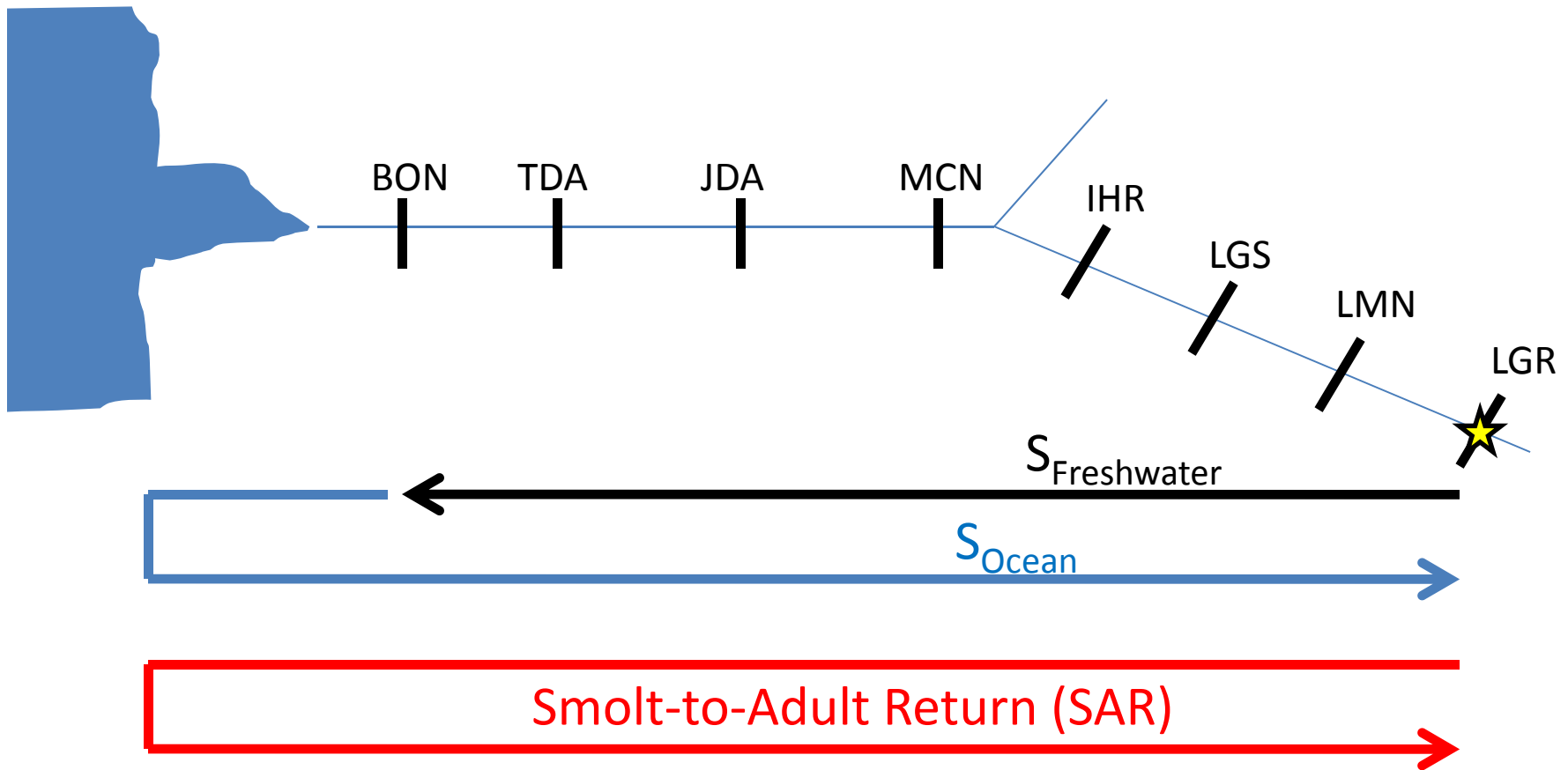


Adults returns: Important factors over the life-cycle

Presenter: Steve Haeseker



Stages of life-cycle survival:



What is the target we're trying to achieve?

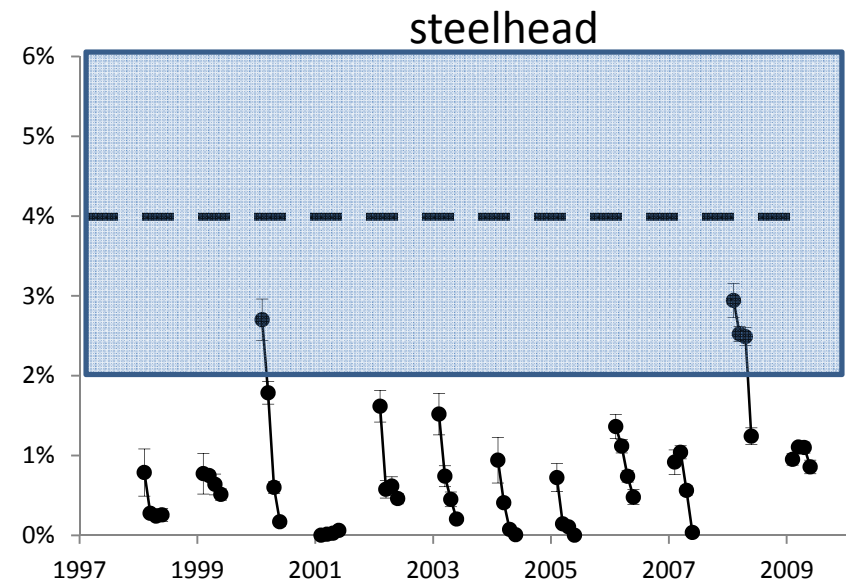
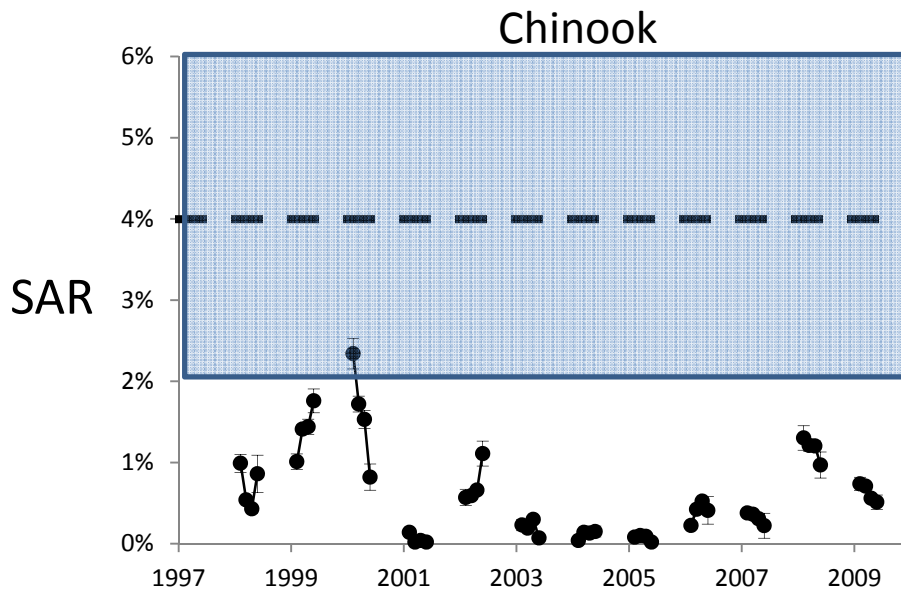
Northwest Power and Conservation Council Fish and Wildlife Program (2003,2009)

Goal: Achieve Smolt-to-Adult Return rates in the **2-6% range (minimum 2%; average 4%)**

What is the target we're trying to achieve?

Northwest Power and Conservation Council Fish and Wildlife Program (2003,2009)

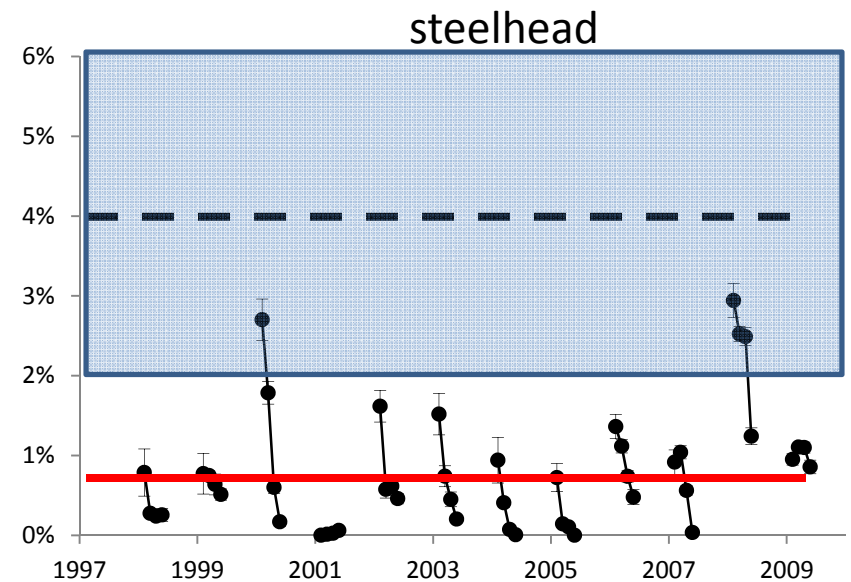
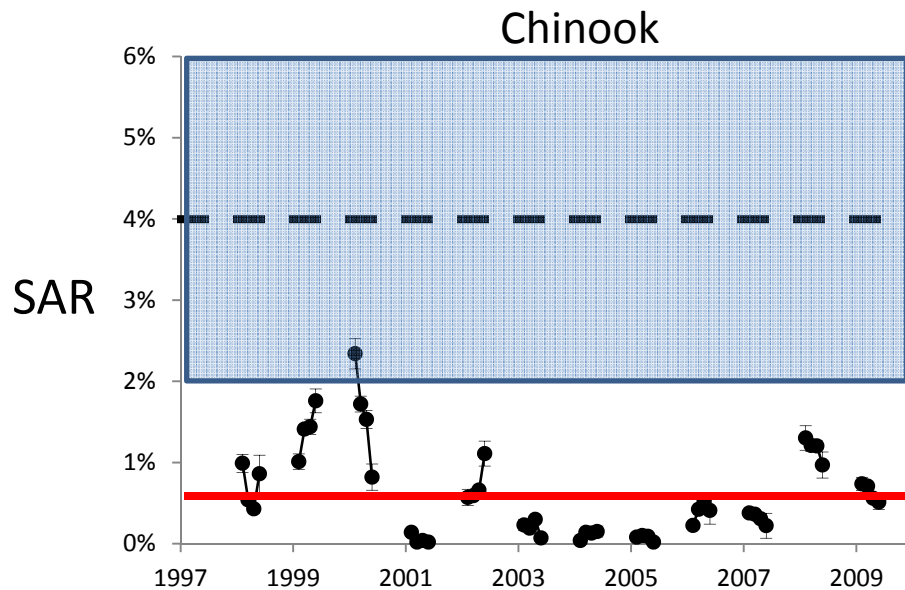
Goal: Achieve Smolt-to-Adult Return rates in the **2-6% range (minimum 2%; average 4%)**



What is the target we're trying to achieve?

