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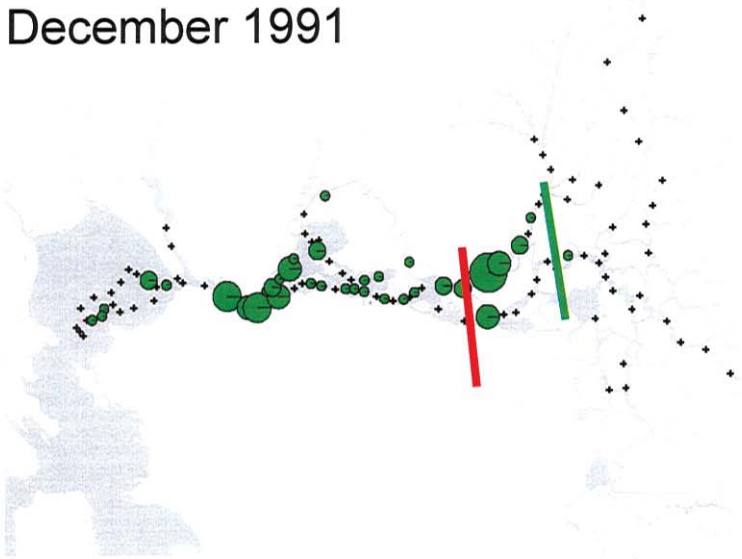

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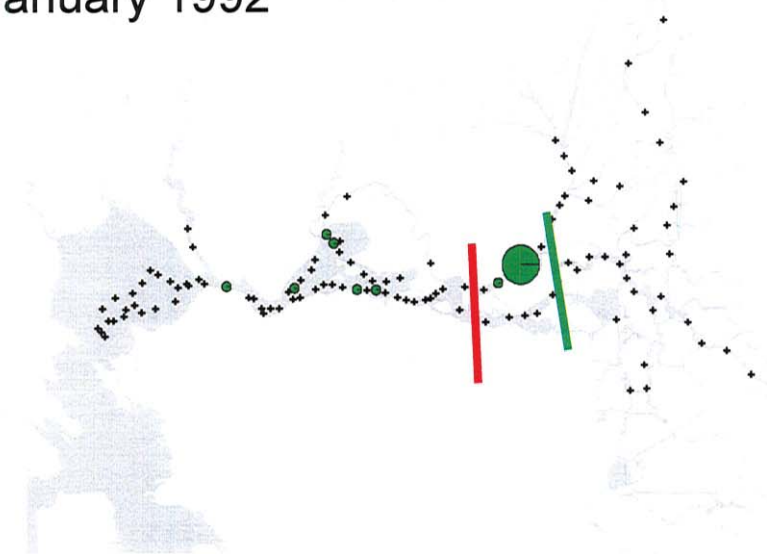

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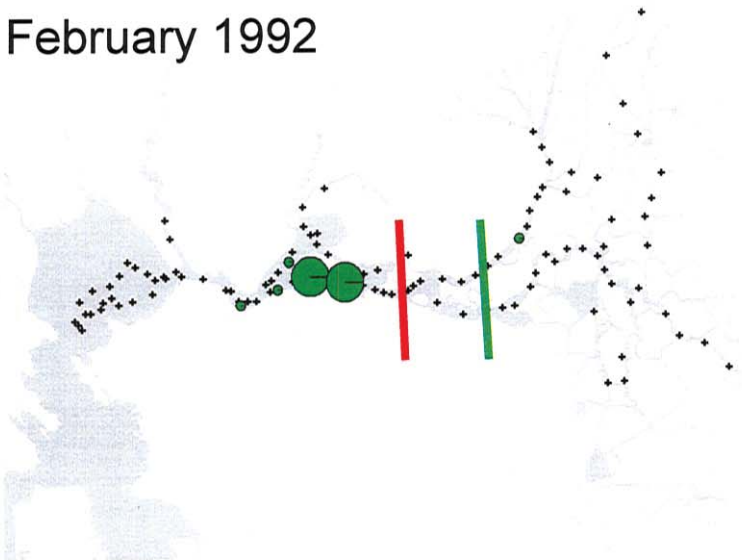

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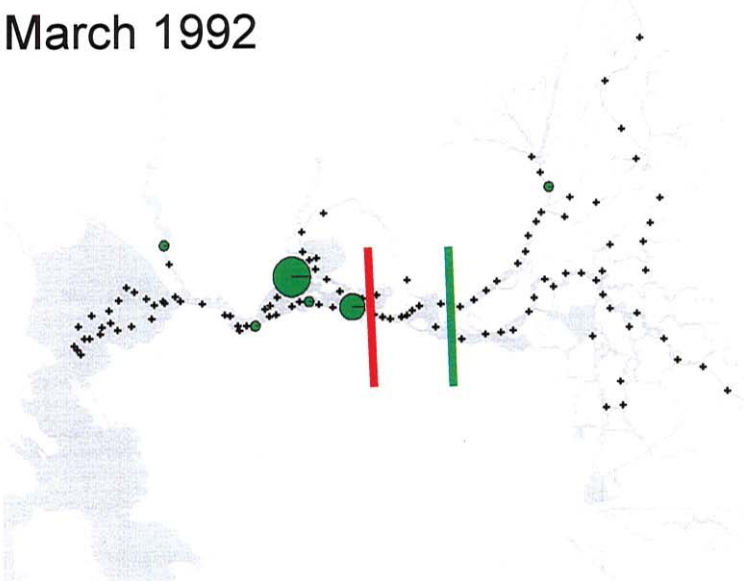

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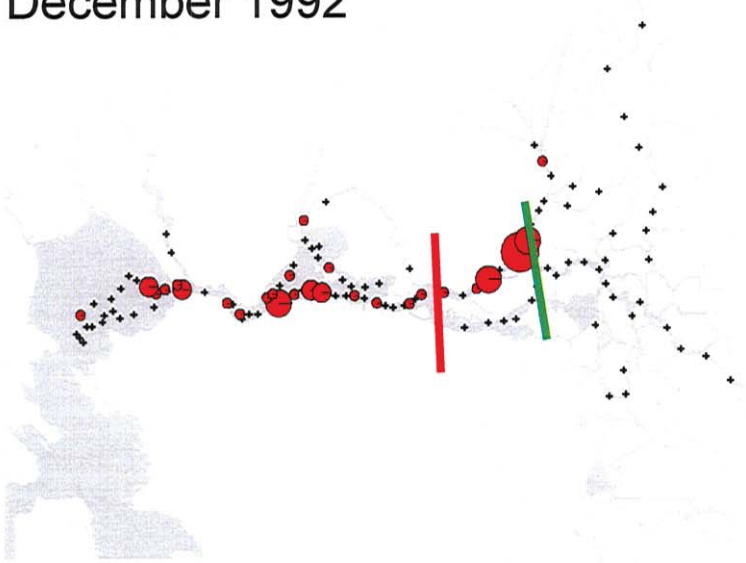

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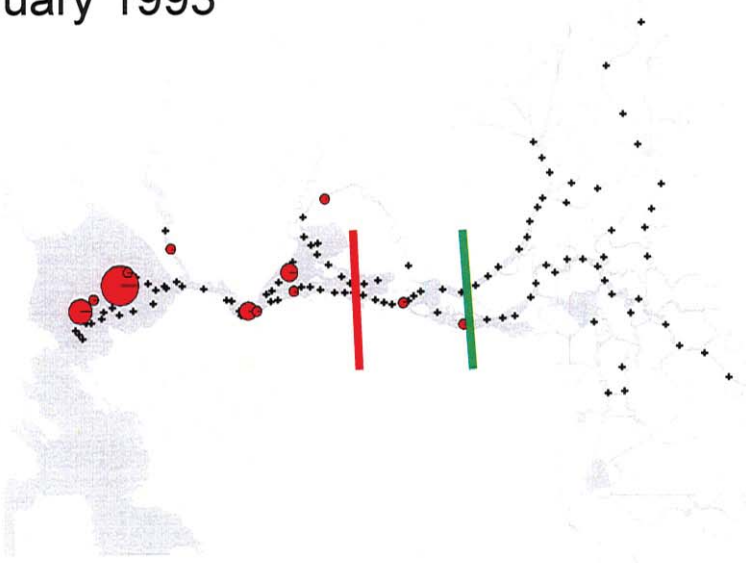

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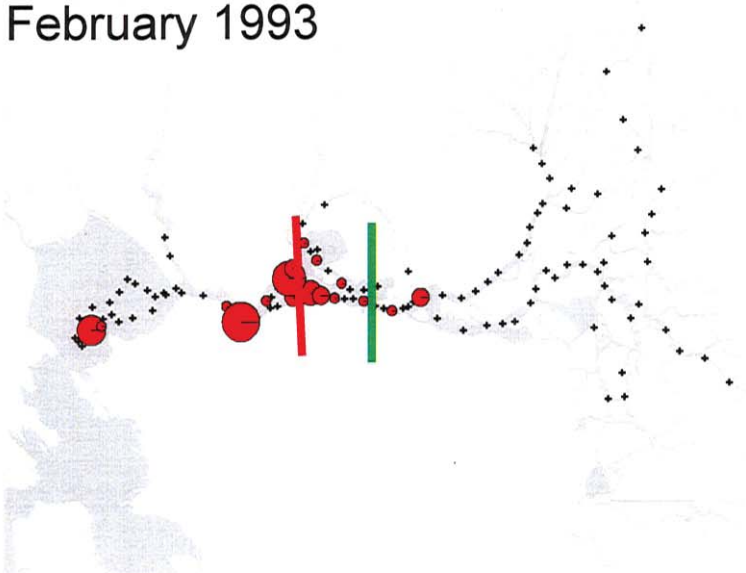

