2010-2011 CEDAR RIVER SOCKEYE HATCHERY ANNUAL REPORT

Cory Cuthbertson

Washington Department of Fish and Wildlife
Olympia, Washington 98051

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Introduction:

Since 1991 the Washington Department of Fish and Wildlife (WDFW) has operated the Cedar River Sockeye Hatchery at Landsburg, Washington at river mile (RM) 22 on the Cedar River. The program was started in response to a decline in naturally spawning sockeye salmon in the Cedar River watershed. In addition to the goal of stabilizing declining populations the program was designed to provide an opportunity to evaluate culture methods that are unique to sockeye culture and test their effectiveness.

History

In response to declining sockeye populations in the Cedar River basin the WDFW began a supplementation program in the main tributary of Lake Washington, the Cedar River. In 1991, after a few years of minimal success with an egg box program on the Cedar River, the WDFW began operation of the interim hatchery at Landsburg Dam near Ravensdale, Washington.

For the first two years adult broodstock for the program were captured by gillnet in the lower river at various locations. Due to salmon redd damage, high prespawn mortality, and relative inefficiency of gillnetting for broodstock, WDFW installed a temporary trap and weir at Cavanaugh Ponds Park (RM 6.4). This trap and weir was operated for 15 years but was replaced due to its susceptibility to high water damage, cost and impact of installation and removal requiring heavy equipment, and lack of access to adults who spawned below RM 6.4. In the fall of 2008 a new, floating resistance-board weir and trap was installed at RM 1.8 between Renton's Cedar River Park and Narco Property just upstream of where I-405 crosses the Cedar River.

The interim hatchery itself is situated on Seattle Public Utilities (SPU) property at the bottom of the Cedar River Watershed parcel. It was built in stages over 17 years of operation and consists mostly of temporary structures and facilities and is capable of incubating up to 18,700,000 eggs. In the first year of operation 2,079,100 sockeye fry were released from the hatchery, this is the lowest number of fry released during the program's history. The largest number of fry released was in the spring of 2001 (brood year 2000) when 17,209,000 fry were released. The average from 1991 through 2009 is 8,513,200 fry per year.

Program Goals

The primary goals of the Cedar River Hatchery program are to enhance the Lake Washington sockeye population to levels allowing for sport and tribal fishing opportunities; to afford scientists the opportunity to study and learn about sockeye salmon and their life cycle; and to not negatively impact other species in the Cedar River watershed.

Specifically, to collect, hold, and spawn enough adult sockeye broodstock to achieve a maximum green egg take of 18,700,00 eggs and release a maximum of 17,000,000 fry after a normal egg to fry loss of 9.1%. Additionally, the hatchery serves to ensure stable

sockeye fry production in years when floods impact the survival of natural production in the river.

For the 2010-2011 season adults were collected at the floating resistance-board weir, at the new trap location in Renton, Washington (RM 1.8). Adults were then hauled by truck to one of four 16-foot diameter circular holding ponds at the Hatchery site in Landsburg. When the adults were ready to be spawned gametes were collected at the adult pond area, transported to and fertilized in the fertilization room, and then put down in one of either the 40 vertical Heath-type or 55 kitoi incubators. When the eggs were in the eyed stage they were shocked, picked, and put back into their incubators to continue incubation until they swam up and were ready to be ponded. At defined times during incubation chilled water was substituted for ambient temperature water to provide distinguishing thermal marks on the otolith bones of all of the hatchery fish. Once the fry swam up and were ready to be ponded they were moved to one of either seven, 6-foot diameter circular ponds or four, 15-foot by 3-foot rectangular fiberglass raceways. In the 2009-2010 season all of the fry were fed for approximately 14 days and then hauled by truck and released at the mouth of the Cedar River (RM 0.1).

Methods and Results:

Adult sockeye counts through the fish ladder at the Ballard Locks conducted by the WDFW and Muckleshoot Indian Tribe biologists indicated that the 2010 run was small but exceeded pre-season estimates. The total count during the normal counting period (6/12/2010-7/31/2010) was only 156,752 (http://wdfw.wa.gov/fish/sockeye/counts.htm).

Trap and Weir Operations:
The weir structure is made up of 3-foot by 20-foot panels of 1-inch diameter schedule 40 PVC pipe spaced with 1-inch spaces between them. Panels are linked together with stringer through overlapping pieces of adjoining panels. The panels are anchored to the river bottom at the upstream edge of the structure by hooking to the substrate cable. The substrate cable runs through eyelets on the substrate rail that is anchored to the river bottom by 38-inch rebar stakes driven into the gravel substrate. The weir panels float up and downstream from the substrate rail lifted by the floatation from the air trapped inside the 1-inch PVC pipes that are capped on both ends and foam in the resistance boards. A 2-foot by 3-foot plywood/Styrofoam hinged resistance board is attached at the downstream end of each panel. Additional flotation during higher flows is achieved by setting the resistance boards to act like flaps on the wings of an airplane, using resistance against the fast moving water to lift the panel. At either side of the weir there are vertical bulkheads that block fish from passing around the end of the submerged portion of the panels. The weir is connected to the riverbank at one end by a customizable, rigid aluminum picket section and at the other (north) end with a custom, rigid aluminum picket section with a 2-foot wide tip gate. The tip gate was designed so that the gate could be opened and closed by someone on the walkway on top of the rock wall on the north bank to allow unimpeded upstream fish passage. The aluminum picket and tip gate

structure are propped up against the river current by tripods and are attached to the weir panels by connecting to the bulkheads.

The trap itself is a 6-foot by 12-foot by 6-foot high cage made of aluminum. It consists of individual frame panels that are bolted together, individual pickets that slide into holes drilled in the frame, lids that are bolted to hinges on the top of the walls, and an adjustable vee-trap leading into the cage.

In addition to the weir and trap there is an aluminum debris shield that was installed upstream of the trap to deflect large debris floating down the river, protecting the trap.

On September 10, 2010 WDFW and SPU installed the weir near the Cedar River Park, Renton location just upstream from the I- 405 overpass. Low flows, good weather, and the ease of access provided by the new driveway made for a quick, approximately 3-hour installation.

Trapped sockeye were sorted by sex from the trap into two aluminum live boxes for holding until they were loaded into rubber carrying boots, and loaded into the tanker trucks to be hauled to the adult holding ponds at the Cedar River Hatchery. In general, on days when there were more than 50 of one sex of sockeye to be hauled SPU hauled fish in their tanker truck, and on days where there were fewer fish WDFW would haul in their smaller trucks. SPU and WDFW staff worked together to load and haul the adult fish.

Hatchery technicians monitored the trap, weir, and stretch of river above and below the weir regularly and passed any Chinook, coho, or other non-target species upstream out of the trap as soon as possible. Technicians also changed the weir configuration to accommodate unimpeded upstream passage of Chinook according to the protocols for operation the weir (Appendix 2). Only 5 Chinook were trapped and passed upstream out of the trap in 2010 and no coho were trapped.

However, on the morning of September 27 WDFW weir staff discovered a dead adipose-present female Chinook wedged beneath the weir at the very upstream end of the weir panels where the panels connect to the substrate rail. The fish was not hung-up on any part of the weir, it was just wedged between the bottom of the panel and the river bottom. The tip-gate had been open the previous night and there were not any obstructions between the underside of the weir and any of the bulkhead openings (to the tip gate or trap). In other words, the fish could have swum out from under the weir on either side of the weir panel section. When weir staff discovered the fish its head was pointing upstream. The fish was pushed downstream and retrieved by staff for sampling by the field technicians. The flows during the previous night fluctuated between 390 and 410 cfs.

On the morning of September 29 WDFW weir staff discovered two dead adipose-present male Chinook wedged in a similar location and in a seemingly similar fashion. Both fish were pointing towards the north bank, parallel with the substrate rail. The tip-gate had been closed during the previous night but there were still no obstructions between the

underside of the weir and the bulkhead openings. Both fish were pushed downstream, retrieved by weir staff, and then sampled by Hans Berge. One of the males had a blue disc tag (from MIF Locks tagging) and was 98 cm in length, the other was 105 cm in length. Flows the previous night had been about 430 cfs.

The cause for these fish getting stuck is still a mystery but DFW staff used gravel bags to block fish access to the narrowest spaces under the weir to make sure this doesn't happen again. Staff have also opened the vee trap to the cage 2 inches to allow for a wider opening into the cage in case the fish were reluctant to pass through the narrow opening into the trap.

In addition to the 5,204 sockeye trapped and hauled from the weir and trap, 1,447 sockeye were transported to the hatchery from the SPU fish passage facility at the Landsburg Diversion Dam.

WDFW and SPU staff removed the trap and weir by hand from the river on November 5 in under four hours. The substrate rail was left in place in the river.

