Overview of SALMOD for the Fall Chinook Salmon Life Cycle Production Model

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U.S. Department of the Interior
U.S. Geological Survey

Overview

- Temporal and Spatial Scale and Extent
- SALMOD's Biological Processes
- Driving Variables
- Updates to SALMOD for life cycle model
- Calibrating SALMOD

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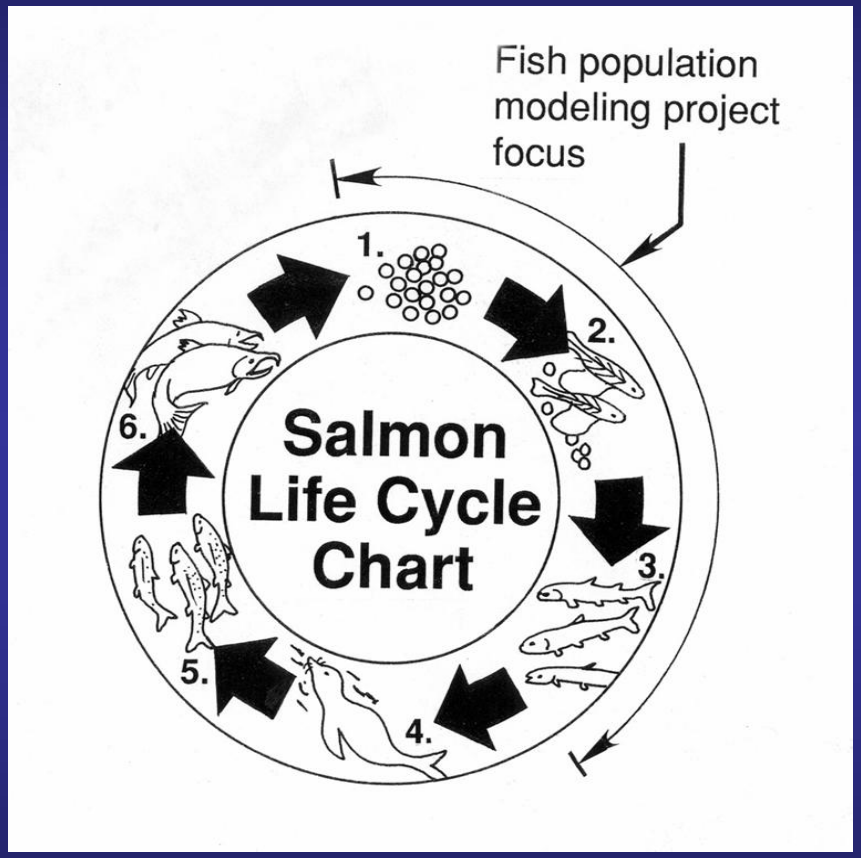
Biological Description - Lifestages



Eggs
Fry (<55 mm)
Juveniles (> 55 mm)

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Temporal Scale and Extent: The Biological Year

