

Prince William Sound hatchery salmon straying: Preliminary models.



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Outline

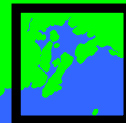
- PWS hatchery release history
- Threshold levels of stray fish
- Pink salmon Model
- Chum salmon Model
- Conclusions

Alaska

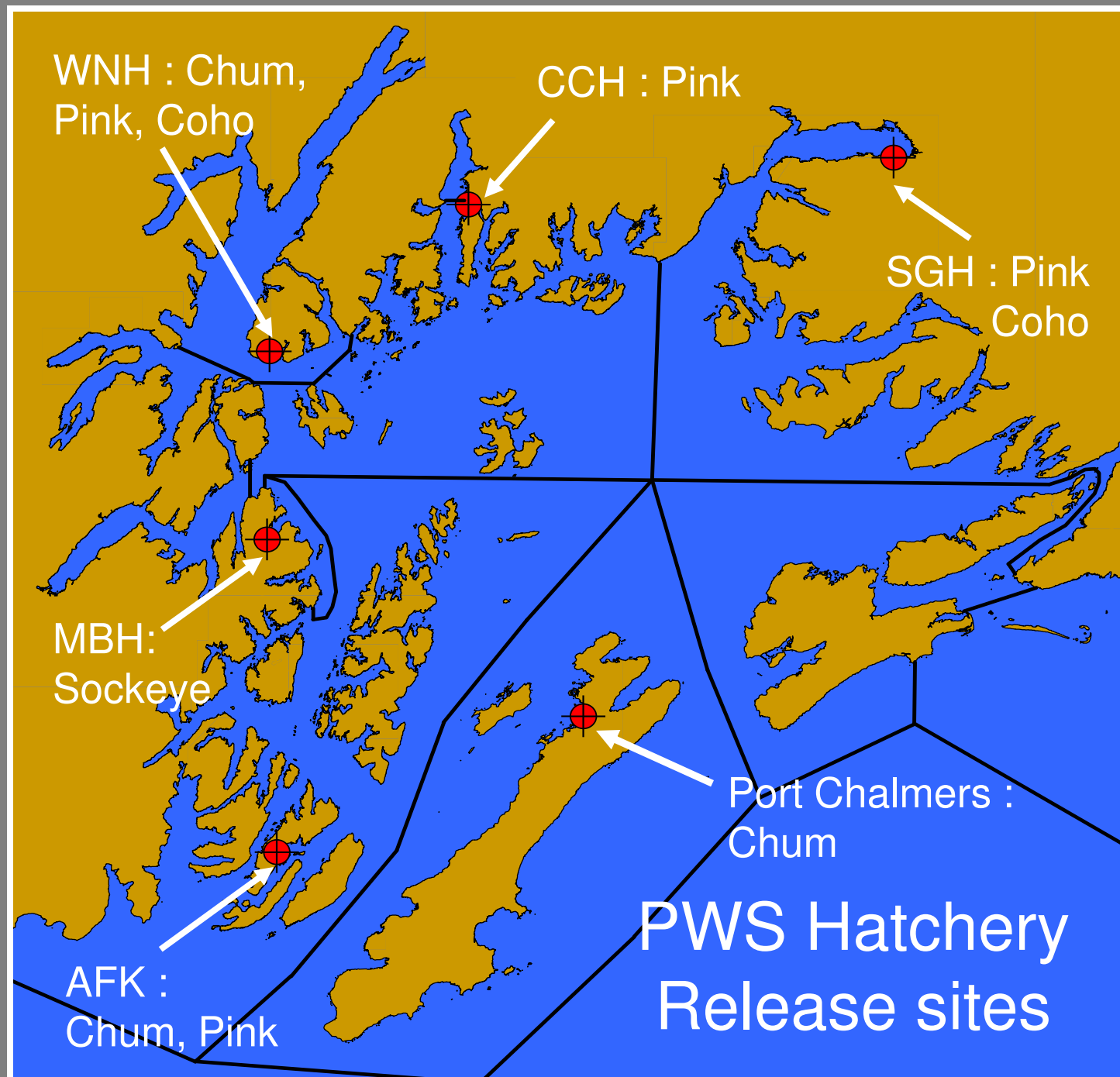