Table 1, Trap Data

	Trap Configuration (hours weir closed and fishing)				Fish Activity at the Weir		
Date	Trap Fishing (closed)	Deep End Weir Panels Raised (not submerged)	Teeter-Totter Closed		Sockeye Hauled From Trap at RM 1.4	Sockeye Hauled From Landsburg at RM 24	SO Trapped and Passed Upstream at RM 1.4
10-Sep	8	8	0			202	
11-Sep	24	24	0				
12-Sep	24	24	0		31		29
13-Sep	24	24	0		27	490	
14-Sep	24	24	0		15		12
15-Sep	24	24	0		109	204	2
16-Sep	24	24	8		33		
17-Sep	24	24	10		238	279	
18-Sep	24	24	0		49		
19-Sep	24	24	0		50		
20-Sep	24	24	10		93		
21-Sep	24	24	8		272		
22-Sep	24	24	8		140		
23-Sep	24	24	8		282		3
24-Sep	24	24	0		50		39
25-Sep	24	24	0		23		24
26-Sep	24	24	0		34		37
27-Sep	24	24	0				1
28-Sep	24	24	10		237		6
29-Sep	24	24	8		88		6
30-Sep	24	24	0				3
01-Oct	24	24	8		62		8
02-Oct	24	24	8		115		4
03-Oct	24	24	0		62		
04-Oct	24	24	0		42		9
05-Oct	24	24	0		25		6
06-Oct	24	24	0		29		1
07-Oct	24	24	8		38		2
08-Oct	24	24	8		312		47
09-Oct	24	24	8		137		3
10-Oct	16	16	8		90		3
11-Oct	10	10	10				
12-Oct	24	24	18		181		5
13-Oct	24	24	15		198		4
14-Oct	24	24	21		116		2
15-Oct	24	24	20		247		10
16-Oct	24	24	15		146		1
17-Oct	24	24	16		129		1
18-Oct	24	24	0		197		
19-Oct	24	24	0		77		
20-Oct	24	24	16		79		
21-Oct	24	24	21		147		1
22-Oct	24	24	21		471		1
23-Oct	16	16	16		337		25
24-Oct	0	0	0		21		40
25-Oct	0	0	0				
26-Oct	15	15	15				
27-Oct	24	24	24		61		
28-Oct	24	24	21				
29-Oct	24	24	21		31		1
30-Oct					47		
31-Oct					21		
01-Nov	8	8	8		15	140	
02-Nov	Storm						
03-Nov	Storm					132	
04-Nov	10	10	10				
05-Nov	8	8	8				
				Totals:	5,204	1,447	336

Spawning Operations:
The 2010-2011 spawning season began on September 16 and ended on November 22. There were a few minor adjustments to the spawning procedures but overall the spawning operations were orchestrated similarly to past years.

On spawn days all sockeye females were crowded in their ponds, checked for ripeness, and then killed if they were ready to be spawned. Gametes were collected in lidded plastic cups, kept in coolers until all the gametes for the day were collected, and then transported to the fertilization room.

Strict disinfection procedures and protocols for spawning IHN infected sockeye were adhered to to limit the risk of vertical transmission of the virus from the parents to the offspring. The last egg takes were small and the eggs were incubated in vertical, Heath type incubators, while all of the other egg takes were large enough to be incubated in kitoi incubators.

Once the gametes were collected they were brought into the disinfected fertilization room for fertilization. Eggs were fertilized according to a 1:1 matrix whereby each female's eggs are fertilized by one male with a secondary male's milt used as insurance against the first male's milt being compromised or non-viable. This 1:1 matrix is used to ensure a maximum combination of genotypes and to minimize the overrepresentation of males with dominant sperm.

Fertilized eggs were then rinsed thoroughly and water hardened for one hour in a 1:100 solution of iodaphor and put into their incubation vessel.

3,109 females were spawned during the 2010-2011 season giving an egg take of 9,560,190 with a fecundity of 3,075 eggs per female.

In addition to taking eggs, otolith, ovarian fluid, kidney and spleen, and fecundity samples were taken by WDFW hatchery and biological staff. There were 1400 otolith, 230 ovarian fluid, and 60 kidney/spleen samples taken in addition to fecundity assessment of 180 females. 61 of the ovarian fluid samples tested positive for IHN virus.

Incubation and Picking Operations:
After one hour of water hardening in a 1:100 solution of iodaphor, eggs were put down in either Heath type or kitoi incubators and left alone until they are at the eyed stage. It takes about 45 days for eggs to reach the eyed stage at normal Cedar River Hatchery water temperatures.

Each day during incubation between the second day after fertilization and hatching the eggs were treated with formalin to control fungus growth. This is done by dumping a prescribed amount of formalin into the inflow of each individual incubator and allowing the formalin to flush through the incubator. This method is called the California Flush.

In addition to being treated with formalin every day the eggs and alevins received thermal marks by supplying their incubators with chilled water for prescribed periods of time. To accomplish this ambient spring water is cooled at least 3 degrees Celsius by an array of chillers before going through an incubator. When an incubator is scheduled to be chilled the ambient temperature spring water supply to that incubator is replaced by the chilled water for the number of hours prescribed by the chilling schedule (Appendix 3). When the mark is complete ambient temperature spring water is returned as the water source for the incubator.

When the eggs reached the eyed stage they were siphoned out of their incubators and physically shocked (bumped) to help distinguish healthy eggs from dead ones. 24 hours after they were shocked they were picked by a Gensorter egg picker initially and secondarily by hand. Once the eggs were picked they were put back into their incubators layered with substrate (vexar pillows in the Heath-type trays and 1 inch plastic "saddles" in the kitios).

During the picking operation eggs were sampled to determine size and weighed to establish accurate populations and rates of loss. The rate of loss for the 2010-2011 season was 5.29%.

Table 2, Egg Inventory and Distribution

EGG INVENTORY AND DISTRIBUTION

I.D. CODE: SO:NA:CEDA:10:M **HATCHERY:** CEDAR RIVER **PERIOD ENDING:**

TAKE	LOT	Females	GREEN EGGS		EYED EGGS			EGG	%	ADJUSTED	Fecundity
DATE	NO.		NUMBER	PICK DATE	NUMBER	LBS	SAMPLE	LOSS	LOSS	EGG TAKE	(eggs/female)
09/16/10	**A1,2 S20**	200	640,000	10/28/2010	590,000	163.4	3610	29,000	4.68	619,000	3,095
09/20/10	**A3,4**	166	531,000	11/02/2010	482,000	133.0	3623	19,000	3.79	501,000	3,018
09/22/10	**A5**	90	288,000	11/04/2010	256,000	69.6	3676	6,000	2.29	262,000	2,911
09/27/10	**A6,7**	174	556,000	11/08/2010	520,000	145.4	3576	32,000	5.80	552,000	3,172
09/30/10	**A8 S19,18**	148	473,000	11/10/2010	437,000	118.9	3676	23,000	5.00	460,000	3,108
10/04/10	**A9, 10 S17**	210	672,000	11/16/2010	568,000	159.1	3571	52,000	8.39	620,000	2,952
10/07/10	**A11, S16,15**	141	451,000	11/18/2010	420,000	112.6	3731	18,000	4.11	438,000	3,106
10/12/10	**A12, A13**	167	529,500	11/23/2010	524,000	140.4	3731	36,000	6.43	560,000	3,353
10/12/10	**A14, A15**	164	529,500	11/24/2010	494,000	132.4	3731	21,000	4.08	515,000	3,140
10/14/10	**A16, S14**	113	361,000	11/29/2010	324,000	90.1	3597	23,000	6.63	347,000	3,071
10/18/10	**A17,18;S13,12**	225	720,000	11/30/2010	662,000	180.1	3676	36,000	5.16	698,000	3,102
10/20/10	**A19,20**	154	492,000	12/02/2010	448,000	124.5	3597	32,000	6.67	480,000	3,117
10/22/10	**A21,22**	154	492,000	12/06/2010	447,000	125.2	3571	18,000	3.87	465,000	3,019
10/25/10	**A23,24;B1**	251	803,000	12/07/2010	740,000	205.7	3597	48,000	6.09	788,000	3,139
10/27/10	**B2,3**	145	464,000	12/09/2010	380,000	104.1	3649	29,000	7.09	409,000	2,821
10/29/10	**B4,5**	151	483,000	12/13/2010	427,000	117.9	3623	14,000	3.17	441,000	2,921
11/01/10	**B6,7**	145	464,000	12/14/2010	407,000	109.9	3704	32,000	7.29	439,000	3,028
11/03/10	**B8,9**	119	380,000	12/16/2010	353,000	93.2	3788	13,000	3.55	366,000	3,076
11/05/10	**B10**	69	220,000	12/20/2010	207,000	53.4	3876	13,000	5.91	220,000	3,188
11/09/10	**B11**	72	230,000	12/22/2010	219,000	57.8	3787	6,000	2.67	225,000	3,125
11/12/10	**B12**	29	92,000	12/23/2010	85,000	22.3	3817	4,000	4.49	89,000	3,069
11/15/10	**S11**	14	44,000	12/28/2010	44,000	11.5	3817	2,000	4.35	46,000	3,286
11/19/10	**S10**	4	12,000	01/03/2011	11,000	2.8	3906	140	1.26	11,140	2,785
11/22/10	**S9**	4	12,000	01/04/2011	9,000	2.3	3906	50	0.55	9,050	2,263
TOTAL		**3,109**	**9,939,000**		**9,054,000**	**2476**		**506,190**	**5.29**	**9,560,190**	**3,075**

Ponding, Rearing, and Planting Operations:
When fry were ready to be ponded and fed, usually about 123 days after fertilization at normal Cedar River Hatchery water temperatures, they were visually inspected to ensure readiness and then netted out of the kitois or carried in their Heath-type incubator baskets to one of either the seven 6-foot diameter circular ponds or four 3-foot by 15-foot fiberglass raceways.

Ponded fry were fed hourly during the normal workday, seven days per week, for an average of 10 consecutive days before being planted. Rangen Soft Moist Starter was fed at a rate of between 2-4% body weight per feed day.

Fish were sampled to determine size when they were ponded and again when they were planted. All fry were hauled and planted by truck at either the mouth of the Cedar River (RM 0.1) in the Cedar Trails Park, or at the Trestle (RM 13.5) according to the plant strategy and schedule developed by the AMWG and the WDFW. 31.3% of the fry were planted at the Trestle and 68.7% were planted at Cedar Trails Park to accommodate for presumed better survival of fry planted in the lower river while still encouraging wide spatial distribution throughout the river of adult recruits from fry planted in the middle river. Overall survival from the green egg stage to planted fry was 87% (92% survival from eyed egg to release) resulting in a planted fry total of 8,362,000.