- Flows and temperature
  - input at weekly time step

- Biological year
  - begins with spawning
  - ends with outmigration

- Biological processes
  - simulated through time by life stage

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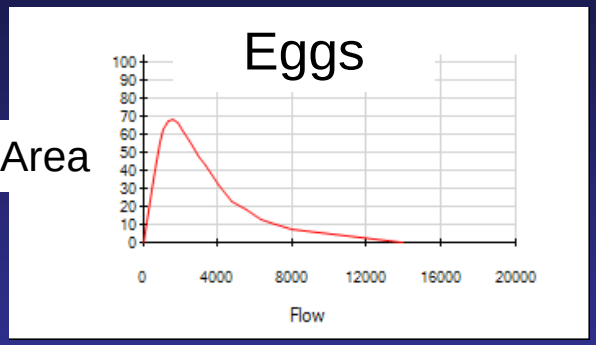
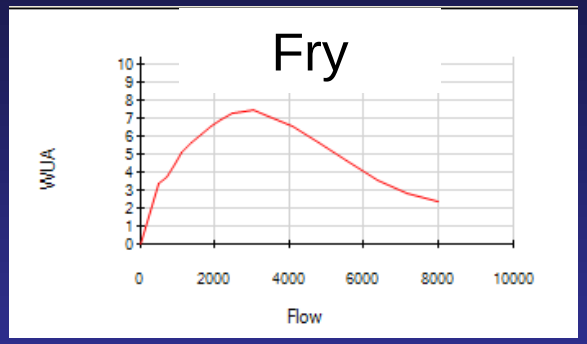
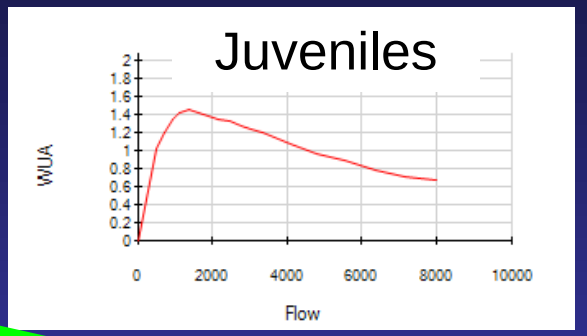
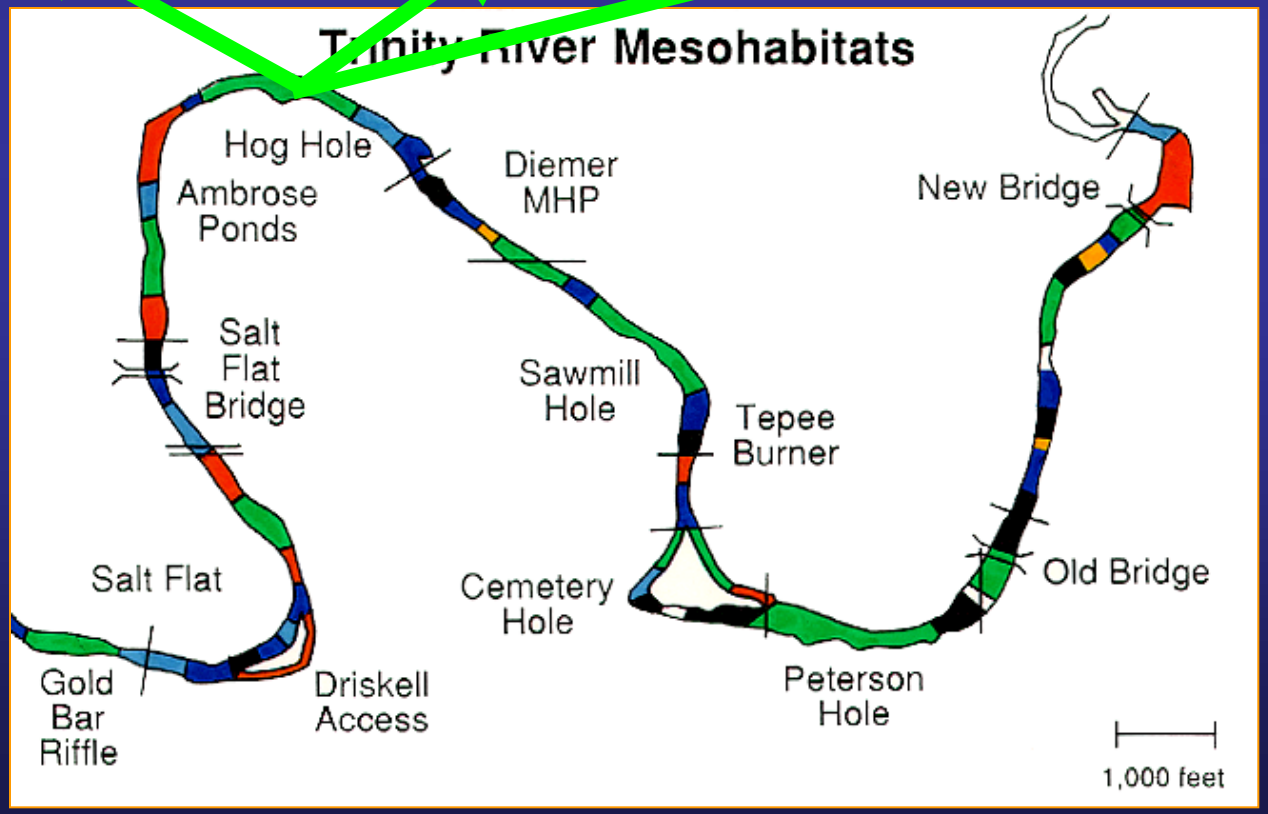
Temporal Sequence of Events

