

Susitna Sockeye Salmon Projects

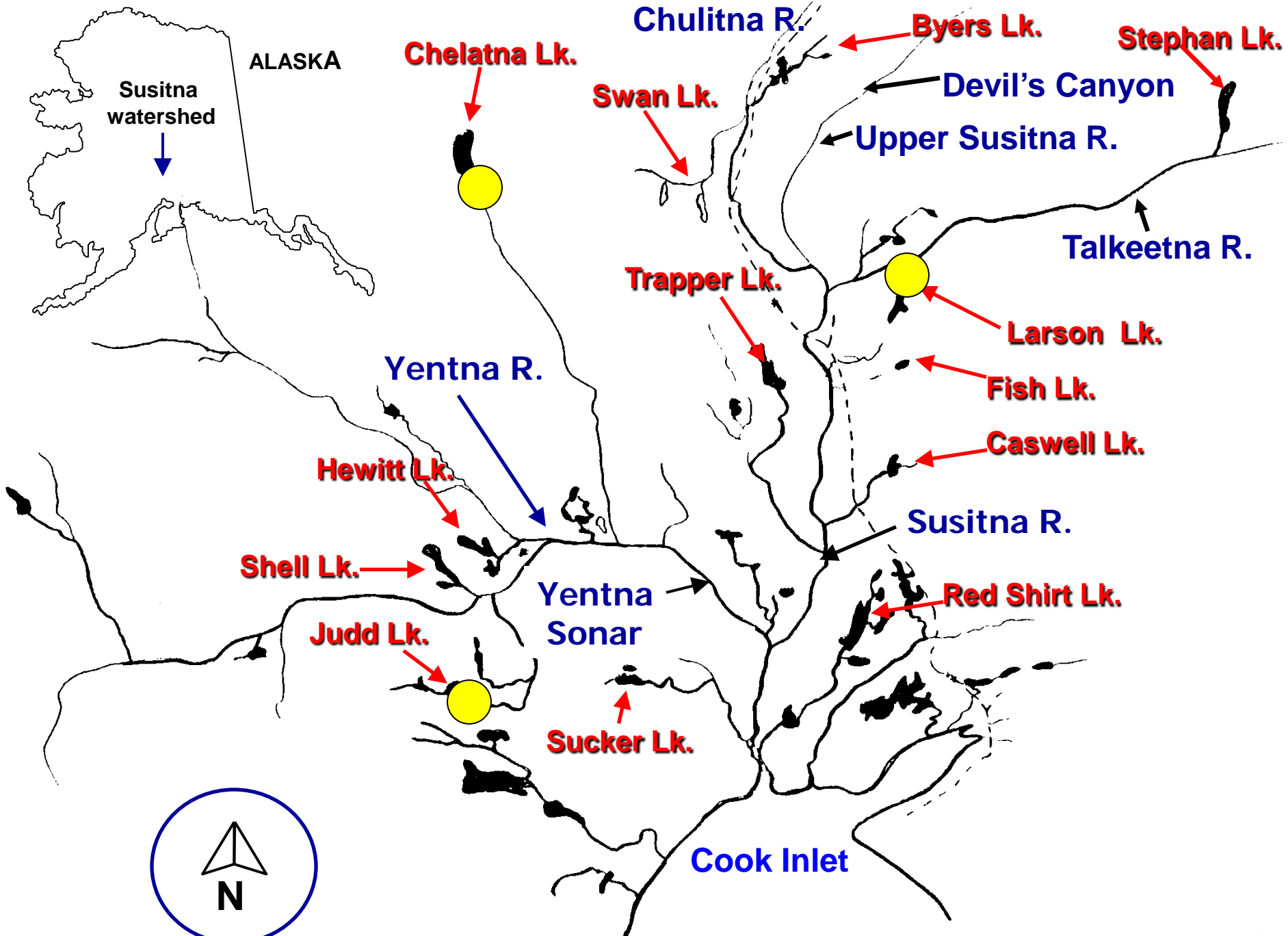
Oral Report to the Alaska Board of Fisheries

by

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Susitna Sockeye Salmon Projects

- Susitna Sockeye Salmon Production

Mark Willette and Gary Fandrei

- Yentna Sonar Estimation

Suzanne Maxwell

- Yentna Fish Wheel Selectivity

Mark Willette

Susitna Sockeye Salmon Production Project

Objectives

- Estimate adult sockeye salmon escapement, and fall fry and smolt abundance in the major sockeye salmon rearing lakes in the watershed.
- Develop life history brood tables to estimate freshwater production of sockeye salmon in each rearing lake.
- Collect limnological data to evaluate limitations to sockeye salmon production in each lake.
- Compare sockeye salmon production in lakes with and without northern pike.