When fry were planted 60 fish from each rearing vessel were collected and sent to the WDFW fish health lab for analysis. While 61 of the ovarian fluid samples taken from the adult broodstock tested positive for IHN virus, none of the fry tested positive. No other fish health concerns were revealed during the analysis.

Table 3, Ponding, Rearing, and Planting Schedule

Incubator	Population	Pond Date	Sample at Ponding (fish/lb)	Plant Date	Sample at Planting (fish/lb)	Food Fed (lbs.)	Days Fed	Conversion
A1	256,000	15-Jan	2,715	27-Jan	2,211	22.5	12	1.05
A2	271,000	15-Jan	2,585	27-Jan	2,015	29.3	12	0.99
S20	63,000	15-Jan	2,585	27-Jan	2,211	**6**	12	1.46
A3	242,000	19-Jan	2,765	1-Feb	2,010	**30.9**	13	0.94
A4	240,000	19-Jan	2,760	1-Feb	2,009	29.4	13	0.90
A5	256,000	21-Jan	2,866	26-Jan	2,479	5.6	5	0.40
A6	257,000	26-Jan	2,595	8-Feb	2,100	45.7	13	1.96
A7	263,000	26-Jan	2,613	8-Feb	2,050	47.7	13	1.73
A8	270,000	29-Jan	2,895	8-Feb	2,308	24.7	10	1.04
S19	83,000	29-Jan	2,916	8-Feb	2,564	**6.1**	10	1.56
S18	84,000	29-Jan	2,916	8-Feb	2,564	**6.1**	10	1.54
A9	230,000	2-Feb	2,718	15-Feb	1,933	42.75	13	1.24
A10	258,000	2-Feb	2,814	15-Feb	2,012	43.5	13	1.19

S17	80,000	2-Feb	2,766	15-Feb	2,012	11.2	13	1.03
A11	264,000	5-Feb	2,819	18-Feb	2,098	30.7	13	0.95
S16	80,000	5-Feb	3,006	18-Feb	2,308	**11.7**	13	1.45
S15	76,000	5-Feb	2,916	8-Feb	2,700	**2.5**	3	1.20
A12	263,000	10-Feb	2,800	16-Feb	2,564	12.5	6	1.45
A13	261,000	10-Feb	2,645	16-Feb	2,618	5	6	4.91
A14	241,000	10-Feb	2,750	10-Feb	2,750			
A15	253,000	10-Feb	2,680	10-Feb	2,680			
A16	268,000	12-Feb	2,840	23-Feb	2,365	**29.9**	11	1.58
S14	56,000	12-Feb	2,800	15-Feb	2,786	**1.75**	3	17.41
A17	265,000	16-Feb	2,897	1-Mar	2,134	35	13	1.07
A18	270,000	16-Feb	2,673	1-Mar	2,216	34.7	13	1.67
S13	65,000	16-Feb	2,879	16-Feb	2,879			
S12	62,000	16-Feb	2,879	16-Feb	2,879			
A19	230,000	18-Feb	2,559	2-Mar	2,154	37.6	12	2.22
A20	218,000	18-Feb	2,552	2-Mar	2,164	**37.9**	12	2.47
A21	231,000	20-Feb	2,660	23-Feb	2,660		3	
A22	216,000	20-Feb	2,619	20-Feb	2,619			
A23	246,000	23-Feb	2,800	8-Mar	2,152	28.6	13	1.08
A24	239,000	23-Feb	2,776	23-Feb	2,776			
B1	255,000	23-Feb	2,790	23-Feb	2,790			
B2	195,000	25-Feb	2,800	8-Mar	2,239	**14.75**	11	0.85
B3	185,000	25-Feb	2,750	28-Feb	2,750		3	
B4	211,000	27-Feb	2,800	4-Mar	2,585	5	5	0.80
B5	216,000	27-Feb	2,800	4-Mar	2,760	1.8	5	1.61
B6	201,000	2-Mar	2,750	21-Mar	1,790	47.3	19	1.21
B7	206,000	2-Mar	2,750	21-Mar	1,781	47.05	19	1.15
B8	181,000	4-Mar	2,750	21-Mar	1,963	55.8	17	2.11
B9	172,000	4-Mar	2,800	21-Mar	1,810	**55.3**	17	1.65
B10	207,000	6-Mar	2,883	11-Mar	2,573	**5.6**	5	0.65
B11	219,000	10-Mar	2,812	1-Apr	1,712	65.8	22	1.31
B12	85,000	13-Mar	2,708	1-Apr	2,000	23.4	19	2.11
S11	44,000	16-Mar	3,467	1-Apr	2,412	12.3	16	2.22
S10	11,000	20-Mar	3,398	1-Apr	2,966	1.38	12	2.93
S9	9,000	23-Mar	3,343	1-Apr	2,926	0.7	9	1.82
Avg/Total:	**9,054,000**		**2865.11**		**2405.04**	**955**	**10**	**1.51**

Discussion:

Adult Trapping and Weir Management:

Table 4, Eggs Taken vs, Ballard Locks Counts

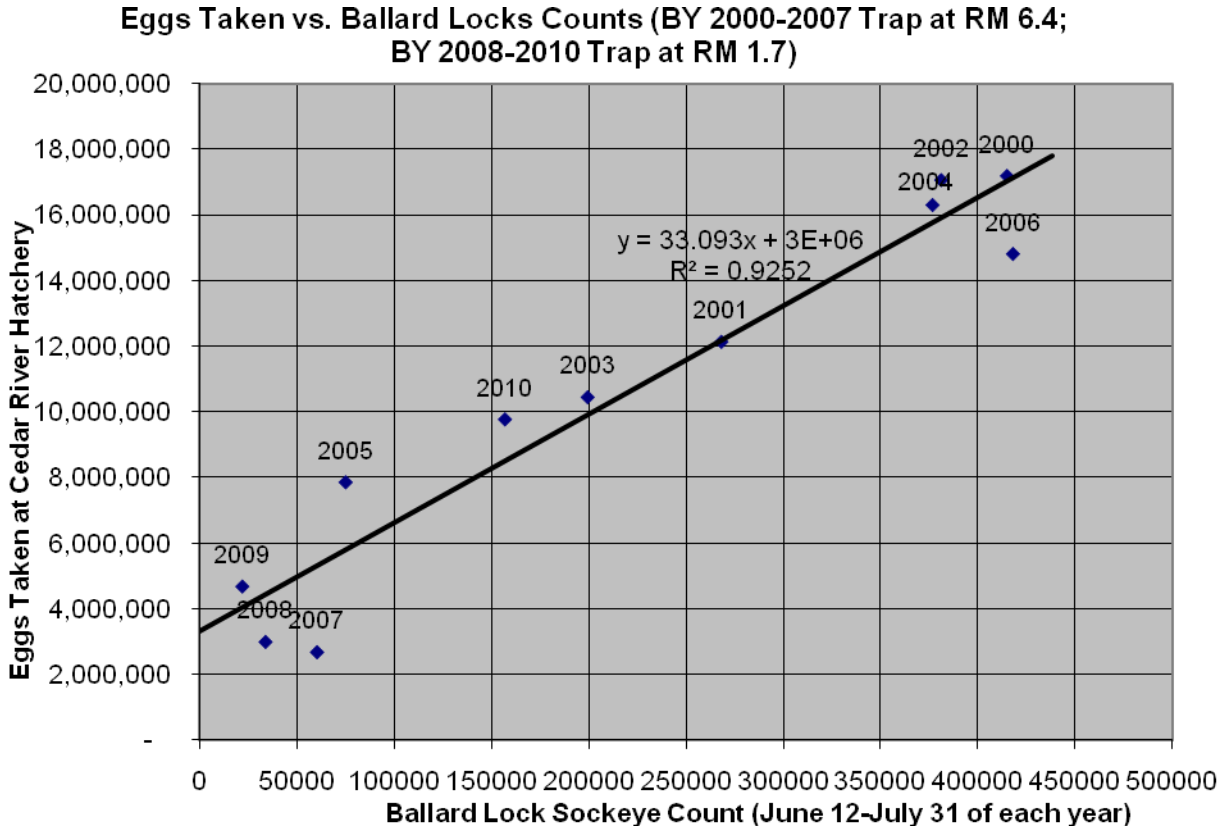

Table 4 shows that trapping in 2010 was relatively successful compared to 2000-2009. More broodstock were collected (eggs taken) than would be expected given the number of sockeye through the Ballard Locks. While this is expected with the new weir and Renton location Table 4 shows that benefits are being realized from those improvements.

However, Table 1 shows that the tip-gate was open for the much of the time during the peak of the Chinook migration to allow unimpeded upstream migration according to the

Operational Guidelines for the Cedar River Weir and Fish Trap at I-405 2010 Field Season (Appendix 2). Many sockeye swam through the open tip-gate along with the Chinook and significant sockeye trapping opportunities were lost as a result. Strategies for improving sockeye trapping without negatively affecting Chinook behavior will be explored for future seasons.

As discussed in the Methods and Results portion of this report there were Chinook mortalities at the weir during the 2010 trapping season. It's unclear exactly how the Chinook got stuck where they did but the installation of the weir in 2011 will reflect adjustments to prevent it from happening again.

Beginning in early September there were more sockeye returning to the river in the early part of the run. A large number of sockeye moved upriver before the trap and weir were installed and were not collected. A large number of sockeye also swam through the Landsburg Fish Passage Facility before it was in active sorting mode. Records show that this was an anomaly but scheduling may be adjusted in the future to access these early fish for hatchery broodstock if they arrive early again.

