CSMEP Hydro DQO Steps 6 & 7

June 21-22, 2005

Hydro subgroup:

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Questions examined

1. Is SAR sufficient for 1) NPCC goal & 2) recovery goals? *(Petrosky and Wilson)*
2. Has hydrosystem complied with performance standards set out in 2000 FCRPS BiOp? (*Paulsen)*
3. Is transportation more effective than in-river passage? (*Petrosky and Wilson)*
4. What's the incremental mortality of Snake River fish populations (passing 8 dams) as compared to lower Columbia stocks (passing 3 dams)? *(Petrosky)*
5. What is the relative survival of transported fish post-BONN, compared to in-river fish? *(Petrosky and Wilson)*
6. What's the inferred delayed mortality of both in-river and transported fish? *(Petrosky/Marmorek - deferred for now)*

Questions continued

7. What's the effect of different within-season transportation management actions in SARs and post-BONN survival of transported fish? *(Paulsen)*
8. What's the effect of different flow/spill management actions in the hydrosystem on a) SAR and Sp/Sp ratios *{Petrosky}* and b) in-river survival? *{Wilson/Marmorek - deferred}*
9. Have freshwater habitat restoration actions been sufficient to compensate for hydrosystem direct and delayed mortality, as measured on the Snake R. aggregate sp/su chinook stock? (Petrosky)
10. What is the relative survival of fish past turbines spillway & bypass? Would RSWs improve SARs, Sp/Sp sufficiently to meet recovery targets? Would RSWs be an effective alternative to transportation? *(Weber)*

Q 1, 3, 5: SARs meeting goals, relative transport effectiveness (T/C ratio) and differential delayed transport mortality (D)?

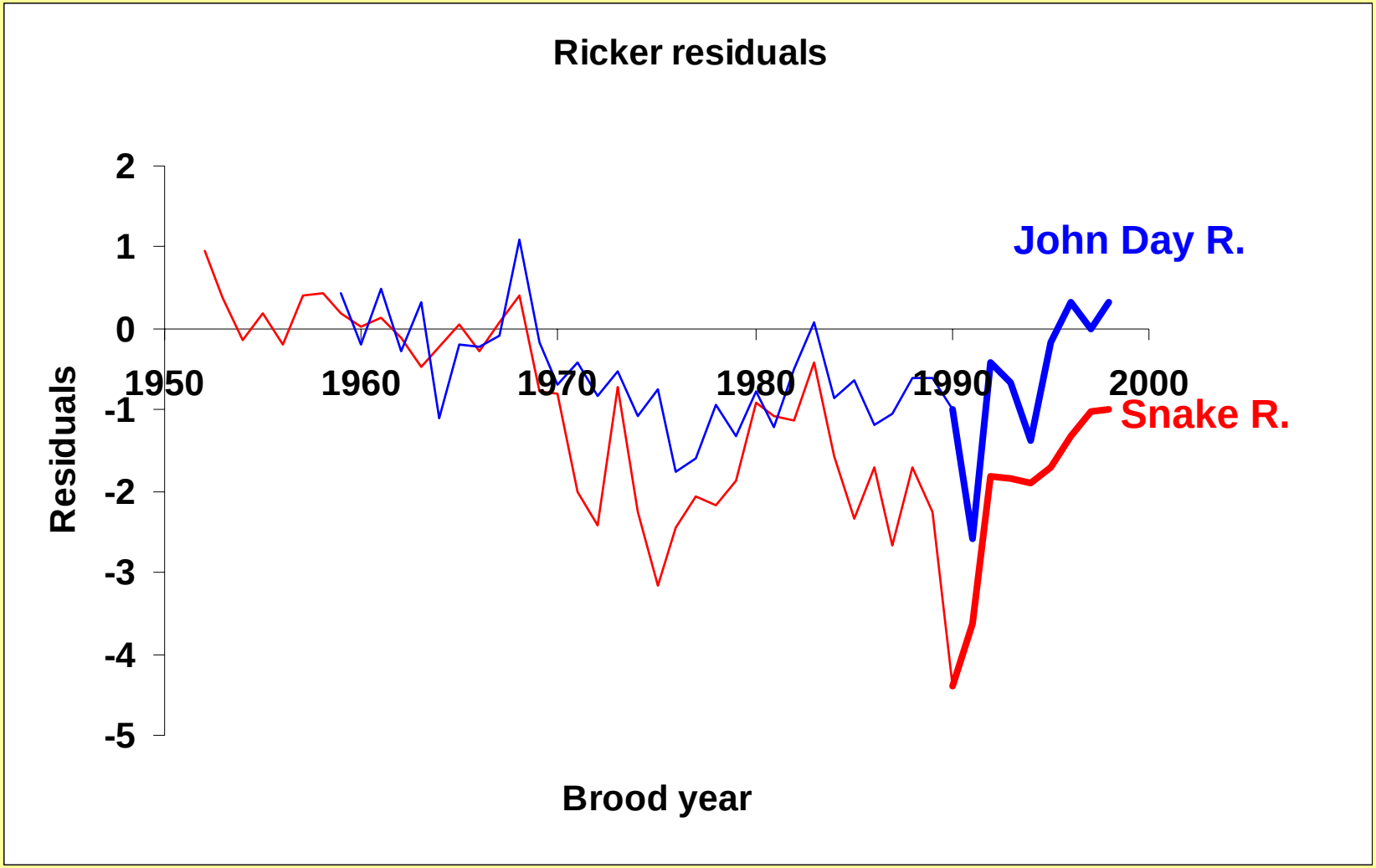
Q4: What is the incremental mortality of Snake River fish populations (passing 8 dams) as compared to lower Columbia stocks (passing 1-3 dams)?