Euphotic Volume Model Estimates of Sockeye Salmon Production (lakes with northern pike are shaded in green)

Drainage	Lake	Lake Area (acres)	Adult Production	Percent
Chulitna	● Byers	368	37,200	3.80%
	● Swan	385	11,000	1.10%
	Spink	252	23,500	2.40%
	Bunco	106	1,600	0.20%
	Total	1,111	73,300	7.60%
Mainstem	● Caswell ●	159	13,700	1.40%
	● Trapper ●	1,188	16,800	1.70%
	● Fish ●	132	10,600	1.10%
	● Sucker ●	273	8,300	0.90%
	● Red Shirt ●	1,272	69,500	7.20%
	Neil	115	7,600	0.80%
Total	3,139	126,500	13.00%	
Talkeetna	● Larson	437	45,100	4.60%
	● Stephan	899	63,700	6.60%
	Total	1,336	108,800	11.20%
Yentna	● Chelatna ●	3,906	363,574	37.50%
	Trinity	308	19,300	2.00%
	● Whiskey ●	271	23,600	2.40%
	Fish Creek	111	9,000	0.90%
	● Shell ●	1,293	90,265	9.30%
	Puntilla	90	8,800	0.90%
	Eightmile	115	5,600	0.60%
	Movie	110	6,700	0.70%
	Lockwood	233	11,000	1.10%
	● Judd	316	59,500	6.10%
	● Hewitt ●	697	60,600	6.20%
Red Salmon	113	3,400	0.40%	
Total	7,563	661,339	68.20%	
Grand Total	13,149	969,939	100%	