Northwest Power and Conservation Council Fish and Wildlife Program (2003,2009)

Goal: Achieve Smolt-to-Adult Return rates in the **2-6% range (minimum 2%; average 4%)**

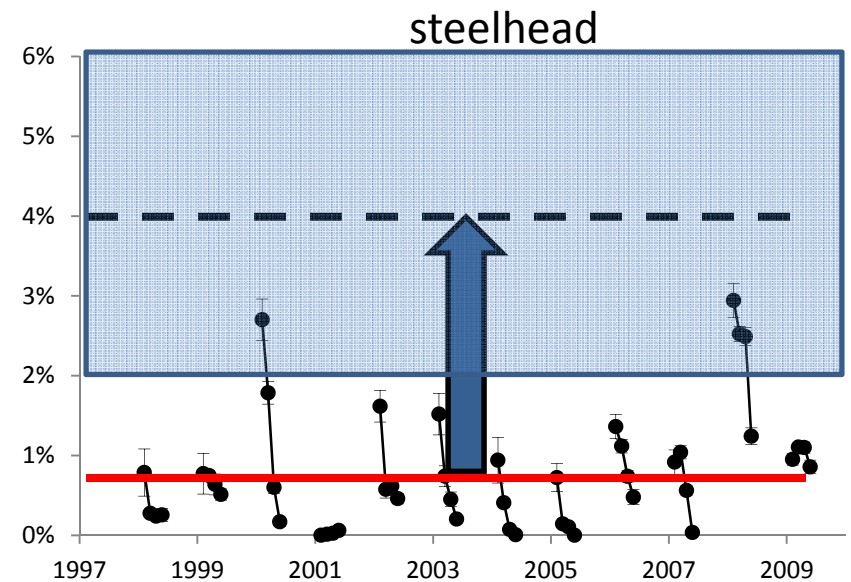
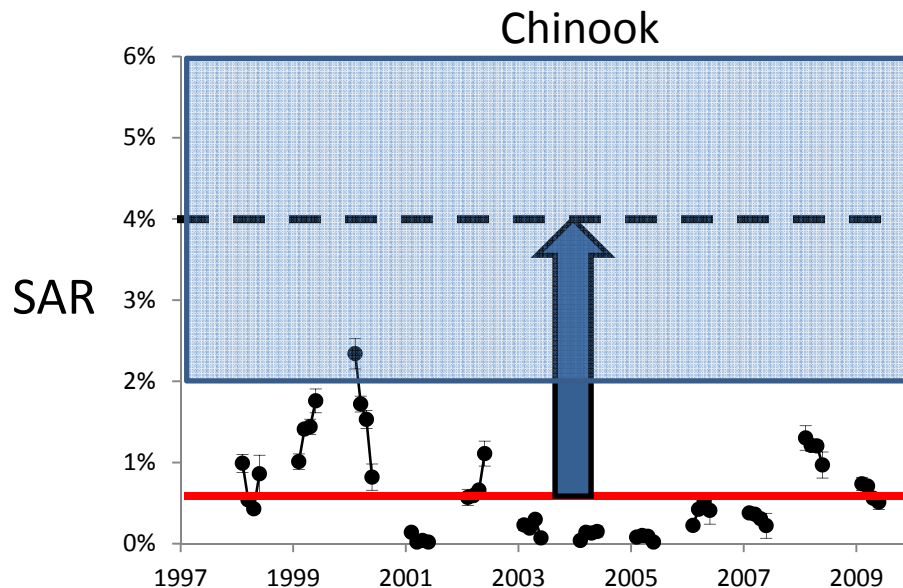


What is the target we're trying to achieve?

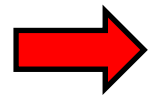
Northwest Power and Conservation Council Fish and Wildlife Program (2003,2009)

Goal: Achieve Smolt-to-Adult Return rates in the 2-6% range (minimum 2%; average 4%)

How do we get there?



1) How do changes in freshwater and ocean survival rates influence SARs?

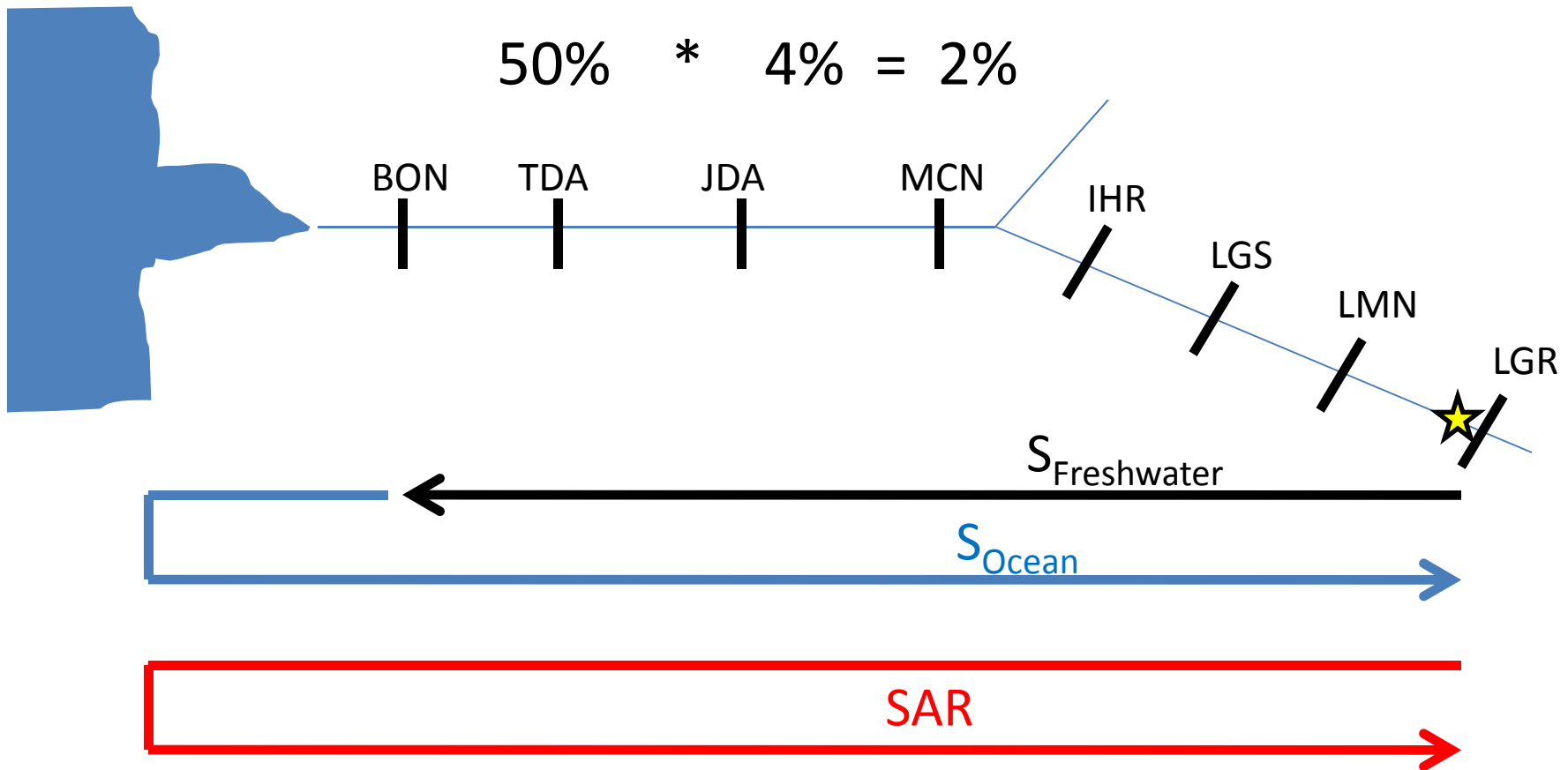


Which freshwater survival values (if any) achieve 4% average SARs?

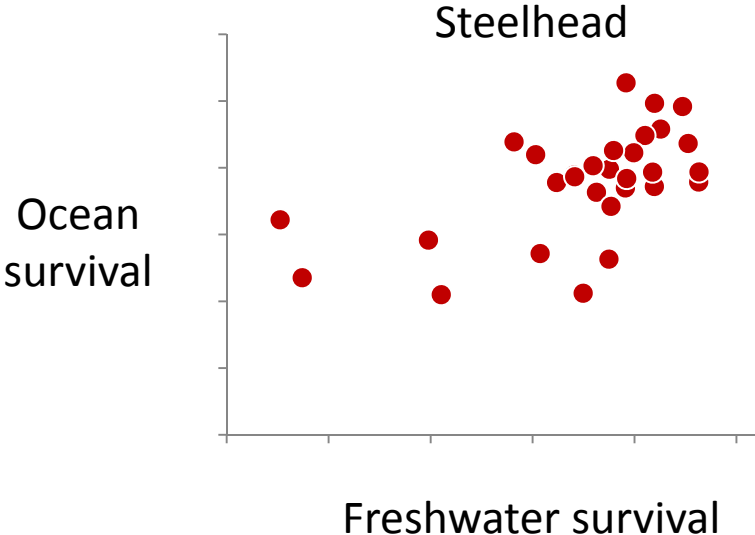
1) How do changes in freshwater and ocean survival rates influence SARs?