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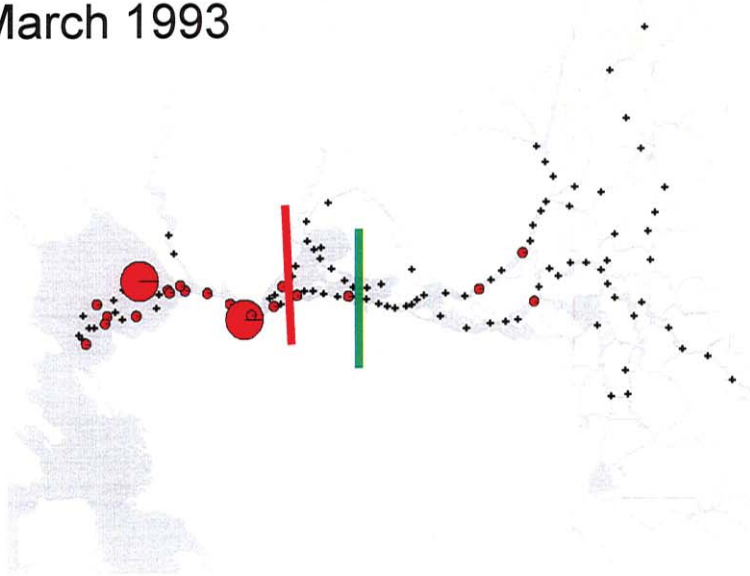

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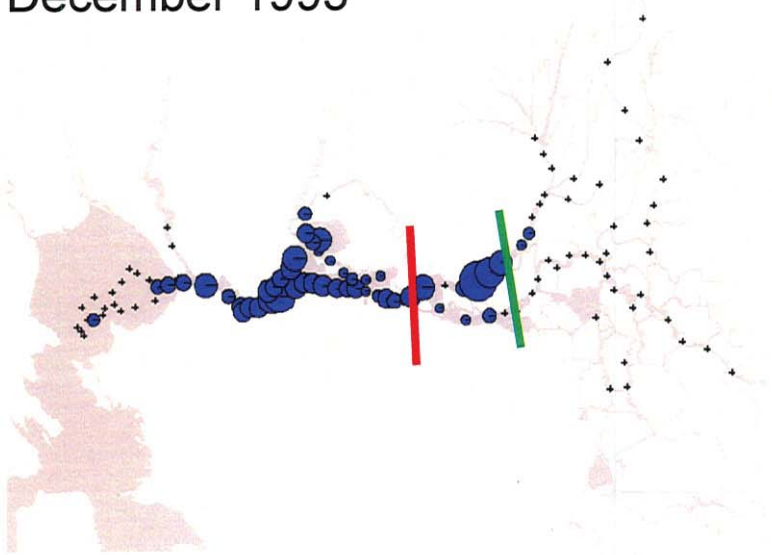

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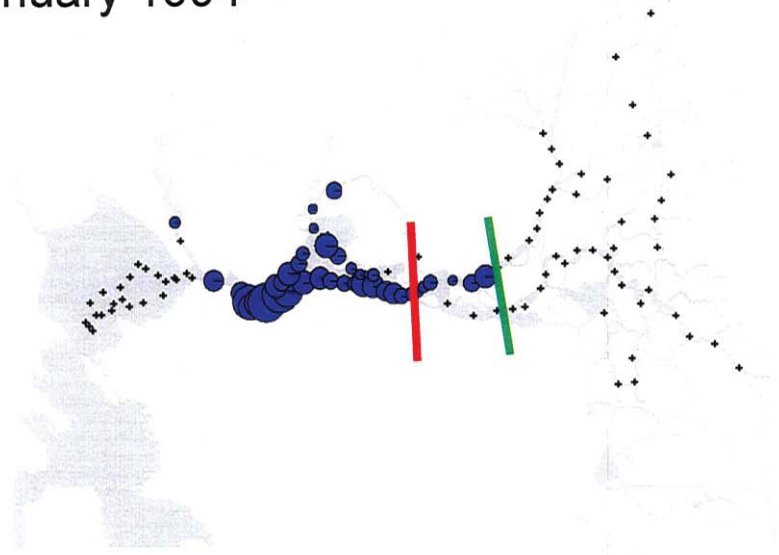

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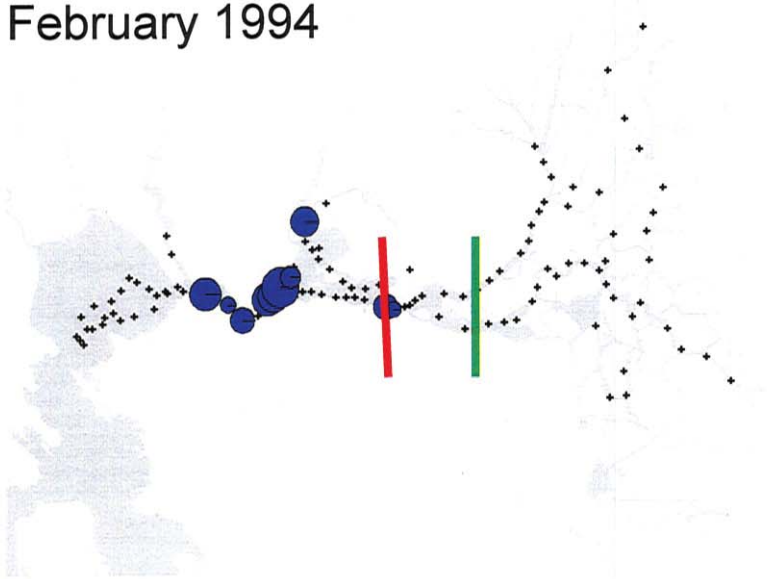

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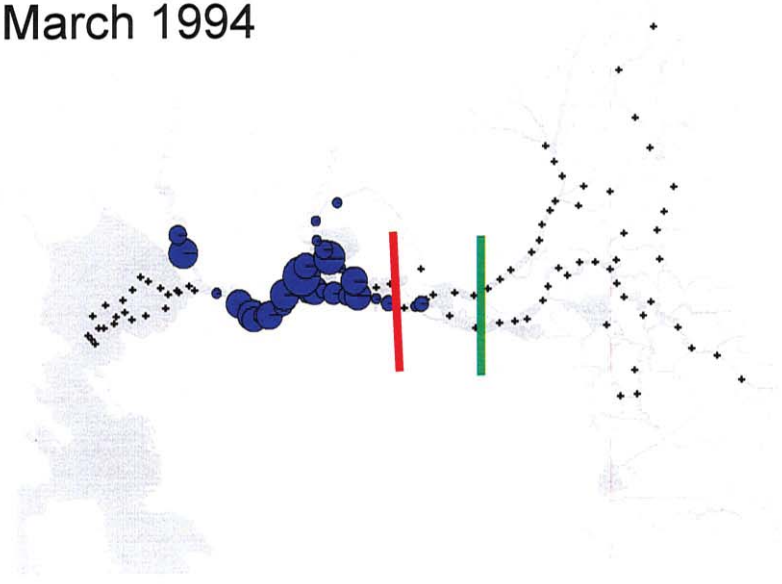

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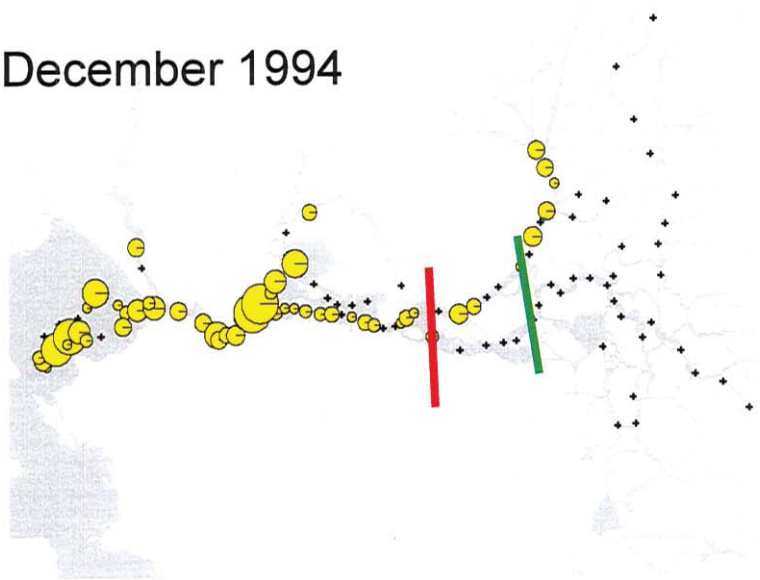

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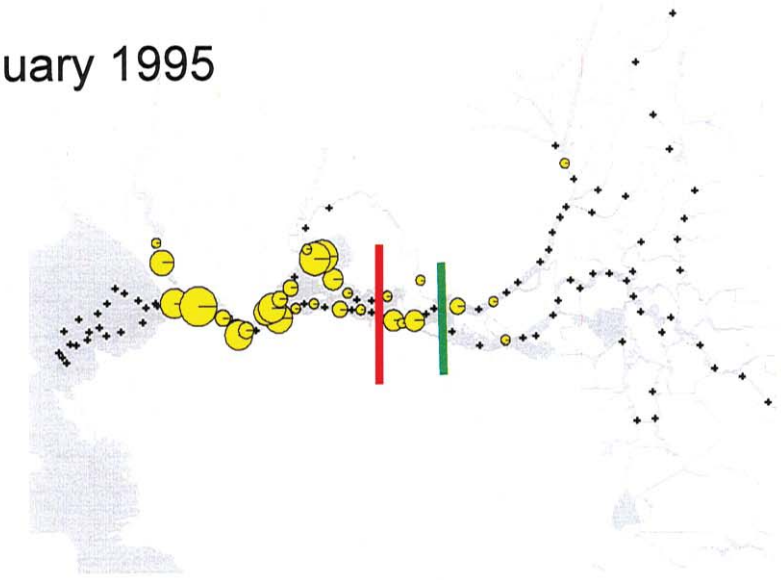

