Run Reconstruction and Interim Escapement Goal Recommendation for Kenai River Late-Run Chinook Salmon

A Presentation to the Alaska Board of Fisheries
Statewide Finfish Meeting
March 19, 2013

Robert A. Clark
Division of Sport Fish

RC 3
Tab 3

Objectives of Presentation

- Describe changes in stock assessment
- Describe run reconstruction
- Describe stock-recruitment analysis
- Discuss interim escapement goal recommendation

Changes in Stock Assessment

- Challenges of counting Chinook salmon at RM 9
  - Using Target Strength (TS) to determine size
  - Accounting for tidal influence
  - Accounting for distribution of Chinook
- External review of assessment identified remedies

Changes in Stock Assessment

- Remedies for challenges at RM 9
  - Stop using Target Strength to determine size
  - Start using imaging sonar (DIDSON) to determine size
  - Develop and use independent indices of Chinook counts
  - Move upstream out of tidal influence
  - Ensonify entire width of river

Changes in Stock Assessment

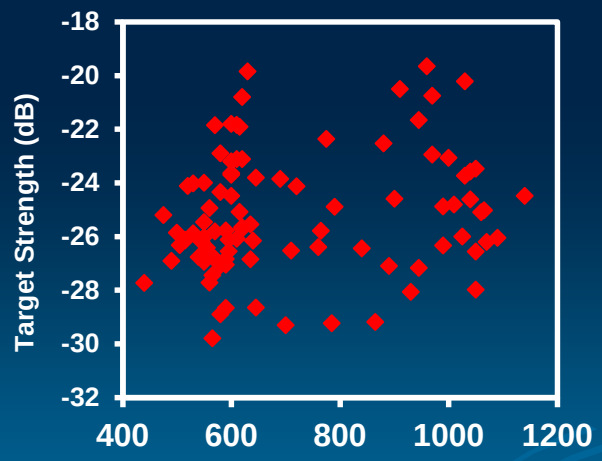
- Remedies for challenges at RM 9 through 2012
  - Stop using Target Strength to determine size
  - Start using imaging sonar (DIDSON) to determine size
  - Develop and use independent indices of Chinook counts
  - Move upstream out of tidal influence
  - Ensonify entire width of river

← 2013

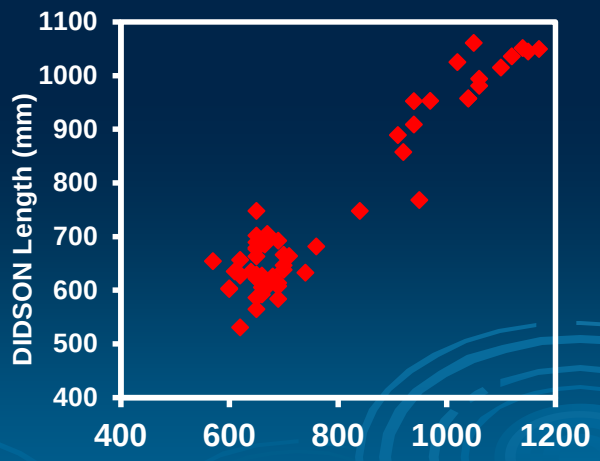
Changes in Stock Assessment

- What do we do with our old TS-based assessments?
  - Cannot simply convert TS-based to DIDSON-based counts

Target Strength
(R^2 = 0.25)



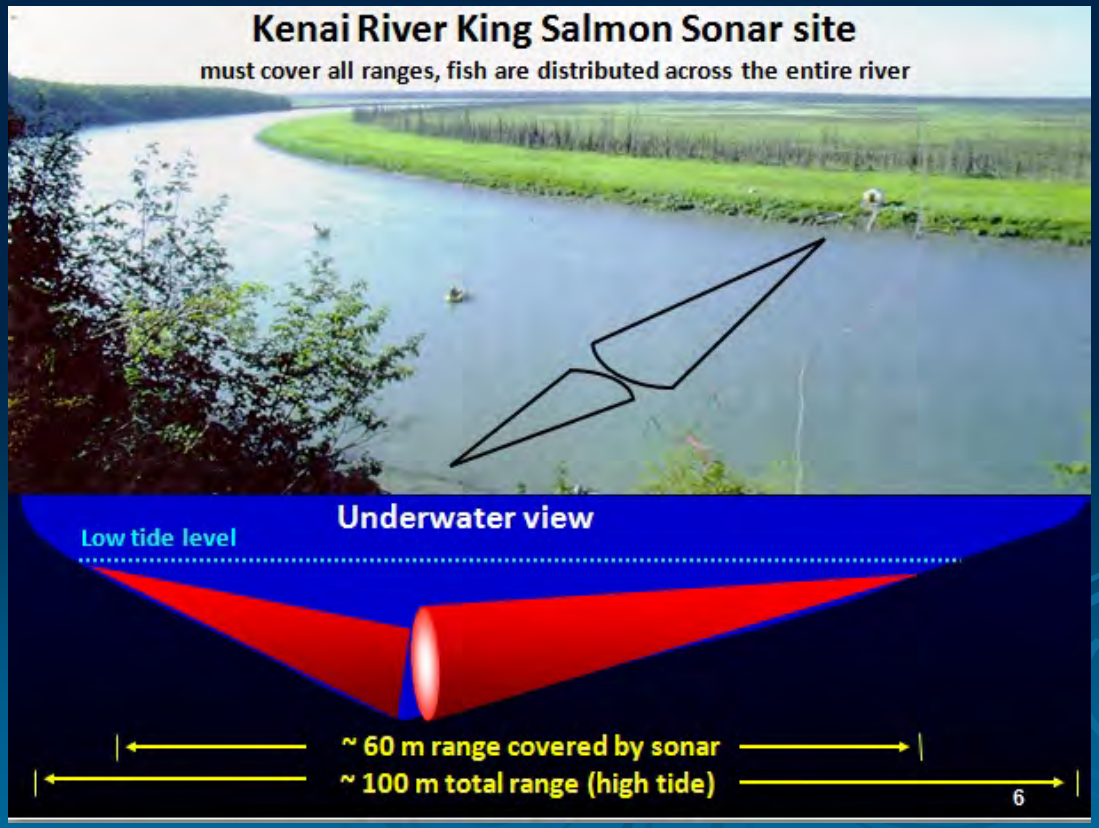
DIDSON length
(R^2 = 0.91)



Fish length in mm

Changes in Stock Assessment

- What do we do with our old TS-based assessments?
  - Also need to account for area not ensonified at RM 9

