Stock-specific pinniped predation estimates for spring Chinook salmon at Bonneville Dam and effects of deterrents

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Corps of Engineers

University of Idaho

Introduction

- ► Pinniped abundance at Bonneville increasing
- ► Total predation on salmonids increasing
  - Steelhead
  - Spring Chinook salmon
- ► Impacts vary with run size and timing
- ► Stock-specific impacts on listed fish largely unknown

- Do impacts differ among populations?
- What about wild fish?

Methods

- Pinniped observation data from USACE
  - Abundance, hourly and expanded catch rates
- Radiotelemetry data from UI and NMFS
  - SPCK run composition from random samples
  - Stock-specific migration timing distributions
- PIT interrogation data from PTAGIS
  - Stock-specific timing distributions

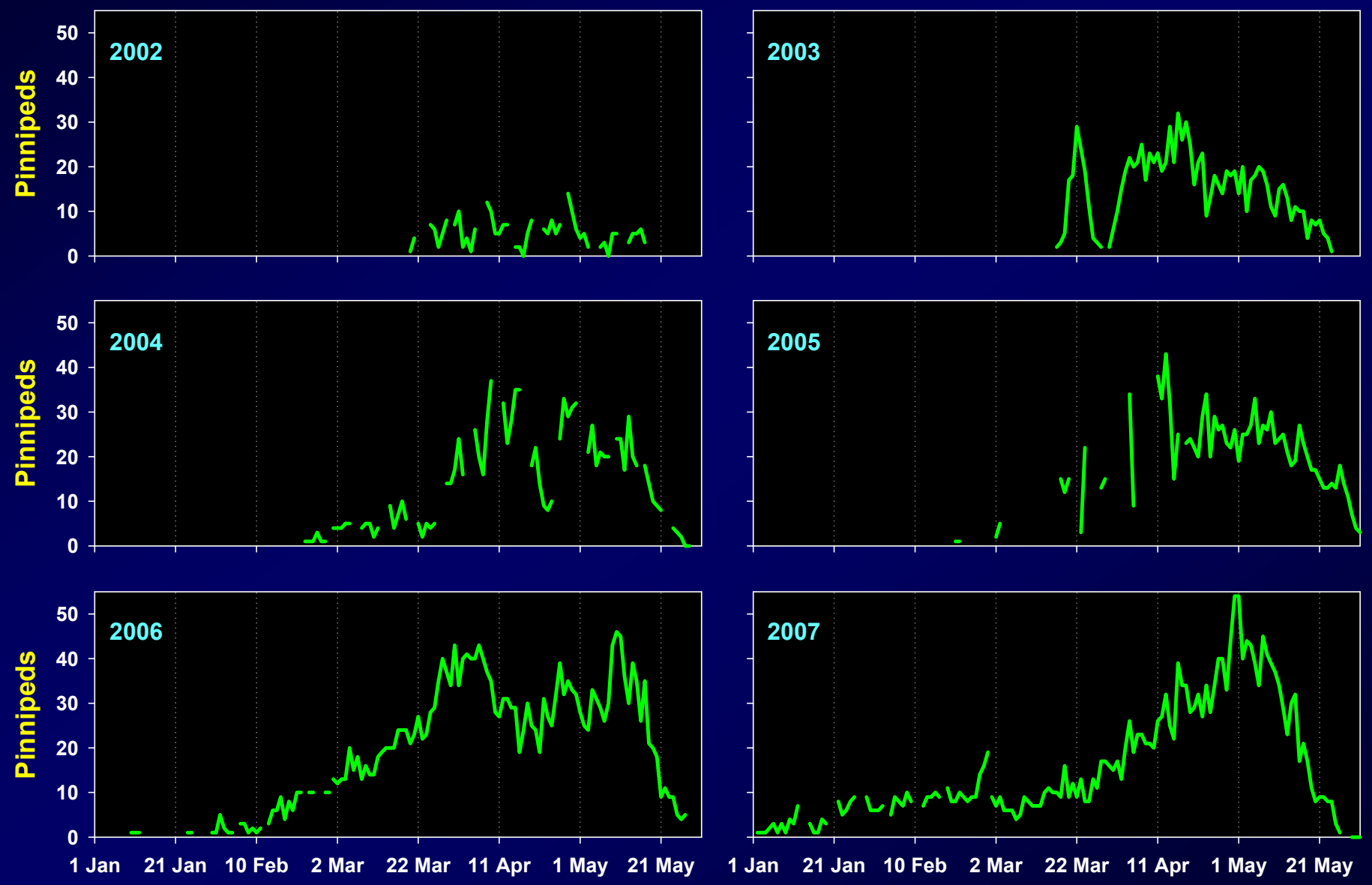
Use probabilities to estimate stock-specific impacts

- Appendix: What are the effects of deterrents? (SLEDs)