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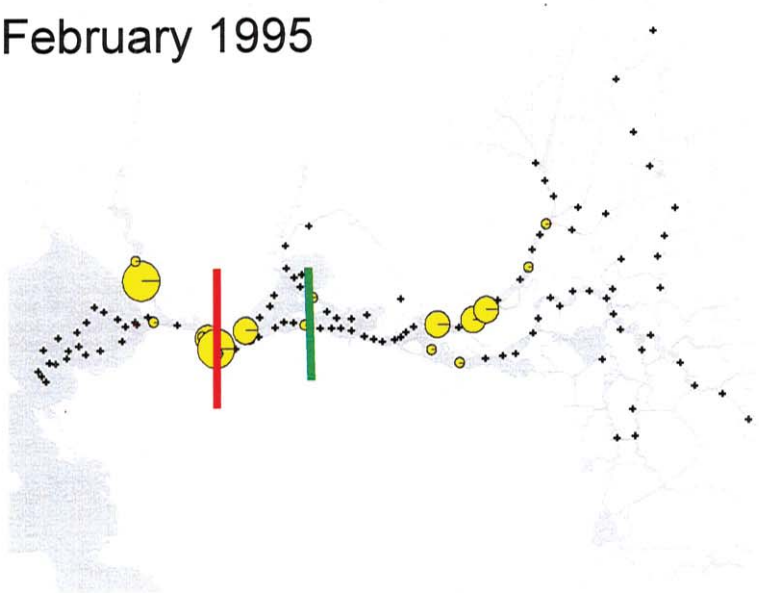

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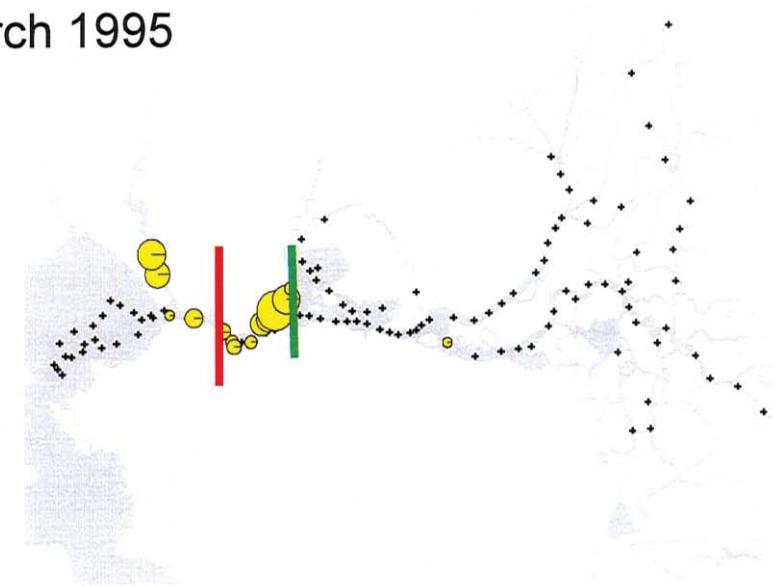

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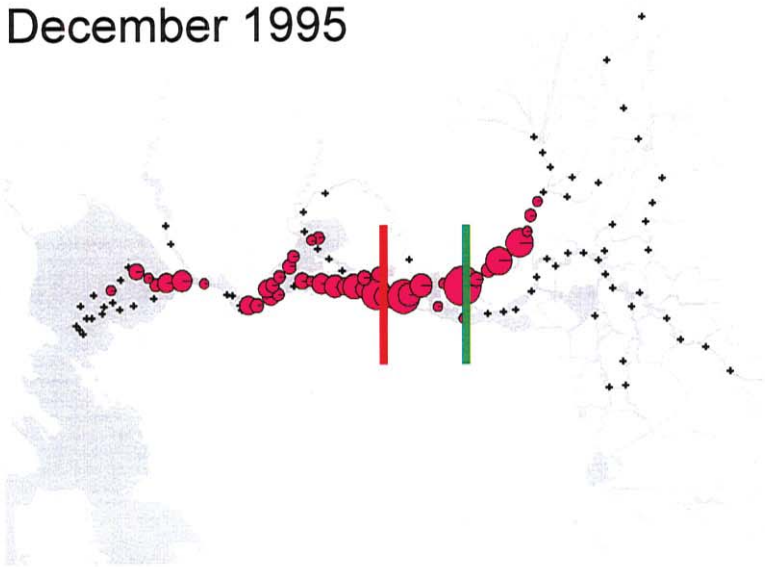

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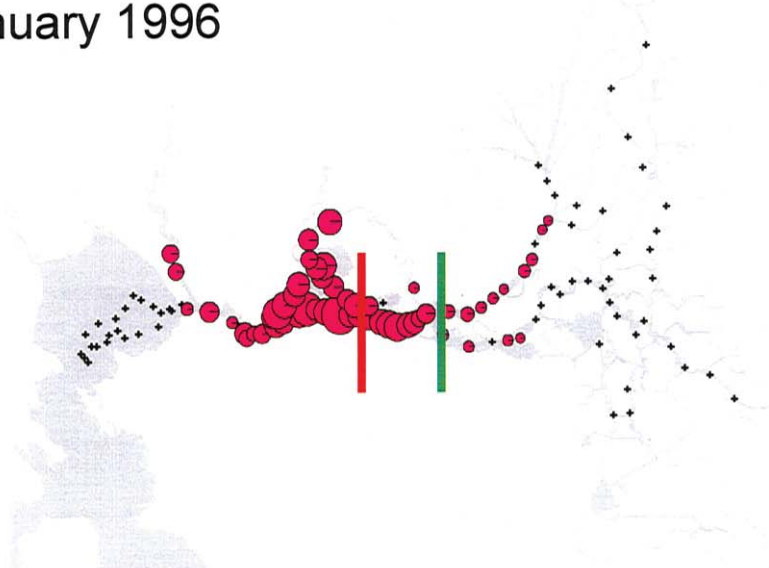

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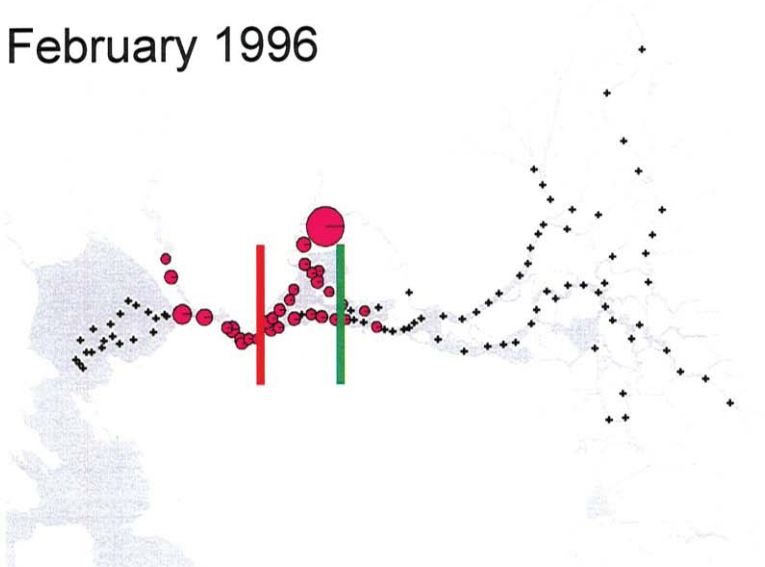

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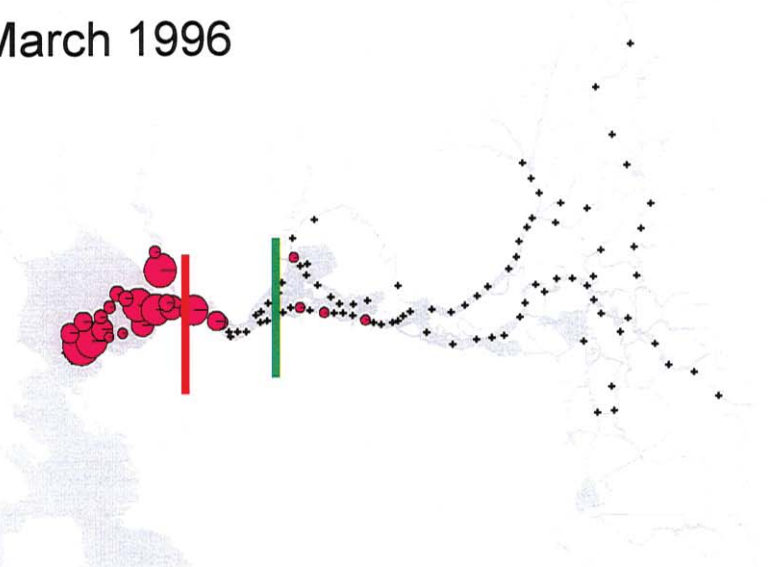

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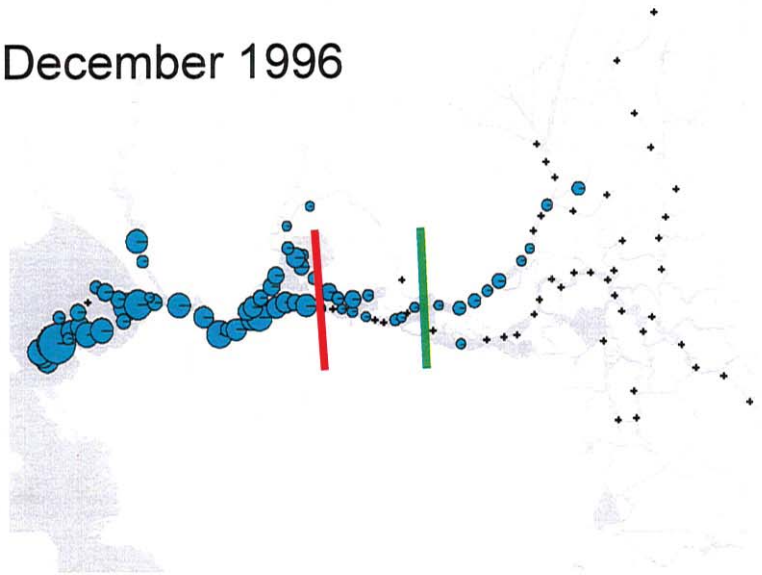