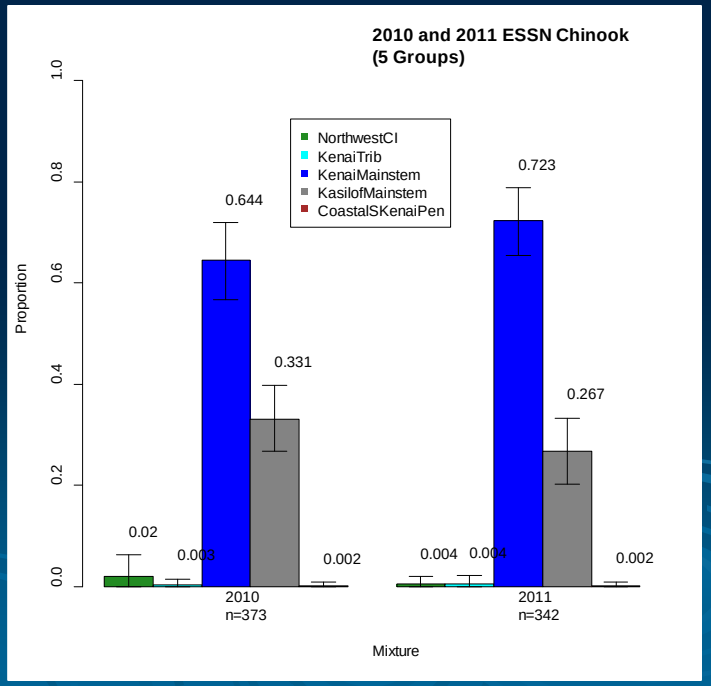


Run Reconstruction

- Total Run = Harvest Below Sonar + Inriver Run
  - Harvest Below Sonar = Catches from Sport, Commercial, Educational, and Personal Use
  - Inriver Run = DIDSON Sonar Count × correction for area not ensonified
- Escapement = Inriver Run – Harvest Above Sonar
  - Harvest Above Sonar = Sport and Federal Subsistence
- Reconstruct Run from 1986-2012

Run Reconstruction

- Commercial Catch
  - Genetic tissue sampling of Eastside Setnet fishery (2010-11)
  - Proportion late-run Kenai fish in catch was:
    - 0.647 in 2010
    - 0.727 in 2011
    - Average of 0.687 applied to 1986-2009 and 2012 catches

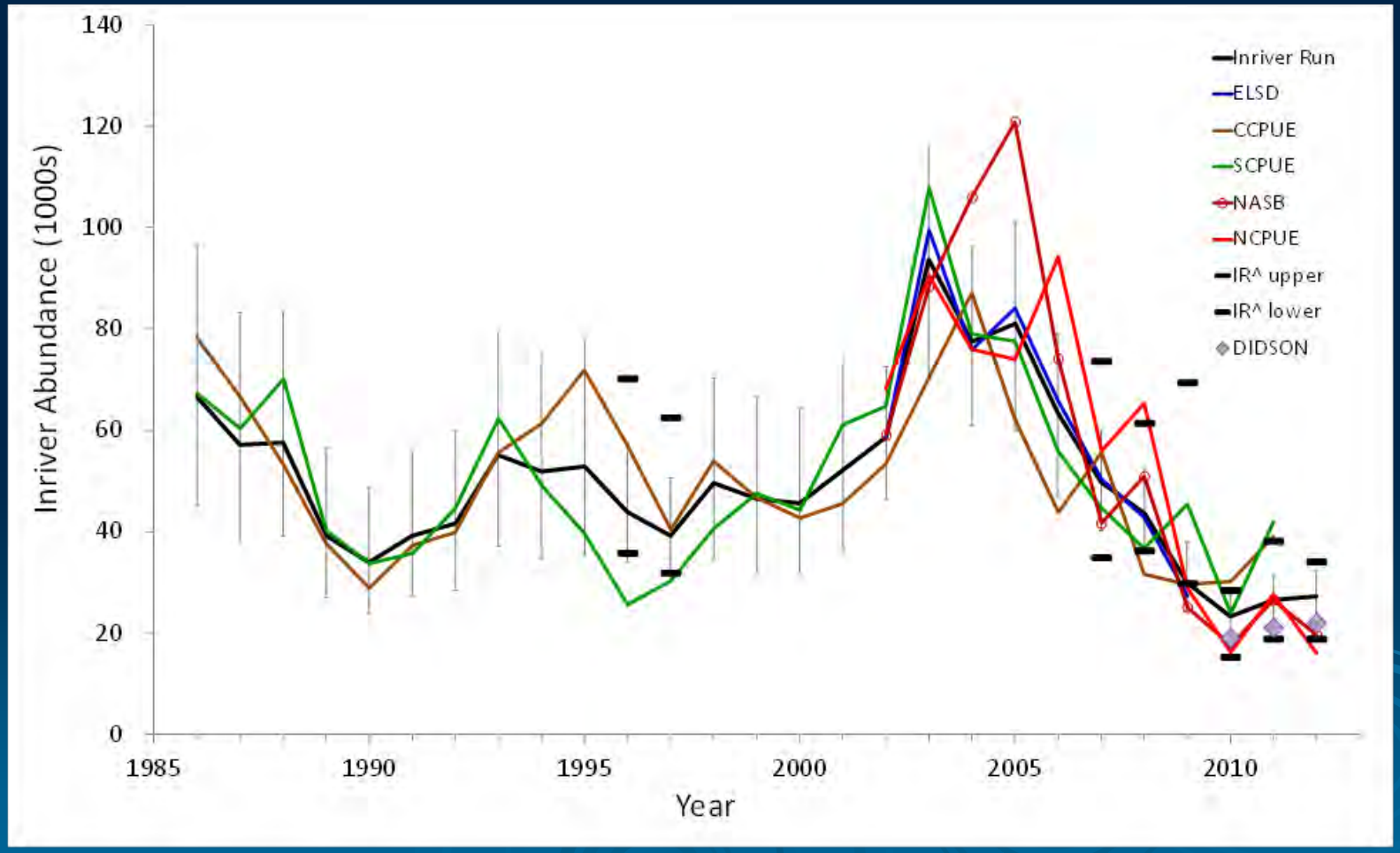


Run Reconstruction

- DIDSON Sonar Count
  - Use indices of run strength at sonar site to estimate DIDSON equivalents
    - Inriver Netting CPUE and sonar-based indices (2002-2012)
    - DIDSON estimates (2010-2012)
- Correction for area not ensonified
  - Use indices and independent estimates of Inriver Run and Total Run to estimate correction
    - Sport and Eastside Setnet CPUEs (1986-2011)
    - Telemetry-based survival estimation (1996 and 1997)
    - Genetic-based mark-recapture (2007-2011)

