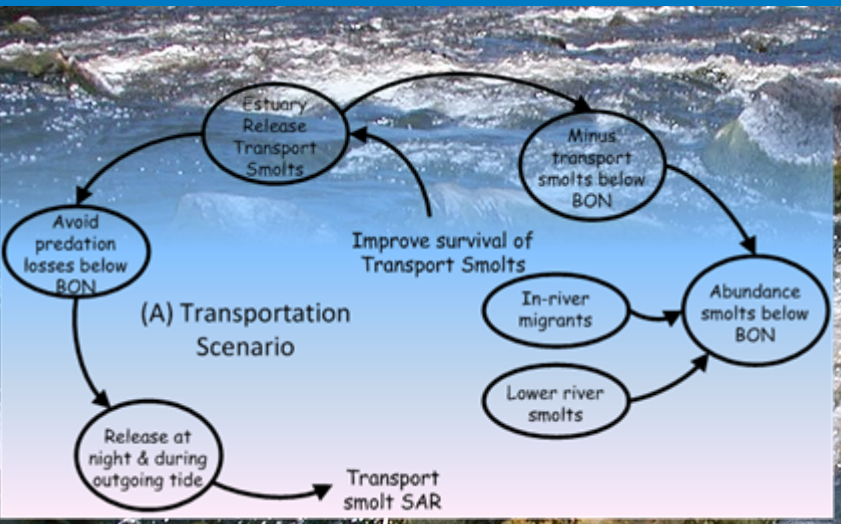
REVIEW OF POTENTIAL EFFECTS OF ALTERNATIVE BARGING STRATEGIES ON PREDATION OF JUVENILE SALMONIDS IN THE LOWER COLUMBIA RIVER



$$\Delta SAR = \frac{(Survival\ Bonneville - to - Plume)_{Alt\ Relese}}{(Survival\ Bonneville - to - Plume)_{Current}} * SAR_{current}$$

Greg Blair, Chip McConnaha, Jessie Schwartz & Bruce Watson, ICF – Jones & Stokes,

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Al Giorgi, BioAnalysts, Inc.,

and

Chuck Coutant

Funded by:

US Army Corps of Engineers
Walla Walla District

PROJECT PURPOSE

- In 2005, a pilot study was initiated to improve survival of transported juveniles by releasing barged fish near the mouth of the Columbia River.

- The USACE initiated our study to investigate potential effect of barge strategy on survival of in-river migrating juveniles.

- Our project will provide:
  - ✓ Predicted change in SAR for transported and in-river juvenile migrants.
  - ✓ Information to help guide refinements of the barging strategy.

PROJECT OBJECTIVES

- Synthesize existing knowledge of predator-prey interactions in Lower Columbia River.
- Analyze potential magnitude effect of extended barging strategy on survival of juvenile migrants.
- Provide a quantitative perspective on possible outcomes.
- Suggest studies to test key hypotheses.