Methods – Adult Weirs



Methods – Limnological Sampling



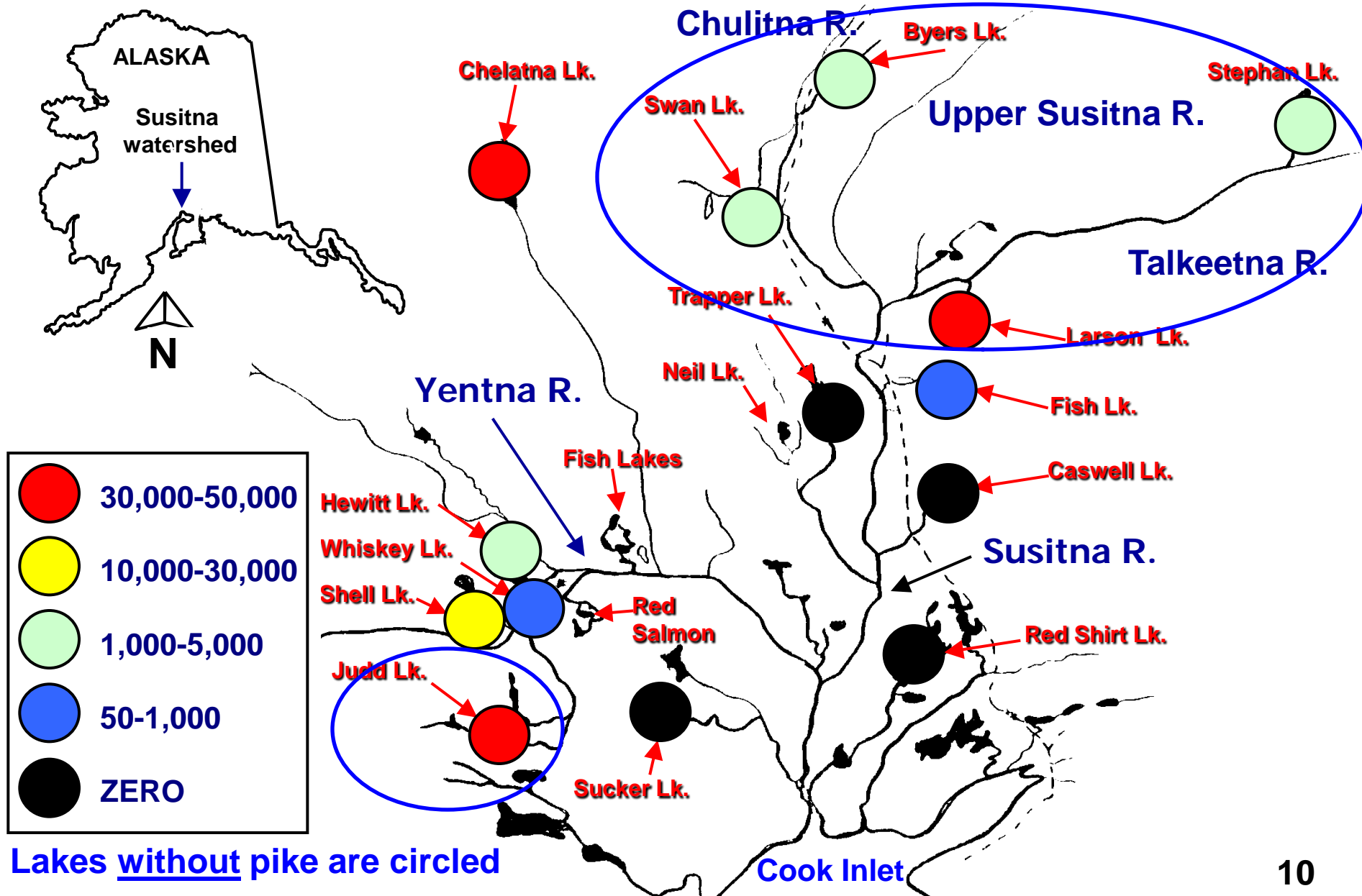
Methods – Fall Fry Abundance



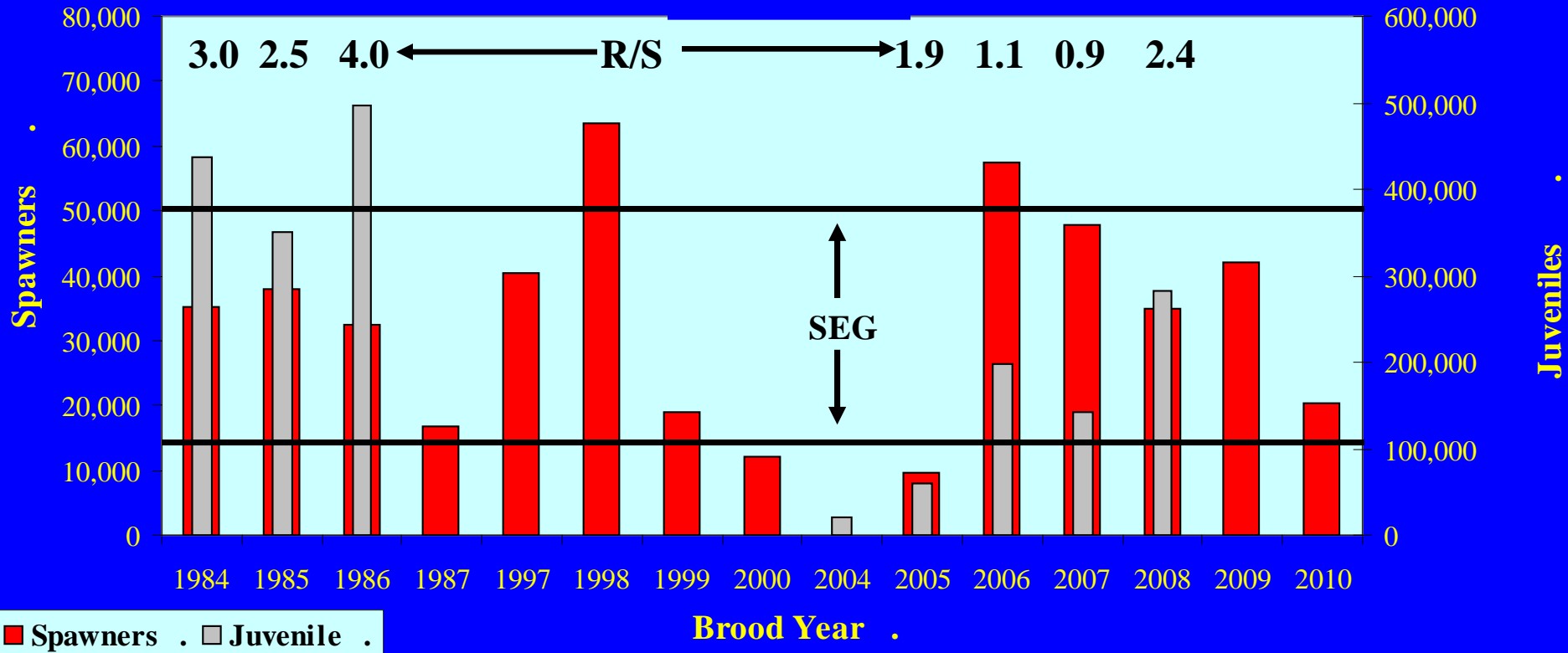