Spatial Scale: Mesohabitat Units









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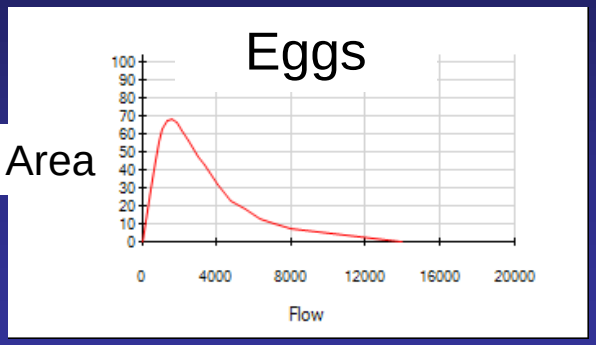
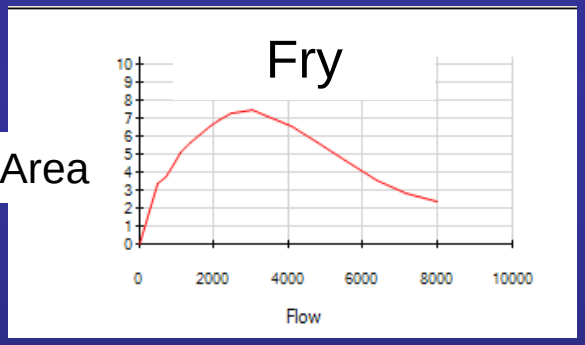
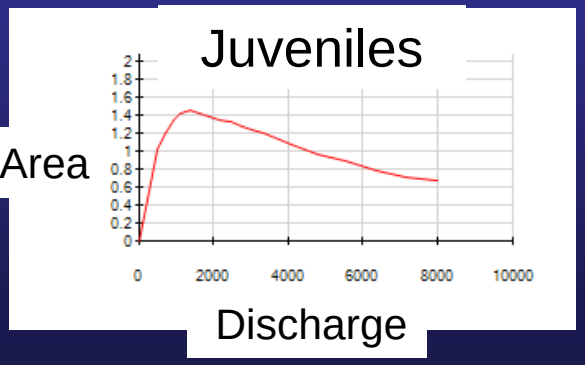
Discharge and Habitat Area Drive Dynamics
by Life-stage and Habitat unit







	Survival	Movement
Eggs	Redd Density	
Fry	Density (fish/m^2) Disease (discharge)	Density (fish/m^2) Discharge
Juveniles	Density (fish/m^2) Disease (discharge)	Density (fish/m^2) Discharge

Temperature Drives Dynamics
by Life-stage and Habitat unit

	Development	Survival
Eggs	Maturation rate	Thermal tolerance
Fry	Growth	Thermal tolerance Disease
Juveniles	Growth	Thermal tolerance Disease

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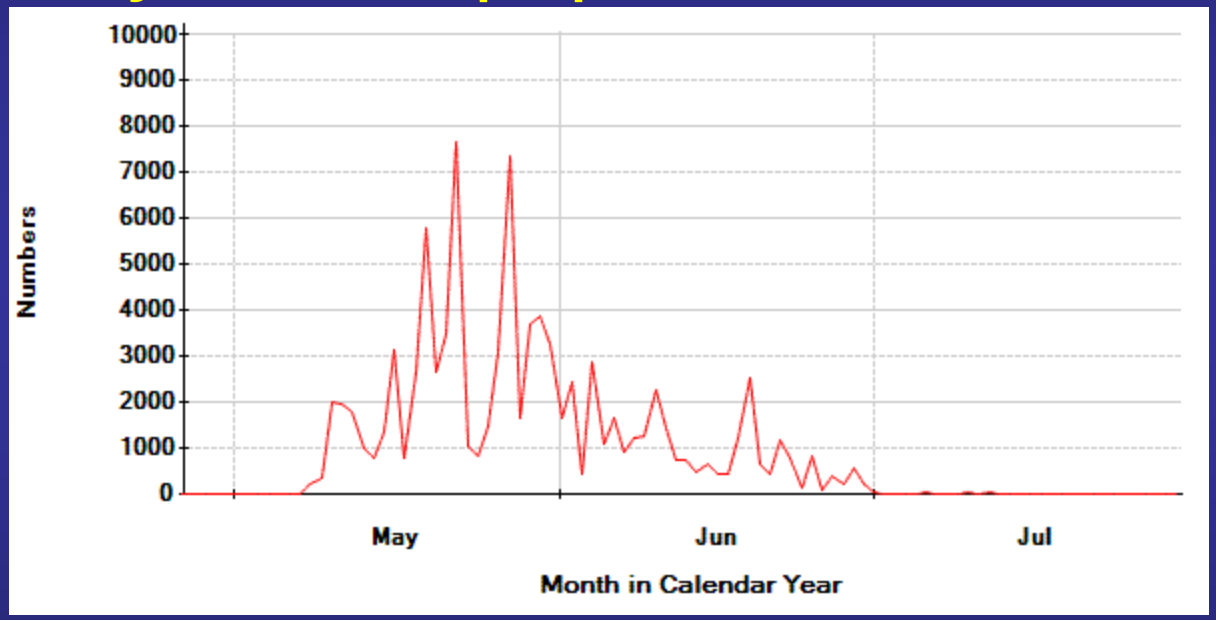
Output for Life Cycle Model