$$S_{\text{Freshwater}} * S_{\text{Ocean}} = \text{SAR}$$

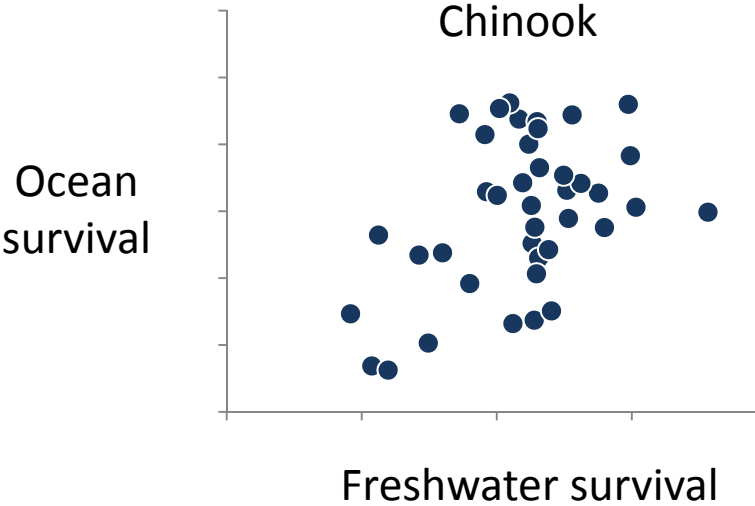
$$50\% * 4\% = 2\%$$



Positive correlations between freshwater and ocean survival rates

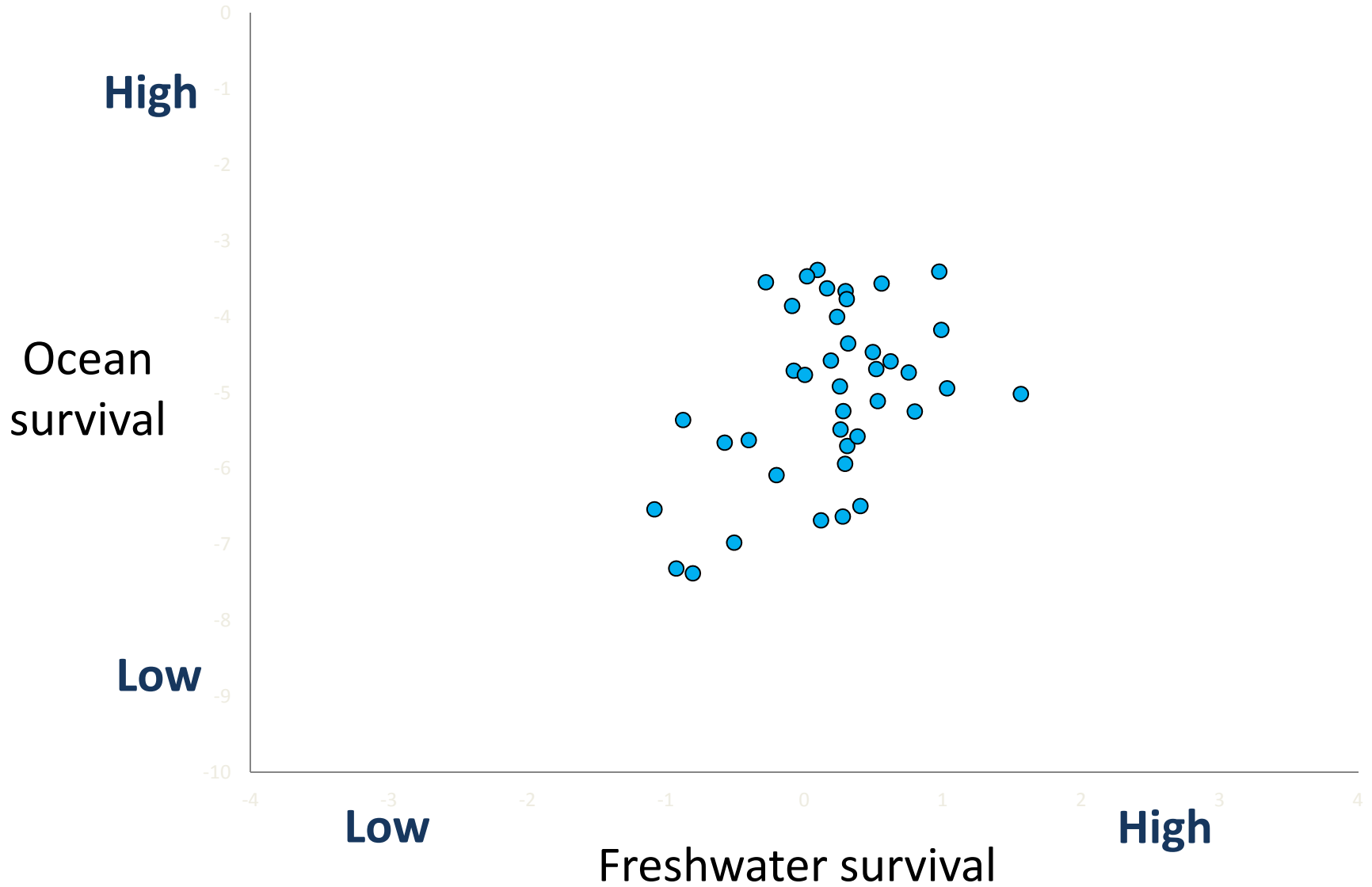


