Hatchery Salmon and Ecosystem Productivity

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*DISCLAIMER: The information presented is my own and does not reflect the positions or policies of the U.S. Forest Service

Hatchery Salmon/ Ocean Ranching

- Not what happens Naturally
- Supplants wild production
- Not sustainable
  - Ecologically
  - Financially
- Must be Moderated
- For a healthy ecosystem

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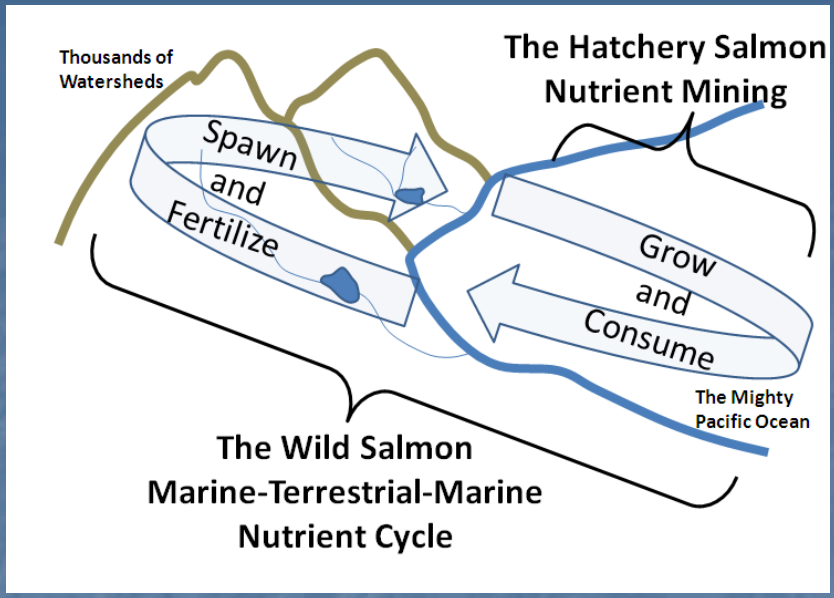
This talk

Specifically about

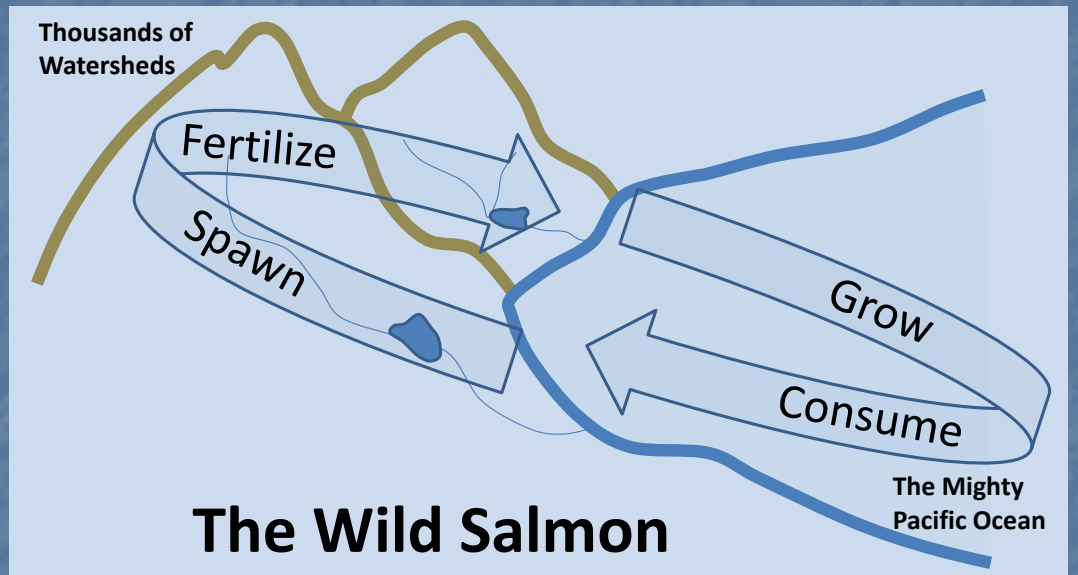
Nutrient Mining



- Fish production is ultimately limited by carrying capacity
- The put-and-take business of “Ocean Ranching” of hatchery salmon
  - Extracts nutrients from the ocean
  - Lowering the carrying capacity for all biota
- Best to have wild salmon maintain the marine-terrestrial-marine nutrient cycle

Wild Salmon – help maintain the marine-terrestrial-marine nutrient cycle

- Grow big in ocean
- Millions of adults allowed to
- Spawn, die, and fertilize
- Thousands of natal streams

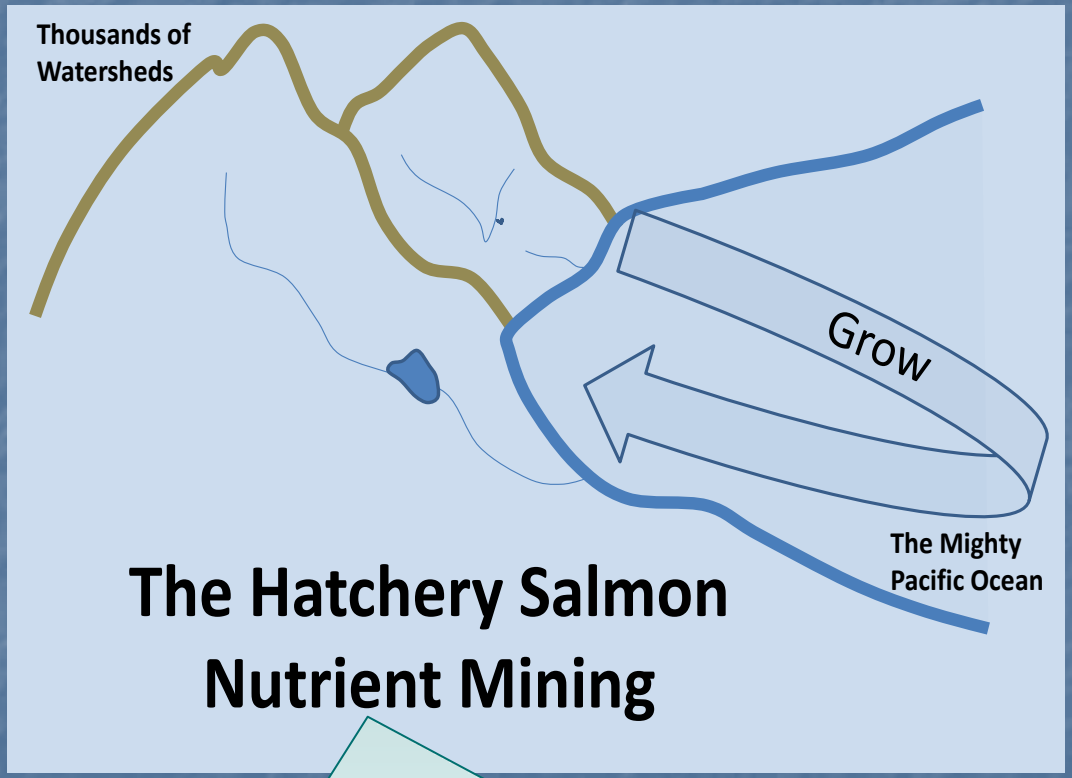


The Wild Salmon Marine-Terrestrial-Marine Nutrient Cycle

An annual “investment” in the carrying capacity

Hatchery Salmon – erode the marine-terrestrial-marine nutrient cycle

- Also grow big in ocean
- But almost all adults
- Are harvested
- No "investment" in ecosystem productivity



Roughly 800 million pounds of salmon a year from the North Pacific

A Farming Analogy

At each harvest, nutrients taken up from the soil [ocean] by the growing crop [fish] are exported from the field [ocean] further depleting the productive capacity of the soil [ocean]

Δ must fertilize (like Wild spawners do)

two kinds of

It takes fish to make fish:

