating from delta by 20%							
S River	Reduce survival of smolts originating from river habitats by 20%							
C URiver	Increase fry rearing capacity in the Upper River by 20%							

Workshops 1- Project Overview

June 21, 2017
980 9th street, Sacramento

Alternative $T_{13.5}$ (egg incubation temperature is 13.5 ºC)

- What is your prediction for equilibrium abundance?
  Abundance is lower - 9.5%
- What is your prediction for smolt origin of distribution?
  Distribution shifts to Lower River slightly
- What is the mechanism?
  Reduced survival in egg to fry leads to lower fry abundance, less density dependence in Lower River, and more smolts originating from the Lower River

Workshop 2 - Enhanced Particle Tracking Model (ePTM)

August 18, 2017
650 Capitol Mall , Sacramento

Topic	Focus	Presenter
Review of DSM2	Role of DSM2 in salmon migration modeling: strengths and limitations, how it should be used	Xiaochun Wang
Review of DSM2-PTM	Structure of the model and capabilities and limitations	Xiaochun Wang
Salmon migration review	(i) Review of knowledge on juvenile salmon migration and ecology (ii) Data and best scientific information for Chinook Salmon in the Delta	Russel Perry/Steve Lindley
ePTM model	(i) Model structure (ii) Behavior models (iii) Mortality	Andrew Hein
Parameter estimation	ePTM model calibration and validation, while specifically addressing rationale behind model choices and parameter selection with evidence from data	Russel Perry/Adam Pope
Model outcomes	(i) Flow/tide/pumping scenarios (ii) In-Delta vs Riverine release effects (iii) Separation of models sensitivity analysis	Vamsi Sridharan

Workshop 2 - Enhanced Particle Tracking Model (ePTM)

August 18, 2017
650 Capitol Mall , Sacramento

Suggestions/feedback from workshop:

Issues with “confusion” factor

Concern over how fish perceive and respond to flows (i.e. average flows at new locations drive fish behavior)

Mismatch between parameter definitions and range of fitted parameter values (fish swim speeds)

Concerns about mismatch between calibration, validation, and application steps

Workshop 2 - Enhanced Particle Tracking Model (ePTM)

August 18, 2017
650 Capitol Mall , Sacramento

Model revisions:

Fish now making decisions based on the local hydrodynamics they experience

Definition and parametrization of swimming velocity now different, so that migration rates are comparable to those observed

Swimming, directional orientation, and memory now decoupled

Presenting an aligned calibration, validation, and application pathway

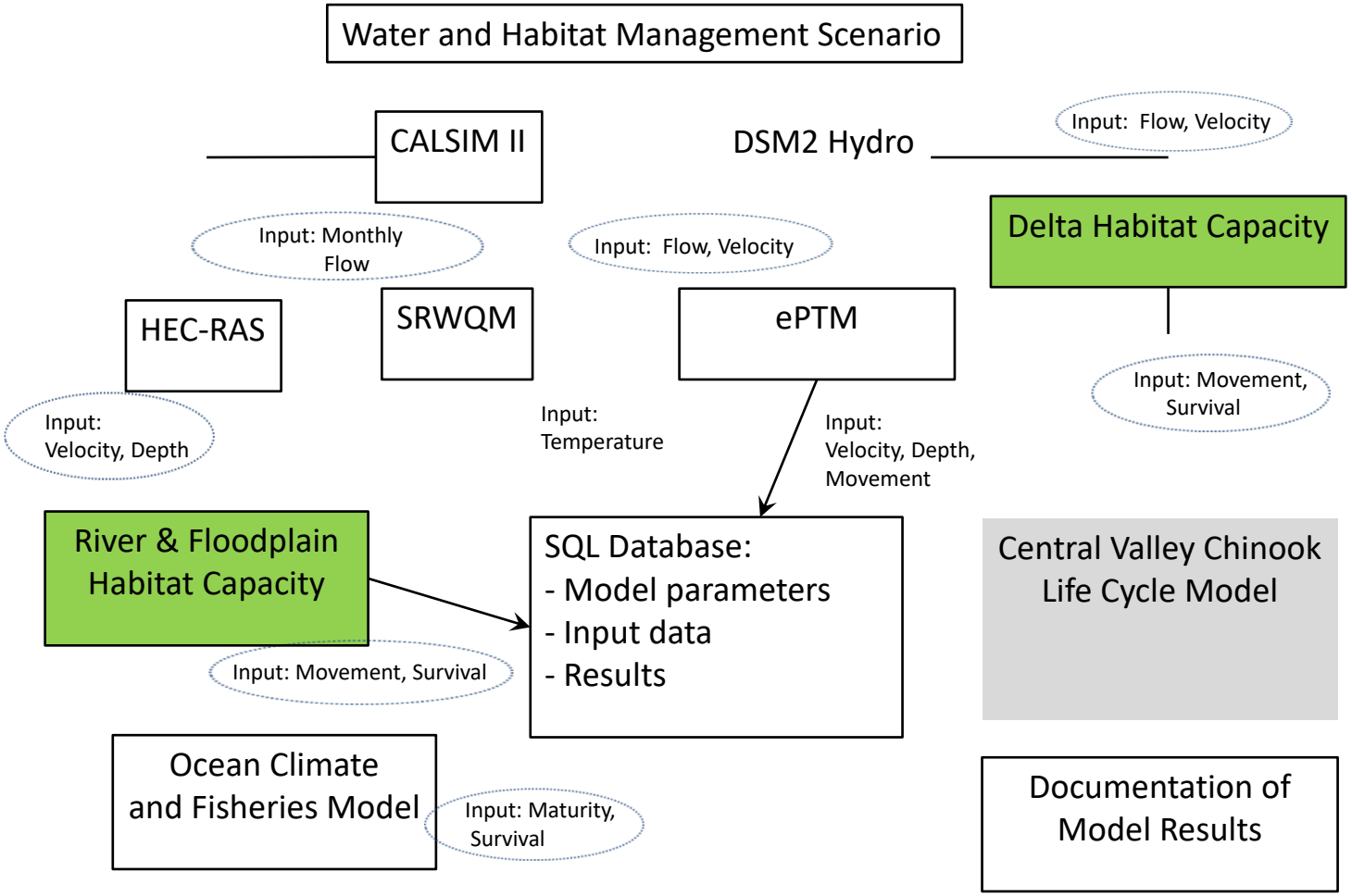
Improved hydrodynamics and water quality co-variate response