- **Management question:** Are SARs of Snake R. stocks < SARs of downriver stocks, as suggested by incremental mortality patterns in R/S data (Deriso et al. 2001), CSS workshop (Marmorek et al. 2004)?
  - SARs are an independent data set which provide estimate of survival rates over a smaller part of the life cycle than R/S, provide supplemental info to understand differences in survival rates between different stock groups.

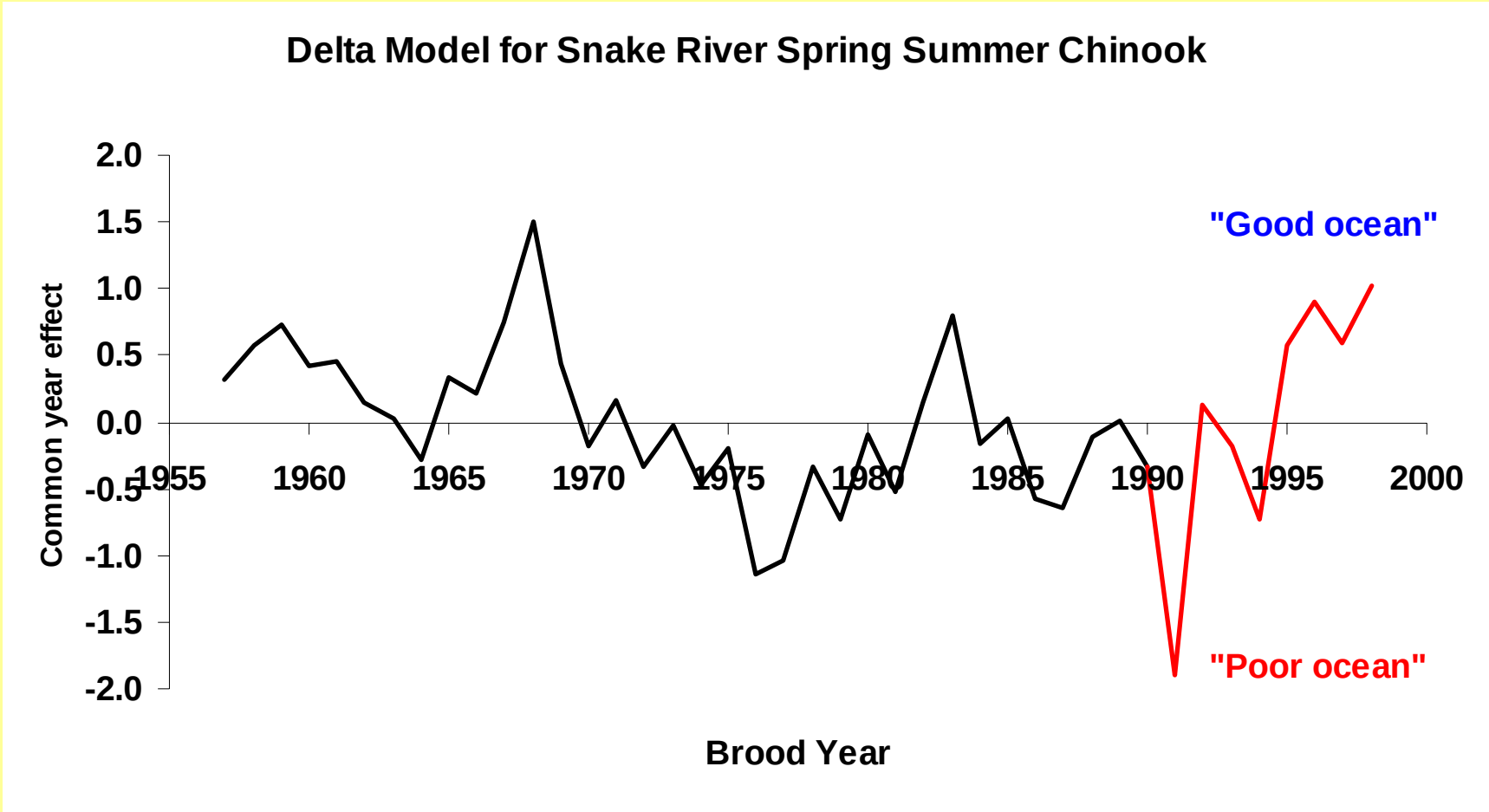
- **Relevant performance measures**: $-\ln(SAR_{upriver}/SAR_{downriver})$ from smolts at 1st dam encountered (LGR or JDA) to adults back to BON. Incremental mortality from R/S patterns of upriver and downriver stocks, μ (Deriso et al. 2001).

