Document ID #P125518

UPPER-COLUMBIA RIVER STEELHEAD KELT RECONDITIONING PROJECT:

2011 ANNUAL REPORT
March 1, 2011 through January 31, 2012

Prepared by:
Matthew S. Abrahamse
Keely G. Murdoch

Yakama Nation
Fisheries Resource Management
P.O. Box 151
Toppenish, Washington 98948

December 2011

Prepared for

Project # 2008-458-00
Contract #52041
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97283-3621

Yakama Nation Fisheries
Toppenish, WA

1.0 Introduction

Upper Columbia River (UCR) steelhead are listed as “Endangered” under the ESA, and naturally-spawning populations currently exist at threshold levels. Unlike other species of Pacific salmon, anadromous steelhead are iteroparous. However, rates of iteroparity for UCR populations are extremely low, likely due to high mortality imposed by such factors as extreme energetic demand, degraded habitat quality, and post-spawning migration through the Columbia River hydropower system.

The Yakama Nation (YN) has begun implementation of a kelt reconditioning project within the Upper Columbia consistent with FCRPS BiOp requirements and the Columbia Basin Anadromous Fish Accords. The goal of the Upper Columbia River Steelhead Kelt Reconditioning Project (UCKRP) is to increase the abundance of naturally-produced UCR steelhead on natural spawning grounds by as much as 10 percent through the use of kelt reconditioning. The program has three objectives:

(1.) Implement a kelt reconditioning program in the UCR to increase natural origin steelhead abundance relative to current conditions,
(2.) Evaluate kelt survival and program effectiveness, and
(3.) Collaborate with ongoing M&E studies to document the reproductive success of kelts released from the reconditioning program.

Important strides were made under the 2011 contract which brought the project closer the addressing the stated objectives. This report documents the work performed under this contract and how it pertains to the project goals and objectives. Topics covered in this report include: the design development and construction of the Methow Steelhead Kelt Facility (MSKF), an evaluation of live spawning steelhead, an evaluation of an experimental steelhead kelt trap, pre-acquisition activities for the Dryden property, and future plans for the project.

2.0 Kelt Reconditioning Facility

Most of the kelt reconditioning facility design work was performed under the 2010 contract. Under the 2011 contract, the final design was produced. The juvenile rearing troughs were removed from the facility designs (Figure 2.1) as they were determined to no longer be needed. The building orientation for the MSKF was changed for aesthetic reasons. The orientation of the MSKF now matchs the orientation of the other buildings on the WNFH grounds (Figure 2.2). Modifications to the facility designs were performed by Sea Springs Co.

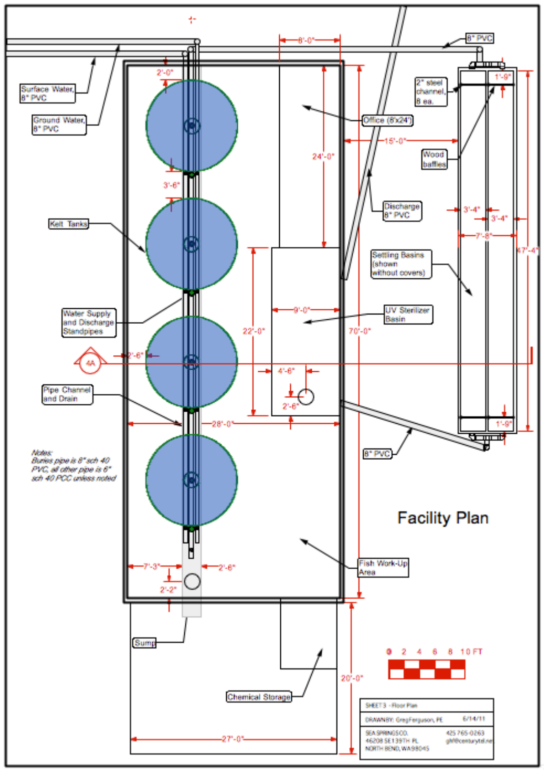

Figure 2.1 – Modified layout for the Methow Steelhead Kelt facility following the removal of the juvenile rearing toughs.

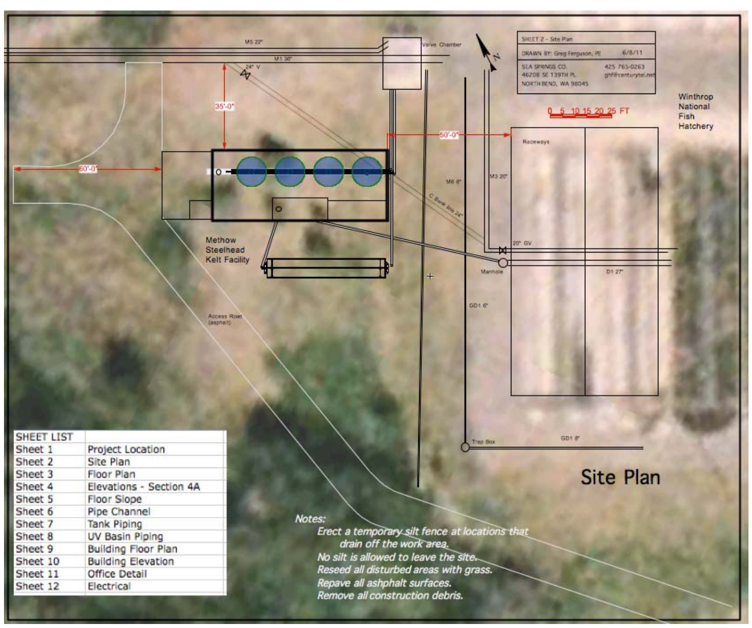

Figure 2.2 – Modified building orientation as requested by Winthrop National Fish Hatchery.

