

# Overview of Escapement Goal Policy and Processes

A Presentation to the Alaska Board of Fisheries  
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**RC 4**

# Roadmap for Presentation

- Review policy framework and processes for escapement goals in Alaska
- Overview of current escapement goal types by region and species
- Concepts and Theory of salmon production
- Commonly asked questions
  - Why and how do escapement goals change?
  - How does declining productivity affect escapement goals?

# Providing for Sustained Yield

## Constitution:

Article VIII, Sec(4). Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on **the sustained yield principle**, subject to preferences among beneficial uses.

## Statute:

AS 16.05.020(2). The commissioner (of the Department of Fish and Game) shall manage, protect, maintain, improve and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state.

# Providing for Sustained Yield

## Policies and regulations

- *Policy for management of mixed stock fisheries, 5 AAC 39.220*
- *Policy for the management of sustainable salmon fisheries, [SSFP] 5 AAC 39.222*
- *Policy for statewide salmon escapement goals, [EGP] 5 AAC 39.223*
- **Salmon Management Plans**

# Escapement Goal Policy

## (b) Department responsibilities:

- (1) Document salmon escapement goals
- (2-5) Establish BEG's, SEG's and SET's for salmon stocks or population aggregates
- (6) Review goals on the Board of Fisheries cycle
- (7) Prepare scientific analyses for goals
- (8) Notify public when goals are established or modified
- (9) Report allocative impacts of goals to the Board of Fisheries

# Escapement Goal Policy

## (c) The Board of Fisheries responsibilities:

(1) Take regulatory action to address allocative issues

(2) Review goals and consider establishing Optimal Escapement Goals or in-river run goals

# Sustainable Salmon Fisheries Policy

(c) (2) Fisheries managed for escapement necessary to conserve and sustain salmon production

(A) Escapement monitoring appropriate to scale, intensity and importance of stock

(B) Goals established in a manner consistent with **sustained yield**; to the extent possible, fisheries managed for **maximum sustained yield**

(C) Goal ranges to consider uncertainty and environmental variability

(D) Escapement managed to maintain genetic and phenotypic characteristics

(F) Escapement and management decisions should protect non-target stocks

(G) Ecosystem function considered in escapement goal setting

# Definition of Terms

- Stock, escapement, run, return, yield
- Sustained yield, maximum sustained yield, and optimum sustained yield
- Stock of concern

# Types of Escapement Goals

- Biological Escapement Goal (BEG)
- Sustainable Escapement Goal (SEG)
- Optimal Escapement Goal (OEG)
- Sustained Escapement Threshold (SET)

# Biological Escapement Goal (BEG)

- Determined by the Department
- Escapement with greatest potential for **maximum sustained yield** (MSY)
- Based on best available biological information
- Scientifically defensible
- Always a range
- Department will maintain evenly distributed escapements within the bounds

# Sustainable Escapement Goal (SEG)

- Determined by the Department
- Escapement known to provide for **sustained yields** over a five to ten-year period
- Used where a BEG cannot be estimated
- Based on best available biological information
- Scientifically defensible
- Can be a range or a bound
- Department will maintain escapements within the bounds of a range or above a lower bound

# Optimal Escapement Goal (OEG)

- Set in regulation by the Board of Fisheries
- Considers biological and allocative factors
- Can differ from BEG or SEG, but **must be sustainable**
- May be expressed as a range
- Department will maintain evenly distributed escapements within the bounds of the range

# Sustained Escapement Threshold (SET)

- Established as needed by the Department in consultation with the Board of Fisheries
- Escapement level, below which sustainability is jeopardized
- Lower than the lower bound of BEG or SEG
- Can be based on lower levels of escapement that consistently sustain themselves

# ADF&G Escapement Goal Development Process

## Regional Escapement Goal Review Team

- Create work assignments
- Review regional/area escapement goals
- Draft stock escapement goal analyses
- Draft escapement goal report



ADF&G staff and  
public review



Approval of escapement goal  
recommendations by Regional Supervisor



Presentation of recommendations  
to Board of Fisheries

Board may adopt OEG's or in-river run  
goals based on biological or allocative factors



Formal adoption by Division Directors

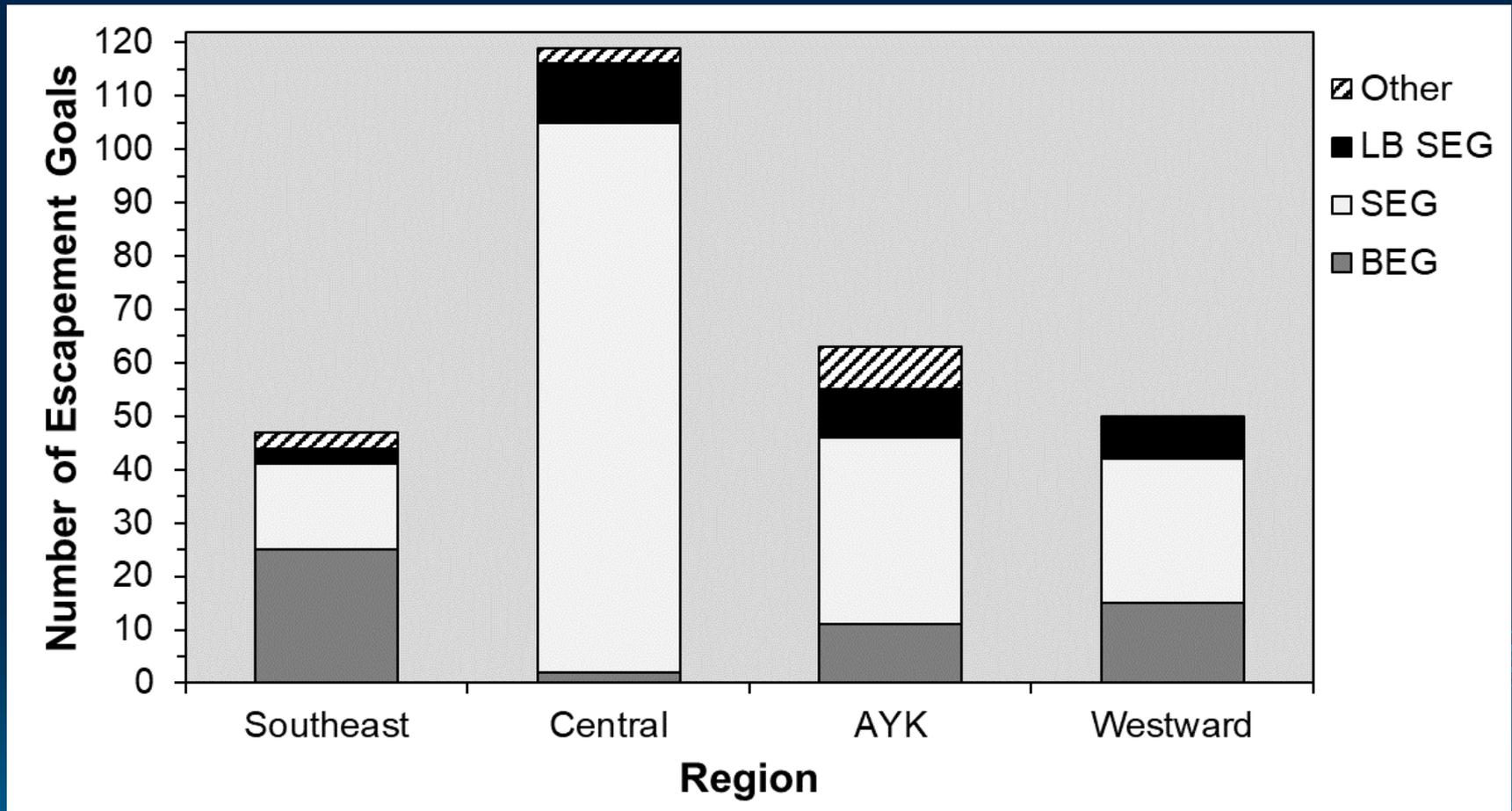
# Questions ?

Next topic:

➤ Overview of current escapement goal types by region and species

# Escapement Goal Types by Region

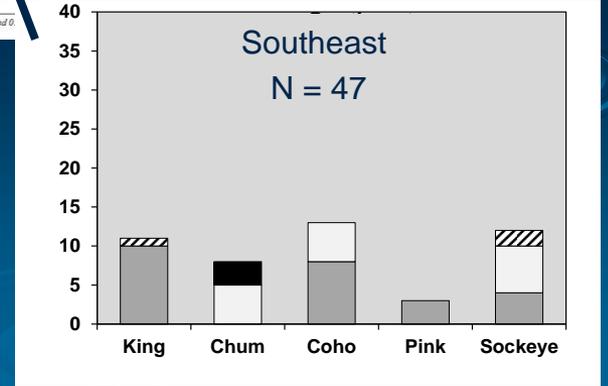
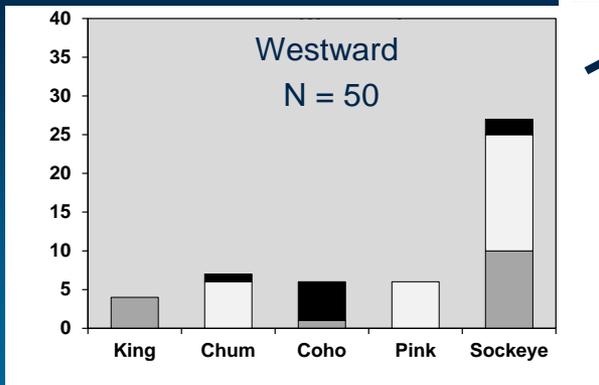
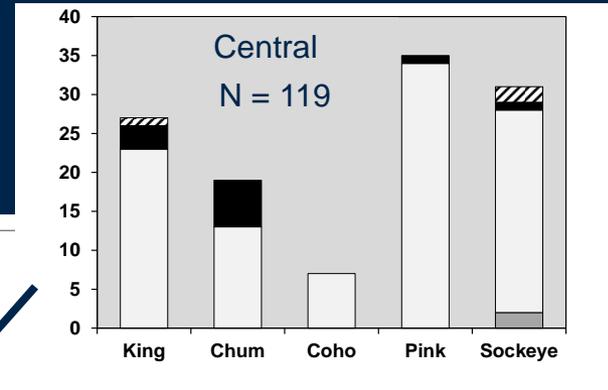
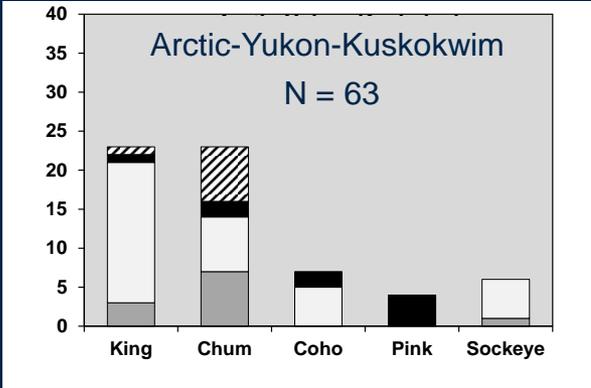
## All species



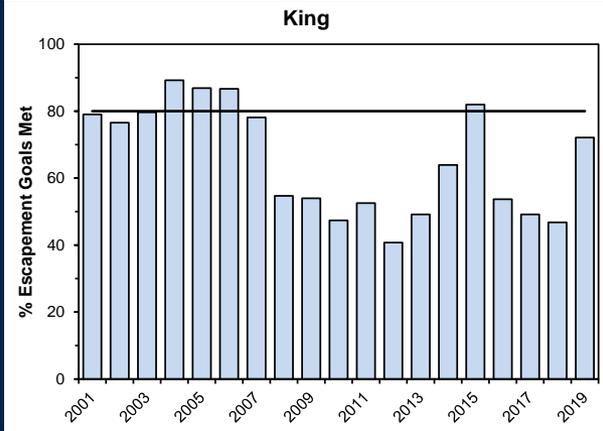
Number of escapement goals = 279 **2019**

