Notes

data on adult returns, and other data from the CHinookProd dataset to evaluate current survival rates of Stanislaus River salmon in different reaches of their life history

Historic Data	**Source**
Oakdale expanded passage	CFS summary report 2013
Caswell expanded passage	CFS summary report 2013
Escapement - Grand Tab	GrandTab 2013
Escapement - Weir	Weir Email from FishBio 2013
Production - Chinookprod	Chiookprod 2013
Ocean Harvest	Chiookprod 2013
Instream Harvest (est 5%)	Chiookprod 2013
Total Harvest	sum of above 2 parameters

Parameter	
EGGS-->ORST	are available for the Tuolumne and could be substituted for this simpler assumption
Spawners --> Juveniles @ ORST	Number of juveniles per previous year's spawners. Ratio of Oakdale RST Annual P
ORST --> CRST	Ratio of Caswell RST Annual Prodcution to Oakdale RST Annual Production
CRST --> Ocean	Ratio of Caswell RST Annual Production to Chinookprod Production two years la
Ocean --> Spawners	Ratio of Grandtab Escapement to Chinookprod Production

Comparative Data	
Typical Egg-Smolt Survival (%) for Chinook Salmon in other Systems	Healy (1991) ~14% Bradsford (1995) ~ 8.6% Quinn (2005) ~10.1%

ass Count data on adult returns, and other data from the CHinookProd dataset to evaluate current survival rates of

5000 eggs/female (2500 eggs/"spawner) --> Approximates Nimbus results from 1997 (DRERIP 2007). NOTE: actual
and could be substituted for this simpler assumption
roduction to Grandtab Escapement in previous year

ter

Historic Data This sheet presents data used in subsequent sheets

max	4,414,407	2,060,282	8,498	7,248	17,559	8,636	425
average	1,624,104	366,229	3,370	2,850	5,990	2,461	159
median	1,119,203	105,821	2,505	2,210	4,377	1,856	125
min	134,216	8,704	168	408	365	0	0
Year	Oakdale expanded passage	Caswell expanded passage	Escapement - Grand Tab	Escapement - Weir	Production - Chinookprod	Ocean Harvest	Instream Harvest (est 5%)
1995			619		2,242	1,592	31
1996	245,892	70,885	168		365	189	8
1997	NA	98,287	5,588		14,290	8,422	279
1998	954,312	1,152,154	3,087		6,082	2,841	154
1999	3,889,456	1,457,859	4,349		7,547	2,980	217
2000	2,818,845	2,060,282	8,498		17,559	8,636	425
2001	1,119,203	178,557	7,033		9,504	2,120	352
2002	993,796	78,505	7,787		11,528	3,351	389
2003	1,742,219	119,654	5,902	4,848	8,724	2,527	295
2004	2,467,746	327,083	4,015	4,408	8,626	4,411	201
2005	1,304,977	266,763	1,427	4,121	2,532	1,034	71
2006	4,414,407	156,185	1,923	3,056	2,671	652	96
2007	867,739	69,959	443	408	842	377	22
2008	134,216	17,833	1,392	923	1,392	0	0
2009	160,541	8,704	595	1,303	595	0	0
2010		26,242	1,086	1,363	1,335	249	0
2011		31,113		818			
2012		105,821		7,248			
2013							

9,061
2,620
2,047
0

Total Harvest
1,623
197
8,702
2,995
3,198
9,061
2,471
3,741
2,822
4,611
1,105
748
399
0
0
249

Parameters each parameter in Wetter years (Wet+ AN) and Drier Years (BN, Dry, and Critical) and the ratio between those two medians

All years						
Max		3093	1.000	1.000	0.189	473.737
Average		591	0.2363	0.273	0.050	125.264
Median		325	0.1300	0.133	0.022	55.419
Min		115	0.0461	0.035	0.003	6.253
year	SJWYI	Spawners --> Juveniles @ ORST	EGGS --> ORST	ORST --> CRST	Eggs --> CRST	Juveniles @ CRST
1995	W					
1996	W	397	0.1589	0.288	0.04581	114.51535
1997	W					
1998	W	171	0.0683	1.207	0.08247	206.18361
1999	A	1260	0.5040	0.375	0.18890	472.25753
2000	A	648	0.2593	0.731	0.18949	473.73695
2001	D	132	0.0527	0.160	0.00840	21.01165
2002	D	141	0.0565	0.079	0.00446	11.16238
2003	B	224	0.0895	0.069	0.00615	15.36587
2004	D	418	0.1672	0.133	0.02217	55.41901
2005	W	325	0.1300	0.204	0.02658	66.44159
2006	W	3093	1.2374	0.035	0.04378	109.44989
2007	C	451	0.1805	0.081	0.01455	36.38014
2008	C	303	0.1212	0.133	0.01610	40.25508
2009	B	115	0.0461	0.054	0.00250	6.25287
2010	A					
2011	W					
2012	D					
2013						
Overall Median		325 #N	0.130 #N	0.133 #N	0.022	55.419
AN-Wet Median		523	0.2091	0.3316	0.0641	160.3495
BN-C Median		224	0.0895	0.0806	0.0084	21.0116
Ratio of Wetter:Drier		**2.33625**	**2.33625**	**4.11239**	**7.63146**	**7.63146**

n each year, as well as the min, max, median, and mean values of those parameters. The Pink-Yellow boxes beginning
Vetter years (Wet+ AN) and Drier Years (BN, Dry, and Critical) and the ratio between those two medians