The construction process was divided into three phases: 1) the erection of the steel building, 2) the pouring of concrete and installation of piping, and 3) the interior construction and equipment installation. Each construction phase implemented under separate sub-contracts. All the necessary permitting for the facility construction was completed and in place on August 22, 2011 allowing the construction to commence. The concrete work for the facility began on August 30, 2011. The concrete, piping, and the building erection were completed on October 14, 2011. The interior construction and equipment installation began on October 15, 2011. The interior construction and equipment installation were set to be completed on January 31, 2012. However, a cost overrun in the interior construction sub-contract will delay the completion of the MSKF. A no cost extension was requested to allow additional time to complete an internal budget modification to account for the cost overrun and to complete the facility construction. Additional work on the MSKF may be performed under the 2012 contract if ways to optimize the facilities performance are identified.

3.0 Live Spawning Study

3.1 Introduction

The acquisition of kelts is the critical component for the UCKRP's success. Under the 2011 contract, the UCKRP explored several methods to obtain NOR steelhead kelts. One of the methods explored was the potential of live spawning natural origin (NOR) steelhead broodstock females collected for Methow River hatchery conservation programs. Currently all Upper Columbia steelhead programs lethally spawn their broodstock (HOR and NOR). The application of live spawning techniques for NOR steelhead females would allow their inclusion into a reconditioning program and subsequently an opportunity to repeat spawn in the natural environment.

Before hatchery programs would agree to alter their methodologies, the efficacy of live spawning needed to be evaluated. The lack of published studies comparing live and lethal spawning methods raised concerns that live spawning could result in a reduction in the number of eggs collected. Since UCR steelhead are listed as "Endangered" and the number of NOR steelhead available for broodstock is limited, if could be difficult for hatcheries to take additional broodstock if egg take was reduced. The UCKRP proposed a study to address those concerns.

The objective of the study was to determine if the number viable gametes collected through live spawning methods was different than the number collected through lethal spawning methods. In achieving this objective we would answer the questions: (1) does air (live) spawning leave behind a significant proportion of viable eggs compared to lethally spawned steelhead, and (2) is there a difference in survival or fertilization rate of eggs extracted lethally, or through live spawning methods? The study was conducted in the spring of 2011.

3.2 Methods

3.2.1 Fish Spawning

The study was conducted at WNFH. The steelhead used in this study were surplus hatchery origin fish not needed for the hatchery's conservation program. Fish were collected on site at Winthrop National Fish Hatchery and using hook-and-line. Air spawning was chosen as the method for live spawning based on literature review (Shrable et al 1999; Orr et al 1999) and personal communications with fish culture professionals identifying it as the most effective live spawning method.

All females not chosen as WNFH broodstock were air spawned using the following method. Fish were anesthetized using Tricaine methanesulfonate (MS 222) prior to air spawning. Female steelhead were held by a person with one hand near the head and the other just anterior to the tail. A16-gauge hypodermic needle with a 1 inch tip attached to a small air compressor via a rubber hose was then inserted ½ inch into the body cavity near the pelvic fins by a second person. Then 5-7 psi of compressed air was injected into the body cavity to expel the eggs. Following spawning, fish were euthanized using a pneumatic cylinder so that a determination of the number of eggs remaining in the body cavity could be made. An incision was made in the abdomen of the air spawned females and the eggs not expelled through air spawning were collected. These eggs were not fertilized and were discarded following data collection.

The eggs from each female were fertilized by two males to ensure fertilization if one of the males has non-viable gametes. All males were euthanized prior to spawning. Eggs fertilized during this study were incubated at WNFH.

The lethally spawned treatment group consists of both HOR and NOR fish spawned by WNFH according to their standard protocol.

3.2.2 Data Collection

The total number of eggs not expelled through air spawning were counted by hand with the aid of a plastic fish egg counter was collected at the time of spawning. The fork length (cm) and the date of spawning were also recorded for all female steelhead, air and lethally spawned. These data were used to determine if factors other than the spawning method influence the quantity of eggs collected.

The number of viable eggs obtained by both air and lethal spawning was quantified by weight once eggs had reached the eyed stage. Egg weight measurements were recorded to the nearest tenth of a gram. Dead eggs were picked from egg trays and enumerated prior to weight measurements.

3.2.3 Data Analysis

The total number of eyed eggs was estimated by dividing the total eyed egg weight by the individual egg weight. The individual egg weight was estimated by dividing the weight of 100 eggs by 100. Percent eye up was calculated by dividing the estimate of total eyed eggs by the total eyed eggs plus the number of dead eggs.

The mean number of eggs not expelled via air spawning was calculated. The percentage of potentially viable eggs lost through air spawning was calculated by dividing the number of eggs not expelled during air spawning by the total number of eyed eggs.

