



FISH PASSAGE CENTER

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MEMORANDUM

TO: MAG
Brian Lipscomb, CBFWA

Michele DeHart

FROM: Michele DeHart

DATE: June 22, 2009

RE: Mainstem monitoring: Comparative Survival Study; Coordination and integration of marking for estimation of smolt to adult returns (SAR) juvenile migration survivals and mainstem passage characteristics, The Smolt Monitoring Program; juvenile migration passage characteristics including survival.

During the June 17, MAG meeting discussing RME, the issue of integrating and coordinating mark groups was discussed. This has been a key ongoing component of mainstem monitoring since 1996 the first year of implementation of the CSS and 1984 the first year of implementation of the Smolt Monitoring Program. The Comparative Survival Study (CSS) is a joint monitoring study of the states, and tribal fishery managers and the USFWS. It is a management-oriented, large scale monitoring study of spring chinook and steelhead in the Columbia Basin. All CSS and SMP data are publically available on the FPC web site. Annual reports for the SMP and CSS are provided to the region for regional review and comment. The SMP and CSS together comprise a management oriented life cycle monitoring program.

The primary objective of the CSS is to establish a long-term dataset that measures the survival rate of year classes of salmon and steelhead from the outmigration as smolts to their return to freshwater as adults to spawn (*i.e.* SAR or smolt-to-adult return rate). Through utilization of PIT (Passive Integrated Transponder) tags, survival metrics such as SARs and juvenile survival rates within the hydrosystem, and important demographic responses such as migration rates, emigration timing, adult fallback rates, adult success rates and others can be estimated over the smolt-to-adult life cycle. The CSS was designed to address several of the basin-wide monitoring

needs and to provide these demographic data for Snake River and Columbia River wild and hatchery salmon and steelhead populations. Monitoring survival rates in this way over the life-cycle can help identify where survival bottlenecks are occurring, which is critical input for informed management decisions.

The CSS is an observational study (Cochran 1983; Eberhardt and Thomas 1991; McDonald et al 2007) that measures the biological responses of population groups with different hydrosystem experiences. The two primary characteristics of observational studies as defined by Cochran (1983) are central to the CSS study design:

1. “The objective is to study the causal effects of certain agents, procedures, treatments or programs”;
2. “For one reason or another, the investigator cannot use controlled experimentation, that is the investigator cannot impose on a subject, or withhold from the subject, a procedure or treatment whose effects he desires to discover, or cannot assign subjects at random to different procedures”.

The goals of CSS are (1) estimate smolt-to-adult survival rate (SAR) for transported wild and hatchery Chinook and steelhead; (2) determine if SAR rates are significantly different from the interim SAR goal established by the NPCC; (3) evaluate SARs and other passage characteristics of Chinook and steelhead populations throughout the Columbia Basin; and (4) estimate transport/control ratio and in-river survival rates for wild and hatchery Chinook and steelhead concurrently over a number of years in order to span a range of environmental conditions. Additionally, the CSS has expanded into component, system-wide analysis of factors associated with survival rates both within and outside of the FCRPS, that is; survival of out-migrating smolts upstream of and within specific reaches of the FCRPS, survival post-Bonneville in the estuary and ocean, and survival of upstream migrating adults.”

The resulting CSS study data are designed to apply to a broad scope of management questions, including hydropower operations, hatchery evaluations and habitat evaluations. An interagency CSS Oversight Committee was established to participate in the study design, planning and analysis, and to oversee the conduct and analyses of this study. Analyses include comparing smolt-to-adult survival rates for wild and hatchery Snake River Chinook and steelhead that were transported with those that migrated in-river to below Bonneville Dam (BON). Estimates of smolt-to-adult survival rates will be made from Lower Granite Dam (LGR) back to Lower Granite Dam, from hatchery back to the hatchery, Adult success and drop-out rates will be measured using the available adult detectors [BON, McNary (MCN), Ice Harbor (IHR), and LGR]. New out-of-hydrosystem detectors arrays are coming online every year so, information about straying will be examined as well. These survival rates may be used in the evaluation of smolt mitigation measures such as flow augmentation, spill, and transportation for the recovery of listed salmon stocks. The NOAA Biological Opinions require a research, monitoring and evaluation program to provide information to continuously improve the survival characteristics of the FCRPS and to identify habitat needs. The NPCC Fish and Wildlife Program has established the need to collect annual salmon and steelhead migration characteristics including survival. The CSS was created to meet the needs stated in the PATH recommendations, the NOAA Biological Opinions and the NPCC Fish and Wildlife Program.