0.110	1.000
0.036	0.617
0.015	0.570
0.003	0.276

CRST --> Ocean	Ocean --> Spawners
	0.276
0.086	0.460
0.077	0.391
0.015	0.508
0.007	0.576
0.006	0.484
0.049	0.740
0.110	0.676
0.021	0.677
0.008	0.465
0.003	0.564
0.009	0.720
0.009	0.526
0.075	1.000
	1.000
	0.814

0.015	0.570

Stanislaus Survival by River Mile (RM) Calculations:

this allows for estimation of reaches where survival is not measured (e.g. between Caswell and Delta) and also allows calculation of survivals necessaary in different reaches if survival between two reaches is intended to improve "proportionately".

specified in row 18. Then a per-RM survival is input into row 20 and adjusted manually until the desired "reach survival rate" is attained in Row 78. Knights Ferry Bridge is assumed to be the center of spawning distribution. Pre-hatching mortality is assumed to be 33% (US DOI testimony 2011. p. 49 Footnote 2).

2) Survival by-reach under assumption of equal per RM survival throughout system (**Starting at Column AA, Row 123**). Columns V thru Y calculate per RM survival necessary across Stanislaus, San Joaquin, and Deltato attain different "Total Freshwater Survival". This calculator estimates survivals at different points along that route and calculates survivals within different reaches under the per-RM assumption.

River Mile Markers in the Stan System Through Delta

Location	RM	Source
Chipps Island	18	www.fws.gov/stockton/jfmp/trawling.asp
Mossdale	54	www.fws.gov/stockton/jfmp/trawling.asp
Durham Ferry (est. from GoogleMaps)	71	
Vernalis	72.5	"SJ Mileposts".xls
Stan Confluence	75	"SJ Mileposts".xls
Caswell RST	83	"SJ Mileposts".xls
Oakdale RST	115.1	"SJ Mileposts".xls
Knights Ferry Bridge	129.5	"SJ Mileposts".xls

Estimated Survival per River Mile in "Delta"

from NMFS Tech Memo: Estimating Survival Per River Mile For River Reaches of Intere

Vernalis-->Chipps Island (54.5 RM)					Knights Ferry Brdg-->Oakdale (24.4 RM)	Oakdale --> Caswell (32 RM)
	Current (5%)	Future "19yr" (27%)	Future "28yr" (29%)	Future "40yr" (31%)	Current* (13%) -- Assume 33% survival egg-->emergence Future	Current (13.3%)

Start Fish	Survival/mi	Survival/mi	Survival/mi		Survival/mi	Survival/mi	Survival/mi
1000	0.947	0.9765	0.9778	0.979	0.96193		0.9389
MI	Fish						
1	947	976.5	977.8	979	317.43624		938.9
2	896.809	953.55225	956.09284	958.441	305.35081		881.53321
3	849.27812	931.14377	934.86758	938.31374	293.72549		827.67153
4	804.26638	909.26189	914.11352	918.60915	282.54277		777.10080
5	761.64026	887.89424	893.82020	899.31836	271.78581		729.61994
6	721.27333	867.02872	873.97739	880.43267	261.43838		685.04016
7	683.04584	846.65355	854.57509	861.94359	251.48490		643.18421
8	646.84441	826.75719	835.60353	843.84277	241.91036		603.88565
9	612.56166	807.32840	817.05313	826.12207	232.70035		566.98824
10	580.09589	788.35618	798.91455	808.77351	223.84098		532.34526
11	549.35081	769.82981	781.17864	791.78927	215.31891		499.81896
12	520.23522	751.73881	763.83648	775.16169	207.12129		469.28002
13	492.66275	734.07295	746.87931	758.88330	199.23577		440.60702
14	466.55162	716.82223	730.29859	742.94675	191.65046		413.68593
15	441.82439	699.97691	714.08596	727.34486	184.35395		388.40972
16	418.40770	683.52745	698.23325	712.07062	177.33522		364.67788
17	396.23209	667.46456	682.73247	697.11714	170.58372		342.39606
18	375.23179	651.77914	667.57581	682.47768	164.08925		321.47566
19	355.34450	636.46233	652.75563	668.14565	157.84205		301.83350
20	336.51124	621.50547	638.26445	654.11459	151.83268		283.39147
21	318.67615	606.90009	624.09498	640.37818	146.05211		266.07626
22	301.78631	592.63794	610.24007	626.93024	140.49161		249.81900
23	285.79164	578.71094	596.69274	613.76471	135.14282		234.55506
24	270.64468	565.11124	583.44617	600.87565	129.99766		220.22374
25	256.30051	551.83112	570.49366	588.25726			206.76807
26	242.71659	538.86309	557.82870	575.90386			194.13454
27	229.85261	526.19981	545.44490	563.80988			182.27292
28	217.67042	513.83411	533.33603	551.96987			171.13605
29	206.13389	501.75901	521.49597	540.37850			160.67963
30	195.20879	489.96767	509.91876	529.03055			150.86211
31	184.86272	478.45343	498.59856	517.92091			141.64443
32	175.065	467.20978	487.52967	507.04457			132.98996
33	165.78655	456.23035	476.70651	496.39664			
34	156.99987	445.50894	466.12363	485.97231			
35	148.67887	435.03948	455.77569	475.76689			
36	140.79889	424.81605	445.65746	465.77578			
37	133.33655	414.83287	435.76387	455.99449			
38	126.26972	405.08430	426.08991	446.41861			
39	119.57742	395.56482	416.63072	437.04382			
40	113.23982	386.26904	407.38151	427.86590			
41	107.23811	377.19172	398.33764	418.88071			
42	101.55449	368.32772	389.49455	410.08422			
43	96.17210	359.67201	380.84777	401.47245			