Once estimates of the total number of eyed eggs were calculated for each female, comparisons were made between air spawned females and lethally spawned females. Simple linear regression was used to confirm the correlation between a fish's fork length and fecundity. A t-test was used to determine if fish in both sample groups were the same size (fork length). If fish size was equal in both treatment groups an analysis of variation (ANOVA) would be applied to determine if spawning method had a significant impact on total number of viable eggs collected. If fish sized proved to be unequal between treatment groups than analysis of covariance (ANCOVA; $\alpha = .05$) would be used to evaluate a difference in the number of eyed-eggs obtained from both treatment groups. Fork length would be used as the covariate to increase the precision of the comparison by accounting for variation in fish size.

3.3 Results

3.3.1 Fish Spawning

Spawning began at WNFH on April 12 and concluded May 11, 2011. The number of fish available for this study was dependant on the total number of broodstock collected. A total of 22 female steelhead were collected . WNFH lethally spawned 15 females for their program. The remaining seven females were air spawned.

3.3.2 Data Collection and Analysis

A summary of the data collected can be found in Table 3.1. Results of the t-test indicated that the lethally spawned treatment group had significantly longer fork lengths (mean = 70.3 cm) than the air spawned group (mean = 64.9 cm; p=.025).

Table 3.1 – Summary of air spawning results.

Spawn Date	Fork Length (cm)	Dead Eggs	Eyed Eggs	Total Eggs	% Eye-up
Lethally Spawned Steelhead					
4/12	71	80	8164	8244	99.0%
4/12	67	90	5088	5178	98.3%
4/12	70	510	4186	4696	89.1%
4/12	73	613	7610	8223	92.5%
4/12	69	38	5416	5454	99.3%
4/19	67	93	6967	7060	98.7%
4/19	68	43	5897	5940	99.3%
4/19	65	24	5320	5344	99.6%
4/26	73	117	6145	6262	98.1%
5/3	69	343	5703	6046	94.3%
5/3	72	125	6250	6375	98.0%
5/3	70	439	5543	5982	92.7%
5/3	74	194	8652	8846	97.8%
5/11	75	50	5981	6031	99.2%
5/11	72	1105	5063	6168	82.1%
Mean	70.3	257.6	6132.3	6389.9	95.8%
Air Spawned Steelhead					
4/26	57	215	4354	4569	95.3%
5/3	70	439	5522	5961	92.6%
5/3	60	253	3977	4230	94.0%
5/3	74	197	8685	8882	97.8%
5/11	61	22	3615	3637	99.4%
5/11	57	47	2416	2463	98.1%
5/11	75	809	7325	8134	90.1%
Mean	64.9	283.1	5127.7	5410.9	95.3%

The mean number of eggs not expelled during air spawning was 522. The percentage of unexpelled eggs to totals eggs can be found in Table 3.2. Two females that were air spawned during the study were found to be partially green. If only the fully ripe females were considered, the unexpelled eggs represented between 1.6 and 11.4% of the total eggs collected.

Table 3.2 – Summary data collected from air spawned female steelhead.

Date	Fork Length	# Unspawned eggs	Total Eggs	% of Total Eggs That Were Unspawned	Comment
4/26	567	154	4569	3.4	
5/3	700	543	5961	9.1	
5/3	600	291	4230	6.9	
5/3	740	140	8882	1.6	
5/11	610	990	3637	27.2	Partially Green
5/11	570	610	2463	24.8	Partially Green
5/11	750	926	8134	11.4	

In adult salmon and steelhead fecundity increases with fish length, but the relastionship varies for different species and stocks (Quinn 2005). While we expect a relationship between fish length and fecundity to occur, simple linear regression was used to verify a positive correlation with fish used in this study. Results of the regression indicated positive correlation ($r^2 = 0.62$) between fish length and total fecundity (Figure 3.1).

Because of the correlation between fecundity and fish length, and because the lethally spawned treatment group was significantly longer than the air spawned group, comparisons between the spawn types were made using ANCOVA to control for differences in fork lengh. The results of the ANCOVA analysis indicated that there was no significant difference in number of eyed eggs collected between spawn types ($p = 0.62$; Figure 3.2)