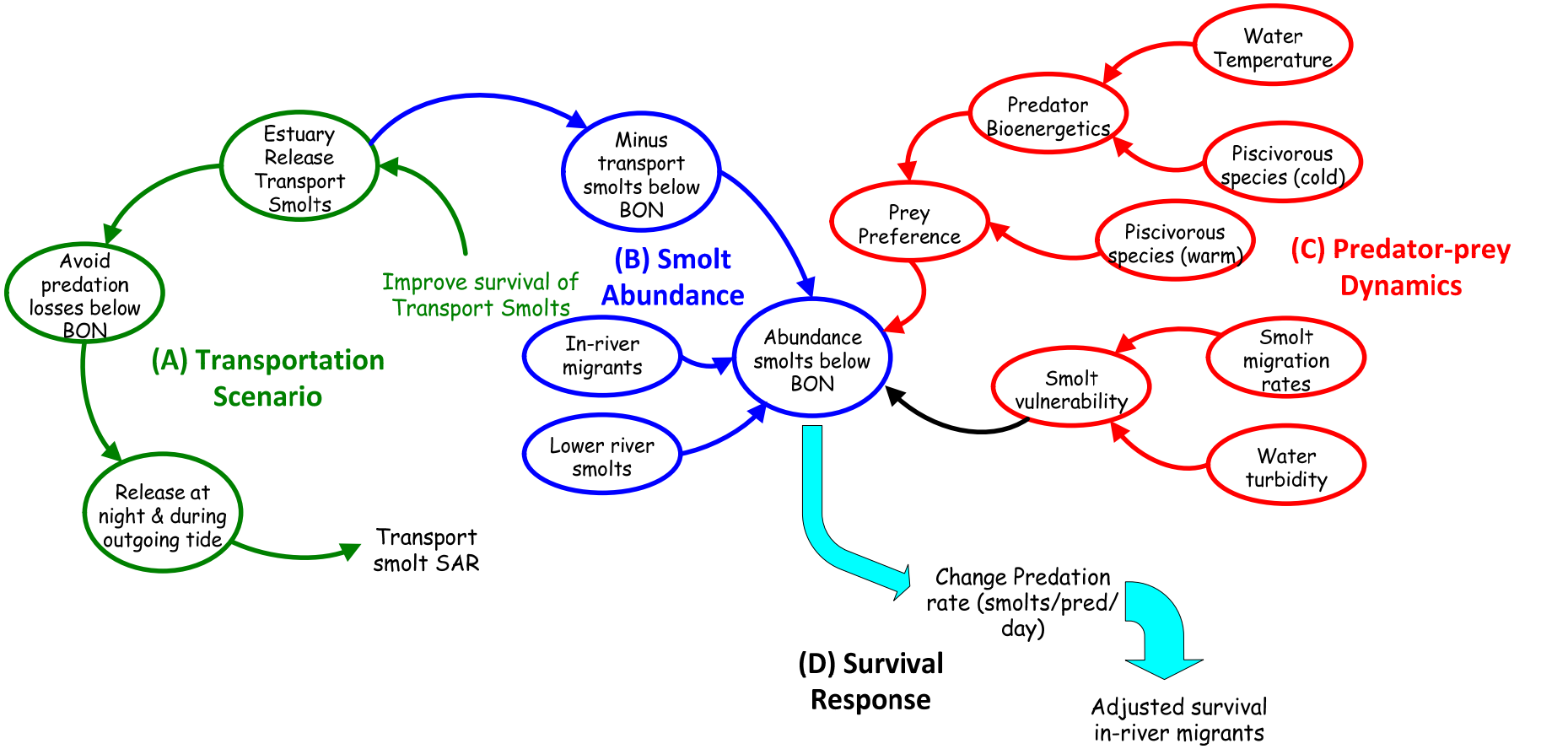
PROJECT APPROACH

- Conceptual model
  - ✓ Describe major elements and
  - ✓ Scope of problem
- Quantitative model
  - ✓ Repository of information
  - ✓ Identify predator-prey relationships that determine predation rates
  - ✓ Evaluate critical uncertainties
- Identify range of potential model parameters
- Complete sensitivity analysis of key model parameters

WHY A MODELING APPROACH?

- Models create a working hypothesis
  - ✓ A basis for taking action
- Decisions will be made, based on:
  - ✓ Scientifically established knowledge
  - ✓ Expert knowledge
- Quantitative models:
  - ✓ Provide accountability by documenting basis for de
  - ✓ Provide basis for evaluating progress
  - ✓ Provide structure to organize knowledge