$r = 0.57, P < 0.02$

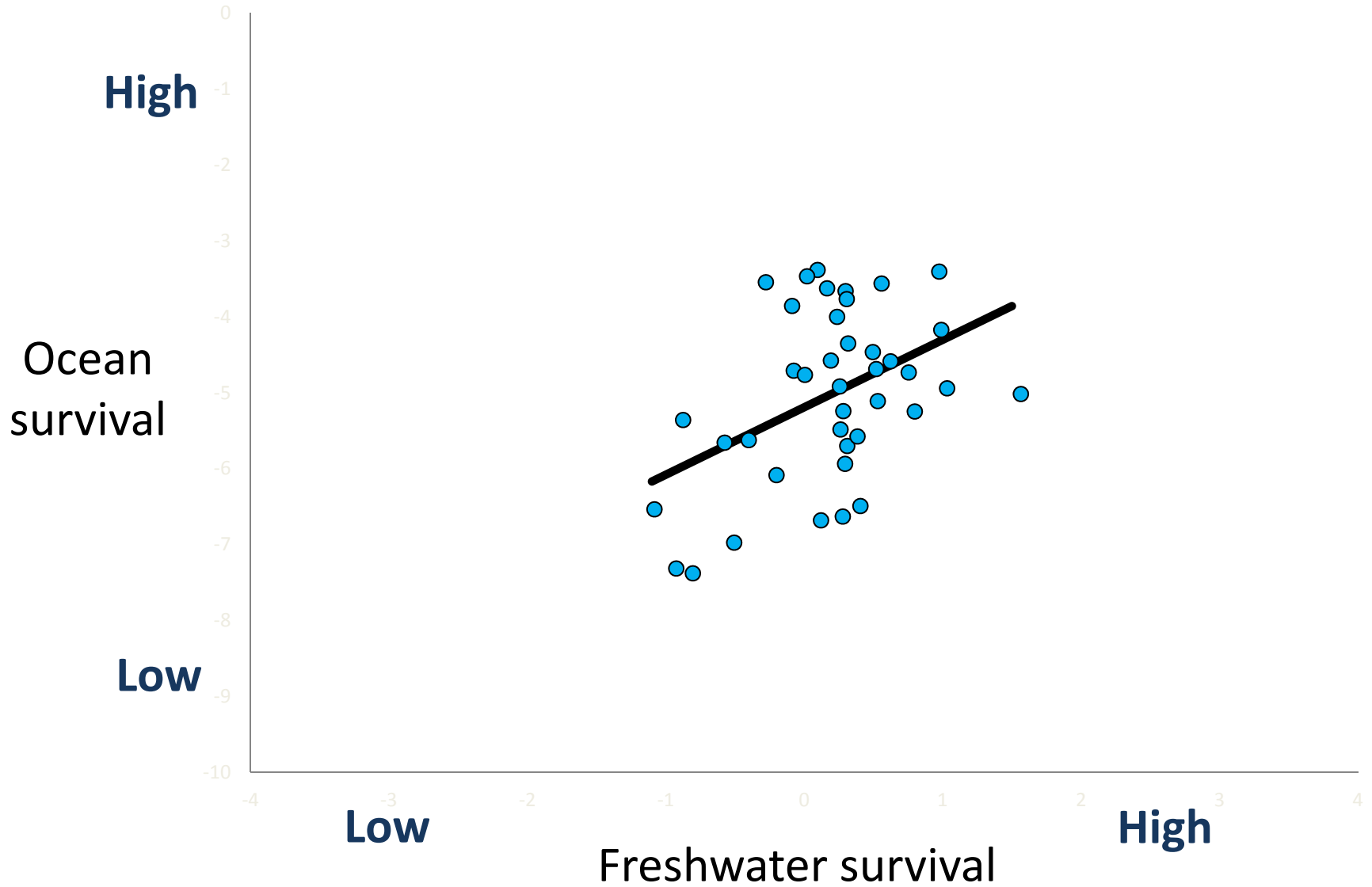


$r = 0.44, P < 0.01$

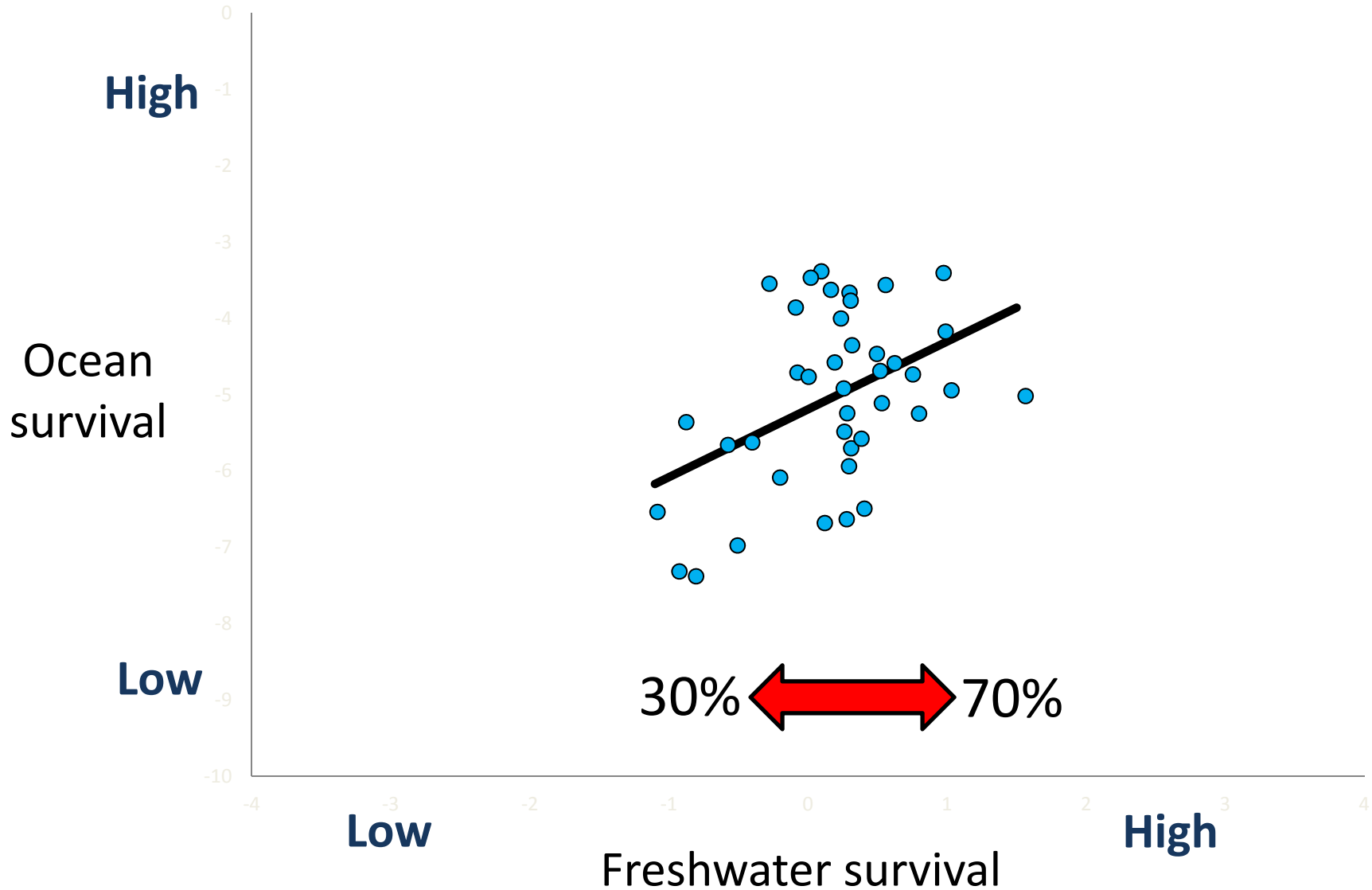
Chinook salmon



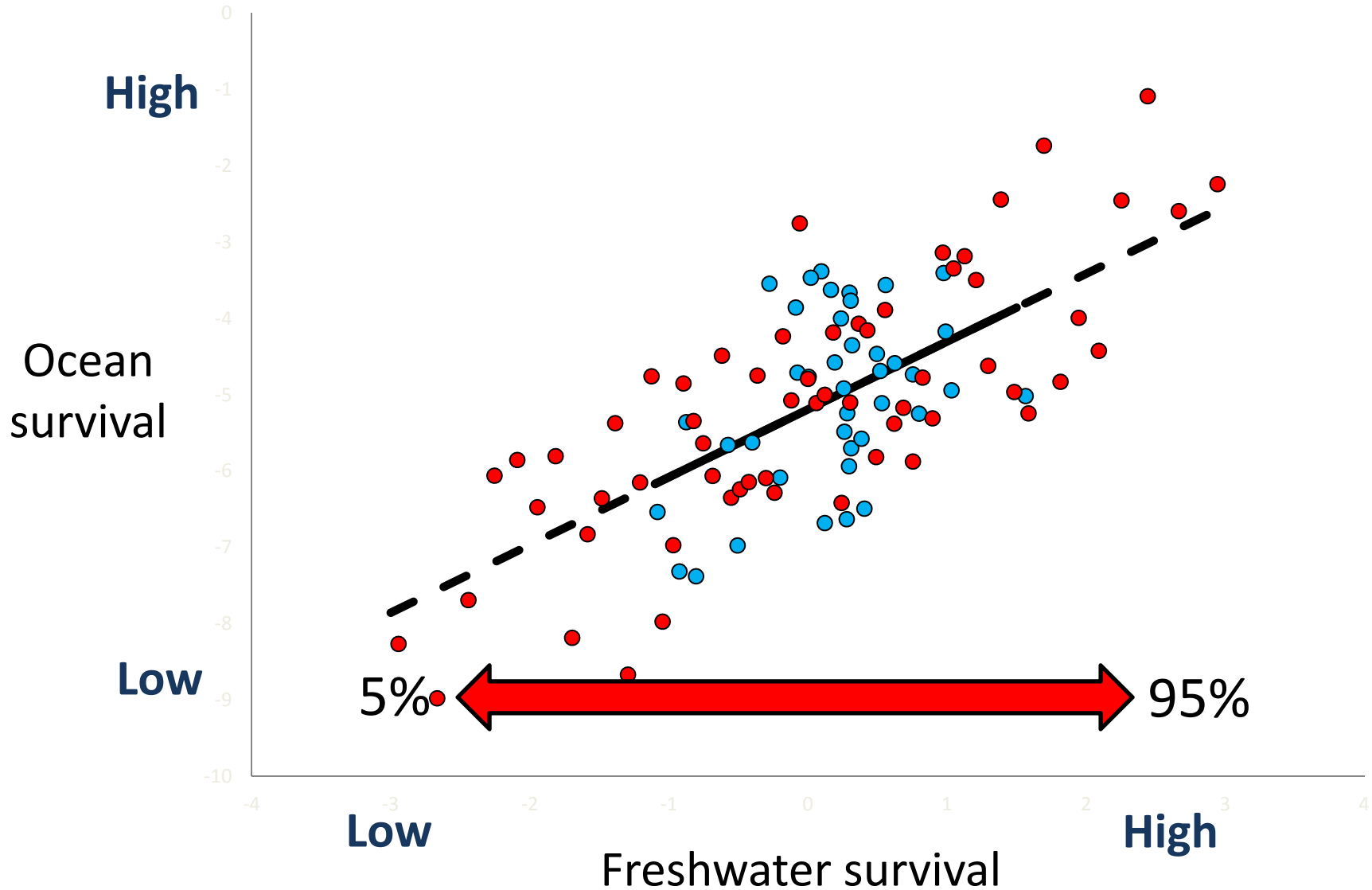
Chinook salmon