- **Evaluation design background**:
  - R/S data-run reconstructions Snake River stocks (ODFW & IDFG) and John Day stocks (ODFW) 1950s-present.
  - PIT tag SARs for Snake R. (various RME & CSS) 1994-present and John Day R. (ODFW & CSS), 2000-present.

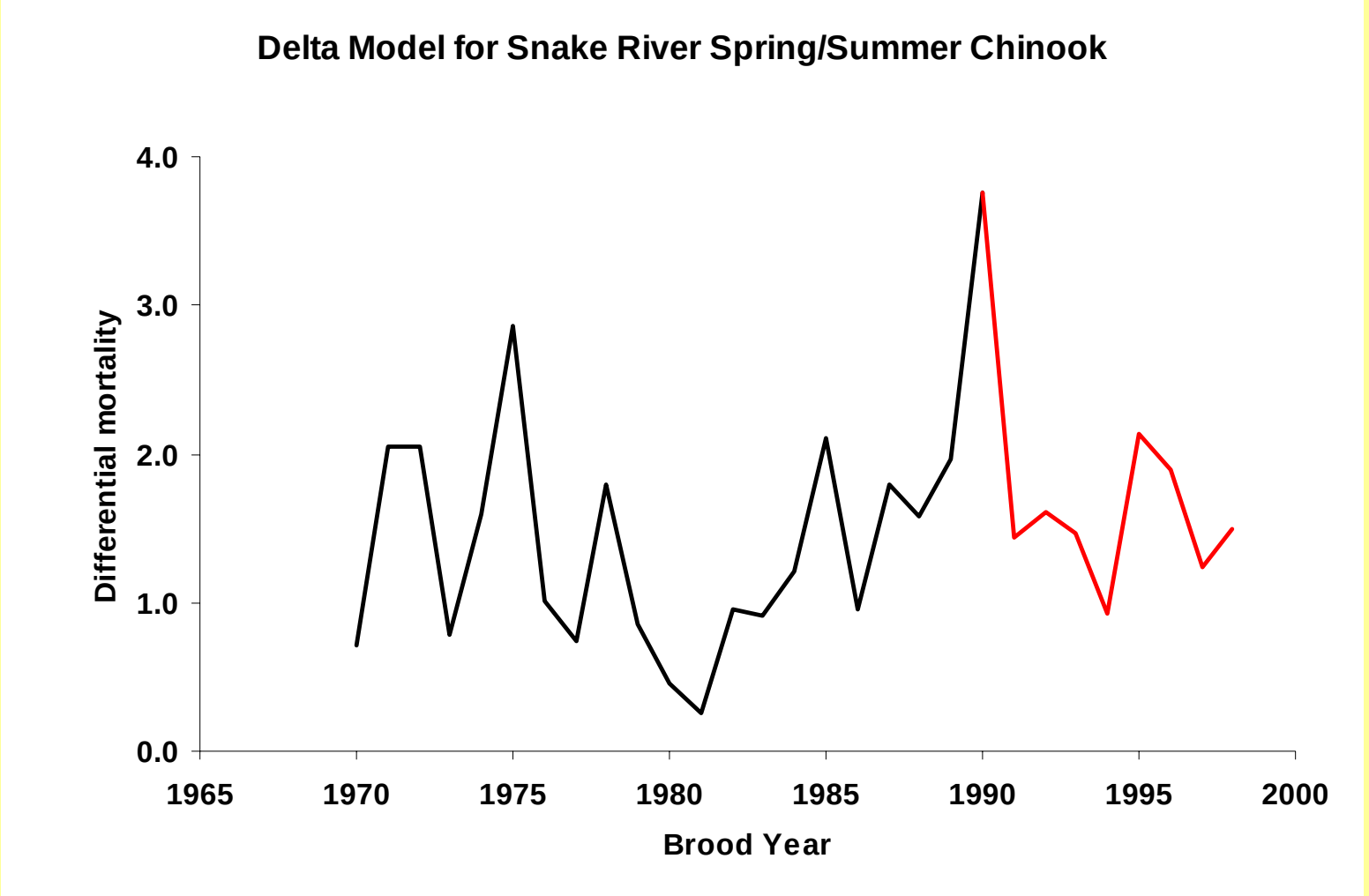
Q4: Ricker residuals from updated Schaller et al. (1999).
Annual survival rates covary among regions;
and greater mortality for Snake stocks since FCRPS development.



Q4: Delta model estimates of common year effect, δ, 1957-1998 brood years (Deriso et al. 2001; CSS workshop – Marmorek et al. 2004)



Q4: Delta model estimates of incremental mortality, μ, between Snake River & John Day River, 1970-1998 brood years (Deriso et al. 2001; CSS workshop – Marmorek et al. 2004).