	44	91.07498	351.21972	372.39295	93.04153	
	45	86.24800	342.96606	364.12583	84.78766	
	46	81.67686	334.90636	356.04223	76.70711	
	47	77.34799	327.03606	348.13809	68.79627	
	48	73.24854	319.35071	340.40943	61.05154	
	49	69.36637	311.84597	332.85234	53.46946	
	50	65.68995	304.51759	325.46302	46.04660	
	51	62.20839	297.36142	318.23774	38.77962	
	52	58.91134	290.37343	311.17286	31.66525	
	53	55.78904	283.54966	304.26482	24.70028	
	54	52.83222	276.88624	297.51014	17.88158	
	55	50.03211	270.37941	290.90542	11.20606	
Reach Survival		50 fish	270 Fish	291	311	
Reach Survival Rate=		5.00%	27.04%	29.09%	31.12%	13.00% 13.30%

* Assumes 1:1 sex ratio, 5000 eggs/spawner, and

2.8142

s -- this allows for estimation of reaches where survival is not measured
if survival between two reaches is intended to improve

l is specified in row 18. Then a per-RM survival is input into row 20 and
sumed to be the center of spawning distribution. Pre-hatching

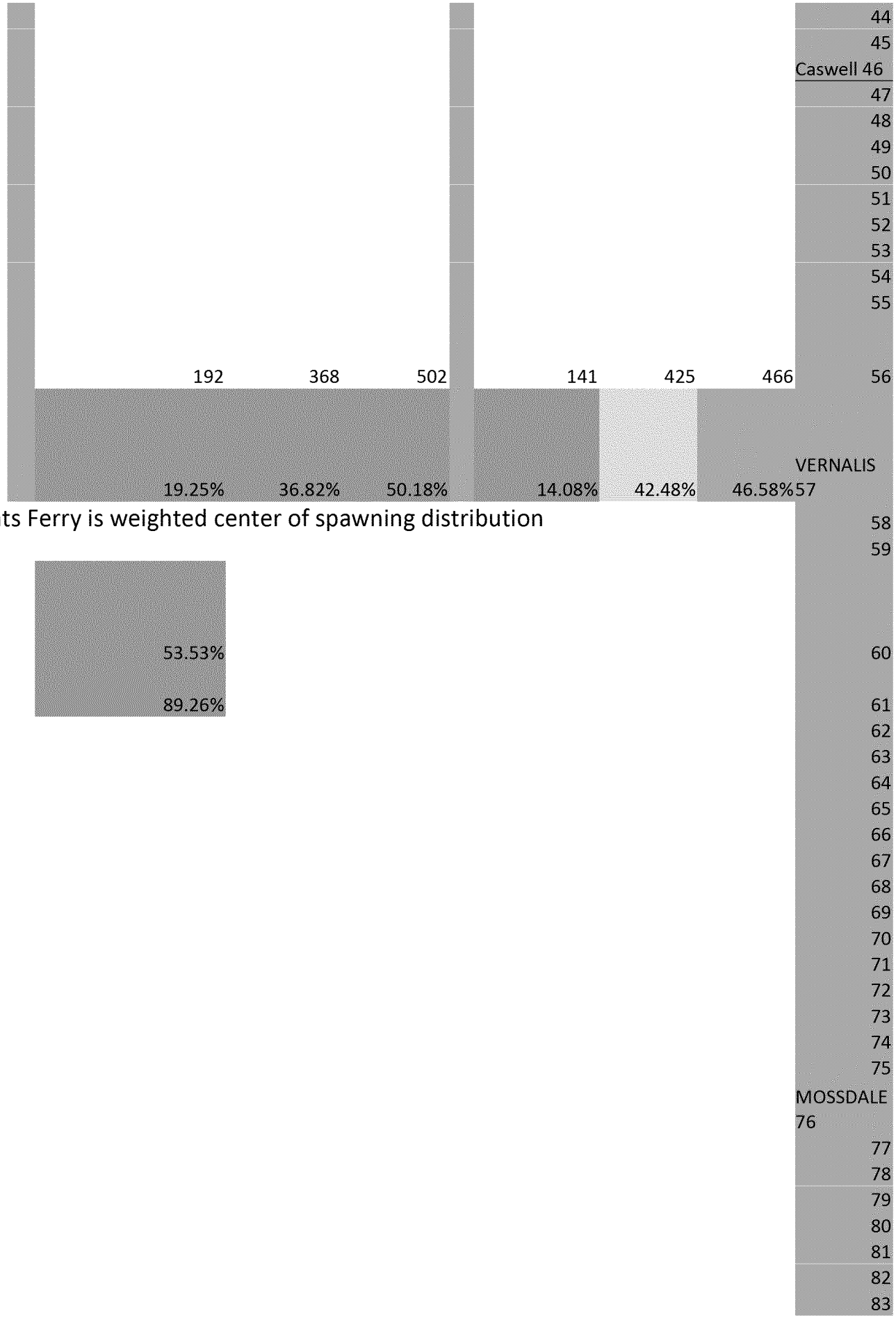
AA, Row 123). Columns V thru Y calculate per RM survival necessary
stimates survivals at different points along that route and calculates