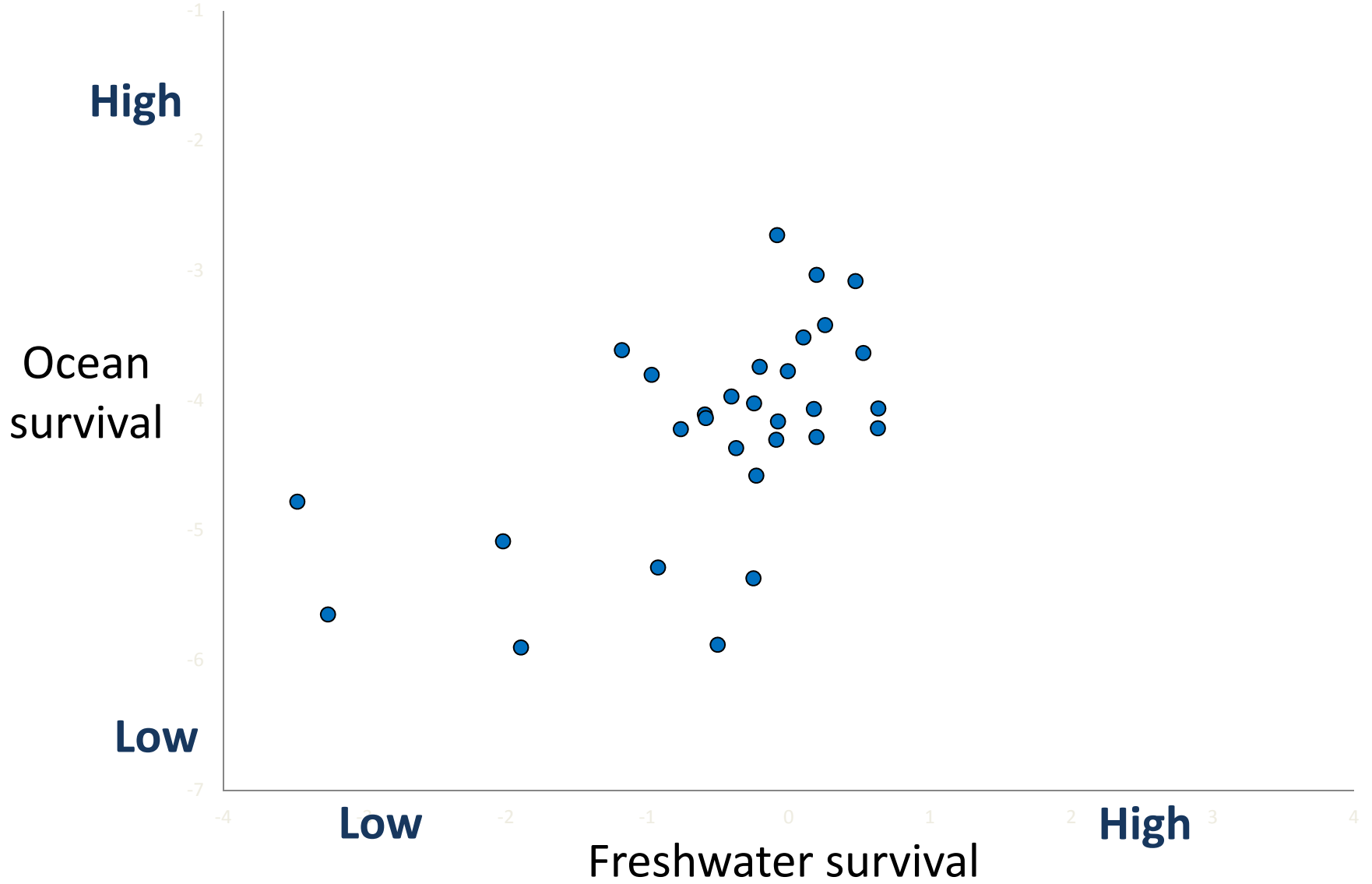
Chinook salmon



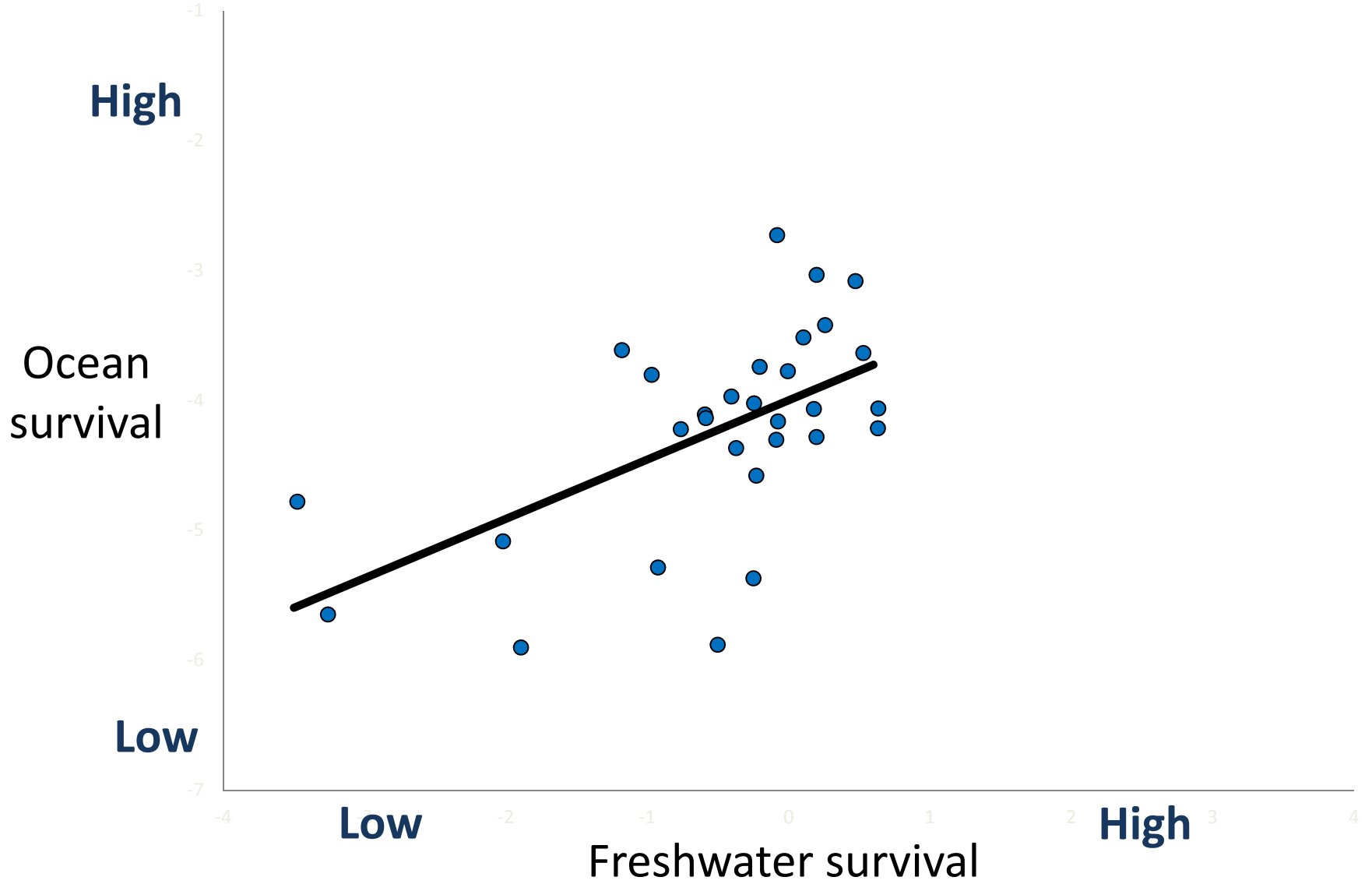
Chinook salmon



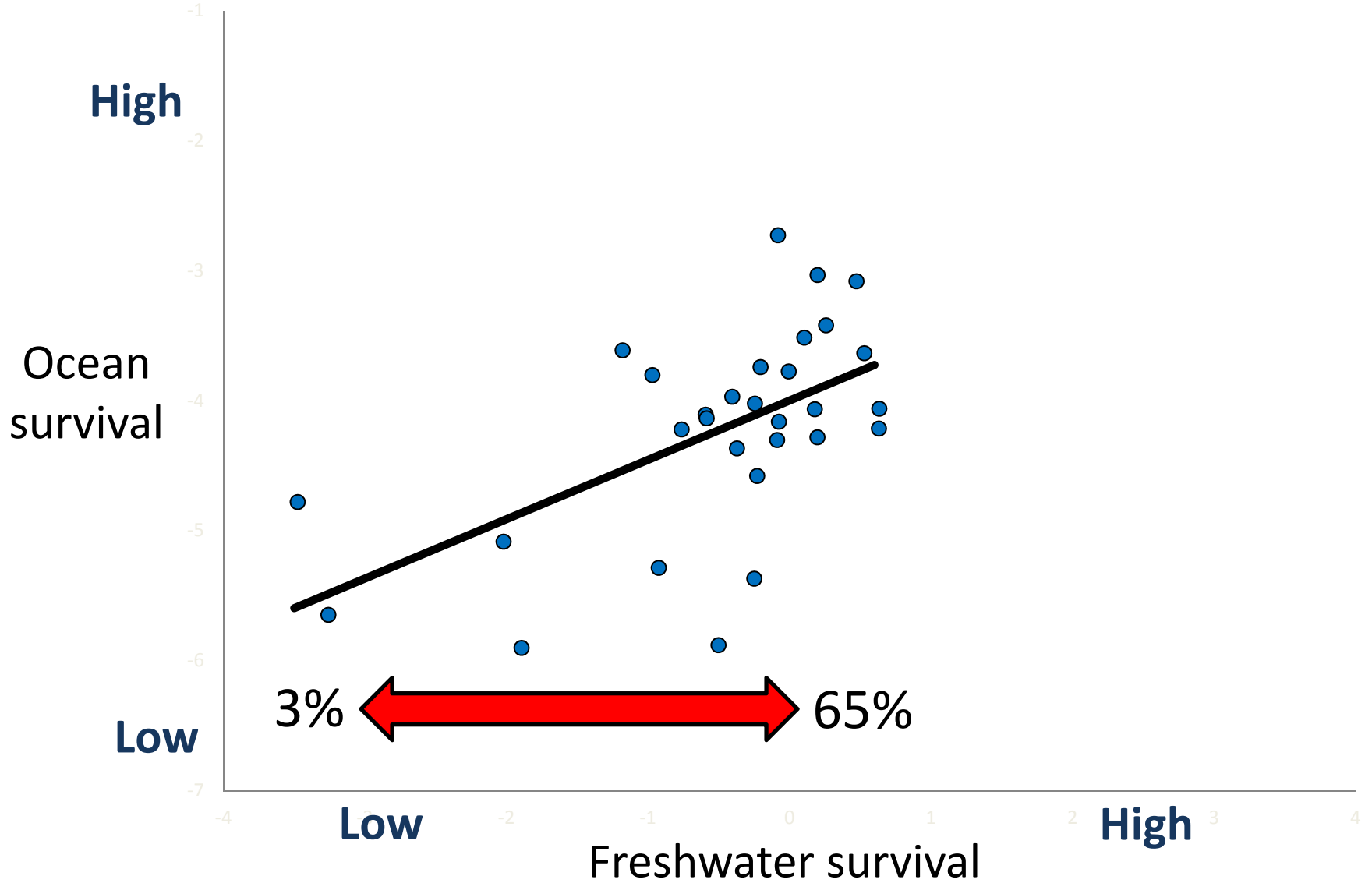
Steelhead



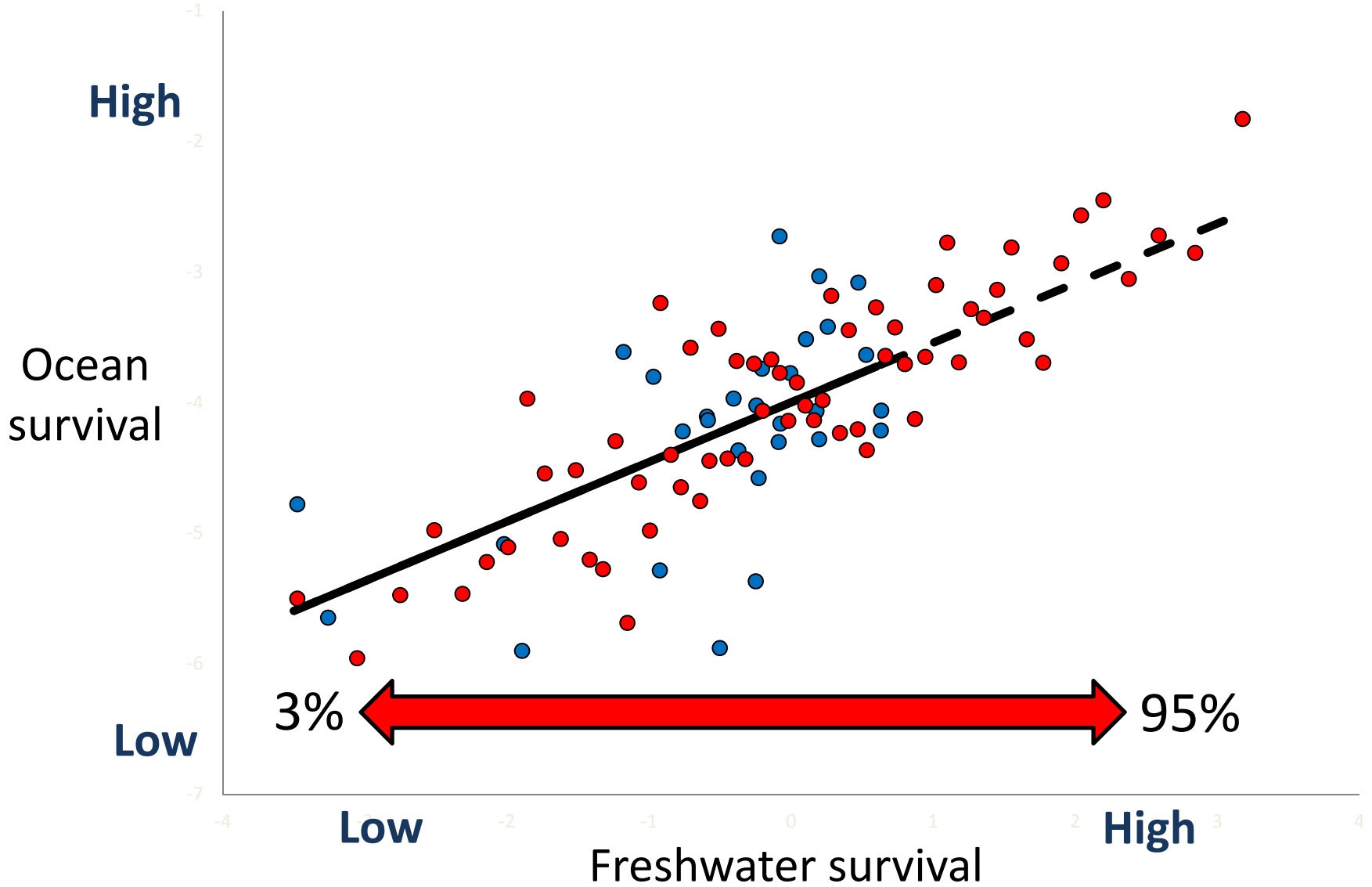
Steelhead