CONCEPTUAL MODEL



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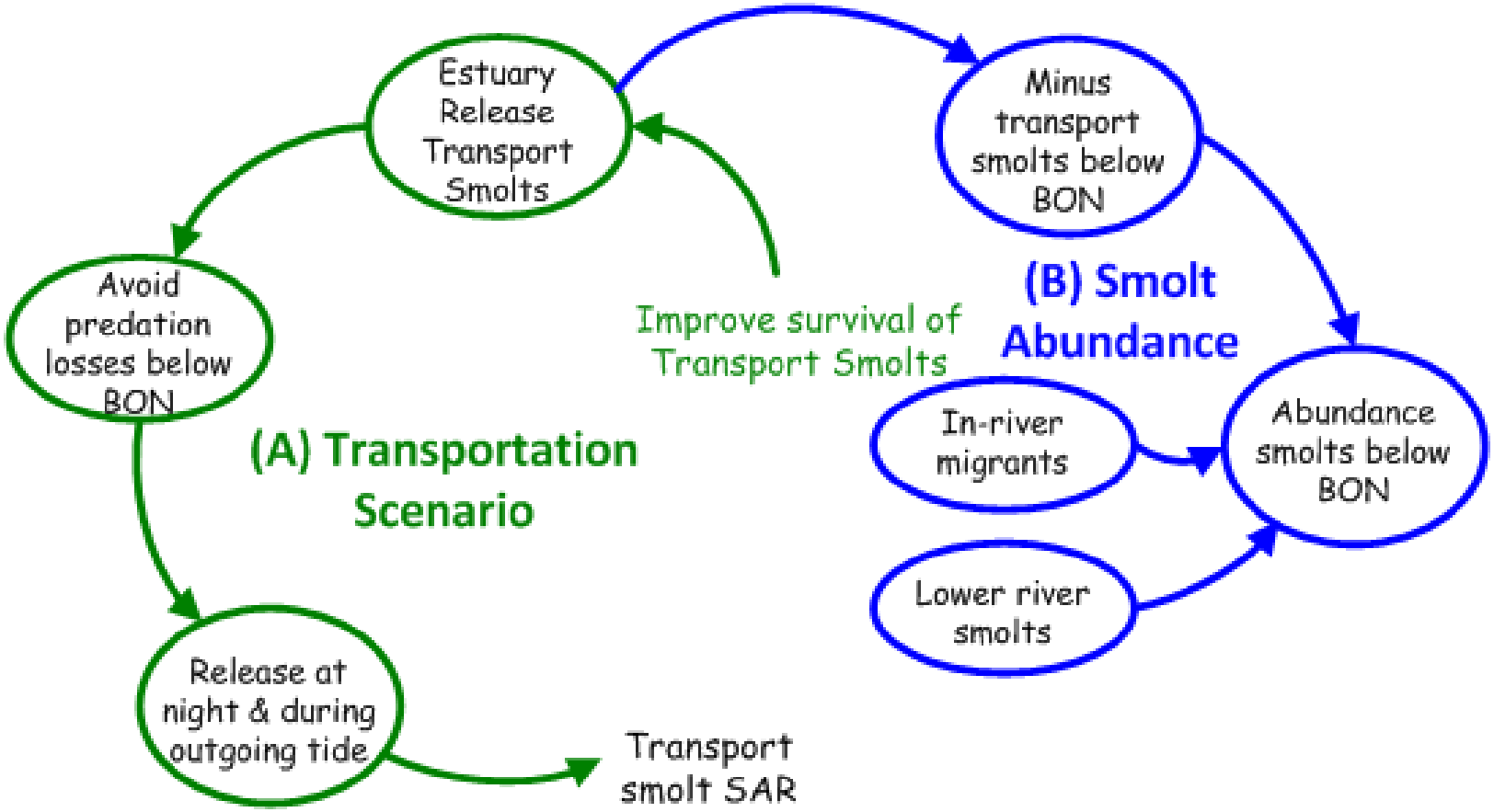
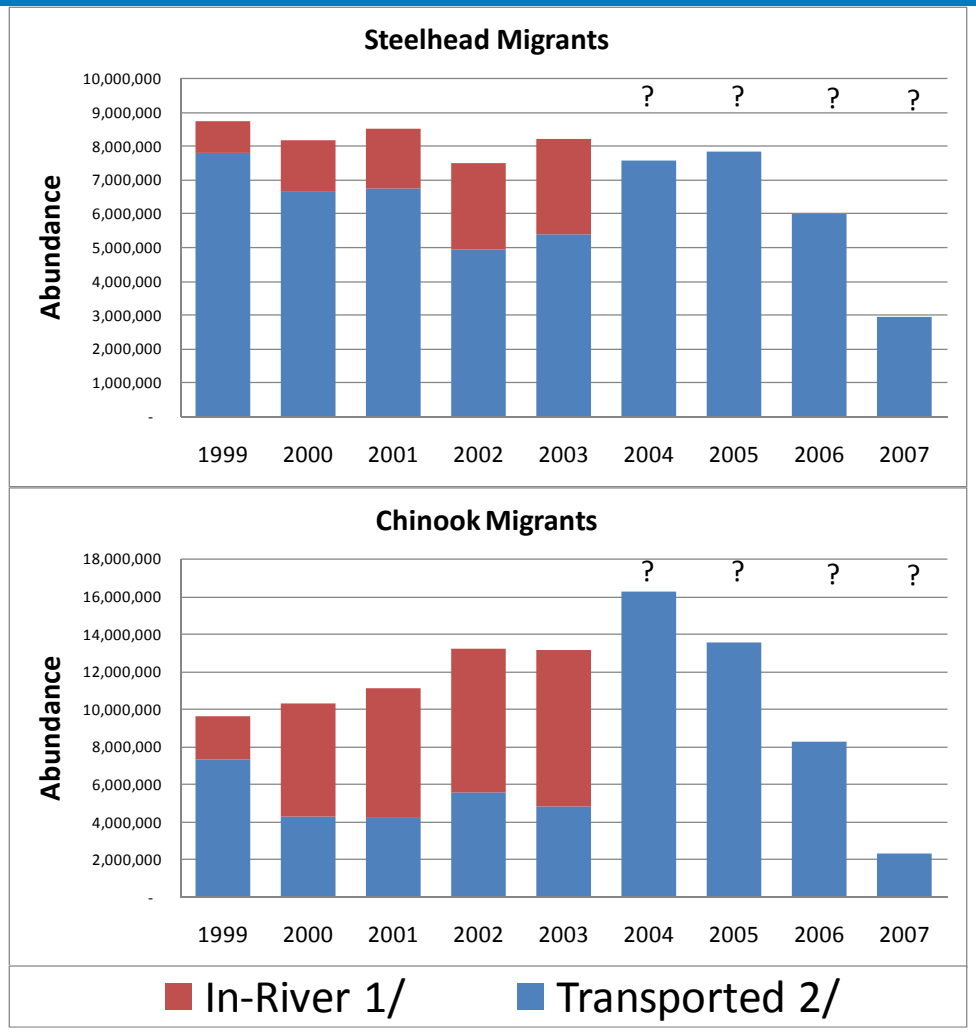
SMOLT ABUNDANCE