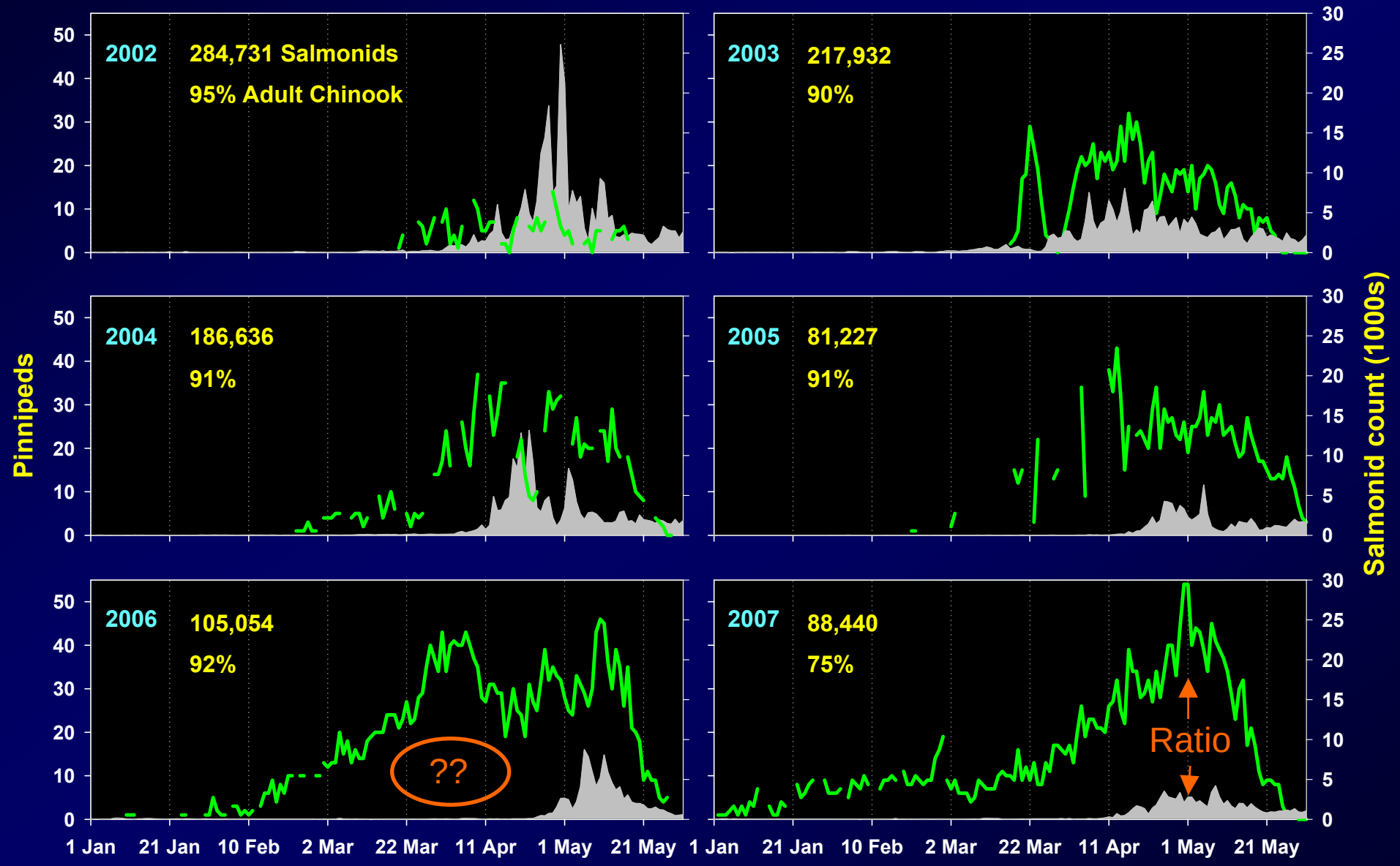
Part I: Pinniped Predation Data

ODFW

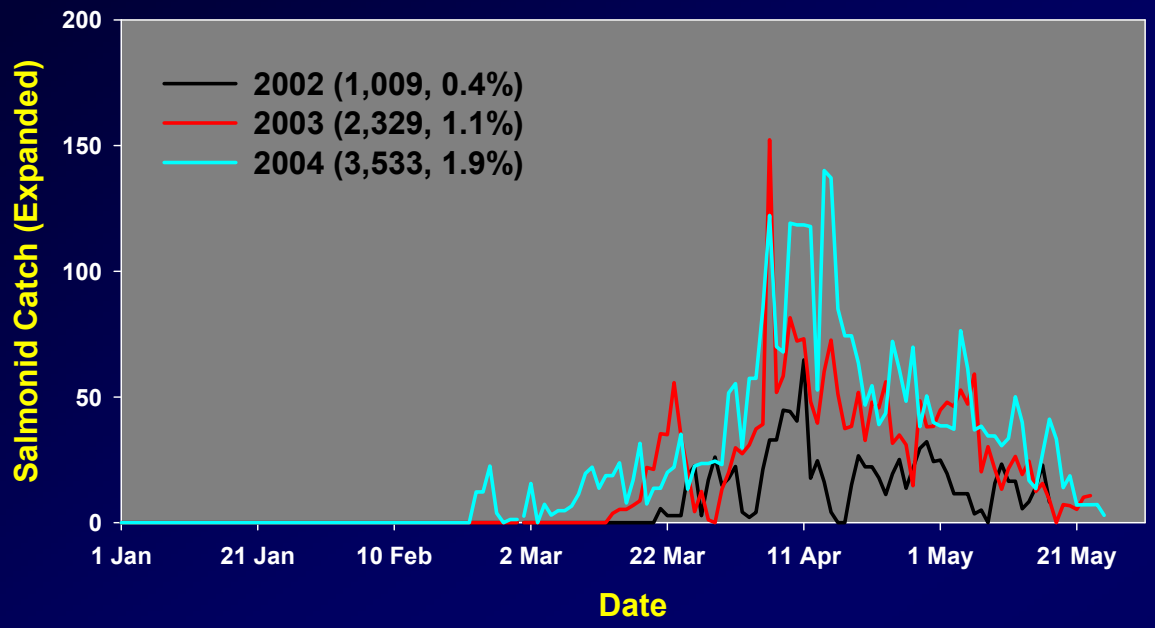
Minimum Pinniped Counts



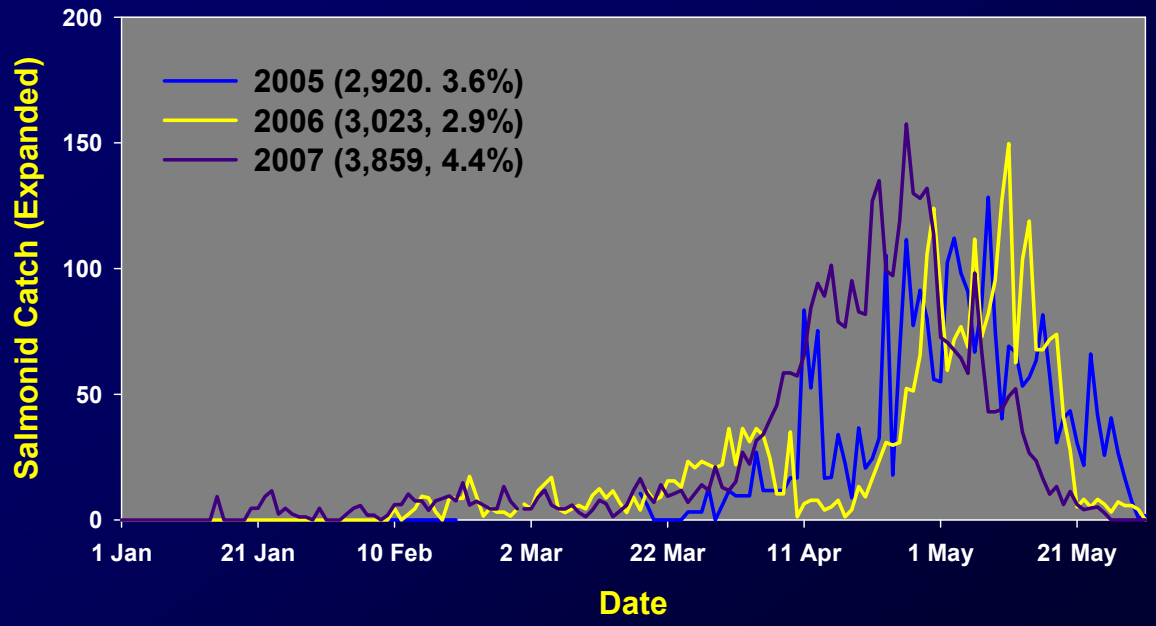
Pinniped Counts + Salmonid Counts



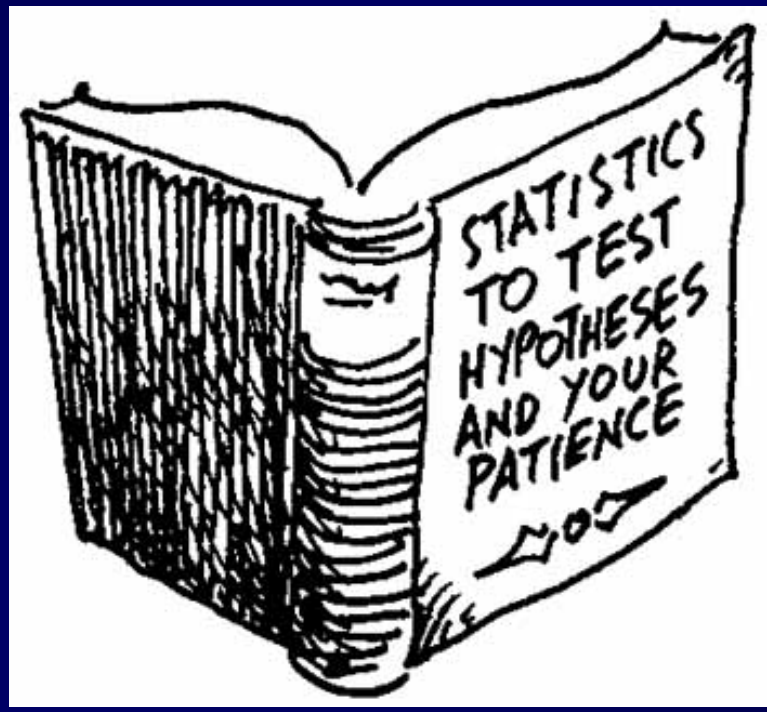
Daily Pinniped Catch (Expanded from Observations)



Expansion estimates based on hourly observational data in tailrace



Estimating Predation Rates



C = Catch by pinnipeds (expanded)