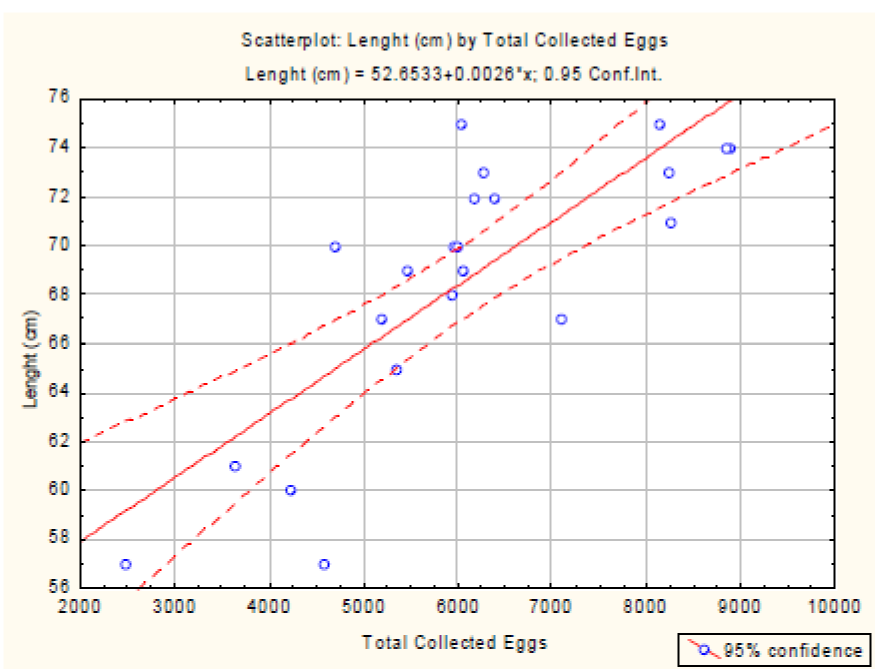

Figure 3.1 – Simple linear regression demonstrating a positive correlation between fish length and total number of eyed eggs collected.

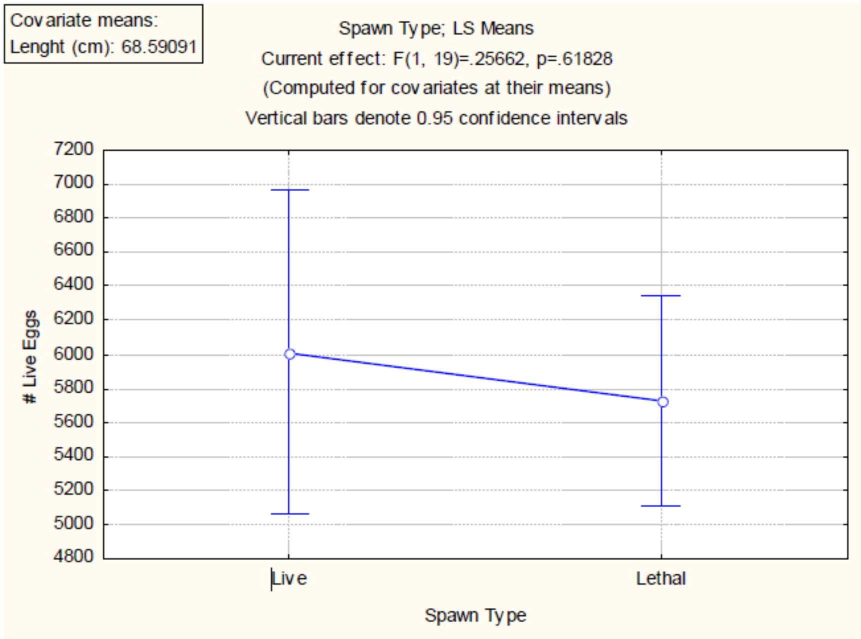

Figure 3.2 – Number of live eggs extracted by spawn type adjusted for equal fork length.

3.4 Discussion

This study demonstrated that the application of air spawning produced the same numbers of eyed eggs as would be expected when lethally spawning. While the air spawning method did not extract all the eggs from the females, no statistically significant difference in eyed egg number was found between the two spawning methods. Either the number of eggs remaining in the body cavity was too small to result in a statistical diffenrece in the number of eyed eggs produced or it is possible that eggs that are left in the body cavity could still be 'green' and would not have developed into eyed eggs had they been extracted. It is important to note that sample sizes in the this study were small due to limitations on fish availability and it is difficult to make a definitive claim that there is no difference between the methods.

Personal communications with hatchery managers and fish biologist support the findings regarding air spawning. The ESA has required the Parkdale Fish Hatchery to live spawn all of their Hood River winter steelhead broodstock. The Parkdale Hatchery Manager, Jim Gidley, stated that their program gets equal egg production to programs that utilize lethal spawning. The Nez Perce kelt reconditioning program conducted a study similar to the one described in this section. They air spawned NOR summer steelhead females and compared the number of eggs collected via live spawning to total number of eggs collected through lethal spawning at Dworshak National Fish Hatchery. They found no difference in the number of eggs collected in the two treatment groups (Scott Everett, Nez Perce Fisheries Biologist, personnel communication).

The results of this study were presented to USFWS hatchery managers and fisheries biologists. They agreed with our findings. As a result, WNFH has agreed to begin live spawning the NOR female steelhead broodstock and allow for their inclusion into the UCKRP starting in the spring of 2012.

3.5 Literature Cited

Orr, W., J. B. Shrable, D.J. Abeyta, J. McFall, and D. Noble. 1999. Hydraulic Spawning of Rainbow Trout. Developments in Fish Culture. U.S. Fish and Wildlife Service, Ennis, MT

Quinn, T. P. 2005. The Behavior and Ecology of Pacific Salmon and Trout. University of Washington Press, Seattle, Washington.

Shrable, ,J. B., D. J. Abeyta, J. E. McFall, D. G. Noble, and W. H. Orr. 1999. Comparison of eye-up of rainbow trout eggs spawned by injecting oxygen at four, eight, twelve, and sixteen pounds of pressure versus spawning with hand pressure. Developments in Fish Culture. U.S. Fish and Wildlife Service, Ennis, MT.

4.0 Twisp Weir Trap

4.1 Background (brief)

The employment of passively operated adult fish traps may be one of the most effective methods for the collection of NOR steelhead kelts. Due to the difficulty associated with establishing new trapping sites the UCKRP first sought to utilize existing trap sites operated by cooperating agencies. One such site was a permanent weir located on the Twisp River in the Methow River basin operated by the Washington Department of Fish and Wildlife (WDFW).

