WELLS BULL TROUT MONITORING AND MANAGEMENT PLAN
2005 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

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ABSTRACT

The goal of the Wells Bull Trout Monitoring and Management Plan (WBTMMP) is to monitor and evaluate bull trout (*Salvelinus confluentus*) presence in the Wells Project and to quantify potential project-related impacts on bull trout. The plan has four main objectives.

The first objective of the plan is to, "identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout." In order to meet the first objective of the WBTMMP, Douglas PUD implemented a bull trout telemetry program to monitor upstream and downstream passage and implemented an experimental off-season bull trout counting program during the winter of 2004 and 2005. In total, six adult bull trout were trapped in the Wells Dam fishway, radio-tagged, and released upstream of the dam. None of the radio tagged fish passed downstream through the dam after being released. All six traveled upstream into the Methow River. Travel time from release to Methow entry ranged from 7 hours to 12 days. At the time of writing, at least five of the six bull trout were still in the Methow River. There is evidence that one fish may have moved back into the Wells Reservoir on 10 Nov 2005, but this fish was not detected passing the dam, nor was it detected during a 23 Dec 2005 mobile survey of the reservoir. To date, none of the bull trout radio-tagged in 2005 have migrated downstream through Wells Dam. Video monitoring of the Wells Dam fishways for the 2004-2005 winter period (November 16, 2004 to April 30, 2005) found no adult bull trout utilizing the fishway during the off-season.

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout. To this end, sub-adult bull trout were PIT tagged opportunistically when encountered during standard fish sampling operations at the Project or during tributary trapping activities. To date, 16 sub-adult bull trout have been PIT-tagged. Video monitoring of the Wells Dam fishways for the 2004-2005 winter period (November 16, 2004 to April 30, 2005) found no sub-adult bull trout utilizing the fishway.

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of the Wells Reservoir. In 2005, this objective was addressed by the collection of high resolution bathymetric information of Well Project waters. This data, combined with Wells inflow patterns, reservoir elevations, and backwater curves will allow the District to begin identifying areas of potential sub-adult bull trout entrapment in 2006.

The fourth objective was to identify the Core Areas and Local Populations of those bull trout that utilize the Wells Project. To date, six genetic samples have been collected from adult bull trout during radio-tagging operations at Wells Dam. Additionally, Douglas PUD also provides funding for genetic sampling (including PIT tagging) of bull trout captured from smolt trapping operations at locations outside of the Wells Project boundary on the Twisp and Methow rivers (up to 10 genetic samples per location). Sixteen genetic samples were collected from these off-Project operations for a total of 22 samples collected in 2005. These samples will be analyzed and compared to genetic baseline data by the US Fish and Wildlife Service (Service). The Core Area associated with all six radio-tagged bull trout was the Methow River. As eight local populations have been identified as using the Methow River Core Area, the precise locations

obtained from the Service's aerial surveys will be helpful in assessing which local bull trout populations are utilizing the Wells Project.

The Wells Bull Trout Monitoring and Management Plan is a three year plan initiated in 2005 and continuing until 2008. This report represents the results after one year (2005) of monitoring.

1.0 INTRODUCTION

In August 1993, Douglas, Chelan, and Grant Public Utility Districts (collectively, "Mid-Columbia PUDs") initiated discussions to develop a long-term, comprehensive program for managing fish and wildlife that inhabit the mid-Columbia River basin (the portion of the Columbia River from the tailrace of Chief Joseph Dam to the confluence of the Yakima and Columbia rivers).

These discussions first explored the possibility of developing an ecosystem-based plan for managing fish and wildlife resources inhabiting the mid-Columbia River basin, but because of the immense breadth of this type of plan the negotiating parties decided to focus on an agreement for aquatic species inhabiting the mid-Columbia River basin including fish, plants and animals. After extensive review, the negotiating parties further concluded, given the likelihood that certain species of salmon and steelhead would be listed in the near future under the Endangered Species Act (ESA) and given the lack of information regarding the other aquatic species, that the best basin-wide approach would be to develop an agreement for anadromous salmonids, specifically: spring, summer/fall Chinook salmon (*Oncorhynchus tshawytsha*); sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and steelhead (*O. mykiss*) (collectively, "Plan Species") which are under the jurisdiction of the National Marine Fisheries Service (NMFS).

