RECLAMATION

Managing Water in the West

Biological Assessment of Potential Effects to Middle Columbia River Summer Steelhead from the Taneum Canal Company Fish Bypass Repair, Kittitas County, Washington

Yakima Project, Washington

U.S. Department of the Interior
Bureau of Reclamation
Columbia-Cascades Area Office
Yakima, Washington

July 2011

Mission Statements

U. S. DEPARTMENT OF THE INTERIOR

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

BUREAU OF RECLAMATION

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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INTRODUCTION

Taneum Creek is located in Kittitas County south of Thorp, WA, and is a tributary of the Yakima River at River Mile (RM) 166.1 (Figure 1). The Taneum Creek watershed is mostly undeveloped with agricultural crop production, forestry, and recreation as the primary land uses. The lower watershed is predominantly privately owned, while the upper watershed includes both public and private lands. Taneum Creek supported salmon runs until the early 20th Century, when the stream was dammed and diverted for irrigation.

Figure 1. Taneum Creek is a tributary to the Yakima River in central Washington.

Habitat conditions in the upper Taneum Creek watershed are considered to be suitable for salmonid production in general and for steelhead in particular due to factors such as stream size, substrate composition and gradient. In recent years a number of fish passage and instream flow improvements have occurred. These improvements include the removal of the Bruton Dam in 2009, and the installation of a fish passage channel at the Taneum Canal Company (TCC) diversion in 2011, addressing two major fish passage barriers on the creek. The Yakama Nation and Washington Dept. of Fish and Wildlife are stocking the creek with coho salmon in hopes of rebuilding a salmon run, and PIT tagging rainbow/steelhead trout they find in Taneum Creek.

The high flows in mid-May in Taneum Creek scoured out a large portion of the TCC canal embankment. The fish bypass that routes fish safely past the TCC fish screens and back to the river passed through that eroded canal embankment. While the Creek was still high and before the condition of the fish bypass could be assessed, the canal embankment was rebuilt by placing sand, gravel, and rip-rap into the scoured areas directly into the stream. Once the flows started to receded, it became apparent that the bypass outfall was at least partially blocked and natural gravel deposition occurred at the previous location of the fish bypass which reduced the effective

depth of water at the bypass outlet. Also, the concrete encasement at the very end of the fish bypass pipe had shifted. As relatively high flows continued and the fish screens operated by passing floating debris down the fish bypass, any openings that remained at the fish bypass outfall apparently became plugged with the debris passing down the fish bypass, so that now the bypass is effectively plugged and there is no sign of free flowing water coming out of the fish bypass outfall area.

On June 15 Reclamation provided temporary bypass at the TCC screens by cutting a hole in the overflow sluiceway gate and creating a plunge-pool in the sluiceway. While this action provides a temporary passage, the bypass pipe needs to be fixed in order for passage to be permanently provided. Additionally, Reclamation proposes to take steps to protect the bypass outfall and the overflow outfall (which can again be used to provide temporary passage in the future, if needed) from future flood flows.

PROPOSED ACTION

Location

The project site is located on Taneum Creek in Kittitas County, Washington. The legal description for the project site is NW ¼ Section 05, TN 18 North, RE 17 East and the 6th Field Hydrologic Unit Code (HUC) identification is #170300010302, Taneum Creek.

Project Description

In order to repair the TCC fish bypass and to protect it from future flood flows, Reclamation proposes to: a) excavate the existing canal embankment to access the fish bypass pipe; b) replace and rebury the fish bypass pipe; c) place a rock barb just upstream of the pipe to protect it from erosion; and d) rock the revetment face and key in large rocks in the revetment to protect the revetment and overflow channel (currently used for temporary fish passage) from erosion during flood flows.

Work performed for this project will occur between July 15 and September 15, 2010: the period of lowest natural streamflow in Taneum Creek (Figure 2). Reclamation crews will construct the project. Construction will require about 8 working days to complete and will entail the following actions (Figures 3-6):

- Heavy equipment required to complete the project includes a hydraulic excavator and/or backhoe working from the canal bank, and a dump truck to deliver rock to the site. The excavator/backhoe will be refueled and staged away from the creek. All other equipment required to complete the project will consist of hand tools (e.g. shovels).
- Very little vegetation, and no mature vegetation, will be disturbed as part of this project. Access and all construction activities will be confined to the right bank, which is currently a highly modified rocked revetment and serves as an access road for the canal. Some immature vegetation around the overflow channel will be removed when rock is placed to stabilize the eroding bank. This vegetation consists of shrubs and small trees in areas of active erosion (Figure 6). The left bank riparian area is vegetated with large cottonwood trees. This bank will not be impacted by construction activity.
- The excavator/backhoe will place a sandbag cofferdam to isolate the work area. In the vicinity of the bypass, the area that will be isolated by the sandbags is not expected to

have surface flow at the time of construction. In the vicinity of the overflow channel, any surface water is expected to be shallow (approximately 0.5 inch deep), if present at all. If subsurface flow contributes a significant amount of water in areas isolated by the sandbags, this water will be pumped out and discharged in the left bank riparian area to minimize turbidity effects.

- The excavator/backhoe will dig out enough of the revetment to access the undamaged portion of the fish bypass pipe. The damaged portion of the pipe will be cut off using a torch and a new fish bypass pipe will be attached and extended out to approximately the edge of the new canal embankment. Personnel working with hand tools will be in the water assisting with spotting, rigging, and cutting/welding.
- The concrete encasement will be reinstalled at the end of the bypass pipe and the whole bypass pipe will be buried with rip-rap and the same fill material that was excavated to access the pipe.
- Rock will be placed upstream of the repaired bypass pipe to form a rock groin, directing flow away from the pipe and helping to protect the pipe from flood flow. In addition, the rock groin currently located upstream of the bypass will be rearranged.
- New rock will be placed along the revetment, starting from the spot where the new rock ends, and the approximate location of the bypass pipe, and extending upstream past where the overflow pipe enters the stream, ending at the point where the riparian vegetation becomes continuous. Rocks will be keyed into the bank at 2 locations: the upstream point where rock is to be placed and just downstream of where the overflow pipe enters Taneum Creek. The revetment will need to be excavated in order to key in the large rocks into the bank. The rock will be individually placed, and no rock will be end dumped into the stream.

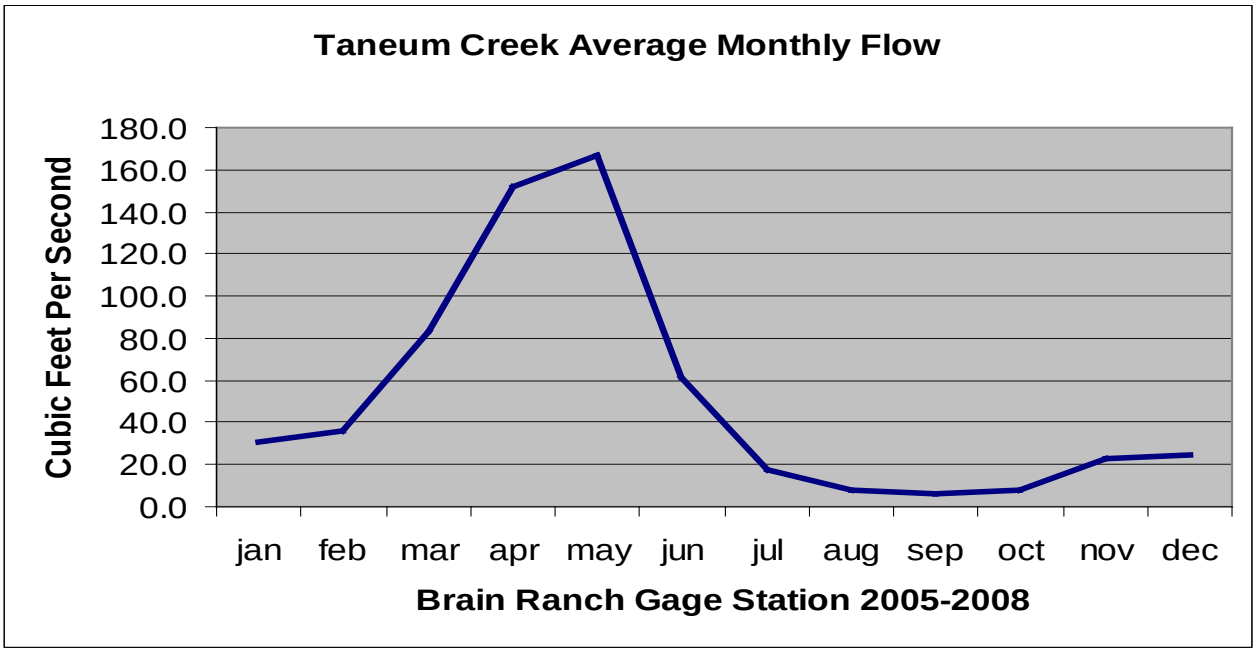

Figure 2. Taneum Creek flow data. Low flows suitable for instream work generally occur from late July through late February.

