Fraser Sockeye Planning WS 2014

A Brief History
Of
Fraser Sockeye Harvest Planning

Presented to: Fraser Sockeye Planning Workshop
Meeting Details: 17 Mar 2014, Richmond Executive Inn
Presented by: Gottfried Pestal

Outline

Introduction
- FRSSI
- Long-term Strategy vs. Annual adaptations

TAM Rules
- Basic Shape
- Comparison to other types of strategies

Choosing TAM Rules
- Collaborative Process
- Considerations
- FRSSI Model overview and general observations
- Key results re: changing cap on TAM rule

Brief Recap of Implementation 2006-2013
- Rationale for Annual adaptations
- Outcomes (harvest & prod & en-route mort)

INTRODUCTION

Fraser River Sockeye Spn Initiative

A process….

- Multi-year collaborative process
- Goal: long-term strategy for setting SPN targets
- Start: 2003 (after 2002 ministerial review)
- Evolved into a WSP Pilot (2006 workshop series)
- Full implementation since then

=> *Summary report from 2008*

… and a model

- Test long-term perf. of different strategies
- Test effect of different biological assumptions
- Force explicit discussion of assumptions

=> *2 CSAS reviews => 2 technical reports*

Long-term vs. Annual

Long-term

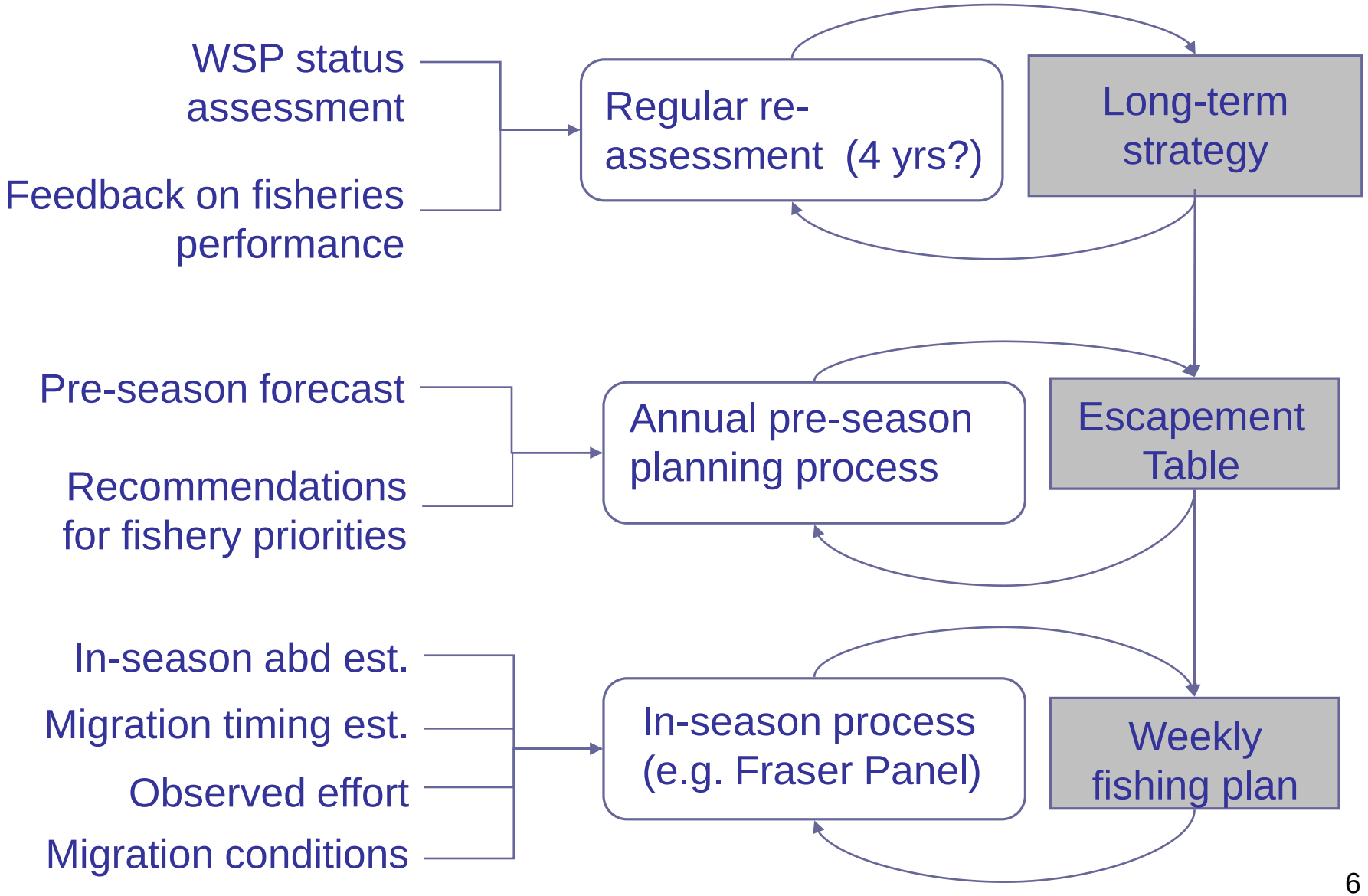
- Ultimate goal: stable long-term strategy
- Basic shape of TAM has been same since 2006
- Evaluation process uses same criteria since 2006
- Learning each year how to better present this info (e.g. spawner expectations tables)