1) Spawners

and

2) Post-spawners

...and both of them wild

Nutrient Mining – unsustainable

- Percent hatchery run[a]
  - Japan - chum 100%, sockeye 100%
  - PWS – chum 73%, pink 78%
  - SEAK – chum 55%

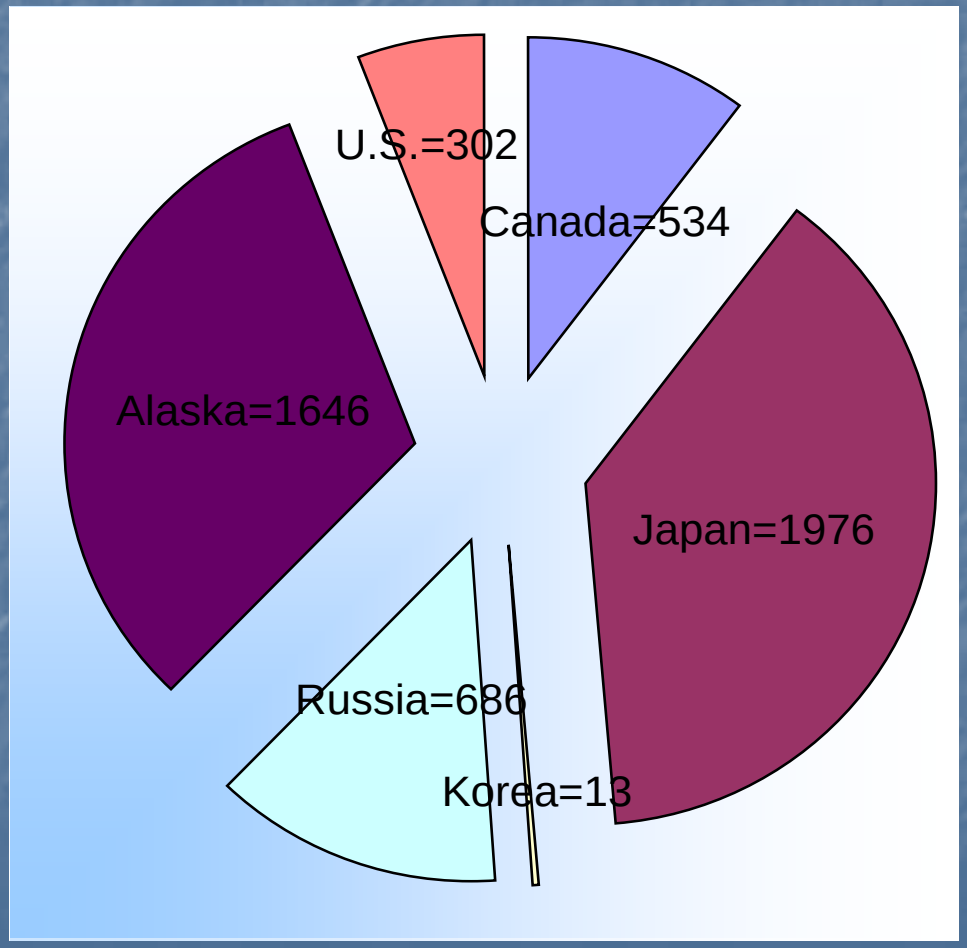
- The refrigerator experiment:
  - Keep taking food out
  - Without putting food in

    ...and see how long you're fat and happy

[a]*Rugerone et. al., 2010)*

Hatchery releases 5+ billion

(all species, millions)



From NPAFC statistical yearbook for 2004 (via. WEB 10/20/2008)

What if mega hatchery releases continue...

- Reduced ocean productivity
- Reduced fish production
- Reduced biodiversity, fitness
- Increased ecologic risk from
  - Hatchery problems
    - Water supply, disease outbreak, fitness
  - Global warming
- Fatter whales, thinner wallets

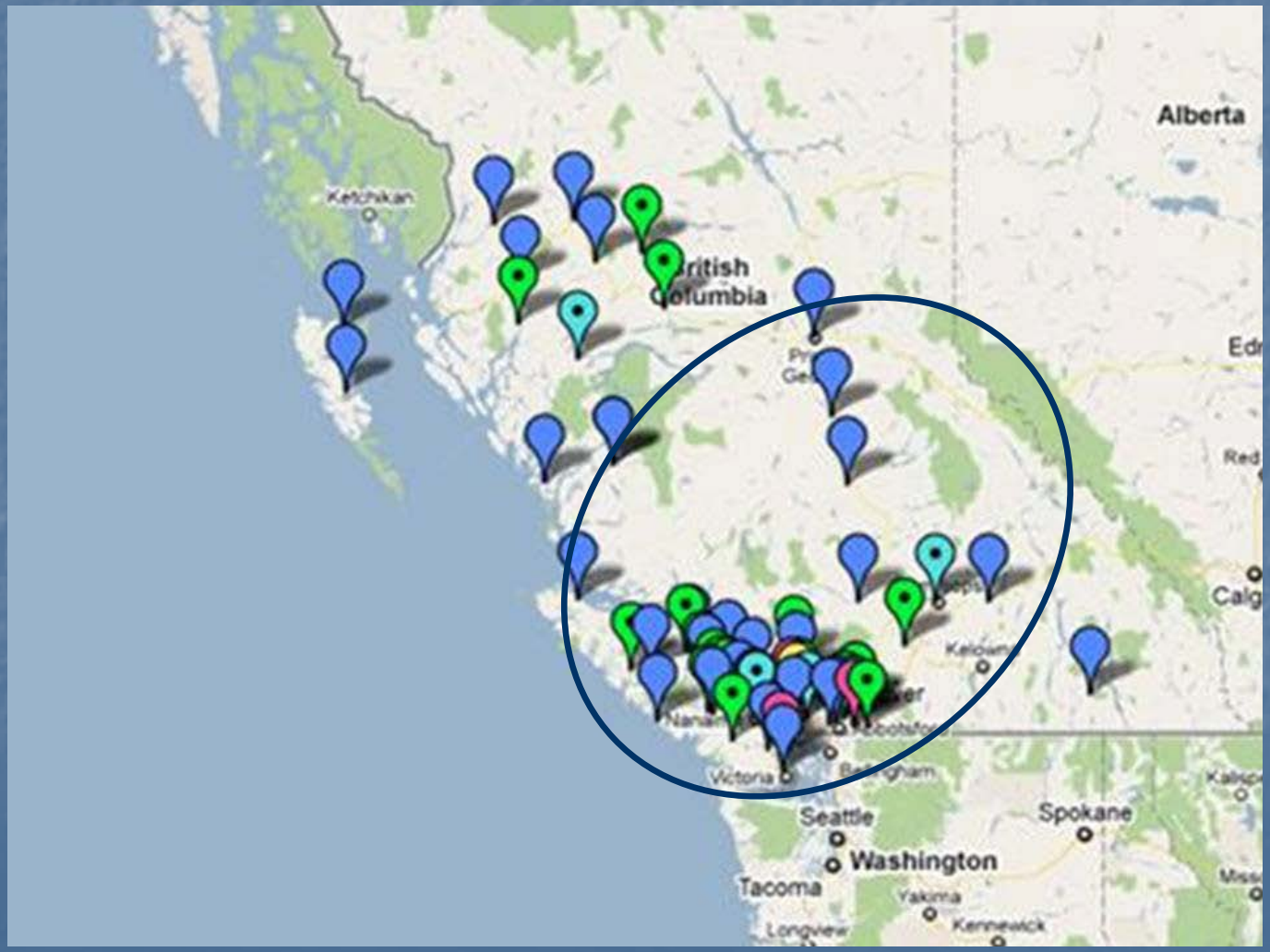
Can you prove it?

- It won’t be easy (kind of like proving that clear cut logging harms salmon production)
- But, it isn't natural, and you can’t do better than what happens Naturally.
- Easier than trying to prove that hatcheries “supplement rather than supplant” wild production
- since….