T = Total salmonid count

A = Adult Chinook

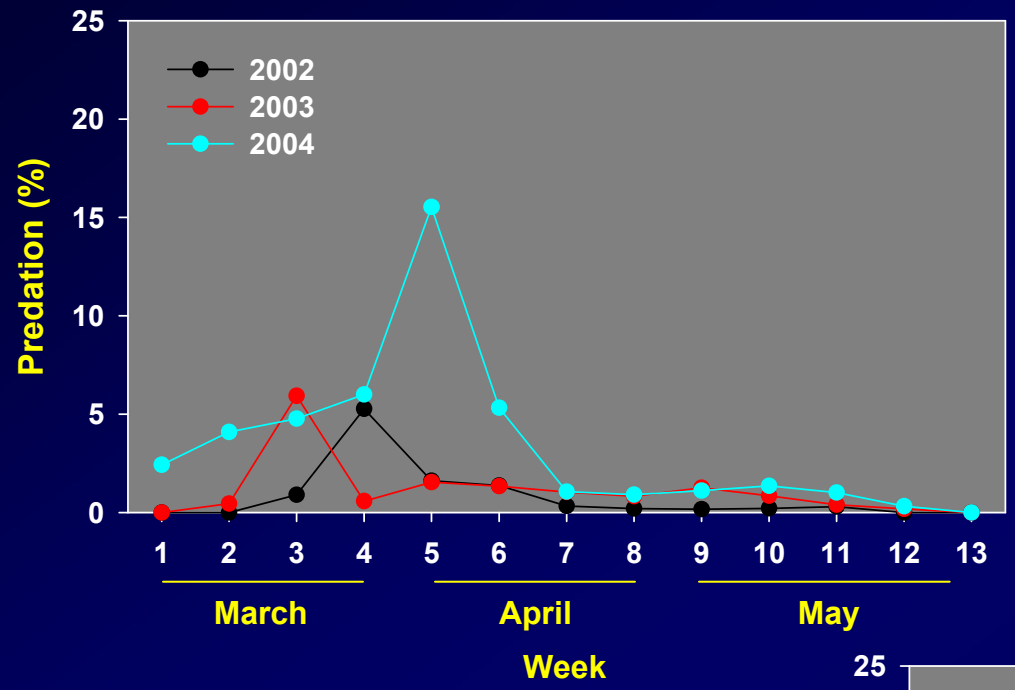
w = week

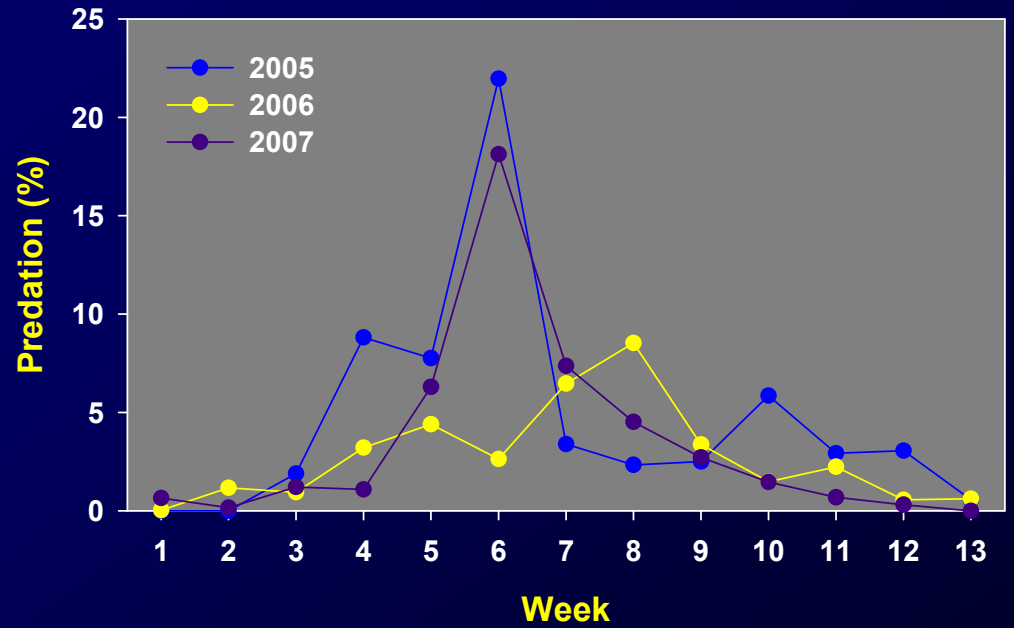
$$\text{Weekly predation \%} = \left(\frac{C_W}{T_W + C_W}\right)$$

$$\text{Weekly adult Chinook predation \%} = \left(\frac{C_W}{T_W + C_W}\right) \times \left(\frac{A_W}{T_W}\right)$$

Weighting term
for Adult Chinook

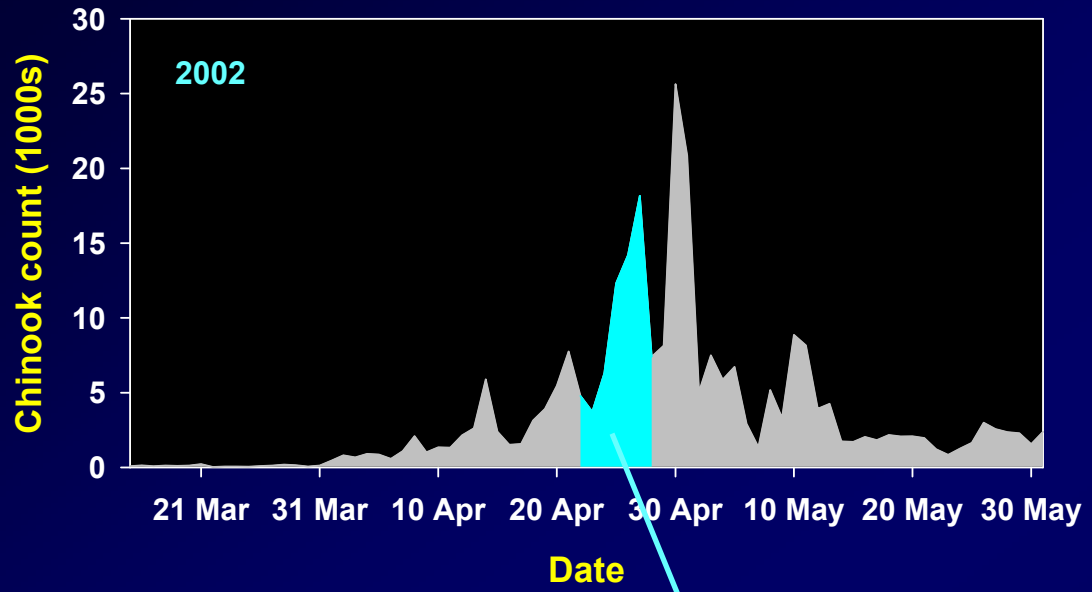
Weekly Adult Chinook Predation Estimates