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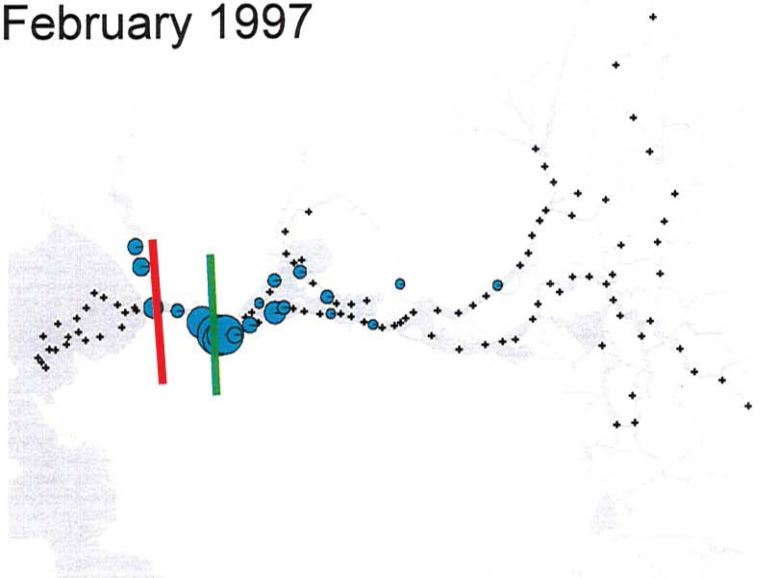

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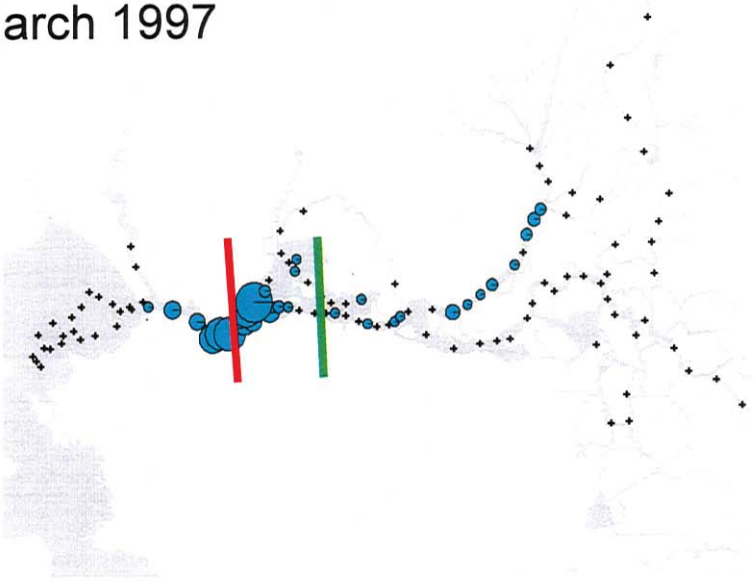

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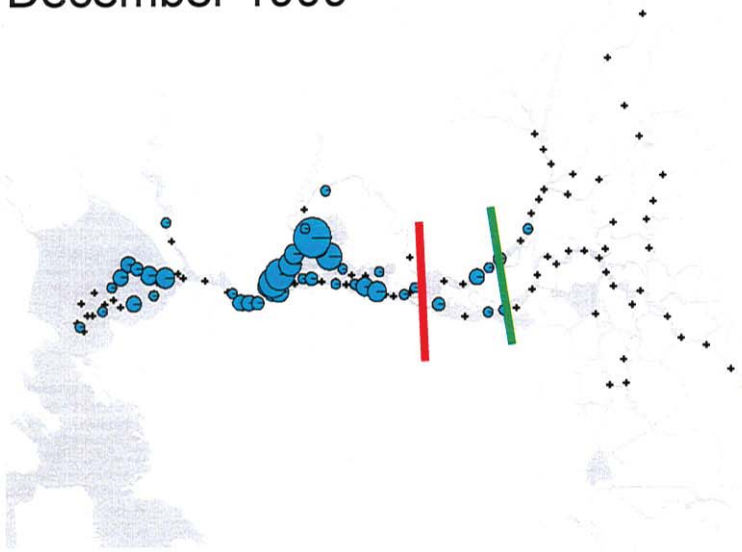

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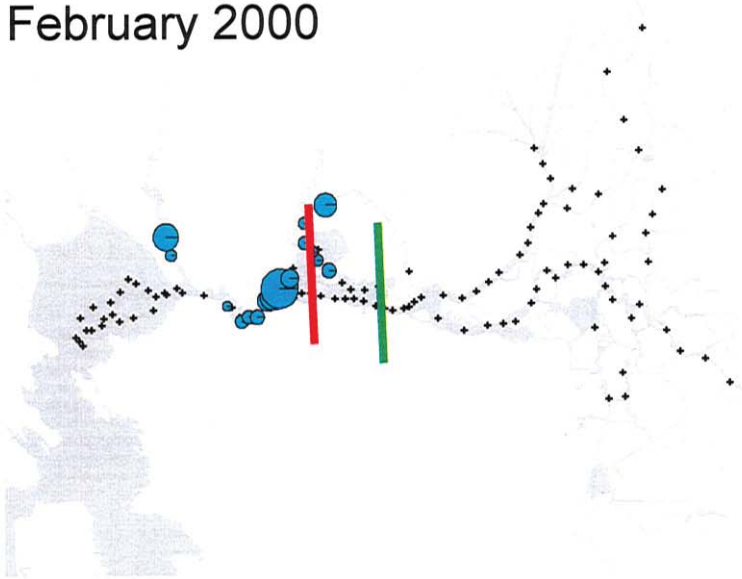

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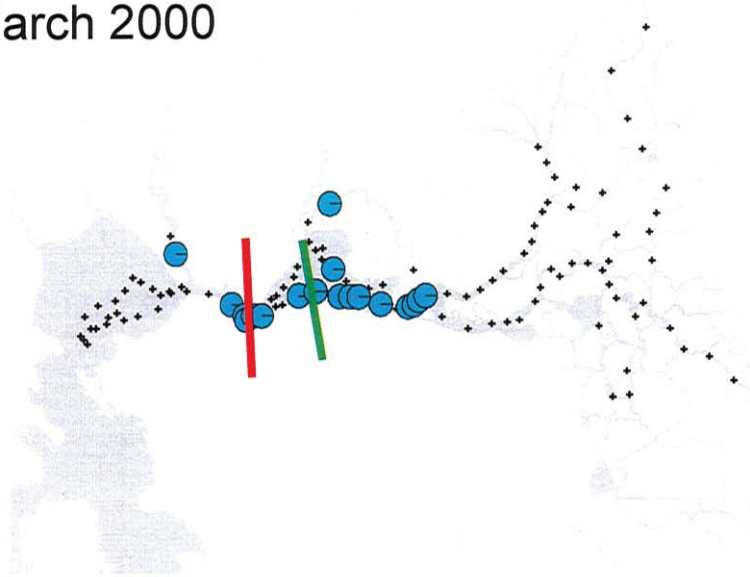

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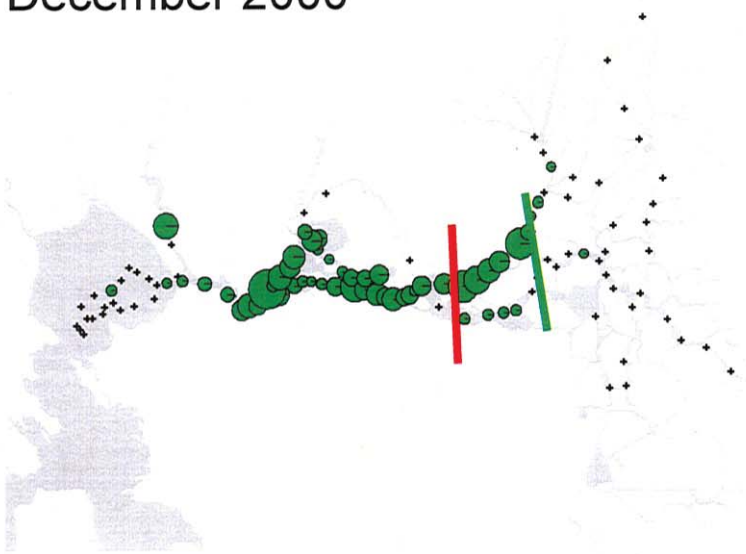

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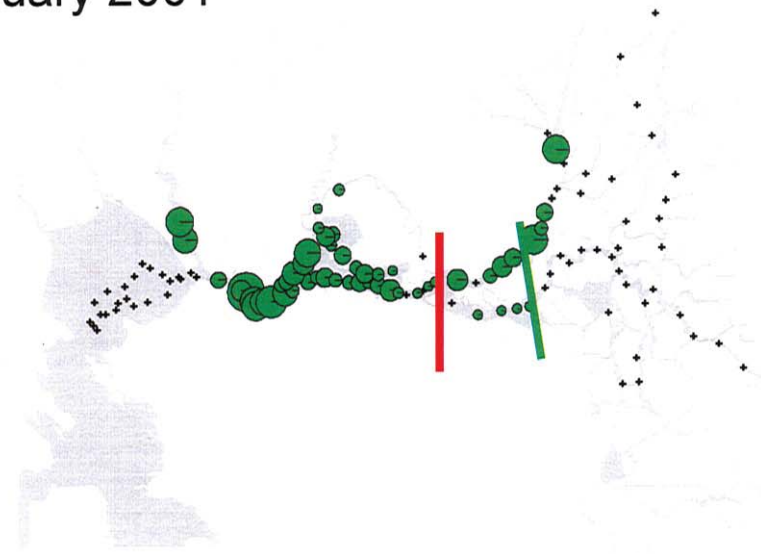