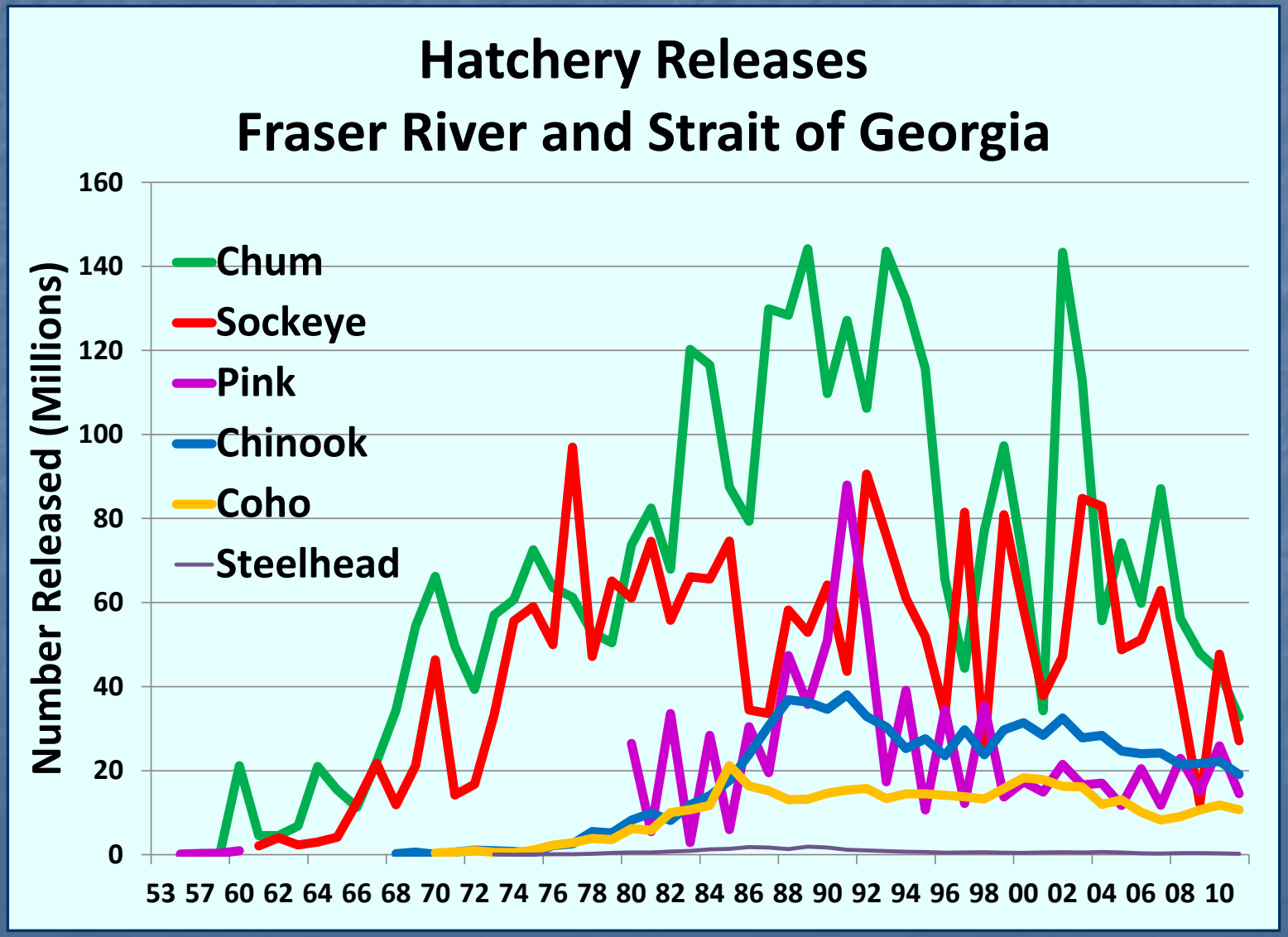
Where have there been big hatchery releases and not declining or depressed wild stocks?

- Columbia River – salmon, eulachon
- Fraser River/Strait of Georgia – salmon, herring, eulachon
- Southeast Alaska – salmon (wild and hatchery), herring, eulachon
- PWS – salmon, herring
- Japan, Russia

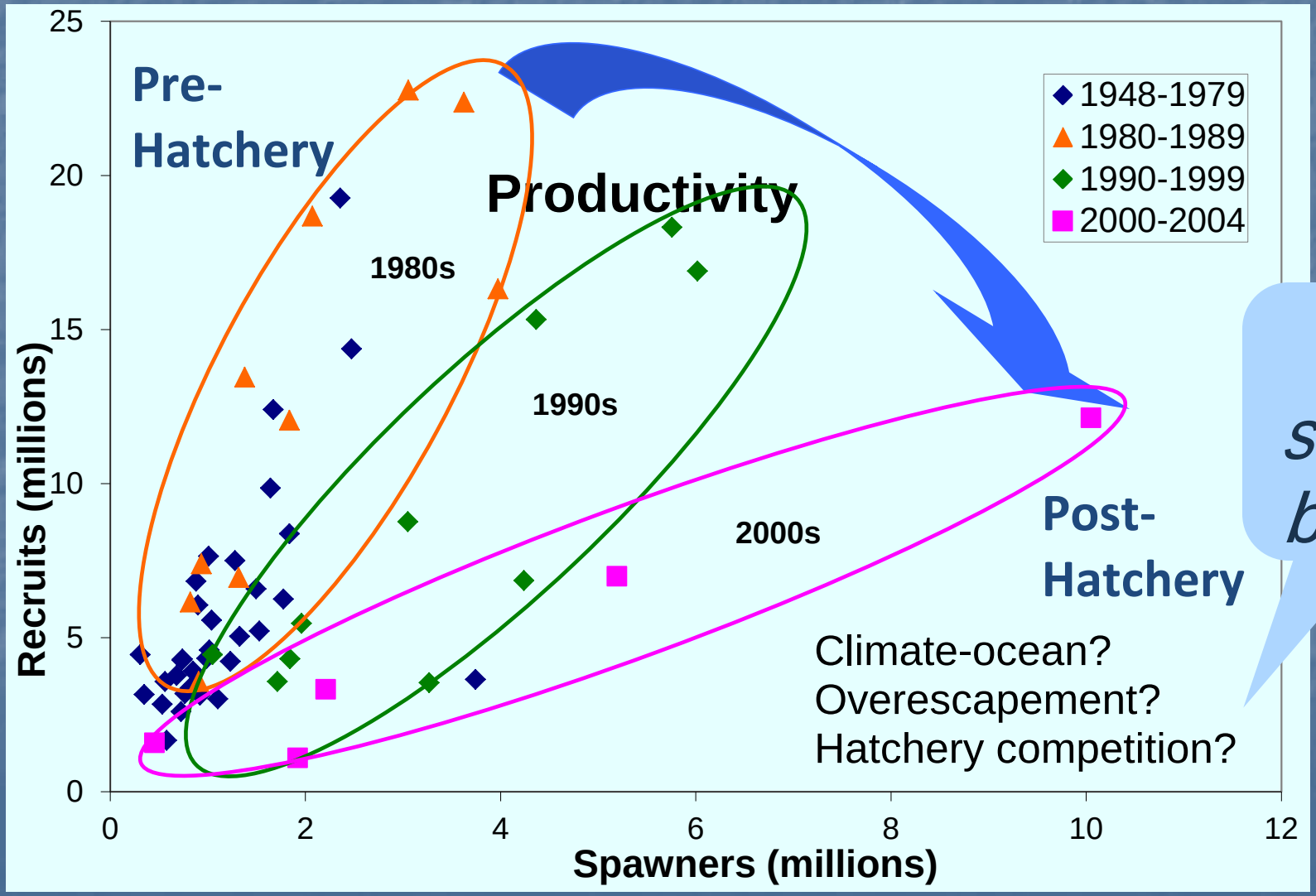
Hatcheries in the Fraser River and Strait of Georgia area