Spawning and Incubation:

Table 5, 2005-2009 Adult Prespawn Mortality

Year	Eggs Taken	Male Morts	Female Morts	Total Mort Rate	Female Mort Rate
2005	7,835,000	407	116	10.68%	2.37%
2006	14,794,000	341	358	7.56%	3.87%
2007	2,496,000	365	92	29.29%	5.90%
2008	2,971,000	241	31	14.65%	1.67%
2009	5,162,325	175	19	6.01%	0.59%
2010	9,560,190	454	86	9.04%	1.44%

Table 5 shows that the prespawn mortality rate was relatively low, especially among females. Adults were sorted carefully, pond loadings were managed conservatively, and fewer adults meant that additional ponds could be used to decrease the number of times fish were crowded, sorted, or moved. The result was less stress on the fish in the adult holding ponds, fewer ripe fish being missed during a spawn day, and lower adult mortality.

Table 6, 2003-2010 Egg loss

Season	Total Eggs Taken	Loss
2003-2004	11,487,100	17.26%
2004-2005	16,682,000	8.99%
2005-2006	7,513,600	8.27%
2006-2007	13,465,000	8.37%
2007-2008	2,870,300	6.62%
2008-2009	2,971,400	4.75%
2009-2010	5,162,395	7.04%
2010-2011	9,560,190	5.29%

As Table 6 shows, egg loss for the 2010-2011 season was the second lowest in the past eight years. Lower egg loss could be attributed to slightly lighter incubator loadings, better egg quality due to favorable temperatures in Lake Washington during the 2010 summer, careful handling of eggs, and meticulous management of incubator water flows.

Feeding:
Because of the success with Rangen's soft moist starter diet in the 2007-2008, 2008-2009, and 2009-2010 seasons the same feed was used for the 2010-2011 season. That feed seems to perform well for sockeye at the Cedar River Hatchery for a number of reasons. Most significantly, perhaps, is that it falls very slowly through the water column giving the less aggressive fry a prolonged opportunity to feed. The rate of conversion of food to growth (Table 3, "Ponding, Rearing, and Planting Schedule") is not as impressive as some of the other starter feeds available, but some of those other feeds sink to the bottom of the pond faster and are wasted which requires feeding more total feed. Additionally, rates of conversion are difficult to compare during the first couple of weeks of feeding because of the presence of slightly variable amounts of yolk on some of the fish. Much more importantly, the fish eat Rangen's feed more aggressively and grow uniformly at a favorable rate.

Once a newly ponded group of fish was eating well the rate of feed was maintained at approximately 3-4% body weight each feed day for a season average of about 10 days. Hatchery personnel were instructed and shown how to watch the fish's feeding behavior carefully, make sure feed wasn't going to the bottom of the pond, and adjust feed rates according to those factors in addition to the rate of feed. This feeding to satiation ensured that all of the fish in each pond were getting enough feed to achieve their maximum growth.

Conclusions:

Broodstock Collection:
As a result of the improvements to the weir, trap, and broodstock collection area outlined above, consistently low flows throughout the collection season, a small Chinook return, diligent weir management by onsite staff, and a number of other factors, broodstock collection was very successful in 2010. The design, construction, installation, and use of

the tip gate and bulkhead opening to the trap alone resulted in a much more efficient, safe, and effective operation.

Egg Loss Improvements and Value:
Extremely high river flows during the incubation period will likely result in low natural survival of sockeye eggs and fry. This, along with relatively low adult returns point towards the need for hatchery supplementation. With the probable increase in survival of additional fed fry achieved with the use of the three new 6-foot rearing ponds, the contribution of the hatchery to rebuilding weaker brood classes seems significant.

Appendices: Appendix 1, 2010 Adult Trap and Weir Activities Log

2010 Trap Log

DATE	TIME	WHAT HAPPENED
10-Sep		Installed weir with SPU crew. Observed sockeye under R.R. hole. A reporter from Renton paper asking questions about new weir to Gary. Crew working on weir observed **1 Chinook** *pass* over weir unrestricted midday. Weir was in the laid down position. Trap not fishing. See saw gate open.
11-Sep	7:00	Observed 12 sockeye under RR bridge. No fish seen in hole above weir.
	8:00	Met Cory, got instructions for today. We finished some work on weir and got tool trailer moved and cleaned up. Waiting for more supplies.
	1:00	Cory and Paul showed up with supplies fro break room. We finished weir work and sand bagging.
	6:00	Observed RR hole for fish, 20sockeye and **1 Chinook** male seen
	7:00	Watched weir till dark no fish movement. Street lights working, no fish seen above weir all day.
12-Sep	6:00	Watched weir for 1hr. No fish movement. 18 sockeye under RR bridge spotted **0 Chinook**
	8:00	Clean up and racked area around driveway.
	9:30	cleaned trash off of weir
	12:30	swept driveway to weir
	2:30	Tree Down across river about two holes up river from weir. Reported it to Paul and Cory. Slow afternoon. No fish movement and no fish above weir. Fire Chief came by today, and wanted to see about getting a key to the posts in front of river driveway after we leave for emergency reasons. Police came and borrowed key to open gate to patrol dog park. Watched weir last 45mins of daylight. no fish movement.
13-Sep	6:30	Person fishing under RR bridge, informed him river was closed. He left, no problems
	8:00	Closed weir trap to begin fishing. Cleaned weir. Spent time today reading manuals for trailer and observed river
14-Sep	6:30	Checked trap, 10 sockeye 2female and 8male. Also **3 Chinook** 1 hatchery and 2 wild. Released Chinook upstream unharmed, called Cory to report Chinook situation

		Met with Cory got instructions for today. Trevor and Andrea finished weir work.
	8:00	Opened see saw gate for **Chinook** passage. Finished hooking up trailer.
	1:00	Transported 7males and 1female to hatchery. Cleaned up after and locked everything up.
	3:30	Steve Foley came by to check things out. He observed no **Chinook** in RR hole
	4:00	Closed see saw gate.
	7:00	Checked trap for fish, no fish to report.
15-Sep		Checked trap for fish, 17 sockeye and 1 Male **Chinook**. The Chinook was turned upstream with no problems. However the I watched two sockeye in the trap swim out and move back down river.
	6:30	
	8:00	Cleaned weir and called Cory for instruction
	9:00	Loaded 15 Sockeye 8female and 7male. Also 1 female Pink salmon in trap, passed up stream. Opened see saw gate for **Chinook** passage.
	11:00	Checked weir, no problems to report. John from SPU came by to take unwanted gear from trap site. Also Mike L. came by for introduction, he will be floating the river Tuesdays to count fish and look for redds.
	12:00	Checked RR hole for fish about 9 sockeye observed.
	2:00	Rich, Andrea and Trevor worked on tool trailer. Built work table and hanging racks for gear. Also built steps to trailer doors. Annette and Steve came by to check progress of weir.
	4:00	See Saw gate closed to fish through the night
	8:00	Checked trap and weir, no problems to report.
16-Sep		Checked trap about 15 sockeye and 1 male **Chinook** in the trap. The Chinook was
	7:00	passed up stream.
	8:00	Cleaned weir and built the river shed.
	9:30	Transported fish 14males and 3females
	11:00	Richard spotted 1 male **Chinook** under the foot bridge. See Saw gate opened for fish passage.
	1:00	Built fence around the tool trailer and living trailer.
	2:00	Observed river for Chinook movement. Nothing to report
	4:00	Closed see saw gate to fish the night.
	8:00	Checked trap, empty
17-Sep		Checked trap for fish **4 Chinooks** inside. I opened the trap door and let all the fish swim out untouched. I then stayed and watched the weir to see if any swam back onto
	6:30	the weir. No fish seen.
	11:00	Opened both doors on weir panels and see saw gate for fish passage.
	12:30	Floaters came down river and saw **15 Chinook** in RR hole also about 20 sockeye. Doors remain open for fish passage.
	2:30	Pulled 5 poles out of forward end of trap to help **Chinook** passage.
18-Sep		Checked trap and cleaned trash off of weir. Counted fish down below RR hole, 5
	7:00	**Chinook** seen
	9:00	All gates remain opened for fish passage. Observed river for fish movement, nothing to report.
	11:00	Built a wall with hinged door around trailer sewage tank.