Chipps as Pro Rata from NMFS "Delta" Survival Estimates

Mile For River Reaches of Interest on Stan

Caswell (32 RM)		**Est. Caswell --> Mossdale (29RM)**			**Est Mossdale--> Chipps (36mi)**		
Future	**Current (weighted ave)**	Future (SJR changes, Stan = no change)	Future (SJR changes, lower Stan = SJR survival)	Current	Future 19 y	Future 40 y	RM

Survival/mi	RM's Oak-Caswell (0.9389*8) & Vernalis-Chipps (0.947*21)	Average RM's Oak-Caswell (0.9389*8) & Vernalis-Chipps (0.9765*21)		Surv/mi (est. from Vernalis)			
	0.94477	0.96613	0.9765	**0.947**	**0.9765**	**0.979**	
	944.77	966.13	976.5	947	976.5	979	1
	892.59035	933.40718	953.55225	896.809	953.55225	958.441	2
	843.29259	901.79268	931.14377	849.27812	931.14377	938.31374	3
	796.71754	871.24896	909.26189	804.26638	909.26189	918.60915	4
	752.71483	841.73976	887.89424	761.64026	887.89424	899.31836	5
	711.14239	813.23003	867.02872	721.27333	867.02872	880.43267	6
	671.86599	785.68593	846.65355	683.04584	846.65355	861.94359	7
	634.75884	759.07475	826.75719	646.84441	826.75719	843.84277	8
	599.70111	733.36488	807.32840	612.56166	807.32840	826.12207	9
	566.57961	708.52582	788.35618	580.09589	788.35618	808.77351	10
	535.28742	684.52805	769.82981	549.35081	769.82981	791.78927	11
	505.72350	661.34308	751.73881	520.23522	751.73881	775.16169	12
	477.79239	638.94339	734.07295	492.66275	734.07295	758.88330	13
	451.40391	617.30238	716.82223	466.55162	716.82223	742.94675	14
	426.47288	596.39435	699.97691	441.82439	699.97691	727.34486	15
	402.91878	576.19447	683.52745	418.40770	683.52745	712.07062	16
	380.66558	556.67876	667.46456	396.23209	667.46456	697.11714	17
	359.64142	537.82405	651.77914	375.23179	651.77914	682.47768	18
	339.77842	519.60795	636.46233	355.34450	636.46233	668.14565	19
	321.01246	502.00883	621.50547	336.51124	621.50547	654.11459	20
	303.28294	485.00579	606.90009	318.67615	606.90009	640.37818	21
	286.53262	468.57865	592.63794	301.78631	592.63794	626.93024	22
	270.70743	452.70789	578.71094	285.79164	578.71094	613.76471	23
	255.75626	437.37467	565.11124	270.64468	565.11124	600.87565	24
	241.63084	422.56079	551.83112	256.30051	551.83112	588.25726	25
	228.28557	408.24866	538.86309	242.71659	538.86309	575.90386	26
	215.67735	394.42128	526.19981	229.85261	526.19981	563.80988	27
	203.76549	381.06223	513.83411	217.67042	513.83411	551.96987	28
	192.51153	368.15565	501.75901	206.13389	501.75901	540.37850	29
				195.20879	489.96767	529.03055	30
				184.86272	478.45343	517.92091	31
				175.065	467.20978	507.04457	32
				165.78655	456.23035	496.39664	33
				156.99987	445.50894	485.97231	34
				148.67887	435.03948	475.76689	35
				140.79889	424.81605	465.77578	36
							37
							38
							39
							40
							41
							42
							43



that Knights Ferry is weighted center of spawning distribution

Caswell to Vernalis Durham (~11mi)	53.53%
Caswell to Confluence	89.26%

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105
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107
108
109
110
111
112
Total FW Survival