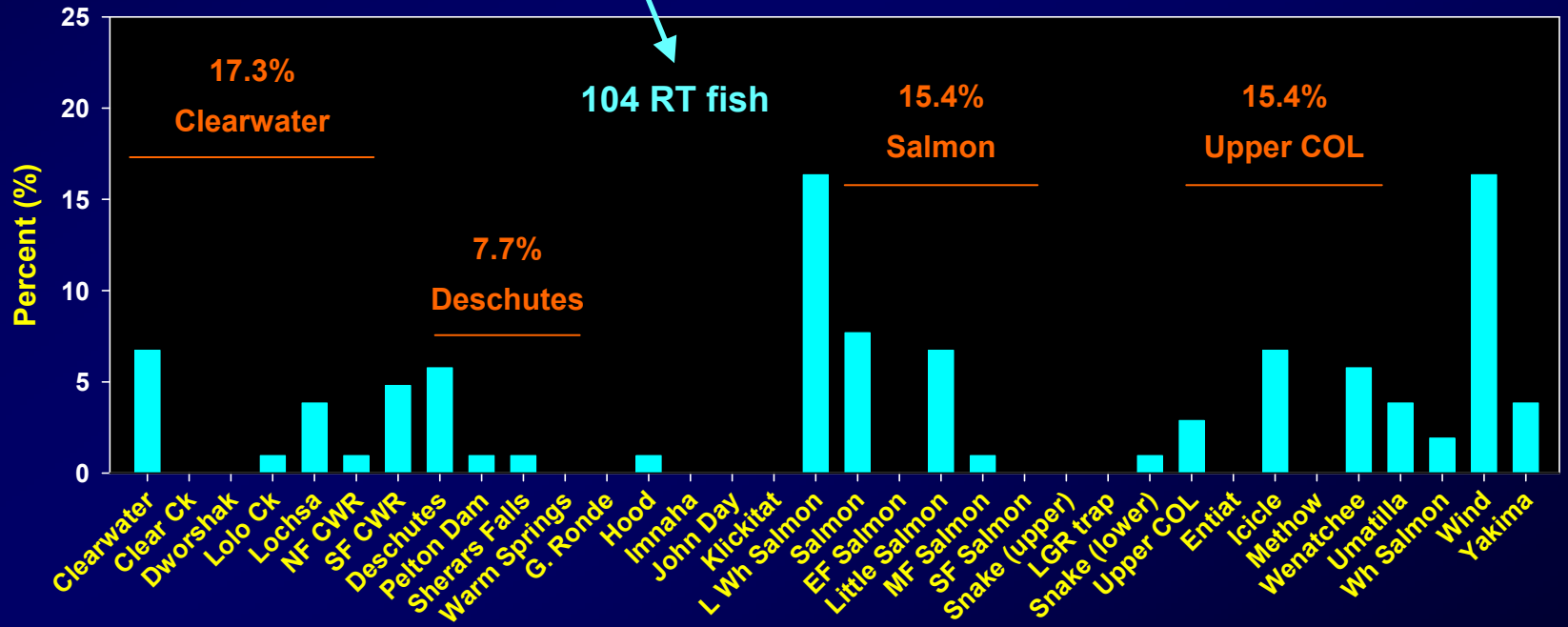




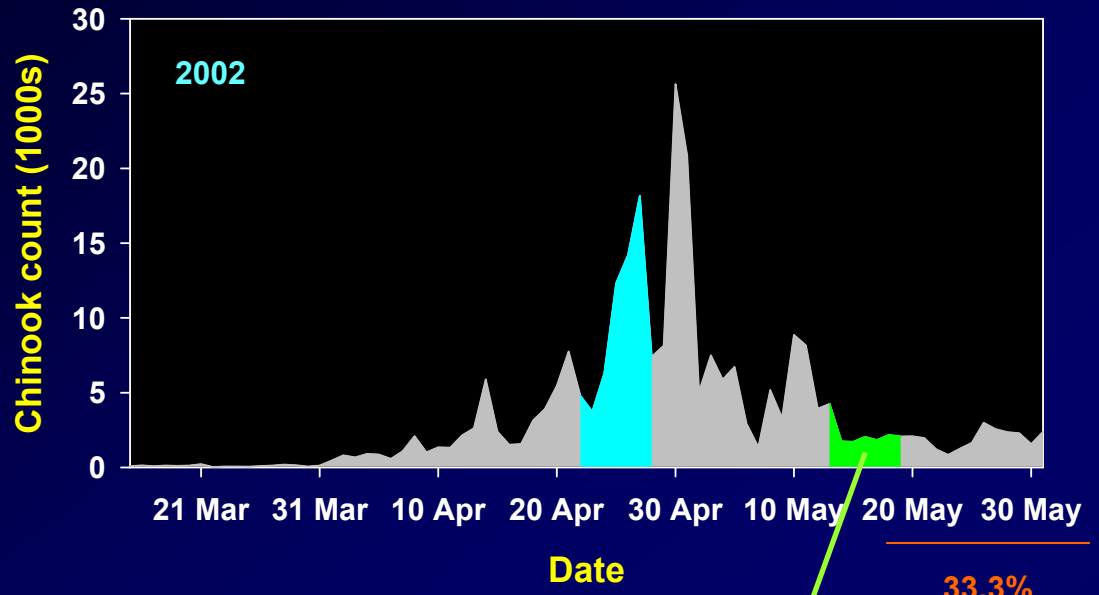
Part II: Chinook Salmon Stock Data

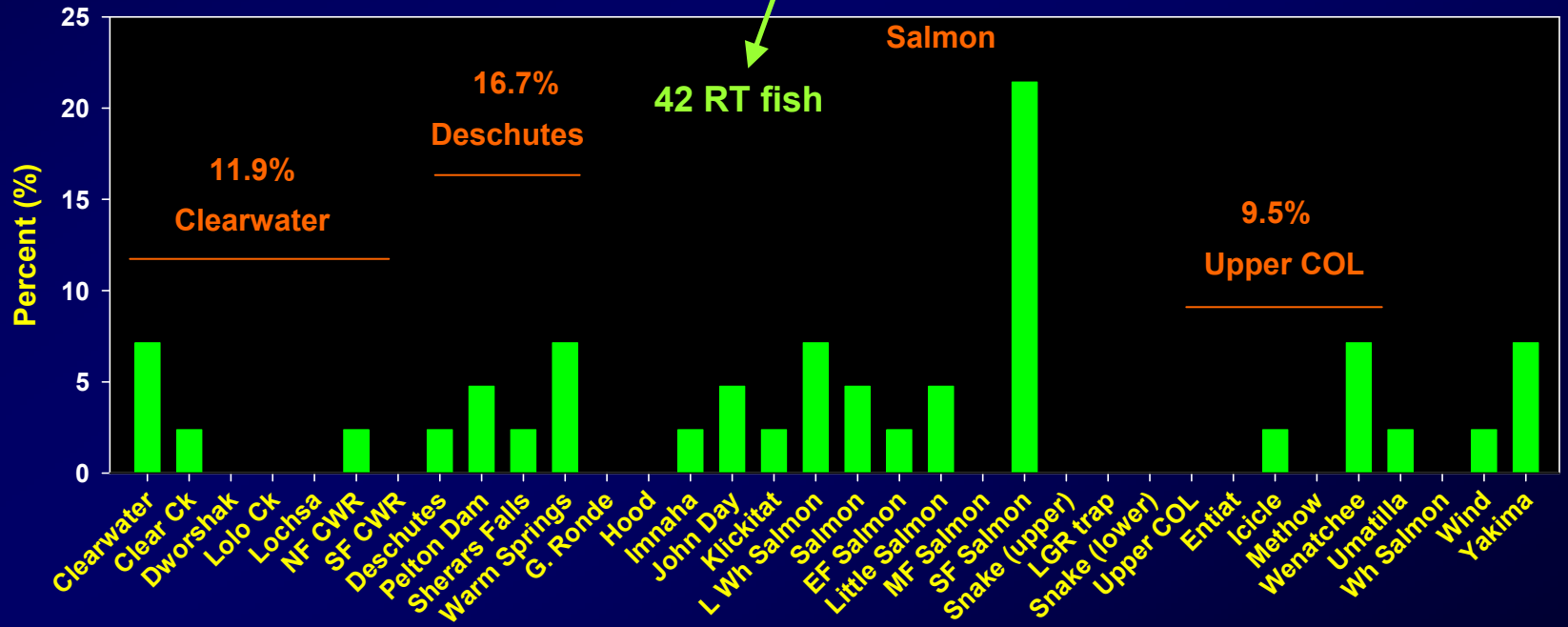
Chinook Stock Composition (Random RT)