# Escapement Goals By Region

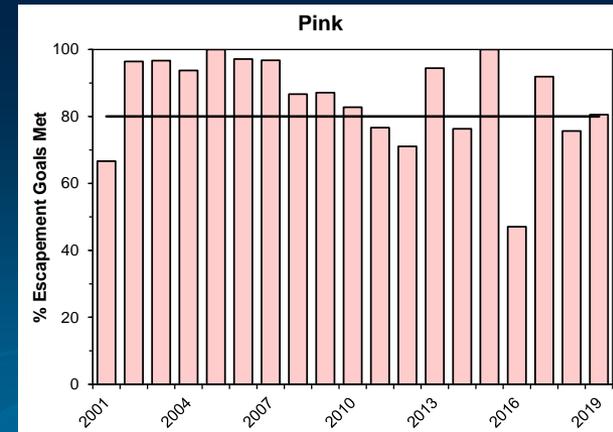
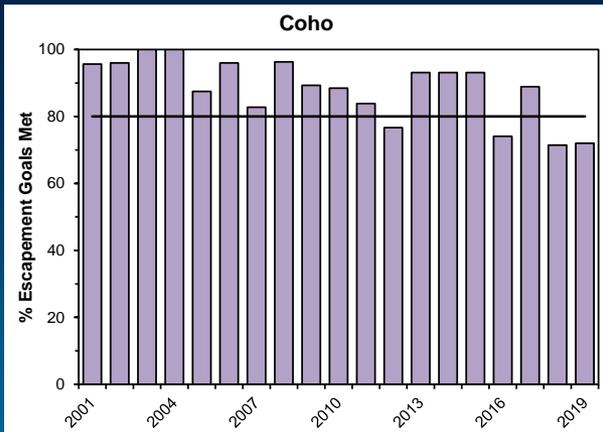
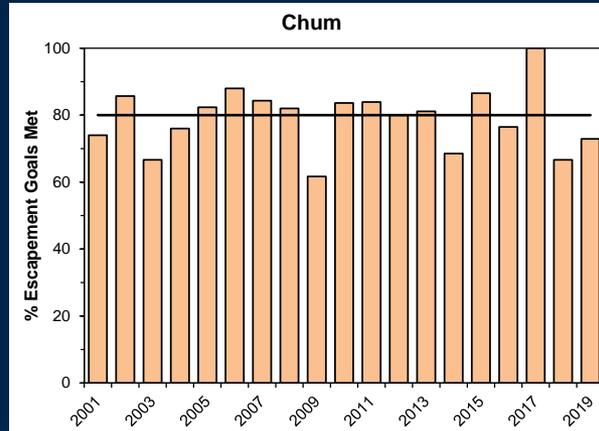
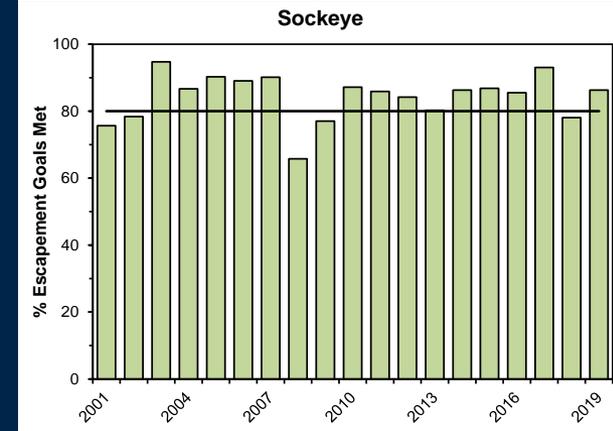
## 2019



# Meeting Escapement Goals - Alaska



Average esc. goals met  
(2001-2019):  
**79%**



Target: 80% esc. goals met

# Questions ?

Next topic:

- Concepts and Theory of salmon production – Concepts

# Terms for Speaking about Salmon Production

**Return** = Adult salmon produced from a single brood year escapement

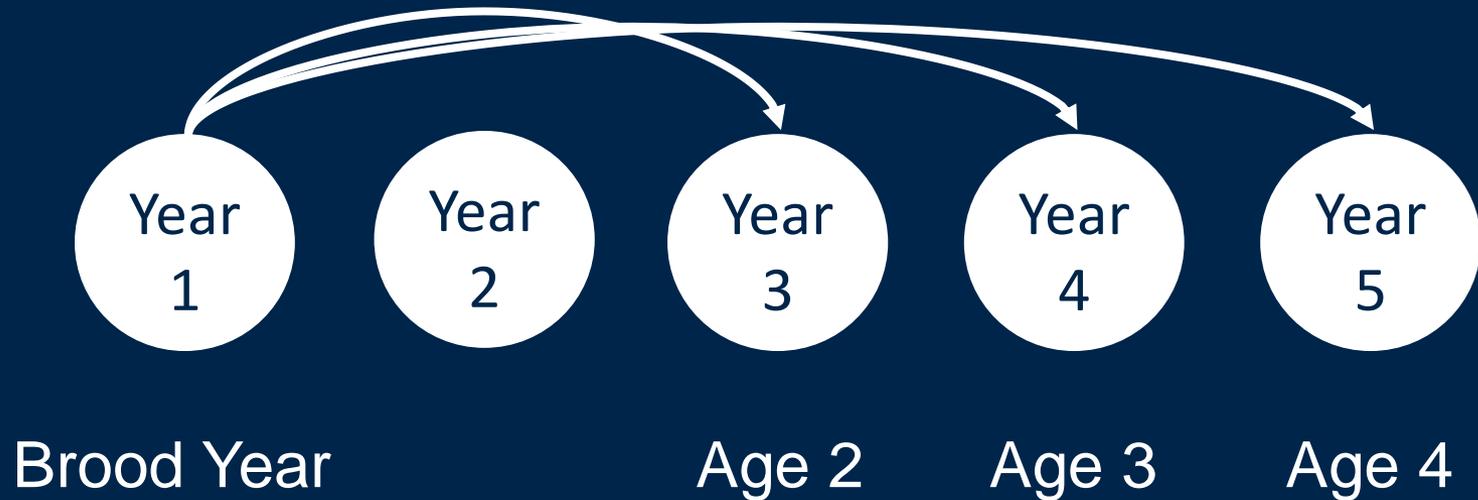
**Run** = Adult salmon returning to the vicinity of the natal stream in a calendar year