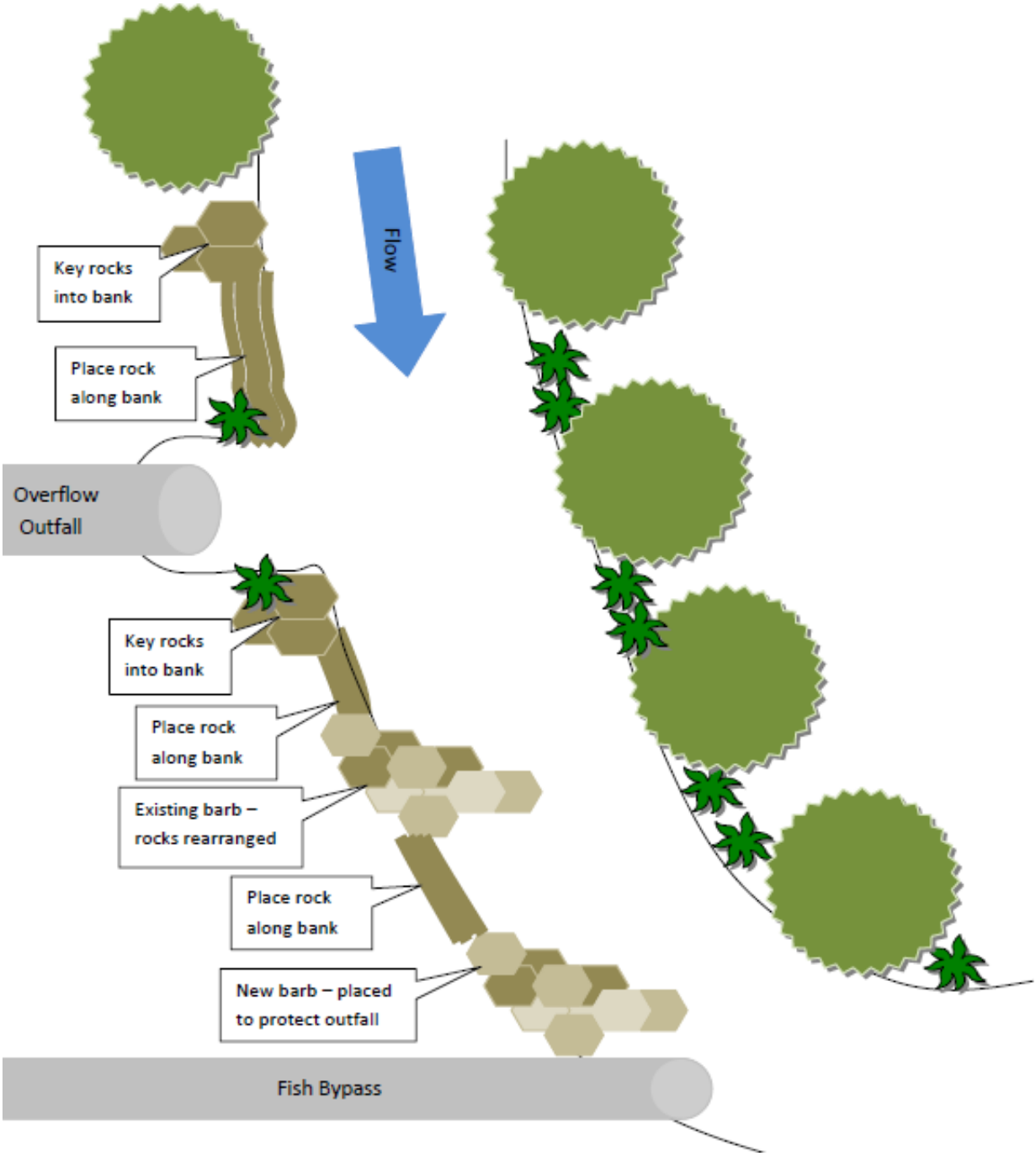

Figure 3: Schematic showing construction elements.

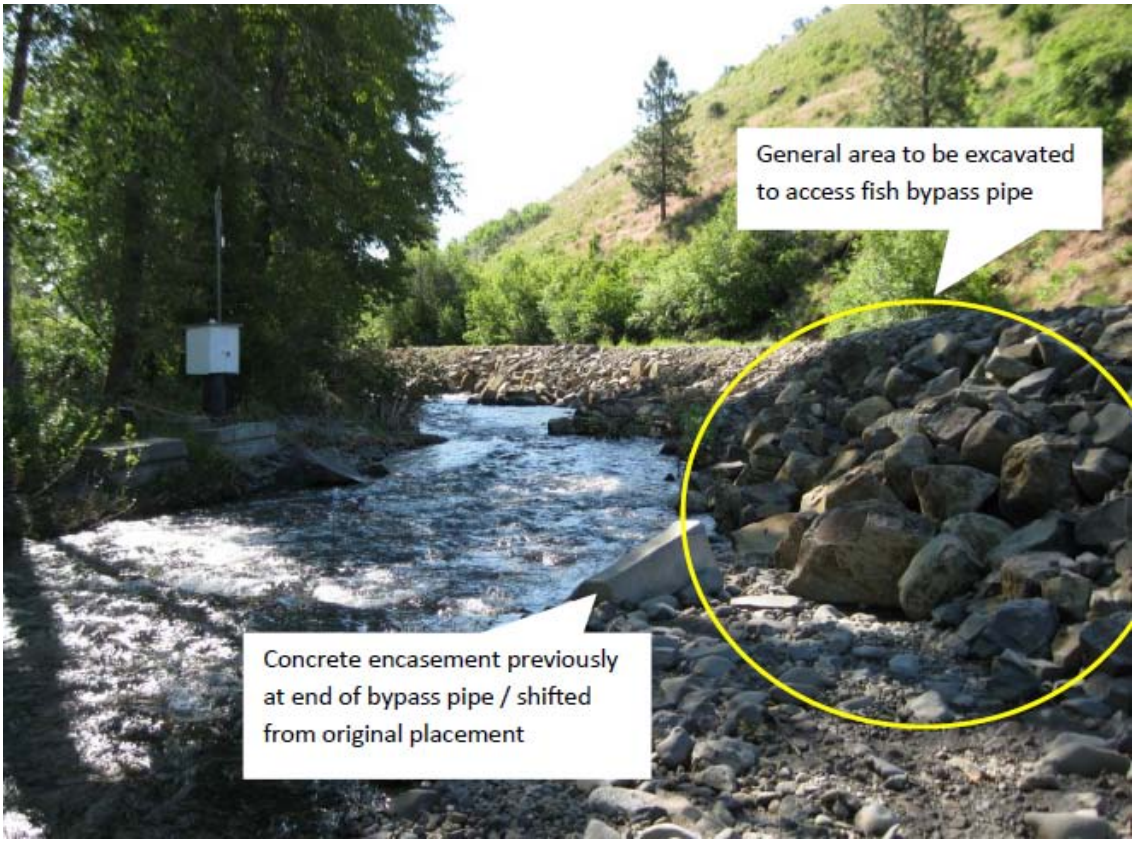

Figure 4. General location of the buried fish bypass pipeline, June 30, 2011. The revetment on the right bank separates Taneum Creek from Taneum Canal. The concrete encasement that was previously at the end of the bypass pipe is the only part of the fish bypass visible.

