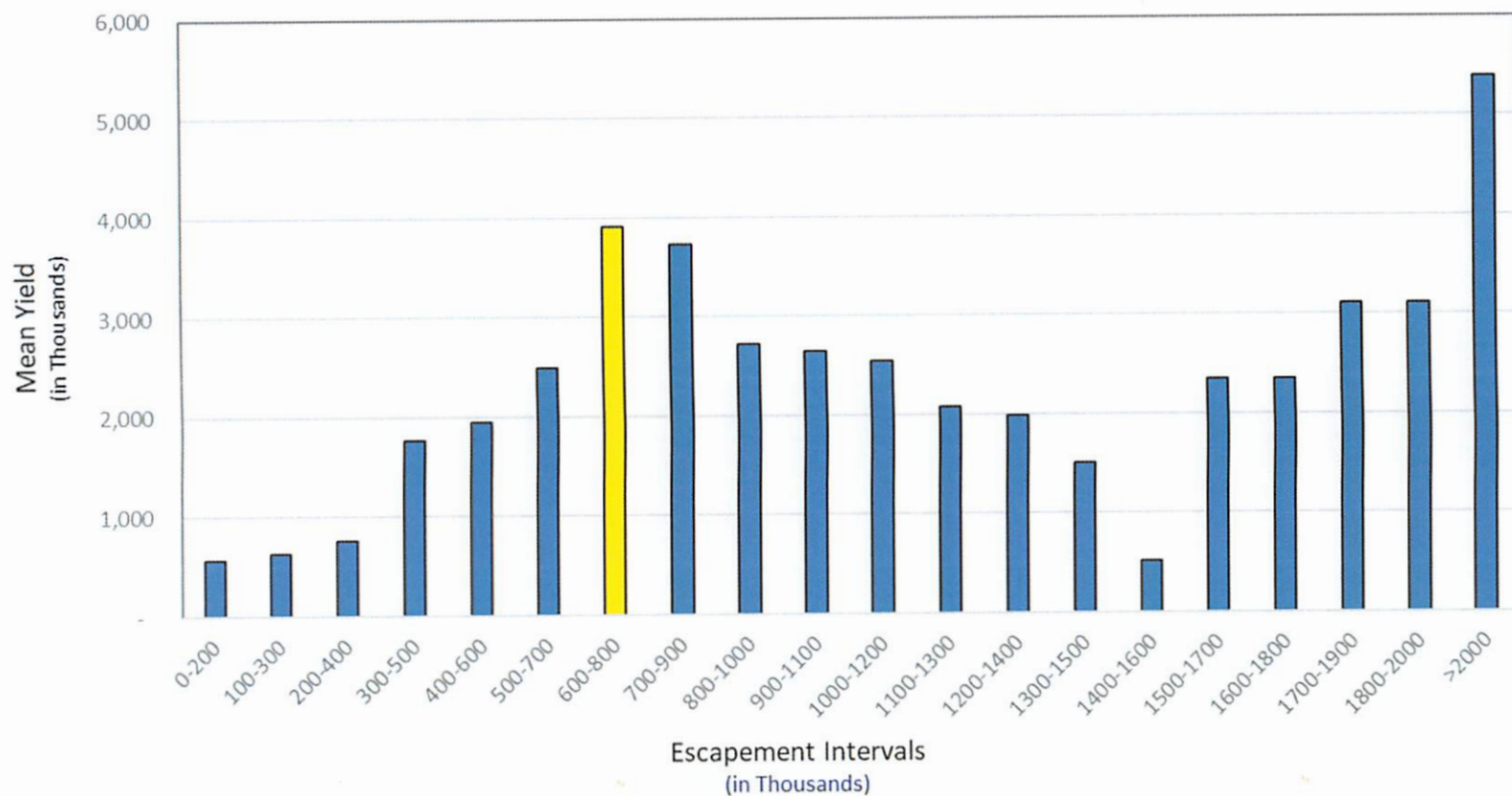


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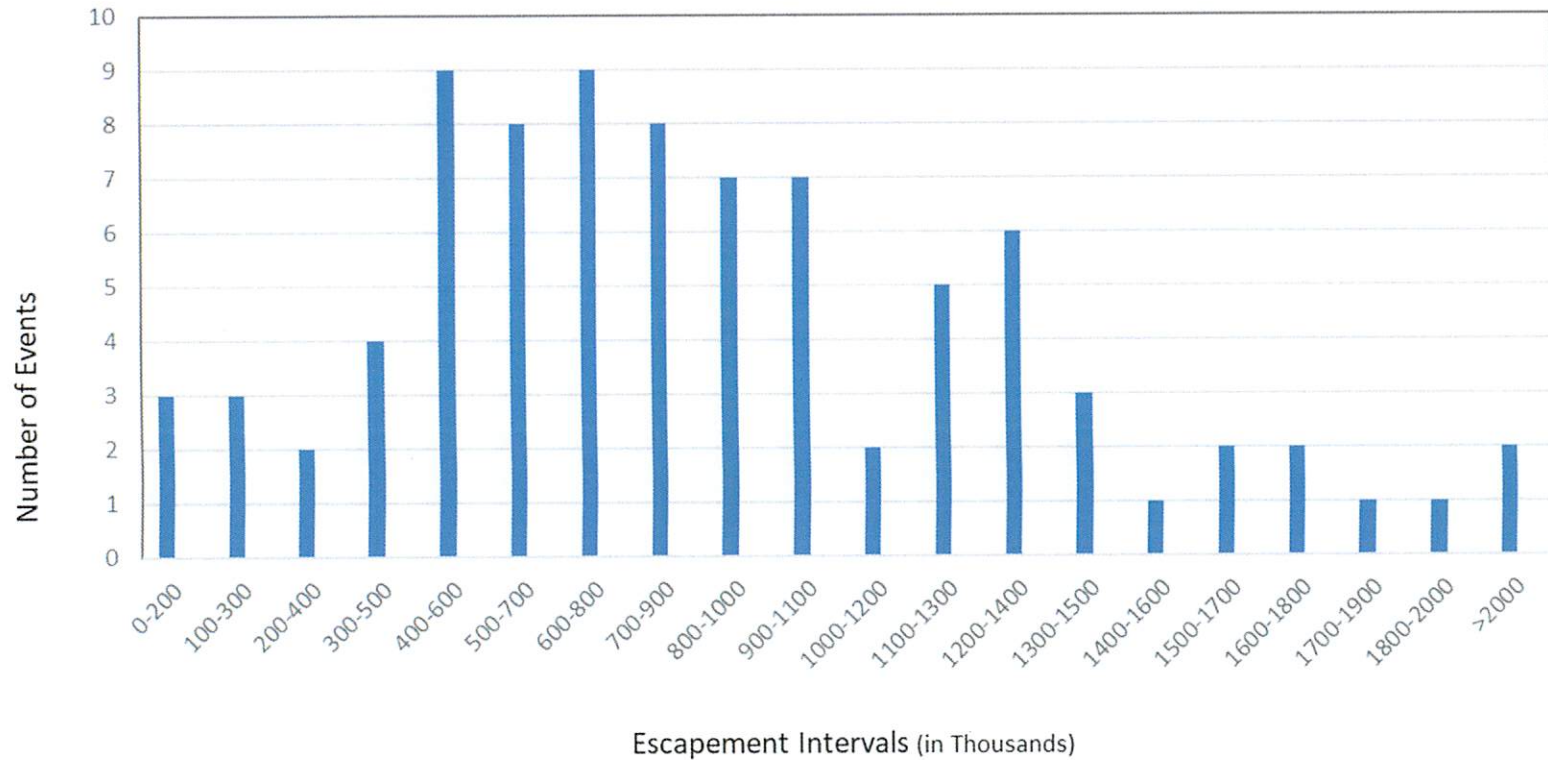
Figure 1. Kenai River Late-Run Sockeye Salmon  
Markov Table for Brood years 1969-2012



1. At escapements of 600,000 - 800,000, the mean return is 4,636,000 with an average yield of 3,902,000
2. The >2,000,000 interval has only 2 events. In 1987, 2,011,722 spawners produced a yield of 8,344,855 and in 1989, 2,026,637 spawners produced a yield of 2,432,042.

Table1. Markov Table for Brood years 1969-2012 in 200,000 fish in overlapping intervals of escapement for Kenai Late Run Sockeye Salmon.						
Escapement Interval	n	Mean	Mean	Return per	Yield	
		Spawners	Returns	Spawner	Mean	Range
0-200	3	120	679	6	564	358-871
100-300	3	165	798	5	633	449-871
200-400	2	292	1,055	4	763	578-947
300-500	4	414	2,179	5	1,764	580-3413
400-600	9	497	2,448	5	1,950	580-3413
500-700	8	563	3,046	5	2,483	999-6361
<b>600-800</b>	<b>9</b>	<b>734</b>	<b>4,636</b>	<b>6</b>	<b>3,902</b>	<b>713-8832</b>
700-900	8	768	4,497	6	3,729	713-8832
800-1000	7	943	3,664	4	2,720	692-4806
900-1100	7	970	3,612	4	2,642	692-4806
1000-1200	2	1,082	3,628	3	2,546	2504-2588
1100-1300	5	1,209	3,291	3	2,082	277-3229
1200-1400	6	1,266	3,250	3	1,985	277-3229
1300-1500	3	1,359	2,867	2	1,508	520-2261
1400-1600	1	1,402	1,922	1	520	520
1500-1700	2	1,672	4,021	2	2,349	1550-3148
1600-1800	2	1,672	4,021	2	2,349	1550-3148
1700-1900	1	1,892	5,004	3	3,111	3,111
1800-2000	1	1,892	5,004	3	3,111	3,111
>2000	2	2,019	7,408	4	5,388	2,432-8,345