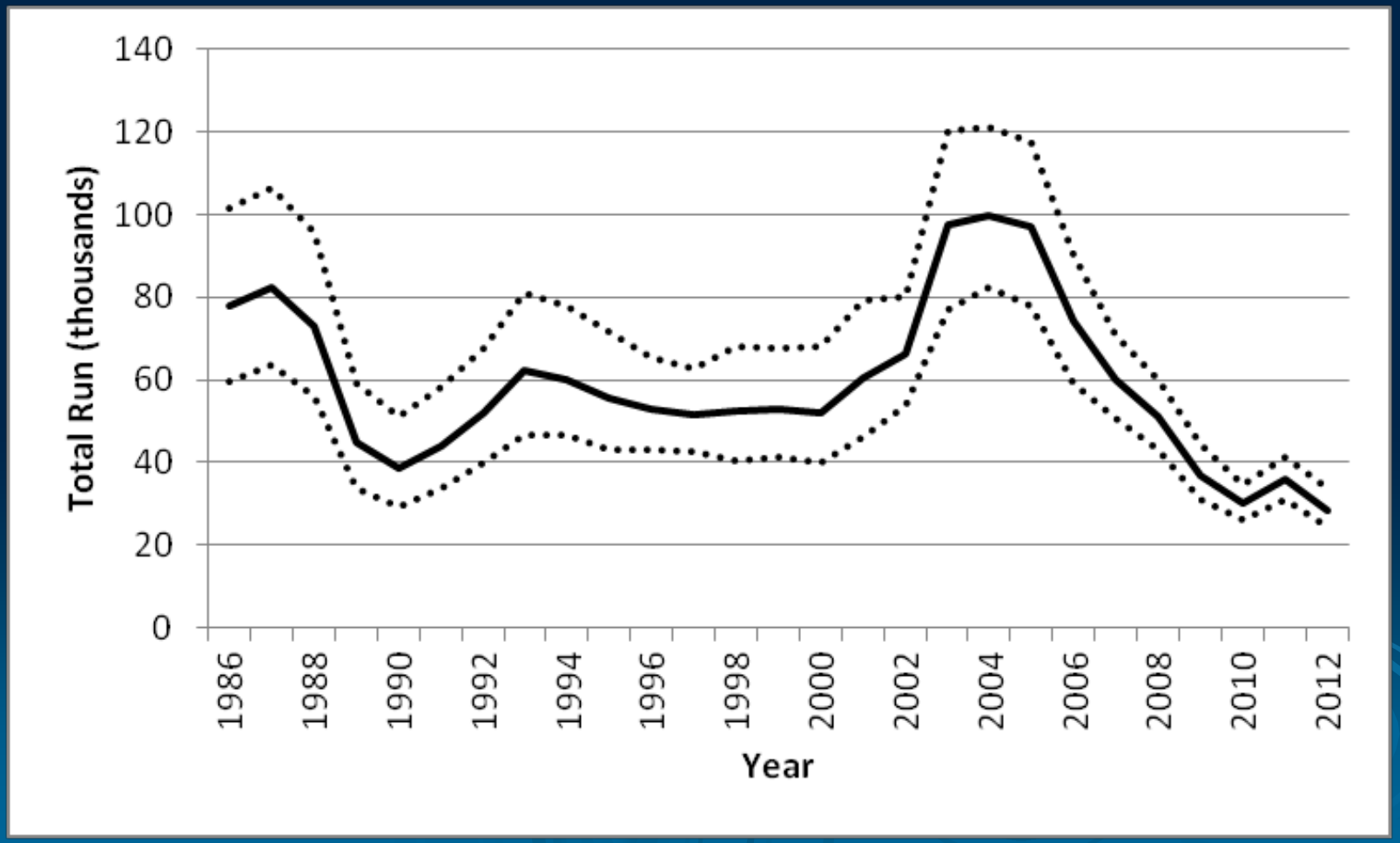
Run Reconstruction

- State-space model results for Inriver Run:



Run Reconstruction

- State-space model results for Total Run:

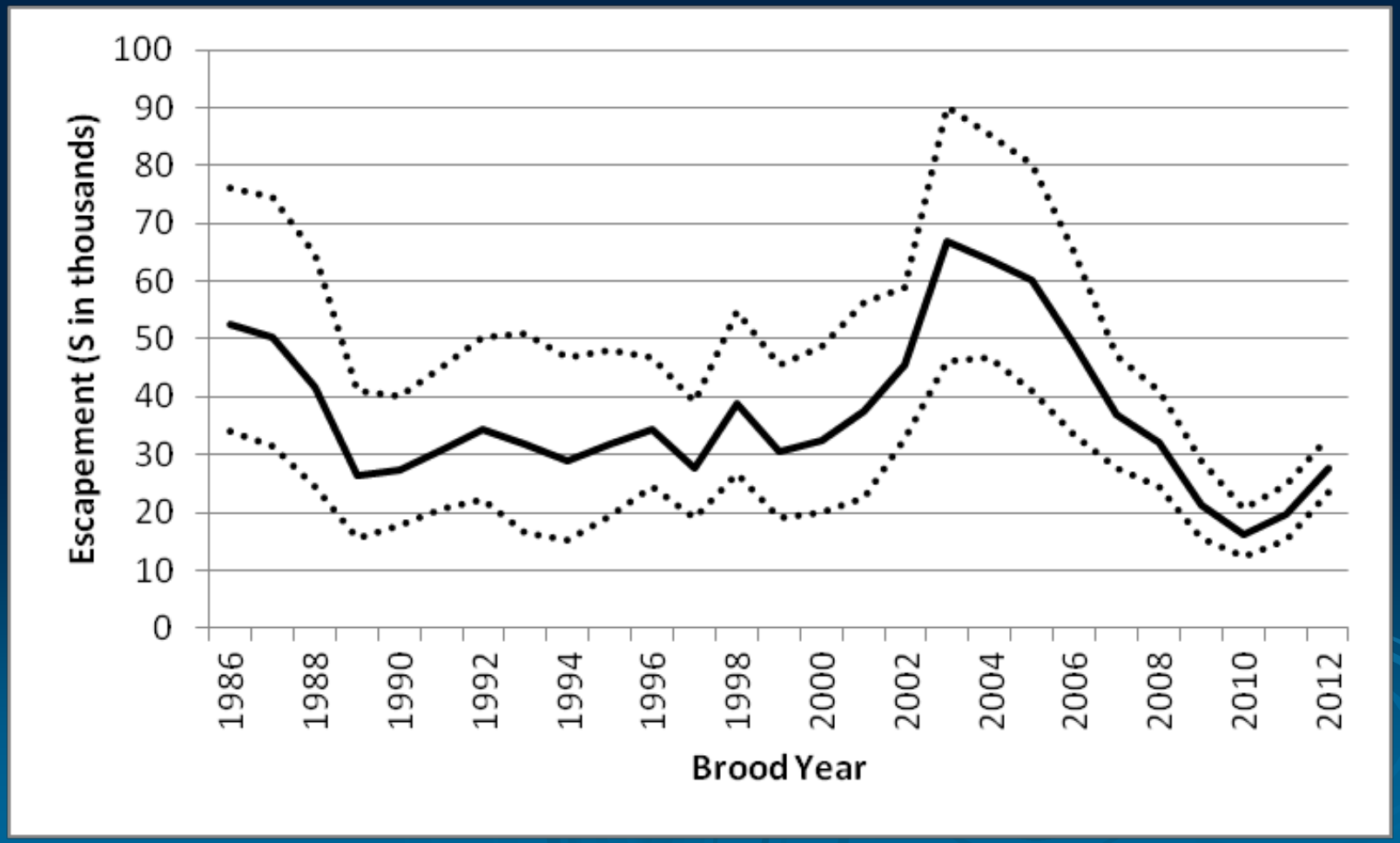


Stock-Recruitment Analysis

- Uses Reconstructed Total Run and Escapements
- Age Composition of Total Run to calculate Return
- Analysis Integrated into Run Reconstruction
  - All uncertainties of run reconstruction and age composition estimation flow into stock-recruit analysis
- State-Space Ricker Stock-Recruitment model
  - Incorporates uncertainty of inputs into model
  - Reduces bias due to time series effects and non-independence