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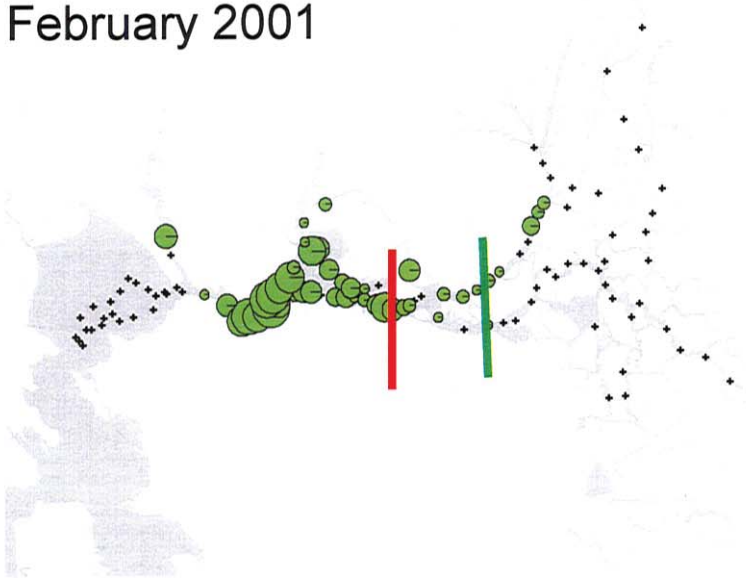

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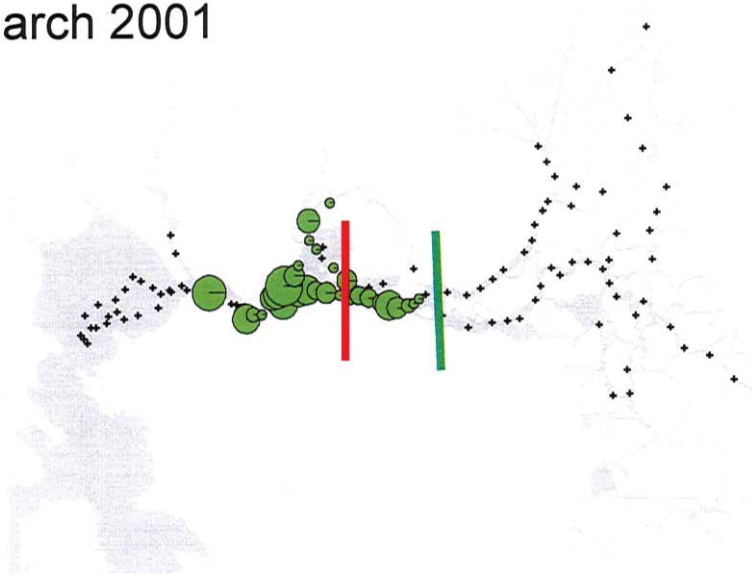


Appendix B

R. Fujimura. 2009. Longfin smelt juvenile and adult loss estimates by water year, 1993-2008.

State of California
Department of Fish and Game

Flex your POWER

Memorandum

Date: January 8, 2009

To: Marty Gingras
Supervising Biologist
California Department of Fish and Game

From: Robert Fujimura
Senior Biologist
California Department of Fish and Game

Subject: Longfin Smelt Entrainment and Loss Estimates for the State Water Project's and Central Valley Project's South Delta Export Facilities

The enclosed Table A provides annual (by water year) estimates of entrainment, loss, and survival of longfin smelt for the State Water Project's (SWP) and Central Valley Project's (CVP) South Delta export facilities from 1993 through 2008. These estimates were calculated using a simple equation routinely used to calculate juvenile Chinook salmon entrainment loss from reported salvage estimates. Estimator constants for pre-screen loss, screening efficiency, and handle and trucking losses were obtained from experiments using delta smelt and other fish species as proxies for longfin smelt. I have included metadata tables and documentation for further information on the estimation method.

The findings indicate that entrainment of longfin smelt at the SWP is approximately 17 to 21 times the reported salvage and 4 times the reported salvage at the CVP. The cumulative entrainment at the SWP from 1993 through 2008 was 1,376,432 juvenile and 11,054 adult longfin smelt. The cumulative 1993-2008 entrainment was 224,606 juvenile and 1,325 adult longfin smelt at the CVP.

Most of these entrained longfin smelt were lost prior to collection within the fish salvage facilities. Ninety-eight percent of juveniles and 95% of adults were lost at the SWP, and 85% of juveniles and 82% of adults were lost at the CVP. Higher pre-screen loss in Clifton Court Forebay is the primary cause of the higher entrainment losses at the SWP compared to those at the CVP. Relatively few of the entrained longfin smelt are salvaged and returned to the Delta alive.

I would like to acknowledge that these estimates were enhancements of earlier work done by Geir Aasen. Geir also provided the salvage queries for this analysis. I would also thank Jerry Morinaka for his technical advice and for verifying the accuracy of the computations.

Marty Gingras

Attachments

Table A: Annual Salvage and Entrainment Estimates for Longfin Smelt by Life Stage

By Water Year

State Water Project

	ENTRAINMENT		LOSS		TOTAL SALVAGE		SURVIVAL	
YEAR	JUVENILES	ADULTS	JUVENILES	ADULTS	JUVENILES	ADULTS	JUVENILES	ADULTS
1993	10,608	17	10,353	16	510	1	255	1
1994	69,964	541	68,282	515	3,364	32	1,682	26
1995	707	1,318	690	1,256	34	78	17	62
1996	1,934	744	1,888	708	93	44	47	35
1997	15,309	0	14,941	0	736	0	368	0
1998	13,187	0	12,870	0	634	0	317	0
1999	13,998	0	13,662	0	673	0	337	0
2000	28,829	304	28,136	290	1,386	18	693	14
2001	45,802	406	44,701	386	2,202	24	1,101	19
2002	1,133,870	1,369	1,106,614	1,304	54,513	81	27,257	65
2003	10,504	3,600	10,252	3,429	505	213	253	170
2004	4,211	2,206	4,110	2,102	202	131	101	104
2005	3,682	101	3,593	97	177	6	89	5
2006	0	0	0	0	0	0	0	0
2007	1,248	0	1,218	0	60	0	30	0
2008	22,578	448	22,036	427	1,086	27	543	21
Total	***1,376,432***	***11,054***	***1,343,345***	***10,530***	***66,175***	***654***	***33,087***	***523***
Percent of Entrainment:			*97.6%*	*95.3%*	*4.8%*	*5.9%*	*2.4%*	*4.7%*

Central Valley Project

	ENTRAINMENT		LOSS		TOTAL SALVAGE		SURVIVAL	
YEAR	JUVENILES	ADULTS	JUVENILES	ADULTS	JUVENILES	ADULTS	JUVENILES	ADULTS
1993	517	0	441	0	132	0	77	0
1994	11,819	0	10,070	0	3,015	0	1,749	0
1995	0	0	0	0	0	0	0	0
1996	517	105	441	86	132	24	77	19
1997	1,505	52	1,283	43	384	12	223	9
1998	329	105	281	86	84	24	49	19
1999	469	52	399	43	120	12	69	9
2000	1,929	52	1,643	43	492	12	285	9
2001	17,076	262	14,549	215	4,356	60	2,526	47
2002	168,403	419	143,486	344	42,960	96	24,917	75
2003	18,024	0	15,357	0	4,598	0	2,667	0
2004	2,540	0	2,164	0	648	0	376	0
2005	47	105	40	86	12	24	7	19
2006	0	0	0	0	0	0	0	0
2007	141	0	120	0	36	0	21	0
2008	1,290	174	1,099	143	329	40	191	31
Total	***224,606***	***1,325***	***191,374***	***1,088***	***57,298***	***304***	***33,233***	***237***
Percent of Entrainment:			*85.2%*	*82.1%*	*25.5%*	*22.9%*	*14.8%*	*17.9%*

***Summary*:**

Entrainment at the SWP is approximately 17 to 21 times reported salvage and 4 times the reported salvage for the CVP.
Pre-screen loss in Clifton Court Forebay is the primary cause of higher entrainment losses at the SWP compared to those at the CVP.
Few entrained longfin smelt survive because most are lost before collection within the fish salvage facilities.
Mark-recapture experiments to determine PSL and SE for longfin smelt are needed to validate our entrainment estimates.

Attachment 1: Skinner Estimates

Table 1 Summary of Pre-Screen Loss Studies at Clifton Court Forebay

Prepared by Robert Fujimura

Species	Date	Fork Length	Mean Water Temp	RG Flow	Pre-Screen Loss	TB Survival	Citation	Comments
Chinook salmon	October-76	114	69	252	97		Gingras 1997	
Chinook salmon	October-78	87	60	4,476	88	85	Gingras 1997	
Chinook salmon	April-84	79	61	6,000	63	90	Gingras 1997	
Chinook salmon	April-85	44	62	6,825	75	52	Gingras 1997	
Chinook salmon	May-92	77	75	306	99	29	Gingras 1997	
Chinook salmon	December-92	121	47	3,390	78	75	Gingras 1997	
Chinook salmon	April-93	66	63	3,390	95	25	Gingras 1997	
Chinook salmon	November-93	117	53	6,780	99	39	Gingras 1997	
Mean		88.13	61	3,927	86.8	56.4		
Std dev		27.33	9	2,628	13.4	26.9		
N		8	8	8	8	7		
CV		31%	14%	67%	15%	48%		
Striped bass	July-84	52		4,000	94	37	Gingras 1997	
Striped bass	August-86	55		7,622	70	29	Gingras 1997	
Mean		53.50		5,811	82.0	33.0		
Std dev		2.12		2,561	17.0	5.7		
N		2		2	2	2		
CV		4%		44%	21%	17%		