Fairbanks ✦

Anchorage ✦

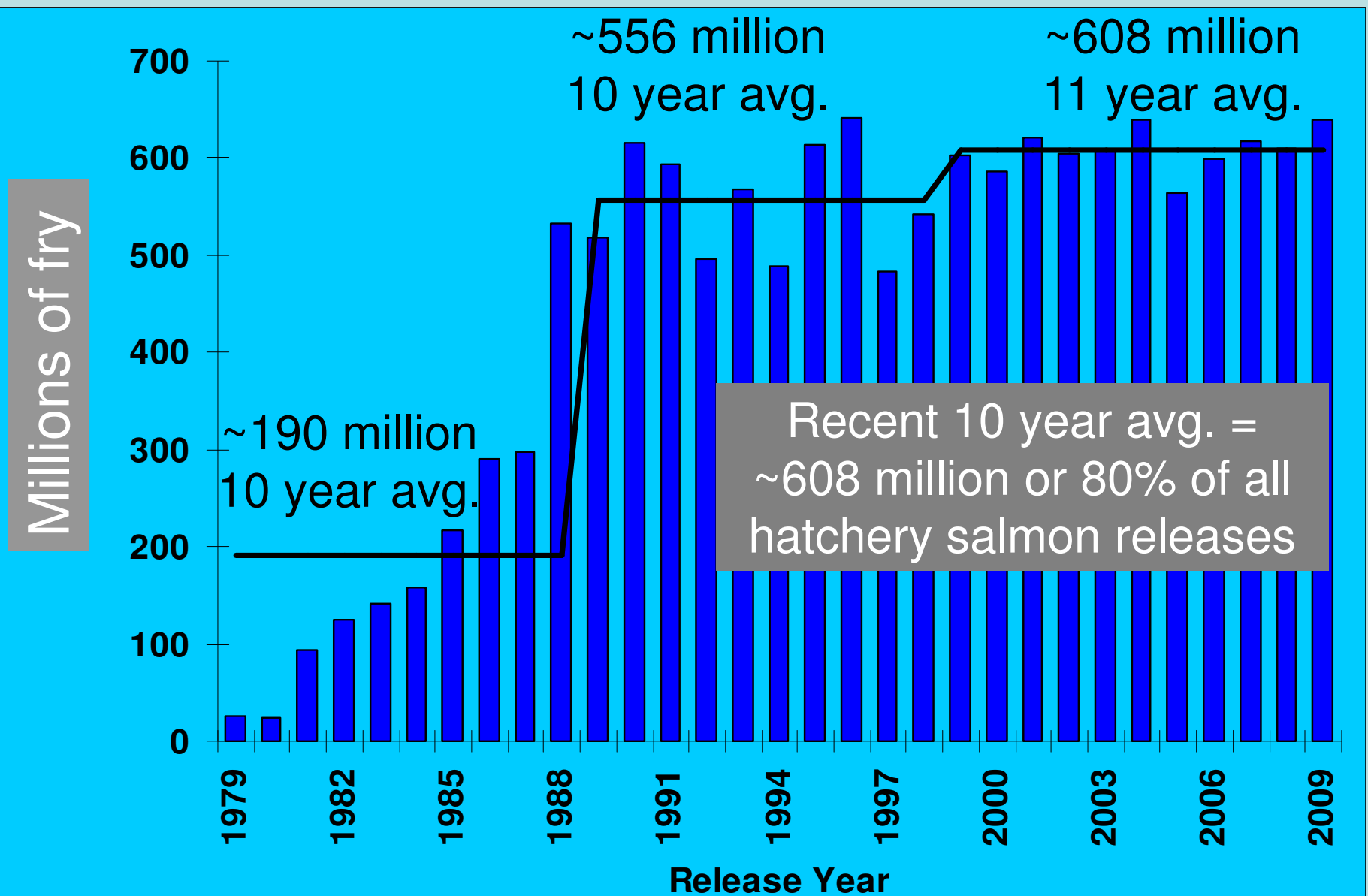
Juneau ✦



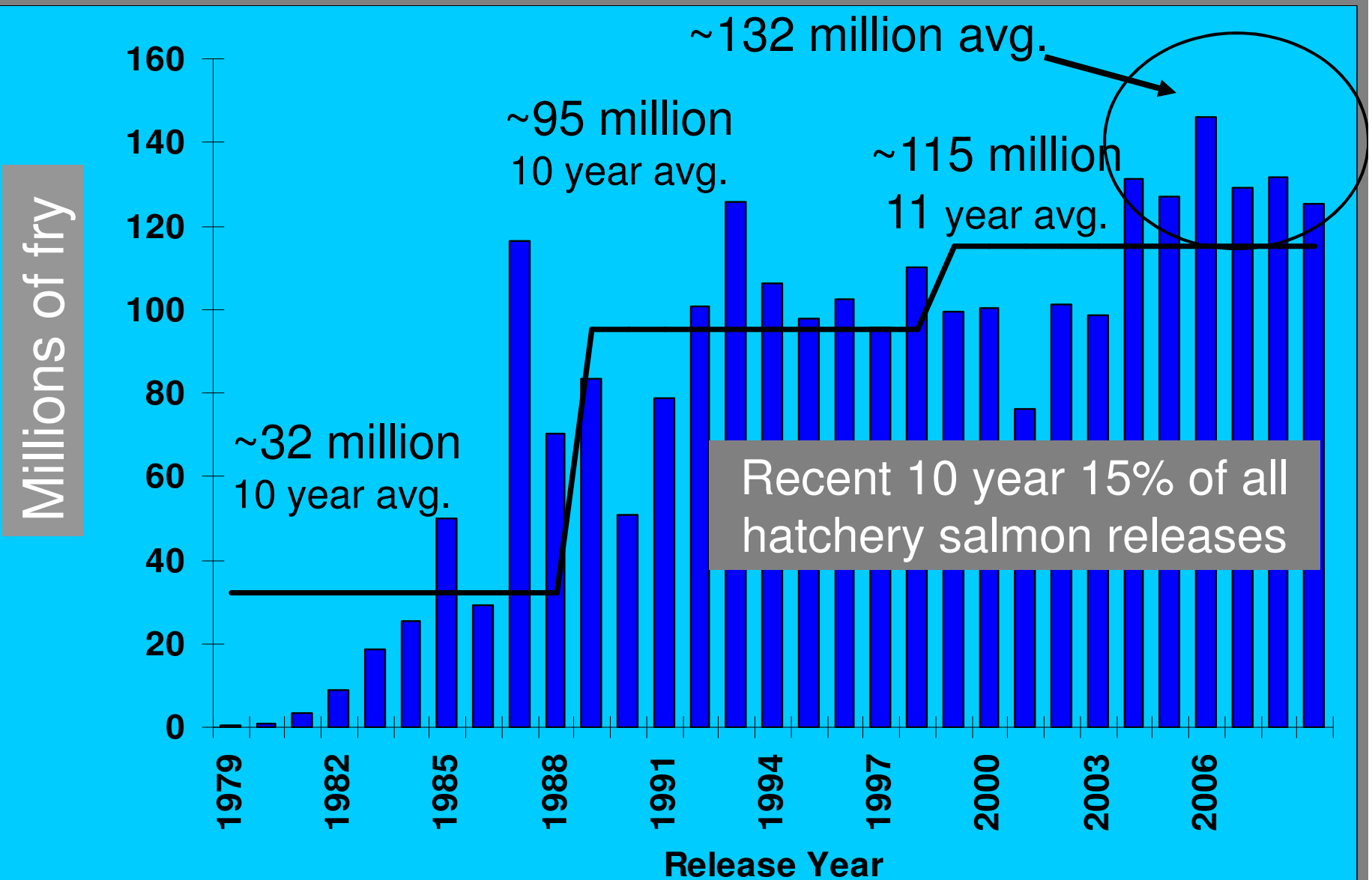
Prince William Sound

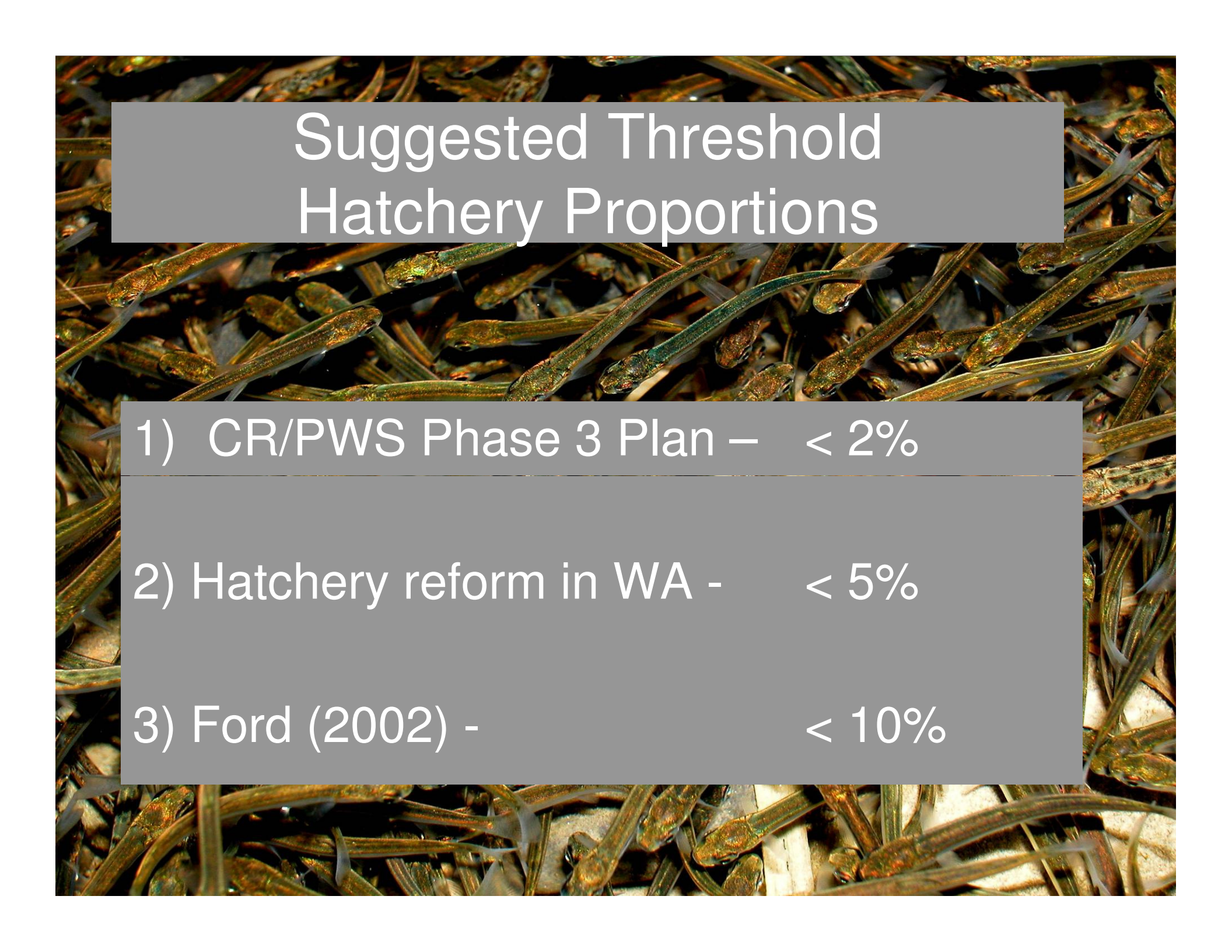


PWS hatchery pink salmon fry releases



PWS hatchery chum salmon fry releases



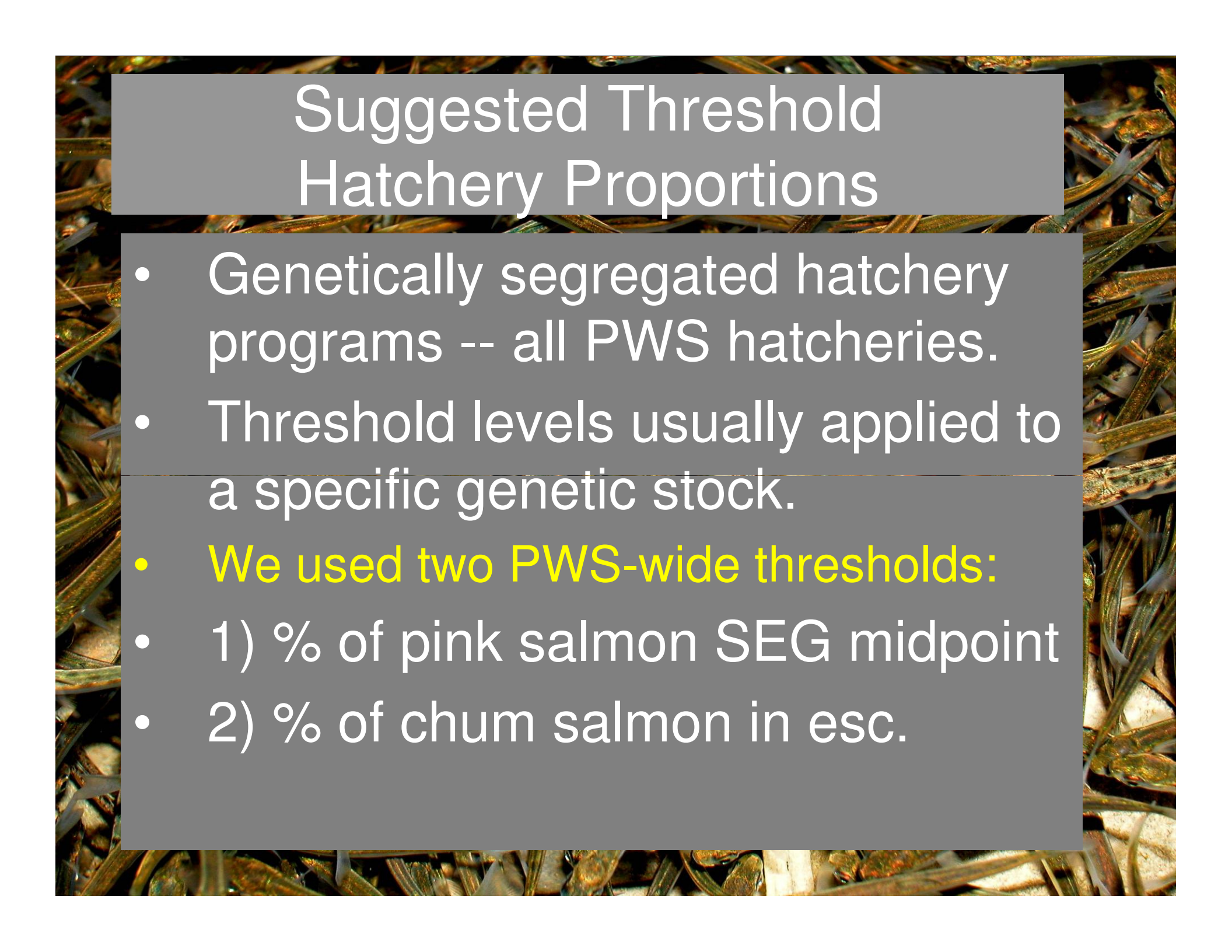