**Escapement** = Count of spawners in a year (or index)

**Yield** = Adult salmon produced in excess of escapement from a single brood year

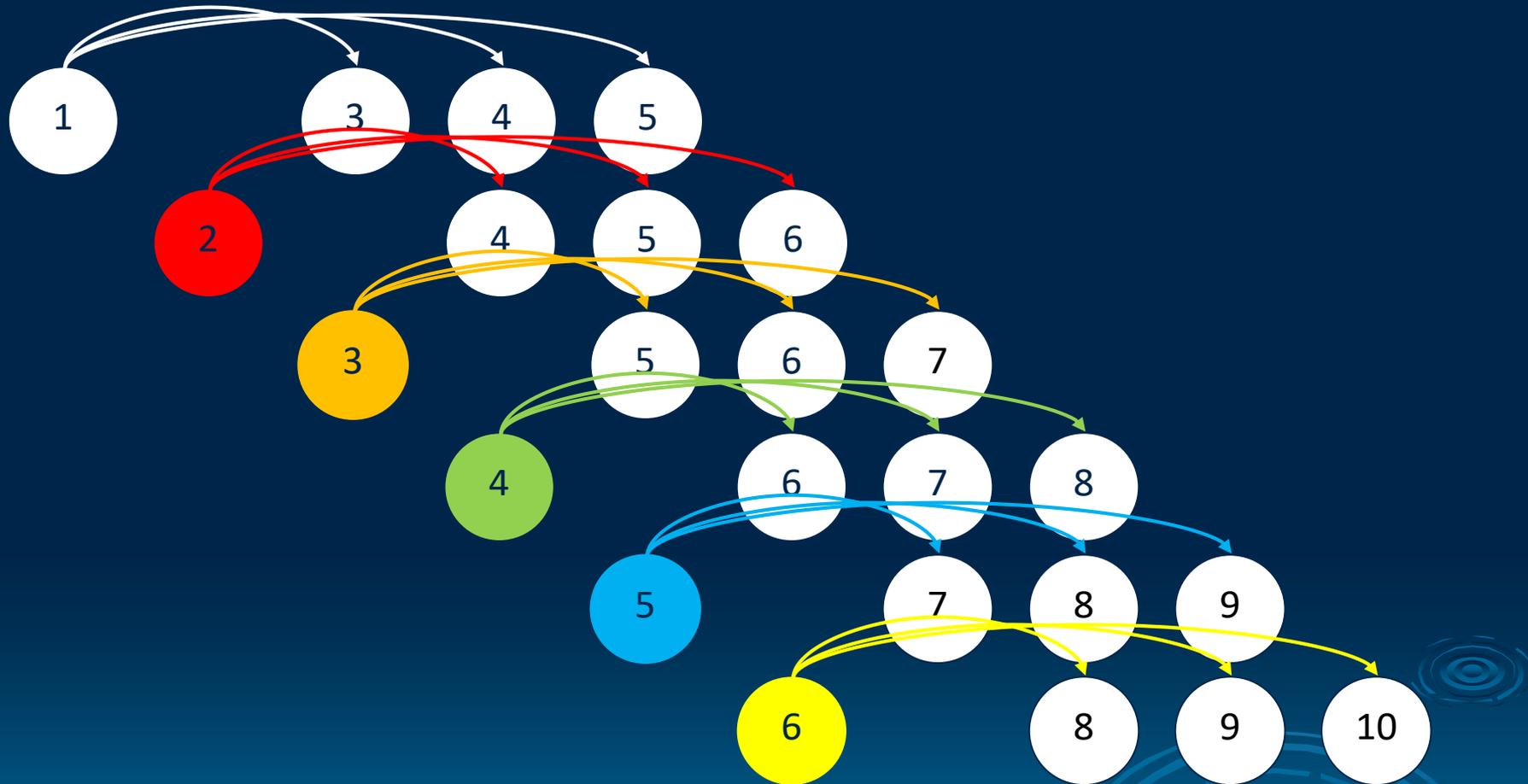
# Understanding Age Structure

## Simple model



# Understanding Age Structure

## Simple model





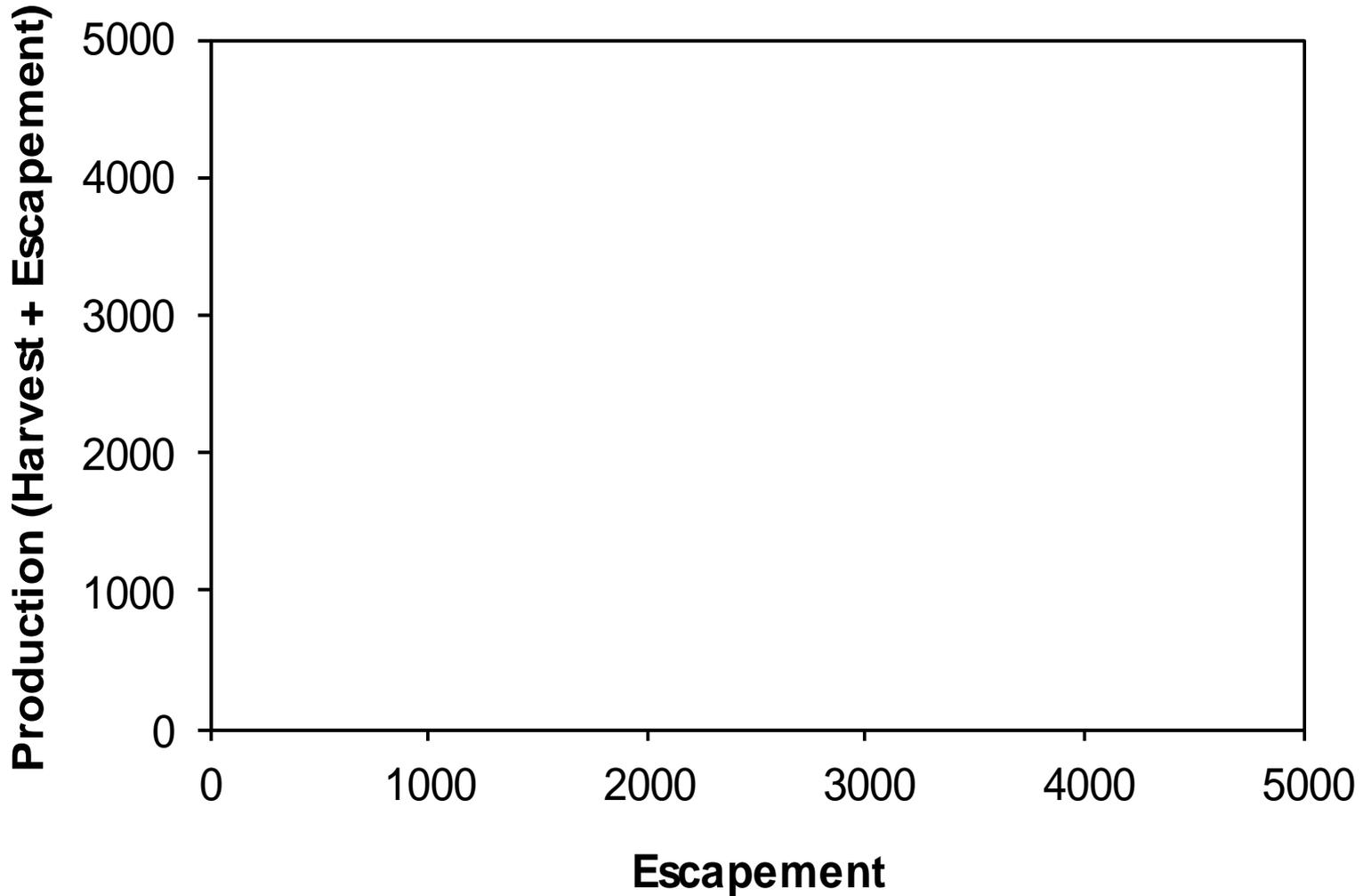
# Questions ?

Next topic:

- Concepts and Theory of salmon production – Theory

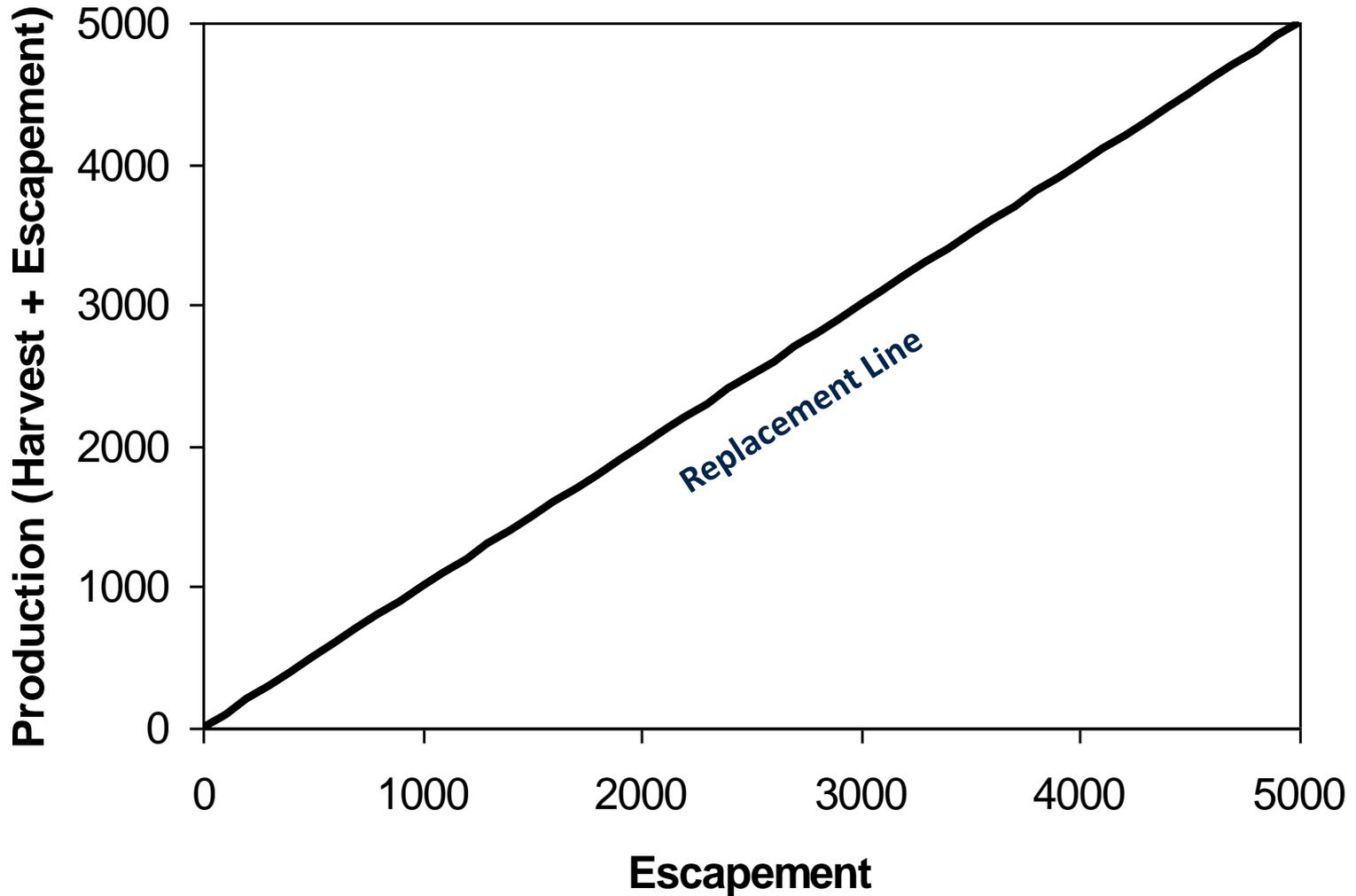
# Theory of Salmon Production

Escapement and the subsequent production can be plotted on a graph like this...



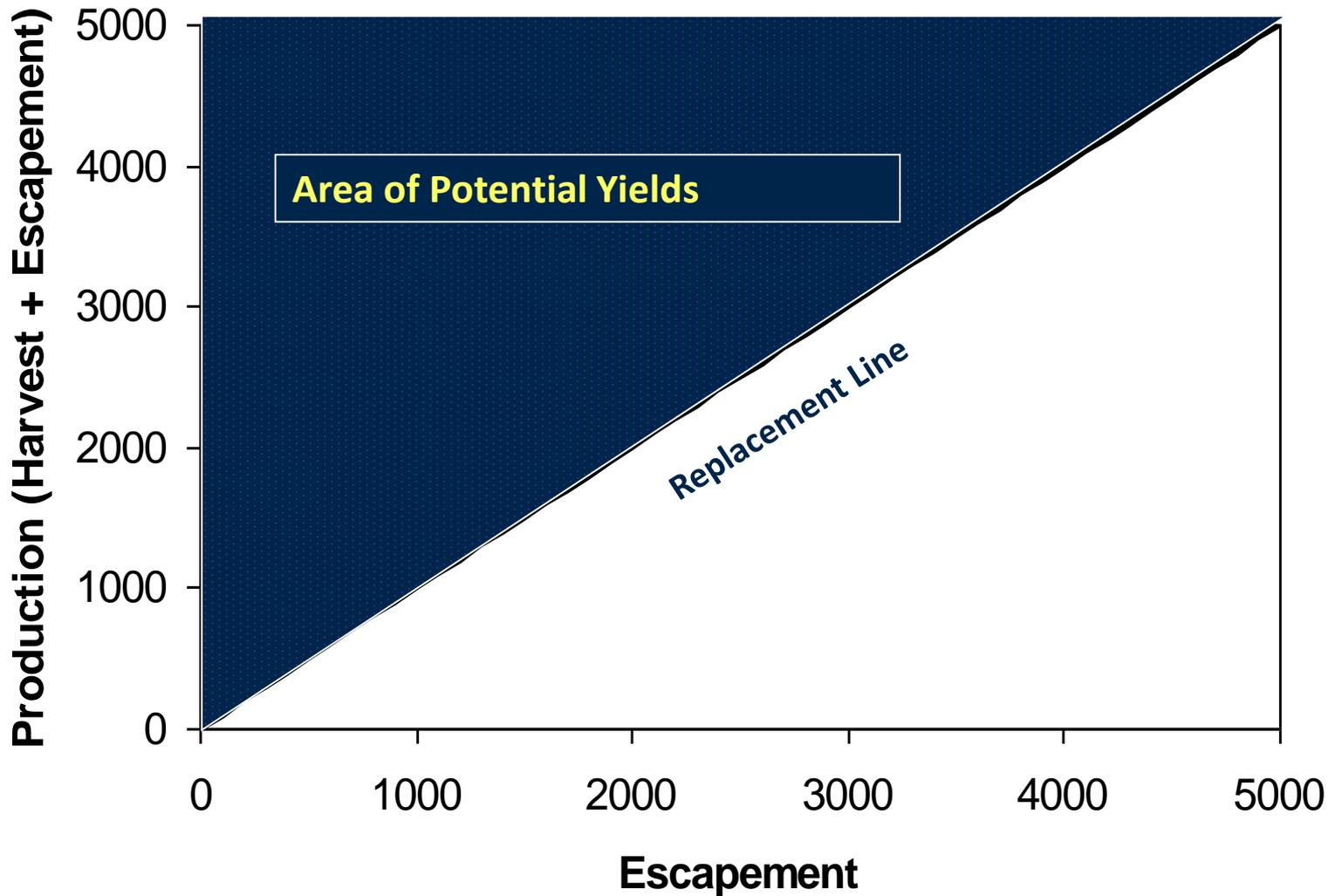
# Theory of Salmon Production

...with a **Replacement Line** where escapement = production (i.e. no yields).



