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MEMORANDUM

TO: Rod Sando

FROM: Michele DeHart

DATE: October 29, 2007

RE: Historic Sockeye PIT-Tag releases at Alturas and Redfish Lakes

Per your request, FPC staff has reviewed historic releases of PIT-tagged sockeye juveniles in Alturas and Redfish Lakes and attempted to identify what types of information may be available from these tagged releases. FPC staff focused on specific release sites for each of these lakes, as they are identified in PTAGiS. There were two release sites for Alturas Lake: 1) Alturas Lake and 2) Alturas Lake Creek. Redfish Lake had a total of three release sites: 1) Redfish Lake, 2) Redfish Lake Creek, and 3) Redfish Lake Creek Trap. Historically, hatchery sockeye have been released into Alturas and Redfish Lakes both as pre-smolts and smolts. The pre-smolts are typically released in the fall prior to the year of their out-migration while the smolts are released in the spring of their migration year (April through June). Finally, wild sockeye are typically tagged and released as smolts in the spring and summer of their migration year.

PIT-Tagged Juvenile Sockeye Releases:

FPC staff tallied the total numbers of hatchery and wild sockeye tagged and released at the above listed sites over the past seventeen years (1991-2007). These data can be found in Table 1. As you can see, there are relatively few tags released each year at these sites. With so few tags being released each year, the amount of information that may be available with these tags is limited.

Table 1. Hatchery and wild sockeye tagged and released at Alturas and Redfish Lakes (1991-2007)

Migration Year	Alturas Lake			Alturas Lake Total	Redfish Lake			Redfish Lake Total
	Pre-Smolt	Smolt			Pre-Smolt	Smolt		
	Hatchery	Hatchery	Wild		Hatchery	Hatchery	Wild	
1991				0			37	37
1992				0			79	79
1993				0			48	48
1994				0			717	717
1995				0	2,728	1,371	109	4,208
1996				0	5,977	1,988	90	8,055
1997				0	1,930		67	1,997
1998	3,890	80		3,970	6,732	2,046	390	9,168
1999	1,246	181	87	1,514	4,179	401	392	4,972
2000	1,554	181	422	2,157	1,557	534	107	2,198
2001[A]		385	174	559		2,389	36	2,425
2002		249	158	407		2,808	627	3,435
2003	3,479	5	1	3,485	2,022	1,331	935	4,288
2004		1		1	1,519	1,915	843	4,277
2005	1,009	246	160	1,415	1,020	3,081	767	4,868
2006	1,011	79	224	1,314	1,008	1,329	368	2,705
2007	1,016	180	265	1,461	1,016	1,971	440	3,422

[A] In 2001 there were 2 sockeye smolts of unknown rearing type tagged and released at Alturas Lake Creek

Release Timing:

One piece of information that can be gathered from these releases of PIT-tags is migration timing to Lower Granite Dam (LGR). This relies on detections at LGR which, prior to 1995, were rare occurrences with so few tags being released. Timing to LGR for each migration year is provided in the figures below (Figures 1-3). For ease of presentation, we have broken the migration years apart. These timing plots combine releases of hatchery and wild sockeye smolts and pre-smolts to Alturas and Redfish Lakes for each migration year.