On July 30, 1998, following five years of negotiations, Public Utility District No. 1 of Douglas County (Douglas PUD), which operates the Wells Hydroelectric Project (Project), submitted an unexecuted form of an Application for Approval of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (the "HCP Agreement") to the Federal Energy and Regulatory Commission (FERC) and to NMFS. Furthermore, to expedite the ability of FERC to complete formal consultation, biological evaluations of the effects of implementing the Habitat Conservation Plan (HCP) on listed species under the jurisdiction of the US Fish and Wildlife Service (Service) were prepared by Douglas PUD.

In a letter to FERC, the Service requested consultation under Section 7 of the ESA regarding the effects of hydroelectric project operations on bull trout (*Salvelinus confluentus*) in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the Service, FERC noted that there was virtually no information on bull trout in the mainstem Columbia River.

On December 10, 2003, the Service received a request from FERC for formal consultation to determine whether the proposed incorporation of the HCP Agreement into the FERC license for operation of the Wells Hydroelectric Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the Service submitted a Biological Opinion (BO) and issued an Incidental Take Permit (ITP) to Douglas PUD. On June 21, 2004, FERC issued an order incorporating the HCP Agreement and the bull trout BO into the FERC license for the Wells Project. This was the beginning of the Wells Bull Trout Monitoring and Management Plan (WBTMMP).

2.0 STUDY GOAL

The goal of the WBTMMP is to monitor and evaluate bull trout presence in the Wells Project and quantify and address, to the extent feasible, potential impacts on bull trout from Project operations and facilities. The plan is designed specifically to (1) address ongoing project-related impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the Service's draft bull trout recovery plan; and (3) monitor and minimize the extent of any incidental take of bull trout consistent with Section 7 of the Endangered Species Act.

The WBTMMP has four main objectives, specifically to (1) identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout; (2) assess similar impacts on sub-adult bull trout; (3) investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir; and (4) identify which Core Areas and Local Populations of bull trout utilize the Wells Project.

This report is divided into four parts. The first section consists of background information outlining the Plan's origin. The second section provides a brief description of bull trout biology, life history, and their status under the Endangered Species Act. The third section provides a description of the Wells Project study site including background regarding previous bull trout studies at Wells Dam. The fourth section describes the strategies used by Douglas PUD to address the four objectives of the plan, the methods used, the results observed to 31 Jan 2006, and a brief discussion of ongoing and future work.

3.0 BULL TROUT BIOLOGY AND STATUS

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and east to western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the McKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are members of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. However, genetic analyses indicate that bull trout are more closely related to an Asian char (*S. leucomaenis*) than to Dolly

Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as cold water, complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The resident, fluvial and adfluvial forms exist throughout the range of the bull trout (Rieman and McIntyre 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Volk 2000; Mongillo 1993). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems. Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes (Riehle et al. 1997). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993) and areas with cold hyporheic zones or groundwater upwellings (Baxter and Hauer 2000).

3.1 Bull Trout Status

On June 10, 1998, the Service listed bull trout within the Columbia River basin as threatened under the Endangered Species Act (50 CFR 63(111). Later (November 1, 1999), the Service listed bull trout within the coterminous United States as threatened under the ESA (50 CFR 64(21)). The Service identified habitat degradation, fragmentation and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (50 CFR 63(111):31657). The Service believes many populations are now isolated and disjunct.

In October 2002, the Service completed the first draft of a bull trout recovery plan intended to provide information and guidance to lead to recovery of the species, including its habitat. Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the Service adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002).

The first tier addressed broad aspects of bull trout recovery that apply at the level of Distinct Population Segments. The Service identified the Columbia River, Coastal-Puget Sound, St. Mary-Belly River, Jarbidge River, and the Klamath River as Distinct Population Segments. The second tier addressed bull trout recovery in smaller areas, such as specific river basins or collections of river basins within population segments, termed "recovery units." There are 22 recovery units in the Columbia River, 1 in the Klamath River, 1 in the Jarbidge River, 1 in the St. Mary-Belly River, and 2 in the Coastal-Puget Distinct Population Segment (USFWS 2002).