Suggested Threshold Hatchery Proportions

1) CR/PWS Phase 3 Plan – $< 2\%$

2) Hatchery reform in WA - $< 5\%$

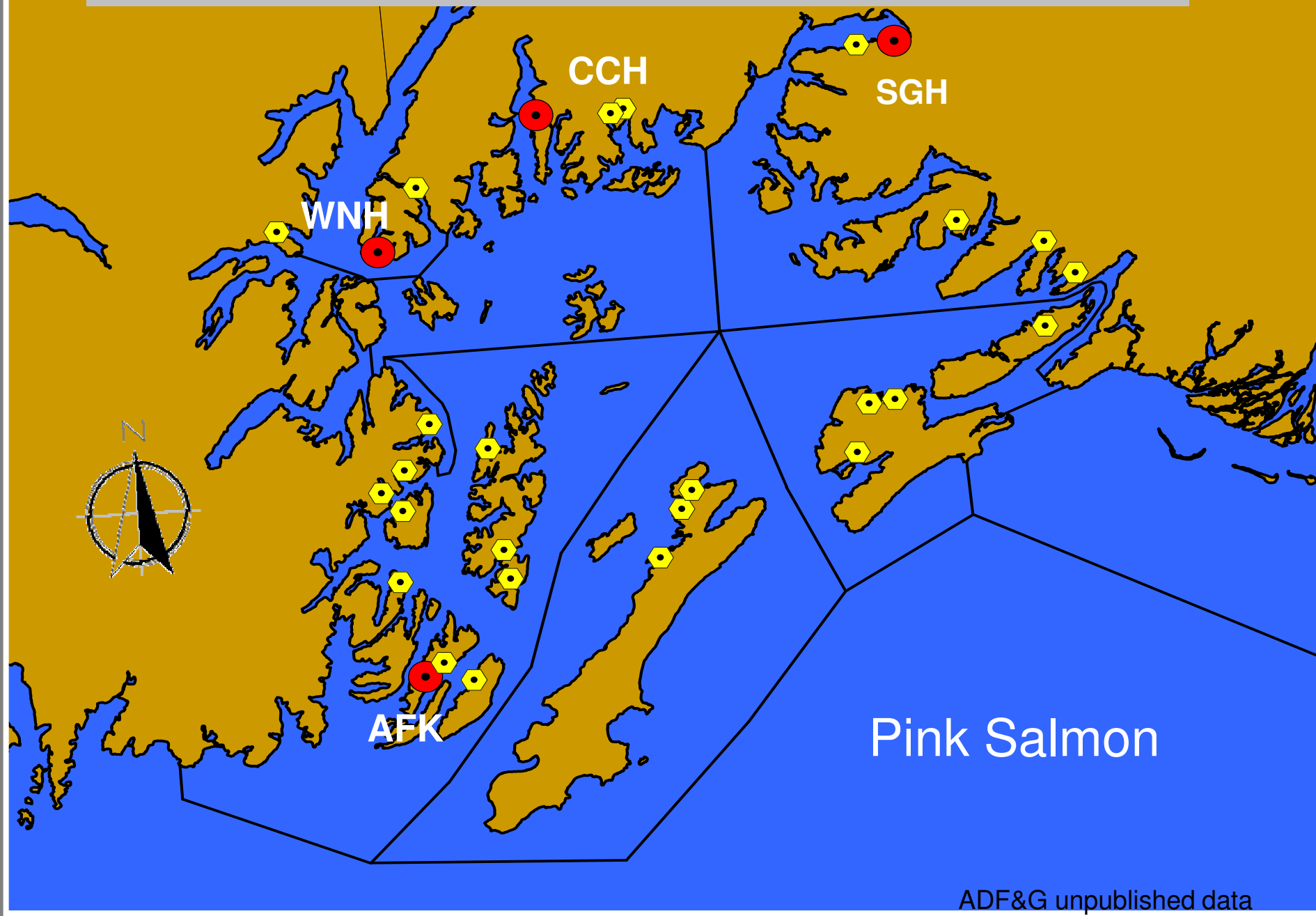
3) Ford (2002) - $< 10\%$

The background of the slide is a close-up photograph of salmon scales, showing their intricate, overlapping patterns and iridescent colors ranging from gold to green.