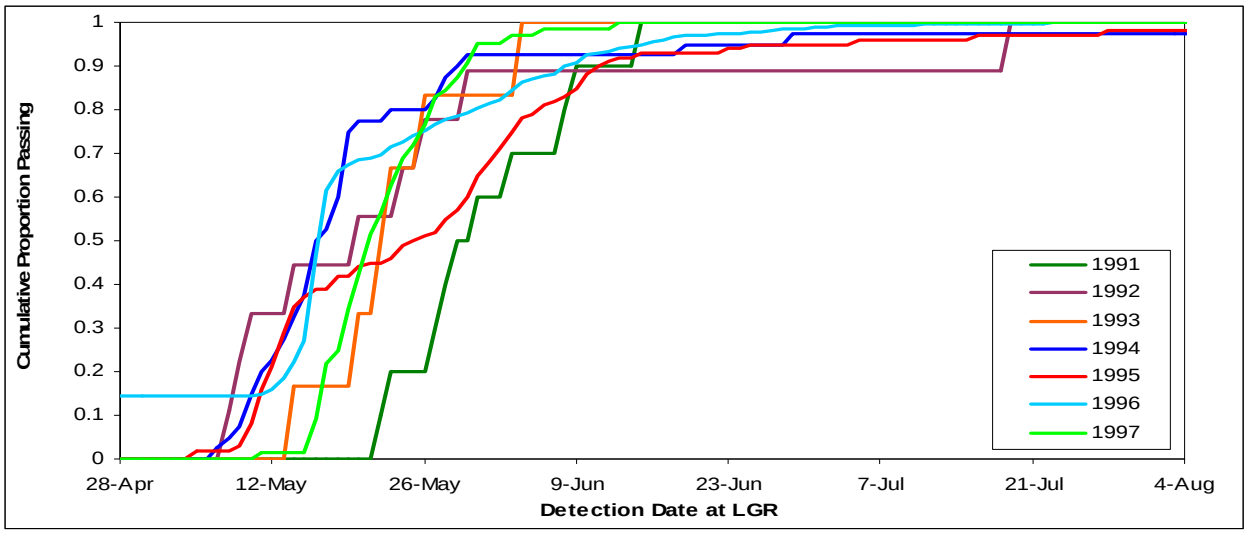

Figure 1. Migration timing to Lower Granite Dam for combined wild and hatchery sockeye smolts and pre-smolts (migration years 1991-1997). During these migration years, sockeye juveniles were released only from Redfish Lake.

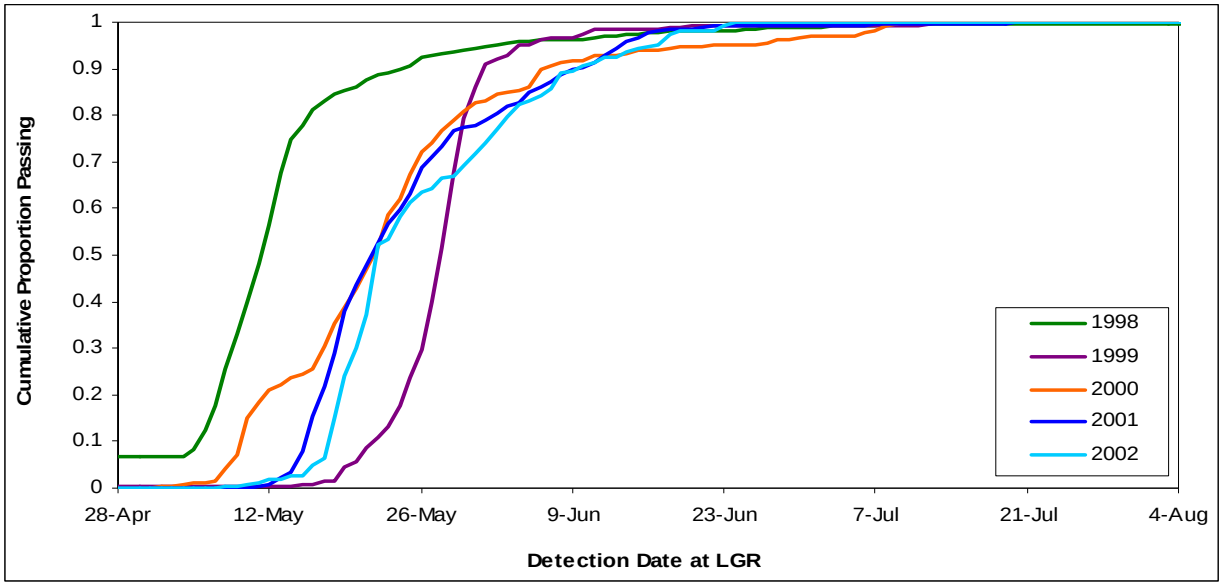

Figure 2. Migration timing to Lower Granite Dam for combined wild and hatchery sockeye smolts and pre-smolts (migration years 1998-2002). During these migration years, sockeye juveniles were released from both Alturas and Redfish Lakes.