Because the Twisp Weir is designed to capture only upstream migrating fish, the UCKRP proposed a study to evaluate a potential modification to capture downstream migrating kelts at the facility. The weir is owned and maintained by Douglas County PUD (DCPUD) whom imposed limitations and guidelines on the types of modifications that could be made to the infrastructure. The limitations included: 1) structures could not be attached to the weir panels or trap boxes, 2) could not interfere with the normal trap operations, including weir panel operation height, and 3) modifications could not pose a danger to the structural integrity of the weir, particularly in times of high flow and debris load. Due to these limitations a novel approach was developed to capture downstream migrating kelts. The proposed kelt capture method consisted of a floating trap box specifically designed to trap downstream migrating steelhead kelts at the Twisp River weir. The objective of this study was to determine the feasibility of capturing kelts using the floating trap box. The results of this evaluation would determine if the Twisp River weir and downstream floating trap-box was a viable kelt collection method.

4.2 Methods

4.2.1 Trap Construction

The trap box was designed to collect adult fish moving downstream over the weir panels. Small fish, such as juvenile salmonids, were not targeted as it was assumed they would fall through the weir pickets before reaching the trap.

The experimental trap box consisted of an exterior wood frame constructed from 2 inch by 2 inch lumber, 8 ft long, 26 inches wide and 12 inches deep (Figure 4.1). Low density polyethylene Vexar mesh was attached to the interior of the wood frame to provide a protective barrier for the fish (Figure 4.2). The wall mesh material was black in color and had 1 inch square openings. The top of the box was open. Squares of foam were added to the bottom and sides of the trap box to provide floatation (Figure 4.3). The downstream side of the trap box had a swivel hinge allowing the box to be opened to release non-target fish species without handling and to release any accumulated debris.

The trap box was held in place behind the weir panels by ropes anchored to bolts installed into the concrete weir apron. Carabineers were attached at each end of the ropes to allow quick removal of the trap. The trap box was attached to the weir panels.

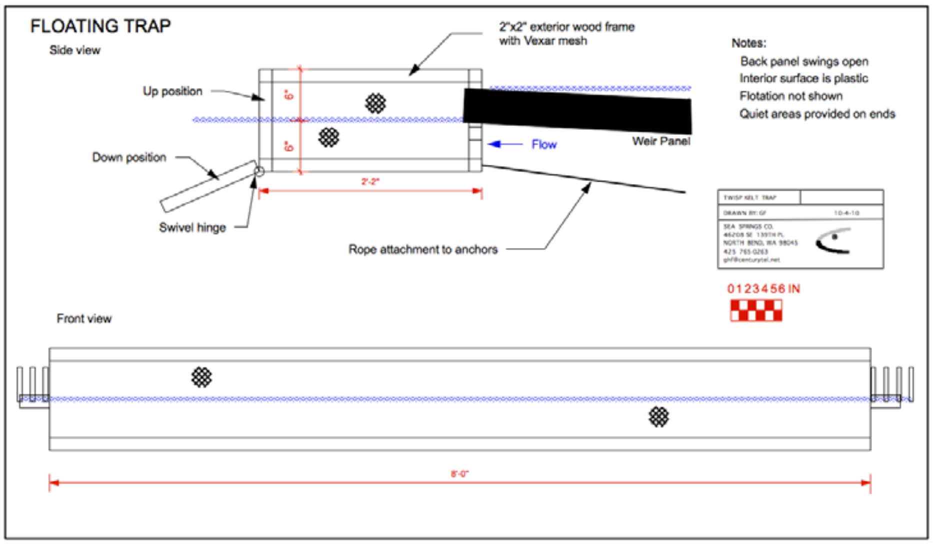

Figure 4.1 - Plan view of proposed temporary trap for capture downstream migrating kelts at the Twisp weir.

Figure 4.2 - Top view of prototype trap box for Twisp River steelhead kelt trap.

Figure 4.3 - Bottom view of prototype trap box for Twisp River steelhead kelt trap with flotation added.

4.2.2 Trap Operation

The trap testing began in early April and continued until river discharge made trap operation unsafe. Prior to the study it was estimated that the highest kelt activity at the Twisp River weir occurs from mid April through May in a given year.

Personnel were on site whenever the trap was operational. The trap was operated for a total of 24 hrs in a given week in an attempt to determine if a specific time period was more conducive to collecting steelhead kelts. The 24 hours of sampling was divided over four days with a six hour block of trap operation each day. The six hour periods were 8:00 AM to 2:00 PM, 2:00 PM to 8:00 PM 8:00 PM to 2:00 AM, 2:00 AM to 8:00 AM. For safety, personnel worked in pairs during night time and high water.

The trap box was operated at the standard weir panel heights. The trap box was accessed by wading downstream of the weir panels. To minimize any potential migration delay and/or stress to trapped fish Yakama Nation personnel checked the trap box a minimum of once per hour. At no time was the trap left unattended and was removed when not in use.