Methods – Smolt Abundance



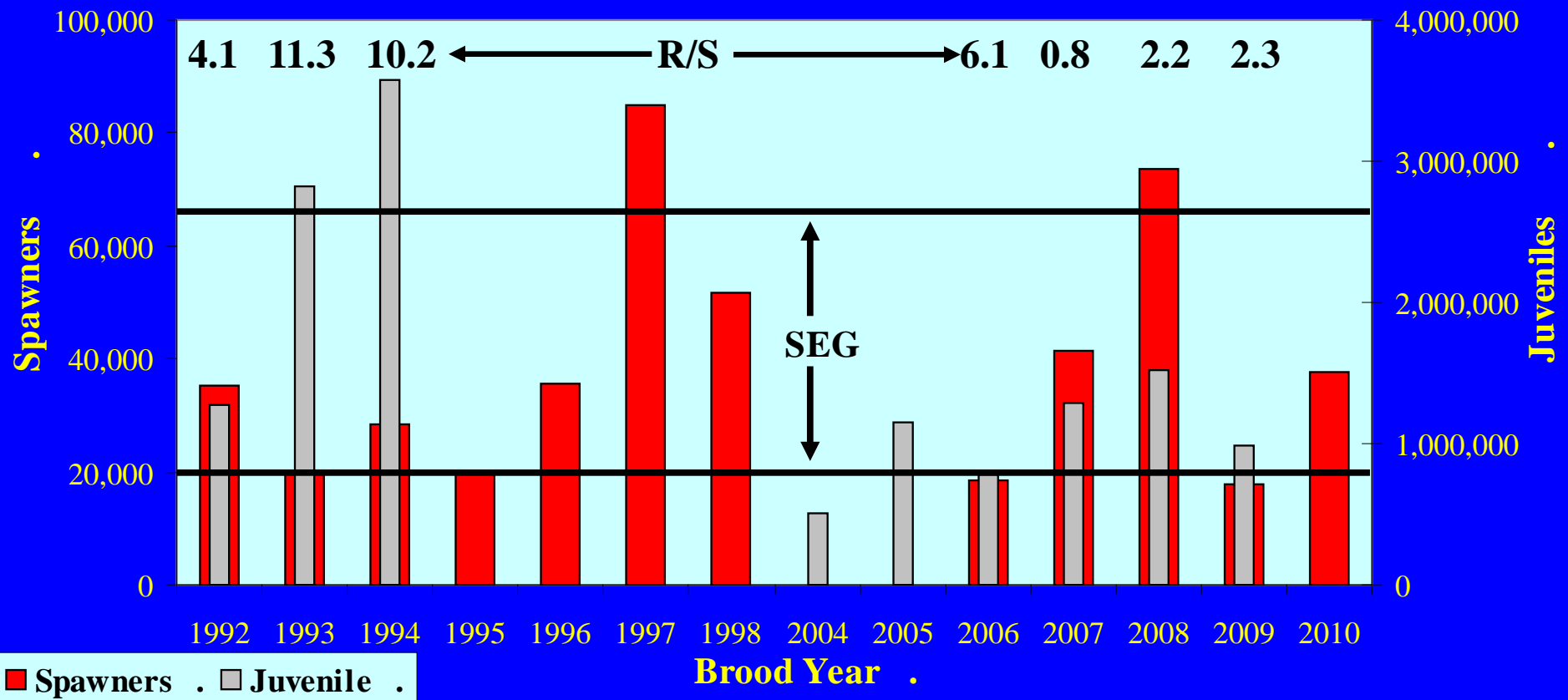
Average Sockeye Salmon Escapement in 14 Susitna Watershed Lakes (2006-2010)



