Management Adjustments 101

Overview of Management Adjustments

Forum on Conservation and Harvest Planning

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Outline

- Key Definitions
- Purpose of Management Adjustments
- Management Adjustment Implementation
- Management Adjustment Model Development
  - Original MA models
  - Current MA models
- Summary

Key Definitions

Management Adjustment (MA)

- The addition of fish (MA) to the escapement goal for a run-timing group
- The addition of fish (MA) is added to the total number of fish that escape fisheries and pass the mission hydroacoustic site

Key Definitions

Difference Between Estimates (DBE)

- The numerical (number of fish) difference between lower river (Mission Estimate minus catch) and upriver estimates (spawning grounds)
- Note: The historical DBEs make up an important data set used to generate predictive MA models

Purpose of the MA

- Canada develops an escapement plan that includes setting escapement targets for each of the four sockeye management groups
- The annual escapement plan includes a MA component
- The MA increases the likelihood of achieving spawning escapement targets by compensating for likely discrepancies between in-season (lower river) and post-season (upriver) escapement estimates

MA Implementation

- Increases the likelihood of reaching spawning escapement goals
- Reduces the harvestable surplus amount for US fisheries, CDN commercial and rec fisheries as well as First Nation FSC and EO fisheries
- In some cases a MA can reduce the apparent harvestable surplus to 0

Run Size = 100K Early Summer sockeye

MA Implementation

Escapement Goal = 40K sockeye

MA = 20K sockeye

Escapement Plan = 60% Total Allowable Mortality
Harvestable Surplus ***before*** MA = 60K sockeye

Harvestable Surplus ***after*** MA = 40K sockeye

MA Model Development

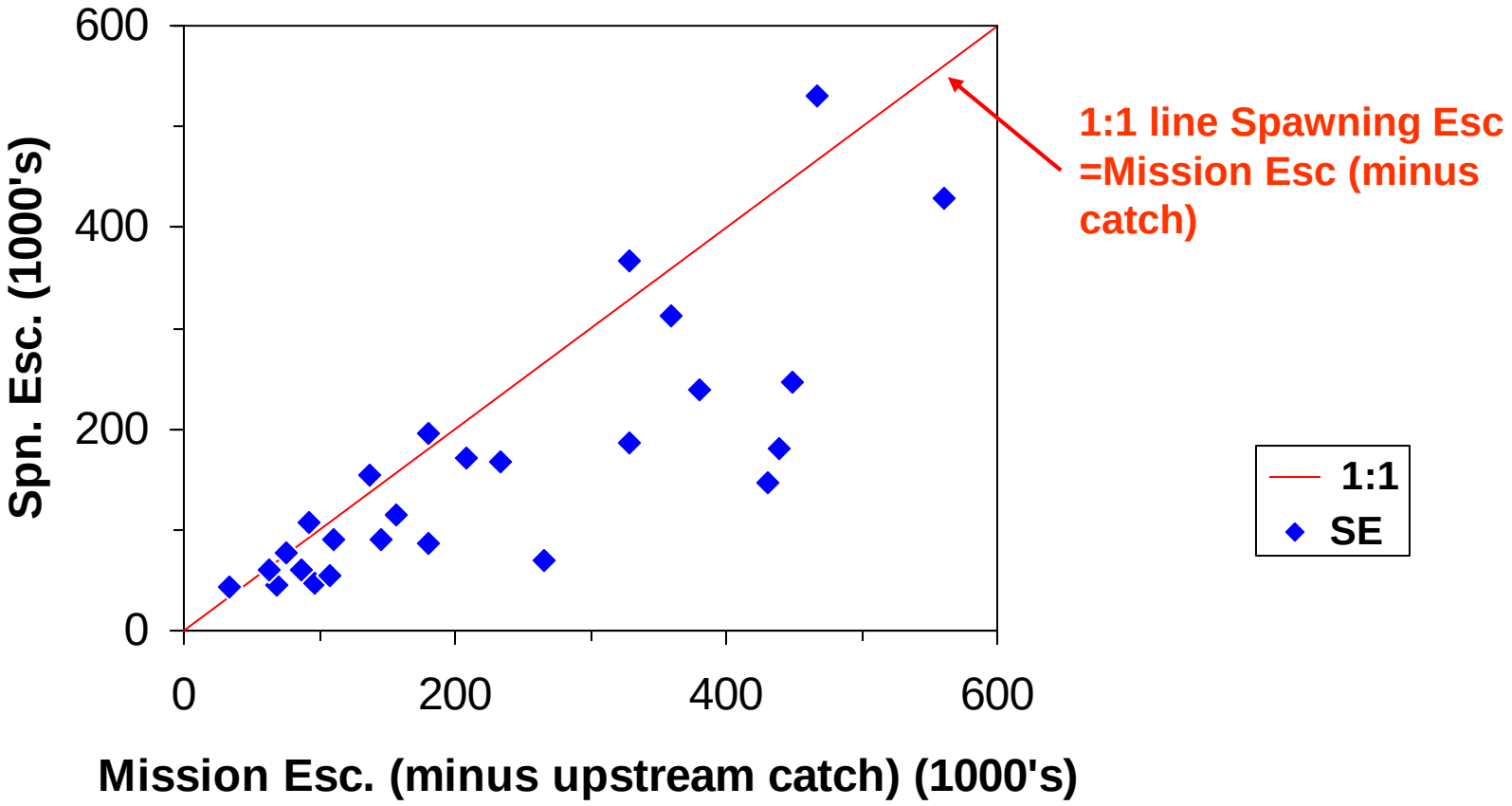
- **Original MA model description**
  - Early Summer example
- **Current MA model description**
  - 2013 Summer Run example
  - 2013 MAs and Escapement Targets