A 20-yr period of high releases

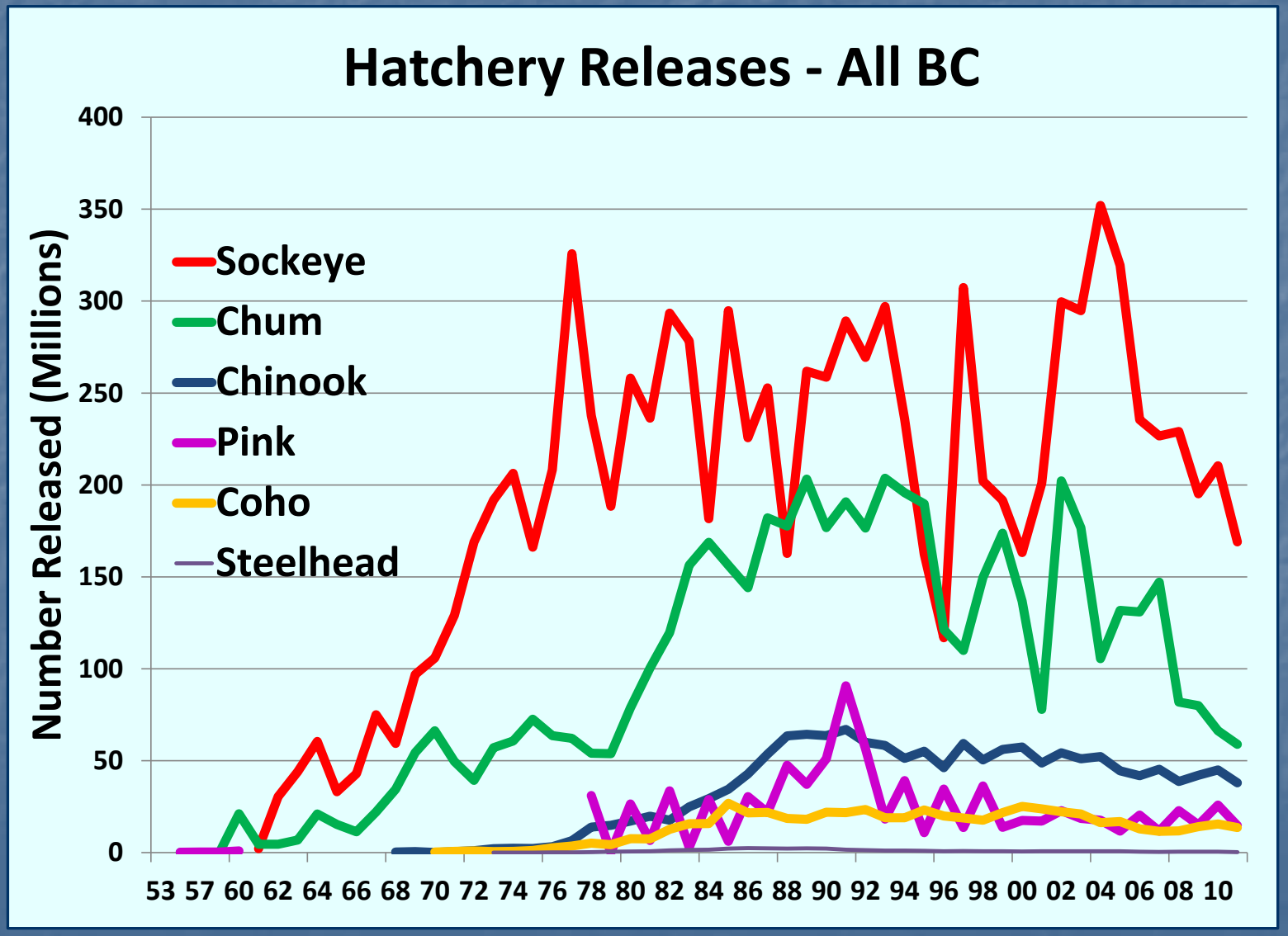


A hatchery induced regime shift for Fraser sockeye (and other spp.)?