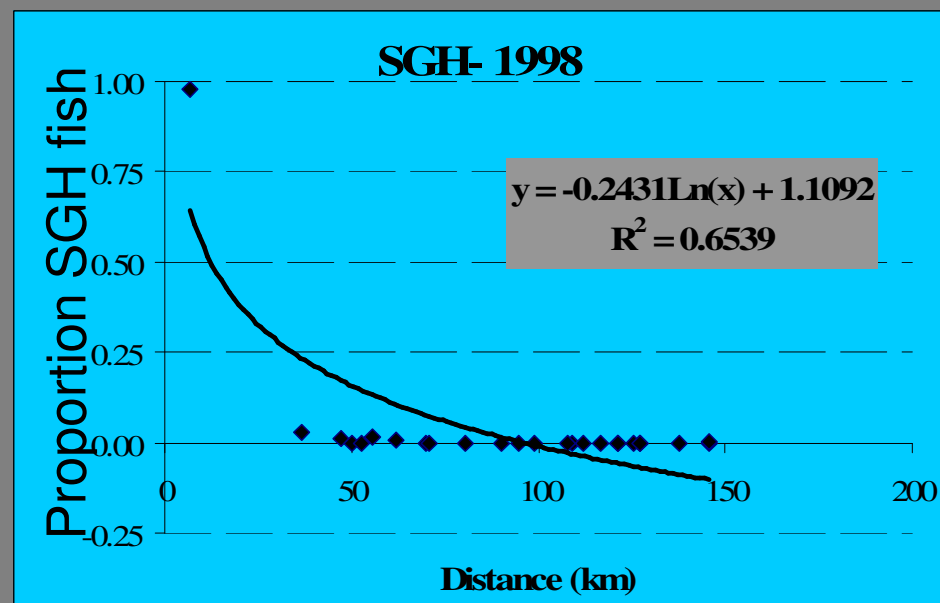
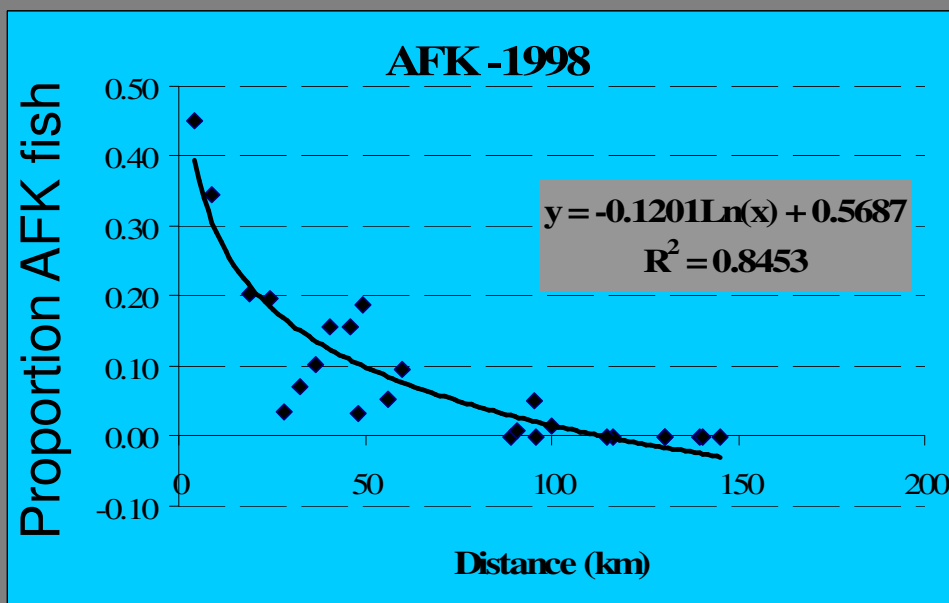
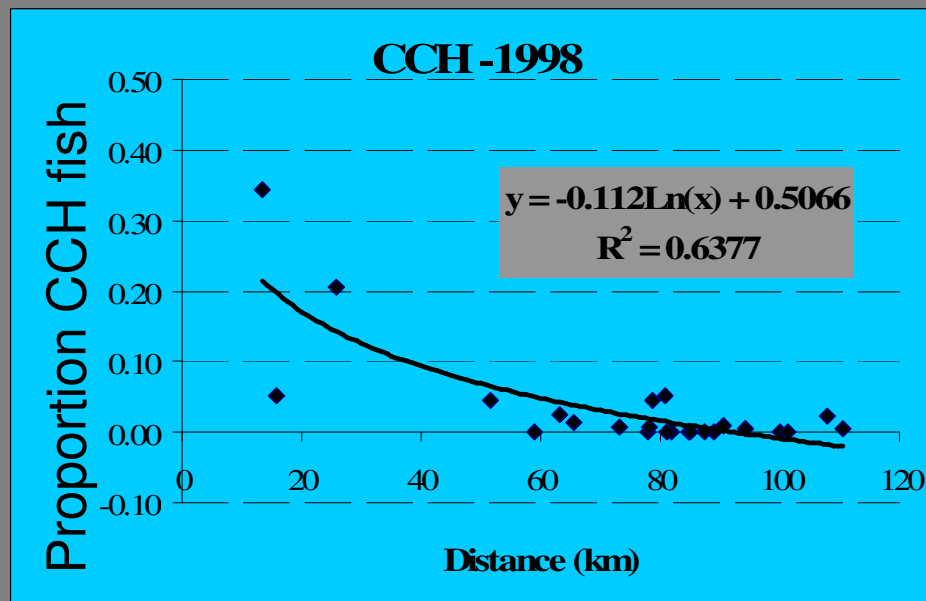
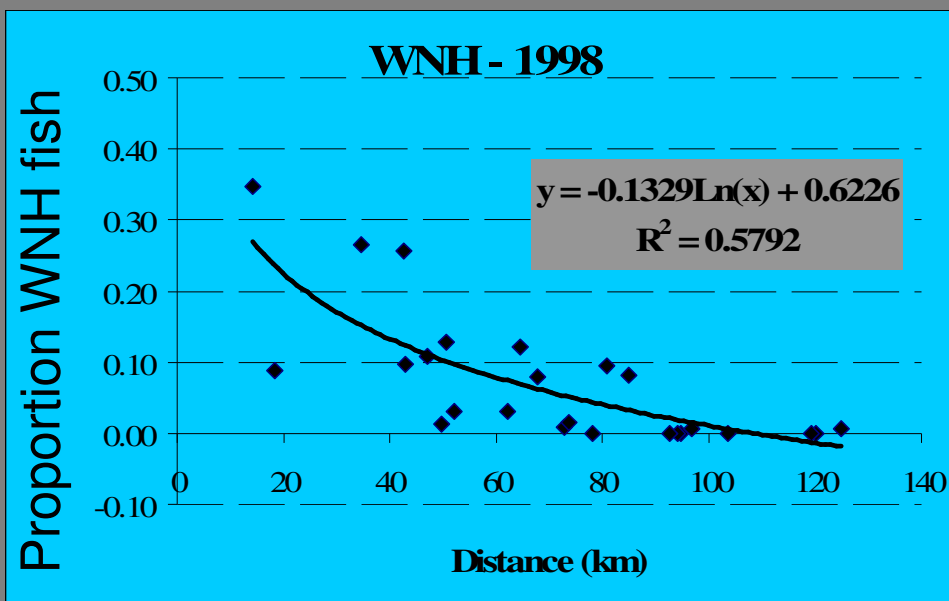
Suggested Threshold Hatchery Proportions

- Genetically segregated hatchery programs -- all PWS hatcheries.
- Threshold levels usually applied to a specific genetic stock.
- We used two PWS-wide thresholds:
 - 1) % of pink salmon SEG midpoint
 - 2) % of chum salmon in esc.