Annual adaptations

- Small change in strategy = small change in long-term performance but can make big difference in 1 particular year (given run size forecast and environmental expectations)
- Adapt to new information (run timing, SR fits)

=> *Detailed chronology later in this deck*

Long-term vs. Annual



TAM RULES

Basic Shape of TAM Rules

Guiding Principles

- 4 management groups
- specify **Total Allowable Mortality** (TAM)
- TAM changes with run size
- Balance between stabilizing aggregate harvest and protecting component stocks

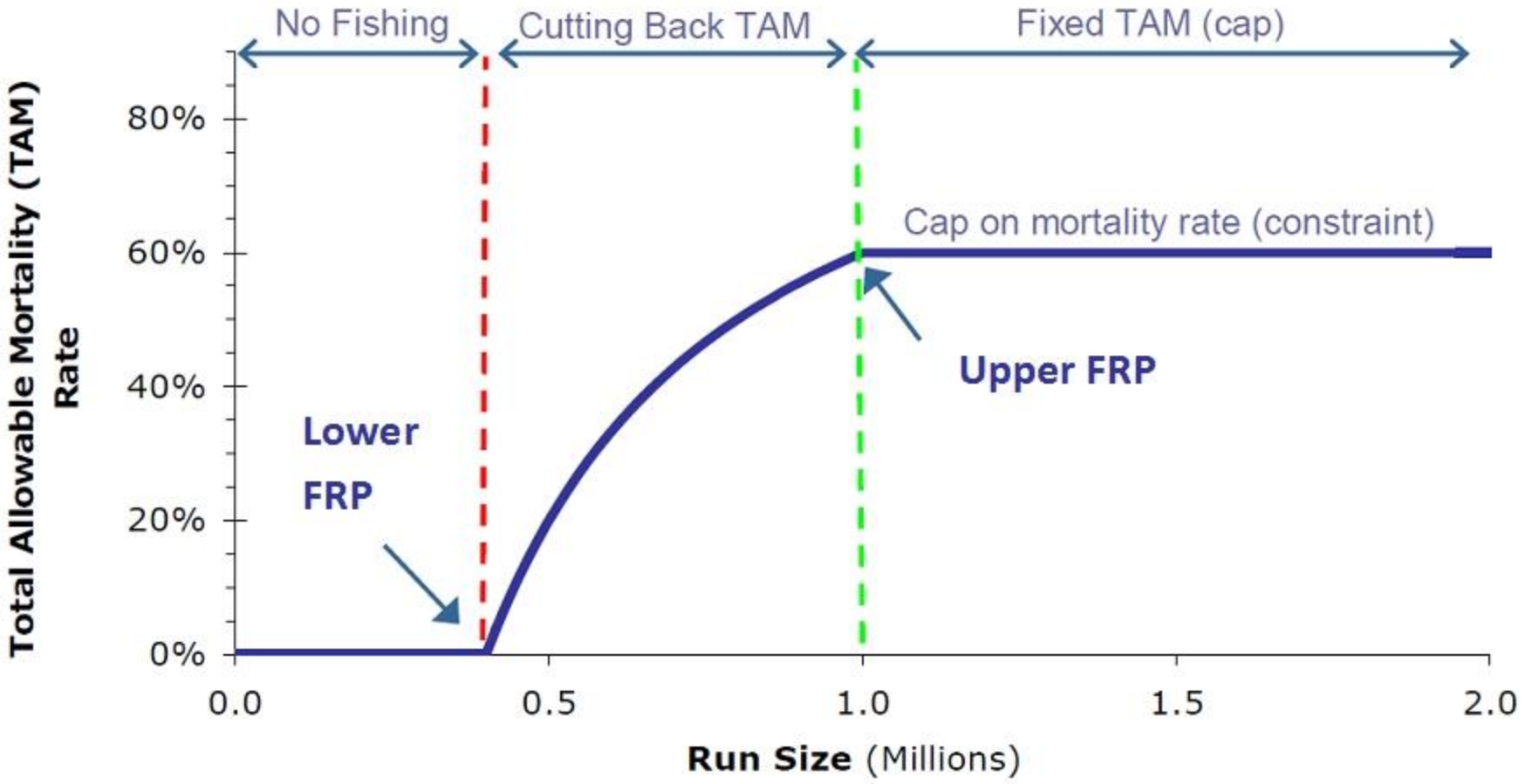
3 Zones

- Mostly no directed harvest at very low run size (some terminal tributary fisheries)
- Fixed spawner target at low run size (gradual increase in TAM)
- Fixed TAM at large run (incr. spawner target)

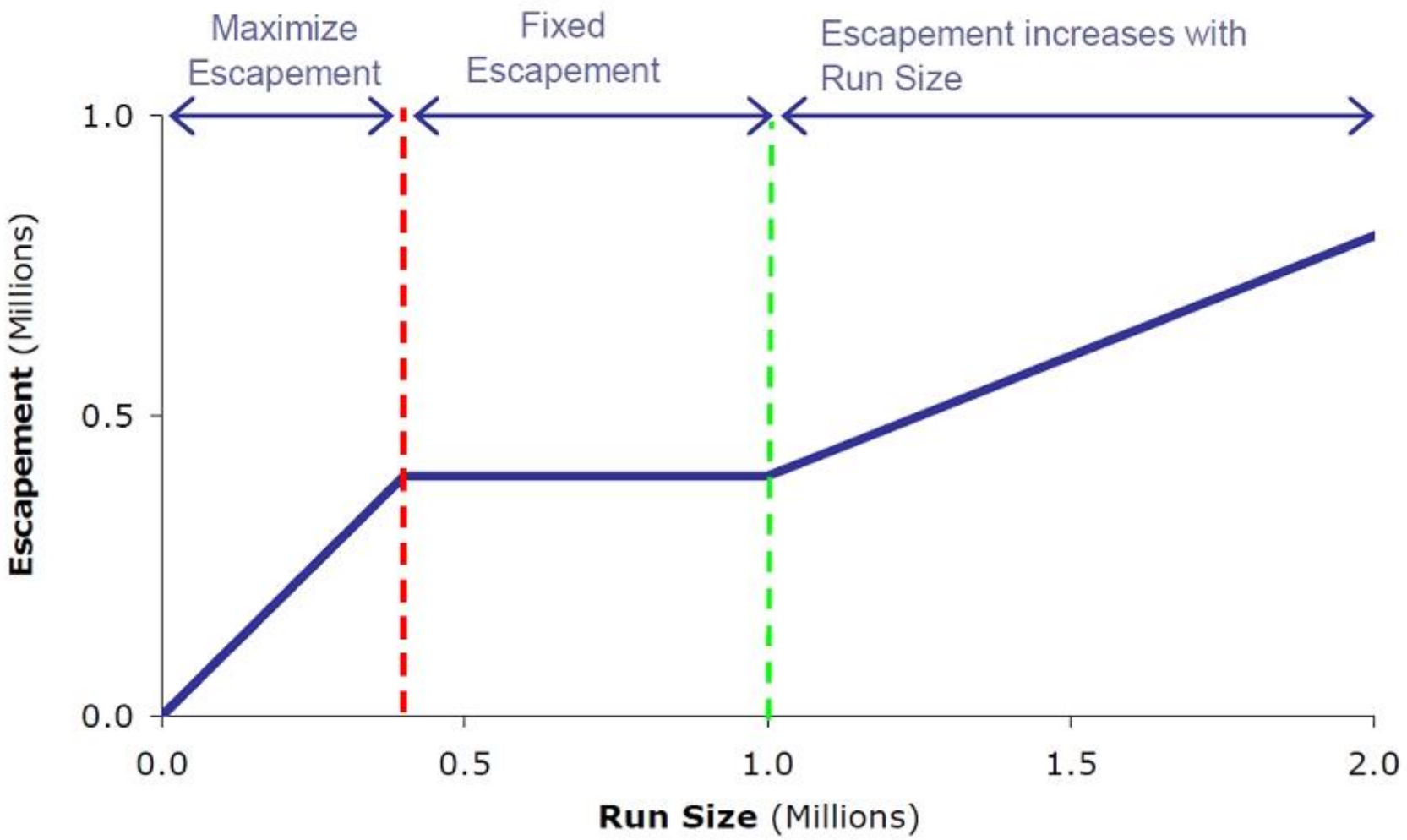
Plus:

- Low Abd ER for test fisheries, FSC, and incidental retention

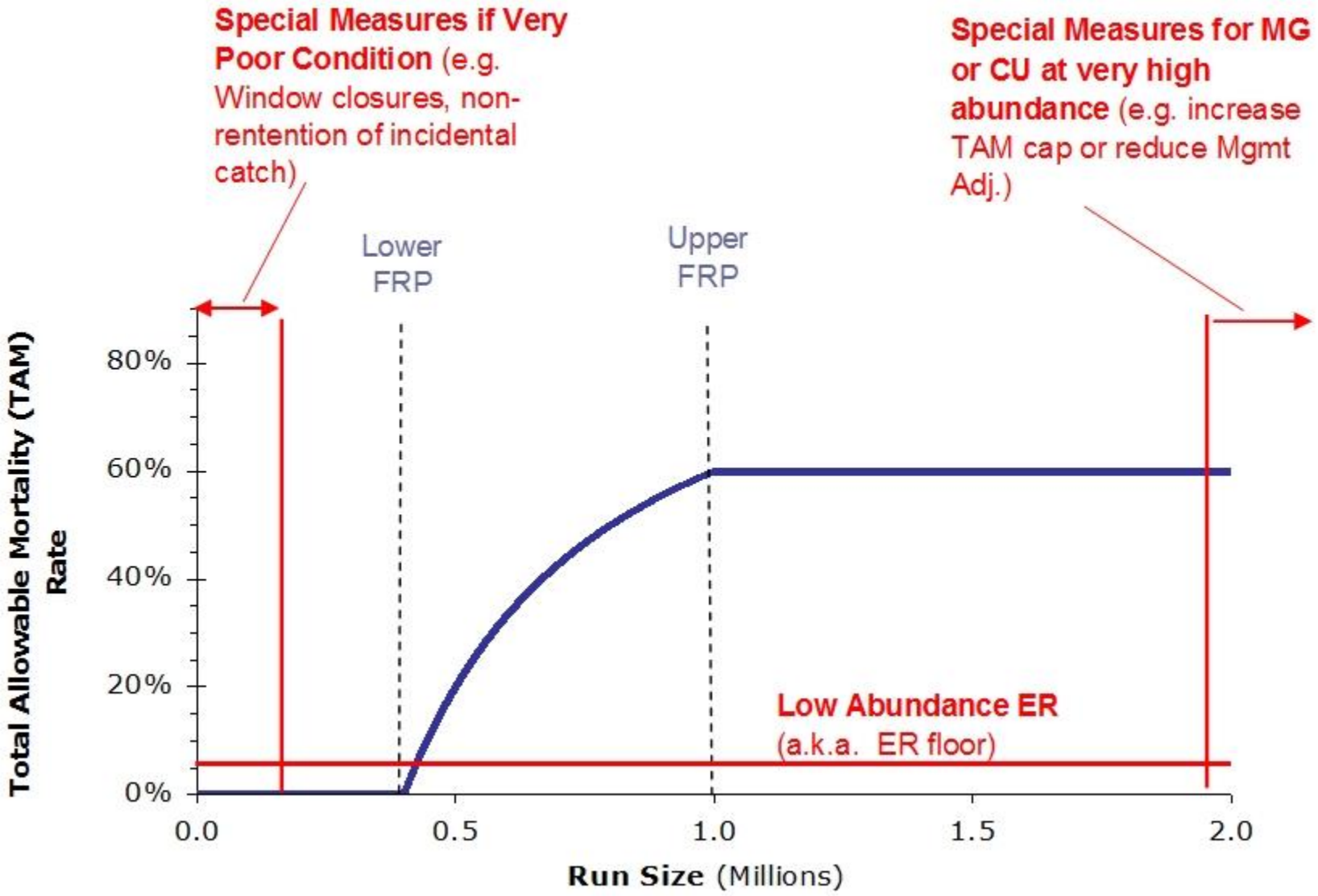
TAM Rule - Plot 1



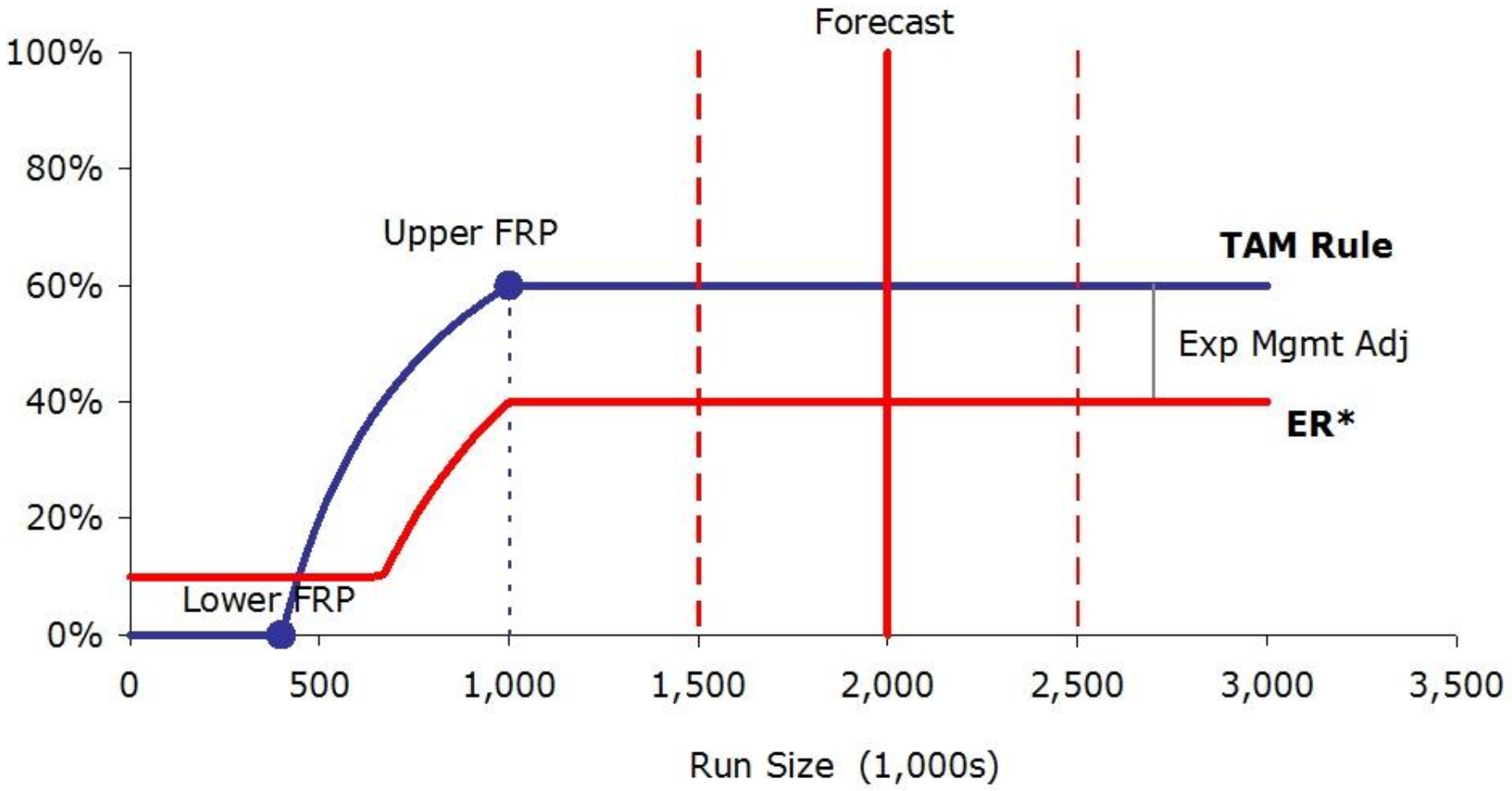
TAM Rule - Plot 2



TAM Rule - Plot 3



TAM Rule - Plot 4



Comparison To Other Strategies

Fixed Spawner Strategy

- Clear goal, easy to communicate
- Robust (?) – run size and prod, but need capacity
- Large uncertainty in estimating optimal SPN
- Do not probe larger SPN levels
- Large ER at larger runs
- High variability in harvest

Fixed Exploitation Rate Strategy

- Clear goal, easy to communicate
- Robust (?)- run size and capacity, but need prod!
- High variability in spawner abundance
- Need to set at compromise across stock prod.