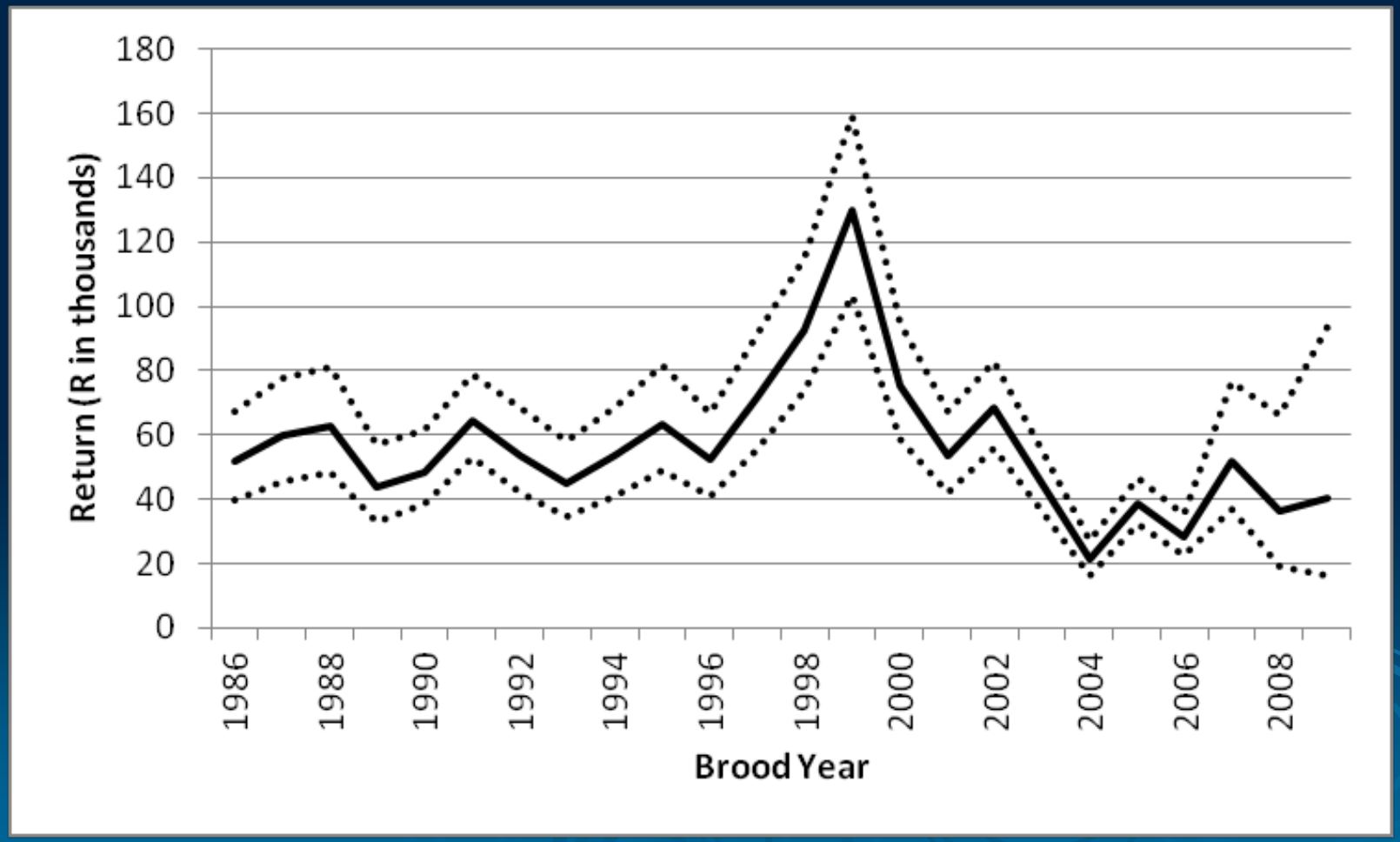
Stock-Recruitment Analysis

- Estimated Escapements



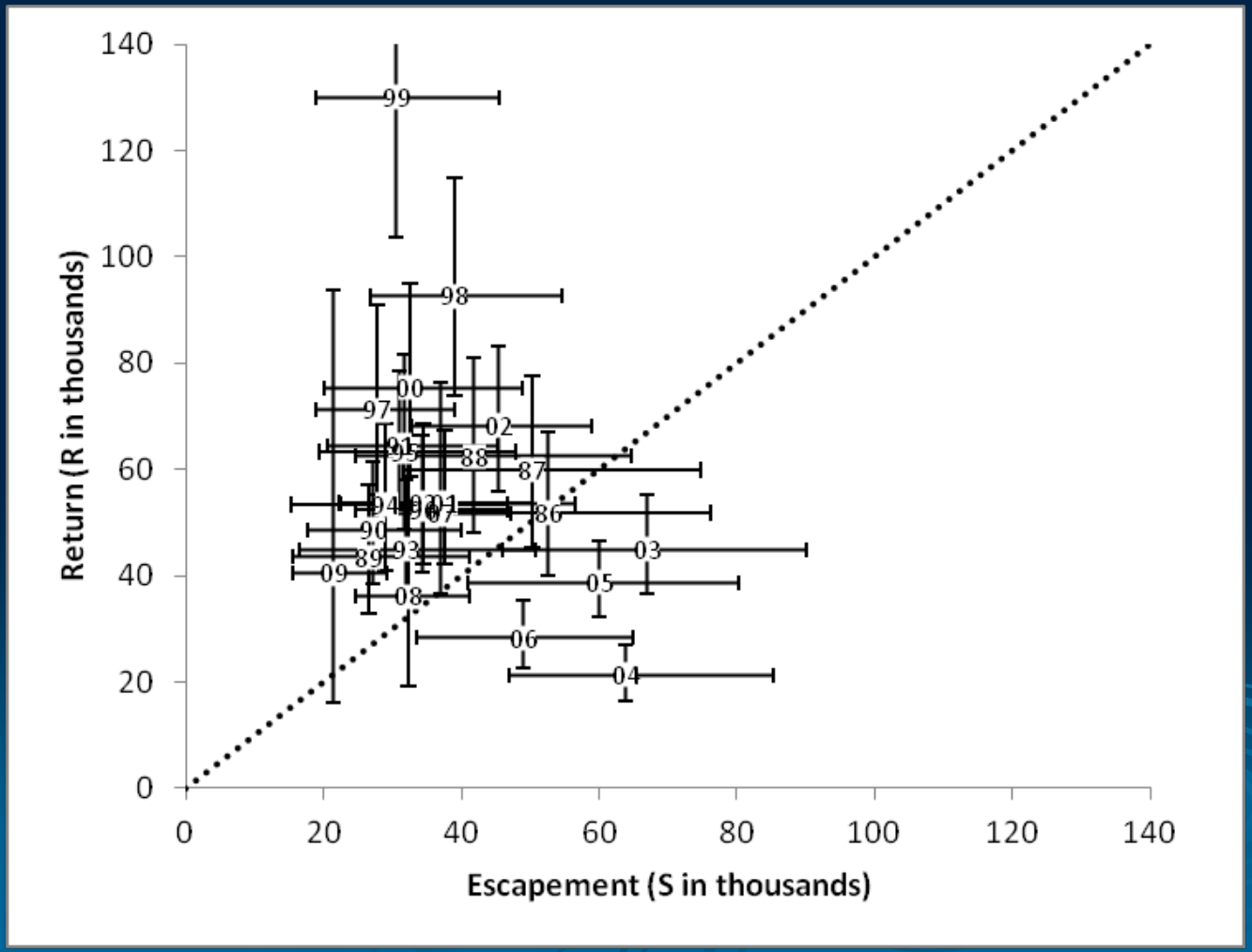
Stock-Recruitment Analysis

- Estimated Returns



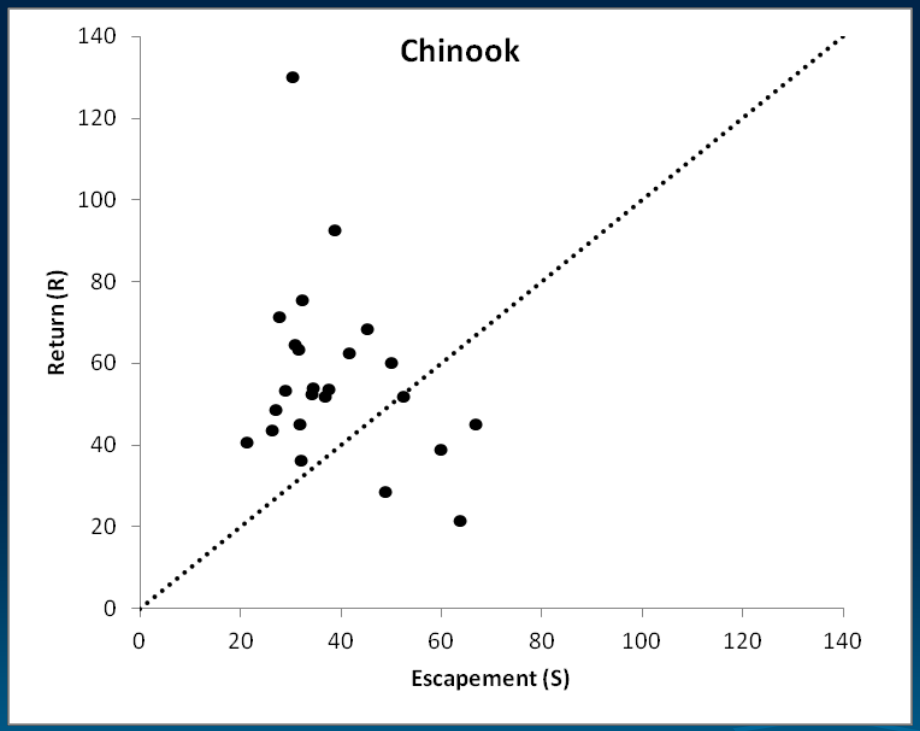
Stock-Recruitment Analysis

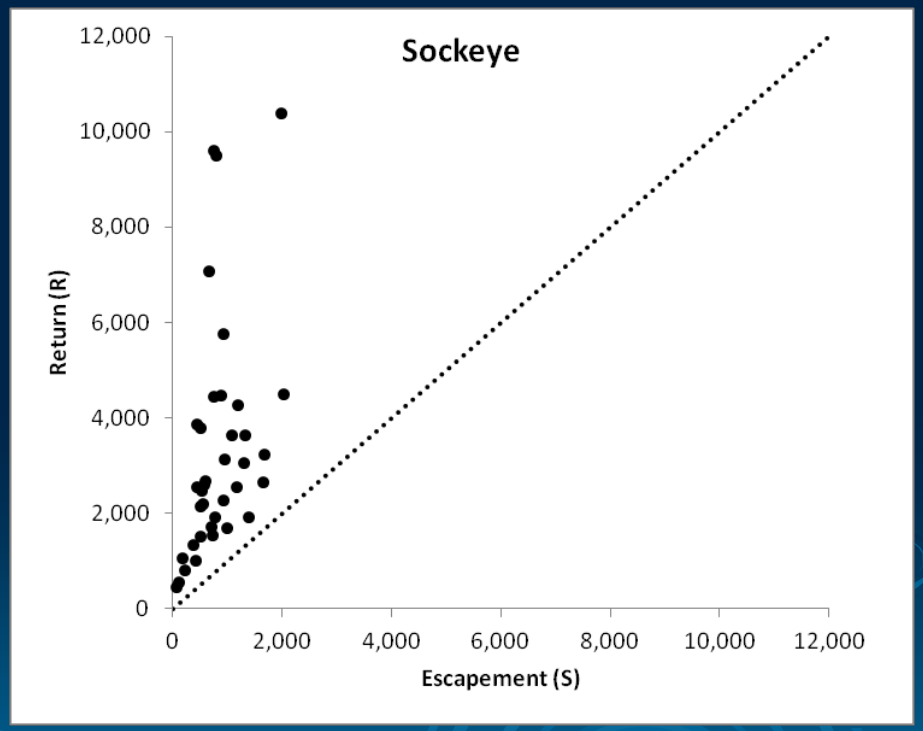
- Estimated Returns plotted against estimated Escapements