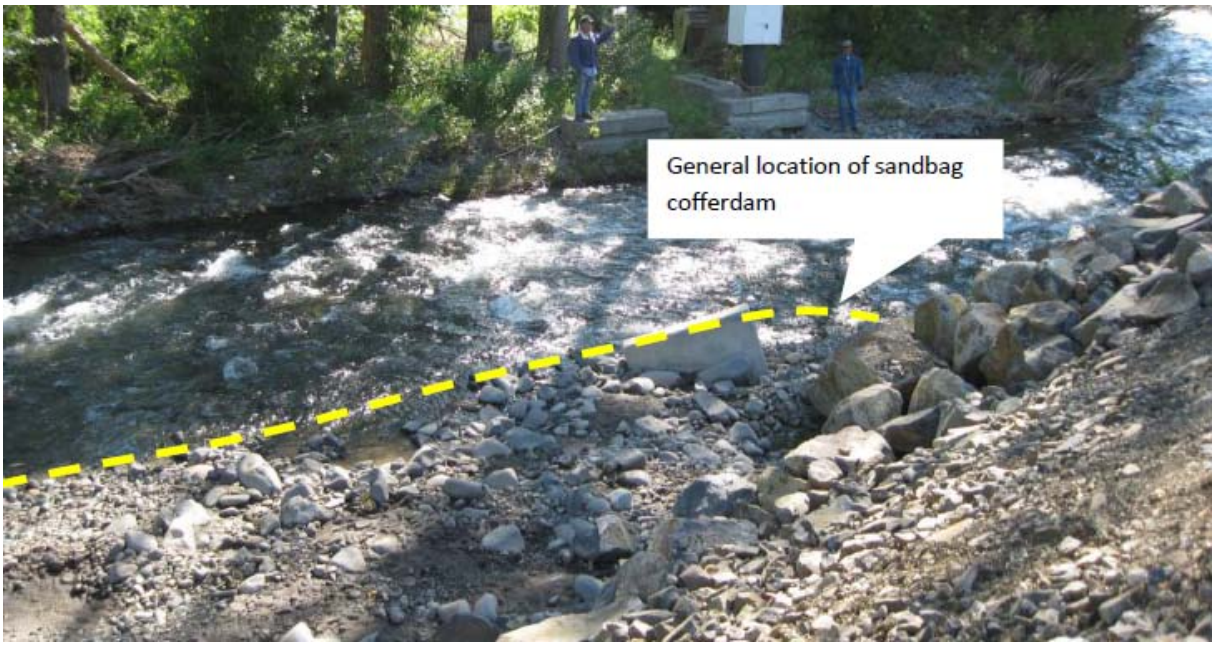

Figure 5. Photograph taken from the top of the revetment looking down on the concrete encasement shown in Figure 2. The general location of the cofferdam is shown.

Figure 6. Bank surrounding the overflow outfall where rock will be placed to protect against further erosion.

In total, approximately 230 cubic yards of new rock will be placed along approximately 75 feet of revetment. Along the toe of the revetment, rock will be placed 2 rocks deep, using 4 foot diameter rock. Rock will be placed up to the top of the revetment, transitioning to 2-3 foot diameter and then 1-2 foot diameter rock as you move up the slope. Turbidity effects from construction are not expected to extend more than 200 feet downstream.

ENVIRONMENTAL BASELINE

Summer Steelhead Trout (*Oncorhynchus mykiss*)

The Middle Columbia River (MCR) Evolutionarily Significant Unit (ESU) of inland steelhead (*Oncorhynchus mykiss*) was listed as "Threatened" by NOAA-Fisheries on March 25, 1999. The MCR ESU includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington (64 FR 14517). Steelhead from the Snake River Basin are excluded from this ESU. Recently the National Marine Fisheries Service (NMFS) has issued its final listing determinations for 10 Distinct Population Segments (DPS) of West Coast Steelhead (71 FR 834). The Middle Columbia River steelhead DPS remained listed as threatened in this document.

General Life History and Yakima River Population Characteristics

Steelhead are phylogenetically and ecologically complex, exhibiting perhaps the most diverse life history patterns of any Pacific salmonid species (Shapovalov and Taft 1954, Barnhart 1986). *O. mykiss* display varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations (Busby et al. 1996).

Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors (NMFS 1996, NMFS 1998). Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat (NRCC 1996). Water diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Loss of habitat complexity, such as reductions in wetlands and deep pools, has contributed to the decline of steelhead (NMFS 1996). Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Dahl 1990, Tiner 1991). Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (Dahl 1990, Jensen et al. 1990, Barbour et al. 1991, Reynolds et al. 1993). In national forests in Washington, there has been a 58 percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (Federal Ecosystem Management Assessment Team (FEMAT). Similarly in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent (FEMAT 1993). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

All steelhead in the Columbia River Basin upstream from the Dalles Dam are summer-run, inland steelhead (Schreck et al. 1986). Life history information for steelhead of this DPS indicates that most Middle Columbia River steelhead smolt at 2 years and spend one, two, or rarely, three years in the ocean (i.e., 1-salt, 2-salt, or 3-salt fish, respectively) prior to re-entering fresh water. Adult steelhead on their spawning migration enter the Columbia River in mid-May and pass over Bonneville Dam between July and August. Summer-run steelhead adults remain up to a year in fresh water prior to spawning.

Middle Columbia River steelhead population size is substantially lower than historic levels, and at least two extinctions are known to have occurred in the DPS. Based on historic estimates, the run size of the MCR DPS could have been in excess of 300,000 fish (Busby et al. 1996) although this figure may be an overestimate since it is largely based on historical estimates of steelhead returns to the Yakima River basin. Other crude estimates, based on the size of the Yakima watershed and salmon and steelhead harvest in the Columbia River (Chapman 1986) lead to lower estimates of historical abundance for the entire MCR DPS. Similarly, there is uncertainty about how many steelhead existed in the Yakima River basin historically. Although run size estimates vary, numerous early surveyors and visitors to the Yakima Basin reported a robust and widespread steelhead population (Bryant and Parkhurst 1950; Davidson 1953; Fulton 1970; NPPC 1986; McIntosh et al. 1990). The Washington Department of Fisheries (WDF 1993) estimated that the Yakima River had annual run sizes of 100,000 steelhead prior to development. However, other historic run size estimates are substantially lower than this figure. For example, Cramer et al. (2003) suggests that production of steelhead in the Yakima River was less than 50,000 fish based on various estimates. Kreeger and McNeil (1993) estimated the historic run of steelhead to the Yakima River was about 20,800 adults based on Columbia River harvest statistics and amount of area the Yakima watershed occupies within the Columbia Basin.

Despite the variation in these historic estimates for the MCR DPS and the Yakima River, all estimates are higher than current abundance levels. Returning adult steelhead are counted and classified as wild or hatchery as they pass the fish ladders at Prosser Dam. Within the Yakima River basin, adult steelhead returns have averaged 1,927 fish (range 505 to 4,491) over brood years 1985-2009 as monitored at Prosser Dam which is downstream of virtually all current spawning locations (RM 47.1; YSPB 2005, 1985-2009 data from Yakima-Klickitat Fisheries Program (YKFP), available at: www.ykfp.org). The relative number and timing of wild adult steelhead returning during the fall and winter-spring migration periods varies from year to year (Reclamation 2000; NPPC 2001). The run is dominated by wild fish, with a hatchery component of 8% over the period of record and 3% between 1999 and 2007. Hatchery releases of steelhead into the Yakima system ceased after 1993 (NPPC 2001); as a result, the proportion of returning spawners at Prosser Dam that are of natural origin has averaged 94% since 1985 and has increased to 99% for the most recent five year period (Figure 7). The ICTRT assumed that hatchery strays were not disproportionately present in any specific populations within the Yakima MPG.

Figure 7 also gives an indication of the variability of recent steelhead returns as measured at Prosser Dam at RM 47.1. At the time of listing (1999), the 10-year average abundance for wild steelhead at Prosser Dam was 933 fish, the majority of which were being produced in a single tributary drainage (Satus Creek). Since then steelhead abundance has increased, with the current 10-year average (1999-2008) being 2,614 adults. Upstream dam, redd and smolt trap counts have also revealed a somewhat wider distribution of steelhead in the Yakima basin than was recognized in 1999.