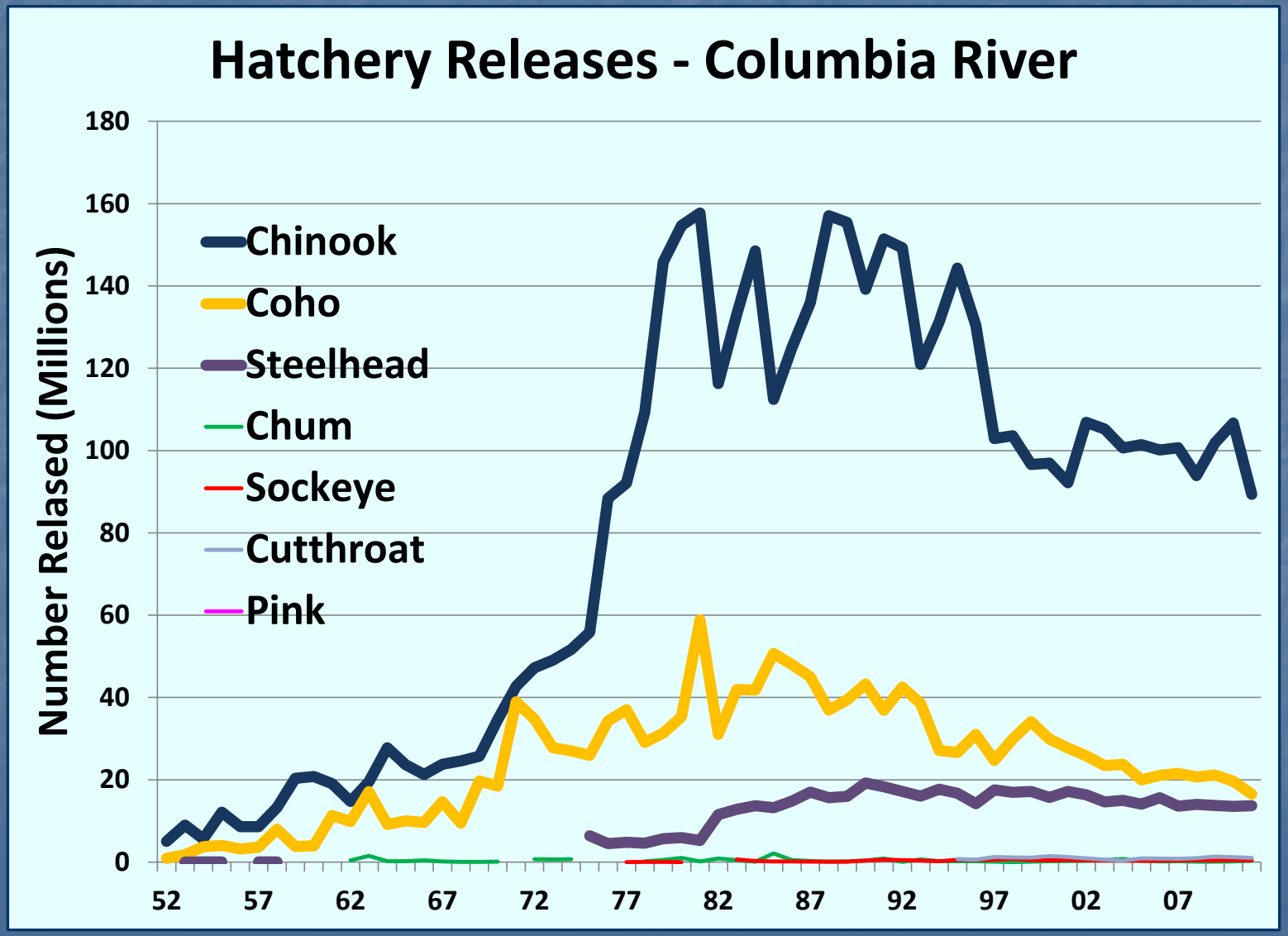


Now shifting back ☺

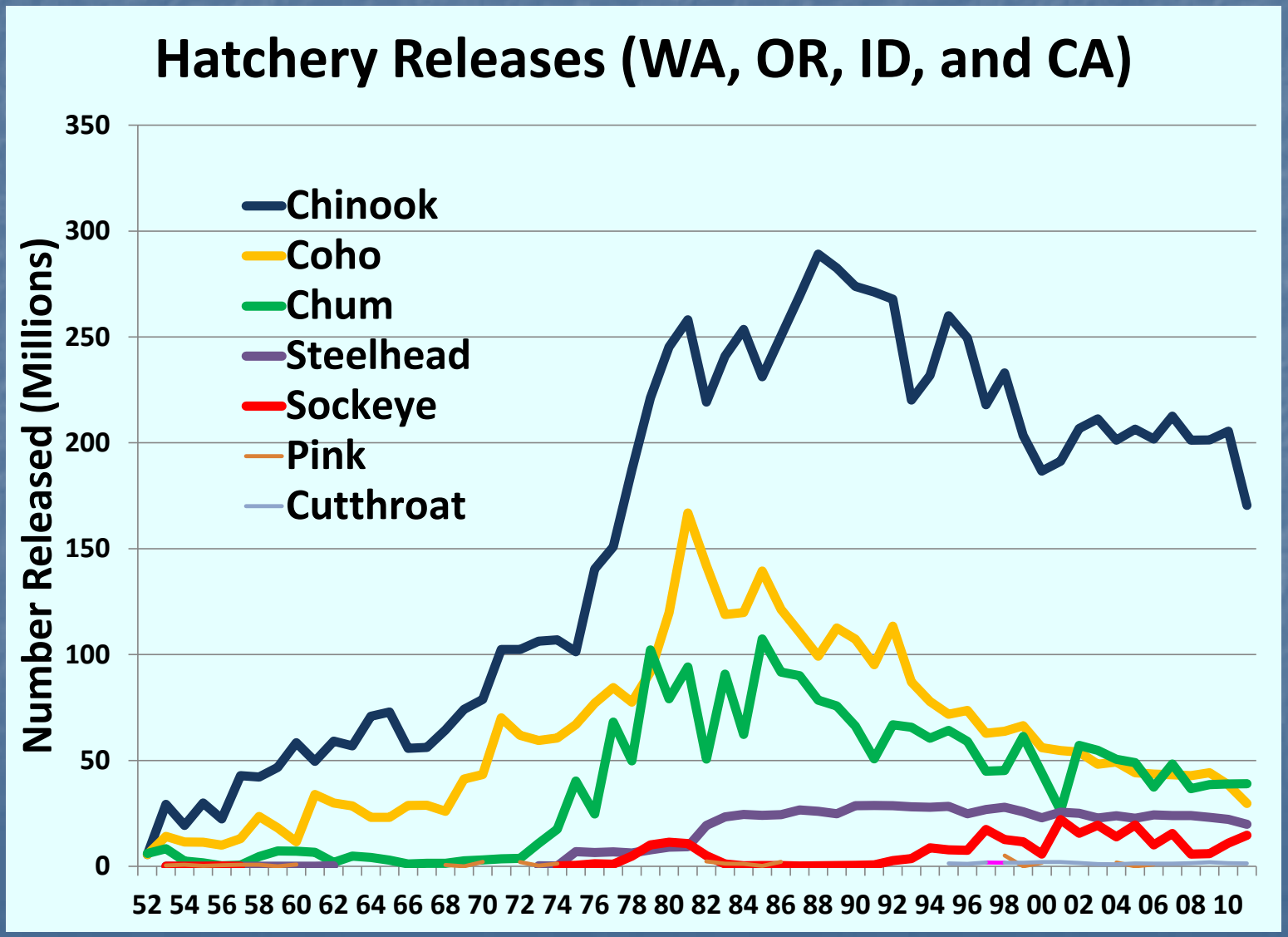
Declining releases in all of BC



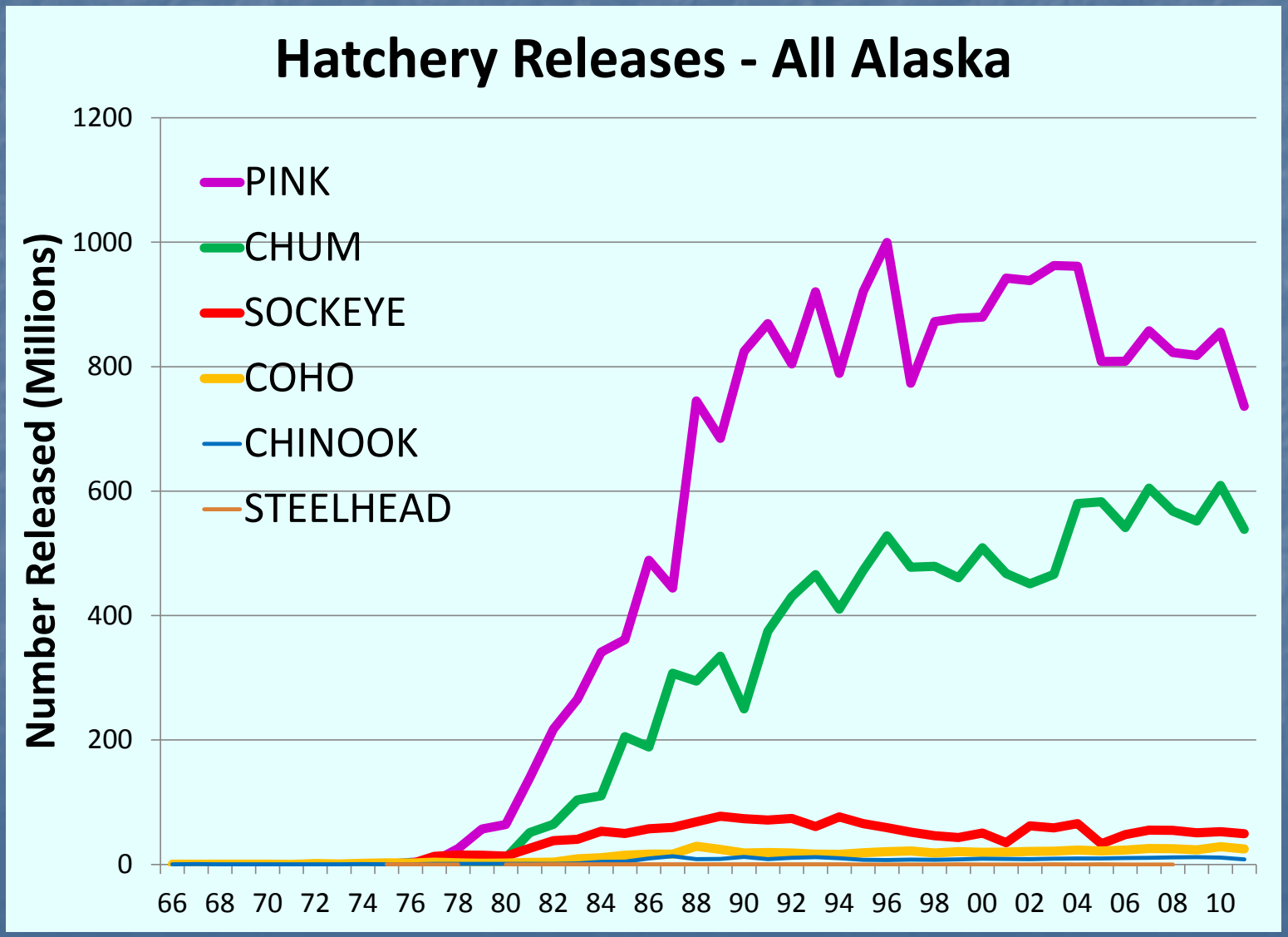
A healthy decline in releases – Col. R.