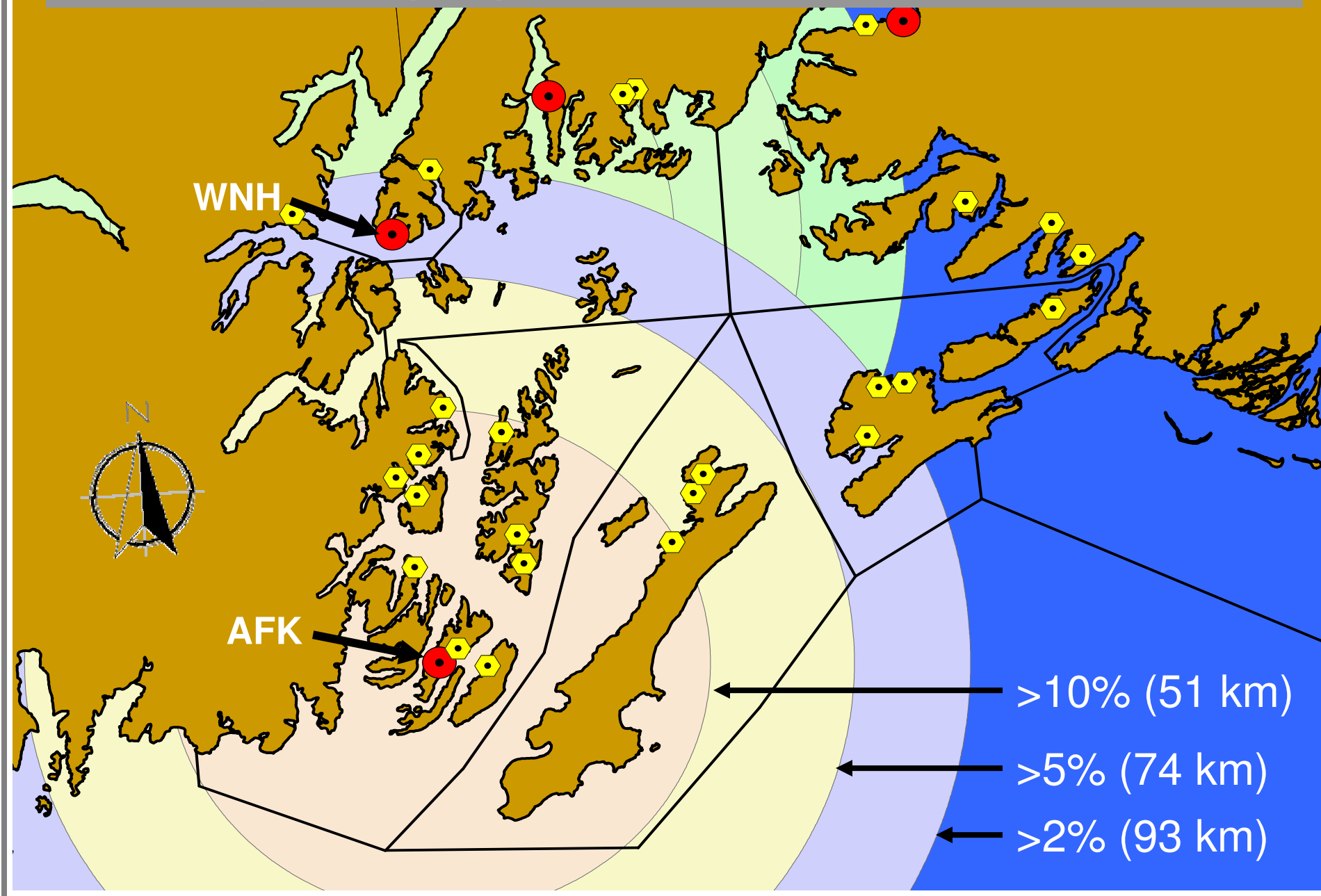
1998 Straying Study Streams (n = 25)



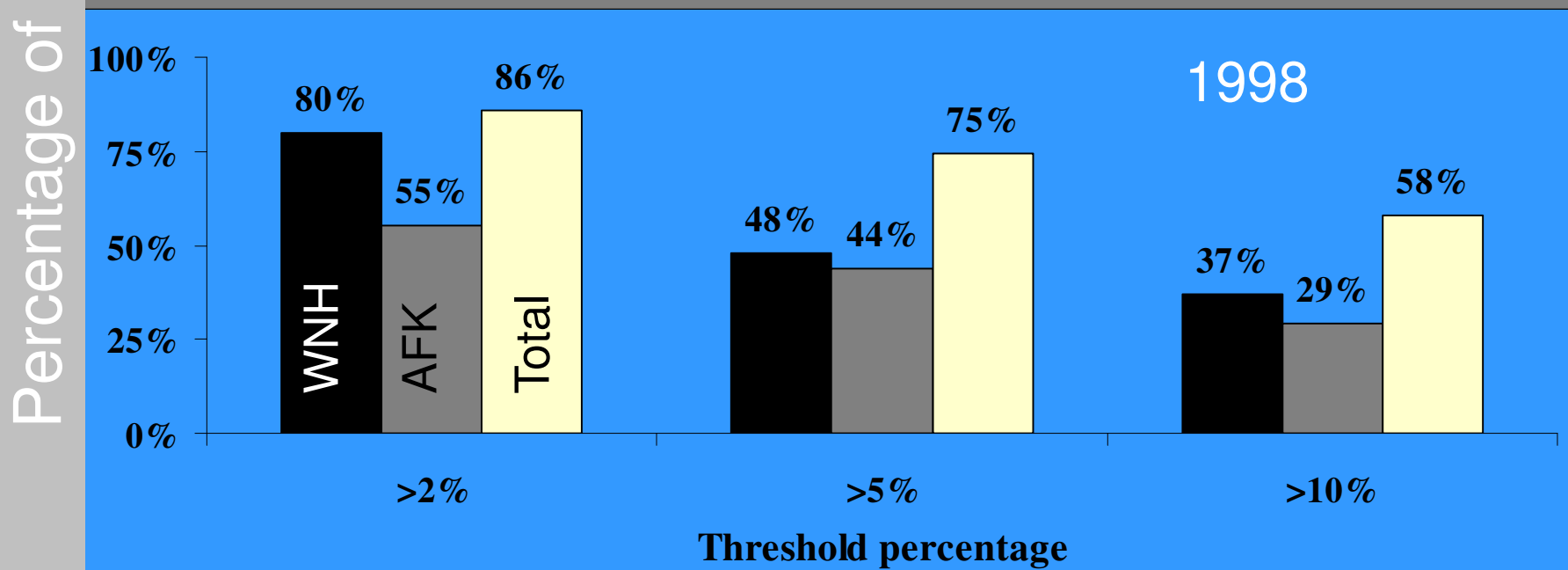
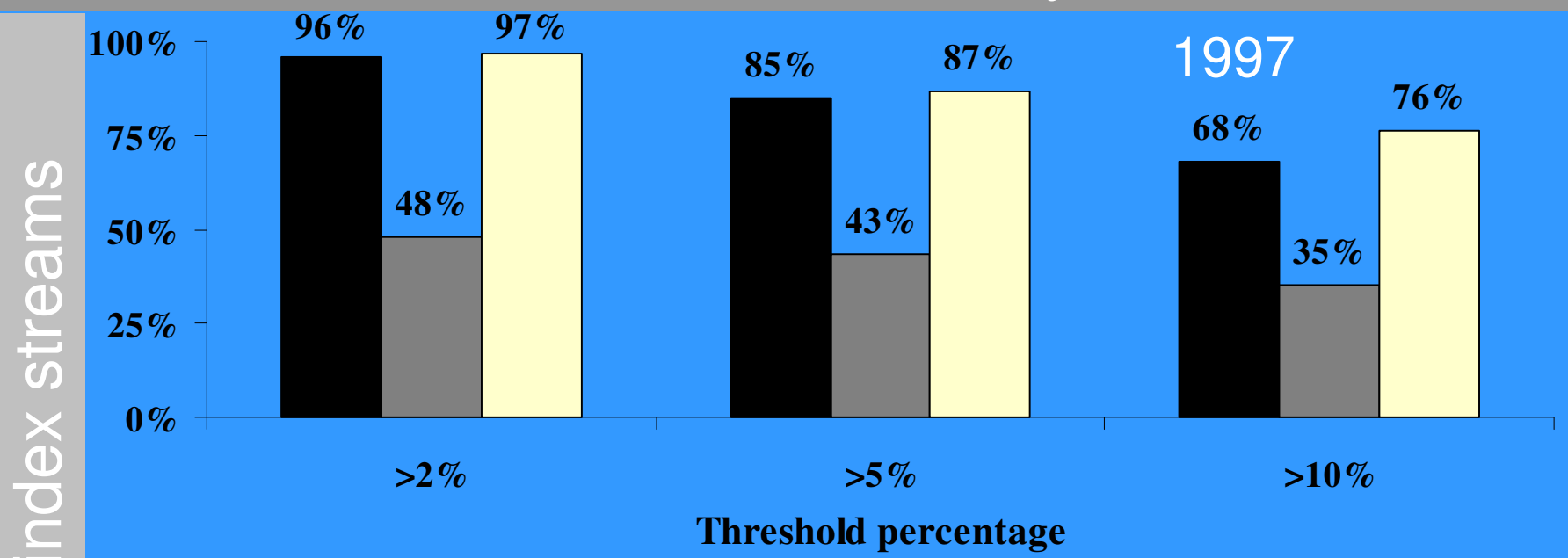
Hatchery prop. vs. distance, 1998



