Draft, Project Management Plan FY2012 Intake Diversion Larval Fish Sampling

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Study Title: Larval Fish Sampling Survey at the Intake Diversion, Yellowstone River, Montana

Study Summary

Beginning in April of 2012 a new screened diversion will be placed into operation at Intake, MT. The design of the screening systems, which consists of 12 cylindrical drums through which water flows passively into the canal headworks, was selected through the extensive screening and the NEPA process. Each drum screen measures approximately 2 meters (6.5 feet) in diameter and 7.6 meters (25.2 feet) in length. The screens have a maximum mesh size of 1.75 mm with a profile bar of 2.38 mm woven wire. Maximum approach velocity in front of the screen is designed at 0.12 meters per second (0.4 feet per second), which will provide an even velocity distribution across the rotating screens. Water will gravity flow from low in the water column through the screens, and pass through the slide gates where it will enter the canal. The fish screens were designed to meet salmonid criteria established by the Service and the National Oceanic and Atmospheric Administration (NOAA).

The new screened diversion will divert between 600 – 1,380 cfs from the Yellowstone River into the main canal during the irrigation season, depending on weather and crop demands.

Reclamation completed fish entrainment investigations (1996-1999). These were performed immediately behind the headworks within the Intake Canal and were used to quantify fish entrainment at the diversion. These investigations were targeting fish that could be collected in ½ inch mesh nets and larval stages were not part of this initial monitoring. Over the irrigation season in 1997, a total of 8,374 fish were netted. Included in this 1997 sampling were 8 days of 24 hour sampling. Thirty-four species were sampled; 25 were native species. Native species-stonecat, flathead chub, sturgeon chub, goldeye and sauger---comprised the highest numbers collected. Average entrainment in 1996 and 1997 was 1.75 and 0.99 fish per acre-foot, respectively for non-larval stages. Entrainment rates of individual species varied with month,

time of day, and turbidity, over the irrigation season when with entrainment flows into the canal were relatively constant. Diel differences in entrainment for many of the native fish were most pronounced later in the irrigation season when river clarity increased. The 1998 entrainment netting collected 4,529 fish which included 744 sturgeon chub. Surprisingly, shovelnose sturgeon accounted for a noticeable high percentage (8 percent) of fish in 1998.

In late summer of 2008 and 2009 several larval fish monitoring trips were performed as part of a larger planned study to determine quantifiable techniques for collecting larval fish in the Intake Canal behind the headworks, and to provide a baseline of data for future reference. In 2008, sampling occurred the weeks of June 24-26, July 8-10 and 23-25, 2008. Three dominant families of fish were identified, Hiodontidae, catostomidae and cyprinidae. In June, samples were mostly comprised of catostomids (31%) and cyprinids (31%), followed by hiodontidae (7%) and 30% were unknown due to damage to the sample or identifiers inexperience with larval ID. Composition in early July was mostly comprised of catostomids (51%), followed by cyprinids (17%) and hiodontidae (6%). Late July collections were comprised mostly of catostomids (58%) followed by cyprinids (35%) and Hiodontidae (1%). Numbers provided in the table below, as cited from a draft Reclamation report on the 2008 sampling provide an estimate of the potential numbers and variability of larval fish entering the canal. Data was collected in 2009, but due to loss of funding for the project data has not been summarized.

Estimated entrainment rates for eggs and larvae sampled in 2008 at Intake Canal. Standard error of daily averages shown in parentheses (draft, these numbers are not final and may change upon review).