Stock-Recruitment Analysis

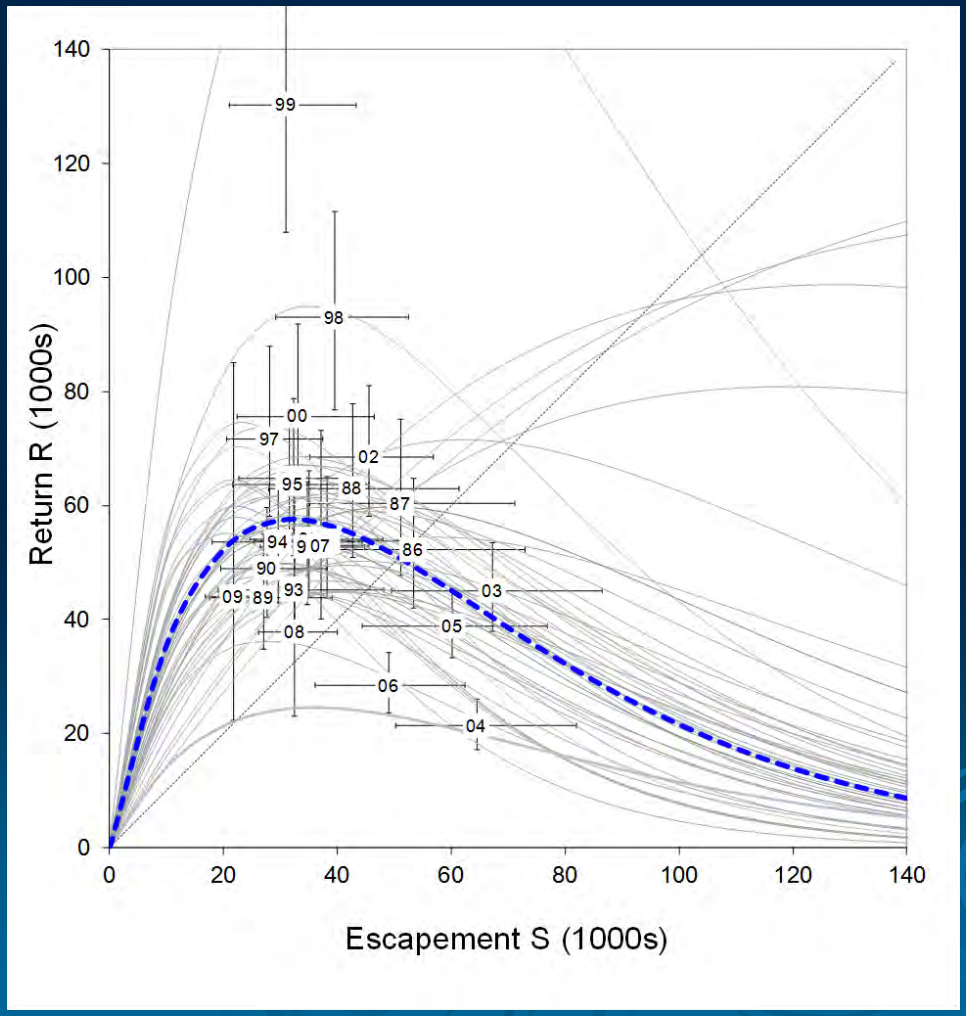
- Comparison with Kenai Sockeye





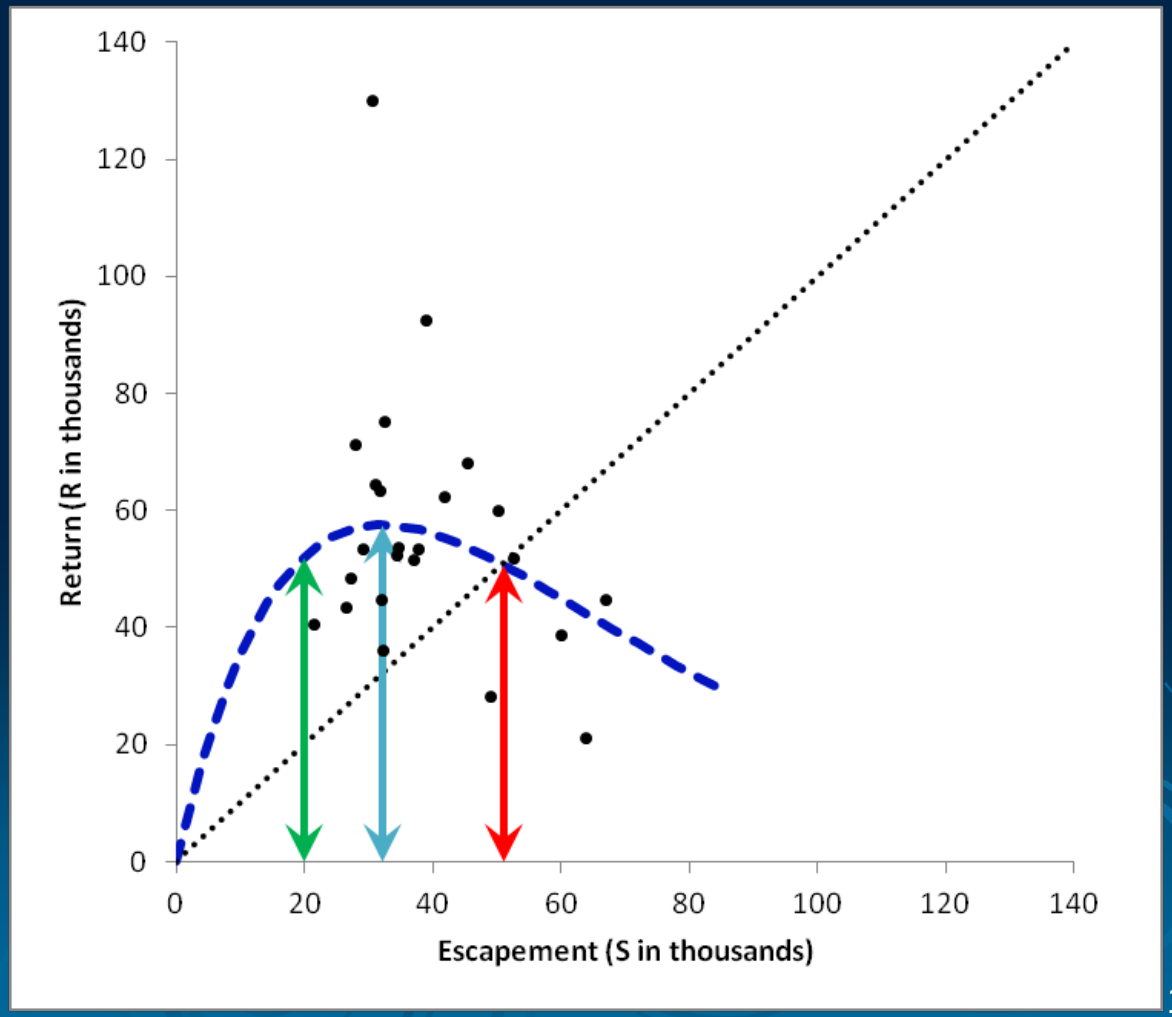
Stock-Recruitment Analysis

- Estimated Stock-Recruitment model



Stock-Recruitment Analysis

- Estimated Management Parameters
  - S_{MSY} = 20,260
  - S_{MAX} = 32,120
  - S_{EQ} = 53,200