Freshwater Survival with Constant Survival/RM

Knights Ferry--> Chipps = Freshwater (111.5mi)

To Attain 10% Survival	To Attain 7.089% Surv (USFWS)	To Attain 6.218% Surv (Combined Mid-Term)	To Attain 4.24% Surv (Combined Model)

0.97956	0.97654	0.97540	0.97206
979.56	976.542	975.395	972.06
959.53779	953.63428	951.39541	944.90064
939.92484	931.26392	927.98632	918.50012
920.71278	909.41834	905.15322	892.83723
901.89341	888.08520	882.88192	867.89135
883.45871	867.25250	861.15861	843.64247
865.40081	846.90849	839.96981	820.07110
847.71202	827.04171	819.30235	797.15831
830.38478	807.64096	799.14341	774.88571
813.41172	788.69532	779.48049	753.23540
796.78558	770.19411	760.30137	732.19001
780.49929	752.12689	741.59416	711.73262
764.54588	734.48350	723.34723	691.84681
748.91856	717.25399	705.54928	672.51661
733.61067	700.42864	688.18924	653.72649
718.61567	683.99799	671.25634	635.46138
703.92716	667.95276	654.74008	617.70658
689.53889	652.28393	638.63020	600.44786
675.44472	636.98265	622.91670	583.67135
661.63863	622.04031	607.58984	567.36357
648.11473	607.44849	592.64009	551.51143
634.86727	593.19896	578.05818	536.10220
621.89058	579.28370	563.83506	521.12351
609.17914	565.69487	549.96190	506.56332
596.72752	552.42480	536.43008	492.40994
584.53040	539.46602	523.23122	478.65200
572.58260	526.81122	510.35712	465.27847
560.87901	514.45328	497.79978	452.27859
549.41465	502.38524	485.55142	439.64192
538.18461	490.60029	473.60442	427.35833
527.18412	479.09178	461.95139	415.41794
516.40848	467.85325	450.58507	403.81116
505.85309	456.87835	439.49843	392.52868
495.51345	446.16090	428.68457	381.56142
485.38515	435.69485	418.13678	370.90060
475.46388	425.47432	407.84853	360.53764
465.74540	415.49355	397.81342	350.46421
456.22556	405.74690	388.02522	340.67224
446.90031	396.22889	378.47786	331.15386
437.76567	386.93415	369.16541	321.90142
428.81774	377.85745	360.08209	312.90750
420.05271	368.99367	351.22227	304.16486
411.46683	360.33782	342.58045	295.66650

403.05645	351.88501	334.15126	287.40557
394.81797	343.63049	325.92947	279.37546
386.74789	335.56961	317.90997	271.56971
378.84277	327.69782	310.08780	263.98205
371.09922	320.01068	302.45809	256.60639
363.51395	312.50387	295.01611	249.43681
356.08373	305.17316	287.75723	242.46755
348.80538	298.01440	280.67697	235.69300
341.67579	291.02358	273.77091	229.10774
334.69194	284.19675	267.03478	222.70647
327.85084	277.53006	260.46439	216.48405
321.14957	271.01976	254.05566	210.43549
314.58527	264.66218	247.80462	204.55592
308.15515	258.45374	241.70739	198.84063
301.85646	252.39093	235.76018	193.28502
295.68651	246.47034	229.95930	187.88464
289.64268	240.68864	224.30115	182.63514
283.72238	235.04257	218.78222	177.53232
277.92310	229.52894	213.39908	172.57206
272.24235	224.14465	208.14840	167.75040
266.67771	218.88666	203.02691	163.06345
261.22682	213.75202	198.03143	158.50746
255.88734	208.73782	193.15887	154.07876
250.65701	203.84125	188.40619	149.77380
245.53358	199.05954	183.77046	145.58912
240.51487	194.39001	179.24879	141.52136
235.59875	189.83000	174.83837	137.56725
230.78311	185.37697	170.53647	133.72362
226.06590	181.02840	166.34042	129.98739
221.44512	176.78184	162.24762	126.35554
216.91878	172.63489	158.25551	122.82517
212.48496	168.58522	154.36164	119.39343
208.14177	164.63055	150.56357	116.05758
203.88735	160.76864	146.85895	112.81493
199.71989	156.99733	143.24549	109.66288
195.63762	153.31449	139.72093	106.59890
191.63878	149.71804	136.28310	103.62053
187.72169	146.20595	132.92985	100.72537
183.88465	142.77625	129.65911	97.91110
180.12605	139.42701	126.46885	95.17547