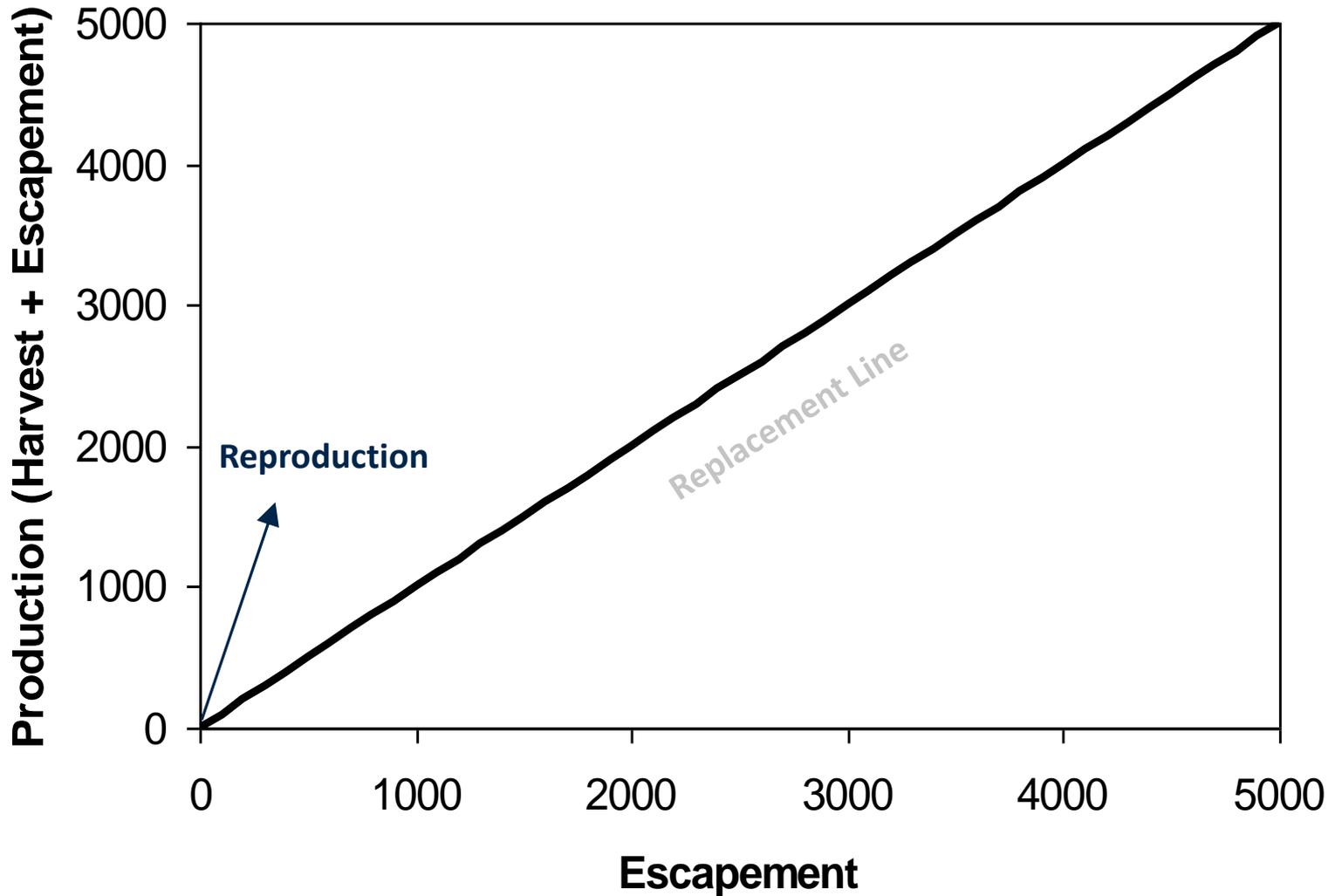
# Theory of Salmon Production

There is a potential for yields only when production is greater than escapement



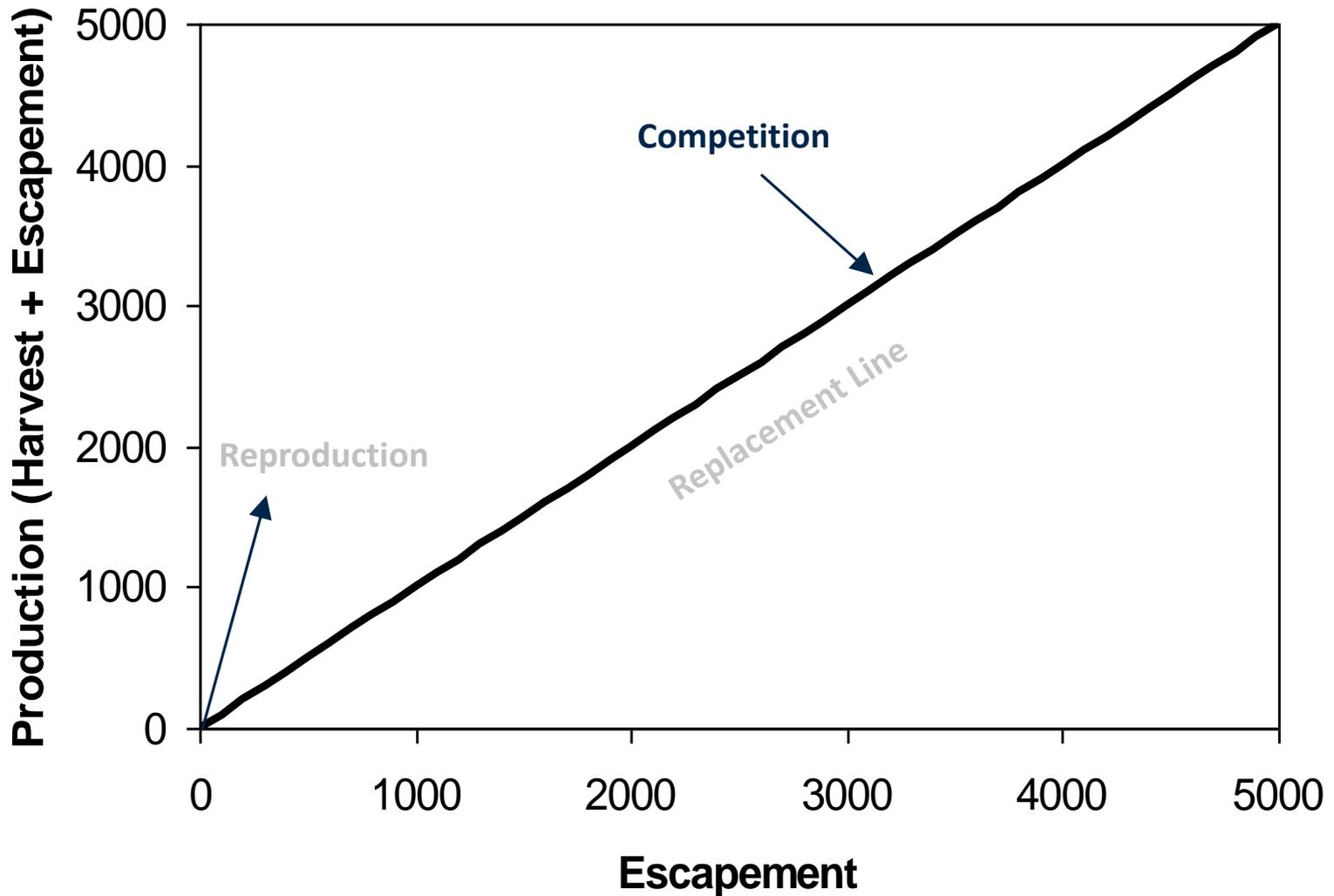
# Theory of Salmon Production

Potential yields can be realized because of the **reproductive capacity** of salmon, but...



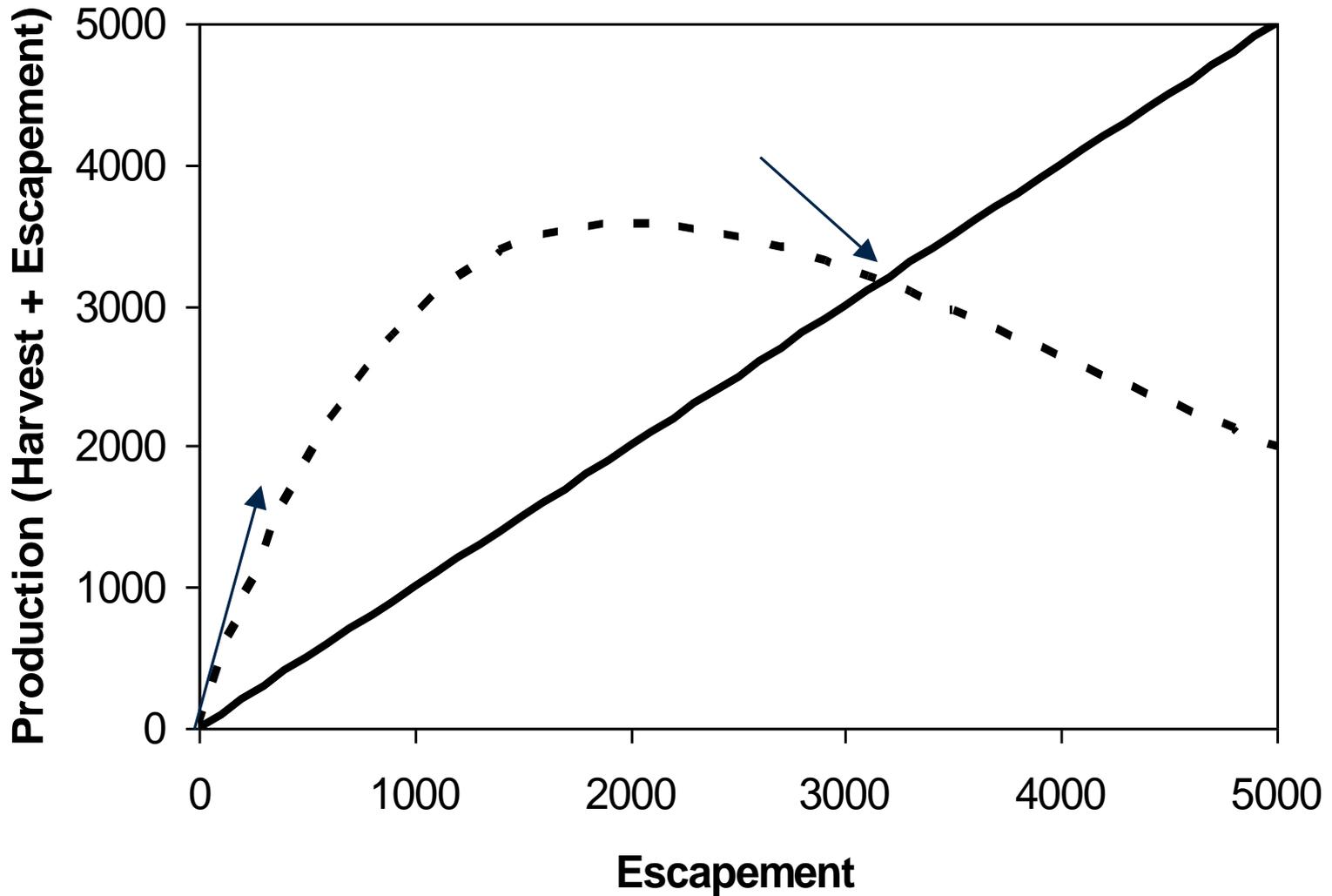
# Theory of Salmon Production

...as escapements are increased, competition increases, which limits potential yields.