Marked fish utilized in the CSS analysis may be from groups PIT-tagged specifically for this program or may be from marked groups planned for other research studies. Wherever possible the CSS makes use of mark groups from other research to meet CSS requirements and increase the data set in order to reduce costs and reduce handling of fish. Every effort is made to avoid duplication of mark groups with other studies and gain the maximum efficiency from mark groups from other research studies. The actual mark proposals for CSS will be dependent on year-to-year coordination with other research entities. Collaborations in recent years include those with the marking programs of the Lower Snake River Compensation Plan (LSRCP), Idaho Power Company (IPC), and Smolt Monitoring Project (SMP). The CSS will review on-going and planned programs in the Middle and Upper Columbia River regions, to establish stock specific or aggregate groups of marks in those regions to support CSS analysis and develop demographic survival data for those stocks.

In addition to the present integrated and coordinated mark groups used in the CSS, the CSS Oversight Committee and FPC, will review mark groups planned for 2010 as part of our continuing coordination efforts. This is consistent with recommendations from the ISAB/ISRP reviews of the CSS in 2007 and 2009. The CSS Oversight Committee is presently reviewing marking efforts in the middle and upper Columbia to ascertain whether or not aggregate population SARs could be estimated from existing marking efforts in those areas. Table 1 shows the number of Snake River hatchery and wild steelhead and Chinook PIT tag marked through the CSS Study. Table 2 shows the integration of the CSS marks with ongoing marking for other purposes. Table 3 shows fish marked for other purposes (i.e., no contribution of tags from CSS) that are used in CSS analysis including calculation of SARs.

Table 1. Number of Snake River hatchery steelhead (see tributary allocations on next page), hatchery Chinook, and additional wild Chinook and wild steelhead to be PIT tagged through CSS contract in 2009.

Organi- zation	Budget Contacts	Tagging Site	Species and rearing type	PIT tag number
IDFG	P. Hassemer	Magic Valley H	H-Stld	11,406
		Hagerman NFH	H-Stld	8,139
	E. Buettner	Clearwater H	H-Stld	6,455
		Niagara Springs H	H-Stld	24,000
		Rapid R H	H-Ch	32,000 ^A
		McCall H	H-Ch	52,000
		Salmon R trap	W-Ch	5,000 ^B
		Snake R trap	W-Ch	2,000 ^B
		Clearwater R trap	W- Ch	3,200
		Clearwater R trap	W-Stld	1,400
		Other tributary traps	W-Ch	14,500 ^C
		Clearwater H	H-Ch	12,400
		Pahsimeroi H	H-Ch	3,800
Sawtooth H	H-Ch	3,800		
ODFW	R. Carmichael and B. Jonasson	Irrigon H	H-Stld	14,000
		Lookingglass H		
		• Innaha R	H-Ch	21,000 ^D
		• Catherine Ck	H-Ch	21,000 ^D
		Grande Ronde R trap	W-Ch	1,400 ^B
USFWS	D. Wills H. Burge	Dworshak NFH	H-Stld	9,000
		Dworshak NFH	H-Ch	52,000
WDFW	J. Bumgarner	Lyon Ferry H. – Cottonwood AP	H-Stld	2,000

^A Additional 20,000 PIT tags provided by Idaho Power Company to create the normal 52,000 PIT tag release from Rapid River Hatchery

^B Additional smolts to be PIT tagged above the current SMP tagging quotas.

^C Cost for PIT tags only to complement on-going PIT tagging efforts in Idaho.

^D Fish PIT tagged in the fall of the contract year for the next year's migration.

Table 2. Summary of Snake River PIT tagged groups that will be pre-assigned in 2009 as part of the CSS.