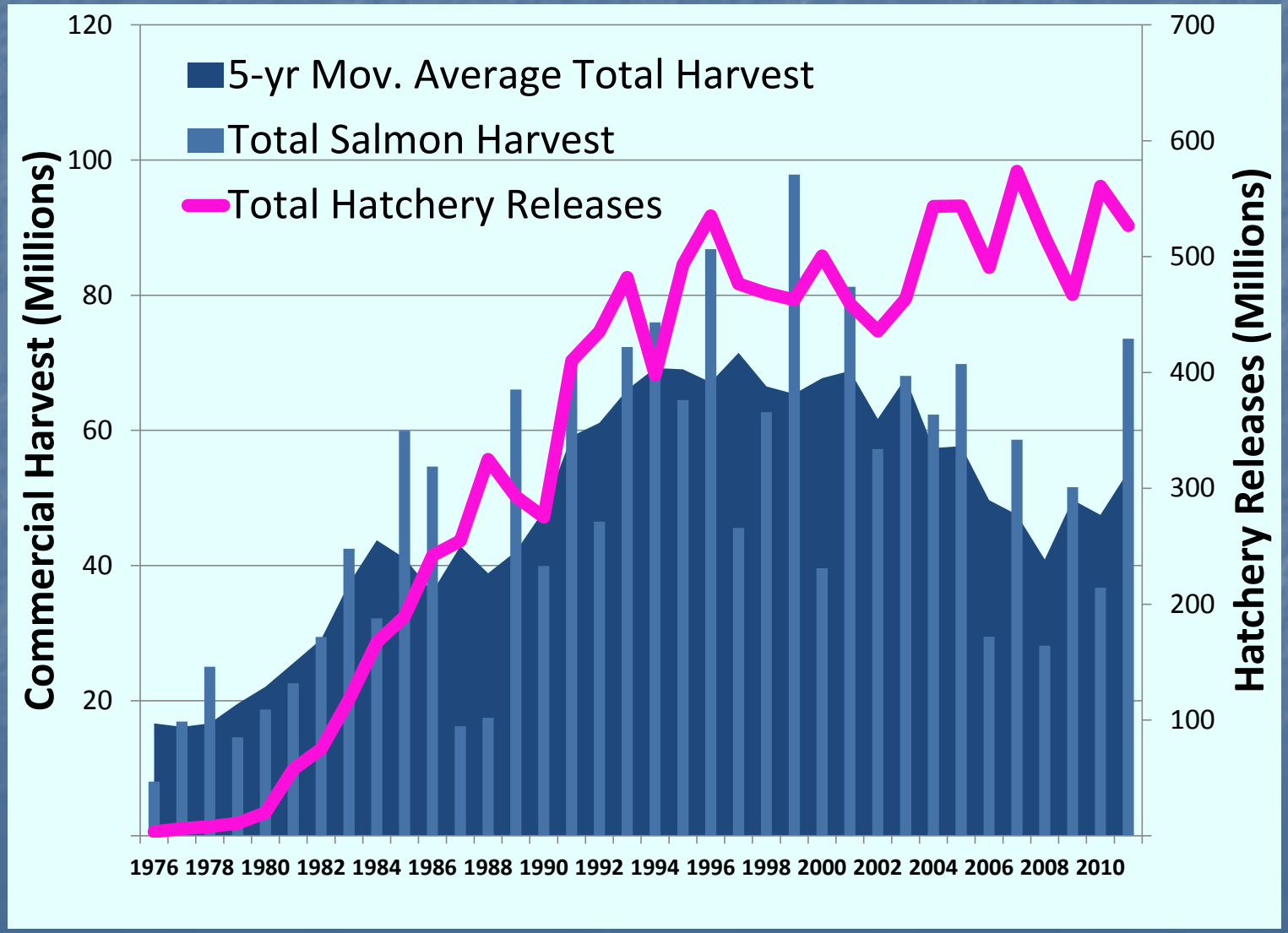
A healthy decline in releases in all U.S.



But not in Alaska (yet)