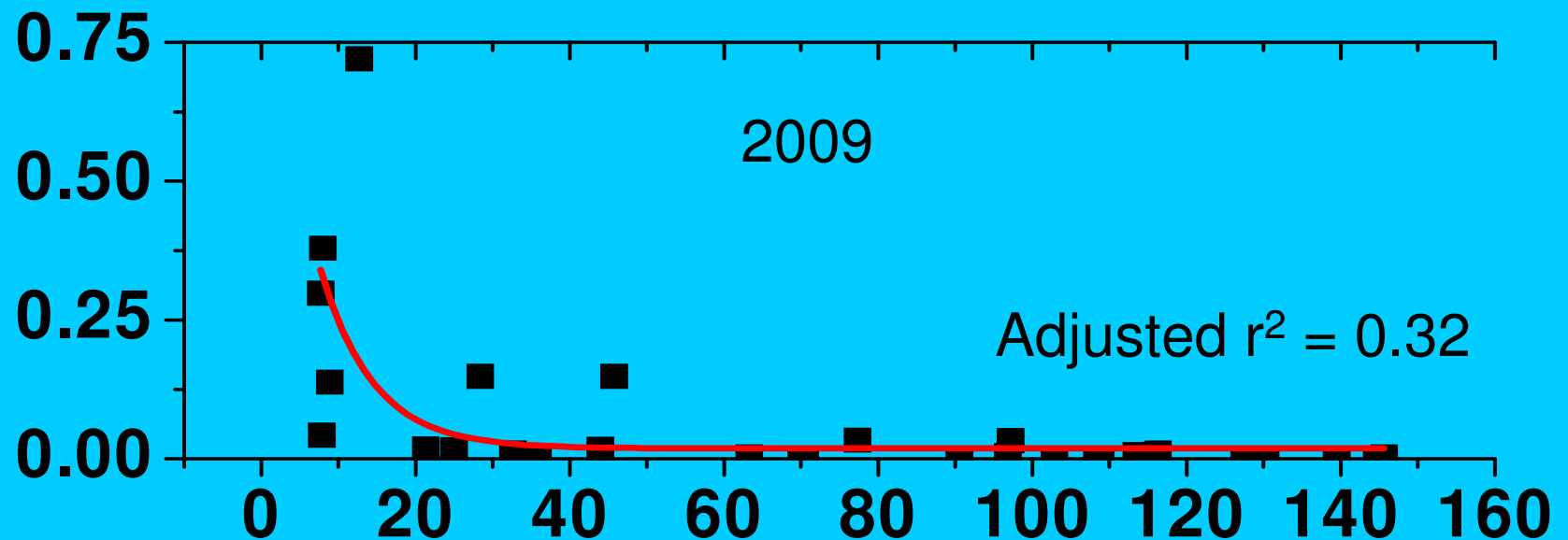
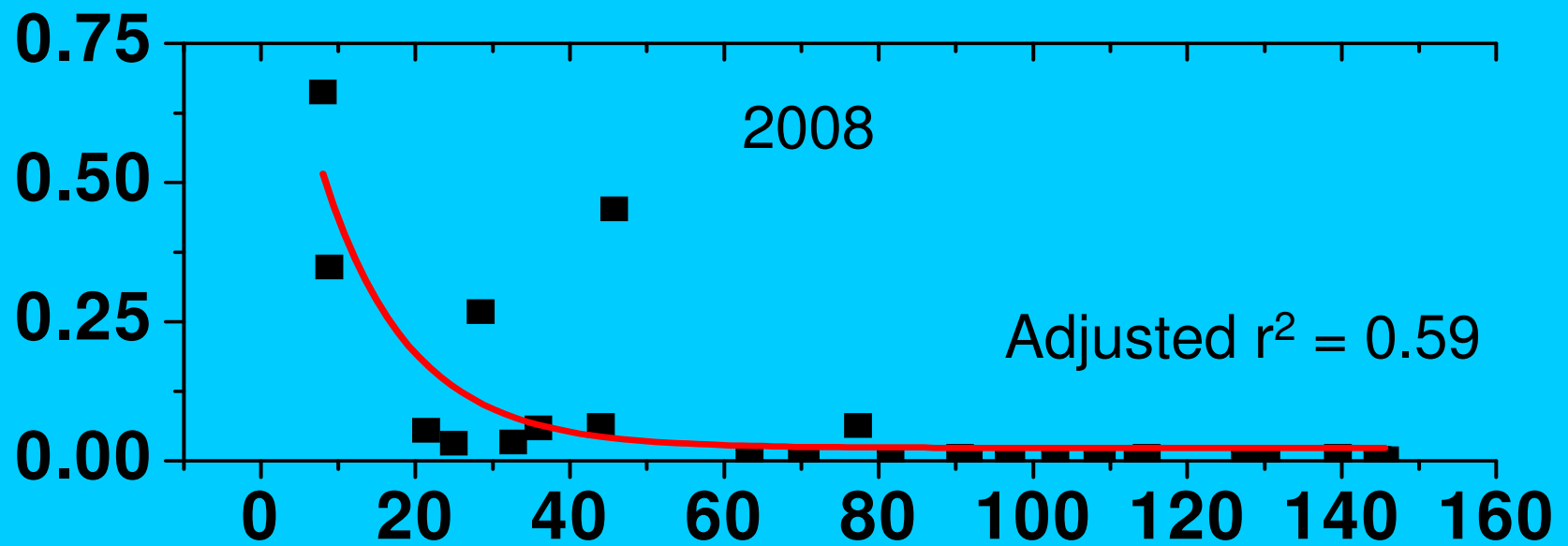
Log fit – proportion vs. distance, 1998