Marking Agency	Total tagged	CSS tags	Tagging Site	Release Site	Stock	In-river percentage	ShyC Agency					
1	52k*	32k	Rapid River H.	Rapid River	HCH(sp)	30%	FPC				√	
2	52k	52k	McCall H.	Knox Bridge	HCH(su)	30%	FPC					
3	45k->75k	14.5k ^o	Fall & Spring Marking ⁺	Same as tag	WCH/WST	30%	FPC					
4	30.4k(SMP)	7k ^o	Snake & Salmon Traps	Same as tag	WCH/WST	30%	FPC			√		
5	5.2k	5.2k	Clearwater Trap	Same as tag	WCH/WST	30%	FPC					
6	37.5k	11.4k	Magic Valley H.	E.F. Salmon, Slate Creek, Squaw creek/pond, Little Salmon	63%HST(A); 37%HST(B)	30%	FPC					
7	IDFG 26.8	8.1k	Hagerman H.	MS. Salmon, Pahsimeroi, Yankee Fork, Valley Creek, Little Salmon	41%HST(A); 59%HST(B)	30%	FPC					
8	21k	6.5k	Clearwater H.	SF Clwr, Lolo Creek	100%HST(B)	30%	FPC					
9	25.2k	24k	Niagara Springs H.	Hell's Canyon, Little Salmon, Pahsimeroi	100%HST(A)	30%	FPC					√
10	68.9k	12.4k	Clearwater H.	Upper Lochsa, Clear Cr, Lower Selway, SF Clearwater	HCH(sp)	25%	IDFG	√				√
11	18.8k	3.8k	Pahsimeroi H.	Onsite, upper Salmon	HCH(su)	28%	IDFG	√				√
12	18.8k	3.8k	Sawtooth H.	Onsite, upper Salmon	HCH(sp)	28%	IDFG	√				√
13	21k	21k	Lookingglass H.	Imnaha AP	HCH(su)	30%	FPC					
14	21k	21k	Lookingglass H.	Catherine AP	HCH(sp)	30%	FPC					
15	ODFW 10.4k(SMP)	1.4k	Grand Ronde Trap	Same as tag	WCH	30%	FPC			√		
16	3.2k -> ?	0	Fall & Spring Marking ^o	Same as tag	WCH/WST	50%	FPC					
17	44.7k	14k	Irrigon H.	Grande Ronde, Imnaha	100% HST(A)	30%	ODFW	√				√
18	52k	52k	Dworshak H.	North Fork Clearwater	HCH(sp)	30%	FPC					
19	USFWS ~28.9k	9k	Dworshak H.	Clearwater MS, Clearwater SF, Clear Creek	100%HST(B)	30%	FPC					
20	WDFW 6k	2k	Lyon's Ferry H.	Cottonwood AP	100%HST(A)	33%	WDFW	√				√
21	CTUIR 1k -> ?	0	Fall & Spring Marking ^Δ	Same as tag	WCH/WST	50%	FPC					
22	Shoban					30%	FPC					
23	Nez Perce ~10k-12k	0	Imnaha Trap (Fall & Spring marking)	Same as tag	WCH/WST	~16%	Nez Perce					

* Idaho Power provided 20,000 of this total
 o The CSS provides tags for WCH at these sites but not for WST
 + Marking at: American R, Crooked R. Trap, Red R. Trap, Crooked Fork C. Trap, Colt Kill Creek, Marsh Creek Trap, Pahsimeroi R. Trap, Sawtooth Trap, Big Creek Middle Fork, Knox Bridge, Secesh River Trap, Lemhi R. Weir, Lemhi R., Hayden Creek, Fish Trap, Rapid R. Trap
 o Marking at: Catherine Creek, Lostine R., Minam R.
 Δ Marking at: Lookingglass C., West Fork Yankee Fork Salmon R., East Fork Salmon R.

LSCRP Cooperative Site
 SMP Cooperative Site
 Idaho Power Cooperative Site
 Nez CSS Site my 2009

Table 3 Middle and Upper Columbia River PIT tag marking for 2009. Tags were not pre-assigned as part of CSS but available for other analyses.