The Original MA Models

- For the Early Stuart and Early Summer runs the Mission escapement estimates (minus upstream catch) tended to be higher than the spawning ground estimates
- Likely a result of combined errors and biases in:
  - Mission escapement, spawning escapement, First Nations catch and recreational catch estimates, en route mortality and others…
  - Although en route mortality component was likely environmental conditions were **not incorporated** into the calculations
- Historical data used by DFO to develop predictive models
- 1st used in 1995

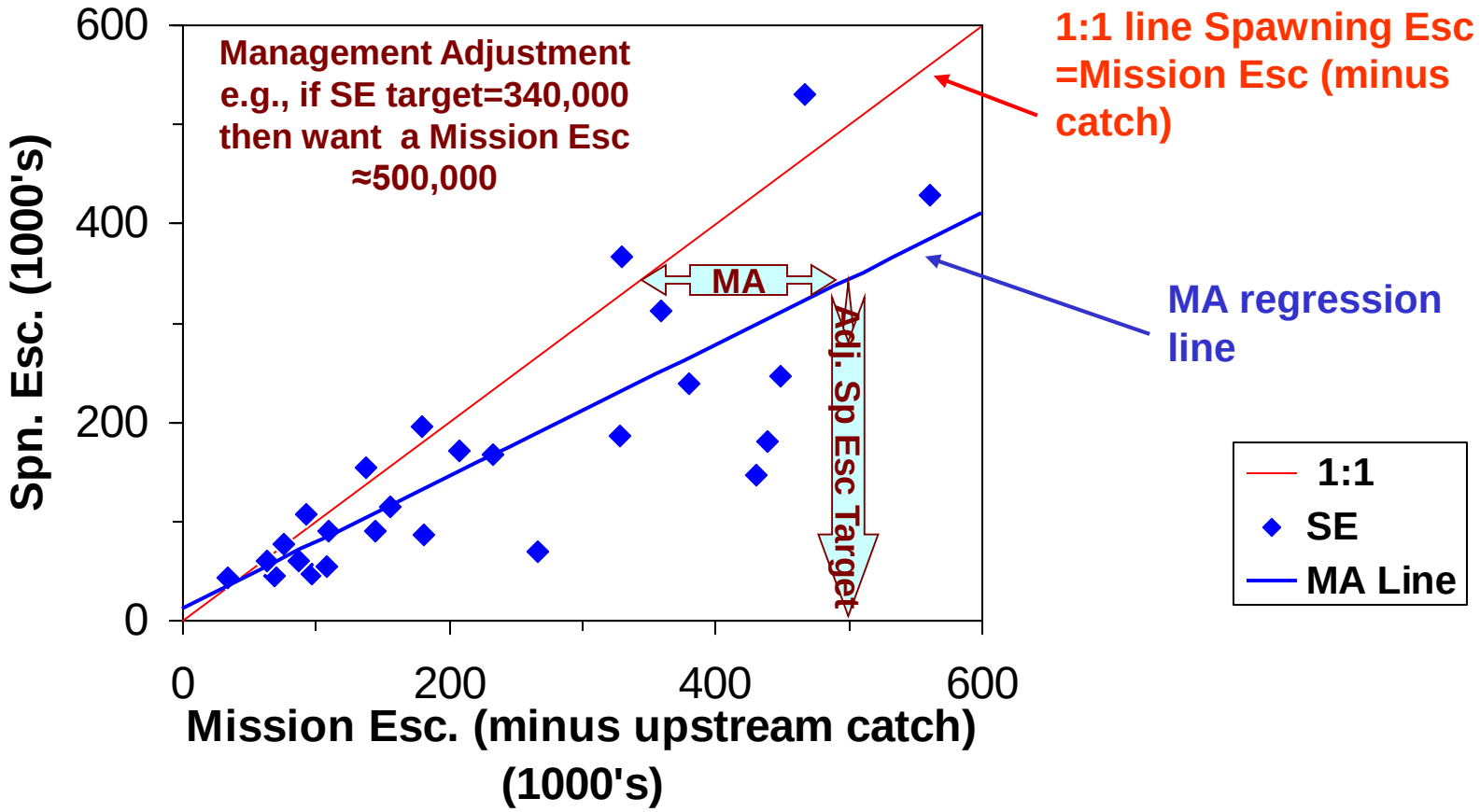