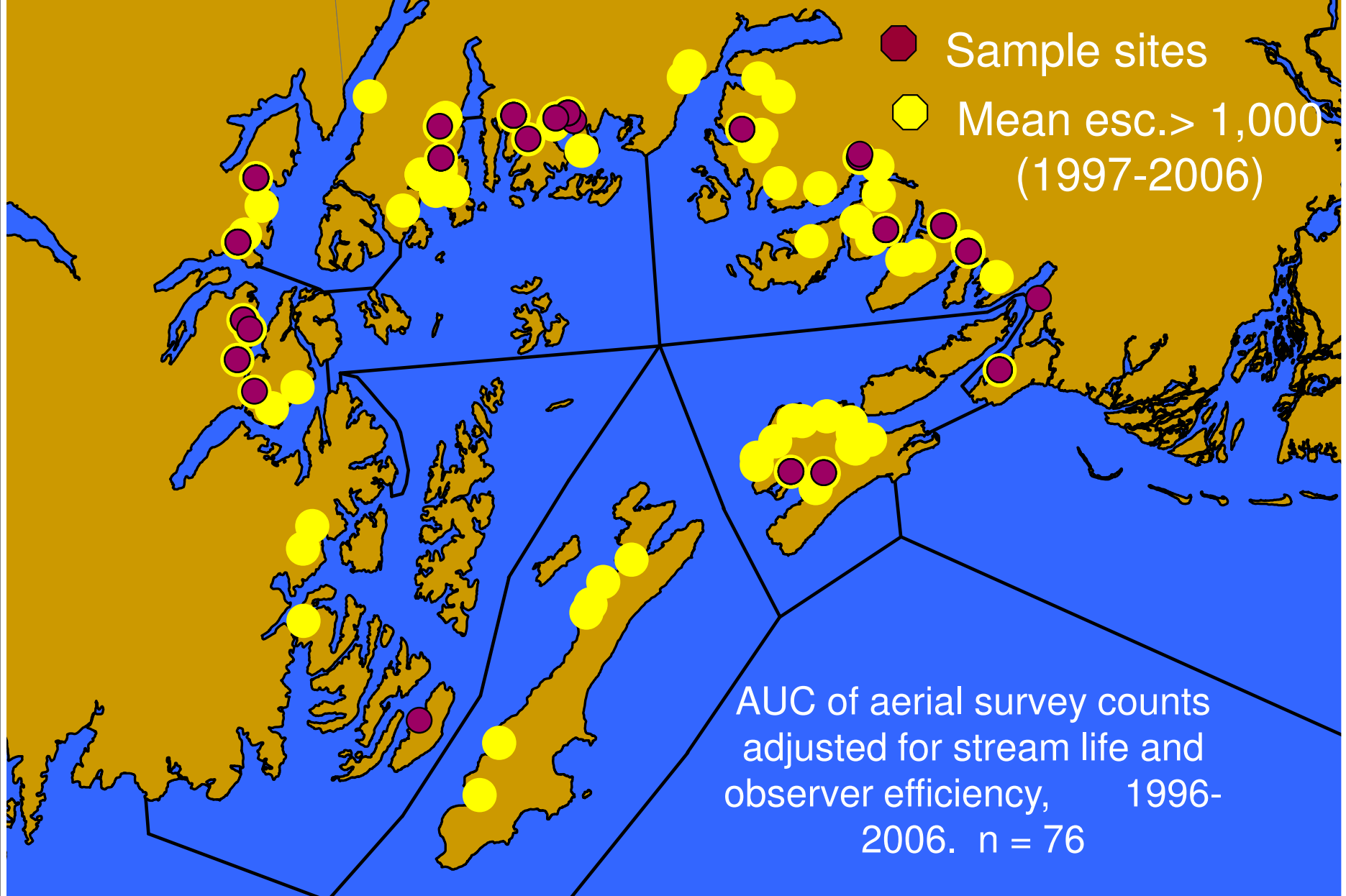
Percent index streams with hatchery fish > threshold.