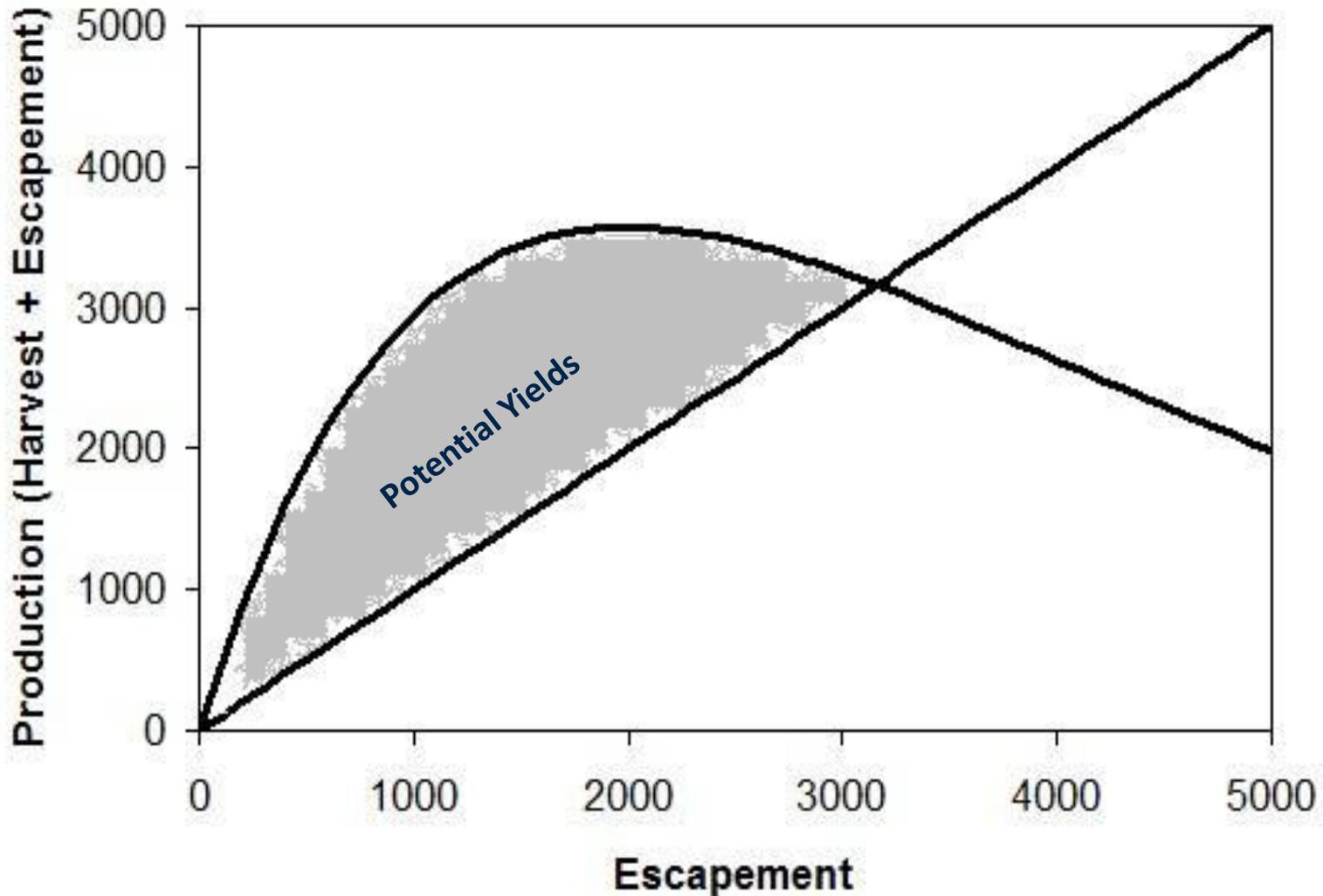
# Theory of Salmon Production

We can model the interaction of reproductive potential and competition using our data.



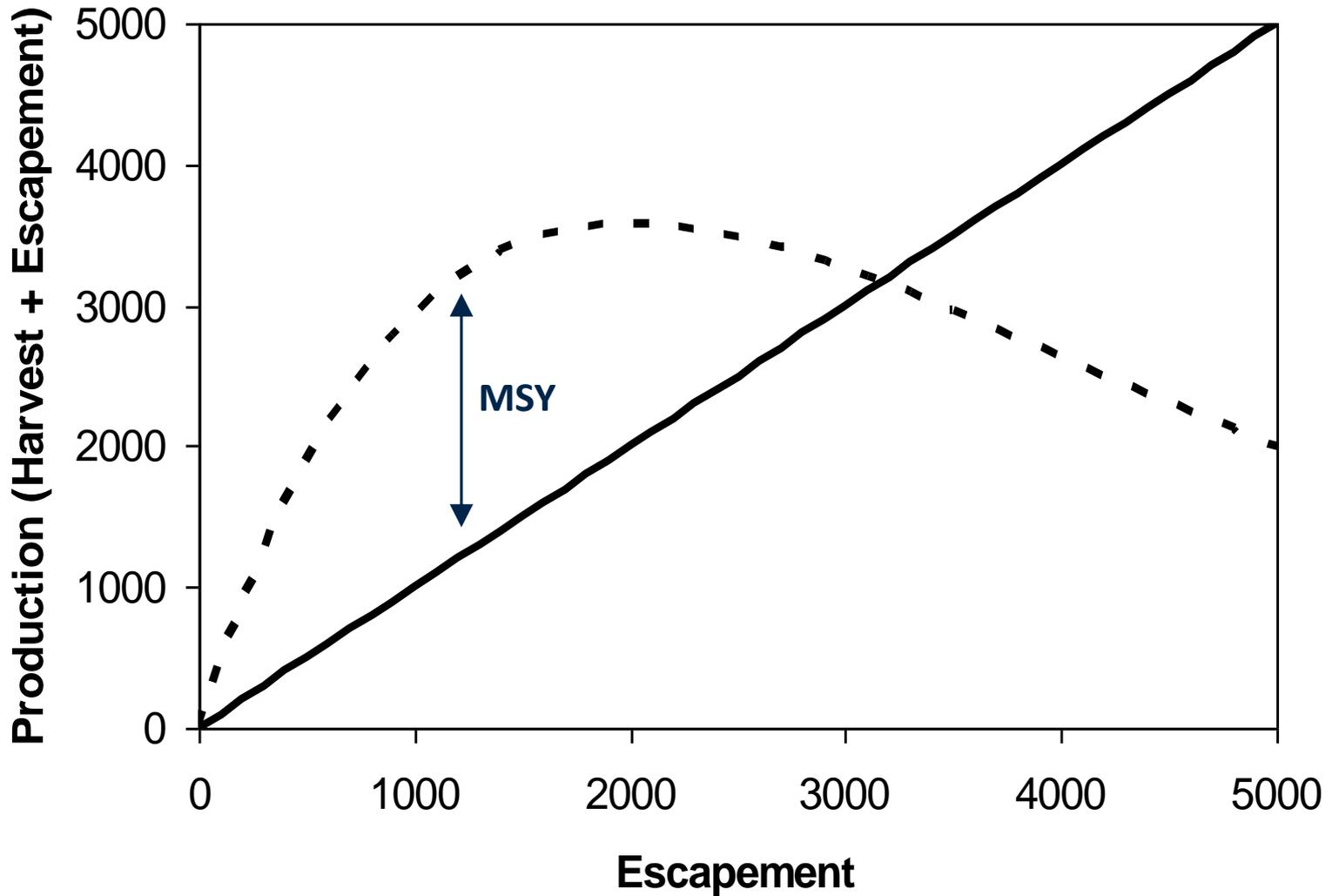
# Theory of Salmon Production

The model helps to define potential yields relative to escapements.



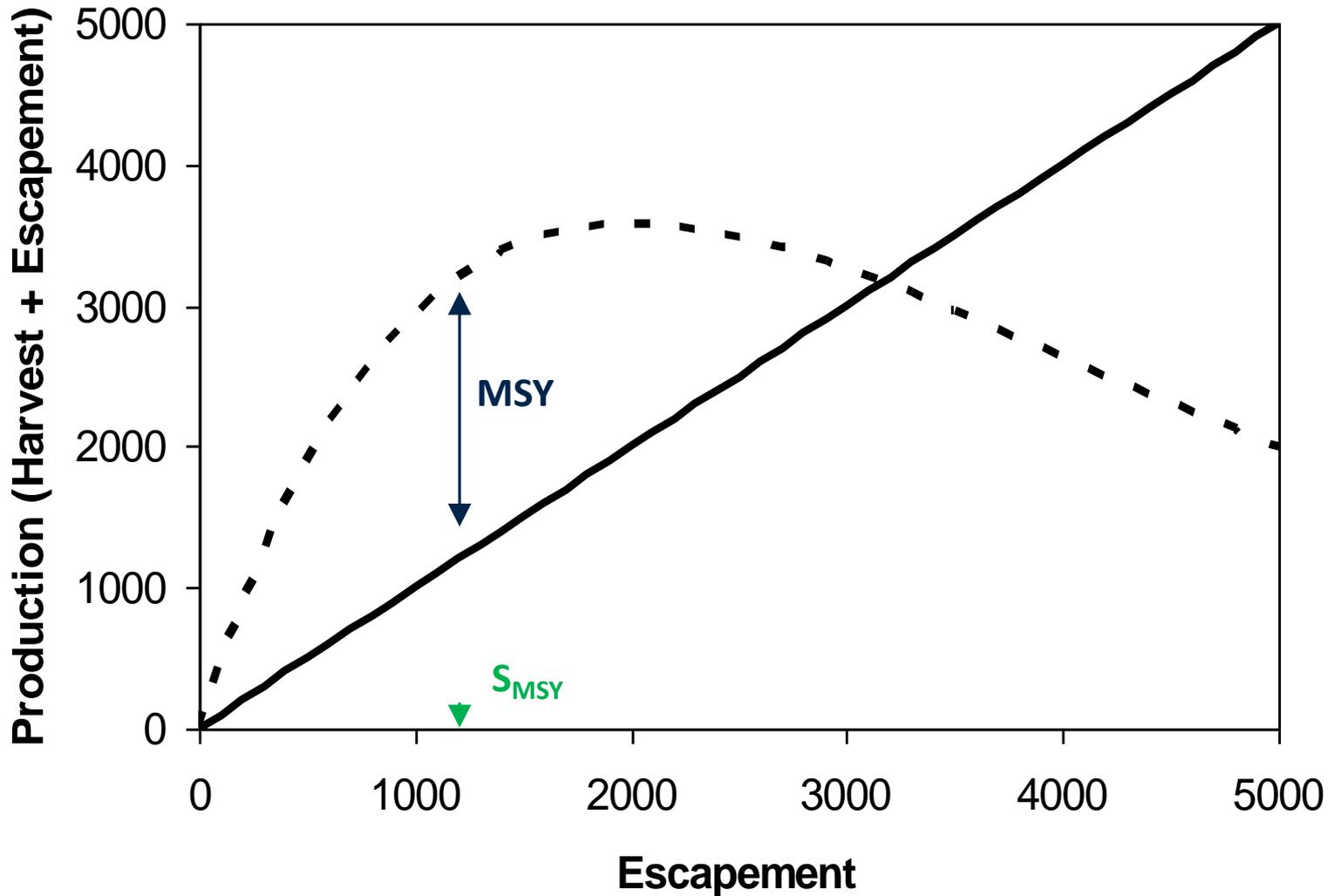
# Theory of Salmon Production

MSY is the **maximum sustained yield** based on the model...