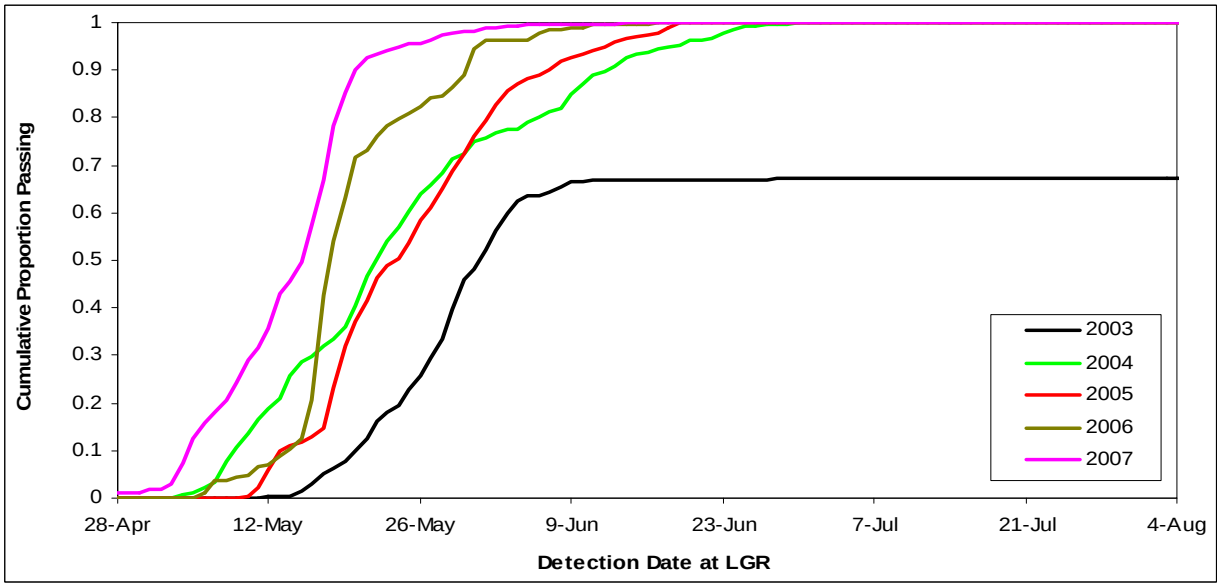

Figure 3. Migration timing to Lower Granite Dam for combined wild and hatchery sockeye smolts and pre-smolts (migration years 2003-2007). During these migration years, sockeye juveniles were released from both Alturas and Redfish Lakes. Of the juvenile sockeye released in migration year 2003, 103 were detected at LGR in 2004 and 1 was detected in 2005.

Juvenile Survival:

Estimations of juvenile survival were also possible with these PIT-tag releases. FPC staff analyzed juvenile survival from release (Alturas and Redfish Lake combined) to Lower Granite Dam for each migration year. Where applicable, juvenile survival from release to McNary Dam was also estimated. Due to difference in their life-histories, these survival analyses were conducted for sockeye smolts (hatchery and wild combined) and pre-smolts separately.

Survival estimates for sockeye smolts (hatchery and wild combined) were not possible for migration years 1991-1993 and 1997, due to the small number of tags released in these years. For all other years, it was at least possible to estimate survival from release to LGR for sockeye smolts (Table 2). Due to higher sample sizes, FPC staff was able to estimate survival from release to McNary Dam (MCN) for migration years 1998, 1999, 2002, 2003, 2006, and 2007. Even though sample sizes were relatively high, estimates of sockeye smolt survival from release to MCN were not possible for migration years 2004 and 2005 since approximately 96% and 86% of the juvenile sockeye that were detected after their release were transported at Lower Granite, Little Goose, or Lower Monumental Dam prior to making it to McNary Dam, respectively.