4.3 Results

4.3.1 Trap Design

Observations of the trap box performance led to modifications to the original trap design. An initial test of the trap box revealed that the trap sat too far out of the water. It was determined that the foam squares provided too much floatation for the trap box to function as designed. To address this we removed the foam squares from the bottom of the trap, cut the foam on the sides at so that the trap would sit at the desired height, and added floatation to the downstream side of the trap.

Although the modifications to the trap's floatation improved its function, modifications to the rope attachment location were required. When the ropes were attached to the trap on the upstream side the downstream side was pushed skyward by the current. When this occurred much of the trap's bottom was out of the water. To address this we mounted an attachment point on the downstream corners of the trap to which we attached ratcheting rope pulleys. We also cut and modified the frame of the trap to create a lip that would sit below the water line and slide under the edge of the weir panels (Figure 4.4). Changing the attachment points, adding the rope pulleys, and creating the lip allowed the trap to sit flush with the weir panel (Figure 4.5).

Figure 4.4 - Side view of trap with modified floatation and attachment.

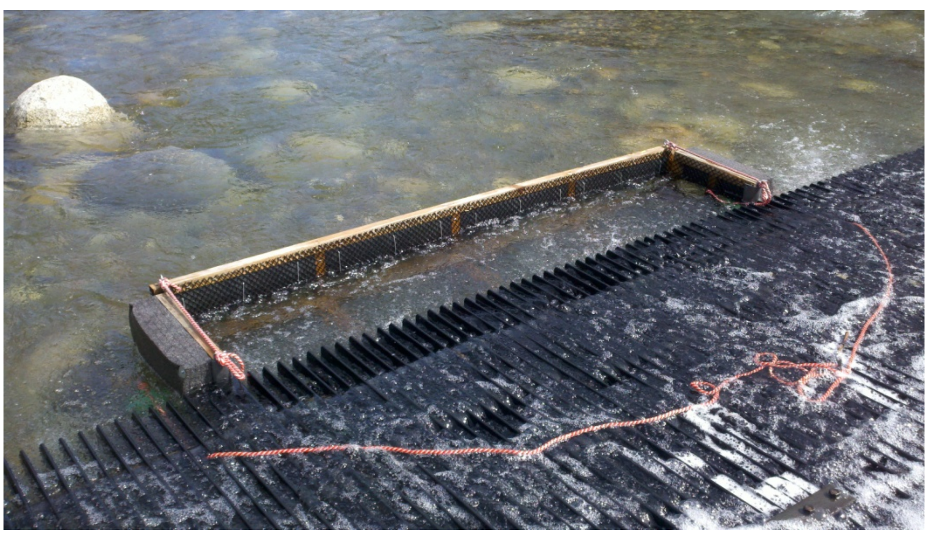

Figure 4.5 - Modified trap installed at Twisp Weir.

The results of an experiment conducted part way through the trap box evaluation prompted further modifications to the trap box. The experiment was designed to determine how long a steelhead kelt could be held in the trap. In this experiment, a hatchery steelhead captured at the Twisp weir by WDFW personnel was placed in the trap box. The fish's behavior and time of retention in the trap were observed. The steelhead remained in the trap for approximately 20 minutes before swimming back on to the weir panel and around the edge of the trap box. This prompted us to develop a lid to prevent fish from escaping the trap (Figure 4.6). The lid covered approximately half the width of the trap and was hinged to allow removal of fish. The lid was constructed of the same materials used for the trap box with the addition of flexible plastic strips designed to flex downstream but not upstream. These strips were screwed into the lid frame at an angle and extended upstream where they fit behind at 2 inch by 2 inch piece of lumber screwed into the trap box frame to act as a stopper. Tests conducted with a steelhead carcass demonstrated that a fish could slide down the weir panel and into the trap. We were unable to obtain another live fish to determine if the trap lid would prevent fish escape.

Figure 4.6 - Trap operating with partial lid in place.

4.3.2 Trap Operation

Trapping began on April 11 and finished on May 2, 2011. The river discharge at the beginning of the study was 273 CFS and was 380 CFS the last day of trapping. Trap performance was observed to be hindered at flows greater than 350 CFS. At these flows it was difficult to keep the trap flush with the weir panels as the pulleys could not withstand the force of the flow. The force of the flow also had an impact on the lid. The strips were pushed downstream and the lid was lifted creating gaps that a fish could escape from. Modifications were done to improve the trap's flotation and plans were made to continue testing. However, when modifications had been completed the river discharge had increased to over 400 CFS. At this discharge level the current was very swift and required an experienced wader to access the trap. It was determined that 400 CFS marked the start of unsafe wading conditions, particularly for night time work. Trap operation ceased at this time.

No steelhead kelts or adult fish were collected during trap testing. Debris accumulation in the trap during the study period was minimal.

4.4 Conclusions

River discharge appeared to be the greatest factor impacting the feasibility of capturing kelts using the trap box design. As river discharge increased to 400 cfs the ability for the trap to function as designed was hindered, as was the ability for personnel to safely access the trap. Further design modifications could likely improve the trap box's performance under increased flow conditions. However, the inability of personnel to access the trap at high flows precludes the need to perform any modifications.

Proposals for the study suggested the trap may be accessed by walking on the weir panels. However, WDFW have stated that their personnel are not allowed to walk on the panels if wading conditions are unsafe. It is our recommendation that these guidelines should apply to UCKRP activities as well. Accessing the trap via the weir panels is not a safe alternative as the panels can be slippery and rapids immediately downstream of the weir would be dangerous if one were to slip from the panels.