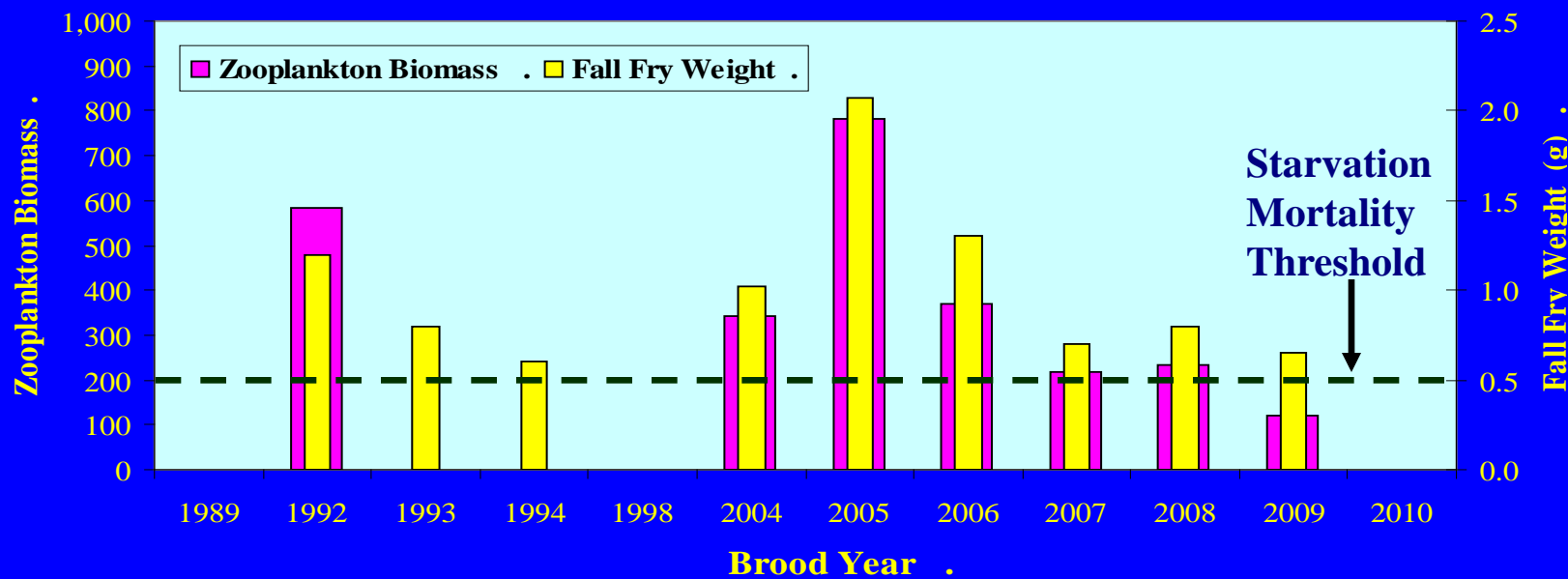
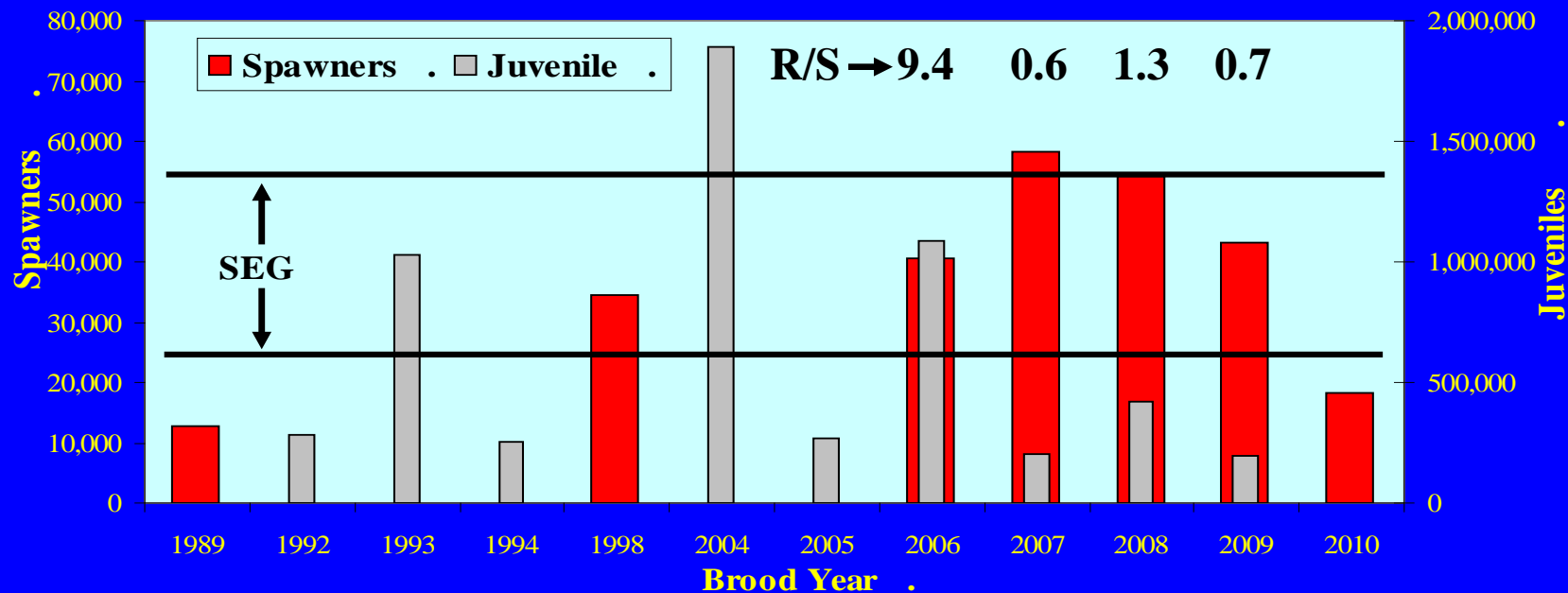
Sockeye Salmon Production Larson Lake