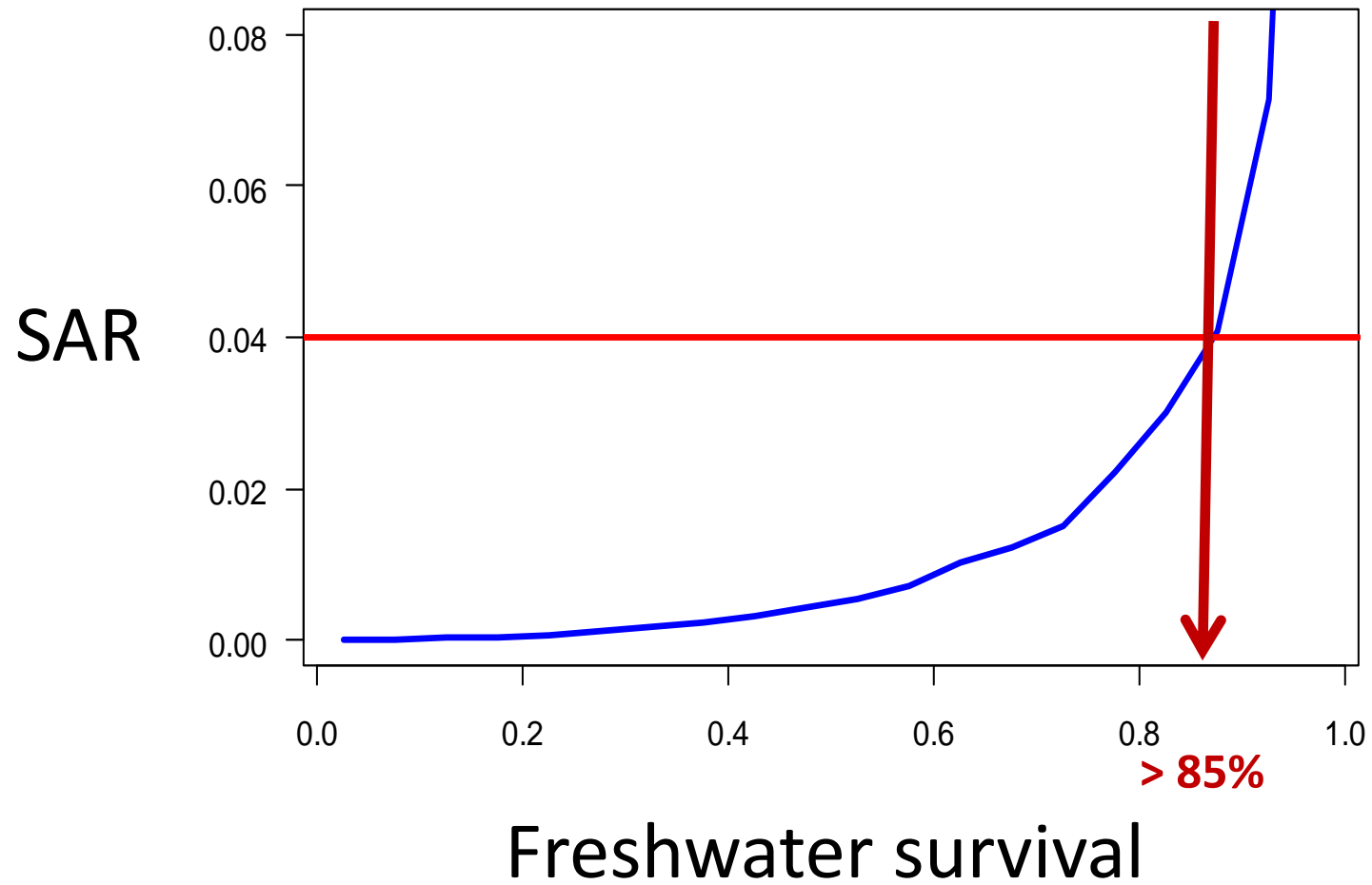
Steelhead



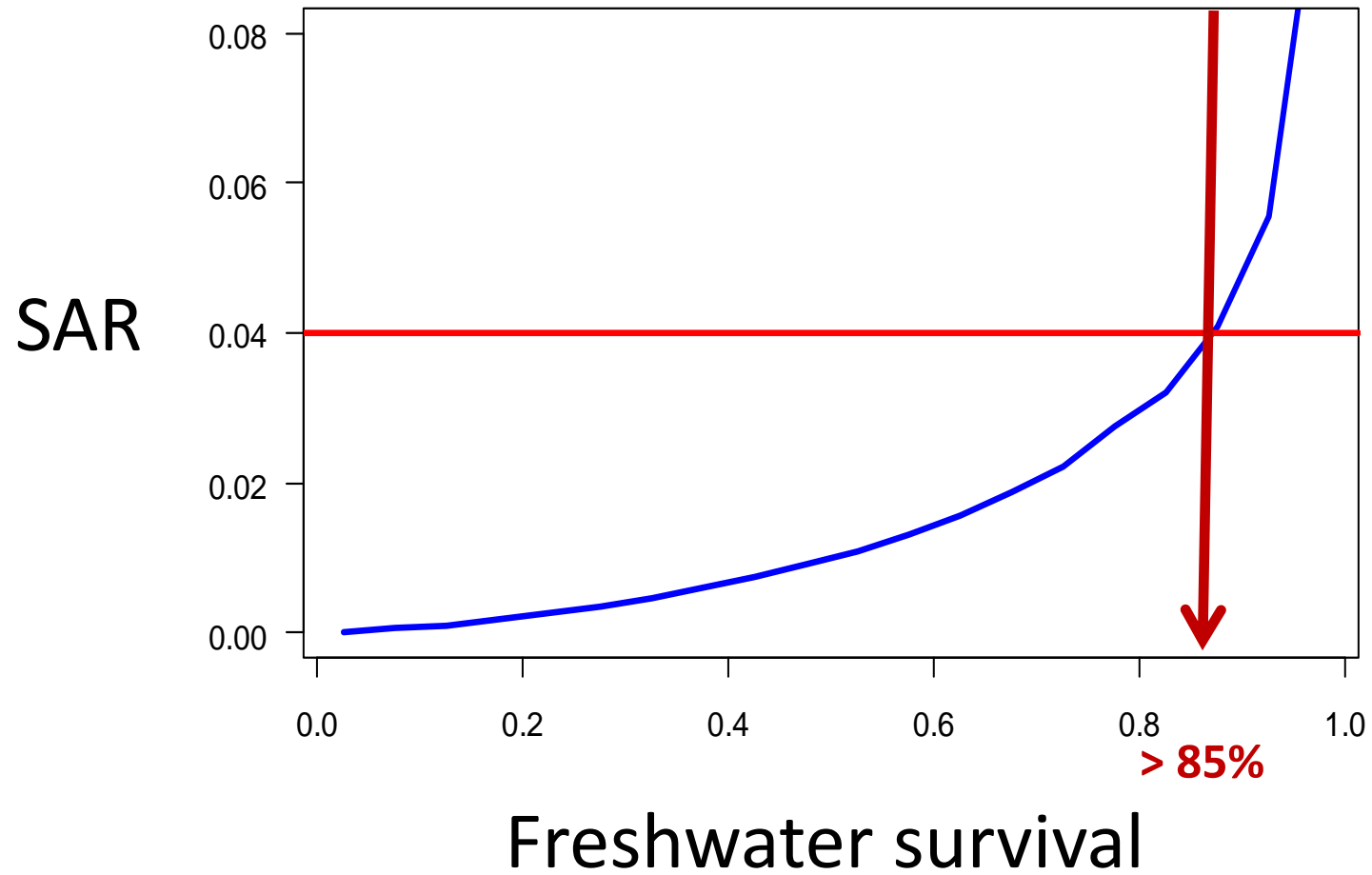
Steelhead



Chinook salmon

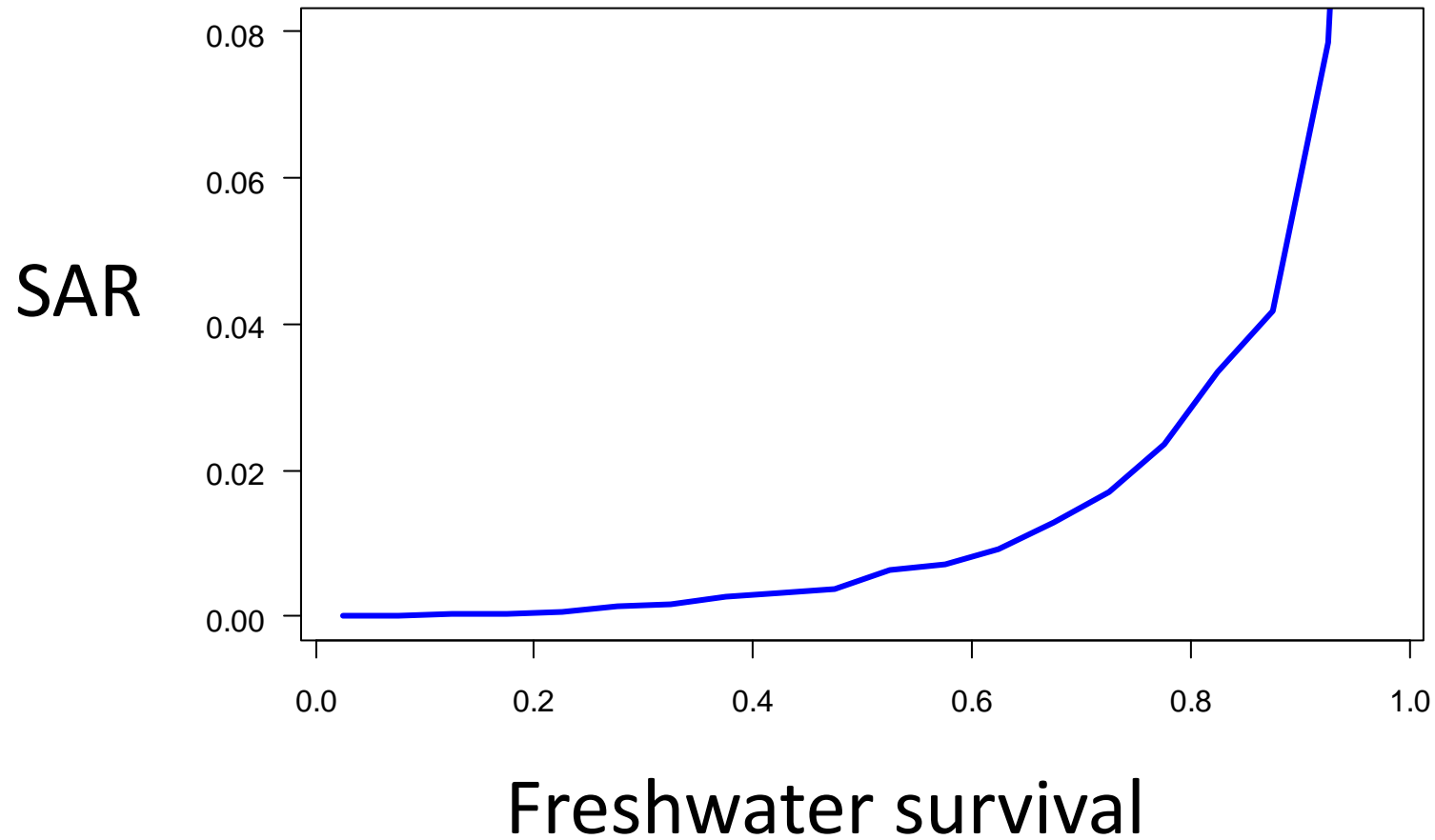


Steelhead



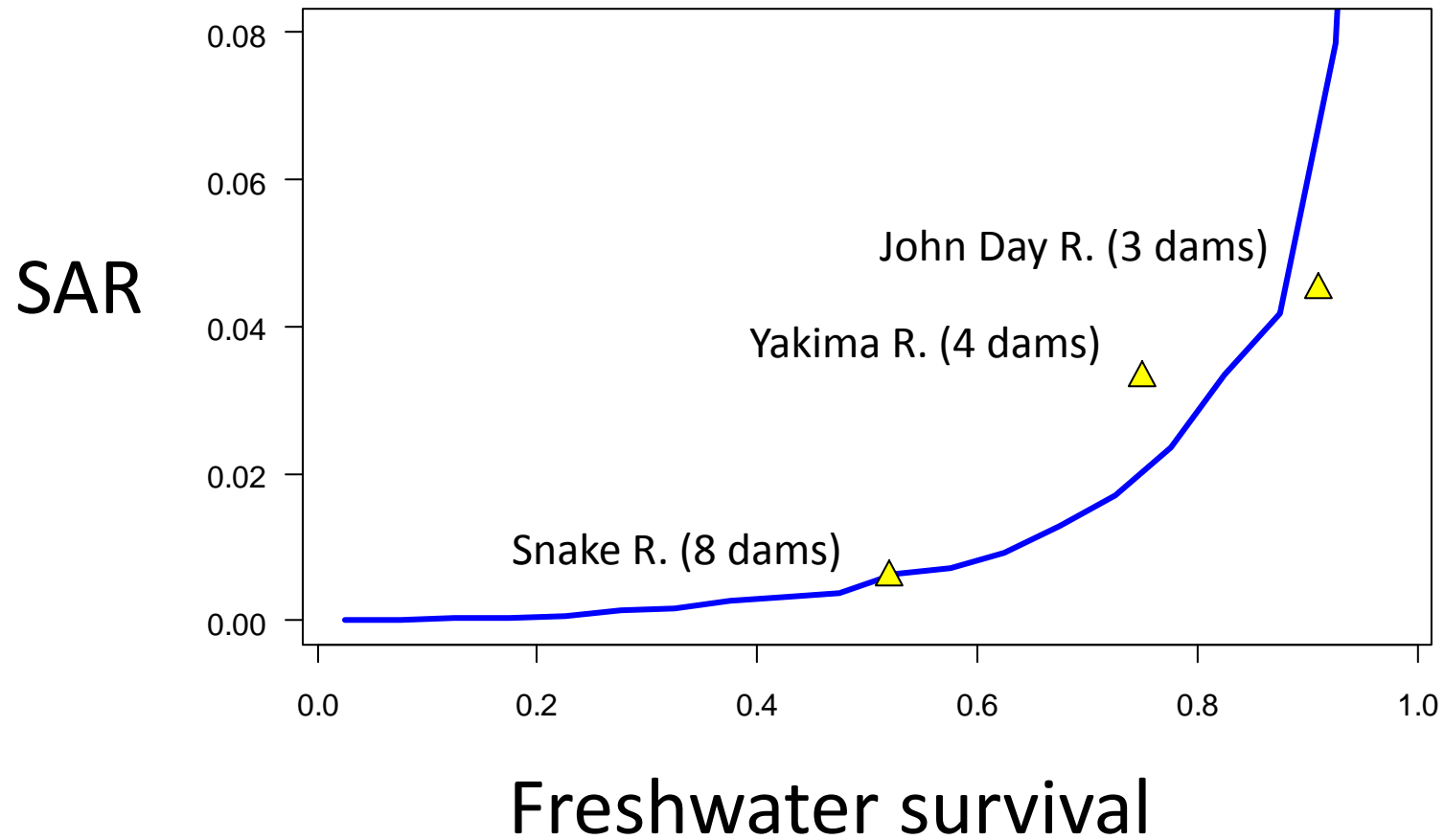
Reasonable predictions?