Table 2. Survival of wild and hatchery sockeye smolts from release to Lower Granite Dam and release to McNary Dam (migration years 1991-2007)

			Release to Lower Granite Dam (95% CI)			**Release to McNary Dam (95% CI)**		
Migration Year	**Number Released**	**Number Recovered**	**Survival**	**Lower Limit**	**Upper Limit**	**Survival**	**Lower Limit**	**Upper Limit**
1991	37	21	N/A	N/A	N/A	N/A	N/A	N/A
1992	79	19	N/A	N/A	N/A	N/A	N/A	N/A
1993	48	21	N/A	N/A	N/A	N/A	N/A	N/A
1994	717	157	0.545	0.295	0.774	N/A	N/A	N/A
1995	1,480	136	0.127	0.100	0.154	N/A	N/A	N/A
1996	2,078	496	0.480	0.401	0.558	N/A	N/A	N/A
1997	67	28	N/A	N/A	N/A	N/A	N/A	N/A
1998	2,516	1264	0.780	0.719	0.830	0.430	0.195	0.664
1999	1,061	345	0.467	0.393	0.543	0.318	0.142	0.494
2000	1,244	271	0.427	0.330	0.531	N/A	N/A	N/A
2001[A]	2,987	701	0.266	0.247	0.285	N/A	N/A	N/A
2002	3,842	829	0.351	0.310	0.395	0.175	0.118	0.232
2003	2,272	639	0.368	0.334	0.403	0.293	0.185	0.401
2004	2,759	1,085	0.407	0.382	0.432	N/A	N/A	N/A
2005	4,254	1,353	0.501	0.445	0.557	N/A	N/A	N/A
2006	2,000	646	0.549	0.463	0.632	0.279	0.133	0.425
2007	2,856	738	0.427	0.381	0.474	0.283	0.158	0.408

[A] In 2001 there were 2 sockeye smolts of unknown rearing type tagged and released at Alturas Lake Creek

Since there were no releases of PIT-tagged sockeye pre-smolts prior to 1995, survival estimates were not possible for migration years 1991 through 1994. Also, there were no releases of PIT-tagged sockeye pre-smolts in 2001 and 2002, so survival estimates are not possible for these migration years. For all other years, it was at least possible to estimate survival from release to LGR for sockeye pre-smolts (Table 3). Estimates of survival from release to MCN for sockeye pre-smolts were only possible for migration years 1998, 1999, 2003, and 2007.

Table 3. Survival of hatchery sockeye pre-smolts from release to Lower Granite Dam and release to McNary Dam (migration years 1991-2007)

			Release to Lower Granite Dam (95% CI)			Release to McNary Dam (95% CI)		
Migration Year	**Number Released**	**Number Recovered**	**Survival**	**Lower Limit**	**Upper Limit**	**Survival**	**Lower Limit**	**Upper Limit**
1995	2,728	38	0.017	0.012	0.024	N/A	N/A	N/A
1996	5,977	397	0.111	0.093	0.128	N/A	N/A	N/A
1997	1,930	119	0.097	0.070	0.124	N/A	N/A	N/A
1998	10,622	773	0.109	0.099	0.121	0.044	0.020	0.069
1999	5,425	574	0.131	0.118	0.145	0.096	0.059	0.133
2000	3,111	372	0.195	0.166	0.227	N/A	N/A	N/A
2003	5,522	345	0.076	0.066	0.086	0.032	0.015	0.050
2004	1,519	140	0.097	0.080	0.117	N/A	N/A	N/A
2005	2,029	328	0.241	0.195	0.293	N/A	N/A	N/A
2006	2,019	294	0.236	0.183	0.299	N/A	N/A	N/A
2007	2,032	270	0.190	0.161	0.223	0.140	0.070	0.211

Travel Time:

Estimates of median travel time are also possible for sockeye smolts or pre-smolts. Travel time of pre-smolts is problematic, due to their beginning their out-migration until several months after being released. Also, releases of smolts were generally conducted over relatively long periods of time (1-2 months), which makes median travel time difficult to estimate, given that different releases would be subject to different operations.

We hope that this memo helps to answer some of your questions regarding the tagging and release of sockeye juveniles in Alturas and Redfish Lakes. If we can provide any additional information on this matter, please let us know.