- Abundance Time Series
  - at ocean entry
  - by source population



Ocean Life Stage

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Changes to SALMOD For Life Cycle Model

- New programming platform
  - from Fortran/C++ to Visual Basic

- Tracking of source populations

- Change in Stewardship
  - from FORT to WFRC

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Changes to SALMOD For Life Cycle Model

-Extended spatial domain

Keno to Ocean

-Incorporate disease model

-Update growth relationship

-Calibrate and validate against data

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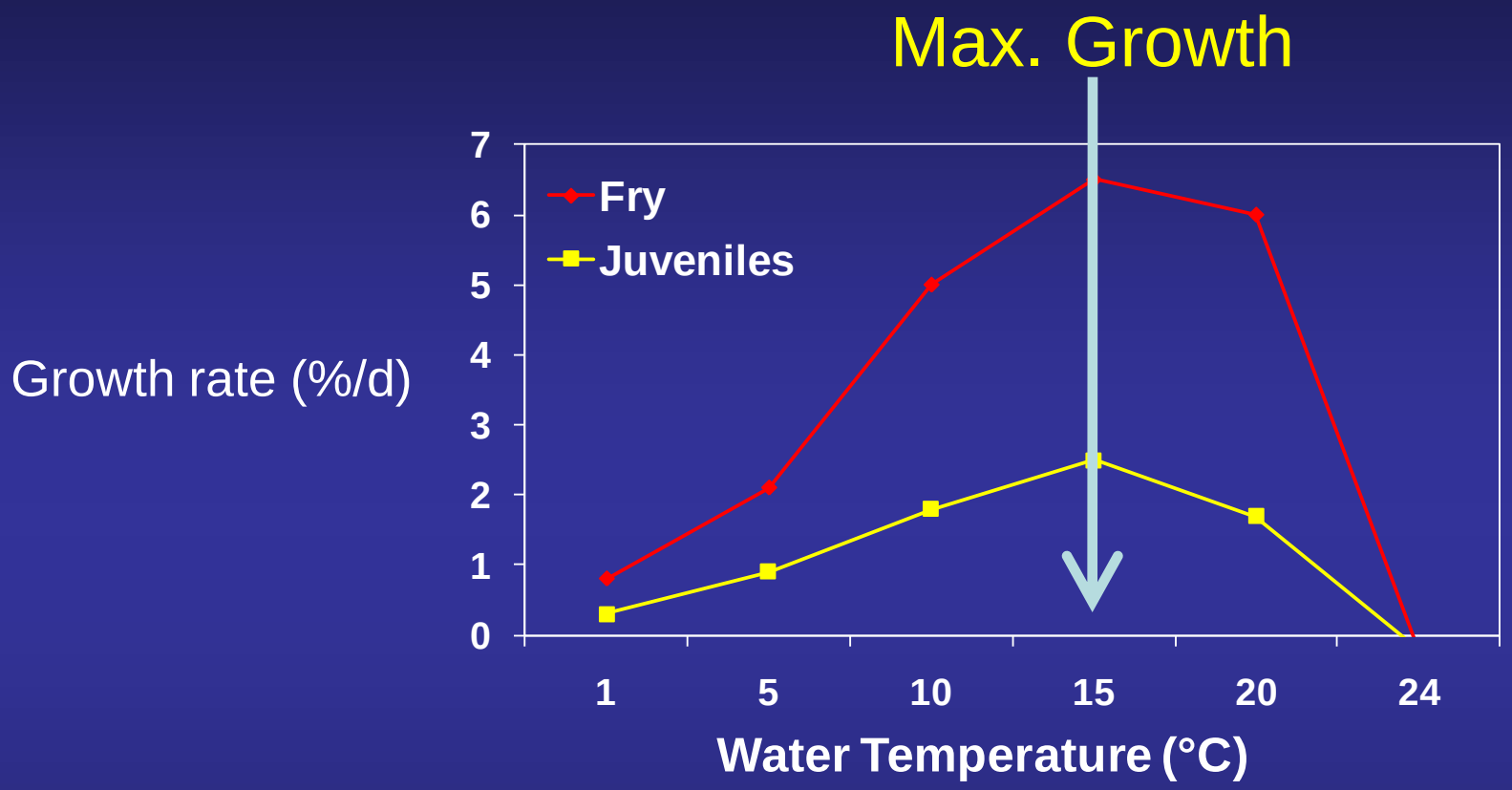
Update growth relationship