Figure 2. Distribution of Kenai River Late-Run Sockeye Salmon Escapements



1. In all intervals above the > 1,400,000 - 1,600,000 range, the actual yield examples are as follows:
  - 2003 escapement of 1,402,340 produced a yield of 519,825
  - 2012 escapement of 1,212,837 produced a yield of 277,297
2. All 21 years with spawners above 794,754 (Table 2, highlighted in yellow) show a reduced yield from the MSY of 3,902,000. 1987 and 1989 are exceptions and are spurious events.

Table 2. Yield from the number of spawners from ADF&G brood tables , 1969-2012 sorted by size of escapements, for Kenai River Sockeye Salmon.

Brood Year	Spawners	Returns	Yield	Return per Spawner	Harvest Rate
1969	72.901	430.947	358.046	5.91	0.83
1970	101.794	550.923	449.129	5.41	0.82
1975	184.262	1,055.373	871.111	5.73	0.83
1974	209.836	788.067	578.231	3.76	0.73
1979	373.810	1,321.039	947.229	3.53	0.72
1971	406.714	986.397	579.683	2.43	0.59
1972	431.058	2,547.851	2,116.793	5.91	0.83
1984	446.397	3,859.109	3,412.712	8.65	0.88
1973	507.072	2,125.986	1,618.914	4.19	0.76
1976	507.440	1,506.012	998.572	2.97	0.66
1978	511.781	3,785.040	3,273.259	7.40	0.86
1981	535.523	2,464.323	1,928.800	4.60	0.78
1986	555.207	2,165.138	1,609.931	3.90	0.74
1985	573.836	2,587.921	2,014.085	4.51	0.78
1980	615.382	2,673.295	2,057.913	4.34	0.77
2000	696.899	7,058.348	6,361.449	10.13	0.90
2008	708.833	3,377.884	2,669.051	4.77	0.79
1991	727.159	4,436.074	3,708.915	6.10	0.84
2001	738.229	1,698.142	959.913	2.30	0.57
1982	755.672	9,587.700	8,832.028	12.69	0.92
1995	776.880	1,899.870	1,122.990	2.45	0.59
1983	792.765	9,486.794	8,694.029	11.97	0.92
1990	794.754	1,507.693	712.939	1.90	0.47
2009	848.117	3,983.872	3,135.755	4.70	0.79
1998	929.091	4,465.328	3,536.237	4.81	0.79
1999	949.276	5,755.063	4,805.787	6.06	0.84
1977	951.038	3,112.620	2,161.582	3.27	0.69
1996	963.125	2,261.757	1,298.632	2.35	0.57
2007	964.261	4,376.406	3,412.145	4.54	0.78
1993	997.730	1,689.779	692.049	1.69	0.41
2010	1,037.666	3,625.388	2,587.722	3.49	0.71
2002	1,126.642	3,630.740	2,504.098	3.22	0.69
1992	1,207.382	4,271.576	3,064.194	3.54	0.72
2012	1,212.837	1,490.134	277.297	1.23	0.19
1988	1,213.047	2,546.639	1,333.592	2.10	0.52
2011	1,284.486	4,513.815	3,229.329	3.51	0.72
1994	1,309.695	3,052.634	1,742.939	2.33	0.57
1997	1,365.746	3,626.402	2,260.656	2.66	0.62
2003	1,402.340	1,922.165	519.825	1.37	0.27
2005	1,654.003	4,802.362	3,148.359	2.90	0.66
2004	1,690.547	3,240.428	1,549.881	1.92	0.48
2006	1,892.090	5,003.585	3,111.495	2.64	0.62
1987	2,011.772	10,356.627	8,344.855	5.15	0.81
1989	2,026.637	4,458.679	2,432.042	2.20	0.55

Spawners, Returns and Yield numbers expressed in Thousands