Early Summer

Differences Between Estimates



Early Summer

e.g. of “Original” Management Adjustment



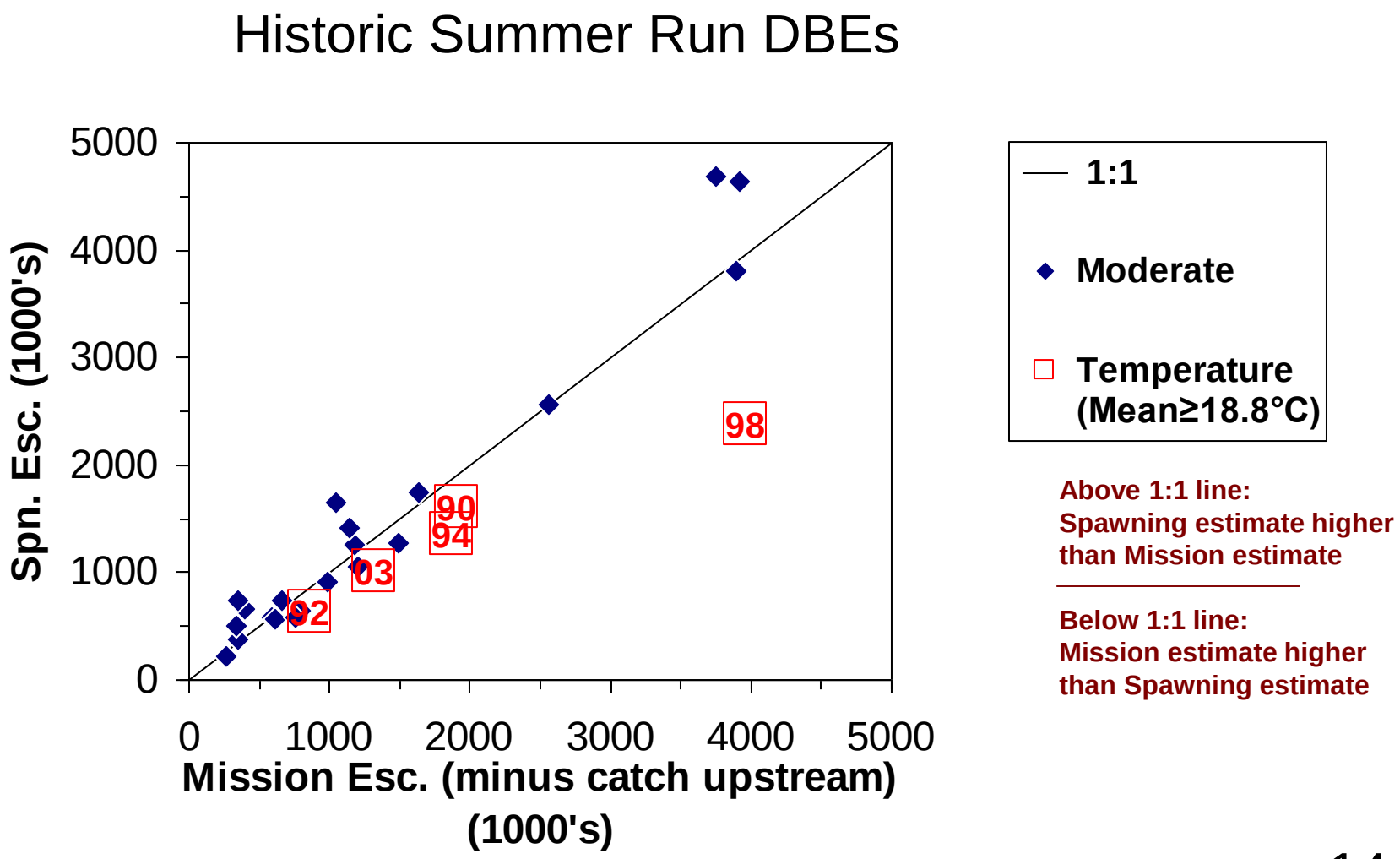
The Current MA Models

- In the mid 1990s, began to see increasing frequency and severity of en route mortality events
  - Could be associated with high river temperatures and flows during Early Stuart, Early Summer and Summer-run migrations
  - Reduced delay period in the Strait of Georgia, resulting in early in-river migration of Late-run sockeye
- Led to joint DFO-PSC development of MA models that included environmental conditions or timing