Marking Agency	Total tagged	CSS tags	Facility/River (Wild)	Release Site	Stock	Tagging Purpose	Funding Source
	20k	0	Warm Springs NFH	Warm Springs River	Spring Chinook	HRT Rec./Hatchery Evaluation	FWS
	15k	0	Leavenworth NFH	Icicle Creek	Spring Chinook	Smolt Monitoring Program	BPA
	3k	0	Winthrop NFH	Methow River	Spring Chinook	Hatchery Evaluation	BOR
	15k	0	Carson NFH	Wind River	Spring Chinook	HRT Rec./Hatchery Evaluation	FWS
	15k	0	Little White Salmon NFH	Little White Salmon River	Spring Chinook	HRT Rec./Hatchery Evaluation	FWS
	40k	0	Little White Salmon NFH	White River (Wenatchee R.)	White River Spr. Chinook	ESA Recovery Program	Grant PUD
	??? *	0	Warm Springs R. (Wild)	Warm Springs River	W. Spr. R. Spr. Chin. (Wild)	Wild Stock Evaluation	FWS/WS Tribe
Total Spring Chinook = 108k							
	5k	0	Winthrop NFH	Methow River	Steelhead	Hatchery Evaluation	BOR
USFWS	1.5k	0	Dworshak NFH	North F. Clearwater River	Steelhead	Smolt Monitoring Program	BPA
Total Steelhead = 6.5k							
	6k	0	Wells SH	Columbia River @ Wells	Summer Chinook	Smolt Monitoring Program	BPA
Total Summer Chinook = 6K							
	15k		Spring Creek NFH	Columbia River @ Spr. Ck.	Tule Fall Chinook	HRT Rec./Hatchery Evaluation	FWS
	25k		Little White Salmon NFH	Little White Salmon River	URB Fall Chinook	HRT Rec./Hatchery Evaluation	FWS
	3k		Priest Rapids SH	Columbia River @ P. Rapids	URB Fall Chinook	Smolt Monitoring Program	BPA
	???		Deschutes River (Wild)	Deschutes River	URB Fall Chinook	Wild Stock Evaluation	FWS/ODFW/WS Tribe
Total Fall Chinook = 43k							
Yakama Nation	40k	0	Cle Elum Hatchery	Yakima R. @ 3 Accl. Ponds	Upper Yakima Spring Chinook	Supplementation	?
	~4.8k	0	John Day River (Wild)	John Day River	Wild Spring Chinook	Smolt to Adult survival	OWEB
ODFW	3k	0	Umatilla River (Wild)	Umatilla River	Wild Summer Steelhead	Supplementation	ODFW
	4k	0	John Day River (Wild)	John Day River	Wild Summer Steelhead	Smolt to Adult survival	OWEB
	~1.5k	0	Deschutes River (Wild)	Trout Creek	Wild Summer Steelhead	Habitat Evaluation	BPA

The annual Smolt Monitoring Program (SMP) is a key component of mainstem monitoring and evaluation. The SMP is designed to provide a consistent and continuous long term data set on juvenile passage characteristics through the mainstem Snake and Columbia rivers. The (SMP) (SMP) provides data on movement of salmonid smolts out of the major drainages and past the series of dams on the Snake and Columbia rivers. Indices of migration strength and migration timing are provided for the run-at-large at key monitoring sites. In addition, marked smolts from hatcheries, traps, and dams provide measures of smolt speed and in-river survival through key reaches. The SMP is coordinated with US Army Corps of Engineers funded monitoring of facility operations impacts and reports fish condition and, descaling, as well as the SMP sampling for gas bubble trauma measures to provide an indicator of facility operations and potential spill impacts. These data are used for in-season operational decisions relative to flow and spill management, particularly during periods when spill is being provided to improve smolt passage at dams. The Fish Passage Center develops an Annual Report each year which summarizes and analyzes SMP data and passage conditions. The SMP data is updated daily and presented to the region on the FPC web site.

The attached memorandum is an example of SMP and CSS data provided directly to fishery managers. In this case, the Rapid River Hatchery manager, regarding the downstream migration experience and smolt to adult return from specific mark groups from his program. These reports and summaries are posted on the FPC web site.