AFK hatchery proportions vs. distance

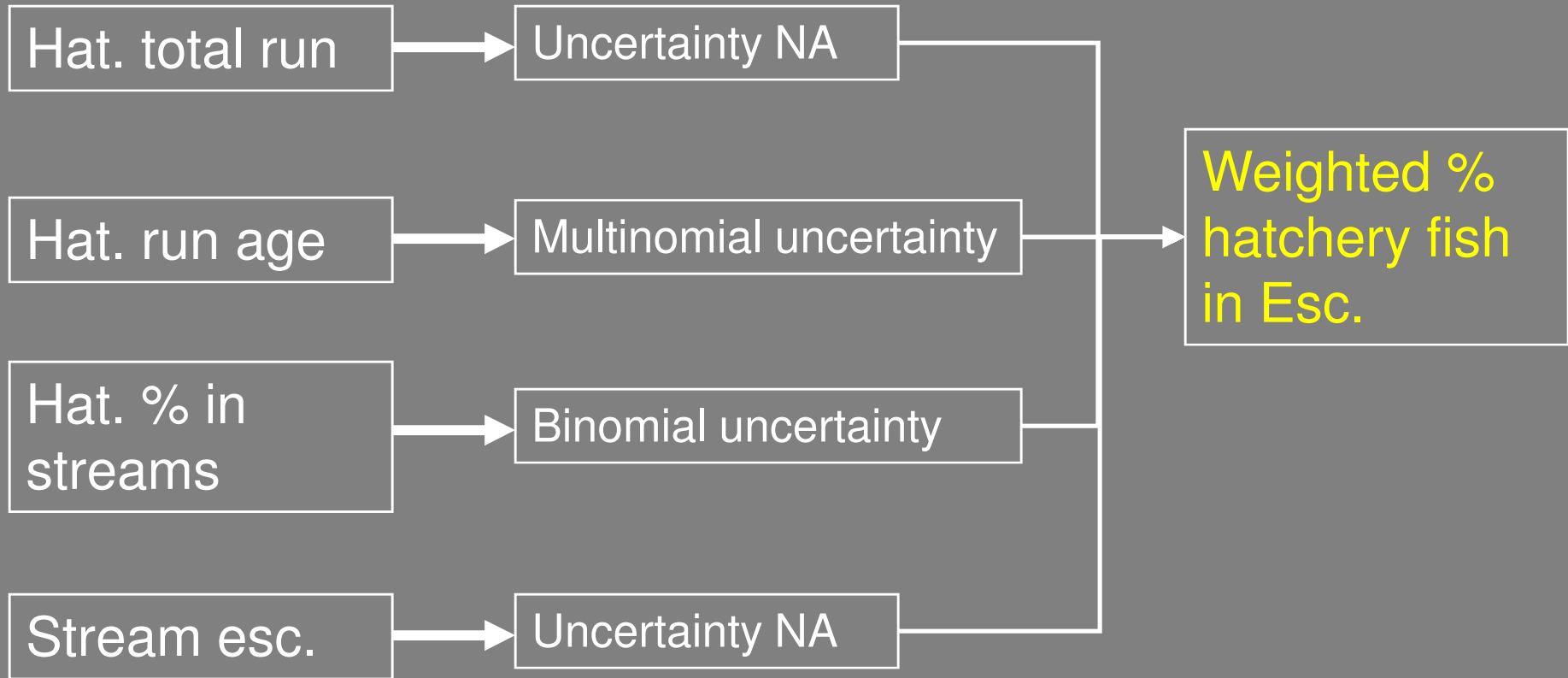


Chum salmon straying samples in MC



Chum Monte Carlo Simulation

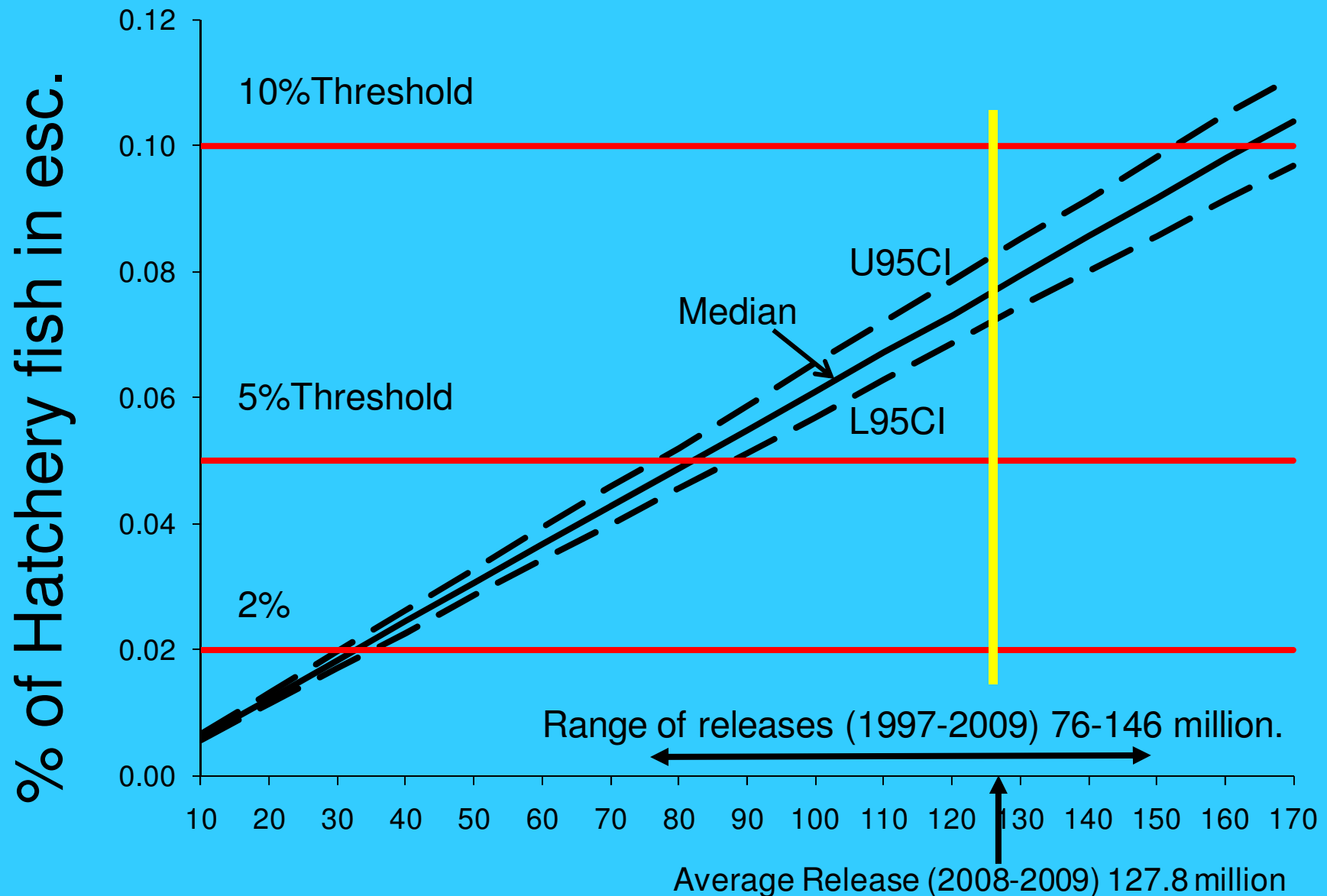
Hatchery fry releases
1,000 iterations per release size



Data summary

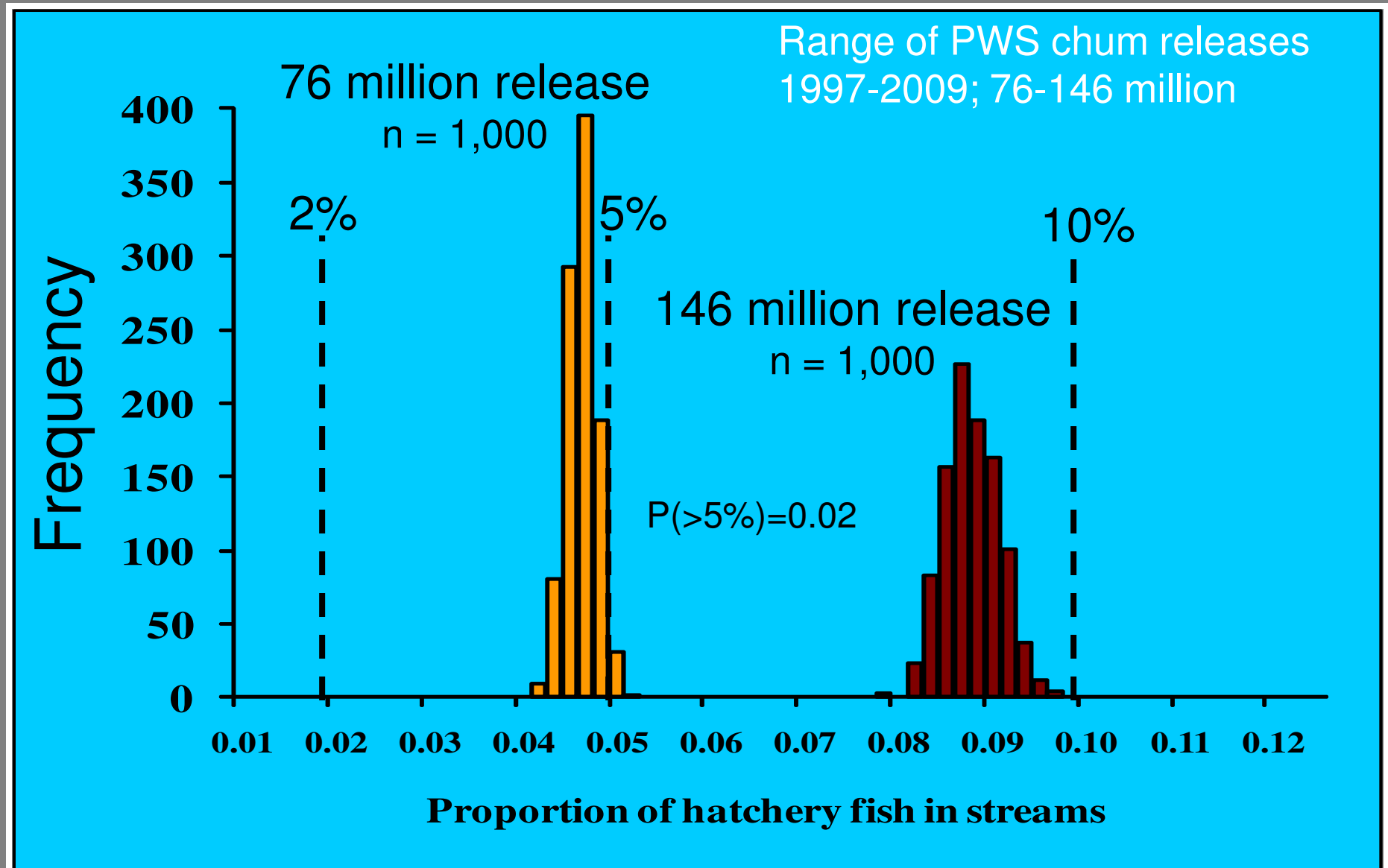
Year	Streams Count	Otoliths	Otoliths per stream	PWS total Adjusted Esc.	Monte Carlo Percent of PWS total esc.
2004	13	952	73	674,315	53%
2005	16	2,283	143	569,707	52%
2006	12	1,566	131	705,303	46%
2007	24	4,599	192	801,778	47%
2008	20	2,499	125	605,040	58%
2009	21	3,388	161	901,220	45%

PWS Chum salmon Monte Carlo



Proportion of hatchery chum salmon in streams

Monte Carlo simulation results



Conclusions - Pink salmon

- In some years, hatchery pink salmon greatly exceed threshold levels in a majority of PWS streams,
- ADF&G wild stock escapement indices are causing us to overestimate wild stock productivity,
- If selection is occurring in hatchery fish and gene flow to wild fish, wild fitness is likely being lost.

Conclusions – Chum salmon

- Monte Carlo results - the recent avg. releases (~128 million) are too large to remain below the 2% or 5% thresholds.

P(<threshold) at release in millions

<u>Threshold</u>	<u>76</u>	<u>128</u>	<u>146</u>
2%	0.00	0.00	0.00
5%	0.98	0.00	0.00
10%	1.00	1.00	1.00

“Under these conditions, even relatively low straying rates of enhanced stocks may cause reduced genetic variability among affected wild stocks.” RPT (1994)

A large school of fish, likely salmon, swimming in clear, shallow water. The fish are densely packed, creating a shimmering, textured surface. The water is a deep greenish-blue, and the fish have silvery scales that catch the light.

Questions?

Acknowledgments:

Tim Joyce

David Evans

Rick Merizon

Scott Raborn

Rich Brenner