	2:00	Observed RR hole with Cory 2 **Chinook** and 10 sockeye seen.
	3:30	Observed RR hole 2 **Chinook** and 13 Sockeye seen
	4:15	Closed the two doors on panels and reset trap to fish overnight. The see saw gate remained opened
19-Sep	6:45	Checked trap 12 sockeye and 1 male **Chinook** in trap. The female sockeye were placed into fish boxes and the males were passed with the Chinook
	10:00	Observed RR hole for fish, 1 **Chinook** seen and about 15 sockeye
	3:15	Checked RR hole for fish. Also checked trap 1 female **Chinook** in trap, I opened the door and let he swim out on her own
	7:00	Cleaned weir, see saw gate left opened for **Chinook** passage.
20-Sep	7:15	Checked trap, 9male and 6female Sockeye an 1 male **Chinook.** Chinook and male sockeye passed up, Females put into live box.
	11:00	Prep. truck for fish transport.
	12:00	Marianne, Paul and myself loaded fish
	1:00	Checked RR hole for fish 1 **Chinook** and 2 sockeye observed
21-Sep	6:30	Check trap, about 40 sockeye and 2 **Chinook** in trap. The Chinook were passed up with no problems
	8:00	Met with Cory cleaned weir. Hauled fish see saw door remains opened for **Chinook** passage.
	9:00	Opened the two hatch doors on weir to promote **Chinook** passage.
	11:00	Observed area around weir. 8 sockeye in RR hole and 0 Chinook . However 1 **Chinook** under foot bridge, no fish movement during the day.
	1:00	Cleaned drive way. Andrea walked down 3 bridges and saw 0 fish and 0 redds. 2 **Chinook** seen in RR hole and 12 sockeye
	3:00	observed 20 Sockeye 2 **Chinook** in RR hole, no fish in trap
	4:00	Trap is fishing, no fish in trap and see saw gate open
22-Sep	6:30	Checked trap 101 sockeye in trap 0 **Chinook**
	7:00	Watched for fish movement observed. Observed 1 large **Chinook** swim up and under weir then over to the see saw gate and swim through the gate and up the river to the next hole.
	7:30	Checked RR hole observed 9 **Chinook** holding in RR hole and 18 sockeye.
	8:00	Crew showed up, checked trap 111 Sockeye and 0 **Chinook**
	10:00	Paul and Gary showed up with others for meeting.
	11:00	5 Sockeye holding below open sea saw door. Talked to Gary for guidance. 1 dead filleted Sockeye washed up on weir (2nd one this year). I reported to Cory.
	1:00	Studied manuals looked for a pluming leak in the trailer.
	3:00	Cory called, Mike Lesly floated the down over the weir. He only saw 5 **Chinook** in the RR hole. Cory told me to close hatches on the weir panels and closed the sea saw gate.
23-Sep	8:00	Crew arrived, we cleaned trap and loaded fish 44 Females and 31 Male Sockeye. 1 **Chinook** male and 1 **Chinook** female passed up stream. Misc projects till lunch, river rising to 227cfs, water coloring up.
	4:30	Cory called to close see saw door and raised sides of weir with the rising water.

24-Sep	7:00	Chinook watch. 0 **Chinook** movement, 6 Sockeye swam up to weir and swam through open sea saw gate.
	8:00	Crew showed up and SPU crew and tanker. We loaded 27 male and 23 Females sockeye to Landsburg. I released 2 **Chinook** up river both males and on a Jack.
	9:00	Cleaned and worked on weir
	11:00	Good viz at RR hole. 25 Sockeye seen and 3 **Chinook**. The Floaters coming down saw only 3 Chinook also. Cory called to close sea saw door.
25-Sep	7:00	Chinook watch, 0 **Chinook** seen. 15 Sockeye moved up from tail out and swam under weir. Between 7:00-8:00. Released 1 **Chinook** from trap
	8:00	Crew showed up and SPU crew we loaded 44 male and 50 female Sockeye in to SPU tanker and they left for hatchery-Landsburg we cleaned weir and fixed weir. Opened sea saw gate for possible Chinook passage trap fishing.
	9:30	Maryanne and Andrea walked down bike trail to senior center and observed 7 male and 1 female sockeye 3 **Chinook**. I observed 2 Sockeye and 1 **Chinook** in the hole above weir.
	12:00	Checked RR hole observed 50 Sockeye 5 **Chinook** holding under track. Good increase of fish from yesterdays numbers.
	12:30	Cory stopped by he observed the same 50 Sockeye and 5 Chinook. He left instructions.
	1:30	Gary called he wanted some catch info.
	3:00	Checked trap 5 Sockeye first daytime catch this season.
26-Sep	7:00	Watched see saw door for 15min saw 7 male Sockeye swim through door.
	8:00	SPU crew showed up with tanker we loaded 50 male Sockeye 46 females. 0 **Chinook** in trap this morning. Trap fishing sea saw gate open for **Chinook** passage
	8:30	Gary arrived to watch operation and to give presentation to salmon naturalist group. Clean around trailer and weir.
	11:00	River observations 7 sockeye in hole above weir, 0 fish below weir. Increased numbers of sockeye in RR hole from yesterday 70 sockeye counted. 7 **Chinook** in RR hole.
27-Sep	7:00	Released 1 **Chinook** from trap upstream unharmed. Trap fishing sea saw door open for **Chinook** passage. Watched weir for fish movement 1 male sockeye swam through sea saw door. 1 **Chinook** Jack swam under weir no other fish movement.
	8:00	Cleaned trap 11 male sockeye 4 female sockeye in trap, transferred to live boxes.
	8:30	Cleaned weir, two male sockeye morts on weir
	9:00	Worked on locking system for live boxes
	10:30	watched weir, 2 sockeye swam into trap and 2 swam up under weir all males
	11:30	Fix minor repair trailer.
	2:00	Observed a group of older males fishing the RR hole, this is the second time I have seen them now so I told them that the river is closed. I told them because the increased number of **Chinook** in the RR hole. Shady Guys! I called and told Cory.
	2:30	I checked the hole they had left
	4:30	After observing the RR hole through out the day there is a noticeably increase of **Chinook** today compared to previous days. I have decided to leave the see saw gate open for **Chinook** passage as instructed by Cory.
28-	9:00	Transported 13 females and 27 males, cleaned weir

Sep		
	10:30	**Chinook** and Coho morts found on weir wand them for tags all neg.
	11:00	Observed RR hole for fish 30-40 sockeye and about 8 **Chinook**
	12:30	Walked with Marianne down to snagging spot to look for sockeye to snagging area to look for sockeye. From library down to senior center 58 plus sockeye observed 0 **Chinook**
	2:30	Checked trap 4 sockeye inside
	6:30	Checked weir and trap only 3 sockeye now
29-Sep	6:15	Checked weir maybe 30 sockeye in trap, 2 mort Pinks on weir as well as 4 sockeye morts
	8:00	Moved 11 female and 34 male sockeye to Hatchery. No **Chinook** in trap
	9:00	Observed the see saw gate for **Chinook** movement
	10:00	Watched 1 male sockeye swim through the see saw, 1 **Chinook** swam through the gate also.
	11:30	4-5 Sockeye in the trap, no fish seen pass through the gate since last.
	2:00	Floaters came by the and saw 9 **Chinook** in the RR hole.
	5:00	Closed the see saw gate as instructed by Cory.
	7:00	Checked trap for **Chinook** only 5 sockeye inside.
30-Sep	6:00	Checked trap and weir around 80 sockeye in the trap and 1 **Chinook**. The **Chinook** was passed up safely with no problems also 2 morts on weir 1 **Chinook** and 1 Sockeye.
	8:00	Opened see saw gate for **Chinook** passage.
	9:00	Transported fish 58 male and 36 females
	10:30	Observed gate and river for Chinook movement
	1:00	Watched 3 sockeye pass thought the gate (all males)
	2:00	Closed see saw gate due to high sockeye activity in the river. I have already witnessed 10 pulse sockeye move thought the sea saw gate.
	2:40	Reopened the gate because 1 **Chinook** was seen under the foot bridge.
	5:00	Checked trap for **Chinook**, none found
01-Oct	6:15	Checked trap and weir 1 Chinook inside passed up with no problems about 40 sockeye in trap
	9:00	Transported 58 male and 38 female
	10:30	Observed see saw gat for fish movement
	11:00	Floaters passed by only 5 **Chinook** in RR hole
	1:00	Put up wing walls above trap . Fixed shed
	3:00	Observed trap and gate for **Chinook** passage nothing to report
	3:30	Closed see saw gate
	7:30	Checked weir and trap. No fish
02-Oct	7:00	Checked trap 2 **Chinook** and about 60 sockeye. Chinook passed up with no problems.
	7:15	Opened see saw gate for **Chinook** passage
	8:00	Loaded fish 33 females and 52 males
	9:00	Closed see saw gate after seeing over 20 sockeye swim through the gate while loading. Will watched for **Chinooks** with gate is closed.
	10:30	Re opened see saw because 4 **Chinook** moved in behind weir
	11:30	Checked trap 30 plus fish so I went in and sorted in to live boxes
	1:00	checked trap 10 sockeye inside no **Chinook**

	3:00	Sorted another 12 females and 20 males into boxes
	6:00	Sorted more fish out of trap into boxes
03-Oct	7:00	Checked trap 1 **Chinook** handled up stream with no problems
	8:30	Loaded fish on SPU truck 137 sockeye on board
	10:00	Observed weir and trap for fish movement
	2:00	Checked weir and observed RR hole
	4:00	Cleaned weir, checked trap 1 sockeye
04-Oct	7:00	Checked trap for fish and cleaned weir
	9:00	Transfer fish to live boxes 80 plus sockeye and one pink salmon inside.
	11:00	Observed river for **Chinook** movement, nothing to report.
	2:00	Checked trap about 12 sockeye and checked RR hole
	4:00	Checked weir and trap, no change
	6:00	Closed see saw gate to fish over night
05-Oct	7:00	Checked trap 2 **Chinook** handled up with no problems. About 60 plus sockeye in trap
	7:15	Opened sea saw gate for **Chinook** passage, on **Chinook** mort on weir
	9:00	Loaded fish 54 females and 46 males sent on SPU truck.
	10:30	Cleaned walking area and drive way. Observed 45 sockeye in RR hole and 1 **Chinook**.
	2:30	2 Sturgeon in RR hole 1 **Chinook** plus 45 sockeye
	4:00	Closed sea saw door as instructed by Cory.
06-Oct	7:00	Weir watch 1 sockeye no **Chinook** movement 45mins.
	8:30	Cleaned trap 28 females loaded and 64 males passed up stream. 1 **Chinook** male passed up stream
	10:00	Fish checks 26 sockeye, 4 **Chinook** and 2 Sturgeon in RR hole.
	1:00	Observed 5 **Chinook** and 2 Sturgeon in RR hole. 1 **Chinook** in pipe line hole just above. Opened sea saw door for possible **Chinook** passage trap fishing.
	1:30	Mike floated by did not get his fish numbers
	2:00	Patrick from the city of Renton came by. He wanted Paul's number. About fresh water hook up. Back flush test?
	3:30	5 **Chinook** in RR hole
	4:00	Andrea turned off the light facing the weir.
	5:00	Observed young man standing in back of tool trailer. When I checked it out he was standing next to his car parked just inside unlocked dog park gate. No problems seen
	8:30	Light check-light facing weir still on
	9:00	Police showed up at gate he contacted me at trailer and explained about break in happening at Stone way Co. in the dog park area. Hew was setting up perimeter. I explained about the gate being unlocked today.
07-Oct	7:00	Weir watch. Decent sockeye movement between 7-7:30 20 sockeye moved up tail out to weir
	8:00	Cleared trap 58 male sockeye 31 female sockeye 1 pink released. No **Chinook** in trap this morning
	10:00	Ralph Little called flow rising through tonight
	11:00	1 **Chinook** female moved up to weir. Opened see saw door for **Chinook** passage
	12:00	3 Sockeye no **Chinook** in trap.
	1:30	Checked RR hole 30 Sockeye 3 **Chinook** seen 2 Sturgeon
	2:30	Closed see saw door.