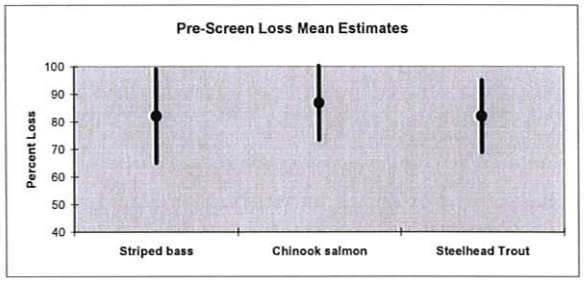
Species	Date	Fork Length*	Mean Water Temp**	BPP Flow	Pre-Screen Loss	TR Recovery	Citation	Comments
Delta smelt	Apr-07	65	60	6,400		34	Morinaka 2008a	Age 1; PIT pilot study; based on detection information
Delta smelt	Apr-07	83	60	6,400		40	Morinaka 2008a	Age 2; PIT pilot study; based on detection information
Mean		74.00	60.0	6,400		37.0		
Std dev		12.73		0		4.2		
N		2		2		2		
CV		17%		0%		11%		

*unpublished data, Jerry Morinaka 2008, personal communication

**from Clark 2008

Species	Date	Fork Length	Mean Water Temp	BPP Flow	Pre-Screen Loss	TR Recovery	Citation	Comments
Steelhead trout	Jan-07				84		Clark 2008	Monthly mean
Steelhead trout	Feb-07				83		Clark 2008	Monthly mean
Steelhead trout	Mar-07				86		Clark 2008	Monthly mean
Steelhead trout	Apr-07				76		Clark 2008	Monthly mean
Mean					82.3			
Std dev					4.3			
N					4			
CV					5%			
Steelhead trout	Overall	217			82*	82**	Clark 2008	Entire study; PSL and TR estimates includes emigration correction
					* SD = 13	** SD = 24		
					*N = 58	**N=47		

	Striped bass	Chinook salmon	Steelhead Trout	
SD+1	99	100	95	
SD-1	65	73	69	Grand Mean =
Mean	82	87	82	84
SD	17	13	13	



Species	Date	Fork Length	W Temp Release**	BPP Flow***	Percent Recovery	TR Recovery	Citation	Comments
Delta smelt	Jun-08		68	2,260		30	Castillo 2008	Juvenile DS M-R releases
Delta smelt	Jun-08		68	375-2,260	8*		Castillo 2008	*Fish release on west side of CCF
Delta smelt	Jun-08		70	3,390-5,650	2*		Castillo 2008	*Fish release on north central portion of CCF

** Jerry Morinaka 2008, personal communication

*** Gonzalo Castillo 2008, personal communication

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Clark, K.W.; M.D. Bowen; R.B. Mayfield; K.P. Zehfuss; J.D. Taplin; C.H. Hanson; Quantification of Pre-Screen Losses of Juvenile Steelhead Within Clifton Court Forebay. September 2008. In Press. CA Department of Water Resources. Sacramento, CA.

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Attachment 2: Tracy Estimates

TFCF Pre-Screen Loss = 15%

Species	Date	Fork Length	SD	BPP Flow	TR SD	TR Recovery	Citation	Comments
Delta smelt	Nov-03	67.3	(10.3)		(7.0)	14.2	Bowen 2008	PACV = 3.23 (0.17) fps
Delta smelt	Nov-07	62.7	(6.1)		(7.9)	38.9	Bowen 2008	PACV = 2.48 (0.20) fps
Mean		65.0				26.6		
Std dev		3.3				17.5		
N		2				2		
CV		5%				66%		

Personal Communications

Mark Bowen. US Bureau of Reclamation. Email communication. December 11, 2008.

Attachment 3:
Longfin Smelt Loss Estimate Assumptions/Definitions
Prepared by Robert Fujimura
December 18, 2008

1. Entrainment losses are functions of:
   - Salvage estimates
   - Size or life stage
   - PSL rates
   - Primary channel velocity
   - CHTR losses

2. Entrainment is defined as the fish entering the intake channel of the CVP or the radial gates of Clifton Court Forebay (SWP).

3. Pre-screen loss is defined as the fish lost within the intake channel and/or Clifton Court Forebay.

4. Pre-screen loss for the TFCF is set as 15% (Exhibit 1 1987)

5. Emigration out of the intake facilities is considered negligible for LFS.

6. The pre-screen loss rate for LFS in CCF is similar to other fish species.

7. The screening efficiency for LFS is similar to the screening efficiency for DS. Although there is no data on LFS performance, this assumption is probably not true since adult LFS may be more capable swimmers than DS and juveniles LFS are salvaged when the FF operate at higher channel velocities. Using DS SEs c

8. Screening efficiency includes within facility losses such as entraining through screens and louvers, emigration away from the fish louvers, and fish predation. Screening efficiency is emprically defined as the percent recovery of marked fish released from the facility's trash racks.

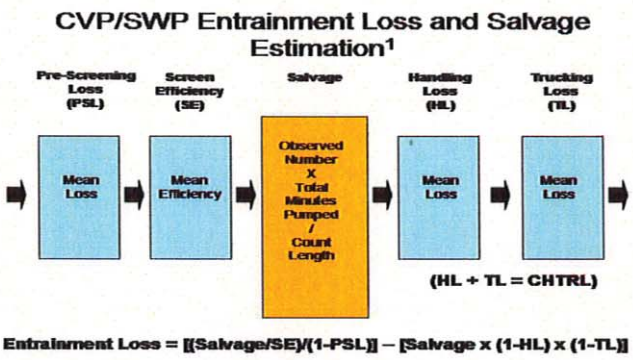
9. No estimates are available for post-release predation at this time for this species (or for any other species).

10. Holding tank losses are considered negligible for this analysis.

11. The CHTR loss rates of LFS are similar to those for DS. Using DS CHTR loss rates may overestimate juvenile LFS CHTR losses since juvenile DS CHTR losses were influenced by higher temperatures.

12. No empirical information is available to adjust SE values to varying primary channel velocities.

13. For life stage classification purposes in the absence of length data, LFS salvaged in December, January, and February were considered adults or Age 1. LFS salvaged in the other months were considered juveniles.



CCF PSL = 0.84
SWP SE (Adults) = 0.37
SWP SE (Juveniles) = 0.30
SWP CHTRL (Adults) = (1-0.78*) = 0.22
SWP CHTRL (Juveniles) = (1-0.58*) = 0.42

TFCF PSL = 0.15
CVP SE (Adults) = 0.27
CVP SE (Juveniles) = SWP SE (Juveniles) = 0.30
CVP CHTRL (Adults) = SWP CHTRL (Adults) = 0.22
CVP CHTRL (Juveniles) = SWP CHTRL (Juveniles) = 0.42

*Based on mean survival of delta smelt after 48 hours; Morinaka 2008b

Entrainment Estimate = (Salvage/SE)/(1-PSL)
Entrainment Loss = [(Salvage/SE)/(1-PSL)] - [Salvage x (1-CHTRL)]

SWP Entrainment Estimate (Adults) = (Salvage/0.37)/(1-0.84) = Salvage x 16.9
SWP Entrainment Loss (Adults) = (Salvage x 16.9) - [Salvage x (1-0.22)] = (Salvage x 16.9) - (Salvage x 0.78) = Salvage x 16.1

SWP Entrainment Estimate (Juveniles) = (Salvage/0.30)/(1-0.84) = Salvage x 20.8
SWP Entrainment Loss (Juveniles) = (Salvage x 20.8) - [Salvage x (1-0.42)] = (Salvage x 20.8) - (Salvage x 0.58) = Salvage x 20.2

CVP Entrainment Estimate (Adults) = (Salvage/0.27)/(1-0.15) = Salvage x 4.36
CVP Entrainment Loss (Adults) = (Salvage x 4.36) - [Salvage x (1-0.22)] = (Salvage x 4.36) - (Salvage x 0.78) = Salvage x 3.58

CVP Entrainment Estimate (Juveniles) = (Salvage/0.30)/(1-0.15) = Salvage x 3.92
CVP Entrainment Loss (Juveniles) = (Salvage x 3.92) - [Salvage x (1-0.42)] = (Salvage x 3.92) - (Salvage x 0.58) = Salvage x 3.34

Attachment 4: Entrainment Calculations

Calculation Checks

	PSL	SE	CHTRL	EF	ELF
SWP Entrainment Estimates(Adults)	0.84	0.37	0.22	16.9	16.1
SWP Entrainment Estimates (Juveniles)	0.84	0.30	0.42	20.8	20.3
CVP Entrainment Estimates (Adults)	0.15	0.27	0.22	4.36	3.58
CVP Entrainment Estimates (Juveniles)	0.15	0.30	0.42	3.92	3.34

Cited Reference

Morinaka, J. Acute Mortality and Injury of Delta Smelt Associated with Collection, Handling, Transport, and Release at the State Water Project Fish Salvage Facility September 2008. Draft Report. California Department of Fish and Game. Stockton, CA

Abbrivations

PSL	Pre-screen loss
SE	Screening efficiency (= whole facility salvage efficiency)
CHTR	Collection, handling, transport, and release
CHTRL	Collection, handling, transport, and release loss
EF	Entrainment factor
ELF	Entrainment loss factor
CCF	Clifton Court Forebay
TFCF	Tracy Fish Collection Facility
SWP	State Water Project
CVP	Central Valley Project
BPP	Banks Pumping Plant
TR	Trash rack
SD	Standard deviation
PACV	Primary approach channel velocity
LFS	Longfin smelt
DS	Delta smelt
FL	Fork length in mm
RG	Radial gates