176.44428	136.15633	123.35709	92.51626
172.83775	132.96237	120.32188	89.93136
169.30495	129.84334	117.36136	87.41868
165.84436	126.79748	114.47369	84.97620
162.45450	123.82306	111.65706	82.60196
159.13393	120.91842	108.90974	80.29406
155.88123	118.08192	106.23002	78.05065
152.69502	115.31195	103.61623	75.86991
149.57393	112.60696	101.06675	73.75011
146.51664	109.96543	98.58000	71.68953
143.52184	107.38586	96.15444	69.68652
140.58826	104.86680	93.78856	67.73948
137.71463	102.40684	91.48089	65.84684
134.89974	100.00458	89.23001	64.00708
132.14239	97.65867	87.03450	62.21872
129.44140	95.36779	84.89302	60.48033
126.79562	93.13065	82.80423	58.79051
124.20392	90.94600	80.76683	57.14790
121.66519	88.81258	78.77956	55.55119
119.17835	86.72922	76.84119	53.99909
116.74235	84.69472	74.95051	52.49036
114.35613	82.70796	73.10635	51.02378
112.01870	80.76779	71.30757	49.59817
109.72903	78.87314	69.55305	48.21240
107.48617	77.02294	67.84170	46.86535
105.28915	75.21613	66.17245	45.55593
103.13704	73.45171	64.54428	44.28309
101.02892	71.72868	62.95617	43.04583
98.96389	70.04607	61.40713	41.84312
10.00%	7.089%	6.218%	4.24%

Total FW = 10%	Total FW = 7.089%	Total FW = 6.218%
% Caswell-Vernalis **79.68%**	**% Caswell-Vernalis** **77.02%**	**76.03%**
Juv @ Caswell (83RM) 386.74789	Juv @ Caswell (83RM) 189.83000	174.83837
Juv @ Vernalis (72RM) 308.16	Juv @ Vernalis (72RM) 146.21	132.93
% Caswell-Mossdale **54.38%**	**% Caswell-Mossdale** **87.77%**	**87.20%**
Mossdale (54RM) 210.31	Juv @ Mossdale (54RM) 166.60788	152.46260
% Knights Ferry Mossdale **21.03%**	**% Knights Ferry Mossdale** **16.66%**	**15.25%**
Pre-Delta Surv (KF--Vernalis) 30.82%	**Pre-Delta Surv (KF--Vernalis)** 25.85%	24.17%
Vernalis @57 RM 308.15515	Vernalis @57 RM 258.45374	241.70739
Through Delta Survival **32.45%**	**Through Delta Survival** **27.43%**	**25.73%**

Total FW = 4.24%	
% Caswell-Vernalis	**73.22%** **% Caswell-Vernalis**
Juv @ Caswell (83RM)	137.56725 Juv @ Caswell (83RM)
Juv @ Vernalis (72RM)	100.73 Juv @ Vernalis (72RM)
% Caswell-Mossdale	**85.58%** **% Caswell-Mossdale**
Juv @ Mossdale (54RM)	117.72550 Juv @ Mossdale (54RM)
% Knights Ferry - Mossdale	**11.77%** **% Knights Ferry -- Mossdale**
Pre-Delta Surv (KF--Vernalis)	19.88% **Pre-Delta Surv (KF--Vernalis)**
Vernalis @57 RM	198.84063 Vernalis @57 RM
Through Delta Survival	**21.35%** **Through Delta Survival**

Model-Allocation of FW Survival Rates

Rates to attain different desired overall CRR (assumes ocean conditions do not change) -- see columns S thru AK & AN thru BF. Finally, the sheet calculates pre-Delta and Delta survival rates necessary to attain targets under different assumptions re: allocation of responsibility

Calculations

are static). I have included a "pre-Delta" term in the US DOI estimate after confirming with US DOI employees that such a term is needed.

2) "Resilience from starting population..." module (**Columns W-AK**) and "Doubling Goal in 3 generations" module (**Columns AN-BF**) allow calculation of "necessary FW survival" that would generate attainment of their respective goals (i.e. relevant CRR's) -- the "necessary FW survival" value is input manually until the desired "Target CRR" is attained.

> Vernalis) that assumes proportionate survival per RM in these two segments of FW.