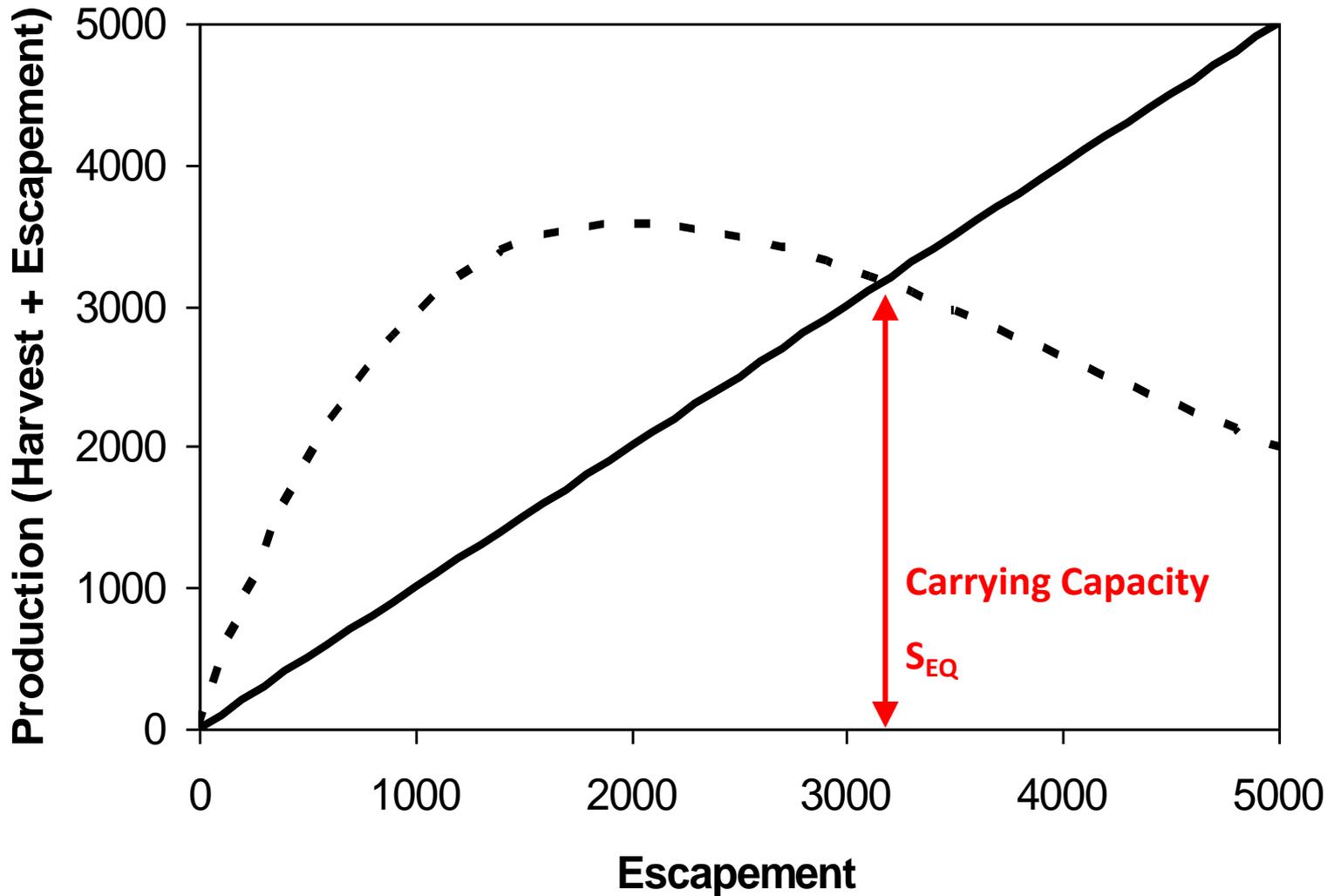
# Theory of Salmon Production

...and is associated with a level of escapement that is expected to produce MSY.



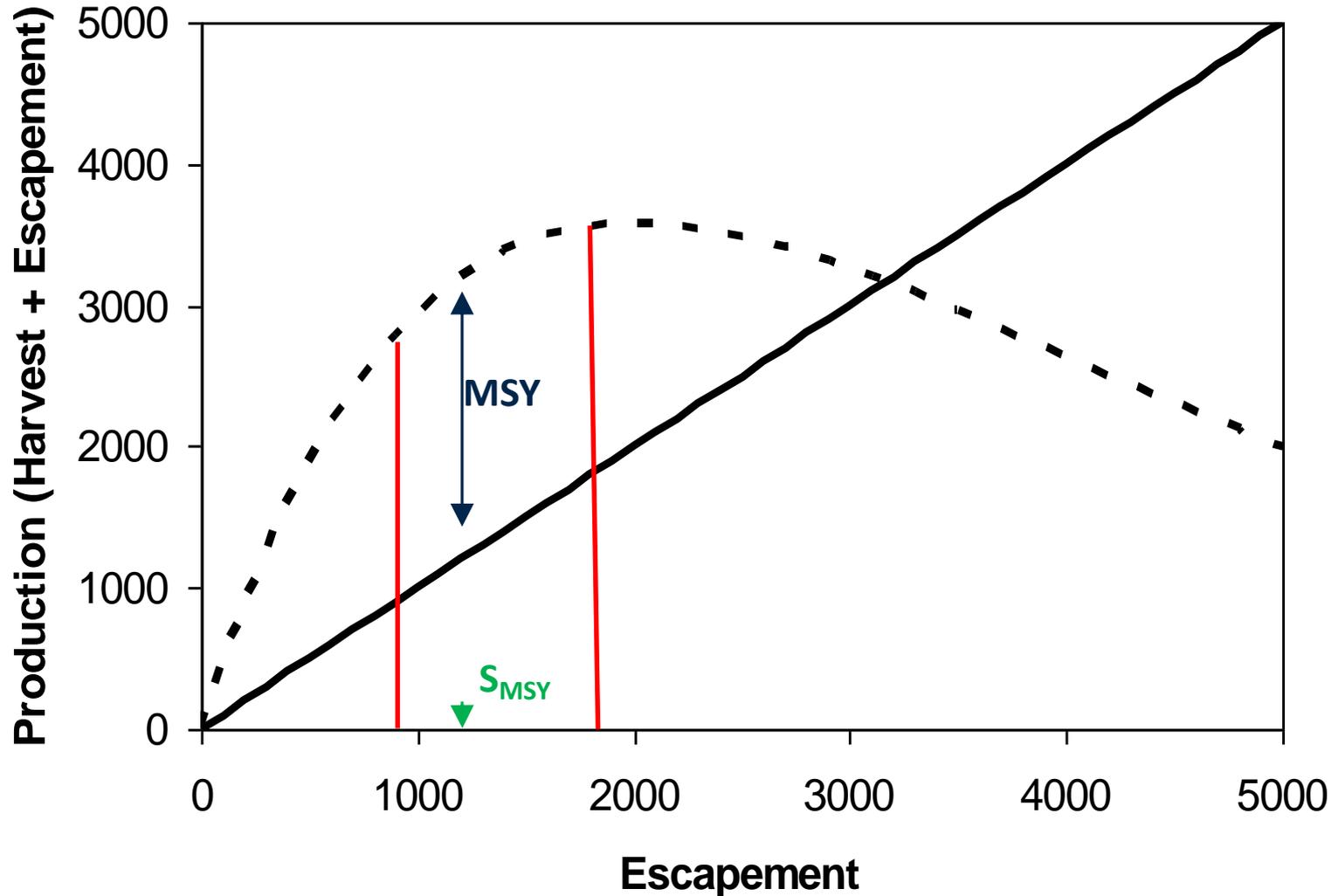
# Theory of Salmon Production

Another quantity we can estimate from the model is the carrying capacity.



# Theory of Salmon Production

A range around the escapement that produces MSY is the theoretical basis of an escapement goal.

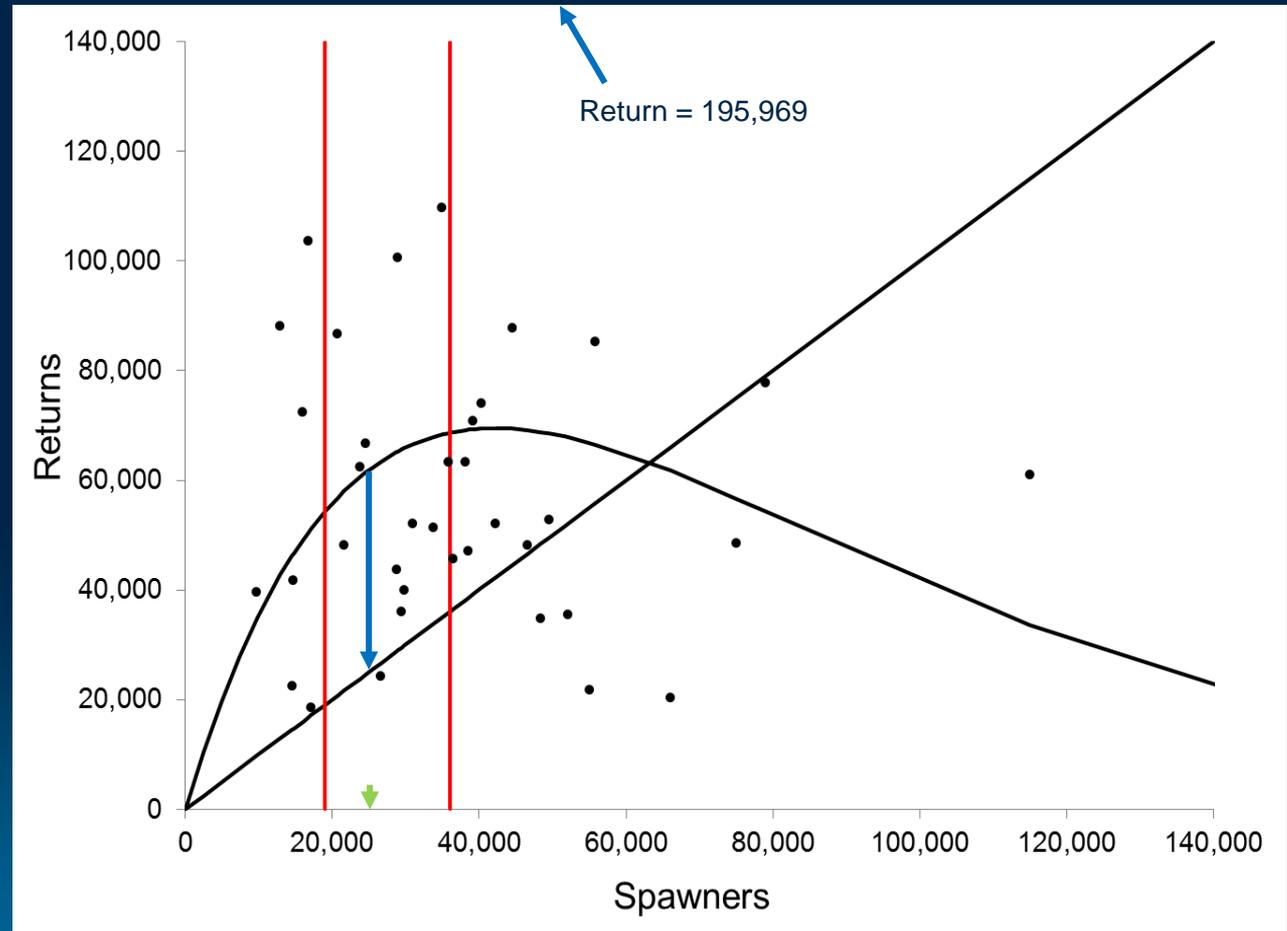


# Escapement Goal with Full Harvest Information

<b>Brood</b> <b>year</b>	<b>Spawners</b>	<b>Returns</b>
1973	14,565	22,399
1974	16,015	72,392
1975	12,920	88,043
1976	24,582	66,673
1977	29,497	36,010
1978	17,124	18,617
1979	21,617	48,174
1980	39,239	70,707
1981	49,559	52,717
1982	23,848	62,420
1983	9,794	39,503
1984	20,778	86,734
1985	35,916	63,280
1986	38,111	63,230
1987	28,935	100,539
1988	44,524	87,819
1989	40,329	74,048
1990	52,142	35,529
1991	51,645	195,969
1992	55,889	85,234
1993	66,125	20,384
1994	48,368	34,701
1995	33,805	51,298
1996	79,019	77,749
1997	114,938	60,968
1998	31,039	52,005
1999	16,786	103,545
2000	34,997	109,715
2001	46,644	48,206
2002	55,044	21,779
2003	36,435	45,692
2004	75,032	48,452
2005	38,599	47,076
2006	42,296	51,986
2007	14,749	41,743
2008	26,645	24,314
2009	29,797	39,971
2010	28,769	43,679