Attachment 5: Salvage Entrainment Worksheet

Longfin Smelt Salvage/Entrainment Estimates 1993-2008 - Age Classification

Year	Month	Facility	Organism Code	Total Salvage	% Ratio Juvenile	% Ratio Adults	Juvenile Salvage (20-79 mm FL)	Adult salvage (≥80mm)	Est Juv Salvage	Est Adult Salvage
1992	12	1	25	1						1
1993	1	1	25	12	100		12			12
1993	4	1	25	8					8	
1993	5	1	25	206	100		206		206	
1993	6	1	25	12					12	
1993	7	1	25	240					240	
1993	8	1	25	32					32	
1993	12	1	25	6						6
1994	1	1	25	8						8
1994	2	1	25	18						18
1994	4	1	25	340	100		340		340	
1994	5	1	25	2,903	100		2,903		2,903	
1994	6	1	25	121	100		121		121	
1994	12	1	25	10		100		10		10
1995	1	1	25	56		100		56		56
1995	2	1	25	12		100		12		12
1995	4	1	25	4	100		4		4	
1995	5	1	25	12	100		12		12	
1995	6	1	25	18					18	
1996	1	1	25	56	50	50	28	28	28	28
1996	2	1	25	16		100		16		16
1996	4	1	25	1	100		1		1	
1996	5	1	25	24	100		24		24	
1996	7	1	25	32					32	
1996	8	1	25	8					8	
1997	4	1	25	4					4	
1997	5	1	25	704	100		704		704	
1997	6	1	25	16					16	
1997	7	1	25	12					12	
1997	12	1	25	6	100		6			6
1998	1	1	25	12	100		12			12
1998	4	1	25	616	100		616		616	
1999	3	1	25	14	100		14		14	
1999	4	1	25	338	100		338		338	
1999	5	1	25	171	100		171		171	
1999	6	1	25	48	100		48		48	
1999	7	1	25	54	100		54		54	
1999	8	1	25	48	100		48		48	
2000	1	1	25	39	100		39		39	
2000	2	1	25	18						18
2000	3	1	25	60	100		60		60	
2000	4	1	25	960	100		960		960	
2000	5	1	25	264	100		264		264	
2000	6	1	25	33	100		33		33	
2000	7	1	25	24	100		24		24	
2000	8	1	25	6					6	
2000	10	1	25	33	100		33		33	
2000	11	1	25	18					18	
2001	2	1	25	24		100		24		24
2001	3	1	25	15					15	
2001	4	1	25	219	100		219		219	
2001	5	1	25	1,917	100		1,917		1,917	
2002	1	1	25	81		100		81		81
2002	4	1	25	11,022	100		11,022		11,022	
2002	5	1	25	41,949	100		41,949		41,949	
2002	6	1	25	1,536	100		1,536		1,536	
2002	7	1	25	6	100		6		6	
2002	12	1	25	12						12
2003	1	1	25	191		100		191		191
2003	2	1	25	10						10
2003	4	1	25	81	100		81		81	
2003	5	1	25	370	100		370		370	
2003	6	1	25	54	100		54		54	
2004	1	1	25	204	36	64	73	130.56	73	131
2004	2	1	25	24	100		24		24	
2004	5	1	25	48	100		48		48	
2004	6	1	25	33					33	
2004	9	1	25	24					24	
2005	1	1	25	6		100		6		6

2005	5 1	25	33	100		33		33	
2005	6 1	25	120	100		120		120	
2005	7 1	25	24					24	
2007	5 1	25	48	100		48		48	
2007	6 1	25	9	100		9		9	
2007	8 1	25	3					3	
2008	1 1	25	22	25	75	6	16.5	6	17
2008	2 1	25	10		100		10		10
2008	3 1	25	8	100		8		8	
2008	4 1	25	146	100		146		146	
2008	5 1	25	924	100		924		924	
2008	6 1	25	2	100		2		2	
1993	5 2	25	132	100		132		132	
1994	3 2	25	36	100		36		36	
1994	4 2	25	615	100		615		615	
1994	5 2	25	2,268	100		2,268		2,268	
1994	6 2	25	96	100		96		96	
1996	1 2	25	24						24
1996	2 2	25	12	100		12		12	
1996	4 2	25	12					12	
1996	5 2	25	72					72	
1996	6 2	25	36					36	
1997	2 2	25	12						12
1997	4 2	25	96	100		96		96	
1997	5 2	25	288	100		288		288	
1997	12 2	25	48	100		48		48	
1998	1 2	25	48	75	25	36	12	36	12
1998	2 2	25	12						12
1999	2 2	25	12						12
1999	4 2	25	43					43	
1999	5 2	25	65					65	
1999	8 2	25	12	100		12		12	
2000	1 2	25	12		100		12		12
2000	4 2	25	396	100		396		396	
2000	5 2	25	96	100		96		96	
2000	12 2	25	24		100		24		24
2001	1 2	25	36		100		36		36
2001	2 2	25	24	100		24		24	
2001	3 2	25	96	100		96		96	
2001	4 2	25	2,268	100		2,268		2,268	
2001	5 2	25	1,968	100		1,968		1,968	
2001	12 2	25	12						12
2002	1 2	25	84		100		84		84
2002	3 2	25	852	100		852		852	
2002	4 2	25	26,268	100		26,268		26,268	
2002	5 2	25	15,708	100		15,708		15,708	
2002	6 2	25	132	100		132		132	
2002	12 2	25	36	100		36		36	
2003	1 2	25	48	100		48		48	
2003	4 2	25	1,608	100		1,608		1,608	
2003	5 2	25	2,894	100		2,894		2,894	
2003	6 2	25	12	100		12		12	
2004	1 2	25	24	100		24		24	
2004	3 2	25	72	100		72		72	
2004	4 2	25	204	100		204		204	
2004	5 2	25	348	100		348		348	
2005	1 2	25	24		100		24		24
2005	4 2	25	12					12	
2007	1 2	25	12					12	
2007	2 2	25	12					12	
2007	5 2	25	12	100		12		12	
2007	12 2	25	12	75	25	9	3	9	3
2008	1 2	25	4						4
2008	2 2	25	20		100		20		20
2008	3 2	25	15	75	25	11	3.75	11	4
2008	4 2	25	184	100		184		184	
2008	5 2	25	134	100		134		134	

Attachment 6: Salvage Query Metadata

Metadata for Salvage Queries and Life Stage Classification

Prepared by G. Aasen unless noted otherwise

Object: Compute juvenile and adult monthly salvage of longfin smelt between December 1992 to 2008

Step1:

Generate 1993-2008 monthly length salvage files from Access by creating 2 files for juveniles (20-79 mm FL) and adults (over 80 mm FL)

C:\Data\SALVAGEACCESS\XP2000\ salvagequery_xp.mdb\1993-2008 LFS <=79 mm monthly length GAA 12112008.mdb and 1993-2008 LFS >=80 mm monthly length GAA 12112008.mdb

Column Headings:
Samplemethod: "1" for SWP and "2" for CVP

Organismcode: species code

SumOfLengthFrequency: sum of number of fish measured

Year: year

Month: month of year

Step 2:

Combine the juvenile and adult Access files into a Excel file:
C:\Data\salvage request\data request bob fujimura LFS length\1992-2008 LFS juvenile and adult length ratios and salvage GAA12122008.mdb

Column Headings:
Year: year

month: month of year

Facility: 1 for SWP and 2 for CVP

Organismcode: species code

Total Salvage: combined juvenile and adult salvage

% ratio juvenile: % ratio of juvenile salvage

% ratio adults: % ratio of adult salvage

Juvenile Salvage (20-79 mm FL): juvenile salvage between 20 mm and 79 mm

Adult salvage (≥80mm): adult salvage over 80 mm

Step 3:

Add 1993-2008 salvage from:

C:\Data\SALVAGEACCESS\XP2000\ salvagequery_xp.mdb\1993-2008 LFS monthly salvage GAA 12122008.mdb

Column Headings:
SampleMethod: 1 for SWP and 2 for CVP

Organismcode: species code

SumOfSalvage: monthly salvage

Year: year

Month: month of year

Step 4:
Add 1992 December salvage from original data sheets since the Access data base only contains data after 1993

Step 5:
Determine % ratio of adult and juvenile salvage by dividing adult or juvenile number of lengths by total number of lengths from juvenile and adult files in step 1

Step 6:
Calculate juvenile and adult salvage based upon the monthly juvenile and adult %ratios by the formula: salvage X % ratio

Note: not all months had length measurements. Consequently, it was not possible to calculate adult and juvenile salvage for all months reflected by blank boxes

Step 7: Copy the longfin smelt juvenile and adult monthly salvage into a microsoft word file (Table 1):

C:\Data\salvage request\data request bob fujimura LFS length\1992-2008 LFS juvenile and adult salvage V2 GAA12122008.mdb

Step 8: Classify salvage months without length measurement into life stages by season and merge previously classified entries (rwf)

Step 9: Create monthly and annual life stage table (Table 2) (rwf)

Step 10: Create annual salvage and entrainment table by life stage (Table A) (rwf)

Attachment 7: Interim Table 1

Table 1 Longfin smelt juvenile (20-79 mm FL) and adult (≥80 mm FL) salvage from December 1992 to 2008