Date	Canal CFS	Canal acre ft/sec	Canal acre ft/ hour	Average egg/acre ft.	Eggs/ hour	Average larvae/acre ft.	Larvae/ hour
24-Jun	1470	0.0337	121.49	5.77 (±5.76)	700.40	17.15 (±17.15)	2083.53
25-Jun	1520	0.0349	125.62	34.44 (±13.51)	4326.85	37.66 (±14.37)	4730.25
26-Jun	1520	0.0349	125.62	37.64 (±16.61)	4728.24	25.98 (±7.88)	3263.10
8-Jul	1570	0.0360	129.75	30.62 (±5.32)	3972.71	157.23 (±49.96)	20401.36
9-Jul	1530	0.0351	126.45	4.95 (±1.95)	625.50	92.01 (±22.64)	11634.64
10-Jul	1470	0.0337	121.49	8.40 (±4.57)	1020.10	107.42 (±30.82)	13049.79
23-Jul	1390	0.0319	114.88	71.14 (±21.52)	8172.78	466.32 (±98.46)	53568.51
24-Jul	1450	0.0333	119.83	45.24 (±10.07)	5420.90	596.95 (±207.94)	71534.96
25-Jul	1430	0.0328	118.18	46.18 (±23.50)	5457.07	642.31 (±128.40)	75909.24

Because the lower Yellowstone River has a diverse assemblage of native fishes and there is

potential for varied seasonal and protracted spawning dependent on river flows, water temperatures and other spawning triggers, hatching will likely occur all spring and most of the summer. We are proposing a sampling program that would increase the probability of capturing pulses in larval drift. The only way to ensure not missing anything would be to sample continuously. However, given the logistics and costs of such a program we feel the proposed schedule below should be adequate to describe entrainment (if any) patterns of larval fish at the intake diversion.

Objective
Determine seasonal larval fish entrainment within Intake Canal, MT.

Scope of work
The complete-season survey would be conducted as a twice monthly sampling including up to 48 samples per week. The proposal is to start work In May of 2012 and extend through August of 2012. The final end date could be extended based on budget considerations.

A sampling program for 10 days each month is initially proposed. We are assuming Monday and Friday will be used primarily as travel days, with equipment setup if time allows. During that period the net(s) will be deployed for a period once an hour during the daylight, a 12 hour rest period, then deployed once and hour during the dark. Approximately 48 samples will be collected per week. Depending on debris levels and numbers of larvae the duration of sampling and the frequency of sampling will be adaptively adjusted. Initially we plan to sample for 30 minutes each hour.

Larval fish will be sampled using a 500um plankton net suspended off the bridge approximately 300 yds downstream of the intake structure. Larval drift sampling at the diversion structure itself is not feasible due to lack of attachment points, and the turbulent nature (back eddies, flow variations) of the area. The bridge at the head of the canal was used to collect most of the data from the previous larval studies because flow is more uniform. The net contains a calibrated flow meter used to determine the volume of water filtered, and is weighted down to ensure it rides at the proper depth below the water surface.

Immediately following collection, each sample will be stained using Rose Bengal to make larvae more observable, and preserved in 5-10% buffered formalin. At the time of collection large debris will be removed prior to preservation of the sample. Separating larvae and eggs from smaller debris will be done once samples have been returned to a laboratory setting.

There also exists the possibility of a screen failure due to extreme river conditions, debris buildup or some other unforeseen issue. This could allow unscreened river water to enter the diversion structure. If such a scenario were to occur it would be beneficial to sample the event as a comparison against times when the screens are in operation, and as a general measurement of larval entrainment without screens. We will plan for this contingency, and if a failure occurs will be able to commence sampling within 24hrs.
<u>Larval Identification</u>

If possible we will use the CSU larval fish lab for larval sample identification and enumeration. Based on previous contact their estimated rate is approximately one hundred dollars per sample, for samples that are free of debris and contain larvae only. Reclamation has larval keys developed from the previous collections and intake and can do the work in house if necessary. At this time we cannot anticipate what the numbers of larval fish are likely to be and can only go upon previous study results. IT would reasonably be expected that the placement of the screens would reduce the debris load greatly and reduce intake of larger larval fishes.

Timeline

Depending on workloads larval samples will likely be stockpiled through the end of the field season at which time personnel could begin the process of sorting and identification. If resources are available during the summer this process will be accomplished sooner. We anticipate having all samples enumerated by February 2013, and a draft data summary available no later than April 1, 2013.