At this point, the feasibility of operating the trap box design at the Twisp weir depends on how frequently river discharge levels are within the safe wading limits during the period of highest kelt activity, mid-April through May. United States Geological Survey (USGS) records indicate that river discharge levels less than 400 cfs are uncommon during in late spring (Table 4.1). In fact, based on the 25 year mean daily discharge data, there are typically only 9 days in which the flow is less than 400 cfs. The USGS records also indicate that the mean daily discharge levels during the trap evaluation, April 15 to May 4, 2011, were lower than the 25 year mean values (Table 4.2). While mountain snowpack levels were above average in 2011, runoff was much later than average, resulting in below average discharge during the evaluation.

Table 4.1. – The mean daily discharge (cfs) for the Twisp River during the time period of highest kelt activity. Mean discharge values are based on 25 years of recorded data. Data gathered from USGS website (http://waterwatch.usgs.gov).

Day of Month	April	May
1		511
2		544
3		564
4		566
5		571
6		590
7		611
8		627
9		648
10		702
11		698
12		725
13		783
14		828
15	306	856
16	304	911
17	309	1000
18	316	1080
19	328	1110
20	344	1060
21	364	992
22	381	933
23	392	916
24	418	935
25	438	996
26	445	1000
27	454	985
28	466	997
29	478	1030
30	500	1060
31		1070

Table 4.2. – Comparison of the daily mean discharge (cfs) of the Twisp River during the trap evaluation to the 25 year mean. Data gathered from USGS website (http://waterwatch.usgs.gov).

	CFS		
Day	**2011**	**25 Year Mean**	**Difference**
15-Apr	279	306	-27
16-Apr	282	304	-22
17-Apr	286	309	-23
18-Apr	286	316	-30
19-Apr	282	328	-46
20-Apr	282	344	-62
21-Apr	280	364	-84
22-Apr	278	381	-103
23-Apr	286	392	-106
24-Apr	302	418	-116
25-Apr	316	438	-122
26-Apr	323	445	-122
27-Apr	335	454	-119
28-Apr	339	466	-127
29-Apr	338	478	-140
30-Apr	341	500	-159
1-May	356	511	-155
2-May	384	544	-160
3-May	385	564	-179
4-May	383	566	-183
Mean	**317**	**421**	**-104**

Based on the results of the evaluation we have decided not to pursue trapping at the Twisp River weir as a method for collecting kelts at this time. River discharge levels for safe trap operation are too rare in a typical year for the trap box to be relied upon as a primary method for kelt collection. We will pursue alternative methods, such as tributary weir traps, for kelt collection. Trapping at the Twisp River weir may be revisited if alternative methods prove unsuccessful or a way to operate the trap box at high flows while maintaining crew safety is developed.

5.0 Dryden Property Acquisition

Little progress was made in the Dryden property acquisition process in 2011 as discussions with stakeholders remain complicated. A property appraisal was completed for the Dryden Property and is under review. Washington State Department of Ecology (WSDOE) has stated that at this point in time no water discharge would be allowed at the Dryden site. Discussions regarding whether non-point, diffuse P loads could be used as an offset, if cleaned up, to get an allocation trade put into effect. The WSDOE's current position is that non-point loads do not carry the same clean-up requirements or priorities as direct source impacts. If a trade-off is to be presented by YN, a point source would need to be remedied. Lead contamination at the Dryden Property continues to be an important issue. While there is no longer a question as to if lead contamination cleanup needs to occur the level of cleanup required is still under discussion. Based on the appraisal value of YN's portion of the property sale and the clean-up costs, the YN will propose that the Washington State Department of Transportation (WSDOT) transfer title to the YN. This would relinquish WSDOT from clean-up costs and potential liability.

The uncertainty associated with the site along with existing discharge permitting and water quality standards in the lower Wenatchee River make the property purchase a much less desirable option for the

UCKRP. Although other YN projects will continue to pursue the Dryden property acquisition, the UCKRP does not plan to continue pursuing of the property in the upcoming contract.

6.0 Recommendations for 2012

The 2011 contract marks the end of the preparation phase of the UCKRP. The scope of the 2012 will cover the first year of implementation of a kelt reconditioning program in the Upper Columbia River. Primary activities to be conducted by the UCKRP include the collection, reconditioning, and release of natural origin (NOR) steelhead kelts in the Methow River basin.

6.1 Kelt Collection

There will be three methods applied in the collection of NOR steelhead kelts. These methods are: (1) development and testing of a temporary weir trap on Little Bridge Creek, (2) live spawning of NOR broodstock females at Winthrop National Fish Hatchery, and (3) hook-and-line collection of NOR kelts in the Methow River.

6.1.1 Little Bridge Creek Weir

A temporary weir designed to trap downstream migrating steelhead kelts will be operated in Little Bridge Creek, a tributary to the Twisp River. Collecting kelts from the Twisp River drainage is of particular interest because of the high proportion of natural origin spawners and the ongoing steelhead genetic analysis being conducted by Department of Fish and Wildlife which could allow evaluation of the reproductive success of reconditioned kelts (a research need identified in the Upper Columbia Salmon Recovery Plan). Little Bridge Creek has substantial steelhead spawning activity and an ideal location for a temporary weir trap.