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September 25, 2008

Mr. Ralph Steiner
 Rapid River Hatchery
 HC 69, Box 85
 Riggins, ID 83549

Dear Ralph-

The Fish Passage Center has been marking fish from the Rapid River Hatchery facility over the last several years as part of the Smolt Monitoring Program (SMP) and the Comparative Survival Study (CSS). For purposes of these studies data are collected on either juvenile life stage, or both the juvenile and adult life stages. The SMP provides information for in-season management of the hydrosystem and post-season analyses to the federal, state, and tribal fishery agencies. The CSS is a multi-year program that estimates survival rates over different life stages for spring and summer Chinook produced in major hatcheries. We would like to share with you some of the information we developed under these studies for the fish used from the Rapid River Hatchery facility.

Under the Smolt Monitoring Program, information is collected on the timing and migration speed from the hatchery to Lower Granite Dam. In addition, as part of the CSS study, juvenile survival estimates are developed for the hydrosystem between Lower Granite and Bonneville Dams, as well as survival from juvenile to adulthood of different passage histories. Table 1 below provides estimates of minimum, median, and maximum travel times from each year's release to Lower Granite Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel time.

Table 1. Rapid River Hatchery Spring Chinook Travel Times to Lower Granite Dam

Release Date	Migration Year	Travel Time (Days)			Confidence Limits 95%		Lower Granite	
		Min	Med	Max	Lower	Upper	Flow (kcfs)	Temp (F)
4/1	1997	1.5	34.9	115.8	34.4	35.4	143	52
4/13	1998	n/a	19.5	60	19.5	19.6	75.2	52.6
4/2, 4/20	1999	1.4	37.1	134.8	36.9	37.2	95.7	49.8
3/17	2000	19.7	49	75.9	48.9	49	79.2	49.7
3/15	2001	16.2	46.3	110.3	46.2	46.3	34.7	46.7
3/18	2002	14.9	47.4	66.8	47.4	47.5	27.5	
3/17	2003	15.1	47.4	84.1	47.2	47.7	28.6	
3/15	2004	14.4	46.7	72.6	46.6	46.9	23.9	
3/15	2005	20.9	50.9	78.2	50.8	50.9		
3/17	2006	15.1	48.9	71.1	48.7	49.1	44	
3/15	2007	11.3	50.3	82.9	50.2	50.4	52.1	
3/17, 3/19	2008	14.1	52.6	86.0	52.6	52.7	52.7	49.7

Table 2 below contains estimates calculated in the CSS study of juvenile survival in the hydrosystem between Lower Granite and Bonneville Dams and the survival to adulthood of juvenile salmonids in several categories. Those categories are SAR(T), SAR(C₀), and Weighted SAR_{LGR-10-LGR}, where SAR(T) represents smolts transported from Lower Granite, Little Goose, or Lower Monumental Dam, SAR(C₀) represents smolts migrating in river, and SAR_{LGR-10-LGR} is a weighted estimate that is obtained by taking the proportion of the total population of smolts (tagged and untagged) at Lower Granite Dam in each study category and multiplying by the respective study category's SAR_{LGR-10-LGR}. In effect, the weighted SAR_{LGR-10-LGR} is the estimated SAR for the overall hatchery release. The data presented in Table 2 were taken from the Draft 2008 CSS Annual Report, which can be downloaded from the FPC webpage (<http://www.fpc.org/documents/CSS.html>).

Table 2. Rapid River Hatchery Spring Chinook Survivals from CSS

Release Date	Migration Year	Juvenile Survival LGR-BON	Proportion Transported	T/C Ratio	SAR(T)	Adult Survival SAR(C ₀) %	Weighted SAR _{LGR-10-LGR}
4/1	1997	0.33	0.54	1.73	0.79	0.45	0.65
4/13	1998	0.59	0.86	1.66	2.00	1.20	1.88
4/2, 4/20	1999	0.57	0.80	1.28	3.04	2.37	2.91
3/17	2000	0.58	0.68	1.32	2.10	1.59	1.94
3/15	2001	0.33	0.97	21.7	1.08	0.05 ^B	1.06
3/18	2002	0.71	0.67	1.50	1.01	0.67	0.90
3/17	2003	0.66	0.55	1.07	0.25	0.23	0.24
3/15	2004	0.35	0.89	1.57	0.36	0.23	0.34
3/15	2005	0.54	0.87	2.36	0.27	0.12 ^C	0.25
3/17	2006 ^A	0.59	0.77	1.25	0.52	0.42	0.49