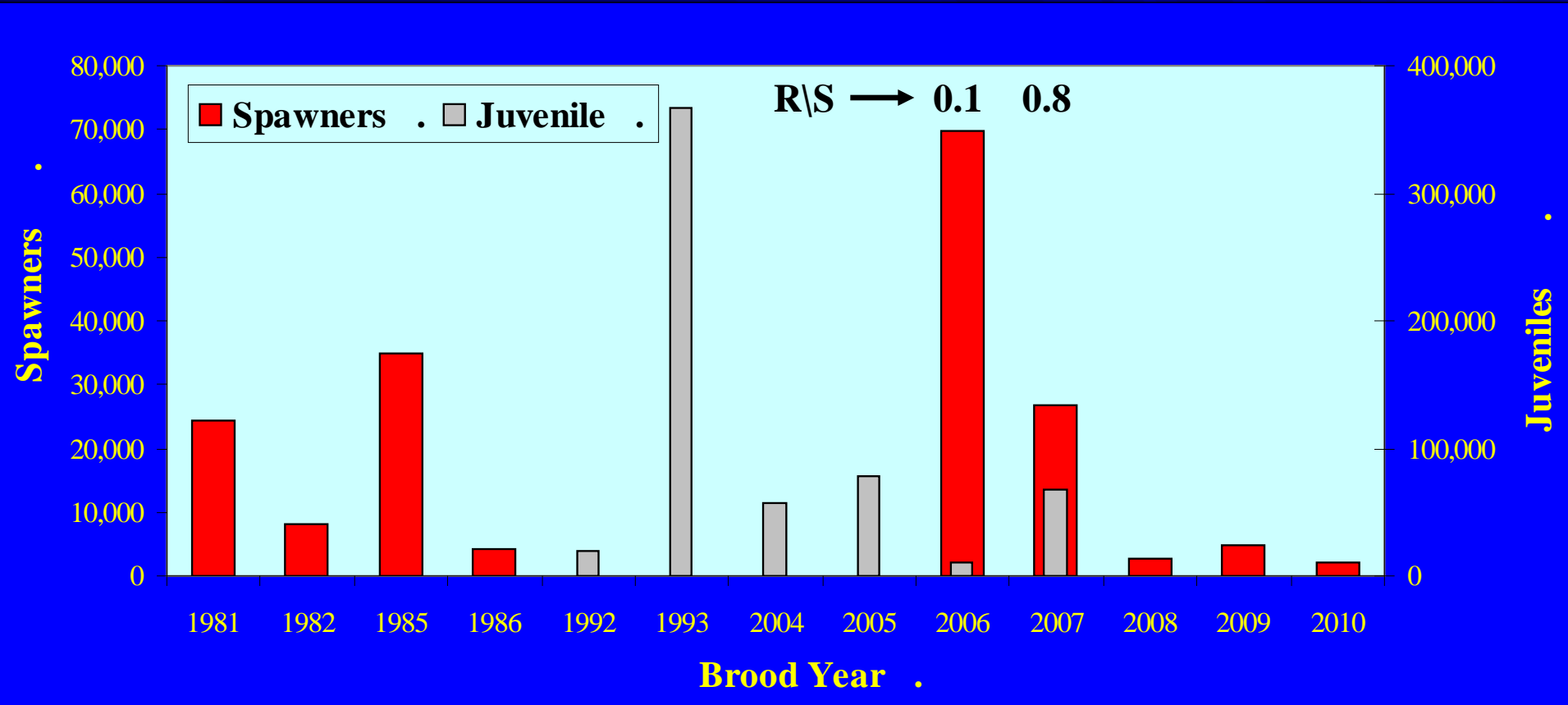
Sockeye Salmon Production Chelatna Lake



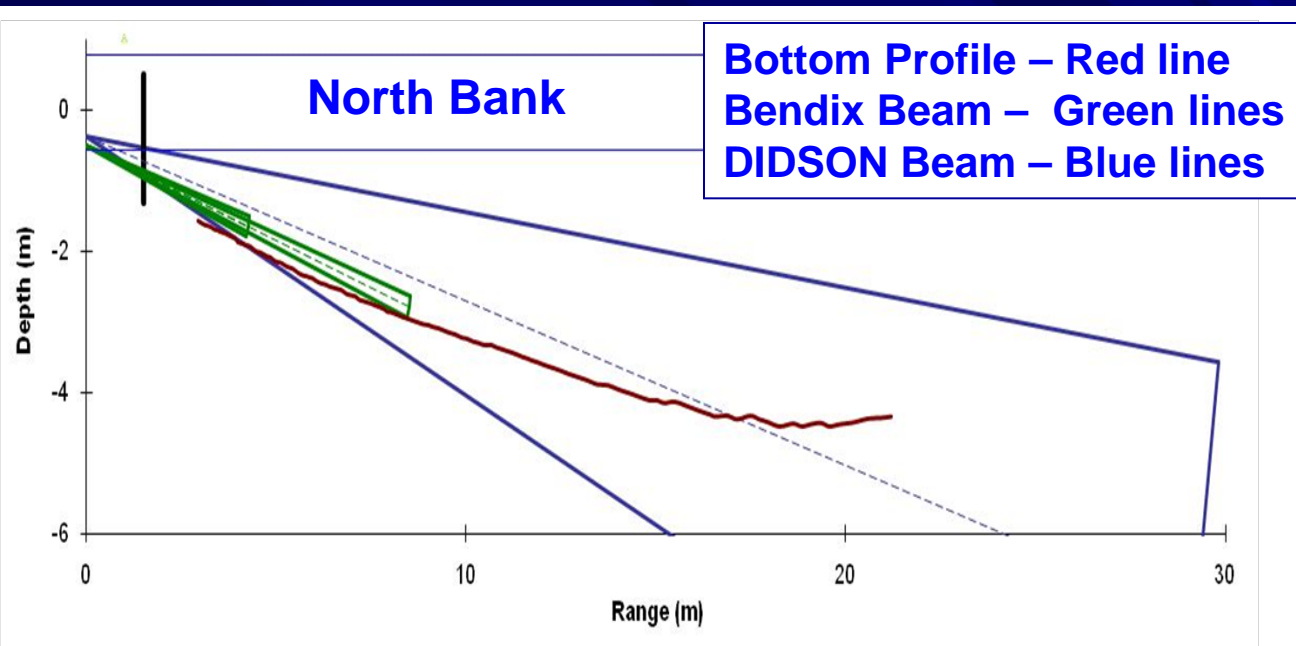
Sockeye Salmon Production Judd Lake



Sockeye Salmon Production Shell Lake



Yentna Sonar Estimation Studies



Estimation Method

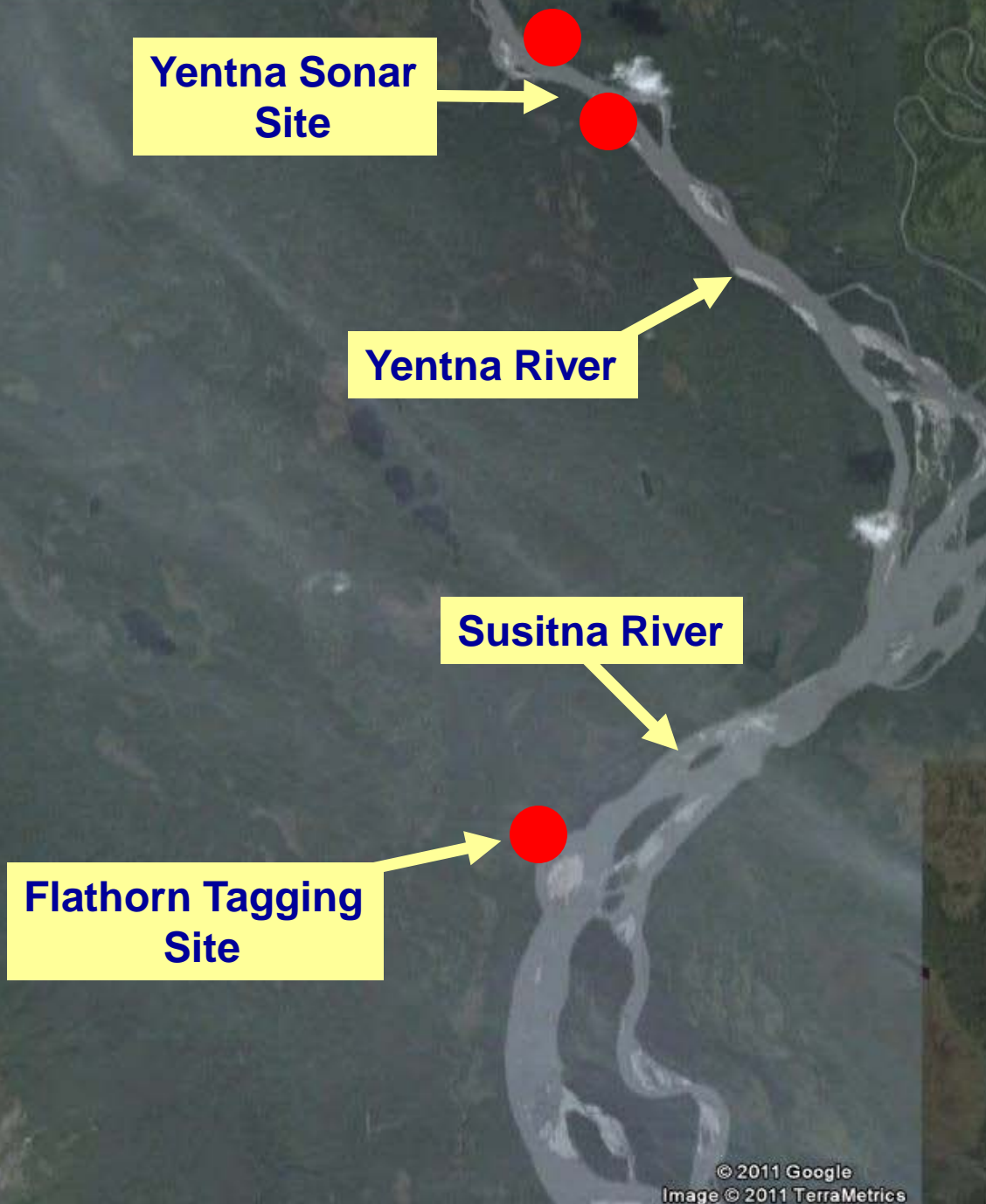
1. Sonars count all species of salmon within the sonar beam along each bank of the river.
2. Catches in fish wheels operated on each bank are used to apportion the total sonar count to different salmon species providing an estimate of the number of sockeye salmon migrating up the river.