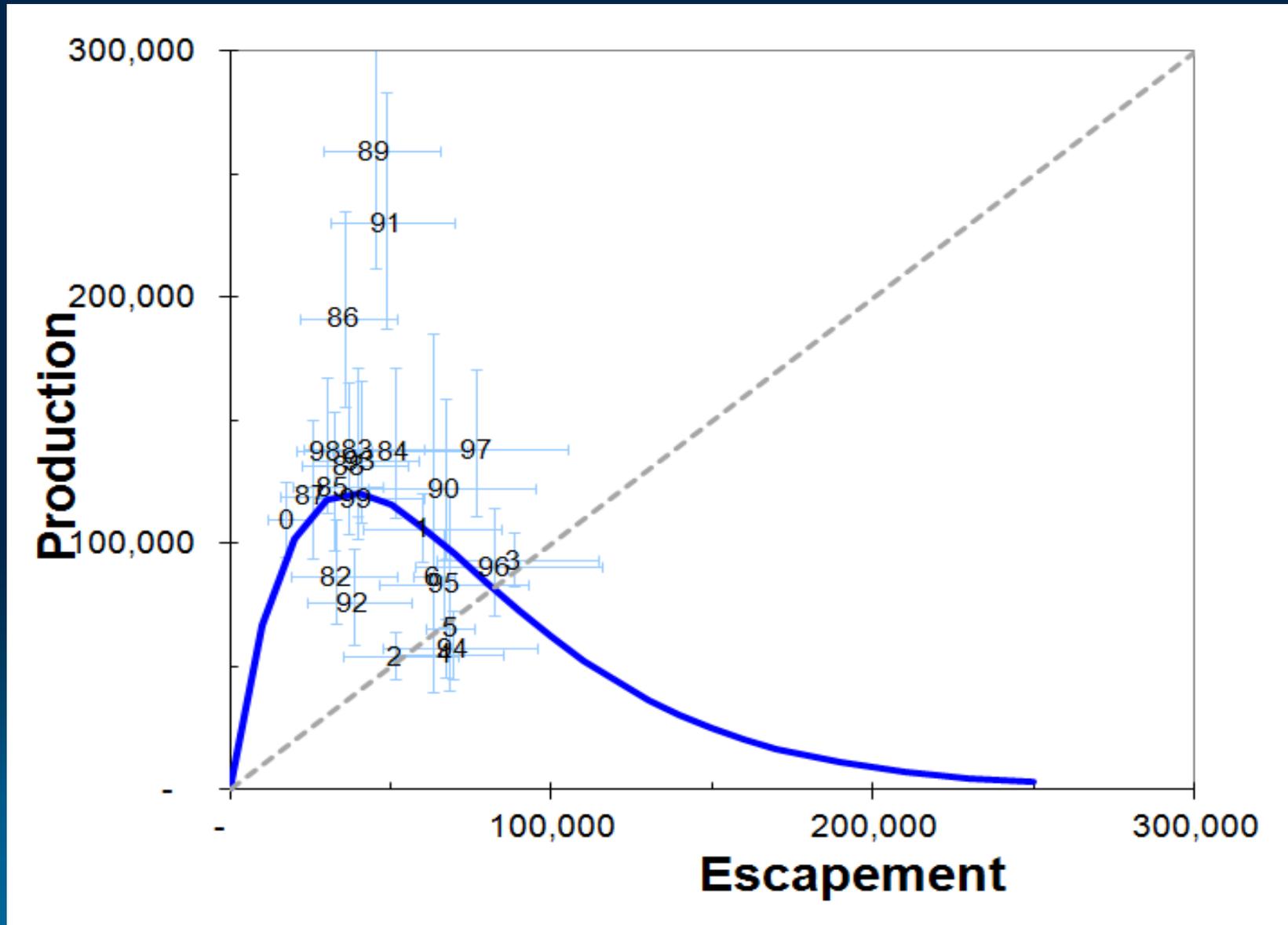
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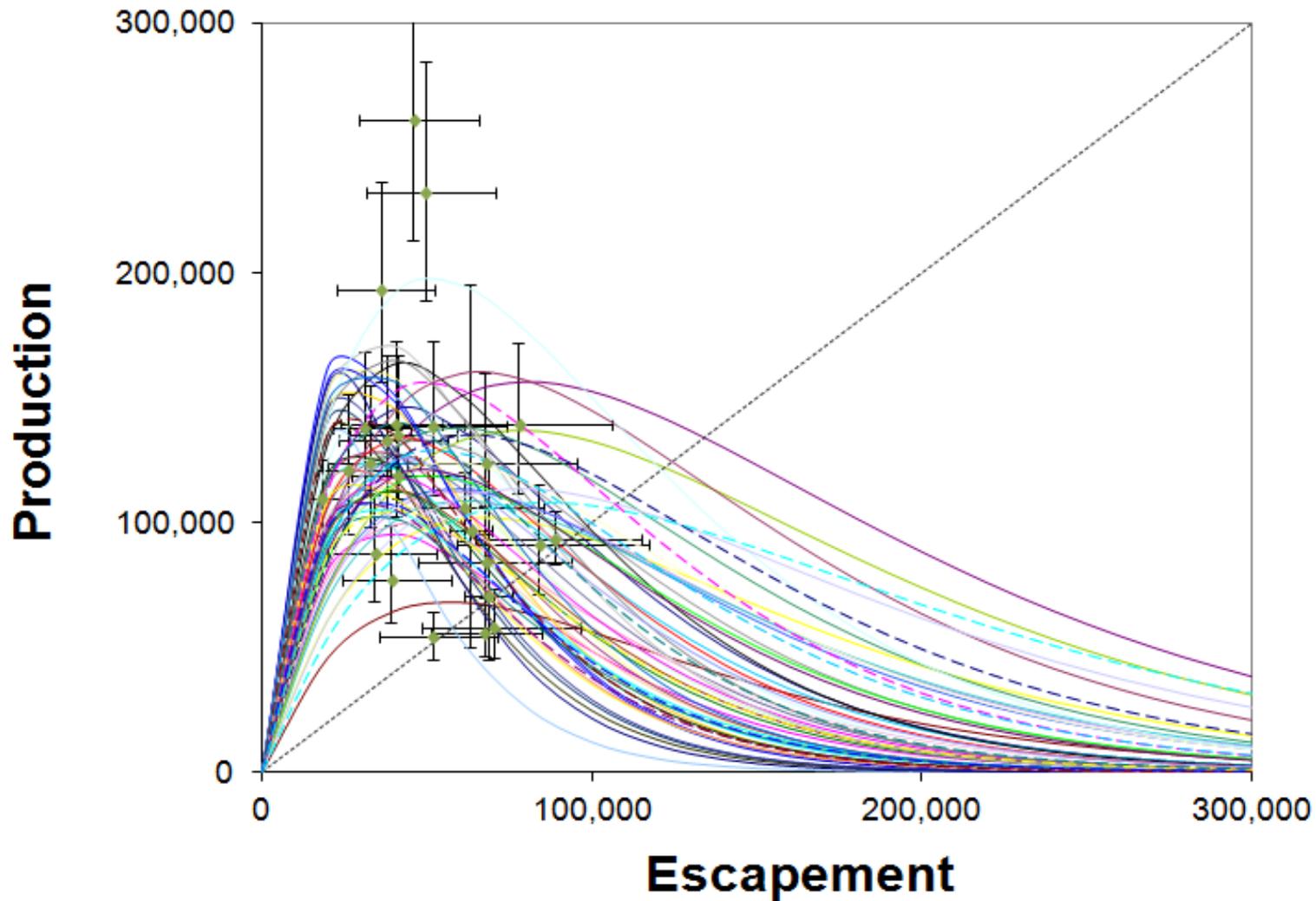
# Uncertainty and Escapement Goals

Actual production data will look very different from our simple production model ...



# Uncertainty and Escapement Goals

...and this uncertainty is factored into the choice of escapement goal range.



# Questions ?

Next topic:

➤ Commonly asked questions

- Why and how do escapement goals change?
- How does declining productivity affect escapement goals?

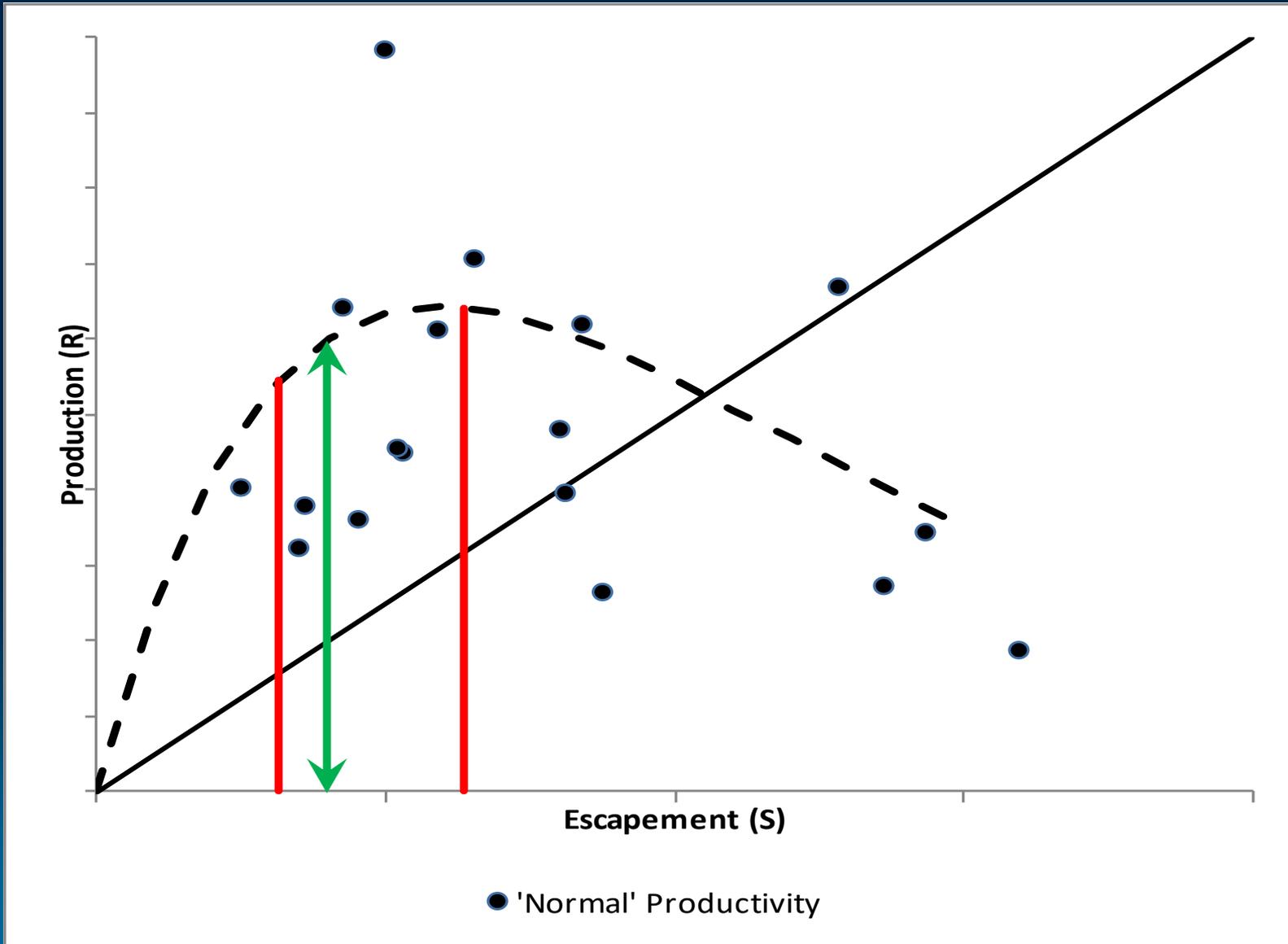
# Why Do Escapement Goals Change?