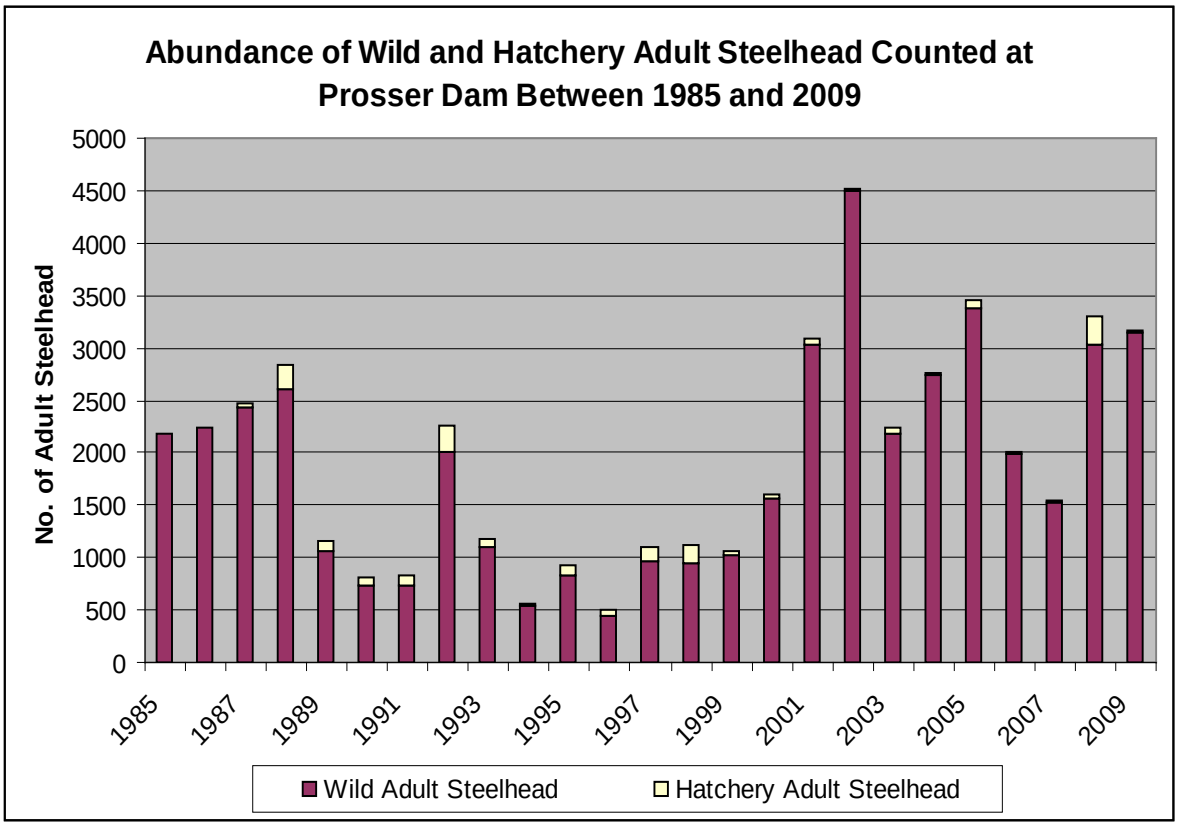

Figure 7. Abundance of both wild and hatchery steelhead adults counted at Prosser Dam (RM 47.1) for brood years 1984-85 through 2008-09.

While at least some adult steelhead movement into the Yakima basin and past Prosser Dam has been documented in every month of the year, the main migration past Prosser Dam occurs from September through April. Passage from the McNary Pool and/or Lower Yakima River past Prosser Dam appears to be driven by flow and temperature cues, with fish generally moving rapidly following increased flow and moderating water temperatures.

Generally, adult MCR steelhead migration into the Yakima basin has a bimodal distribution with peaks in late October and again in late January or early March. Figure 8 indicates the predominant upstream migration timing pattern for adult steelhead into and through the lower Yakima River as measured at Prosser Dam (RM 47.1) between 1994 and 2008. Minimal numbers of adult steelhead pass Prosser Dam during July and August, with numbers beginning to increase in September. Peak passage timing above Prosser Dam occurs in October and November when a combined 50% of the steelhead run occurs at this location. Steelhead abundance over Prosser Dam declines slightly in December and early-January due to the onset of cold water temperatures and low streamflows. Usually by the end of December over 70% of the run has passed Prosser Dam. During this time, about one third of the run holds between McNary Pool in the Columbia River and Prosser Dam in the Yakima River. These fish are thought to be using habitat in both the McNary Pool of the Columbia (where temperatures are lower through the summer) and the lower Yakima River, which cools off faster than the McNary Pool after September 1. The steelhead migration over Prosser Dam resumes in February through April, coincident with behavioral cues related to the spawning run and physical cues associated with increases in water temperatures and streamflows. Adult steelhead migration is essentially completed at Prosser Dam by the end of April.

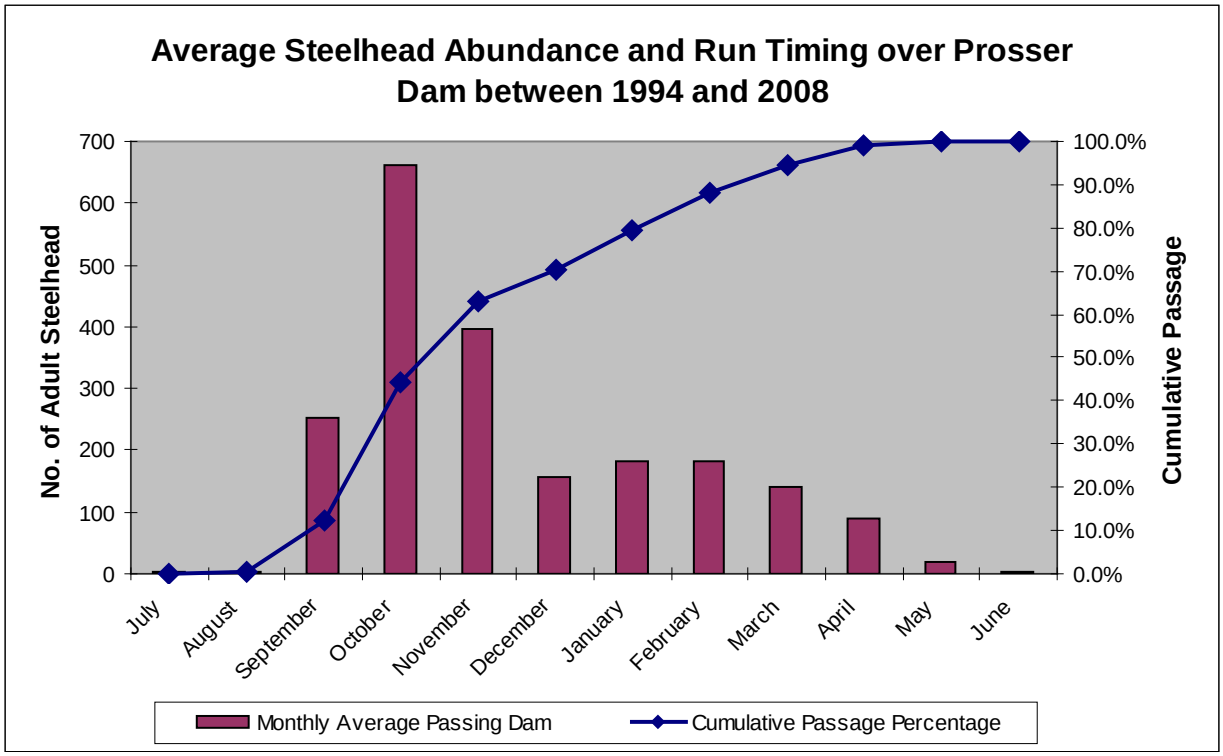

Figure 8. Average steelhead abundance by month and cumulative passage timing of steelhead passing Prosser Dam between 1994 and 2008. Data are from the Yakima Klickitat Fisheries Project (YKFP) website and Haring 2001.