Chinook salmon



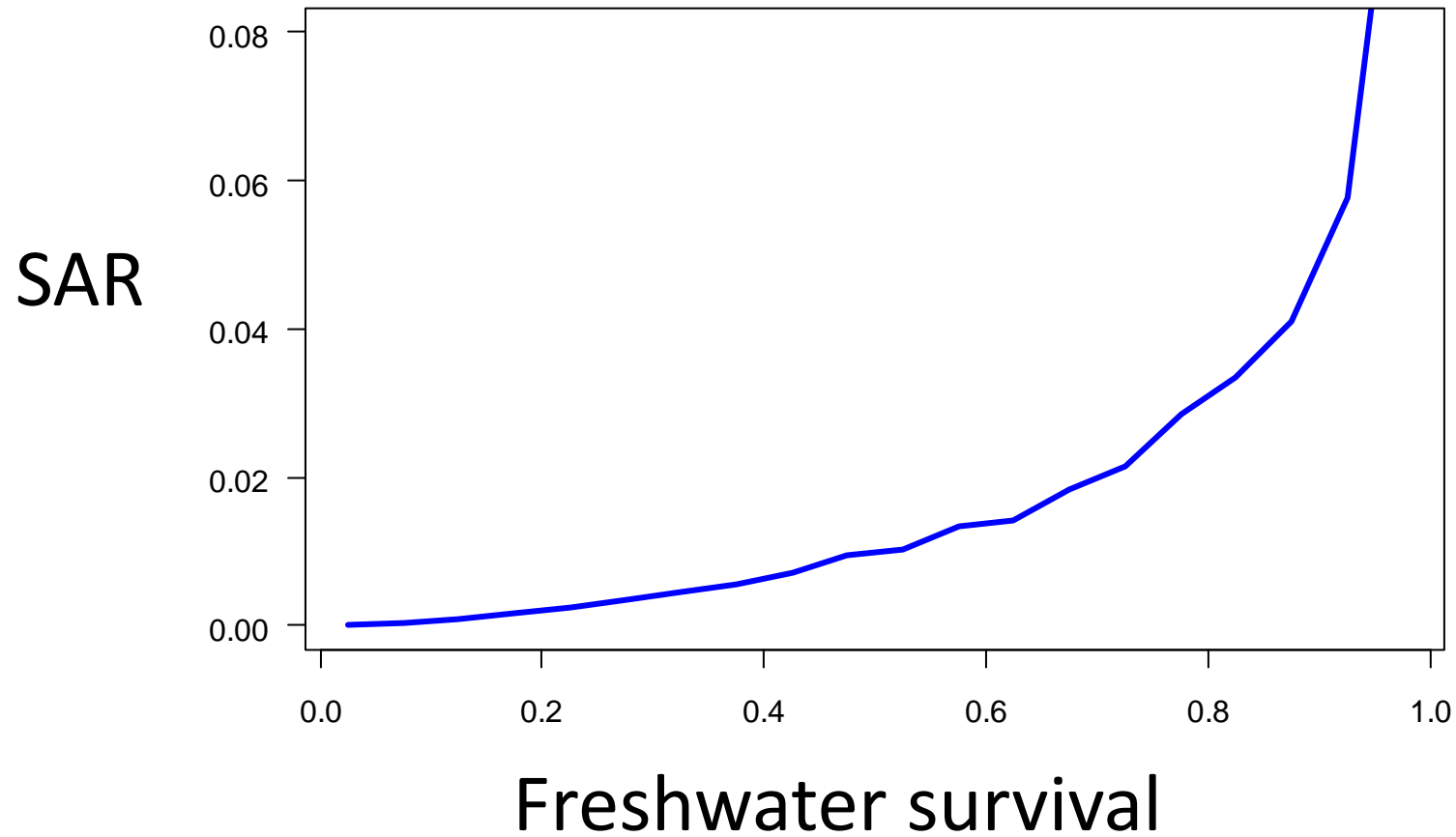
Reasonable predictions?

Chinook salmon



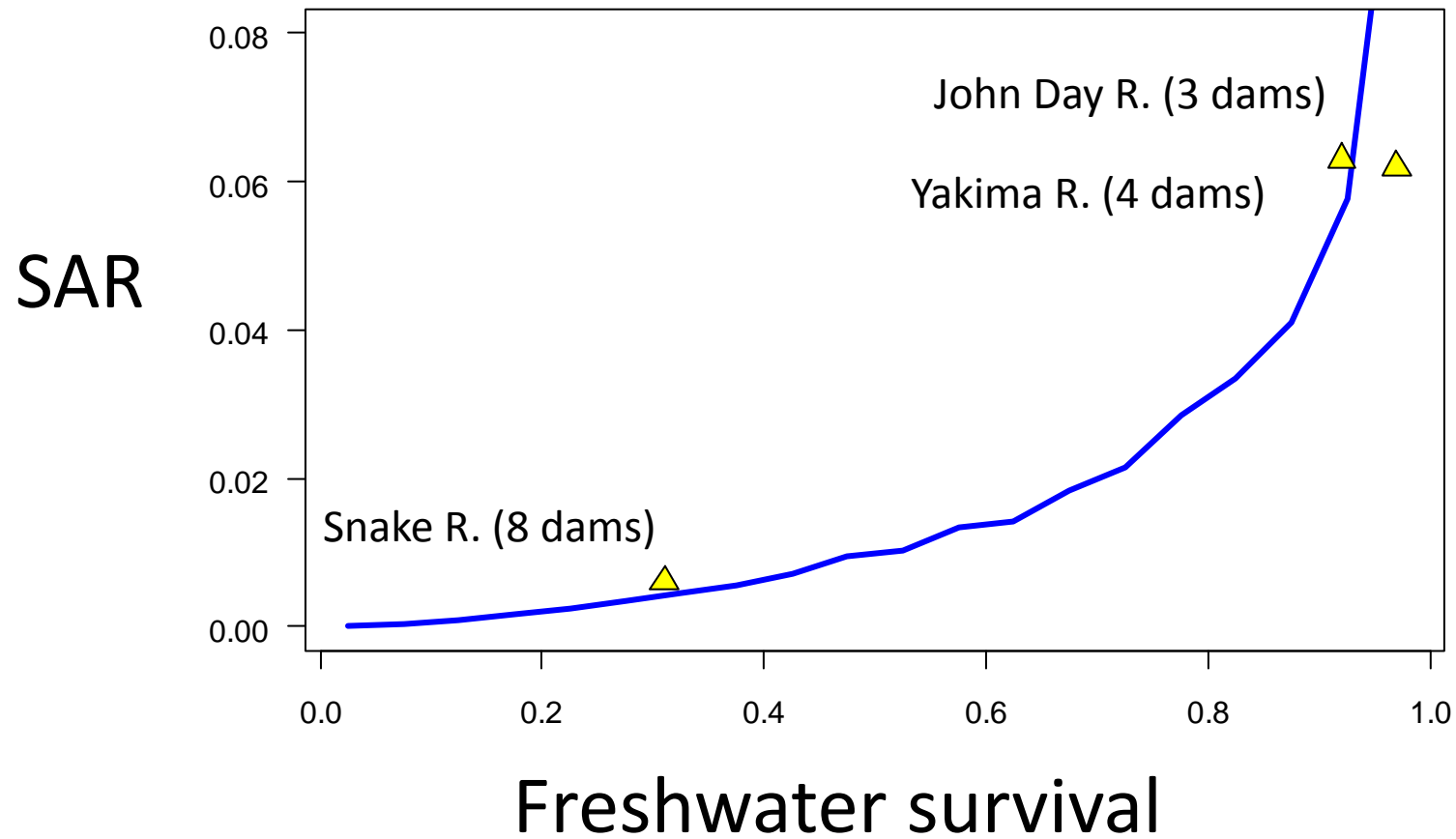
Reasonable predictions?

Steelhead

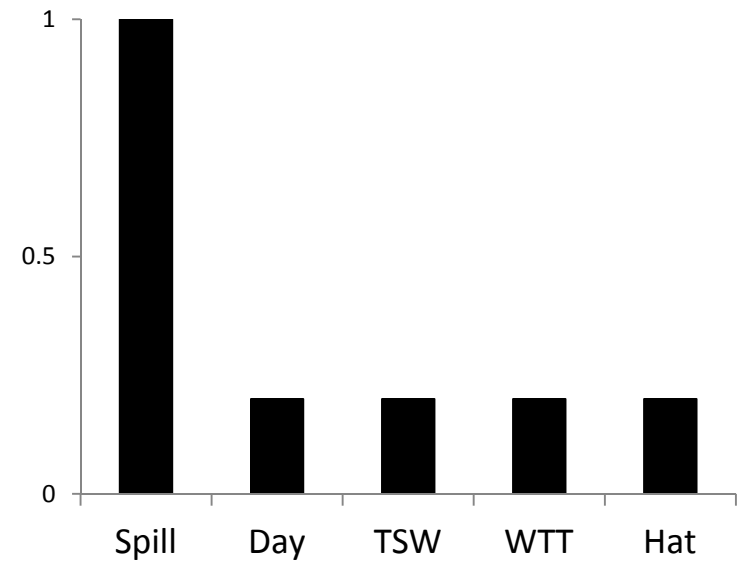
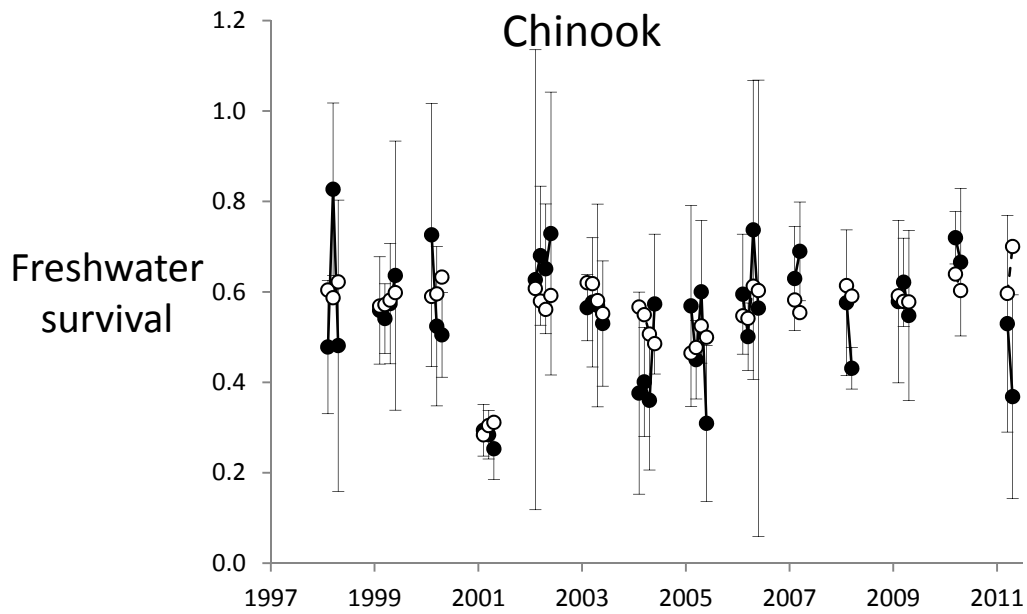
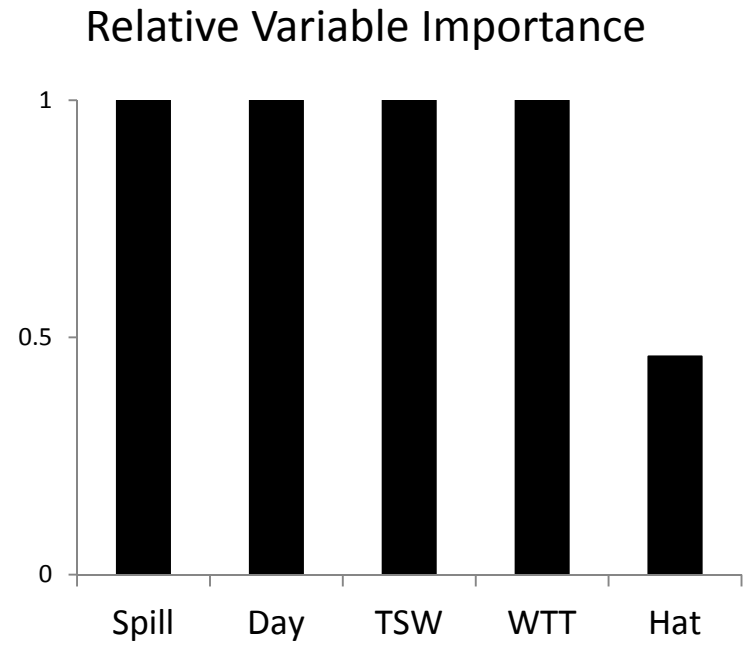
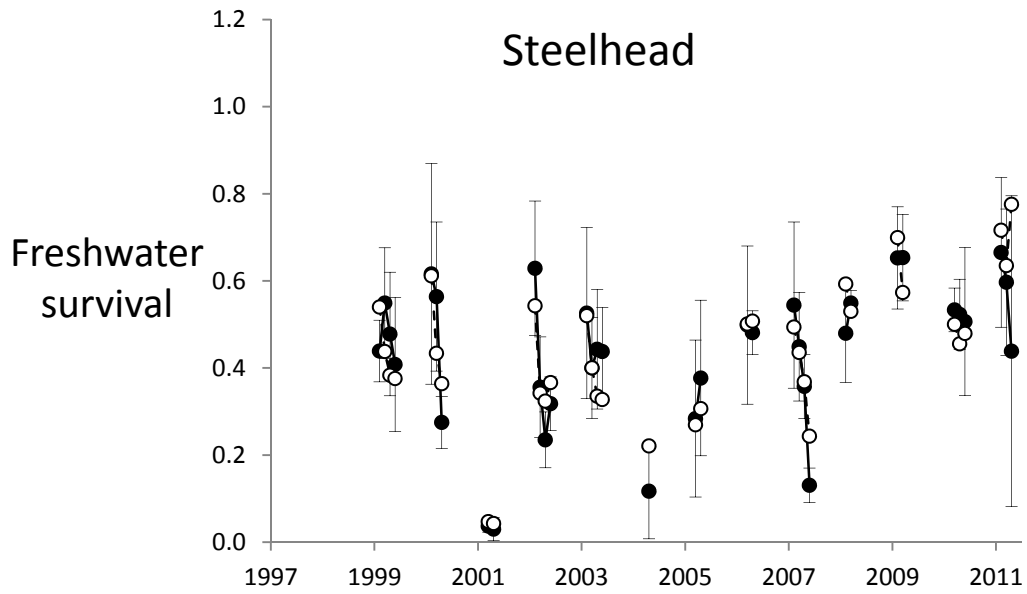


Reasonable predictions?