SMOLT ABUNDANCE ESTIMATES

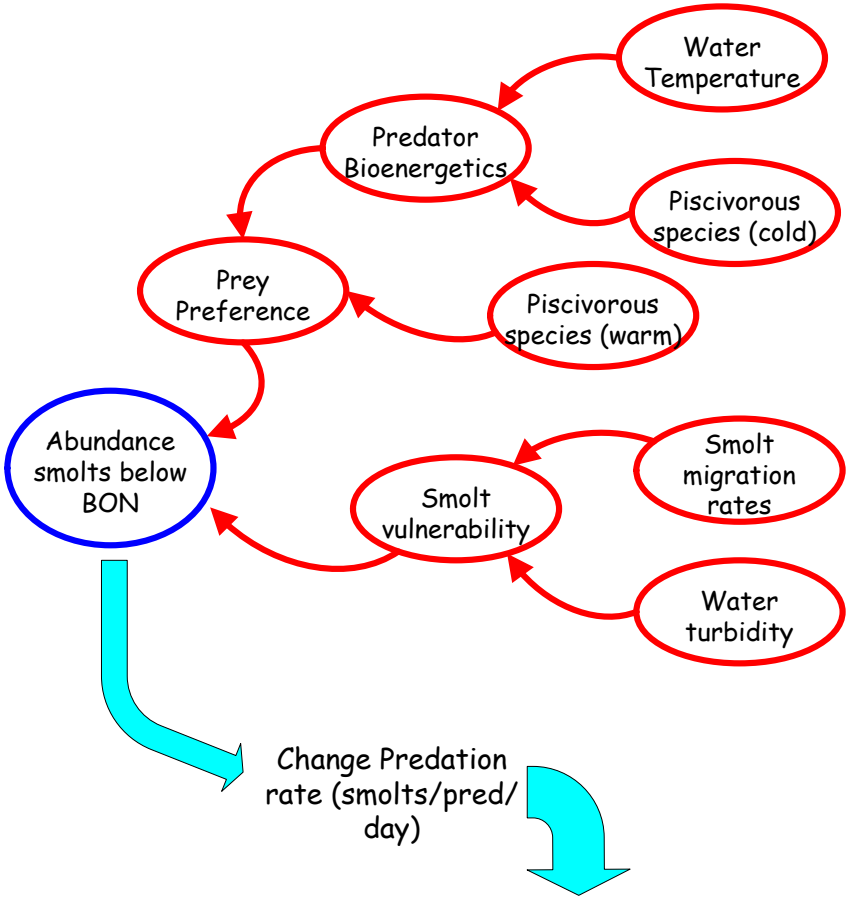


1/ Abundance in-river fish for 1999 to 2003 are unpublished data provided by Doug Marsh NOAA Fisheries

2/ Abundance transported fish from Fish Passage Center web site.

Data Sources:	Information:
Fish Passage Center	Annual abundance transported juveniles and smolt passage indices
D. Marsh (NOAA unpublished data)	Annual estimated juvenile migrants past BON
J. Ferguson (NOAA juvenile abundance estimates)	Annual predicted abundance at locations below BON
Population modeling (EDT & AHA)	Predicted average abundance of juveniles entering Lower Columbia River

PREDATOR-PREY DYNAMICS



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PREDATOR-PREY SCENARIOS

1. Prey preference?
   - No preference – prey switching
     OR
   - Strong preference – predation insensitive to availability
     ALSO
   - Smolt size preference

2. Predator distribution sensitive to prey availability?
   - Predator distribution insensitive to transport strategy
     OR
   - Elimination of transported fish redistribute predators

PREDATOR-PREY SCENARIOS

3. Environmental factors affecting predation?
   - Turbidity will affect visual predators
   - Water temperature will affect all fish predators

4. Smolt migration rates?
   - Transportation strategy more likely to affect fish with longer residence times

5. Smolt origin?
   - Hatchery vs wild
   - Lower river vs up-river populations

6. Interactions among predators?

POTENTIAL CHANGES IN PREDATION MORTALITY

		Prey Preference for smolts		
		None	**Low**	**High**
Predator redistribution	**None**	No Change	Moderate increase	Signficant Increase
	Low	Moderate decrease	Slight decrease	No change to slight increase
	High	Significant decrease	Moderate decrease	Moderate decrease

A REQUEST FOR COLLABORATION

- Review conceptual model
  - ✓ Utility
  - ✓ Key factors
- Estimates of predator abundances below BON
  - ✓ Any information available will help
  - ✓ We are prepared to use expert knowledge
- Diet composition
  - ✓ Peterson et al. (1992); Zimmerman (1999)?
- Smolt migration rates
  - ✓ Availability of results migration studies below BON?

QUESTIONS/COMMENTS

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