After entry into the Yakima River approximately 60% of adult steelhead over-winter in the mainstem river between Prosser (RM 47.1) and Sunnyside Dams (RM 103.8) while 28% use areas downstream of Prosser Dam for overwintering before moving upstream into tributary or mainstem spawning areas (Hockersmith et al. 1995). The remaining 12% of tagged steelhead from the Hockersmith study were observed overwintering in the Yakima River between Sunnyside Dam and the Naches River confluence. The final upstream migration from mainstem holding or overwintering areas to the spawning grounds begins between January and May, with fish that spawn in lower elevation tributaries generally beginning to move earlier.

The historical distribution of Yakima steelhead is thought to have included all reaches of the Yakima River mainstem and its tributaries that supported spring Chinook salmon (*O. tshawytshca*), as well as many other tributaries (YIN et al. 1990). As steelhead spawners are capable of utilizing smaller streams with steeper gradients than spring Chinook, most accessible permanent streams and some intermittent streams may have once supported spawning steelhead. Currently, Yakima River steelhead are found in nearly all mainstem and tributary reaches, however, access to portions of the headwaters of the Yakima River and some tributaries are blocked by dams and other passage barriers. As a result, anadromous steelhead cannot access the entire Yakima River watershed.

Hockersmith et al. (1995) identified the following spawning populations within the Yakima Basin: upper Yakima River above Ellensburg, Teanaway River, Swauk Creek, Taneum Creek, Roza Canyon, mainstem Yakima River between the Naches River and Roza Dam, Little Naches River, Bumping River, Naches River, Rattlesnake Creek, Toppenish Creek, Marion Drain, and Satus Creek. Of 105 radio-tagged fish observed from 1990 to 1992, Hockersmith et al. (1995) found that well over half of the spawning occurred in Satus and Toppenish Creeks (59%), with a smaller proportion in the Naches drainage (32%), and the remainder in the mainstem Yakima River below Wapato Dam (4%), mainstem Yakima River above Roza Dam (3%), and Marion Drain (2%), a Wapato Irrigation Project drain tributary to the Yakima River. Electrophoretic analyses have identified four genetically distinct spawning populations of wild steelhead in the Yakima Basin: the Naches, Satus, Toppenish, and Upper Yakima stocks (Phelps et al. 2000).

Steelhead spawning varies across temporal and spatial scales in the Yakima Basin, although the current spatial distribution is significantly decreased from historic conditions. Yakima Basin steelhead spawn in intermittent streams, mainstem and side-channel areas of larger rivers, and in perennial streams up to relatively steep gradients (Hockersmith et al. 1995; Pearsons et al. 1996). Typically, steelhead spawn earlier at lower, warmer elevations than higher, colder waters. Overall, most spawning is completed within the months of January through May (Hockersmith et al. 1995), although steelhead have been observed spawning in the Teanaway River (RM 176.1), a tributary to the Upper Yakima into July (Todd Pearsons, Washington Department of Fisheries and Wildlife (WDFW), personal communication).

Steelhead eggs take about 30 days to hatch at 50 degrees Fahrenheit, and another two to three weeks before fry emerge from the gravel. However, time required for incubation varies significantly with water temperature. Fry emergence typically occurs between mid to late May, and early July, depending on time of spawning and water temperature during incubation.

Juvenile steelhead utilize tributary and mainstem reaches throughout the Yakima and Naches Basins as rearing habitat, until they begin to smolt and emigrate from the basin. Smolt emigration begins in November, peaking between mid-April and May. Busack et al. (1991) analyzed scale samples from smolts and adult steelhead and found that the smolt transformation

typically occurs after two years in the Yakima system, with a few fish maturing after three years and an even smaller proportion reaching the smolt stage after one year. When compared to spawning distribution and run timing, these data suggest that various life stages of listed steelhead may be present throughout the Yakima Basin and its tributaries virtually every day of the calendar year.

Water temperatures in the lower Yakima River may contribute to lower survival of smolts and kelts during summer months (Vaccaro 1986; Lichatowich and Mobrand 1995; Lichatowich et al. 1995; Pearsons et al. 1996; Lilga 1998). Steelhead kelts and smolts have been observed at the Chandler Juvenile Enumeration Facility (RM 47.1) into the middle of July, when water temperatures can become lethal. Conditions in the lower Yakima River become suitable once again for salmonids in early fall, near the end of the irrigation season (NPPC 2001).

Upper Yakima River Steelhead Population

Although adult run sizes above Roza Dam are not large, they constitute an important part of the overall MCR steelhead ESU. Since 1985 steelhead abundance in the upper Yakima River above Roza Dam has averaged about 92 to 108 returning adults, depending on the data source analyzed (YKFP website, www.ykfp.org, 2008, Haring 2001, and Columbia River DART website, www.cbr.washington.edu/cgi-bin/dart, 2008. Figure 9, shows the total steelhead run size for the upper Yakima River stock and the number of adults passing Roza Dam for the years 1985 to 2008 from these various data sources.

Data provided in Figure 9 contains some level of inconsistency in data records for the upper Yakima River stock abundance and fish ladder counts at Roza Dam. Most of these inconsistencies occurred as a result of inadequate monitoring of fish passage at the dam prior to 2001 or because of lack of record keeping related to steelhead passage. However, the data from 2001 to the present is considered to be the most accurate because more detailed record keeping and specific monitoring activities for anadromous steelhead passage at Roza Dam has taken place at the Yakama Nation adult counting facility during this time period.

For run years 1993 to 2005, Roza Dam counts were incorporated into abundance estimates for the Upper Yakima population by the YBFWRB. During the Hockersmith study, some radio tagged steelhead were tracked to the mainstem Yakima River below Roza Dam but above the confluence with the Naches River. To account for possible spawning below Roza Dam, the year-specific counts at Roza Dam were averaged with corresponding estimates based on the 1990-92 radio telemetry proportion returning to the Upper Yakima (YBFWRB 2008).

As indicated by the Hockersmith et al. (1995) study, only a small percentage of steelhead that enter the Yakima basin each year migrate to habitat areas in the upper Yakima River upstream of Roza Dam. For example, only 3% of all adult steelhead that were tagged and monitored for migration timing and distribution during the three year long Hockersmith study (1989-1992) were radio-tracked to areas upstream of Roza Dam. More recent data on steelhead abundance and distribution within the Yakima basin indicate that only between 3.8 and 7.5% of all steelhead entering the Yakima basin migrated into the upper Yakima River above Roza Dam between 2001 and 2009 (Table 1).