The State of Washington contains the Coastal-Puget Sound Distinct Population Segment and is a part of the larger Columbia River Distinct Population Segment. In total, there are 9 recovery units within the state; the Olympic Peninsula, Puget Sound, Lower Columbia River, Middle Columbia River, Upper Columbia River, Northeast Washington, and portions of the Snake River, Umatilla-Walla Walla River and Clark Fork River Recovery Unit.

The Wells Project is situated within the Upper Columbia River Recovery Unit and the Service has identified the Wenatchee, Entiat, and Methow rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Sixteen local populations were identified in the Wenatchee (6), Entiat (2) and Methow (8) core areas (USFW 2002).

4.0 STUDY AREA

The Wells Hydroelectric Project is located on the mainstem Columbia River at RM 515.8. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from Wells Dam. The dam spans 4,460 feet, with the hydro-combine structure (spillway, turbine and fishways combined into one structure) comprising 1,130 feet. Wells Dam is a 185 foot high concrete gravity dam completed in 1967. The reservoir formed by the Project extends upstream 29.5 miles past the cities of Pateros, Brewster and Bridgeport and up to the Army Corps of Engineer's Chief Joseph Dam, totaling 331,200 acre feet of water, and having a surface area of 9,740 acres at the normal pool elevation of 781 feet above msl.

The Project includes a spillway, powerhouse, an earthen embankment section, a juvenile bypass system and two adult fishways. The spillway consists of 11 spillway gates with a combined capacity of 1,180 kcfs. The powerhouse has 10 Kaplan turbine units, equipped with minimum gap turbine runners to increase protection for juvenile salmonids during turbine passage, with a combined hydraulic capacity of 205 kcfs and a peak generating capacity of 840,000 kW of electricity. The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, adult count station, trapping facilities and an exit in the forebay. The juvenile bypass system utilizes

five of the existing spill bays and consists of five evenly spaced surface collector entrances that guide fish into and through the juvenile bypass system and into the tailrace of the dam.

4.1 Previous Bull Trout Study at Wells Dam

Columbia River bull trout have been observed and counted at Wells Dam since 1998. In 2000 the Service requested that the mid-Columbia PUDs evaluate the status of bull trout in their respective project areas. This request was due to the potential for operations at the mid-Columbia PUD dams to affect the movement and survival of bull trout. At that time, little was known about the life-history characteristics (e.g., movements, distribution, habitat use, etc.) of bull trout in the mid-Columbia River. Therefore, in order to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD (Grant, Chelan and Douglas PUDs) radio-telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River. The number of bull trout collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

Bull trout at Wells Dam were trapped at the brood-stock collection facility located within the left bank fish ladder. Bull trout > 40 cm were anesthetized, weighed, measured and radio tags were inserted into the peritoneal cavity using surgical procedures similar to those described in Summerfelt and Smith (1990). After recovery from sedation, the fish were released. In order to increase the sample size of fish ascending the ladder system, half of the radio-tagged fish were released downstream of the dam. The remaining radio-tagged fish were released upstream from the dam, as close to the dam as possible, yet outside of the influence of the forebay hydraulics (including spill and bypass entrainment flows). A combination of aerial and underwater antennas were deployed in order to document the presence of bull trout at the Project, identify passage times and determine their direction of travel (upstream/downstream). Additional telemetry systems were deployed to monitor behavior in the fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually in 2001, 2002 and 2003, allowing the route of passage to be determined as well as the exact time of entrance and exit from the ladder system. English et al. (1998, 2001) provided a detailed description of the telemetry systems at each of the dams and within the tributaries. To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial surveys were conducted on the reservoir and throughout both watersheds (see English et al. 1998, 2001).

The key findings of these previous studies were:

- Total upstream fishway counts (May 1st to November 15th) at Wells Dam from 2000 to 2003 were 90, 107, 76, and 53 bull trout, respectively. Bull trout migrating upstream through Wells Dam in 2001 were 5 year old (n=2, mean fork length=55.6cm) and 6 year old (n=6, mean fork length= 54.6cm) fish as determined by scales.
- Adult bull trout made migrations upstream through Wells Dam from May through November. Peak movement occurred in May and June with 94, 95, 92, and 89

percent of adult bull trout being detected during these months at Wells Dam for years 2000-2003, respectively.