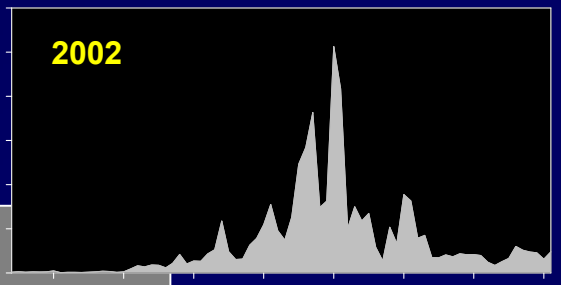


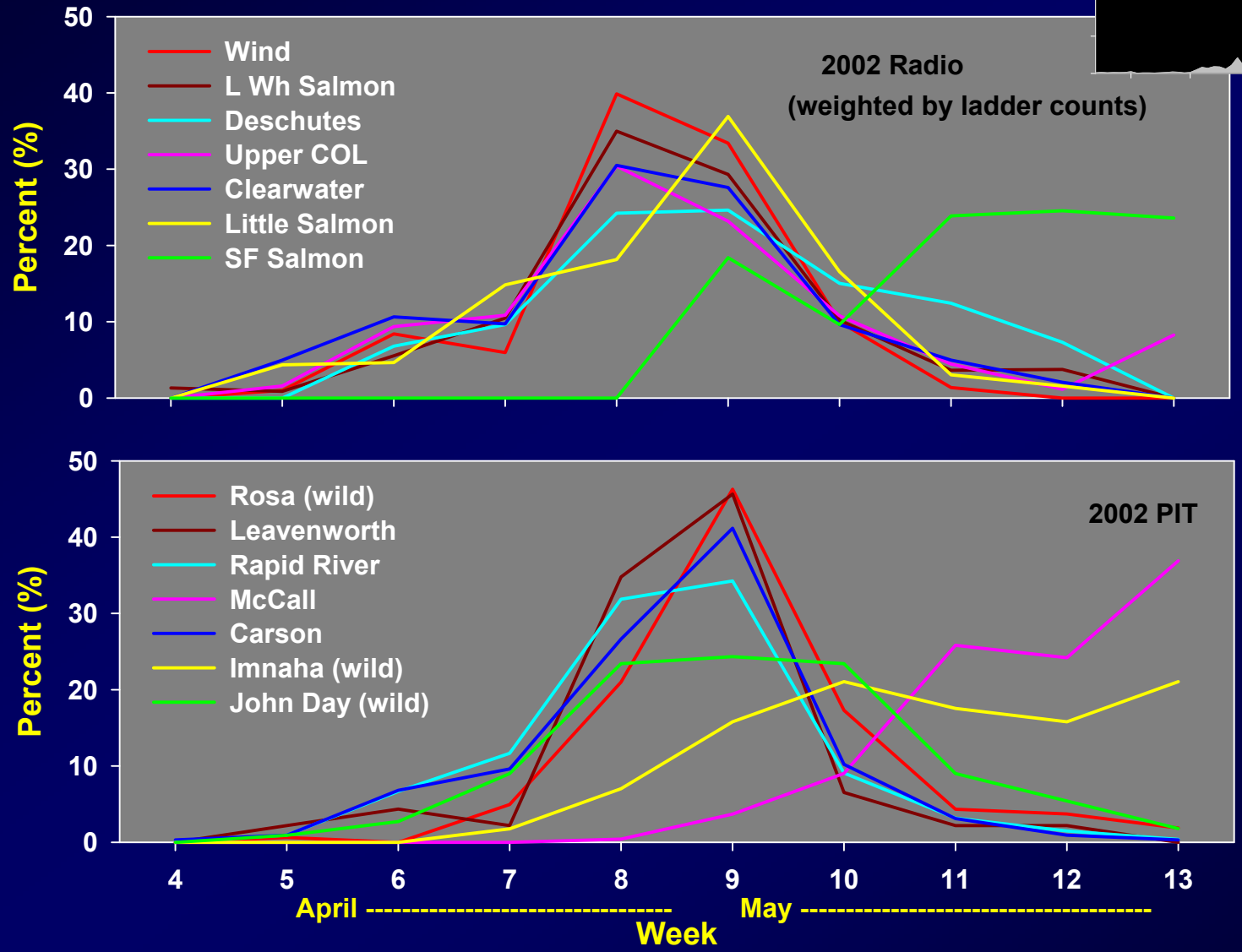
Chinook Stock Composition



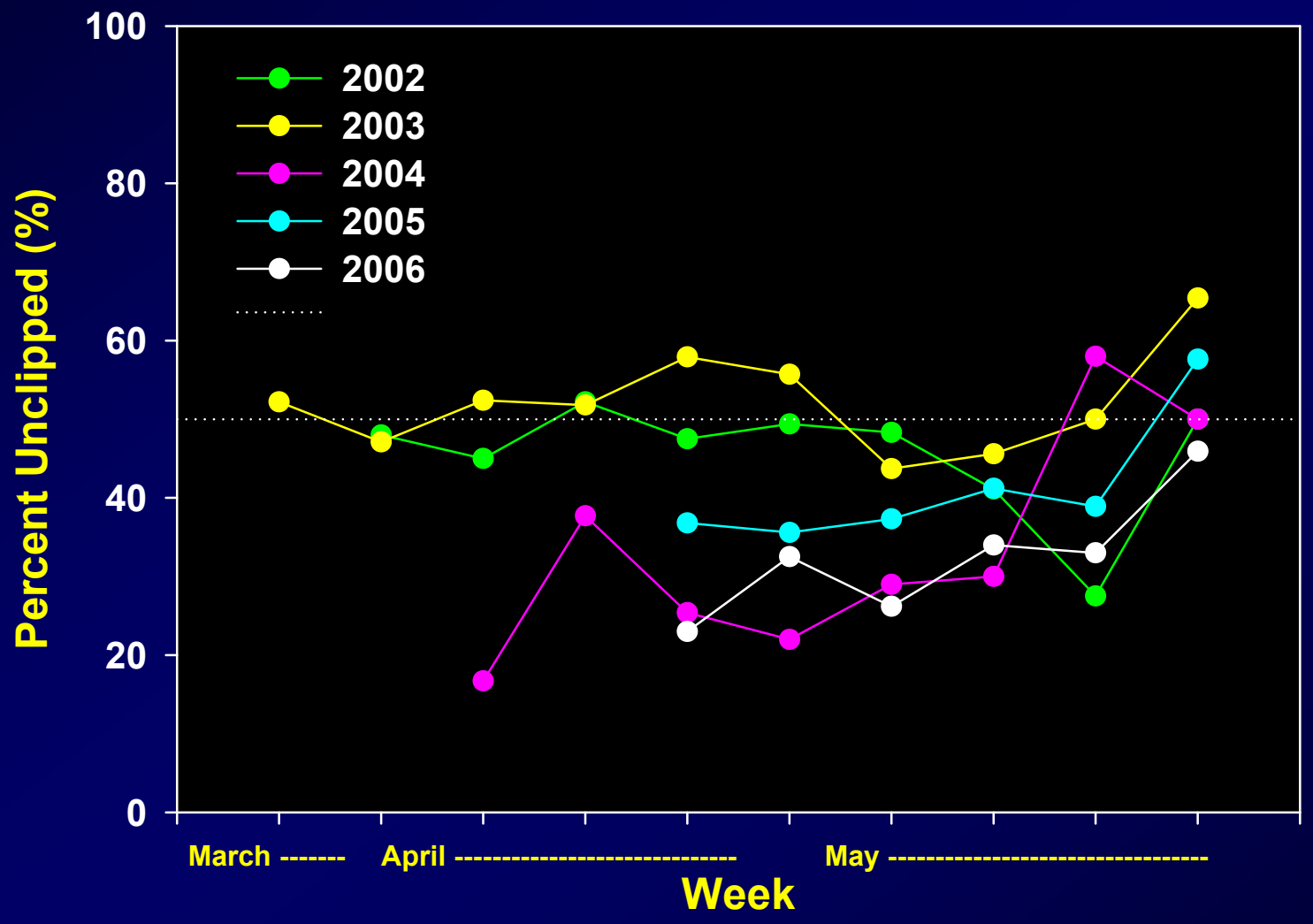


Chinook Stock Timing (Examples)





Timing of 'Wild' (Unclipped) Spring Chinook

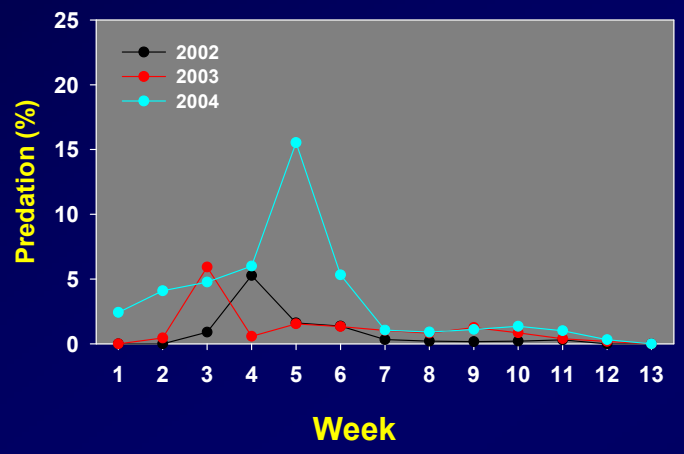


Data from CRITFC sampling at Bonneville