4) Estimated production of juveniles at Caswell -- In **rows 22-27**, a calculator takes the estimated Knights Ferry- Caswell survival rate -- **Rows 18-20** -- and estimates the number of juveniles passing Caswell implied by a range of spawning stocks (assuming 1:1 sex ration and 2500 eggs per spawner)

Current Estimated Survival Rates

Starting Spawning Stock	Eggs to start (Assumes 1:1 Sex Ratio & 5000egg/fem)	**Source**	**Knights Ferry-to-Oakdale**	**Oakdale-Caswell**
2500	6,250,000	US DOI (2011) (w Caswell to Vernalis/Durham Ferry term added)		6.64%
		NMFS (2012)		
		Consensus Estimate		2.22%
		Consensus Estimate Source	From Parameters page	
	"Typical" Populations	Bradford Quinn		
		Healey		
		FW Survival Target = 10%	**USFWS 0.18% to 10%**	**USFWS 0.18% to 10%**

	Even Split	Pro-Rata (by RM)
Pre-Delta	31.62%	34.10%
Delta	31.62%	29.32%

Year Type -:	Dry	Med
Survival -->	13.00%	19.30%
Spawning Stock		
2,000	650,000	965,128
4,000	1,300,000	1,930,256
6,000	1,950,000	2,895,384
8,000	2,600,000	3,860,512

nislaus compiled by different authors (Columns A-P, thru Row __; "Current Estimated Survival Rates") and then
overall CRR (assumes ocean conditions do not change) -- see columns S thru AK & AN thru BF. Finally, the sheet
different assumptions re: allocation of responsibility

nates to calculate current Freshwater (Egg-->Smolt) survival rates and current Marine (pre-fishery & fishery+post-
nsus Estimate" pulls the best-documented parameter estimates from NMFS 2012, US DOI 2011, and this
to cells where they are calculated in this worksheet -- in modules to the right, they are static). I have included a
ees that such a term is needed.
pling Goal in 3 generations" module (**Columns AN-BF**) allow calculation of "necessary FW survival" that would
ssary FW survival" value is input manually until the desired "Target CRR" is attained.

is) -- **Rows 13-16** -- Using "Necessary FW Survival" estimates above, this calculator shows how different FW target
tween Delta and River. Also, below the "Consensus Estimate" there is a calculator -- **Rows 18-20--** to estimate
es (Caswell--> Vernalis) that assumes proportionate survival per RM in these two segments of FW.
akes the estimated Knights Ferry- Caswell survival rate -- **Rows 18-20** -- and estimates the number of juveniles
n and 2500 eggs per spawner)

Estimated Caswell--Delta (Vernalis/Durham Ferry)	**Pre-Delta**	**Delta (Vernalis/Durham Ferry-->Chipps)**	**>>>>>>**
53.53%	3.55%	5.00%	
	5.64%	5.00%	
53.53%	1.19%	5.00%	
From "STAN Survival-RM"	Column G * Column E	NMFS (2012)	
USFWS 0.18% to 10%	**USFWS 0.18% to 10%**	**NMFS 0.28% to 10%**	**NMFS 0.28% to 10%**

Proportionate Improvement	50% Delta Survival	Proportionate Improvement	31% Delta Survival
26.46%	20%	33.71%	32.26%
37.79%	50.00%	29.88%	31.00%

Pre-Delta Survival

Wet

25.00%

1,250,000

2,500,000

3,750,000

5,000,000

Current Estimated Survival Rates") and then
nns S thru AK & AN thru BF. Finally, the sheet

nd current Marine (pre-fishery & fishery+post-
om NMFS 2012, US DOI 2011, and this
to the right, they are static). I have included a

tion of "necessary FW survival" that would
CRR" is attained.

e, this calculator shows how different FW target
e is a calculator -- **Rows 18-20--** to estimate
M in these two segments of FW.
20 -- and estimates the number of juveniles

Documented Freshwater Survival	Chipps-Ocean Production	Production-Escapement	Saltwater Survival	Spawning Stock	CRR
0.18%	2.83%	50.00%	1.42%	157	0.06287
0.28%	2.83%	70.00%	1.98%	349	0.13966
0.0593%	2.83%	56.99%	1.61%	59.80	0.02
	2008 OCAP Bio Opinion 98 thru 2007	From Parameters Page	Column L* Column M		
8.6%					
10.4%			**3.1%**	20150.00	**8.06**
14.0%					

CONSENSUS .0589% to 10%

Resilience from Starting Pop of 5,000

	Proportionate Improvement	Delta stays Status Quo (=5% Survival)
	15.38%	NOT POSSIBLE
	65.15%	5.00%
Knights Ferry--> Caswell	19.30%	
Caswell --> Vernalis	79.68%	
	15.38%	

Starting Spawning Stock	Eggs to start (Assumes 1:1 Sex Ratio & 5000egg/fem)	**Source**	Knights Ferry-to-Oakdale	Oakdale-Caswell	**Estimated Caswell Delta (Vernalis/Durham Ferry)**	Pre-Delta	**Delta** (Vernalis/Durham Ferry-->Chipps)
5000	12,500,000	US DOI (2011) (w Caswell to Vernalis/Durham Ferry term added)	6.64%		53.53%	3.55%	5.00%
		NMFS				5.64%	5.00%
		Consensus Estimate	2.20%		53.53%	1.18%	5.00%
	"Typical" Populations	Bradford					
		Quinn					
		Healey					
		n Target in 1 generation / Escapement % CRR=2.5075, Starting = ,000)	**FW Survival Target = varies with Ocean surival**	**USFWS 0.18% to 7.089%**	**USFWS 0.18% to 7.089%**	**USFWS 0.18% to 7.089%**	**USFWS**