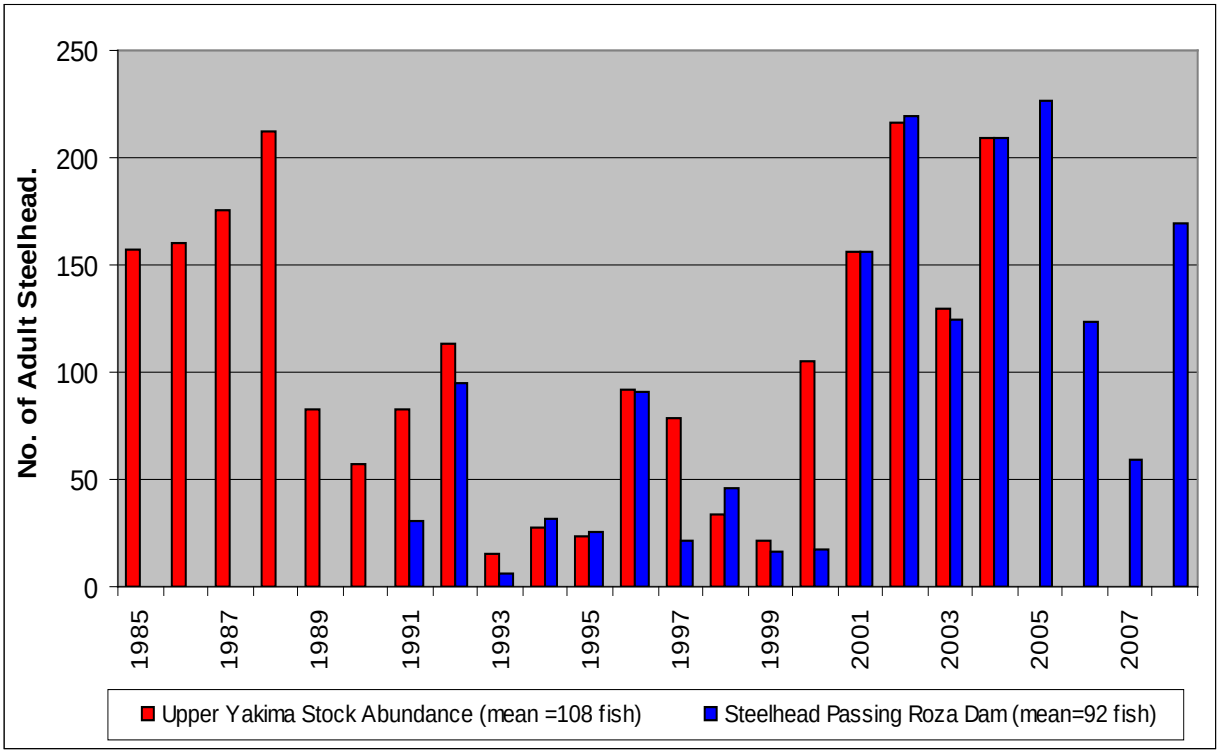

Figure 9. Abundance of the Upper Yakima River stock and total number of steelhead passing Roza Dam (RM 127.9) between 1985 and 2008. Data are from the Yakima Klickitat Fisheries Project (YKFP) and Columbia River DART websites and from Haring 2001.

Table 1. Abundance of steelhead passing Prosser Dam (RM 47.1) and Roza Dam (RM 127.9) indicating the percentage of fish utilizing the upper Yakima River for brood years 2000-2009.

Brood Year	Number of Steelhead Passing Prosser Dam	Number of Steelhead Passing Roza Dam	Percent of Total Run Above Roza Dam
2000-2001	3,089	139	4.5%
2001-2002	4,525	236	5.2%
2002-2003	2,235	133	5.9%
2003-2004	2,755	209	7.5%
2004-2005	3,425	227	6.6%
2005-2006	2,005	123	6.1%
2006-2007	1,540	59	3.8%
2007-2008	3,310	169	5.1%
2008-2009	3,450	204	5.9%

Annual monitoring of steelhead passage upstream of Roza Dam at the Yakama Nation adult counting facility as well as data collected for the radio tracking study have provided new and important information on the timing of steelhead migrations into the upper Yakima River basin. For example, of the 669 wild adult steelhead that ascended the Roza Dam fish ladder from fall 2002 to spring 2006, the vast majority showed a peak arrival time of March and April, but could occur anytime between September and late June (Reclamation 2003; Reclamation 2005;

Reclamation 2009). The number of adult steelhead ascending the Roza Dam ladder during the winter period between 1996 and spring of 2008 were distributed in the pattern exhibited in Figure 10. Eighty-eight percent of steelhead passage past Roza into the Upper Yakima occurs in March, April and May with the remaining 12% scattered from September through February. This migration timing information coincides well with the existing spawn timing information for the upper Yakima River and tributaries which suggests that spawning occurs from late April through early June, with a peak in May (NPPC 2001, Reclamation 2009).

Specific information regarding steelhead distribution within the upper Yakima River has not been well understood despite the early radio tracking work of Hockersmith et al. (1995). However, the recent steelhead radio-tracking studies in the upper Yakima River basin (above Roza Dam) that were conducted by Reclamation and the Yakama Nation

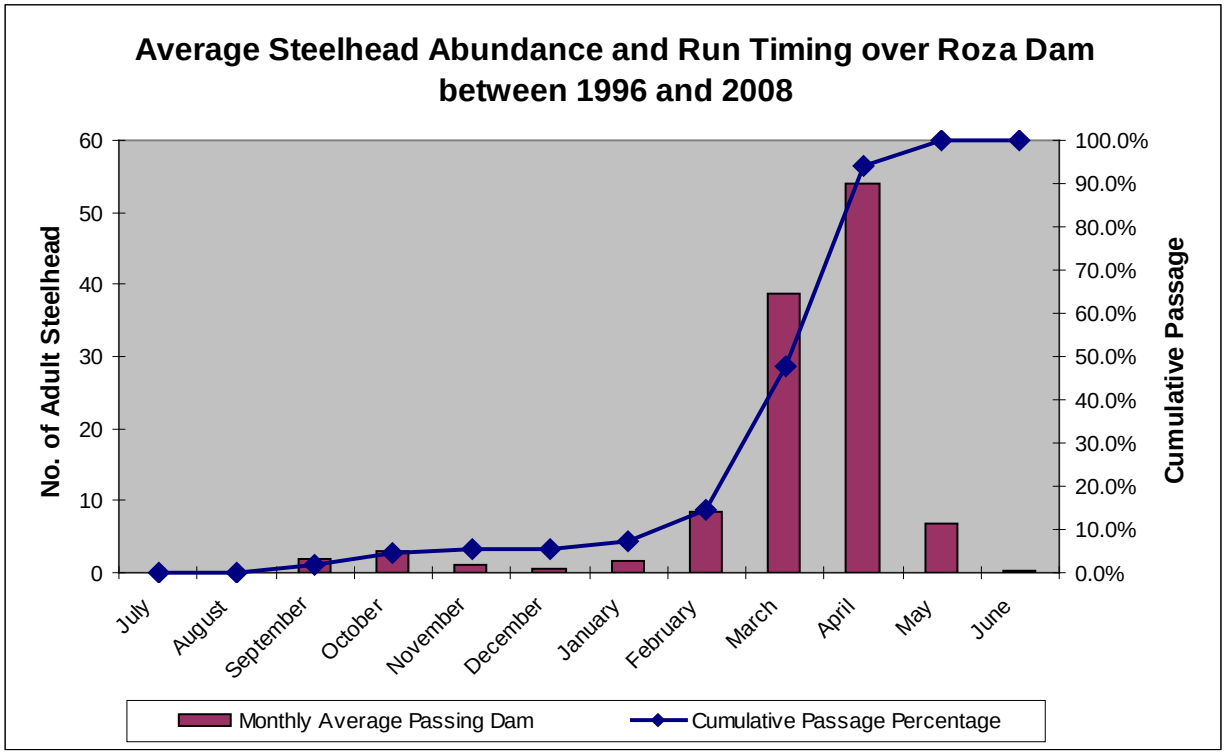

Figure 10. Average steelhead abundance by month and cumulative passage timing of steelhead passing Roza Dam between 1996 and 2008. Data are from the Yakima Klickitat Fisheries Project (YKFP) website.

between 2002 and 2006, have provided detailed information on the distribution patterns of adult steelhead in the upper Yakima River basin (Reclamation 2003, Reclamation 2009). These recently completed studies indicate that steelhead are migrating to and spawning in the Yakima River mainstem as well as in several major tributary systems of the upper Yakima River (Reclamation 2009).

Between 2002 and 2006, 351 wild adult steelhead were tagged with Lotek Inc. radio tags and were subsequently tracked to their presumed spawning location within the upper Yakima basin (Reclamation 2009). Of these, most (98.3%) moved upstream following release, and 62% moved into tributaries to spawn (Table 2). Upper Yakima River steelhead primarily migrated into the Teanaway River, Swauk and Taneum Creek watersheds, and the mainstem Yakima

River between Roza Pool and Easton Dam during the spawning season. The lower Cle Elum River, Umtanum Creek, Naches River, and Wilson-Cherry Creek watersheds were used less frequently by radio-tagged steelhead (Table 2).

Table 2. Summary of wild steelhead movements for 351 steelhead tagged at Roza Dam and tracked to upstream locations between 2002 and 2006.