Part III: Bringing it All Together

Stock-Specific Predation Estimates

$$\text{Stock impact \%} = \sum_{W=1}^{T} (\text{Predation\%}_W) \times (\text{Stock\%}_W)$$



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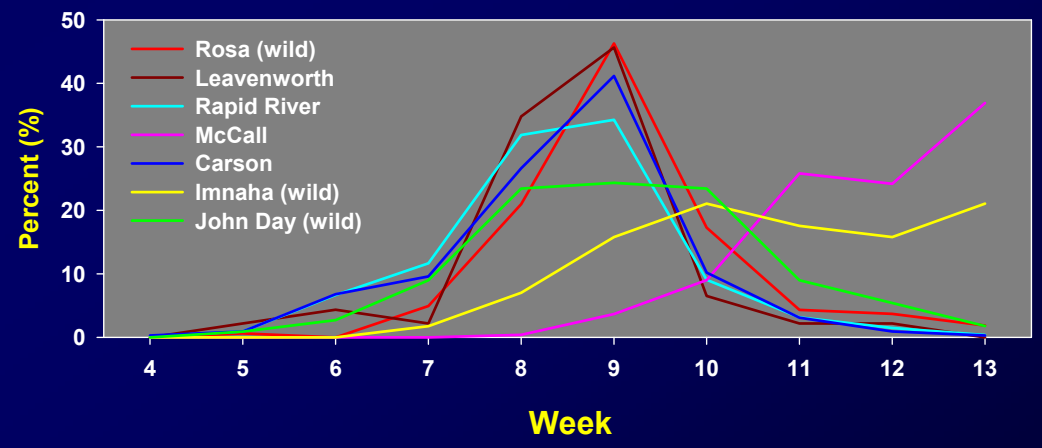
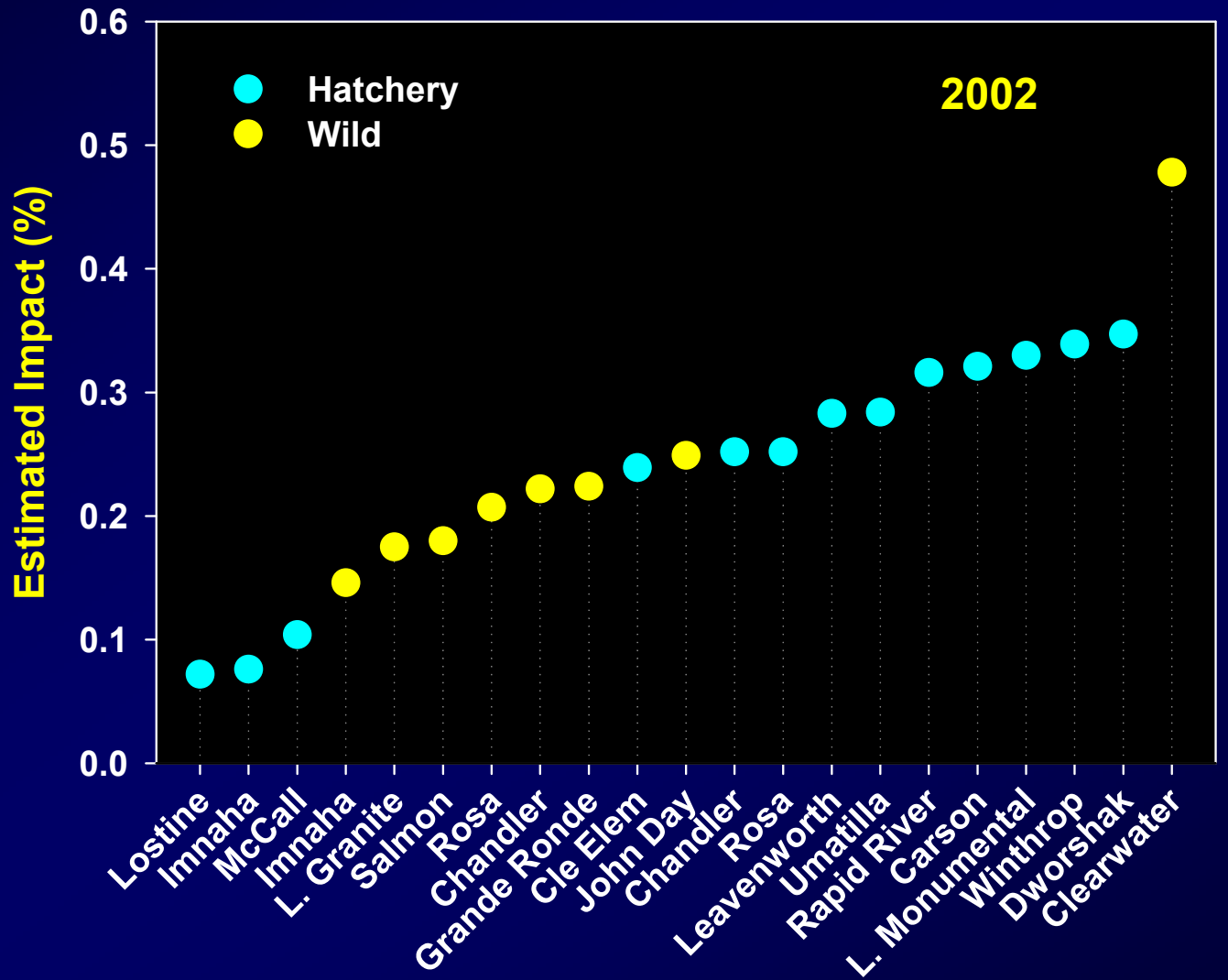