Comparison To Other Strategies

TAM Rule

- Like fixed spawner strategy at low abundance, and like fixed ER at larger abundances, plus added step of adjusting for en-route mortality
- Perception of complexity, because SPN target changes with abundance
- Probe capacity of the system when run is large
- Robust to uncertainty in productivity and capacity
- "Trying for best of both worlds, but get a compromise"

=> For more details, check Table 1 in "Brief History" document

CHOOSING TAM RULES

Collaborative Process

- Use long-term simulations to narrow down the suite of options (FRSSI Workshops 2006-2009)
- Choose a few options for pre-season planning (DFO WG)
- Collaborative process to choose a specific annual TAM rule for each management group (IFMP, workshops, established consultation processes)

Considerations Shaping Choice

- Choose based on simulated performance and feedback from public consultation
- Evaluate performance relative to biological and socio-economic indicators
- Biological: Prob (Low Spawners) by stock
- Socio-Econ: Prob(Low Catch) by mgmt group

- Many variations of indicators
- Many alternative assumptions
- Many different strategy options

=> *Lots of information to digest*

FRSSI Model

Structure

- 18 (19) stocks with Spawner-Recruit Models
- Simulate harvest, en-route mortality, and recruitment into future
- No harvest areas
- No in-season process details

Purpose

- Test long-term performance of different strategies
- Test alternative biological assumptions

General Observations

- No single indicator is informative across all stocks and scenarios
- Complex interactions (mgmt group <-> stocks)
- Population assumptions and stock mix have more effect than variations of harvest strategy (except for extremes)
- Lower prod => higher prob(Low Spawners)
- Gradual changes in strategy = gradual change in performance
- Big effect: Run-timing overlap, en-route mortality
- Any strategy with high ER at low runs tends to create or perpetuate strong cycles

Sim of Diff TAM Caps (40-90%)

AVERAGE Productivity

- Prob(Low Spawners) showed little to no change up to about 70-80% for all of the 19 stocks under average productivity, with a steep increase for higher caps
- Prob(Low Catch) decreases steadily as TAM cap increases
- Median catch gradually increases as TAM increases, peaks at a TAM cap of 85-90%, and then drops sharply

Sim of Diff TAM Caps (40-90%)

HALF Productivity

- Same general pattern, but shifted to lower cap
- Most stocks show pronounced increase in Prob(Low Spawners) for caps larger than about 60-70%
- Prob(Low Catch) now shows u-shape for 3 of the 4 management groups, which is most pronounced for the Summer group with a clear minimum around a TAM cap of 70%-80%
- Median catch now shows a clear dome shape, most pronounced for the Summer group, peaking at a TAM cap of about 70-75%

RECAP OF IMPLEMENTATION

Annual Adaptations

Purpose

- Small change has little effect in long-term sims, but may have large effect in a specific year
- account for each year's particular constellation of aggregate forecast, stocks-specific forecasts, and expected en-route mortality.
- Updated information (e.g. Harrison, Raft, North Thompson

=> Details in Ch 4 of *Brief History* document

Outcomes - 1

- FRSSI process was initiated after a period of declining productivity
- Productivity continued to decline during the initial implementation phase of the FRSSI TAM rules, and hit the lowest point since the 1950s in the 2009 return year.
- 2010 started a reversal of the downward trend and Returns/Spawner in the last 4 years are back to levels more similar to long-term averages.
- Overall Fraser sockeye exploitation rates were reduced and an increasing proportion of the run was set aside for potential contribution to spawning (and therefore to future abundance).

Outcomes - 2

- additional fluctuations due to uncertain and highly variable en-route mortality.
- Spawner abundance and resulting returns would likely have been much lower for many of the Fraser River sockeye salmon stocks if historic exploitation rates had been maintained in the face of reduced productivity during the last 10-15 years.