Location of Upstream Migration and Presumed Steelhead Spawning	Number of Radio-tagged Steelhead
Mainstem Yakima River	133 (38.2%)
Total Mainstem Spawning	**133 (38.2%)**
Teanaway River	137 (38.8%)
Swauk Creek	46 (13.0%)
Taneum Creek	17 (4.8%)
Cle Elum River	12 (3.4%)
Lower Naches River, Umtanum Creek, Cherry/Wilson/Naneum Creeks	6 (1.7%)
Total Tributary Spawning	**218 (61.8%)**

Of all 351 adult steelhead tagged during the four year radio-tracking study, 133 or 38.2% of the total fish tagged, were tracked to mainstem Yakima River spawning areas. The percentage of fish that used mainstem reaches varied from 34 to 45% of fish tagged in any specific year. Although steelhead use of the mainstem Yakima River was concentrated between Umtanum Creek (RM 139.8) and the confluence with the Cle Elum River (RM 186.5), steelhead were observed using all mainstem areas from Roza Dam to approximately Easton Dam (RM 202.5). The upper extent of steelhead migration in the Yakima River was observed to be as far upstream as the base of Easton Dam where at least three steelhead were tracked during three years of the study. However, it was uncertain if these fish ascended the ladder and moved farther upstream to spawn or reached the fish ladder and moved downstream shortly thereafter. It appears from both radio-tracking information as well as Easton Fish Ladder video and acoustic counts (VAKI Counter) that steelhead do not routinely migrate to habitat areas above Easton Dam (Reclamation 2009; Steve Hiebert, Reclamation, personal communication, 2006).

Presumed and observed tributary spawning areas in the upper Yakima River basin included the Teanaway drainage (mainstem and all three forks), Swauk Creek, Taneum Creek, lower Cle Elum River, Umtanum Creek, and the Wilson Creek, Cherry Creek, and Naneum Creek systems near Ellensburg. The Teanaway River system and Swauk Creek were the most consistently used tributary spawning areas as indicated by the radio-tracking study (Reclamation 2008). For example, the Teanaway River drainage was the most heavily used tributary during the spawning season and was the destination of 39% of all fish radio-tagged at Roza Dam over the entire four year steelhead tracking study (Table 2). Tagged fish were found as far as 20 miles upstream in the North Fork Teanaway River, including one mile up Stafford, Standup, and Jack Creeks; and at least 5 miles upstream in both the Middle and West Forks of the Teanaway River. At least 20 radio-tagged male-female pairs were located throughout the system including one pair in the West Fork Teanaway River.

Forty-six steelhead (13% of all tagged fish) used the Swauk Creek system, moving upstream at least 20 miles to the Swauk Creek campground. Steelhead were observed using both First and Williams Creeks in the Swauk Creek drainage; migrating at least one mile up each tributary. A total of 17 adult steelhead used Taneum Creek, some moving upstream at least to the Taneum Creek campground at RM 9.0. Most (82.4%) ascended the Bruton Diversion Dam fish ladder (about 1.6 miles) and more than half of these moved above the Taneum (RM 2.4) and Knudsen Diversions (RM 3.0). Three male-female pairings of steelhead were observed together in the middle and upper reaches as a result of the radio-tracking study.

Finally, at least twelve wild steelhead were radio-tracked into the lower few miles of the Cle Elum River, two fish moved at least four miles into Umtanum Creek, and three steelhead moved about two miles into the Wilson Creek drainage (including Naneum and Cherry Creeks). Four fish radio-tagged at Roza Dam moved downstream following release and were tracked to a location about five miles into the lower Naches River and into Cowiche Creek, a Naches River tributary.

Taneum Creek Fish Populations and Habitat Conditions

Taneum Creek historically supported anadromous runs of spring Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*). Bryant and Parkhurst (1950) report that the stream supported good runs of coho and spring Chinook prior to the construction of Taneum Ditch in 1910. Current use of Taneum Creek by coho salmon is largely unknown, however this species is likely to occur in the lower section of the creek especially since reintroduction efforts have been and continue to occur in the upper Yakima River by the Yakama Nation. This creek also continues to support small runs of spring Chinook and steelhead trout spawning and rearing into both forks.

In addition to anadromous salmon and steelhead, Taneum Creek also currently supports resident populations of cutthroat trout (*O. clarki*), rainbow trout (*O. mykiss*), brook trout (*S. fontinalis*), and various species of shiners, dace and sculpin (WDFW 1993). Taneum Creek may have historically supported a resident or fluvial population of bull trout, however, this species has not been observed in the drainage since 1989 (Teske 1994).

Taneum Creek is considered to have substantial potential for producing steelhead and spring Chinook, and coho to a lesser degree (Haring 2001, YIN 1990). As part of the Yakima River Sub-basin Salmon and Steelhead Production Plan, guidelines were developed to reestablish anadromous salmonid fish stocks (YIN 1990). Carrying capacities were estimated for the Taneum drainage based on full implementation of the Production Plan. Carrying capacity estimates of 74,179 smolts and 295 adult spring Chinook, and 21,840 smolts and 213 adult summer steelhead were reported for the Taneum Creek drainage.

Recent steelhead radio-tracking studies in the upper Yakima River basin conducted by Reclamation and the Yakama Nation indicate that tagged steelhead are entering and spawning in Taneum Creek (Reclamation 2003, Reclamation 2009). In 2003, one steelhead moved about 2.5 miles up Taneum Creek past the Bruton Diversion Dam and was tracked to its presumed spawning location just downstream of the Taneum fish ladder. Low flows in the creek during the spawning migration may have precluded upstream passage through this facility. In 2004, seven steelhead were tracked into Taneum Creek (Cathy Karp, personal communication, Bureau or Reclamation, 2006). Six of these steelhead migrated upstream of the Taneum fish ladder, while the remaining fish stayed in the lower section of the creek below the Bruton fish ladder.

Radio tagged steelhead entered the creek and migrated above both diversion dams after instream flows improved due to increases in natural spring runoff. In 2003, the single steelhead recorded in Taneum Creek migrated into the Taneum watershed on April 28th and remained in the creek until May 16th at which time it moved downstream to the Yakima River. The preliminary steelhead tracking data analyzed for 2004 indicates that the seven steelhead that entered Taneum Creek did so between late March (March 25 and 29th) through mid April (April 1, 5, 9, and 12th). Most of the 2004 fish moved out of the system by late April or May (Cathy Karp, Bureau of Reclamation, personal communication, 2005).

Knowledge of resident and anadromous salmonid and non-game fish population densities and stability within the Taneum watershed is very limited. Few presence/absence or population density surveys have been conducted to document fish communities in the drainage to date. However, information from the studies that have been conducted on Taneum Creek indicate that fish populations are relatively diverse and abundant compared to other upper Yakima River west bank tributaries. Salmonid population densities in Taneum Creek were the highest of ten upper Yakima tributaries that were evaluated by Pearsons et al. (1993).

Channel conditions are generally rated as fair in the Taneum Creek watershed (Teske 1994, USFS 1996). Instream cover, in the form of large woody debris and boulders, is abundant on the NF and SF, except where LWD was cleaned out of the channel as part of past logging activities. The moderately steep gradient in the lower reaches tends to limit pool frequency, resulting in the habitat being relatively more suitable for steelhead than coho (YIN1990). Substrate in the moderately steep lower reaches is composed primarily of large and small cobbles. However, patches of good gravel are numerous and are more than adequate to satisfy steelhead, spring Chinook and coho salmon spawning needs (Haring 2001, YIN 1990).

The lower eight miles of the mainstem Taneum Creek (downstream from the Wenatchee National Forest boundary) are identified as core summer salmonid habitat for its aquatic life designated use. Tributaries to Taneum Creek from its mouth to the Wenatchee National Forest boundary are designated as salmonid spawning, rearing, and migration habitat. Taneum Creek, SF Taneum Creek, and Lookout Creek (a tributary to Taneum Creek) are on the Clean Water Act 303(d) impaired water quality list for water temperature, and the lower reaches of the mainstem are listed for non-compliance with instream flows. Maximum summertime water temperatures in the lower sections of Taneum Creek can occasionally approach 70ºF (NPPC 2001), but these episodes are brief, diurnal fluctuations are large, and excessive temperature is not believed to be a serious problem. Water temperature is likely exacerbated by low instream flows (Haring 2001).

The major constraints on salmonid production in Taneum Creek include very low summer and fall flows in the lower section of the creek (downstream of the major diversions), and, before recent fish passage restoration efforts, adult fish passage barriers during low flow periods (Haring 2001). Approximately 85% of the natural flow of Taneum Creek is appropriated for irrigation. As a result, the lower portion of the creek is heavily diverted, with 3 irrigation diversions in the lower 3.5 miles. Low flows in the lower 2.4 miles of Taneum Creek in the late summer can preclude anadromous salmon access to good spawning habitat upstream (YIN 1990, WDFW 1993). Fishways and screens were installed on all Taneum Creek diversions by 1990. In 2009 the Bruton Dam was removed and replaced with a roughened stream channel, and in 2011 a fish passage channel was installed at the TCC dam.