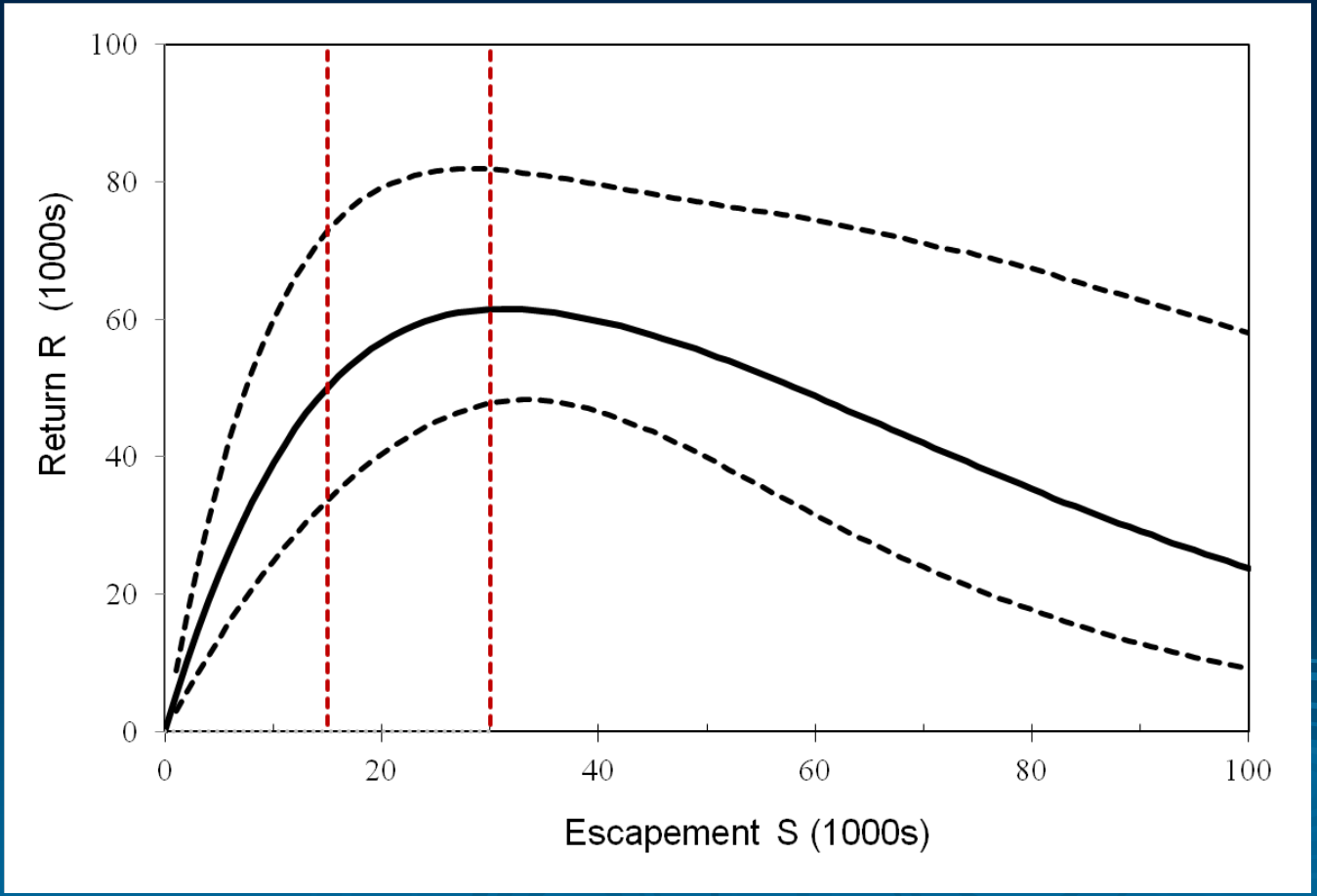


Interim Escapement Goal

- Sustainable – encompasses best estimate of S_{MSY}
- Credible – robust to uncertainties
- Implementable – can be evaluated inseason
- Transferrable – can be easily implemented at new site