08-Oct	7:00	Weir watch. 1 **Chinook** below see saw door. Opened see saw door for **Chinook** passage
	8:00	Checked trap no **Chinook** in trap
	8:20	SPU tanker here- cleared trap 52 male and 59 female sockeye.
	9:30	Cleaned up- cleaned weir
	10:00	Gary arrived to give tour for school children. Put 1 Male and 1 Female Sockeye in live boxes for kids
	11:00	Checked RR hole 6 **Chinook** seen 20 sockeye
	12:30	Checked weir watched 12 sockeye males and 1 **Chinook** pass through open sea saw door
	2:30	1 **Chinook** passed through open see saw door. Decent daytime fish movement
	3:00	Sweep driveway
	3:30	Checked trap 15 sockeye 1 **Chinook** female released upstream
09-Oct	7:15	Weir watch 1 **Chinook** passed through open see saw door and 12 plus sockeye. 30 sockeye holding below weir good morning sockeye movement.
	8:15	Cleaned trap 71 male and 65 female sockeye hauled to Landsburg. 3 male sockeye released up stream. Transfer 17 males and 26 females to live boxes
	10:30	2nd haul to Landsburg 17 males and 26 females
	12:30	Mics project and observations 30 sockeye 7 **Chinook** observed in RR hole. We are leaving see saw door open for Chinook passage.
	3:00	Andrea returned from walk to senior center she observed 300 plus sockeye between RR hole and senior center
	5:30	Checked trap 12 sockeye 0 **Chinook**
10-Oct	7:00	Weir watch poor morning sockeye movement 3 sockeye holding below weir 0 fish passed through door in 20 mins. No sign of **Chinook**
	8:00	SPU tanker show up we loaded trap 36 male and 25 female sockeye, 1 male sockeye released upstream No **Chinook** in trap.
	10:00	Observations 0 Sockeye holding below weir 15 Sockeye and 3 **Chinook** in off Pipeline hole also 3 **Chinook** in RR hole. No fish moving up river
	12:30	Observations 0 Sockeye holding below weir 3 Chinook seen in R.R. Hole midday
	3:30	5 **Chinook** seen between walk bridge and RR hole. See Saw door open for tonight for **Chinook** passage
	5:30	Checked trap 15 Sockeye in trap no **Chinook**. Cleaned weir, 2 **Chinook** carcasses on weir one wild and one hatchery
11-Oct	7:15	Weir watch 1 Sockeye moved up from foot bridge. Poor fish movement for this morning 1 Sockeye holding below weir.
	8:00	Cleaned trap transferred 18 males and 19 Female Sockeye to live boxes. No **Chinook** in trap. Released 1 male Sockeye
	8:30	Cleaned weir 1 wild Coho and 2 **Chinook** carcasses on weir.
	9:00	1 Chinook seen in RR hole and 0 Sockeye holding between foot bridge and weir
	11:00	Sweep drive way
	1:00	Misc projects and trailer cleanup
	3:30	Close see saw door trap fishing
	5:00	Trap check-sockeye are moving up to weir 20 Sockeye in trap and 0 **Chinook**.
12-Oct	8:00	Loaded SPU truck 88 females and 86 male Sockeye, 1 Pink was passed up

	8:30	Opened see saw for **Chinook** passage. Observed RR hole 1 **Chinook** seen
	10:00	Checked weir and trap about 5 Sockeye in trap and about 15 holding behind/under weir
	11:30	Checked trap about 10 Sockeye now in trap and 3 **Chinook** observed in RR hole
	2:00	Lots of fish observed moving up about 20 Sockeye in the trap now, no **Chinook** inside and gate still open
	4:00	Closed see saw door to fish trough the night and morning
13-Oct	7:00	Checked trap and cleaned weir. No **Chinook** in trap
	8:30	Loaded fish into trucks and one male Sockeye passed up.
	9:00	Cleaned weir with Cory, see saw door still closed
	10:00	No **Chinook** observed down in RR hole
	11:00	Checked trap about 15 Sockeye no **Chinook** in trap. 1 **Chinook** observed in RR hole
	1:00	Cleaned weir with Andrea and Marianne, found the weir panel gate open we closed it
	2:30	Observed river and RR hole 1 **Chinook** observed, The girls walked down passed the library they observed up to 300 Sockeye 25% on redds.
	3:00	Checked trap 1 male **Chinook** and 2 Pinks were in trap all passed up with no problem.
	4:00	Cleaned weir about 20 fish in trap and 15 staging behind the trap.
	6:00	Checked weir and trap for **Chinook**, no **Chinook** and 30 plus Sockeye
14-Oct	7:00	Cleaned weir checked trap
	8:00	Loaded fish 227 Sockeye, 3 Pinks passed up no **Chinook** in trap.
	9:30	Went to hatchery to take care of some stuff. Andrea and Rich covered for me
	11:00	Andrea opened see saw because she observed 3 **Chinook** at weir. She observed all 3 **Chinook** pass through the see saw gate.
	12:00	She then closed the gate
	1:00	Sorted fish in to boxes
	2:00	We decided to make a second haul up to Hatchery with 36 males and 50 females.
	3:30	Checked trap, cleaned weir. Maybe 20 plus Sockeye in trap
	6:30	Sorted fish in to boxes
15-Oct	7:15	Cleaned weir, 1 Coho mort on weir and one Trout (Rainbow). 100 plus Sockeye in trap and no **Chinook** seen.
	8:00	Cory saw 3 **Chinook** move up under weir, then opened the see saw gate and watched all 3 **Chinook** swim through the gate.
	8:30	Loaded fish 1 **Chinook** and 1 Coho passed up with no problems
	9:00	Cleaned weir and left gate open for **Chinook** passage
	10:00	Observed river for **Chinook** movement, 2 **Chinook** passed through the gate and up the river.
	11:15	River observations the fish aren't moving as much now still have 1 **Chinook** below weir and 3 in RR hole the gate remains open.
	1:00	Checked trap 20 plus Sockeye. Observed RR hole only 1 **Chinook** seen lots of Sockeye moving up but no **Chinook.**
	2:30	Cleaned weir
	3:00	Checked RR hole 3 **Chinook** seen
	6:00	Checked out trap and weir no problems to report. See saw gate closed
16-Oct	7:15	Checked trap 20 plus fish, Observed RR hole only 1 **Chinook** seen lots of sockeye moving thought gate but no **Chinook** moving

	8:00	Transported fish, 1 **Chinook** in trap safely handled up stream 15 Female and 40 Male Sockeye loaded
	9:00	Cleaned weir 2 mort **Chinook** on weir both hatchery males. Called Steve for **Chinook** mort samples
	10:30	Checked RR hole for **Chinook**, none seen. Called Cory he instructed to close gate.
	11:30	Checked trap only 2 Sockeye inside
	2:00	Cleaned weir
	3:00	Laid down weir panel flaps for high flow this weekend. Also pulled trap poles for fish passage
17-Oct	7:15	Checked weir, no problems
	8:00	Dropped the resistance boards back down to fish today and Sunday. Also put the trap poles back in
	9:30	Checked trap 12 plus Sockeye, poor viz for river observations
	11:00	Cleaned weir. Checked trap about 30 Sockeye
	2:00	Sorted fish into live boxes 30 Females. 40 males were passed up river
	3:00	Cleaned Weir.
	6:00	Checked weir adjusted resistance boards
18-Oct	7:30	Cleaned weir only 20 fish in trap
	9:00	SPU called, flows will come up to about 500cfs today but will drop back down so I may not fish the afternoon
	11:00	Loaded fish 57 females and 2 Jacks, I passed up 20 males. River cfs high
	1:00	Checked weir. No problems to report
	2:00	Tried to drop all the resistance boards on weir and opened the see saw gate.
19-Oct	7:30	Checked trap and weir no problems with weir and about 10 fish. 0 **Chinook** in trap
	8:00	Cleaned and reset up weir. Loaded fish 6 females loaded and 7 males passed up river
	10:00	Water clarity better observed river no **Chinook** seen
	1:00	Cleaned weir checked trap about 20 Sockeye in trap. Marianne walked down below snagging area she saw about 340 Sockeye.
	1:30	Checked RR hole no **Chinook** see and about 40 Sockeye holding
	2:00	Checked trap and weir no change
	3:30	Cleaned weir
	6:15	Checked trap and weir, no problems
20-Oct	7:15	Checked trap about 60 fish no **Chinook**, 2 **Chinook** morts on weir, both wild one male and on female
	8:00	Hauled fish, 31 females and 35 males passed up also 3 pinks
	9:00	Cleaned weir and did my RR hole observations
	11:00	Paul from SPU came by to check on weir
	1:00	Cleaned weir. Checked trap 20 Sockeye inside
	2:00	SPU guys came by to work on trap bridge/walkway I helped and then cleaned weir
	2:45	Checked RR hole only saw about 20 sockeye viz wasn't very good. No **Chinook** seen
	4:00	Cory called said that floaters saw multiple **Chinook** below weir and instructed to open gate for the night
21-Oct	8:00	Transported fish 24 female Sockeye
	9:00	Closed see saw gate