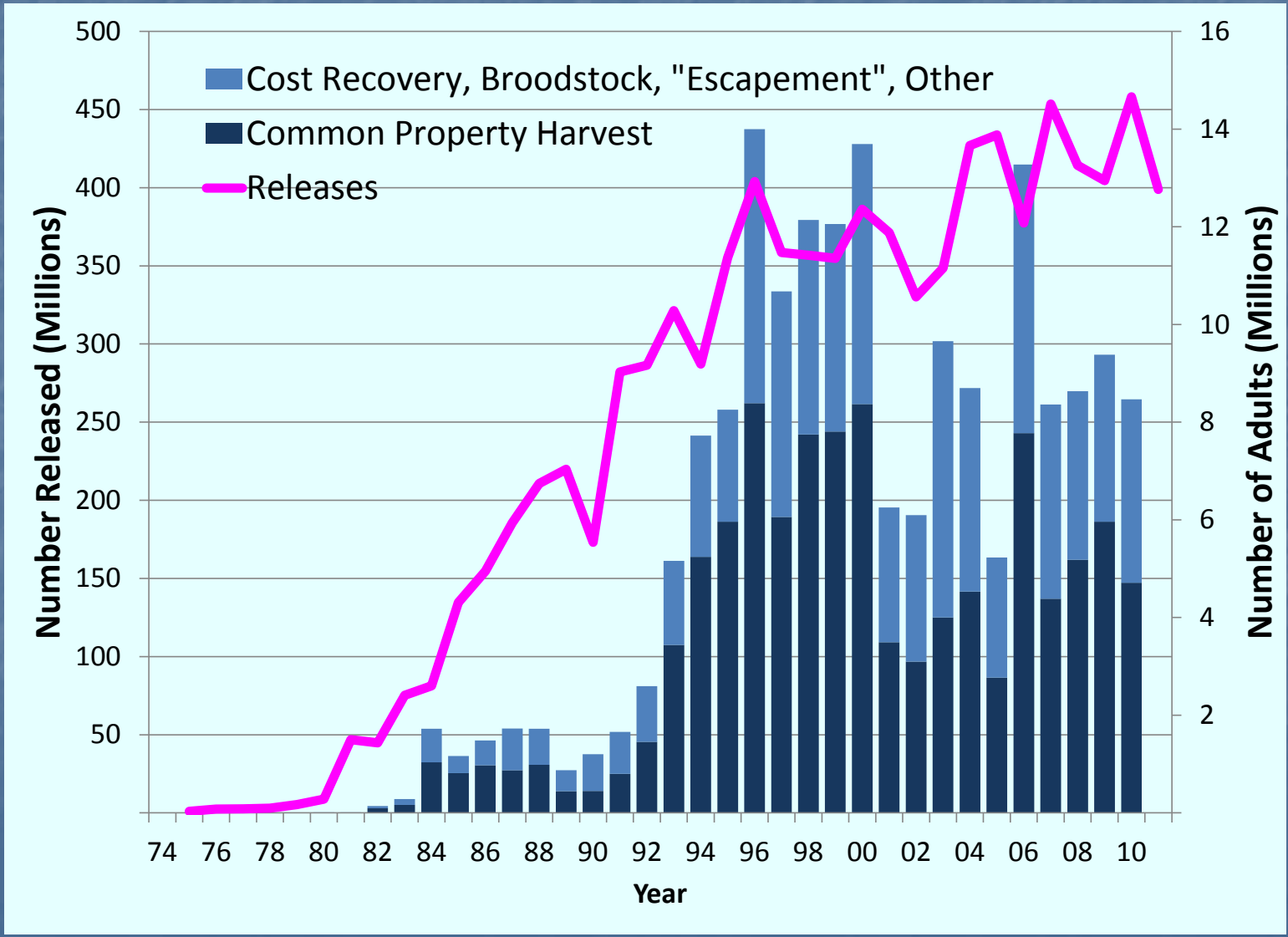


Hatchery Releases Up, Harvests Down in Southeast Alaska

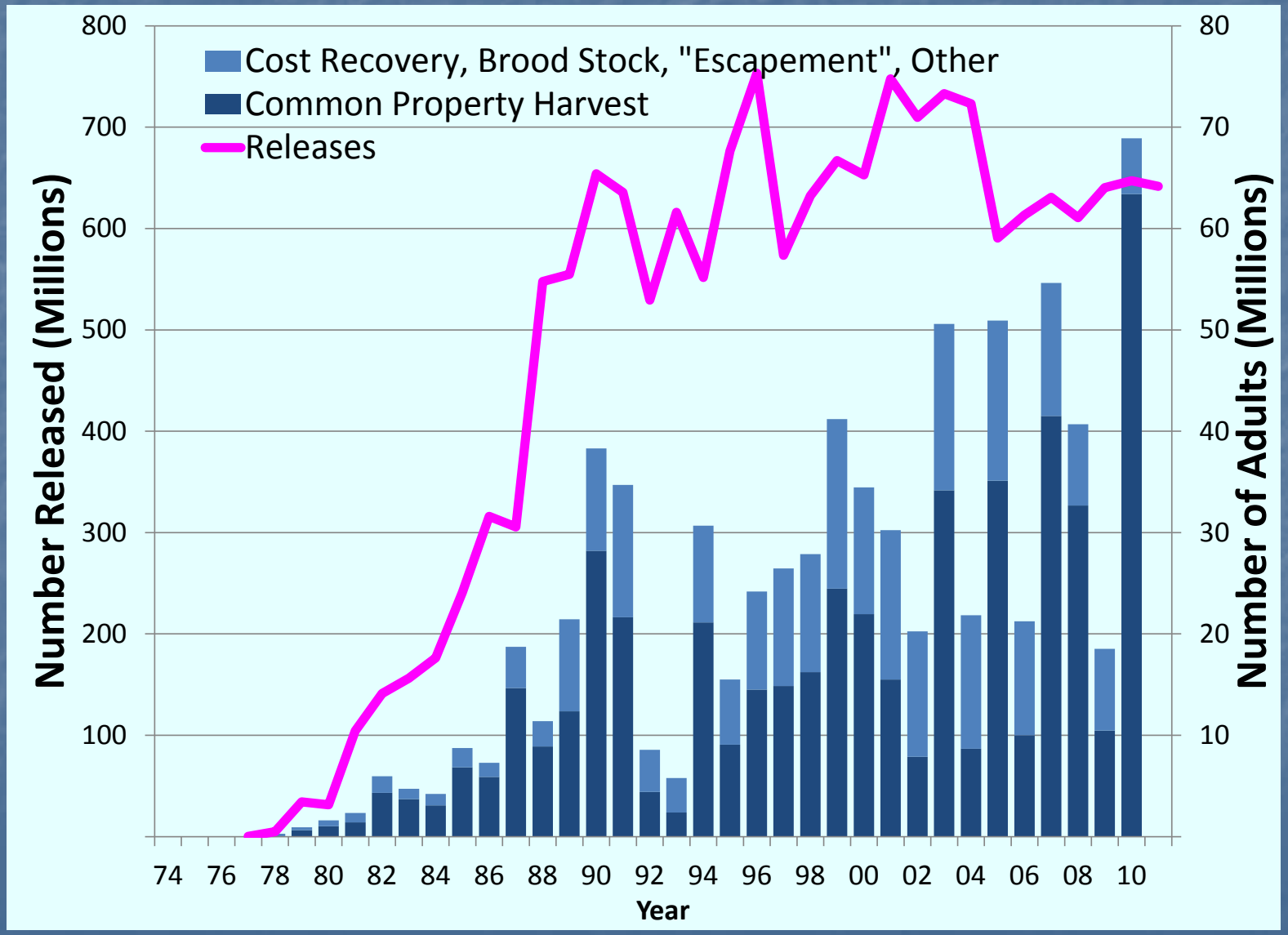


S.E. Alaska Hatchery Chum

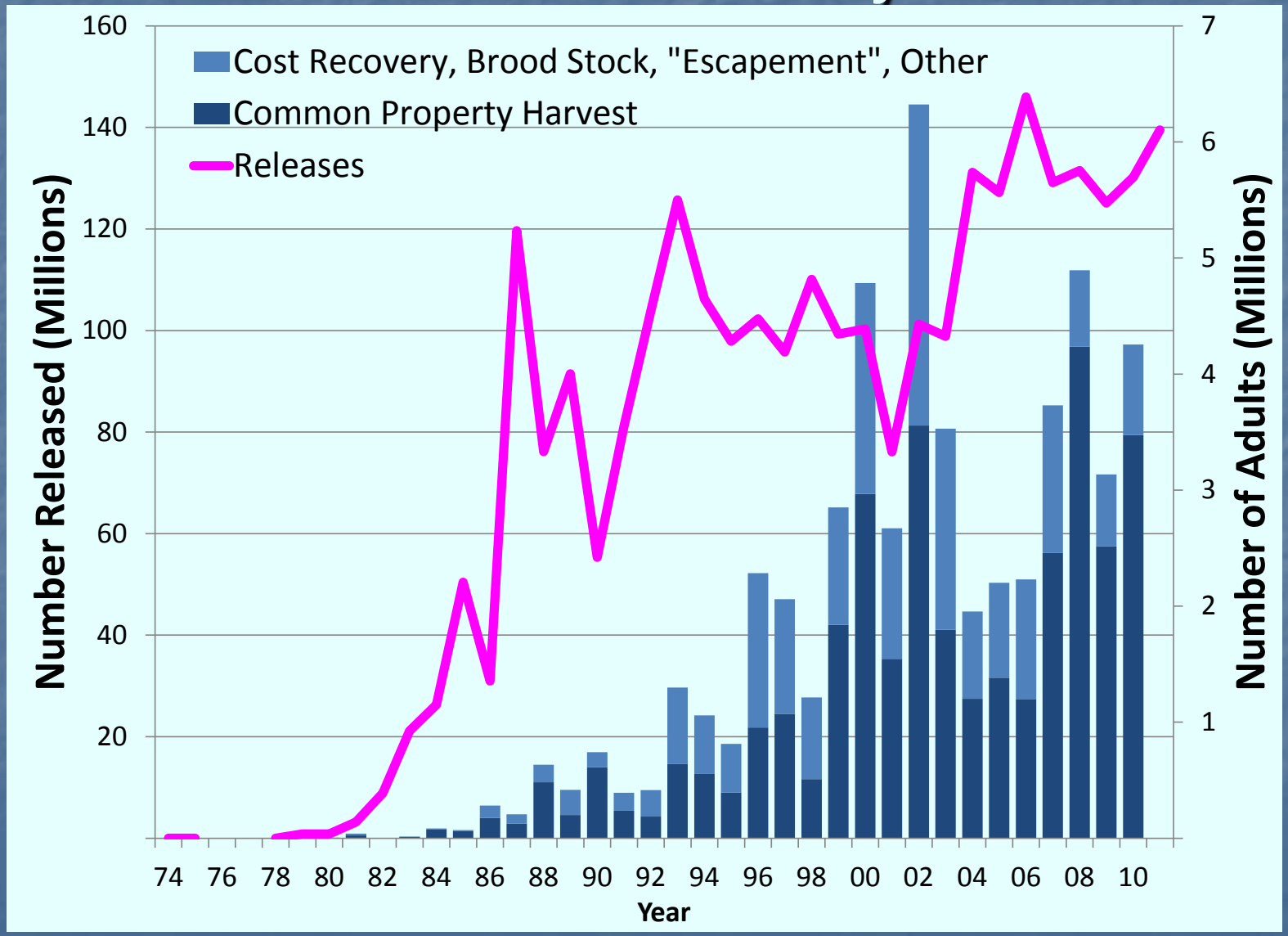
hatchery releases up, hatchery harvests down