Steelhead



2) What operations might achieve 85% freshwater survival rates?



Steelhead

Spring flow levels

Spill (%)	Low	Average	High
0	0.04	0.09	0.17
10	0.08	0.17	0.30
20	0.15	0.29	0.45
30	0.26	0.44	0.62
40	0.41	0.61	0.76
50	0.58	0.75	0.86
55	0.66	0.82	0.90
60	0.73	0.86	0.93

Steelhead

Spring flow levels

Spill (%)	Low	Average	High
0	0.04	0.09	0.17
10	0.08	0.17	0.30
20	0.15	0.29	0.45
30	0.26	0.44	0.62
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Chinook salmon

Spring flow levels

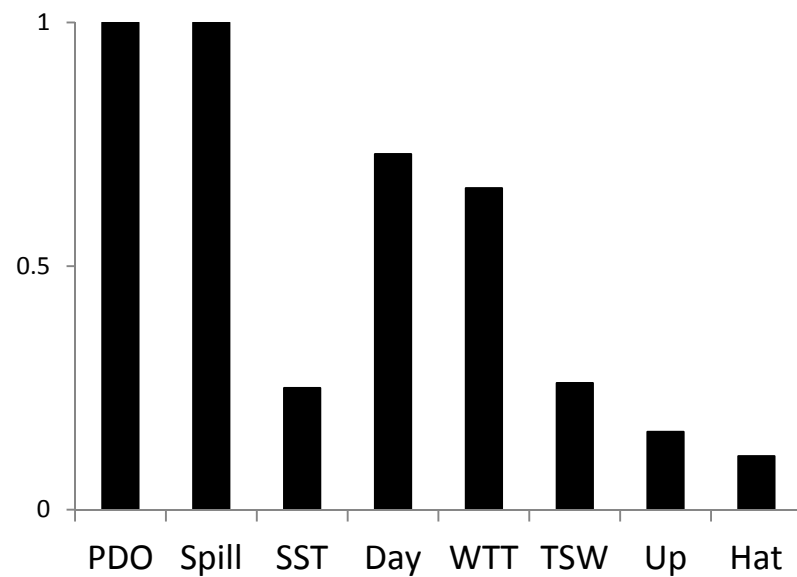
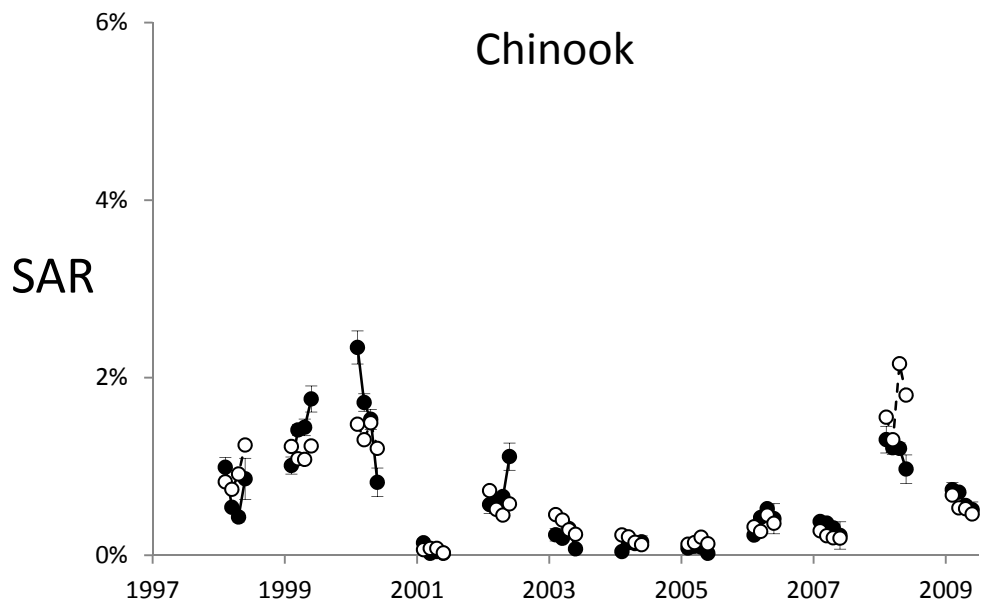
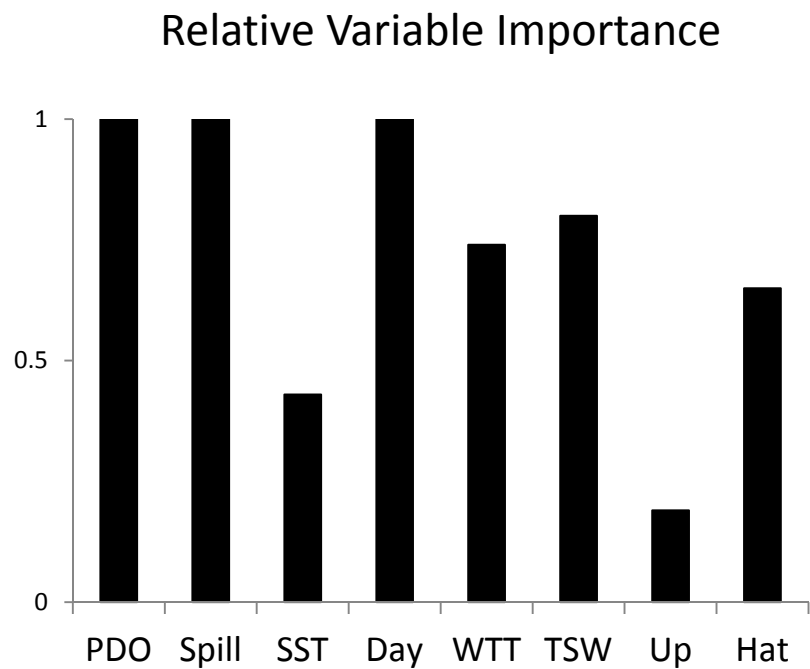
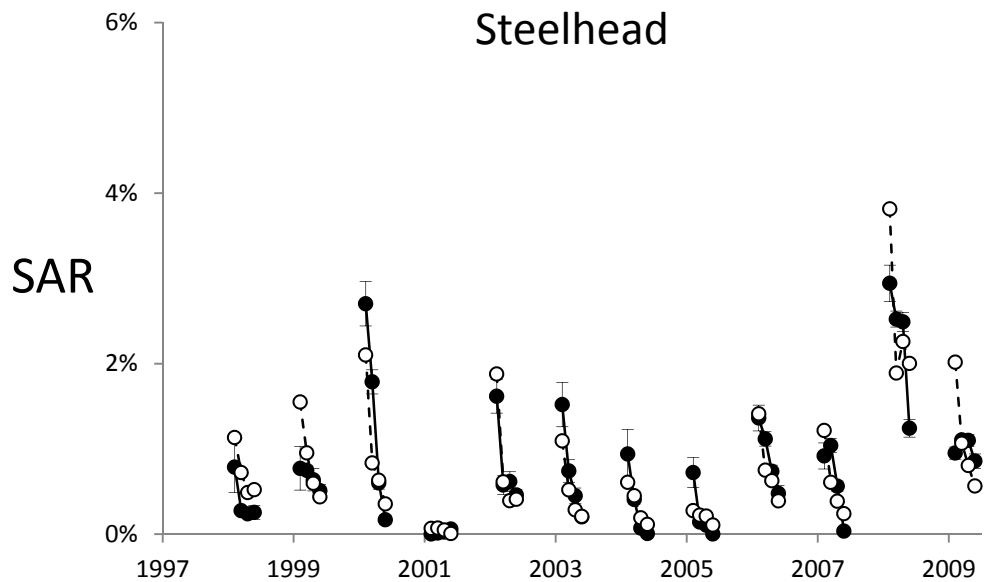
Spill (%)	Low	Average	High
0	0.19	0.19	0.19
10	0.27	0.27	0.27
20	0.38	0.38	0.38
30	0.50	0.50	0.50
40	0.62	0.62	0.62
50	0.73	0.73	0.73
55	0.77	0.78	0.78
60	0.81	0.81	0.81

Chinook salmon

Spring flow levels

Spill (%)	Low	Average	High
0	0.19	0.19	0.19
10	0.27	0.27	0.27
20	0.38	0.38	0.38
30	0.50	0.50	0.50
40	0.62	0.62	0.62
50	0.73	0.73	0.73
55	0.77	0.78	0.78
60	0.81	0.81	0.81

3) What operations might achieve SARs averaging 4%?



Steelhead

Spring flow levels

Spill (%)	Low	Average	High
0	0.0	0.0	0.1
10	0.1	0.1	0.1
20	0.2	0.2	0.3
30	0.4	0.6	0.9
40	1.0	1.5	2.1
50	2.4	3.6	5.0
55	3.8	5.5	7.6
60	5.8	8.3	11.3

Steelhead

Spring flow levels

Spill (%)	Low	Average	High
0	0.0	0.0	0.1
10	0.1	0.1	0.1
20	0.2	0.2	0.3
30	0.4	0.6	0.9
40	1.0	1.5	2.1
50	2.4	3.6	5.0
55	3.8	5.5	7.6
60	5.8	8.3	11.3

Chinook salmon

Spring flow levels

Spill (%)	Low	Average	High
0	0.0	0.0	0.0
10	0.0	0.0	0.1
20	0.1	0.1	0.2
30	0.2	0.3	0.4
40	0.6	0.8	1.0
50	1.5	2.0	2.6
55	2.4	3.2	4.1
60	3.9	5.0	6.3

Chinook salmon

Spring flow levels

Spill (%)	Low	Average	High
0	0.0	0.0	0.0
10	0.0	0.0	0.1
20	0.1	0.1	0.2
30	0.2	0.3	0.4
40	0.6	0.8	1.0
50	1.5	2.0	2.6
55	2.4	3.2	4.1
60	3.9	5.0	6.3

Conclusions

Snake River simulations and data from other stocks both indicate that freshwater survival rates need to be $> 85\%$ to achieve 4% SAR goals.

Freshwater survival models indicate that high flows and spill levels of 55-60% may achieve 85% freshwater survival.

SAR models indicate that high flows and spill levels of 55-60% may achieve the 4% SAR goal under a similar series of ocean conditions.

Recent operations have been insufficient for achieving regional SAR goal. Degradation of conditions (lower flows or lower spill levels) will widen the gap.