Escapement goals are considered for review every three years - on Board cycle

- Changes in one or more factors
  - Assessment
  - Biological
  - Fishery-Related
- Evolution of a goal is usually driven by improved information and model development

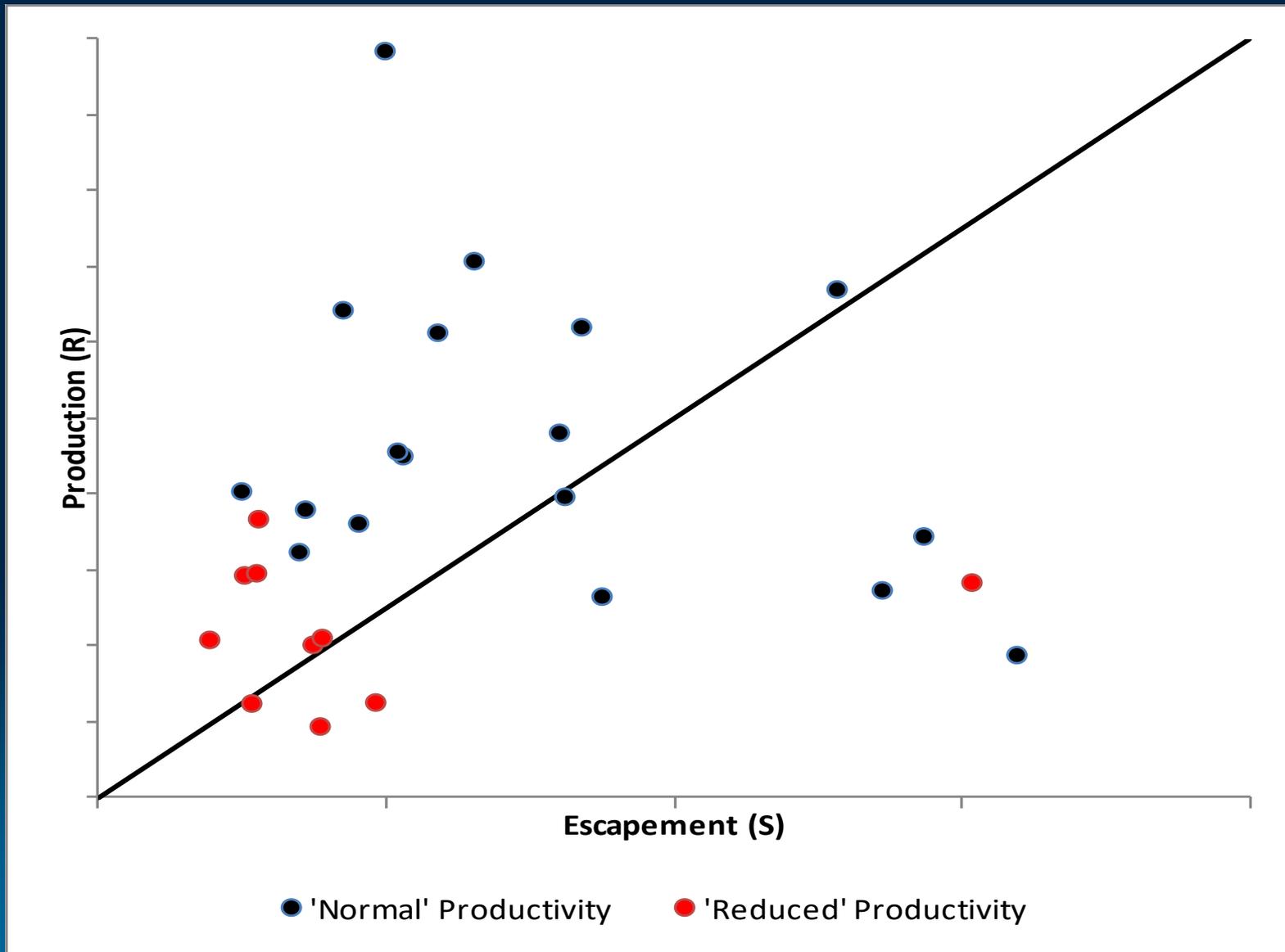
# How does declining productivity affect escapement goals?

Beginning with some hypothetical data, we can fit the production model and develop an escapement goal range.



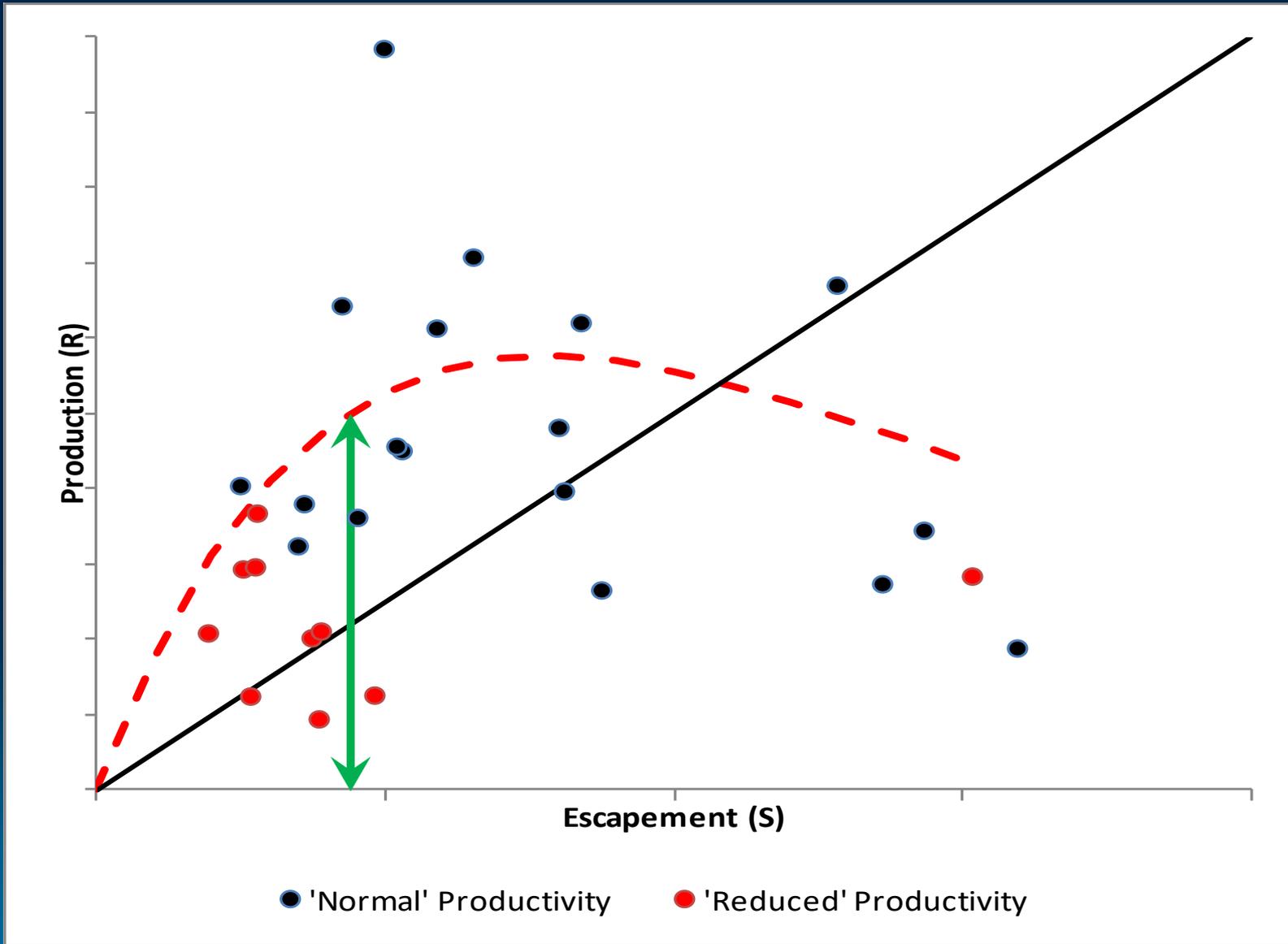
# Escapement Goals as Productivity Declines

As productivity declines we will see reductions in **production and escapement...**



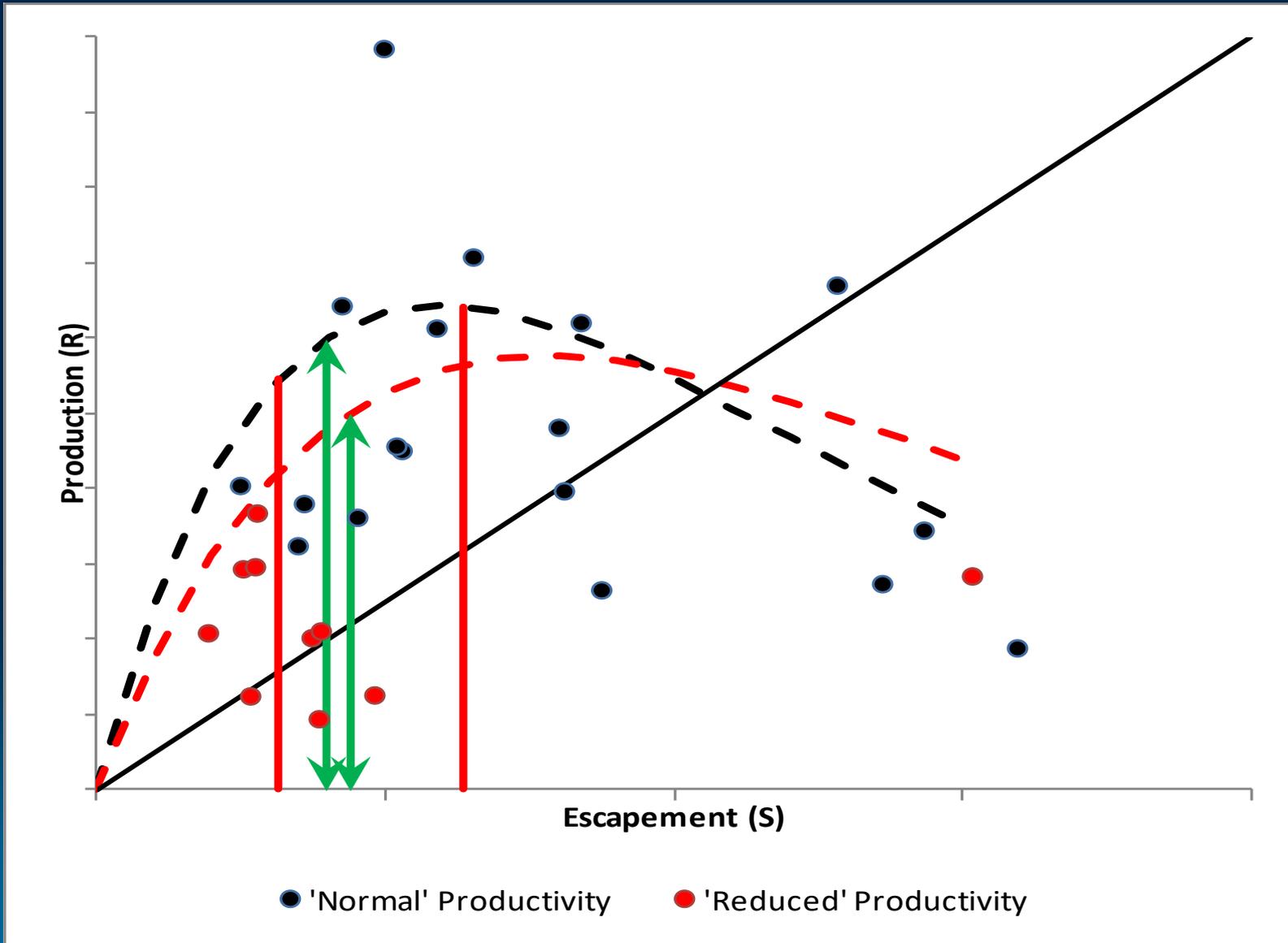
# Escapement Goals as Productivity Declines

...and can fit a new production model to all of the data...



# Escapement Goals as Productivity Declines

The original escapement goal should not change as productivity declines.



# Questions?

- Review policy framework and processes for escapement goals in Alaska
- Overview of current escapement goal types by region and species
- Concepts and Theory of salmon production
- Commonly asked questions
  - Why and how do escapement goals change?
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