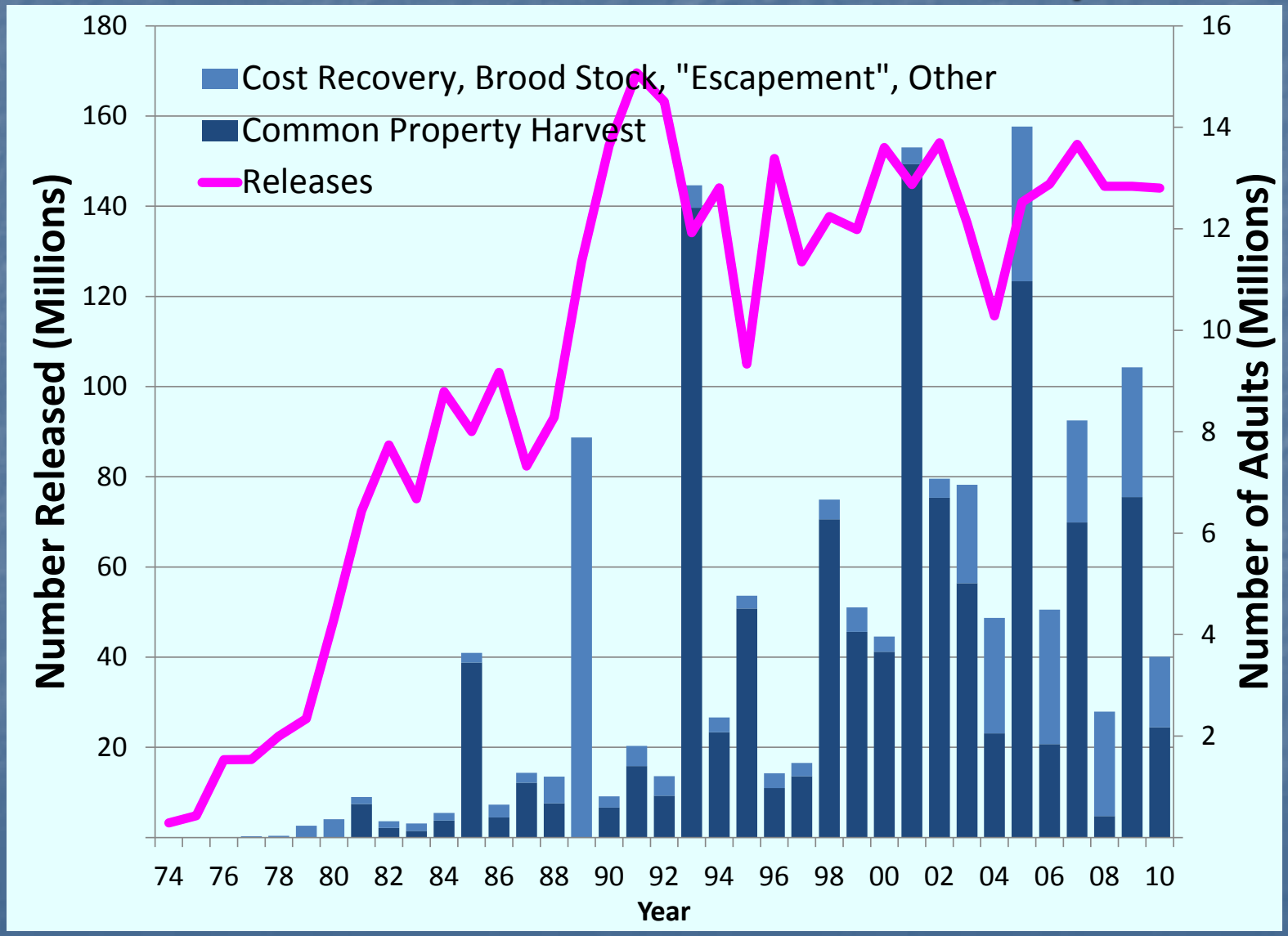
PWS Hatchery Pink – extreme variability around a carrying capacity threshold?



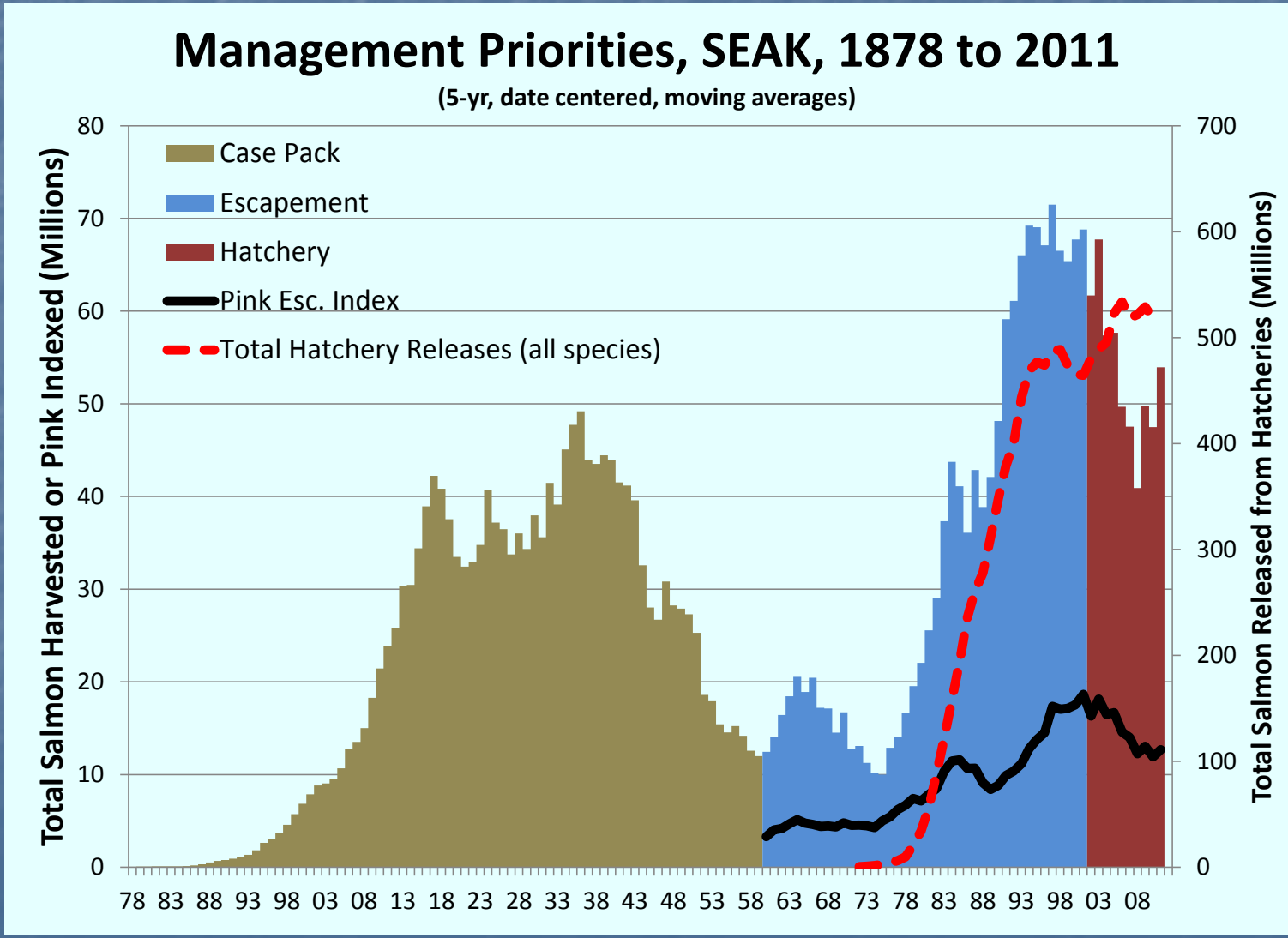
PWS Hatchery Chum
– threshold variability too?



Kodiak Hatchery Pink
– extreme threshold variability?



An industry-biology-industry shift in management priority?



The unsustainable problem

- Hatchery releases put wild and hatchery fish in direct competition for declining resources

They should call it "ocean farming"

The sustainable solution

- Moderate and minimize hatchery releases


Thanks for your carrying capacity!
Food for Thought: Why release annuals when you can grow perennials?