- Tagged migratory adult bull trout successfully moved both upstream and downstream past the Project. Five radio-tagged bull trout passed downstream through Wells Dam, four through Rocky Reach, and eight through Rock Island from 2001 to 2003. None of the downstream passage events resulted in injury or mortality to bull trout.
- Median Wells tailrace occupancy times in 2001-2003 were 1.53, 7.84, and 1.00 days, respectively. Median Wells fishway passage times in 2001-2003 were 8.87, 7.60, and 1.16 days, respectively. Median Wells ladder passage times in 2001-2003 were 5.70, 0.23, and 0.16 days, respectively.
- Adult bull trout migrating upstream of Wells Dam were destined for the Methow River. Between 2001-2003, no bull trout selected the Okanogan system (one trout moved into the Okanogan, but left shortly thereafter and moved into the Methow system).
- Median travel time from Wells Dam (ladder exit) to the Methow River in 2001-2003 was 0.40, 2.78, and 1.09 days, respectively.
- All 28 tributary entrance events occurred before June 27. Bull trout in the Methow system selected two primary areas, the mainstem Methow River and the Twisp River.
- 30% of bull trout that entered the Methow River have been detected leaving the system. Tributary exit dates were recorded for 78% of these emigrating bull trout and 86% of these left the Methow River system between Oct-Dec.
- It appears that no radio tagged bull trout were injured at the dams or in the reservoirs due to project effects during telemetry monitoring in 2001, 2002, and 2003.
- 92% and 53% of tagged bull trout detected in the vicinity of Wells Dam entered the Wells Hatchery Outfall in 2001 and 2002, respectively, possibly in search of prey near the outfall.

5.0 WELLS BULL TROUT MONITORING AND MANAGEMENT PLAN

The goal of the WBTMMP is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout from Wells Project operations and facilities. This plan is intended to be an adaptive approach, where strategies for meeting the goals and objectives may be negotiated under a collaborative effort with the Service based on new information and ongoing monitoring results.

Through monitoring and implementation of WBTMMP measures, this plan is designed specifically to: (1) address ongoing project-related impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the Service's draft bull trout recovery plan; and (3) monitor and minimize the extent of any incidental take of bull trout consistent with Section 7 of the Endangered Species Act.

Douglas PUD has committed to use the management strategies outlined in this section to meet the protection, monitoring, and evaluation (PME) measures outlined in the 2004 BO for bull trout; and will simultaneously address potential project-related impacts on bull trout for the duration of the existing license as required by license articles 61, 62 & 63. The PME measures

will also be consistent with the Service's overall bull trout recovery plan and with Section 7 of the Endangered Species Act.

The WBTMMP has four main objectives. Specifically, these are to: (1) identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout; (2) assess similar impacts on sub-adult bull trout; (3) investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of the Wells Reservoir; and (4) identify which Core Areas and Local Populations of bull trout utilize the Project area. Each of these four objectives is treated separately below.

5.1 Objective 1

The first objective was to identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout. This objective was addressed using four strategies: (1) an adult bull trout telemetry program was implemented to monitor adult upstream and downstream passage in the Wells Project and to monitor any incidental take of bull trout; (2) passage results and operational data were analyzed to determine if correlations exist between passage times and passage events and project operations; (3) video monitoring was used to determine off-season adult bull trout passage through the adult fishways at Wells for an experimental period 2004 to 2005; and (4) should upstream or downstream passage problems be identified, to assess the feasibility of options to modify upstream passage facilities or operations that reduce the impact to bull trout passage.

5.1.1 Strategy 1-1: Adult bull trout telemetry program

The adult bull trout telemetry program had several main goals. First, the program would allow monitoring of bull trout movements in the Wells Project, including the timing and frequency of upstream and downstream passage events (and associated survival rates). Second, the program allowed for monitoring of any incidental take. Finally, the program also supported several of the other objectives of the WBTMMP. For example, the program provided genetic samples of the radio-tagged bull trout (in support of strategy 4-1), and provided data on the timing and frequency of movements into and out of spawning tributaries (in support of strategy 4-2). In brief, the program involves the capture and radio-tagging of 10 adult bull trout each year for three years (May 2005 through July 2007). Details of methodology and results are presented below.