^A Migration year 2006 is incomplete with Age 2-salt adult returns through 8/13/2008

^B Assumed SAR(C₀) same as SAR(C₁) for 2001

^C In-river SAR is combination of groups C₁ and C₀

Figure 1 below is a time series of the the Weighted SAR_{LGR-10-LGR} estimates over the ten years of available data.

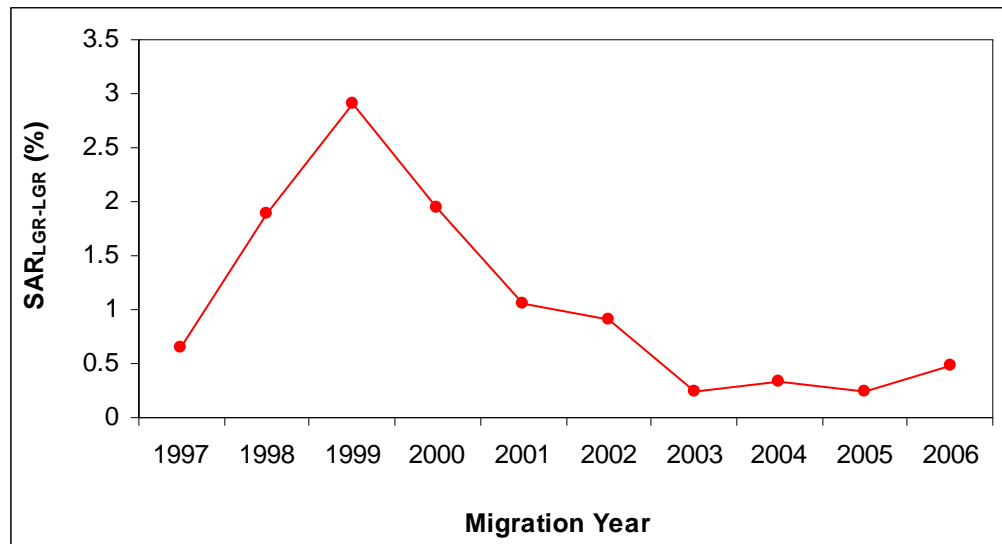
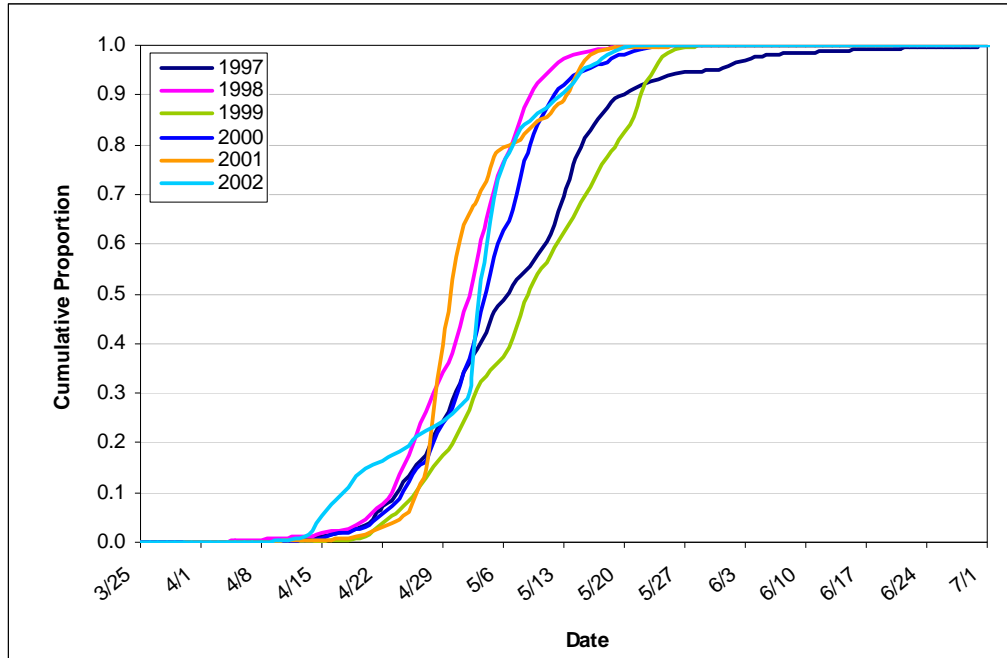