The proposed trap location on Little Bridge Creek is 0.15 river miles from the mouth of Little Bridge Creek. At this point limited gradient creates a wide, pool area where water velocity is diminished. The site can be accessed from a small two track road off of National Forest Development Road 4415.

The trap and its installation involve no permanent changes or obstructions to the river bed or surrounding area. The trap will be installed and removed annually. The proposed trap will be constructed of multiple angle iron/aluminum panels arranged side by side into an 'X' spanning the width of the stream. The vertical pieces of the frame will be 4.5 feet tall. The horizontal pieces will be 6 feet long and have 0.875 inch holes spaced 1.5 inches apart. Steel/aluminum electrical conduit pickets, 5 ft tall and 0.75 inch diameter, will be inserted into the holes in the cross pieces. The pickets will not be attached to the panel frame to allow their removal during cleaning and times of high flow. Two legs would be attached to each frame for support. These legs will be adjustable to allow the angle of the panel to be modified to best suit their placement location and stream flow. A downstream trap box and an upstream passing chute will be placed side by side at the center of the X. The trap box will be constructed of an angle iron/aluminum frame 3 ft wide by 4 ft long by 3 ft deep. The sides and floor of the trap will consist of Vexar mesh secured to the frame with rivets and washers. The downstream end of the trap box will have 1 inch steel pipe installed horizontally at a spacing of 1.5 inches instead of mesh to allow small, non-target fish to swim through the trap box. The downstream end will also be removable. The upstream end of the trap will be configured into a downstream facing V with a gap of 4 inches to which a caudal trigger will be attached to prevent fish from swimming out. The top of the trap will be constructed of wood and will be hinged to allow fish to be netted out. The upstream passage chute will allow fish to move past the weir unobstructed.

Data will be collected from all steelhead kelts captured in the downstream trap box. The data recorded will include: length (fork and mid-orbital post-hypural) in millimeters, weight in grams, origin (natural or hatchery), sex, scale samples, fish condition (good- lack of any wounds or descaling, fair- lack of any major wounds and/or descaling, poor- major wounds and/or descaling), and color (bright, medium, and dark). All fish will also be scanned for the presence of PIT tags. If a tag is present we will record the tag number, if not, we will insert a PIT tag into the fish's pelvic girdle. Most natural origin kelts will be taken to the Methow Steelhead Kelt Facility at Winthrop Nation Fish Hatchery for reconditioning. Up to one third of the natural origin kelts captured may be released as an in-river control group. All hatchery origin kelts or other non-target fish will be released downstream of the weir. Data may be collected from non-target fish species if requested. The upstream movement of fish will be monitored using a PIT tag array.

Additional weir traps similar to the one described here may be installed in other tributaries in the Methow River basin in future years.

6.1.2 Live Spawning

The results of the live spawning study described in Section 3 of this report were presented to the USFWS and Winthrop National Fish Hatchery staff. Upon review of our study they confirmed that the application of air spawning is a viable method for collecting eggs for their program. Beginning in 2012 female NOR broodstock will be live spawned and encorperated into the UCKRP. Winthrop National Fish Hatchery typically spawns approximately 15 hatchery/wild crosses each year. We expect that live spawning will provide consistent source of kelts for the UCKRP with potential to expand to include other Methow basin steelhead hatchery programs. Coordination with affected stakeholders (USFWS, WDFW, USGS, USFS, Chelan PUD and Douglas PUD) regarding live spawning of NOR broodstock will continue in 2012.

6.1.3 Hook-and-Line

The USFWS typically encounters steelhead kelts during their broodstock collection. Any NOR steelhead kelts caught during broodstock collection will be included in the kelt reconditioning project. Angling methods employed will be in accordance with Washington Department of Fish and Wildlife regulations, however, permits obtained by the USFWS will allow persons listed to fish after the designated season.

6.2 Kelt Reconditioning

All NOR steelhead kelts collected will be brought to the Methow Steelhead Kelt Facility for reconditioning. Upon arrival at the facility the kelts will be administered medication to treat any existing pathogens. Kelts will be segregated by location and/or method of capture. Segregation will be done to allow for differentiation between groups and to prevent horizontal transmission of pathogens, if present. An effort will then be made to reinitiate feeding in the kelts. Small amounts of freeze dried krill will be administered to the kelts. When a feeding response is observed in the kelts, the amount of krill offered will be gradually increased. After approximately one month, pelleted fish feed will gradually introduced and the amount of krill fed gradually decreased. After approximately six months of feed and pathogen treatment, the gonadal maturation status will be examined via ultrasound. Once it is confirmed the majority fish have mature gonads, all fish will be released at the mouth of the Methow River regardless of maturation status. Any mortalities in the project will be buried at a designated site in accordance with Winthrop National Fish Hatchery protocols.

6.3 Kelt Release

Kelts will be transported from the Methow Steelhead Kelt Facility (MSKF) to a release site at the mouth of the Methow River. Kelts will be released after ultrasound examinations confirm that the majority of fish have mature gametes. All fish will be released regardless of maturation status. The release date will likely be in mid-October. Water temperature and dissolved oxygen data will be collected from the source and receiving waters to prevent stress to the fish caused by differences in values.