		Cleaned weir and checked RR hole. Watched redd below foot bridge, didn't see female **Chinook** maybe she has passed away. RR hole very dark hard to see, 20 Sockeye 1 **Chinook** observed 15 Sockeye under weir.
		Paul from SPU called and wanted width of walkway we have been using to get to cage. Dark still in RR hole Still 20plus Sockeye 0 **Chinook** seen but viz was poor.
	11:00	Raining very steady 339 cfs
	1:00	Shawnee with the city came by with electrical permit- asked for key to electric boxes- she said they would be here tomorrow
	2:00	Cleaned part of weir wing and backside. RR hole has lots of sockeye over 40 . Still hard to see- I saw 2 Chinook
	3:00	Marianne being nice to me cleaned weir I helped at the end
	4:30	Look down below
22-Oct	7:30	Cleaned weir, Looked at RR hole saw a couple of Sockeye no **Chinook**
	8:30	SPU picked up fish 23 male and 24 female Sockeye. Passed up 1 pink and 1 Trout, no **Chinook**
	9:30	Cleaned up weir put things away locked up stuff for the day
	10:45	Cleaned weir gave tour to pretty girl walking dog
	12:00	Larry and Janis from Seattle Aquarium came by with two classes of kids for tours
	2:00	Renton PUD Came by and signed off on electrical permits
	2:00	20/20 came by and filmed a man fishing right above the weir the guy was using just a weight and no hook I asked them and looked at his gear.
	3:00	Racked weir and walked to RR hole about 20 sockeye couldn't see any **Chinook**.
	3:30	Hans floated by and marked a Chinook redd 50 feet down from weir. He said it looked like she was spawning right there and wasn't going to go any further
	4:30	Cleaned weir for the night
23-Oct	7:30	Cleaned weir with Cory, moved live boxes back in the water.
	8:30	SPU came down and hauled 61 male 37 female Sockeye
	9:30	Adjusted V-gate in trap and sand bagged the front of live boxes in hopes of keeping them in place
	10:00	Cleaned weir and gate a lot of leaves
	10:45	Walked down to RR hole saw about 10 Sockeye and nothing else.
	12:00	Larry and Janis came bye with more school kids
	1:30	USGS taking samples from D. Bridge, RR hole and below weir only 20 Sockeye.
	3:00	Cleaned weir a lot of leaves
	3:45	Laid down all the resistance board, Kimberly at Landsburg called they were shutting down the diversions and to expect high flows tonight
	4:30	Tied live boxes off to shore for high flows coming tonight.
24-Oct	8:00	SPU hauled 15 male and 9 female. Weir under water this morning.
	8:30	Cory came by and helped me fix the wing wall which was flattened by heavy flows and leaves last night
	9:30	RR hole water high and dirty can't see anything
	10:00	Replaced padlocks with new ones from SPU
	11:00	Cleaned out trap and fixed wing wall to stacks flow still strong about 450-500cfs
	12:00	RR hole too dirty to see
	1:00	Cleaned front of trap again and wing wall
	2:30	walked to library water still dark hard to see fish
	4:00	Cory and Pat fixed weir bulkhead and cleaned weir

25-Oct	8:00	Cleaned weir and trap removed fingers in trap. Weir under water this morning
	10:00	Cleaned weir of logs 10-15 Sockeye above weir
	11:00	RR hole 10 Sockeye
	2:00	Cleaned weir and trap
	3:45	Tied off bulkhead on the gate side to keep it up right
26-Oct	8:00	Cleaned weir, almost whole thing under water this morning
	8:30	Loaded fish 10 females, passed up 14 male Sockeye and 1 Bull Trout.
	9:00	Dropped resistance boards on weir because of high flows from rain.
	12:00	Museum Class came by I pulled out 2 male Sockeye to show class and then passed them up river
	1:30	Checked weir. No problems to report
	3:00	Pulled picket poll out of trap with John(SPU)
	4:30	Towed live boxes out of with trucks. Flows very high
	7:00	Checked on weir, water very high but trap stable
27-Oct	7:30	Checked weir/trap. Paul was at trap all is secure, flow still high. Won't go in the water till flows go down. Weir is under water 591cfs
	12:00	Went into trap to try and clean logs out and off of trap. Most logs moved but still need help fixing see saw and bulkheads
	2:00	Worked on weir
28-Oct	7:30	Checked on weir, completely underwater/sunk
	8:00	Went out with the others to set trap and weir back up
	12:00	The Aquarium class came by I pulled out 1 male Sockeye to show kids and passed it up after.
	1:00	Checked trap about 10 Sockeye in trap
	2:00	Walked down to the snagging area and counted about 250 plus Sockeye
	3:30	Cleaned weir, about 25 fish in trap
	6:00	Checked weir, all clear no problems
29-Oct	7:30	Cleaned weir with Cory, Weir was under water
	8:30	Loaded fish with SPU 25 males and 11 females. No **Chinook**
	10:00	Check weir and trap all clear a few fish in trap about 10
	11:00	Checked trap about 20 fish
	2:00	Hauled fish 16 males and 3 females
	3:00	Cleaned weir
	5:30	Checked trap a15 fish, weir ok
30-Oct	7:30	Checked trap 20ish fish/ weir under water
	8:15	Cleaned weir. Will transport fish this afternoon
	10:30	Checked trap maybe 30 fish, cleaned weir.
	1:00	Hauled fish with SPU 12 males and 7 females
	1:30	Dropped resistance board on weir opened gates for high flows tonight.
	6:00	A man came to my trailer because his dog was washed down on the see saw and was trapped so I suited up and went out on and safely retrieved the dog
31-Oct	9:00	Cleaned weir. Closed see saw gate began fishing again.
	11:00	Checked trap and weir 7 fish inside trap

	1:00	Cleaned weir 10 fish in trap
	2:00	Seattle Aquarium came by with class I pulled out a Sockeye for them and then returned it to the trap.
	5:00	Cleaned weir with Cory
01-Nov	7:00	The weir was under water so I cleaned it and set it back up. 1 **Chinook** female hatchery in trap passed up with no problems
	11:00	Cleaned weir
	1:00	Loaded fish 7 females and 9 males
	3:00	Cleaned weir and only 2 fish in trap
	6:00	Checked trap and weir, no problems
02-Nov	7:00	Checked trap and the weir was under water. 5 fish in trap
	8:00	Cleaned weir and trap hauled 3 male and 2 female Sockeye
	12:00	Cleaned weir 5 fish in trap
	2:00	Cleaned weir
	3:30	Cleaned weir 10 fish in trap
03-Nov	7:00	Cleaned weir
	8:30	Hauled 12 male and 9 female
	10:00	Picked up thing we aren't using at trap an preped them for transport to hatchery
	10:30	Paul and John came by to look at what it was going to take to remove weir
	1:00	Andrea and Rigo came down with the truck to pick up unneeded equipment and took it back to hatchery
	1:30	Cleaned weir 2 fish in trap
	2:30	Cleaned weir and trap
	3:00	Pat walked down river to count fish, 200 Sockeye 1/3 spawned out
	4:00	Cleaned weir for the night 4 fish in trap
04-Nov	7:00	Cleaned weir about 20 fish in trap
	8:30	Hauled fish 18 males and 5 female
	10:00	John and James from SPU came down with the flat bed and we pulled out the trap and wing wall.
05-Nov	7:00	Removed the rest of the weir with SPU done fishing
	12:00	Paul buying pizza fro lunch

Appendix 2, Trap and Weir Protocols

Operational Guidelines for the Cedar River Weir and Fish Trap at I-405
2010 Field Season

These guidelines are based on the framework that was established for the 1999 field season in response to concerns regarding weir impacts to Chinook salmon. The guidelines are based on eleven years of successful implementation during the 1999-2009 brood collection years. It is recognized that the Cedar River Anadromous Fish Committee and the Sockeye Hatchery Adaptive Management

Work Group will have the opportunity to recommend changes to these guidelines if conditions change during the season. Such adaptive management will be documented and communicated through the committee chair. Since the implementation of this protocol and the adaptive management approach, the operation of the weir has been successful in avoiding impacts to Chinook salmon. Careful monitoring of fish behavior at the new weir will be necessary to be responsive to changing conditions and fish behavior. The number of Chinook salmon passing the weir and entering the trap in relation to the number of sockeye salmon entering the trap will dictate how the trap and weir will be operated.

GOALS

The weir and fish trap in the Cedar River are maintained and operated to collect sockeye broodstock. However, an additional goal of equal importance is to minimize the risks of adverse effects to upstream migrating adult Chinook salmon. These protocols are intended to satisfy both goals.

Due to ESA issues involving Chinook salmon in the Cedar River, the weir will be operated to avoid adverse impacts to adult Chinook salmon. There are two major impacts that we will seek to avoid: 1) having Chinook spawn within 25 meters above or below the weir such that the eventual removal of the weir could impact those redds, and 2) significantly delaying (defined as more than 24 hours) the upstream migration of Chinook. It is recognized that operating the weir to avoid impacts to Chinook compromises our ability to meet the objective of collecting sockeye broodstock.