Recent data from Snake, Sac., Klamath Rivers
- Max. Growth at 19-20 °C

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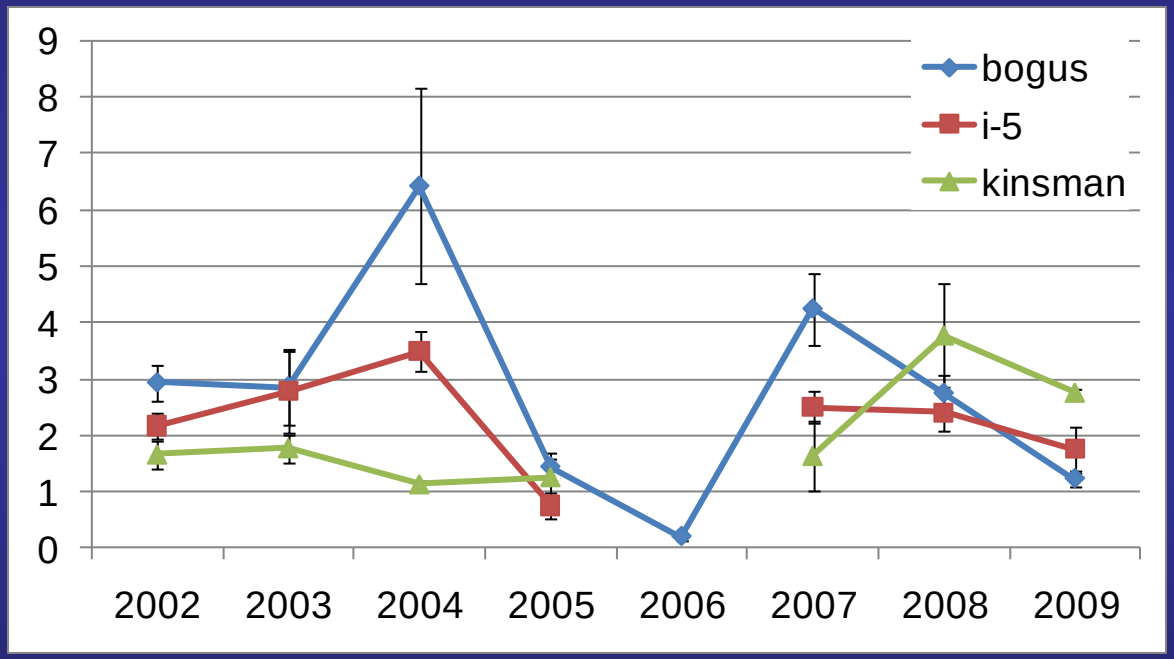
Calibration and Validation Data

-Trapping data on Lower Klamath mark-recapture abundance estimates

Juvenile abundance (millions)



-Survival to Age 2 from cohort reconstruction

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Calibration via Monte Carlo Simulation

- Draw parameter values from distribution
  e.g., coefficients of logistic disease model

- Compare predicted vs. observed abundance
  likelihood function, lognormal error structure

- Repeat, Repeat, Repeat
  generate distribution of likelihood values

- Highest likelihood = best set of parameters

- Many plausible parameter sets
  e.g., draw parameter set from best 10%

Status of SALMOD Updates

- Completed tasks
    - New platform implemented
    - Track source populations
    - Extend from Keno to Ocean

- Tasks in progress
    - Disease model
    - Growth relationship
    - Calibration

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Questions?

Source: www.napavalleyregister.com/articles/2008/02/1...