Prepared by G. Aasen

Year	Month	Facility SWP=1 CVP=2	Salvage	% Ratio juvenile (20-79 mm FL)	Juvenile salvage (20-79 mm FL)	% Ratio adults (≥80mm)	Adult salvage (≥80mm)
1992	12	1	1				
1993	1	1	12	100	12		
1993	4	1	8				
1993	5	1	206	100	206		
1993	6	1	12				
1993	7	1	240				
1993	8	1	32				
1993	12	1	6				
1994	1	1	8				
1994	2	1	18				
1994	4	1	339.67	100	339.67		
1994	5	1	2903	100	2903		
1994	6	1	121	100	121		
1994	12	1	10			100	10
1995	1	1	56			100	56
1995	2	1	12			100	12
1995	4	1	4	100	4		
1995	5	1	12	100	12		
1995	6	1	18				
1996	1	1	56	50	28	50	28
1996	2	1	16			100	16
1996	4	1	1	100	1		
1996	5	1	24	100	24		
1996	7	1	32				
1996	8	1	8				
1997	4	1	4				
1997	5	1	704	100	704		
1997	6	1	16				
1997	7	1	12				
1997	12	1	6	100	6		
1998	1	1	12	100	12		
1998	4	1	616	100	616		
1999	3	1	14	100	14		
1999	4	1	338	100	338		
1999	5	1	171	100	171		
1999	6	1	48	100	48		
1999	7	1	54	100	54		
1999	8	1	48	100	48		
2000	1	1	39	100	39		
2000	2	1	18				
2000	3	1	60	100	60		
2000	4	1	960	100	960		
2000	5	1	264	100	264		
2000	6	1	33	100	33		
2000	7	1	24	100	24		
2000	8	1	6				
2000	10	1	33	100	33		
2000	11	1	18				
2001	2	1	24			100	24
2001	3	1	15				
2001	4	1	219	100	219		
2001	5	1	1917	100	1917		
2002	1	1	81			100	81
2002	4	1	11022	100	11022		
2002	5	1	41949	100	41949		
2002	6	1	1536	100	1536		
2002	7	1	6	100	6		
2002	12	1	12				
2003	1	1	191			100	191
2003	2	1	10				
2003	4	1	81	100	81		
2003	5	1	370	100	370		
2003	6	1	54	100	54		
2004	1	1	204	36	73.44	64	130.56
2004	2	1	24	100	24		
2004	5	1	48	100	48		
2004	6	1	33				
2004	9	1	24				
2005	1	1	6			100	6
2005	5	1	33	100	33		
2005	6	1	120	100	120		
2005	7	1	24				
2007	5	1	48	100	48		

2007	6	1	9	100	9		
2007	8	1	3				
2008	1	1	22	25	5.5	75	16.5
2008	2	1	10			100	10
2008	3	1	8	100	8		
2008	4	1	146	100	146		
2008	5	1	924	100	924		
2008	6	1	2	100	2		
1993	5	2	132	100	132		
1994	3	2	36	100	36		
1994	4	2	615	100	615		
1994	5	2	2268	100	2268		
1994	6	2	96	100	96		
1996	1	2	24				
1996	2	2	12	100	12		
1996	4	2	12				
1996	5	2	72				
1996	6	2	36				
1997	2	2	12				
1997	4	2	96	100	96		
1997	5	2	288	100	288		
1997	12	2	48	100	48		
1998	1	2	48	75	36	25	12
1998	2	2	12				
1999	2	2	12				
1999	4	2	43.07				
1999	5	2	64.5				
1999	8	2	12	100	12		
2000	1	2	12			100	12
2000	4	2	396	100	396		
2000	5	2	96	100	96		
2000	12	2	24			100	24
2001	1	2	36			100	36
2001	2	2	24	100	24		
2001	3	2	96	100	96		
2001	4	2	2268	100	2268		
2001	5	2	1968	100	1968		
2001	12	2	12				
2002	1	2	84			100	84
2002	3	2	852	100	852		
2002	4	2	26268	100	26268		
2002	5	2	15708	100	15708		
2002	6	2	132	100	132		
2002	12	2	36	100	36		
2003	1	2	48	100	48		
2003	4	2	1608	100	1608		
2003	5	2	2894	100	2894		
2003	6	2	12	100	12		
2004	1	2	24	100	24		
2004	3	2	72	100	72		
2004	4	2	204	100	204		
2004	5	2	348	100	348		
2005	1	2	24			100	24
2005	4	2	12				
2007	1	2	12				
2007	2	2	12				
2007	5	2	12	100	12		
2007	12	2	12			100	12
2008	1	2	4				
2008	2	2	20			100	20
2008	3	2	15	75	11.25	25	3.75
2008	4	2	184	100	184		
2008	5	2	134	100	134		

Attachment 8: Interim Table 2

Longfin Smelt Salvage by Life Stage (as defined by size and season)

Longfin Smelt Salvage Estimates 1993-2008 - Age Classification

Year	Month	Facility	Total Salvage	Est Juv Salvage	Est Adult Salvage	Yr Juv Total	Yr Adult Total
1992	12	1	1		1		
1993	1	1	12	12			
1993	4	1	8	8			
1993	5	1	206	206			
1993	6	1	12	12			
1993	7	1	240	240			
1993	8	1	32	32		510	1
1993	12	1	6		6		
1994	1	1	8		8		
1994	2	1	18		18		
1994	4	1	340	340			
1994	5	1	2,903	2,903			
1994	6	1	121	121		3,364	32
1994	12	1	10		10		
1995	1	1	56		56		
1995	2	1	12		12		
1995	4	1	4	4			
1995	5	1	12	12			
1995	6	1	18	18		34	78
1996	1	1	56	28	28		
1996	2	1	16		16		
1996	4	1	1	1			
1996	5	1	24	24			
1996	7	1	32	32			
1996	8	1	8	8		93	44
1997	4	1	4	4			
1997	5	1	704	704			
1997	6	1	16	16			
1997	7	1	12	12		736	0
1997	12	1	6	6			
1998	1	1	12	12			
1998	4	1	616	616		634	0
1999	3	1	14	14			
1999	4	1	338	338			
1999	5	1	171	171			
1999	6	1	48	48			
1999	7	1	54	54			
1999	8	1	48	48		673	0
2000	1	1	39	39			
2000	2	1	18		18		
2000	3	1	60	60			
2000	4	1	960	960			
2000	5	1	264	264			
2000	6	1	33	33			
2000	7	1	24	24			

2000	8	1	6	6		1,386	18
2000	10	1	33	33			
2000	11	1	18	18			
2001	2	1	24		24		
2001	3	1	15	15			
2001	4	1	219	219			
2001	5	1	1,917	1,917		2,202	24
2002	1	1	81		81		
2002	4	1	11,022	11,022			
2002	5	1	41,949	41,949			
2002	6	1	1,536	1,536			
2002	7	1	6	6		54,513	81
2002	12	1	12		12		
2003	1	1	191		191		
2003	2	1	10		10		
2003	4	1	81	81			
2003	5	1	370	370			
2003	6	1	54	54		505	213
2004	1	1	204	73	131		
2004	2	1	24	24			
2004	5	1	48	48			
2004	6	1	33	33			
2004	9	1	24	24		202	131
2005	1	1	6		6		
2005	5	1	33	33			
2005	6	1	120	120			
2005	7	1	24	24		177	6
2007	5	1	48	48			
2007	6	1	9	9			
2007	8	1	3	3		60	0
2008	1	1	22	6	17		
2008	2	1	10		10		
2008	3	1	8	8			
2008	4	1	146	146			
2008	5	1	924	924			
2008	6	1	2	2		1,086	27
1993	5	2	132	132		132	0
1994	3	2	36	36			
1994	4	2	615	615			
1994	5	2	2,268	2,268			
1994	6	2	96	96		3,015	0
1996	1	2	24		24		
1996	2	2	12	12			
1996	4	2	12	12			
1996	5	2	72	72			
1996	6	2	36	36		132	24
1997	2	2	12		12		
1997	4	2	96	96			
1997	5	2	288	288		384	12
1997	12	2	48	48			
1998	1	2	48	36	12		

1998	2	2	12		12	84	24	
1999	2	2	12		12			
1999	4	2	43	43				
1999	5	2	65	65				
1999	8	2	12	12		120	12	
2000	1	2	12		12			
2000	4	2	396	396				
2000	5	2	96	96		492	12	
2000	12	2	24		24			
2001	1	2	36		36			
2001	2	2	24	24				
2001	3	2	96	96				
2001	4	2	2,268	2,268				
2001	5	2	1,968	1,968		4,356	60	
2001	12	2	12		12			
2002	1	2	84		84			
2002	3	2	852	852				
2002	4	2	26,268	26,268				
2002	5	2	15,708	15,708				
2002	6	2	132	132		42,960	96	
2002	12	2	36	36				
2003	1	2	48	48				
2003	4	2	1,608	1,608				
2003	5	2	2,894	2,894				
2003	6	2	12	12		4,598	0	
2004	1	2	24	24				
2004	3	2	72	72				
2004	4	2	204	204				
2004	5	2	348	348		648	0	
2005	1	2	24		24			
2005	4	2	12	12		12	24	
2007	1	2	12	12				
2007	2	2	12	12				
2007	5	2	12	12		36	0	
2007	12	2	12		12			
2008	1	2	4		4			
2008	2	2	20		20			
2008	3	2	15	11	4			
2008	4	2	184	184				
2008	5	2	134	134		329	40	
			124,430	*123,472*	*958*	*123,472*	*958*	*124,430*
					124,430			

Attachment 9:

Number of Fish Reported in SWP Entrainment Experiments

Prepared by RW Fujimura December 29, 2009 for Randy Baxter

See Table 1 from Gingras 1997 for fish numbers reported in juvenile Chinook salmon experiments.

Table 2. Number of fish used in recent SWP entrainment loss experiments

Species	Date	TR % Recovery	Citation	Number of Fish	Comments
Delta smelt	Apr-07	34	Morinaka 2008a	36	PIT tagged fish
Delta smelt	Apr-07	40	Morinaka 2008a	42	PIT tagged fish

Species	Date	Pre-Screen Loss %	Citation	Number of Fish
Steelhead trou	Jan-Apr-07	82	Clark 2008	130 acoustical; 922 PIT tagged

Species	Date	Percent Recovery	TR % Recovery	Citation	Number of Fish	Comments
Delta smelt	Jun-08		30	Castillo 2008	200	Juvenile DS M-R releases
Delta smelt	Jun-08	8*		Castillo 2008	500	*Fish release on west side of CCF
Delta smelt	Jun-08	2*		Castillo 2008	2,647	*Fish release on north central portion of CCF

Species	Date	Life Stage	CHTR % Survival	Citation	Number of Fish
Delta smelt	2006	Adults	78	Morinaka 2008b	275
Delta smelt	2006	Juveniles	58	Morinaka 2008b	254

I was not provided with the number of fish in the 2 Tracy Fish Collection Facility (CVP) releases but I recall that they were in the low hundreds.