Workshop 3 - Habitat Capacity

September 26, 2017
650 Capitol Mall, Sacramento

Introduction - Capacity and Productivity - Steve Lindley
Habitat Capacity Models - Correigh Greene
ePTM model - Incorporating fish screens into the life cycle model - Steve Lindley
Management Questions - Identification and discussion of management questions
Categorization of questions based on model capabilities

Capacity in a multimodel framework



Workshop 3 - Habitat Capacity

September 26, 2017
650 Capitol Mall, Sacramento

Suggestions/feedback from workshop:

Challenges of capturing growth effects of restoration

The role of habitat does not seem to be adequately described (restoration again, WR are not the only fish in the system)

Fish access (both juveniles and adults) to the Yolo Bypass and the distinction between the floodplain and the North Delta sloughs are misrepresented (alternative states to overtopping, distinguishing between Yolo and Liberty, missing Yolo data)

Run model with only high-quality riverine and estuary habitat (assume lower quality habitats are avoided)

Concerns about using Skagit data…request clarification on when model is informed by Skagit data vs. CV data

Bay boundary could vary a lot depending on water year (using just delta outflow as predictor of X10, will miss a lot of areas where fish are where salinity is < 10ppt)

Workshop 4 – Management Questions

October 19, 2017
650 Capitol Mall, Sacramento

1) Management Questions - Submitted management questions - Bruce DiGennaro
2) Scenarios - Management question prioritization exercise - Eric Danner
3) Determination of sensitivity runs to be run and discussed at the next workshop (tentatively in January) - Eric Danner and Cathy Marcinkevage

Workshop 4 – Management Questions

October 19, 2017

650 Capitol Mall, Sacramento

Management Questions	LCM capabilities			Notes	Under management control (degree)	Expected Population Response (sensitivity)
	Yes	Maybe	No			
Changing conditions / baselines						
How does the model incorporate and/calibrate to changing baselines (fish screens, improvements to passage, etc.)? Can the model evaluate past changes (fish screens, improvements to passage, etc.)?	X			Factors that are responsible for the changing baselines would need to be defined.		
Ocean life stages						
What are the effects of ocean harvest regulation on adult escapement?	X			Harvest control rules would need to be defined.	Hi	Hi
What are the effects of ocean harvest on age structure? Is the population less resilient to e.g. drought due to harvest impact rates on age-4 and age-5 winter run?	X				Med	Lo
What is the contribution of hatchery production to abundance in the ocean and escapement?	X				Hi	Hi
What is the level of fry-ocean entry survival required to produce a positive (>1) cohort replacement rate on average?				Not clear what this question is asking. Two related questions answered below.		
1) What is the level of fry to ocean entry survival to produce a CRR > 1	X				Med	Hi
2) What is the level of ocean entry survival by the fry stage to produce a CRR > 1?	X				Lo	Lo
What is the level of ocean survival required to produce a positive (>1) cohort replacement rate on average?	X				Lo	Hi
Policy						
What are the effects of each NMFS RPA on survival and abundance individually and in combination?		X		This is a large set of actions that likely need to be broken into specific types of actions that may be addressed.		
What is the impact of alternative flow/export scenarios (say, Sacramento River Flows, Vernalis flows, Delta exports) on juvenile outmigration success of a single yearclass?	X			More of an ePTM focused question for a single year class.	Hi	Med
What is the impact of alternative flow/export scenarios (say, Sacramento River Flows, Vernalis flows, Delta exports) on population growth rate over a 30 year timeframe?	X			Multiple cohorts and water year types better addressed by LCM.	Hi	Med
What is the contribution of exports (e.g., I:E. OMR, DCC gate closure, etc.) and salvage to population abundance and survival of juveniles in the Delta and adult escapement?	X					
				Compliance location - maybe with		

Workshop 4 – Management Questions

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Topics from Workshop IV - *and their status*:

- Does restoration improve survival?
  Analysis of the CWT data and evaluating evidence for survival benefits of restoration is proposed as a task under the next funding cycle

- Adding the adult mortality due to stranding to the model
  On the list for the next model fitting this spring

- Incorporating the screening volumes as a covariate on the fry survival rate in the UR
  On the list for the next model fitting this spring

- Computing stock-recruitment curves for different water year types
  Model has been completed and is being presented at this workshop

- Preparing user interface application
  First public version completed and will be presented at tomorrow