Predation Estimates (PIT Example)



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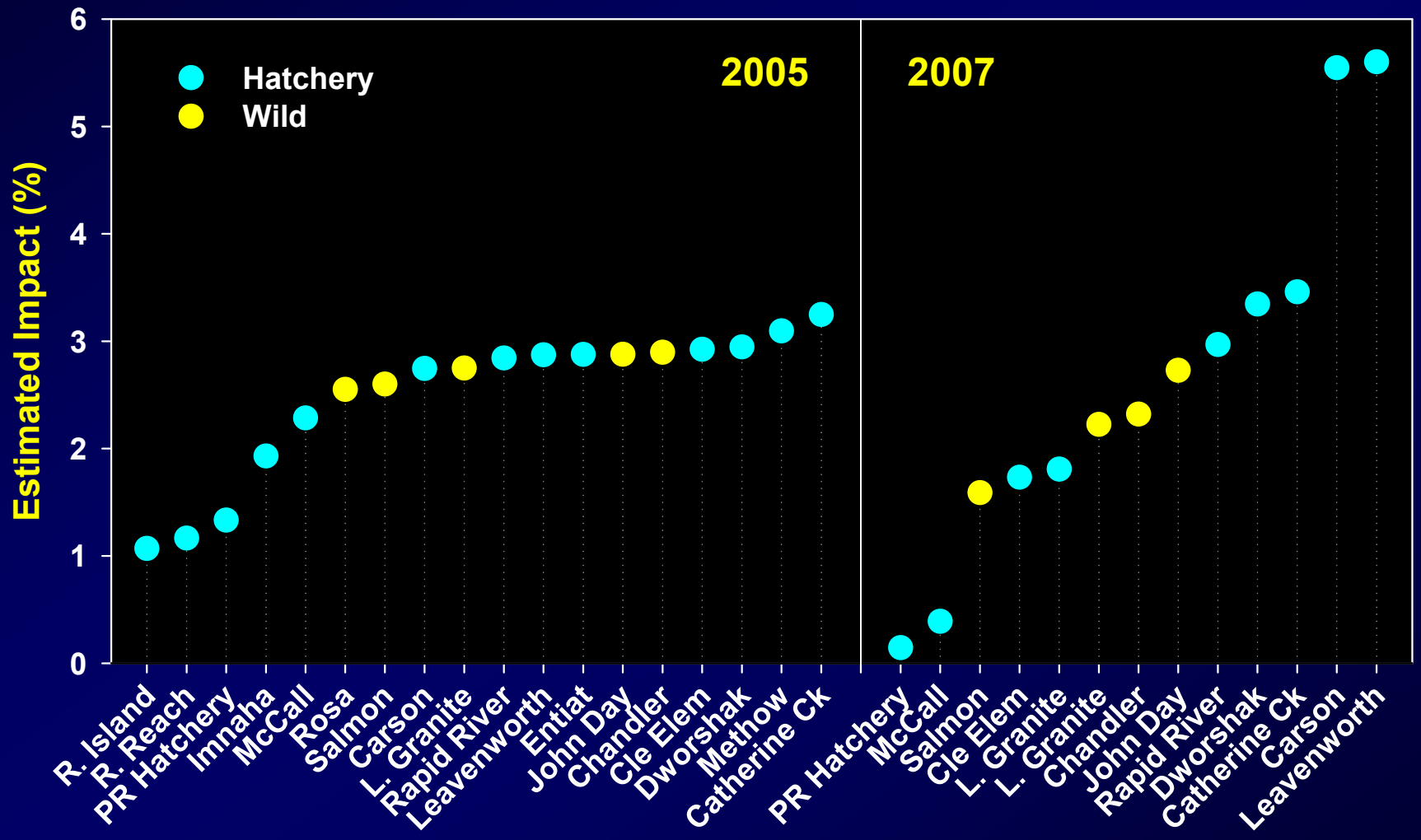
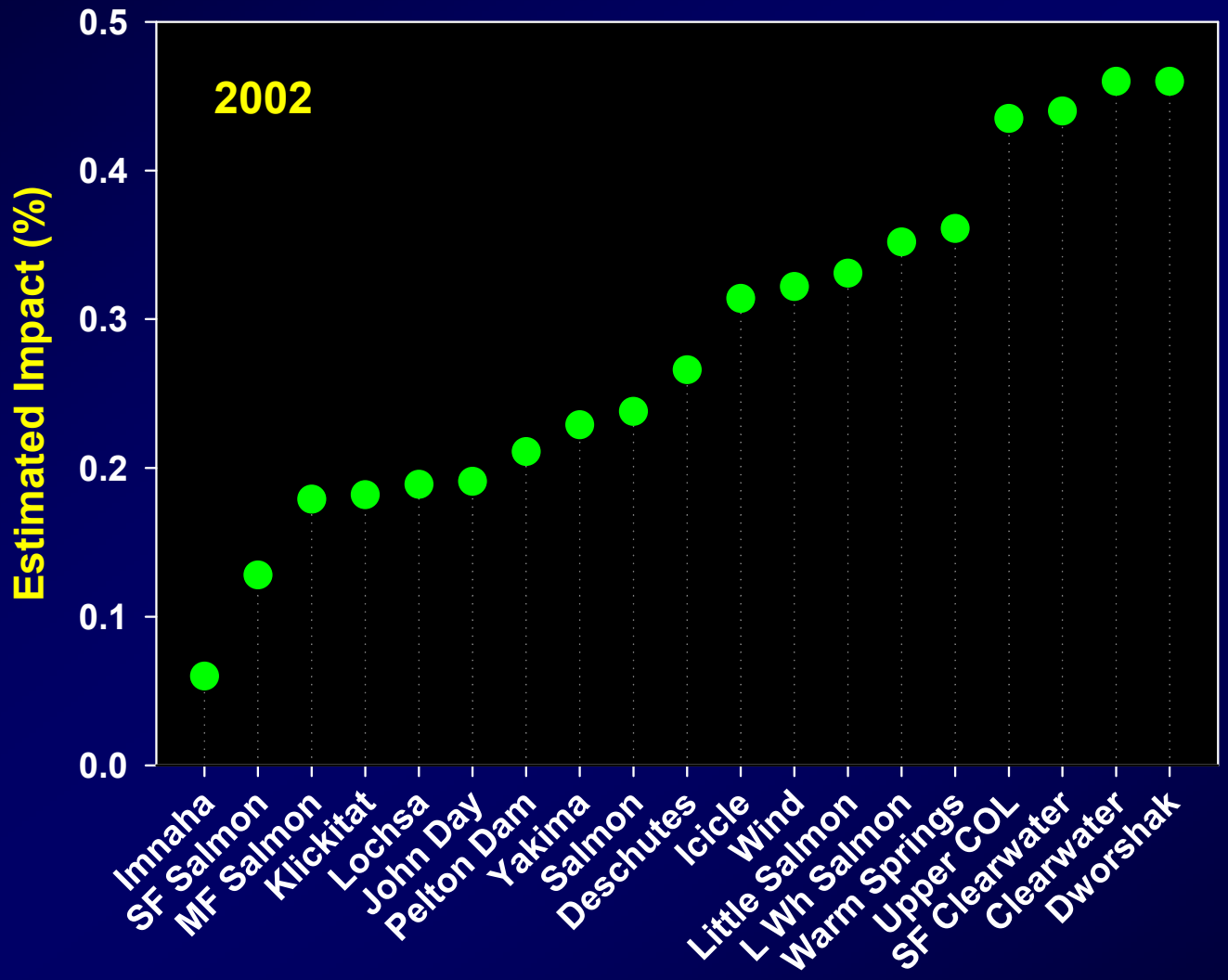
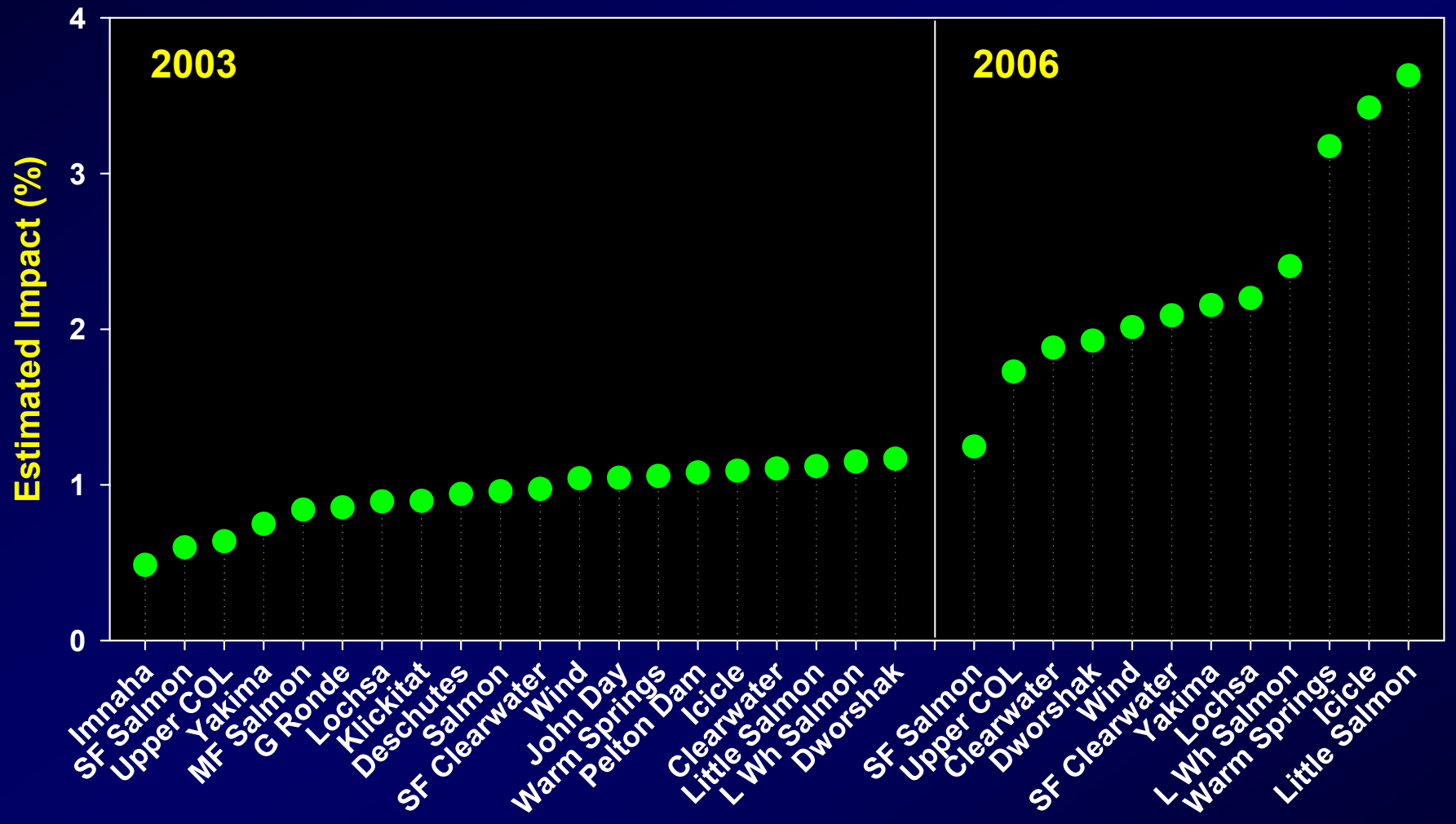