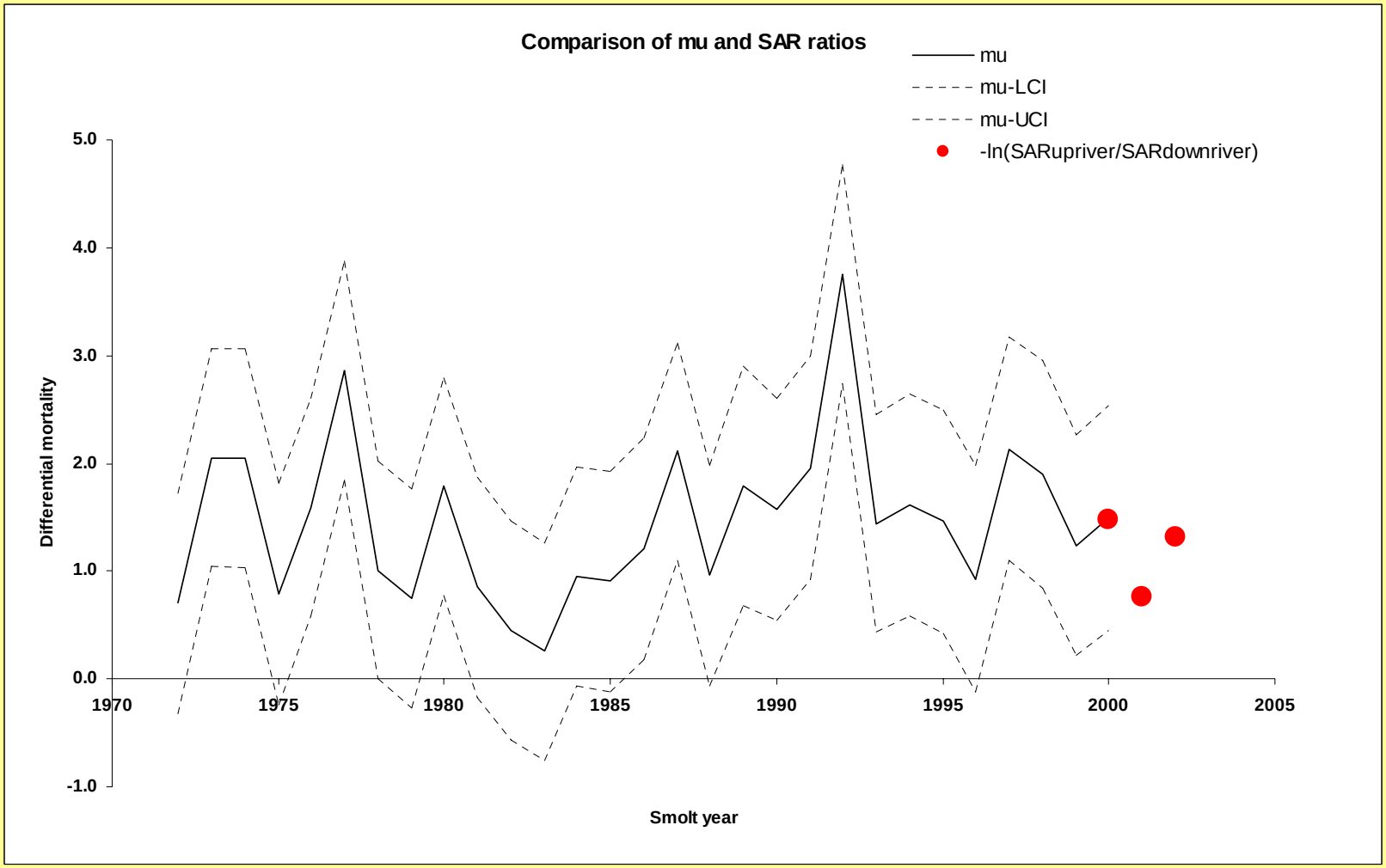
Q 4: incremental mortality, continued.

- **Formalizing management question into a quantitative evaluation approach:**
- H_0: $-\ln(SAR_{upriver}/SAR_{downriver})$ not equal μ
- H_a: $-\ln(SAR_{upriver}/SAR_{downriver}) = \mu$

- **Plausible range of values for SAR ratio, defined from R/S estimate of incremental mortality, μ. $\mu = 1.47$, 1975–1998 brood years, so SAR ratio plausibly would be expected to be ~23% ($e^{-\mu}$)**
  - R/S estimates of μ updated through brood year 1998 (smolt year 2000)
  - SAR estimates for both Snake & John Day for smolt years 2000-2002

- **Uncertainty:**
  - Delta model confidence limits on μ;
  - CSS bootstrap program for estimating CI for SAR ratios (in progress)

Q4: Delta model estimates of incremental mortality, μ, between Snake River & John Day River, 1972- 2000 smolt years and $-ln(SAR_{upriver}/SAR_{downriver})$, 2000-2002 smolt years



Q4: Incremental mortality, alternative designs (sp/su chinook)

- High
  - *Elements from medium level, plus more representative wild stock composition for R/S and SAR, both regions (e.g., Warm Springs, Yakima) plus upper Columbia (e.g., Wenatchee, Methow)*
- Med
  - *R/S estimates for μ, plus SARs from PIT tag studies for Snake and John Day wild stocks, plus hatchery stocks. (current CSS and R/S data)*
- Low
  - *R/S estimates for μ, wild index stocks from Snake River and downriver regions. No program for SARs.*