Instream flow is considered to be the most significant irrigation related problem in Taneum Creek. Stream flow problems are especially critical during the late summer and fall period for salmon species (spring Chinook and coho) and during the winter period for steelhead. Flows are needed for upstream migrants and to ensure adequate spawning and rearing habitat. Flow also influences water quality. Fluctuations in flow can have detrimental affects of stranding fish and dewatering redds or displacing fish to less suitable habitats. Water quality problems affecting upper Yakima River fish populations include sedimentation caused by increased silt loads and elevated water temperatures.

In 1994, an agreement was reached involving the Bureau of Reclamation, the Kittitas Reclamation District, WDFW, and the Yakama Nation, transferring up to 20 cfs, when available (typically available in the spring, not available in the summer through late August, and available in September), from the Yakima River through the KRD canal to enhance instream flow in the lower reaches of Taneum Creek (Reclamation 2000). Consequently, the ability for adult salmonids to access the watershed upstream of RM 1.6, and the ability of juvenile salmonids and smolts produced in the upper watershed to safely migrate out of Taneum Creek has only recently been accommodated.

Yakima River Basin Steelhead Critical Habitat

The final rule designating critical habitat for 12 Evolutionarily Significant Units (ESUs) of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho was published in the Federal Register on September 2, 2005, and became effective on January 2, 2006 (70 Fed. Reg. 52630). This rule designated over 20,630 miles of lake, riverine, and estuarine habitat in Washington, Oregon, and Idaho, as well as approximately 2,312 miles of marine nearshore habitat in Puget Sound, Washington. Critical habitat within the Middle Columbia River (MCR) steelhead DPS was designated as part of this Federal Register final rule notification, including the entire mainstem Yakima River from the confluence with the Columbia River to the upstream limits of migration at storage dams or tributary headwater streams.

Critical habitat for steelhead in the Yakima River and in Taneum Creek consists of primary constituent elements (PCEs) that support steelhead spawning, freshwater rearing, and migration habitat (NMFS 2004, 70 Fed. Reg. 52630). NMFS has determined that critical habitat PCEs exist in the Upper Yakima and Naches Rivers as well as several tributaries (including Taneum Creek) and that these PCEs are currently providing an acceptable level of protection that will contribute to the conservation of steelhead populations in this area (NMFS 2004). Despite the altered flow regime in the Yakima River, presence of the several diversion dams, and lack of general channel structure and stream complexity in the mainstem Yakima River and most tributaries, it is believed that streamflows and habitat conditions in the Yakima River currently support critical habitat PCEs for steelhead spawning, rearing, and migration.

EFFECTS DETERMINATION

Effects to Steelhead

Due to the complex and diverse life history characteristics exhibited by steelhead and resident rainbow trout (*O. mykiss*), it is likely that at least one life history stage (adult, egg, fry, juvenile, and smolt) will be present in the project vicinity during all times of the year. The proposed project timing occurs during the summer base flow period between mid-July to mid-September, 2010 and avoids conflicts with as many life history forms as possible. Adult steelhead spawning

will have been completed by the construction period, so adults should not be in the vicinity of the project area during construction. Similarly, proposed project timing should occur after the steelhead egg incubation period, preventing impact to any redds sited downstream of the project area. It is likely that juvenile steelhead will be present in the project area vicinity during the proposed project.

Juvenile steelhead (i.e. mixture of young-of-the-year, 1+, and 2+ fish) are likely to be present within and in the vicinity of the proposed project area during the construction period. Steelhead fry and juveniles will be using this section of Taneum Creek for rearing and cover habitat. These fish are likely to be the most vulnerable life history stages affected by the proposed action due to their small size and distribution within the project area. Potential impacts to juvenile steelhead include: mechanical injury from equipment; stress or injury from turbidity; and changes in habitat condition.

The most significant step to avoid impacts to juvenile steelhead is to completely isolate the project area from Taneum Creek. In the vicinity of the fish bypass, where significant excavation will be required to dig out the damaged pipe, the area enclosed by sandbags will be dry at the time of construction. In the vicinity of the overflow channel, there may be surface flow immediately adjacent to the bank where rock is to be placed. This water, if present at all, is expected to be very shallow (0.5 – 1 inch deep) and does not constitute the main flow along that stretch of river. In addition to isolating the work area, potential impacts will further be avoided by ensuring that all necessary work is conducted from the left stream bank and that heavy machinery will not need to enter the stream. Finally, rocks will be placed by the excavator, rather than end-dumped along the revetment. Given measures to taken to isolate the work area and the fact that heavy machinery will not enter the stream channel, mechanical injury to steelhead juveniles is discountable.

Isolating the work area will also help to avoid sedimentation effects downstream of the project as rocks and gravel material are removed by construction equipment. In addition to placing a sandbag coffer-dam, any water in the work area (anticipated to be contributed by subsurface flow) will be pumped out and deposited in the riparian area of the left streambank. While the placement and removal of the sandbags will mobilize some fine sediment, given both the scale of the impact and the low flows at the time of construction, any elevation in suspended sediment is expected to be modest and limited to a distance of less than 200 feet downstream of the project area. Since sediment will primarily be mobilized during the installation and removal of the sandbags, increases in suspended sediment levels will be of only a short duration. Finally, construction activities will not increase long-term sediment loading to the creek. The construction area is currently a highly modified rock revetment with little to no vegetation. Rock armoring that is removed to unearth the bypass pipe will be replaced. Any new rock placed will be an extension of current rock armoring. Due to these measures to minimize sediment inputs to the stream, impacts to rearing steelhead from elevated sediment levels associated with construction are discountable.

As previously mentioned, the revetment that composes the left bank of Taneum Creek along this stream reach, and separates the creek from Taneum Canal, is highly modified and currently characterized by a large amount of armoring. Additional rock placed to protect the fish bypass outfall and overflow outfall is located in an area that is already simplified and lacking developed riparian habitat. New rock placed around and keyed into the bank by the overflow outfall will only impact a small amount of immature vegetation, and is strategically placed to both provide

the needed protection to the outfall while also avoiding the more heavily vegetated area located just upstream of the project area.

Although juvenile summer steelhead are known to utilize Taneum Creek within the project area and may be present within the project area during proposed maintenance activities in the mid-July through mid-September period, impacts from excavating the revetment, repairing the pipe, and placing new rock will be minimized by isolating the work area, conducting necessary work from the revetment, and individually placing rock rather than end-dumping it. Furthermore, neither instream nor riparian habitat will be fundamentally changed by this project. Any potential effects are considered to be very low intensity, localized, and short-term. Further, a permanent bypass will be restored by this project. This bypass is particularly crucial because during the summer irrigation months, nearly the entire flow of Taneum Creek is diverted for irrigation. Because of these factors **Reclamation has determined that the project may affect, but is not likely to adversely affect steelhead in Taneum Creek.**

Effects to Steelhead Critical Habitat

Freshwater spawning, freshwater rearing, and migration PCEs have been identified for critical habitat associated with the proposed project. Effects to these PCEs can be characterized as short-term construction impacts or longer-term impacts that will persist beyond construction. Increased turbidity related to construction impacts may affect the freshwater rearing PCEs. However, these impacts will be of very low intensity, only affect a small section of Taneum Creek and for only a short duration in time. The longer-term impacts will generally be insignificant or beneficial to steelhead PCEs present in the project area. While additional rock will be added to the revetment, only a very small amount of immature riparian habitat will be disturbed and neither instream nor riparian habitat will be fundamentally changed. Therefore, this project will have no significant will impact on floodplain connectivity or instream complexity. The most significant benefit of the project will be restoring permanent passage at the bypass, which will support the freshwater rearing and migration PCE. Critical habitat PCEs supporting adult migration may be temporarily affected while construction activities occur. However, when construction activities stop, rearing habitat and migratory conditions will be maintained. Furthermore, no steelhead spawning habitat will be adversely modified in the localized project area or in downstream areas as a result of the proposed action. **Reclamation therefore concludes that the proposed project may affect, but is not likely to adversely affect steelhead critical habitat in Taneum Creek.**

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