Predation Estimates (Radio Example)



Predation Estimates (Radio Examples)



Summary of Predation Evaluation

- ► Do predation impacts differ among populations? <u>Almost certainly</u>

- ► Spring Chinook stock impacts differ within and among years
  - ● On average, 'risk' greater for earlier-timed populations
    - *- Rapid River, Icicle, Clearwater, Wind, Deschutes, Methow*

- ► Potential for substantial predation on steelhead, sturgeon
  - ● Counts at Bonneville not a reliable indicator of availability
  - ● Steelhead PIT data not very informative
    - *- Snake, John Day, Hood, Wind (very small samples)*

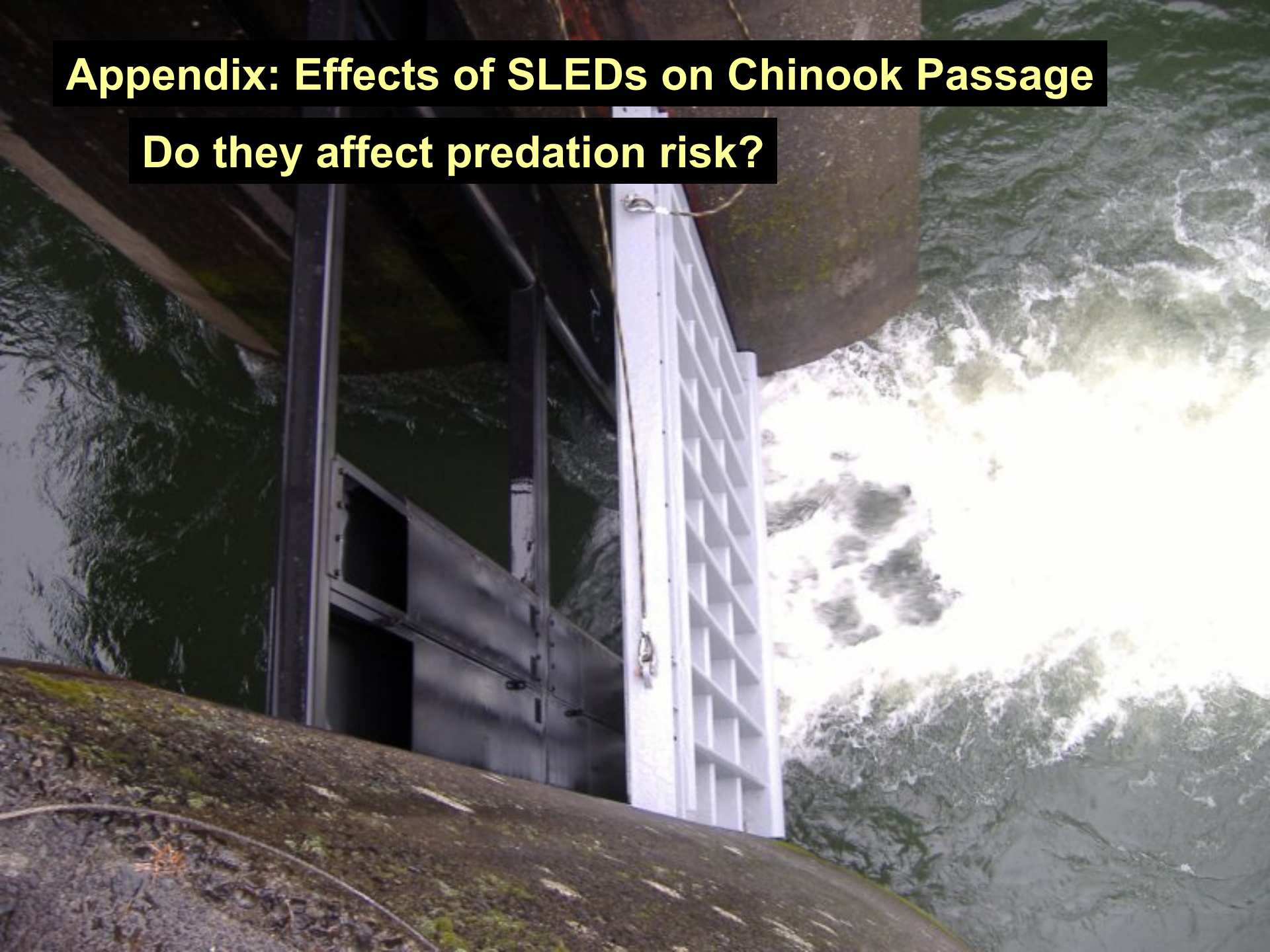
OR Anglers

Summary of Predation Evaluation

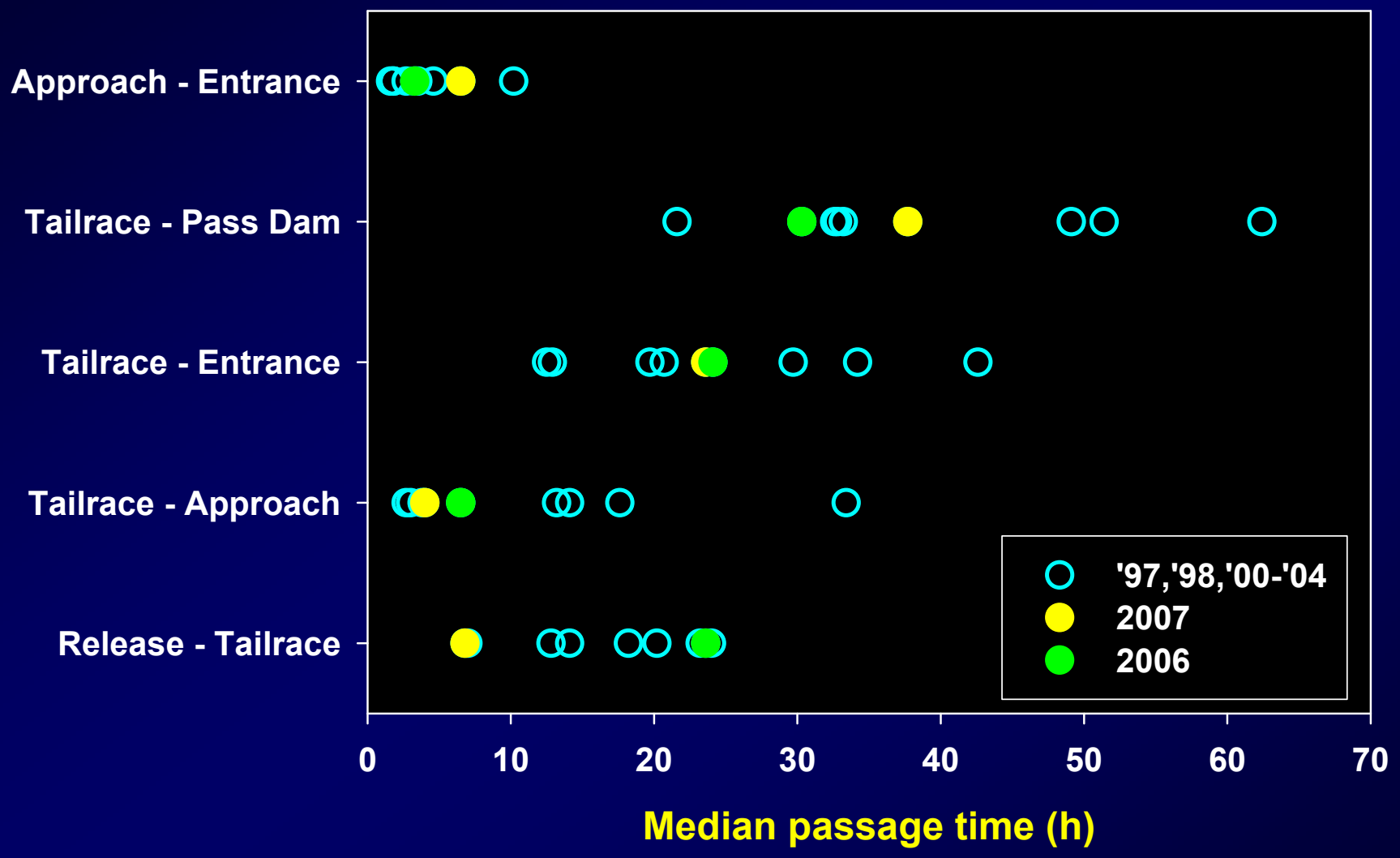
- Additional questions
  - How do dam counts relate to availability in tailrace?
  - Is predation size or stock selective?
  - Is there prey (species) switching when Spring Chinook arrive?
  - How much predation occurs downstream?
  - Estimates are sensitive to the catch data
    - Can these estimates be improved?

Appendix: Effects of SLEDs on Chinook Passage

Do they affect predation risk?

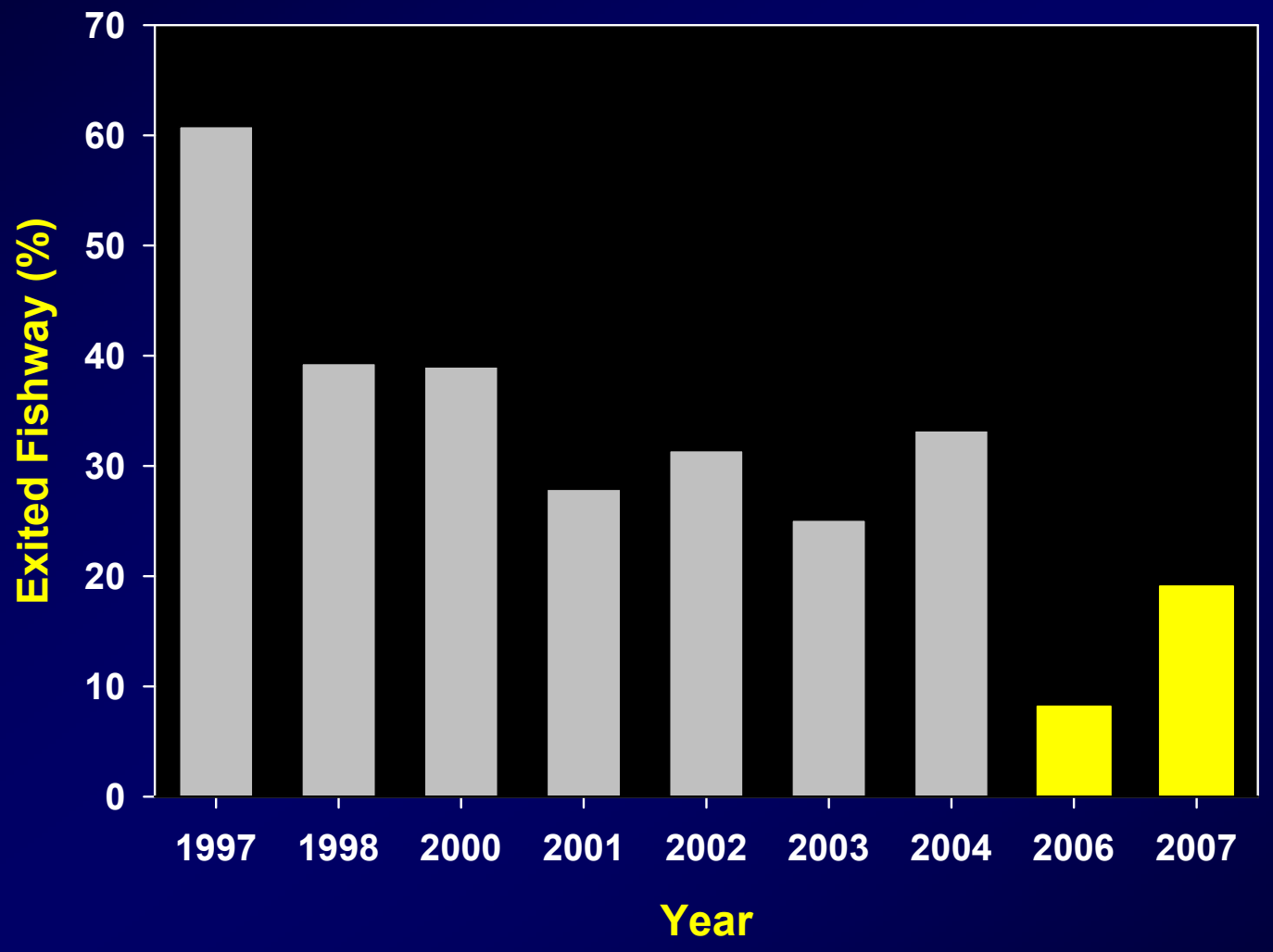


Effects of Exclusion Devices on Passage Times



- No clear evidence of Spring Chinook delays

Effects of Exclusion Devices on Fishway Exits



- Exit rates appear to be lower with SLEDs (sea lion avoidance?)

Summary of SLED Evaluation

- No smoking gun