Objectives:

- Estimate the effects of observer bias on the accuracy of sonar escapement estimates.
- Estimate the number of salmon migrating outside of the sonar beam.
- Estimate the number of pink salmon migrating within the range of the sonar beam.

Yentna Fish Wheel Selectivity Studies





Objectives

- Estimate tag recapture probabilities for sockeye, pink, chum, and coho salmon in fish wheels operated at the Yentna sonar site.
- Apply tag recapture probabilities to correct fish wheel catches at Yentna for species selectivity and estimate sockeye salmon escapement using species-apportioned sonar counts.
- Estimate sockeye salmon escapement using a genetic-based mark-recapture method.
- Compare sonar and mark-recapture escapement estimates.

Tag Recapture Probabilities

2009

Species	Proportion Yentna	Number Tagged	Effective Tagged	Number Recaptured	Recapture Probability
Sockeye	0.970	1,945	1,887	69	3.7%
Coho	0.883	2,821	2,491	125	5.0%
Pink	0.950	11,056	10,503	886	8.4%
Chum	0.815	735	599	36	6.0%
Total		16,557	15,480	1,116	6.7%

2010

Species	Proportion Yentna	Number Tagged	Effective Tagged	Number Recaptured	Recapture Probability
Sockeye	0.990	6,590	6,524	269	4.1%
Coho	0.862	3,075	2,650	174	6.6%
Pink	0.920	4,080	3,754	277	7.4%
Chum	0.765	3,198	2,447	159	6.5%
Total		16,943	15,375	879	5.7%

Comparison of Yentna Sockeye Salmon Abundance Estimates

Year	Aggregate Weir Count	Unadjusted DIDSON	Adjusted DIDSON	Yentna Mark-Recapture			Yentna M-R/ Unadjusted DIDSON	Yentna M-R/ Adjusted DIDSON
				Point	Lower 95% CI	Upper 95% CI		
2006	128,866	166,697	-	311,197	252,000	391,000	1.9	
2007	126,208	125,146	-	239,849	205,955	273,743	1.9	
2008	130,397	131,772	-	288,988	251,436	326,540	2.2	
2009	65,979	45,484	85,651	152,676	137,854	167,497	3.4	1.8
2010	58,367	88,332	122,424	177,521	160,250	194,792	2.0	1.5

Note: Aggregate weir counts are for Judd, Shell, and Chelatna lakes.

Judd, Chelatna, Larson and Total Susitna Sockeye Salmon Run Estimates

Judd-Chelatna-Larson Aggregate				
Year	Harvest	Escapement	Run	Harvest Rate
2006	18,260	116,477	134,737	13.6%
2007	139,999	147,160	287,159	48.8%
2008	90,252	162,813	253,065	35.7%
2009	45,523	102,947	148,470	30.7%
2010	-	76,469	-	-
Average	73,509	132,349	205,858	32.2%
Total Susitna				
Year	Harvest	Escapement	Run	Harvest Rate
2006	49,932	418,197	468,129	10.7%
2007	249,132	327,732	576,864	43.2%
2008	143,967	359,540	503,507	28.6%
2009	103,096	240,028	343,124	30.0%
2010	-	219,863	-	-
Average	136,532	336,374	472,906	28.1%

Susitna Sockeye Salmon Project Summary

- ❑ **Zero sockeye salmon spawners were counted entering Red Shirt, Trapper, Caswell, and Sucker lakes. In one year of assessment, only 548 spawners entered Fish Lake and 58 entered Whiskey Lake.**
- ❑ **Zero juvenile fish of any species were caught in Red Shirt and Trapper lakes.**
- ❑ **Sockeye salmon production in Larson and Chelatna lakes has declined in recent years compared with historical estimates.**

Susitna Sockeye Salmon Project Summary

- **Recent low sockeye salmon production in Judd Lake is associated with relatively high spawner abundances, low zooplankton biomass, and low fall fry size indicating rearing limitation.**
- **Causes of recent low sockeye salmon escapements, juvenile abundances, and freshwater survival in Shell Lake are not clear but may be related to northern pike predation.**

Susitna Sockeye Salmon Project Summary

- ❑ **Yentna fish wheels selected for pink salmon. The selectivity for pink salmon was greater in 2009, when pink salmon were more abundant.**
- ❑ **Yentna sonar estimates of sockeye salmon escapement adjusted for fish wheel selectivity were still significantly less than mark-recapture estimates of escapement.**
- ❑ **Total Susitna sockeye salmon runs estimated from mark-recapture and genetic stock identification of commercial harvests averaged 472,906 and commercial harvest rates averaged 28% from 2006-2009.**

A stream flows through a lush green landscape. The water is dark and turbulent. Numerous dead salmon are floating in the stream, their bodies appearing pale and lifeless. The surrounding vegetation is dense and green, with some rocks visible along the banks.

THE END