The Current MA Models

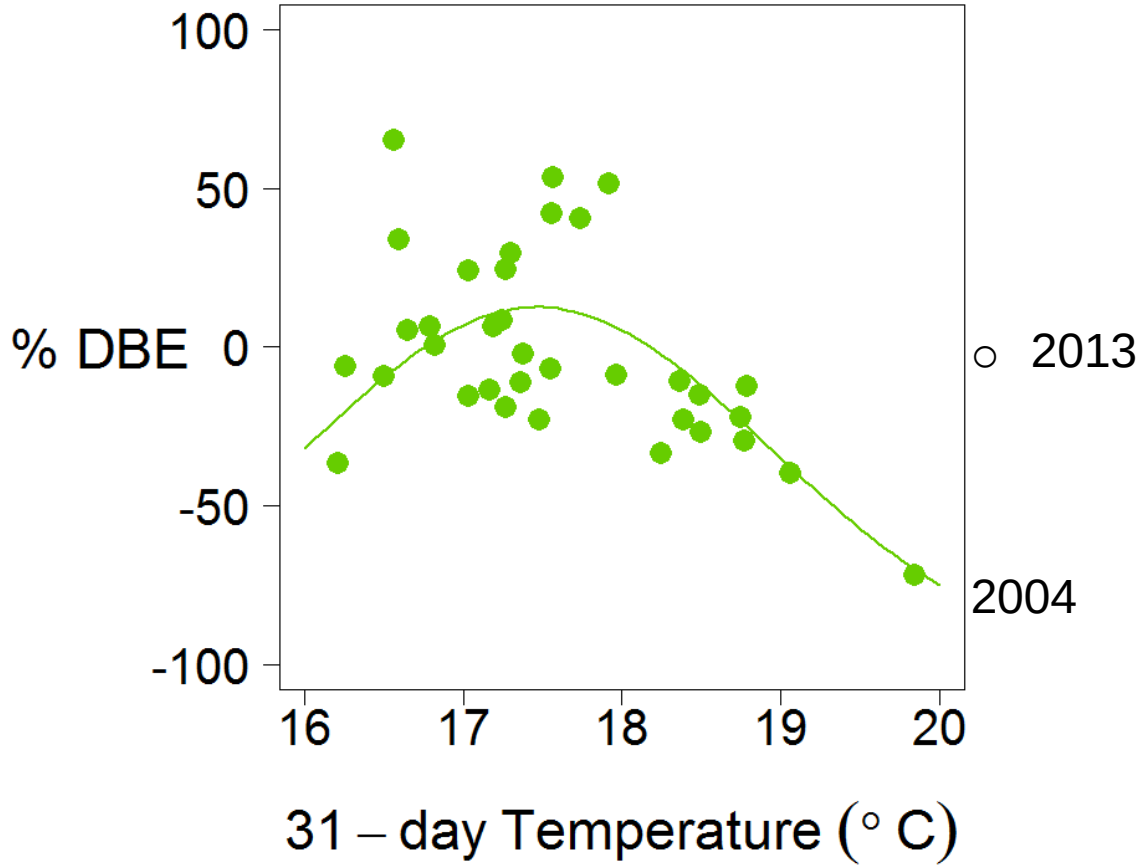
- Goal of the current models is to include an in-season management response to poor migration conditions and early Late-run migration
- 1st used in 1998 for Summer run, due to high river temperatures
- Initially, not enough data for quantitative models, so “expert judgement” used
- More years’ of data allowed models to be developed by 2001 and updated annually

The Current MA Models



The Current MA Models

Historic correlation of Summer (without Harrison) %DBE with temperature



The Current MA Models

- In 2013 the MAs used for Early Stuart, Early Summer and Late- run sockeye helped reach spawning escapement targets.

Timing group	Mission less catches upstream	Predicted Spn. Esc. based on 19-day MA model	Prelim. adult spawning ground estimate	Escapement Goal	DBE	%DBE
Early Stuart	171,000	74,000	86,000	108,000	-85,000	-50%
Early Summer	484,000	305,000	212,000	220,000	-272,000	-56%
Summer	2,042,000	709,000	1,902,000	1,254,000	-140,000	-7%
Late	561,000	300,000	288,000	313,000	-273,000	-49%

Summary

- Historically there are many years of data that show there are differences between estimates of sockeye in lower river assessments to observations on the spawning grounds
- The goal of MA is to compensate for these difference by passing more fish upstream to help reach spawning escapement goals
- The models used to predict MAs are developed using many years of data but are uncertain especially in years when environmental conditions are extreme
- There is likely more variables to consider than just temperature and discharge models when estimating MAs
- The use of MAs generally do not eliminate DBEs but do reduce them
- Further work to be ongoing to improve models or improve process for estimating MAs for in-season use

Model Improvement?

Relative to 2004 what was different? Why the high survival for the Summer Run in 2013?

- Higher flows than 2004? Less silt than 2004?
- Cooler tributary temperatures providing refuges?
- “Super” fish (genetic or developmental effects)?
- Reduced prevalence of pathogens (stressed fish couldn’t get sick)?
- Reduced in-river effort resulting in low fishery-induced mortality?
- Better condition on arrival from marine areas?
- Other?

MA Models and Process

- DBE model (no environmental conditions)
- Temperature only model
- Discharge only model
- Timing based model
- Median or mean observations
- Weighted mean of median observations and model results
- Expert opinion
- Upstream in-season observations