Hatchery personnel and biological staff will communicate and work together to monitor Chinook activity in the area adjacent to the weir.

- Because this weir design and location are new this year, monitoring and documenting Chinook responses to this new situation is very important.
- An open weir is defined as the condition that exists when fish have unrestricted access through one or more openings in the weir or trap.
- There will be no restrictions on fishing (closed weir) if there are no Chinook observed downstream of the weir for a 24-hour period, outside of the peak Chinook spawning period, however during the typical peak Chinook spawning period (typically September 25 through October 10) as determined by redd surveys and live counts, the weir will be opened for a 12-hour period following three consecutive days of fishing regardless of Chinook being observed.
- If Chinook are observed holding in the area immediately downstream of the weir, and there is a need to collect sockeye adults, then the weir will be opened to allow Chinook to move upstream. The duration of the opening will be in response to the observed behavior of the Chinook, with the goal of keeping any potential delay of Chinook to less than 24 hours. This may be accomplished by opening the weir at night.
- If field biologists or field technicians see more than 10 Chinook holding between the weir and the Renton Library below the weir, they will discuss the situation with the hatchery staff and jointly determine a course of action (i.e., opening the weir).
- The weir is to be fished only when sockeye adults need to be collected.
- <u>If there are more Chinook in the trap than sockeye trap pickets will be pulled.</u>
- <u>Chinook that enter the trap will be passed upstream as quickly as possible.</u>
- <u>If the number of Chinook in the trap exceeds what can be removed in 30 minutes, trap pickets will be pulled to pass Chinook.</u>

If a Chinook female unavoidably constructs a redd in close proximity to the weir, then the redd is to be immediately marked and a discussion will take place. This discussion will include, but is not limited to, the following types of actions: early weir removal, staged weir removal, and modification of weir operations. Discussion will include at least these people or their designee: Paul Faulds and

Rand Little (SPU), Cory Cuthbertson, Larry Fisher, and Doug Hatfield or Annette Hoffmann (WDFW), Eric Warner (MIT), and Tom Sibley (NMFS).

PROPOSED SCHEDULE FOR BROODSTOCK COLLECTION

The following target numbers to be collected are based upon a large run size, assuming an average fecundity of 3,200, and a 1:1 male to female spawning ratio. The 2010 preseason forecast for sockeye returns entering Lake Washington is 123,600. Weekly targets for gamete collection are based upon the average run timing curve. It is agreed that between- week adjustments to accommodate actual returns will be appropriate.

Week Beginning	Percentage of Eggs	Cumulative Number of Eggs	Cumulative Number of Adults	Weekly Adult Goal
Sept. 15	4.9%	901,600	564	564
Sept. 22	12.0%	2,208,000	1,380	817
Sept. 29	21.7%	3,992,800	2,496	1,116
Oct. 6	33.3%	6,127,200	3,830	1,334
Oct. 13	45.2%	8,316,800	5,198	1,369
Oct. 20	56.3%	10,359,200	6,475	1,277
27-Oct	66.4%	12,217,600	7,636	1,162
Nov. 3	75.4%	13,873,600	8,671	1,035
Nov. 10	83.4%	15,345,600	9,591	920
Nov. 17	90.0%	16,560,000	10,350	759
Nov. 24	95.5%	17,572,000	10,983	633
Dec. 1	100.0%	18,400,000	11,500	518

MONITORING

The following monitoring activities associated with the weir are to be conducted by hatchery personnel:

- Observe and enumerate Chinook and sockeye 25 m up and downstream of the weir (when possible) three times daily; it is recognized that at times of high flow or turbidity, accurate observation and enumeration may be compromised. The observation times are as follows: once between 7 AM and 9 AM, once between 11 AM and 1 PM, and once between 3 PM and 5 PM. For sockeye, total estimated numbers are to be recorded.
- Record the number and sex of Chinook that are collected in the fish trap and passed upstream; notice and record any tags or marks observed on the fish. Provide data to the co managers.
- Record the number and sex (where possible) of all other species passed upstream. All Atlantic salmon will be killed and sampled by WDFW staff.
- Count and flag any Chinook redd within 25 m of the weir.
- Chinook carcasses that float onto the weir will be retrieved (placed on the bank) as workload allows. Carcass sampling will be coordinated with WDFW float crews.

Field biologists and hatchery staff will communicate and discuss activities that are observed at the weir as they occur. All biologists and technicians will identify themselves and their respective

agencies while making weir observations. Field biologists and hatchery staff will communicate and share information and observations via email. Responsible persons for coordinating this are Cory Cuthbertson and Aaron Bosworth. The email group this information includes Rand Little, Paul Faulds, Eric Warner, Annette Hoffmann and the Cedar River Anadromous Fish Committee.

Appendix 3, Summary of Thermal Mark Patterns

Incubation Vessel	Pop.	Egg Take Date	Release Date	Thermal Codes	River Location	# Fry Released	Thermal Mark Pattern	Symbol
A1	310,000	9/16/10	1/31/11	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
A2	310,000	9/16/10	1/31/11	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
S20	20,000	9/16/10	1/31/11	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
A3	265,000	9/20/10	2/3/11	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
A4	265,000	9/20/10	2/3/11	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
A5	288,000	9/22/10	1/26/11	EC4	Park		nwn wwnnn	‖ ‖ | | ‖‖
A6	278,000	9/27/10	2/11/11	EF4	Park		nwn www	‖ ‖ | | |
A7	278,000	9/27/10	2/11/11	EF4	Park		nwn www	‖ ‖ | | |
A8	400,000	9/30/10	2/11/11	EF4	Park		nwn www	‖ ‖ | | |
S10	36,000	9/30/10	2/11/11	EF4	Park		nwn www	‖ ‖ | | |
S18	36,000	9/30/10	2/11/11	EF4	Park		nwn www	‖ ‖ | | |
A9	320,000	10/4/10	2/17/11	EF4	Park		nwn www	‖ ‖ | | |
A10	320,000	10/4/10	2/17/11	EF4	Park		nwn www	‖ ‖ | | |
S17	32,000	10/4/10	2/17/11	EF4	Park		nwn www	‖ ‖ | | |
A11	350,000	10/7/10	2/23/10	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
S16	50,000	10/7/10	2/23/10	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
S15	50,000	10/7/10	2/23/10	EF2	Trestle		nwn nnn	‖ ‖ ‖‖
A12	265,000	10/12/10	2/18/11	MF4F	Park		nwn nwn	‖ ‖ ‖ ‖
A13	265,000	10/12/10	2/18/11	MF4F	Park		nwn nwn	‖ ‖ ‖ ‖
A14	265,000	10/12/10	2/12/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A15	265,000	10/12/10	2/12/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A16	310,000	10/14/10	2/25/11	MF4	Park		nwn nwwn	‖ ‖ ‖ | ‖
S14	11,000	10/14/10	2/16/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A17	310,000	10/18/10	3/3/11	MF2	Trestle		nwn nwnwnwn	‖ ‖ ‖ ‖ ‖ ‖
A18	310,000	10/18/10	3/3/11	MF2	Trestle		nwn nwnwnwn	‖ ‖ ‖ ‖ ‖ ‖
S13	50,000	10/18/10	2/18/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
S12	50,000	10/18/10	2/18/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A19	246,000	10/20/10	3/4/11	MF4	Park		nwn nwwn	‖ ‖ ‖ | ‖
A20	246,000	10/20/10	3/4/11	MF4	Park		nwn nwwn	‖ ‖ ‖ | ‖
A21	246,000	10/22/10	2/23/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A22	246,000	10/22/10	2/23/11	MC4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
A23	268,000	10/25/10	2/25/11	LF2	Trestle		nwn nnwwwn	‖ ‖ ‖‖ | | ‖
A24	268,000	10/25/10	2/25/11	LC4	Park		nwn wwnnw	‖ ‖ | | ‖‖ |
B1	268,000	10/25/10	2/25/11	LC4	Park		nwn wwnnw	‖ ‖ | | ‖‖ |
B2	232,000	10/27/10	2/27/11	LF2	Trestle		nwn nnwwwn	‖ ‖ ‖‖ | | ‖
B3	232,000	10/27/10	2/27/11	LC4	Park		nwn wwnnw	‖ ‖ | | ‖‖ |
B4	241,000	10/29/10	3/7/11	LF4F	Park		nwn wnnwn	‖ ‖ | ‖‖ ‖
B5	242,000	10/29/10	3/7/11	LF4F	Park		nwn wnnwn	‖ ‖ | ‖‖ ‖
B6	232,000	11/1/10	3/21/11	LF4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |
B7	232,000	11/1/10	3/21/11	LF4	Park		nwn nnwnw	‖ ‖ ‖‖ ‖ |

B8	190,000	11/3/10	3/21/11	LF4	Park		nwn nnwnw	|| || ||| || |
B9	190,000	11/3/10	3/21/11	LF4	Park		nwn nnwnw	|| || ||| || |
B10	220,000	11/5/10	3/13/11	LF4F	Park		nwn wnnwn	|| || | ||| ||
B11	230,000	11/9/10	3/29/11	L2	Trestle		nwn nnwwwn	|| || ||| | | ||
B12	92,000	11/12/10	3/29/11	L2	Trestle		nwn nnwwwn	|| || ||| | | ||
S11	44,000	11/15/10	4/4/11	L2	Trestle		nwn nnwwwn	|| || ||| | | ||
S10	12,000	11/19/10	4/4/11	L2	Trestle		nwn nnwwwn	|| || ||| | | ||
S9	12,000	11/22/10	4/4/11	L2	Trestle		nwn nnwwwn	|| || ||| | | ||