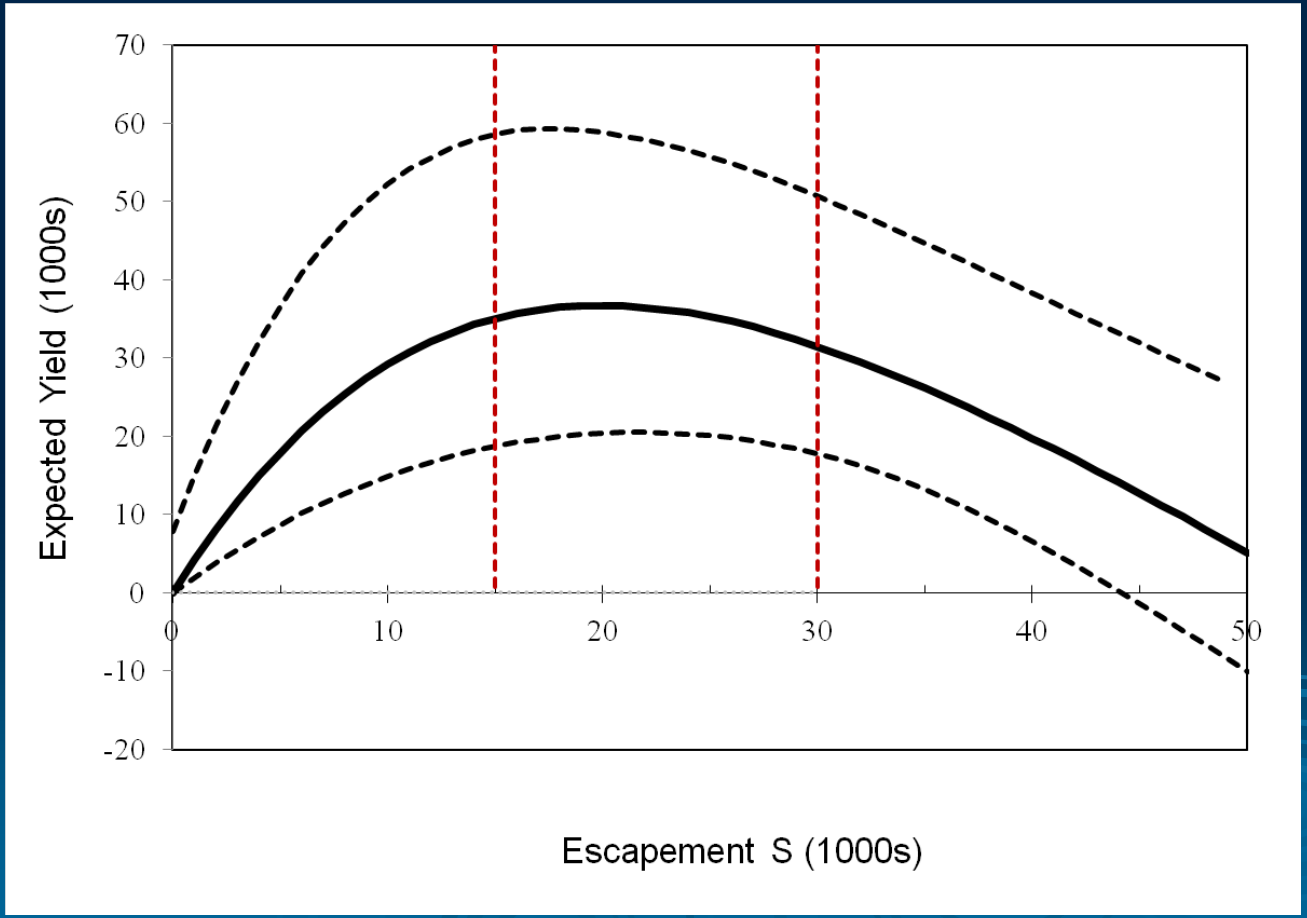
Interim Escapement Goal

- Recommended SEG of 15,000 – 30,000 fish



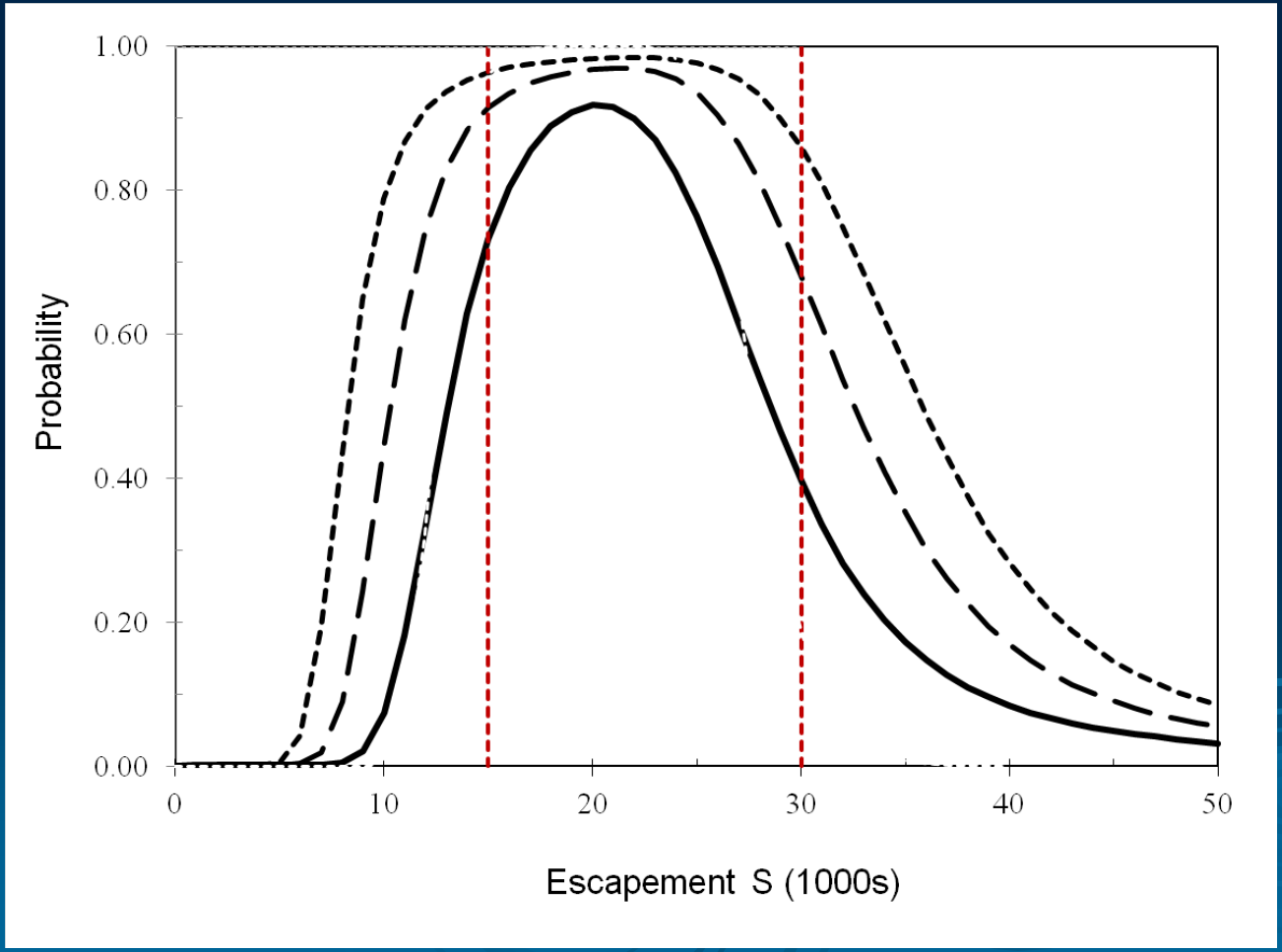
Interim Escapement Goal

- Expected Yields from Recommended Goal Range



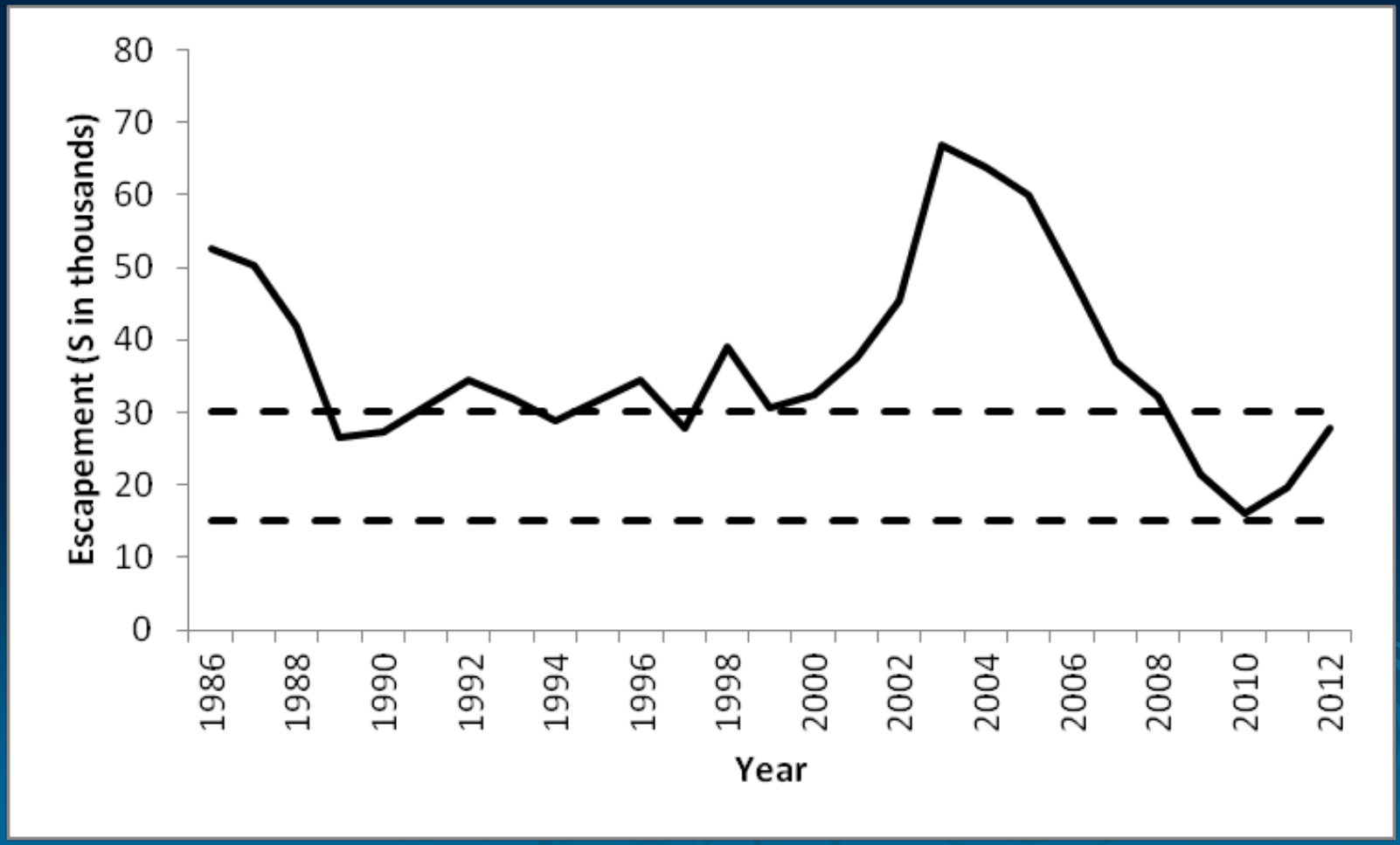
Interim Escapement Goal

- High probability of achieving MSY



Interim Escapement Goal

- Can be implemented in 2013 at current site



Acknowledgements

Researchers:

Steve Fleischman – DSF Fisheries Scientist I

Jack Erickson – DSF Research Fishery Biologist IV

Lowell Fair – DCF Research F&G Coordinator

Tim McKinley – DSF Research Fishery Biologist III

Mark Willette – DCF Research Fishery Biologist III

Managers:

Robert Begich – DSF Management Fishery Biologist III

Jason Pawluk – DSF Management Fishery Biologist II

Pat Shields – DCF Management Fishery Biologist III

Early-Run Interim Escapement Goal

- Run reconstruction similar to late run analysis
- Stock-recruitment analysis similar to late-run
- S_{MSY} = 4,434; **S_{MAX} = 6,362**; S_{EQ} = 12,270
- Recommended Interim SEG: **3,800 – 8,500**
- Final report available online

Questions?