To Regain Production Target in 1 generation after low Escapement (FW Survival = 7.089% CRR=2.5075, Starting = 5,000)

	Even Split (FWS Survival)	Pro-Rata (by RM)	Proportionate Improvement	50% Delta Survival
Pre-Delta	26.63%	29.04%	22.28%	14.18%
Delta	26.63%	24.41%	31.38%	50.00%

Year Ty	Dry	Med	Wet
Survival -	9.00%	15.74%	22.20%
Spawning Stock			
2,000	450,000	786,815	1,110,000
4,000	900,000	1,573,629	2,220,000
6,000	1,350,000	2,360,444	3,330,000
8,000	1,800,000	3,147,259	4,440,000

Delta scaled to **Mossdale--Chipps**	**Calculated Freshwater Survival**	**Necessary FW Survival**	Chipps-Ocean Production	Production-Escapement	**Calculated Saltwater Survival**	Spawning Stock	**New** Spawning Stock	Prev. CRR	**New CRR (Target =2.5075)**
	0.18%	**7.089%**	2.83%	50.00%	1.42%	1575281.87304		0.06287	2.50773
	0.28%	**5.063%**	2.83%	70.00%	1.98%	349.15135281.16413		0.1397	2.50745
	0.0589%	**6.2180%**	2.83%	57.00%	1.61%	59.375281.44769		0.02	2.50756
	8.6%								
	10.4%				**3.1%**	20150.00		**8.06 (3.2 to 8.75)**	
	14.0%								

NMFS 0.28% to 5.063%	**NMFS 0.28% to 5.063%**	**CONSENSUS .0589% to 6.2180%**

Proportionate Improvement	Mid-term Delta Survival (29%)	Proportionate Improvement	Delta stays Status Quo (=5% Survival)
23.98%	17.46%	12.12%	NOT POSSIBLE
21.26%	29.00%	51.37%	5.00%

Pre-Delta Survival	Knights Ferry--> Caswell	15.74%
	Caswell --> Vernalis	77.02%
		12.12%

Doubling Goal in 3 generations

Starting Spawning Stock	Eggs to start (Assumes 1:1 Sex Ratio & 5000egg/fem)	**Source**	Knights Ferry-to-Oakdale	Oakdale-Caswell	**Estimated Caswell--Delta (Vernalis/Durham Ferry)**
2505	6,262,500	US DOI (2011) (w Caswell to Vernalis/Durham Ferry term added)		6.64%	53.53%
		NMFS Consensus Estimate		2.20%	53.53%
	"Typical" Populations	Bradford Quinn			
		Healey			
		FW Survival Target = varies with Ocean surival	**USFWS 0.18% to 4.835%**	**USFWS 0.18% to 4.835%**	**USFWS 0.18% to 4.835%**

To Attain Doubling in 9 years (CRR=1.71, Starting = 2,505)

	Even Split (FWS Survival)	Pro-Rata (by RM)	Proportionate Improvement
Pre-Delta	21.99%	24.28%	18.40%
Delta	21.99%	19.91%	25.91%

Year Typ	Dry	Med
Survival --	6.00%	13.67%
Spawning Stock		
2,000	300,000	683,566
4,000	600,000	1,367,131
6,000	900,000	2,050,697
8,000	1,200,000	2,734,263

Pre-Delta	Delta (Vernalis/Durham Ferry-->Chipps)	Delta scaled to Mossdale--Chipps	Calculated Freshwater Survival	Necessary FW Survival	Chipps-Ocean Production	Production-Escapement	Calculated Saltwater Survival	Spawning Stock
3.55%	5.00%		0.18%	**4.835%**	2.83%	50.00%	1.42%	157
5.64%	5.00%		0.28%	**3.455%**	2.83%	70.00%	1.98%	349.1513
1.18%	5.00%		0.0589%	**4.2400%**	2.83%	57.00%	1.61%	59.37
			8.6%					
			10.4%				**3.1%**	20150.00
			14.0%					

USFWS 50% Delta Survival	**NMFS 0.28% to 3.455%**	**NMFS 0.28% to 3.455%**	**CONSENSUS .0589% to 4.24%**

	Proportionate Improvement	Short-term Delta (27%)	Proportionate Improvement	Delta stays Status Quo (=5% Survival) COMBINED est.
9.67%	19.81%	12.80%	10.01%	84.80%
50.00%	17.56%	27.00%	42.42%	5.00%

Pre-Delta Survival	Knights Ferry--> Caswell	13.67%
	Caswell --> Vernalis	73.22%
		10.01%

Wet

20.60%

1,030,000

2,060,000

3,090,000

4,120,000

New Spawning Stock	Prev. CRR	New CRR (Target = 1.71)
4284.50503	0.06287	1.71038
4286.27732	0.1397	1.71109
4283.26443	0.02	1.70989
	8.06	