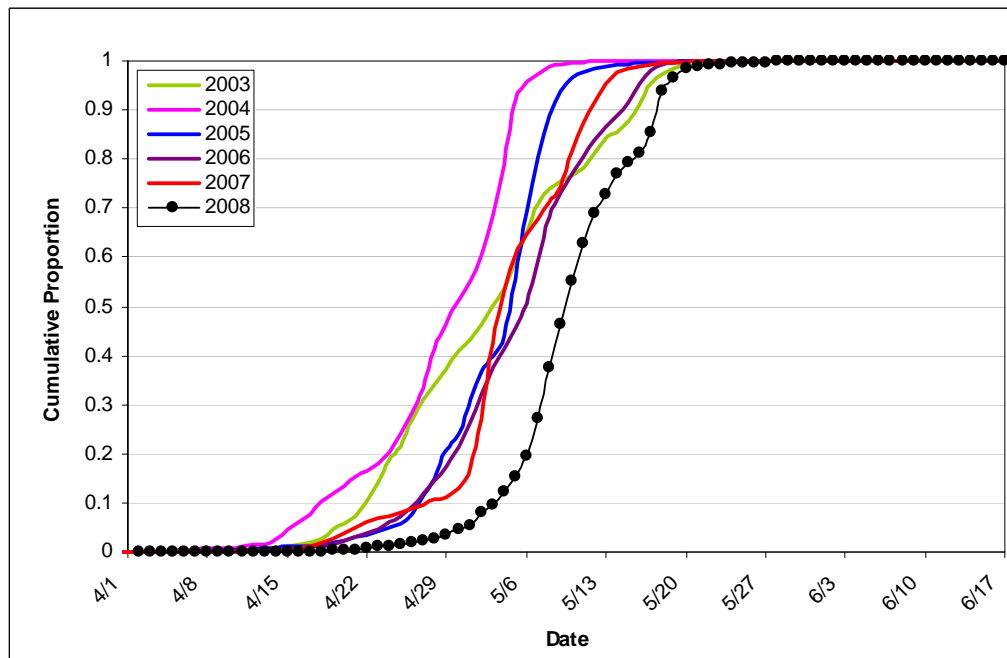
Figure 1. Weighted SAR_{LGR-10-LGR} for Rapid River Hatchery spring Chinook releases over the past 10 years (1997-2006).

Finally, we are providing figures to illustrate passage timing of Rapid River Hatchery spring Chinook to Lower Granite Dam over the past several years. To better facilitate comparison, we have broken the years into two separate graphs. Please note the different scales on the x-axis.

Rapid River Hatchery – Spring Chinook (1997-2002)
Passage Timing to Lower Granite Dam

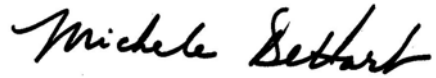


Rapid River Hatchery – Spring Chinook (2003-2008)
Passage Timing to Lower Granite Dam



We hope that the information we have provided regarding the use and application of information from the marked groups over the last several years is of some use to you. If you would like any additional information regarding these releases please feel free to contact us.

Sincerely,

A handwritten signature in black ink that reads "Michele DeHart". The signature is written in a cursive, flowing style.

Michele DeHart
Fish Passage Center Manager

Cc: Pete Hassemer, IDF&G
Doug DeHart, USFWS
Brian Lipscomb, CBFWA
Tony Nigro, ODFW
Ron Boyce, ODFW
FPAC