5.1.1.1 Tagging

Bull trout at Wells Dam were trapped using the brood-stock collection facilities located within the East and West fishways. Trapping operations occurred during the peak of the bull trout passage period. The majority of the trapping occurred in the East fishway, as the West fishway was only used during the last week of trapping (Table 1). Traps were operated no more than 3 days a week, and no more that 16 trap-hours of effort occurred in a single day (Table 1). The brood-stock collection facilities were located at pool 40 approximately half way up each fish ladder. The traps were operated by placing a barrier fence across the entire width of the pool. When a trap was in operation, all fish attempting to ascend the ladder were forced to ascend a steep-pass denil into an upwell enclosure, and then down a sorting chute. When a bull trout was observed in the sorting chute, it was redirected into a holding facility; whereas non-target species were shunted back to the ladder upstream of the trapping barrier. When a bull trout was observed in the West ladder sorting chute, a technician activated a pneumatic gate diverting the fish into the Wells Hatchery brood stock collection pond. In the East ladder, bull trout were pneumatically diverted into a 1236 L holding tank. The fish ladder supplied the East ladder holding tank with freshwater at a rate of 24 L/min to maintain adequate dissolved oxygen and temperature levels.

Immediately after capture, bull trout were netted from the holding tank and transferred to an anesthetic vessel containing an 90 mg/L solution of tricaine methanesulfonate (MS-222) and a few drops of Stress Coat (Aquarium Pharmaceuticals, Inc. Chalfont, PA). After 1.5 to 2 minutes, the fish lost equilibrium and was considered to be adequately anesthetized. The fish was then removed from the solution, weighed, measured, and placed in a wet V-shaped trough (coated with Stress Coat to minimize scale loss and maintain the exterior mucous coat) for further processing. A tube was placed in the fish's mouth, supplying cool river water and MS-222 (45 mg/L), flushing the gills, and maintaining unconsciousness during the procedure. A small (1 cm^2) clip was taken from the upper lobe of the caudal fin, and placed in non-denatured alcohol to be sent to the Service for genetic analyses. Four to five scales were removed from the area above the lateral line (adjacent to the "line" between the end of the dorsal fin and the start of the anal fin), and placed in a scale book to be sent to the Washington Department of Fish and Wildlife (WDFW) for aging analyses. For sub-adults, (bull trout smaller than 40 cm), a Passive Integrated Transponder (PIT) tag was injected into the dorsal musculature, and the fish was released back into the fish ladder (upstream of the trapping barrier). Larger fish were PIT and radio-tagged as described below.

Table 1. The timing of trap operations and catch of bull trout at Wells Dam, 2005.

Ladder	Day	Date	Open	Close	Op Time (h)	Catch
E	Thursday	26 May	9:30 AM	6:00 PM	8.50	1
E	Friday	27 May	9:33 AM	6:06 PM	8.55	0
E	Saturday	28 May	8:30 AM	5:00 PM	8.50	0
	Sunday	29 May			0.00	-
	Monday	30 May			0.00	-
	Tuesday	31 May			0.00	-
	Wednesday	1 Jun			0.00	-
E	Thursday	2 Jun	9:20 AM	9:06 PM	11.78	1
E	Friday	3 Jun	7:02 AM	7:04 PM	12.03	1
E	Saturday	4 Jun	7:04 AM	9:00 PM	13.93	0
	Sunday	5 Jun			0.00	
E	Monday	6 Jun	5:10 AM	9:10 PM	16.00	0
E	Tuesday	7 Jun	4:53 AM	9:07 PM	16.23	2
E	Wednesday	8 Jun	4:54 AM	8:54 PM	16.00	0
	Thursday	9 Jun			0.00	
	Friday	10 Jun			0.00	
	Saturday	11 Jun			0.00	
E	Sunday	12 Jun	5:00 AM	9:00 PM	16.00	0
E	Monday	13 Jun	5:01 AM	9:01 PM	16.00	0
E	Tuesday	14 Jun	5:00 AM	9:00 PM	16.00	0
	Wednesday	15 Jun			0.00	
	Thursday	16 Jun			0.00	
	Friday	17 Jun			0.00	
	Saturday	18 Jun			0.00	
E	Sunday	19 Jun	8:00 AM	4:00 PM	8.00	0
E	Monday	20 Jun	8:00 AM	4:00 PM	8.00	0
E	Tuesday	21 Jun	8:00 AM	4:00 PM	8.00	0
	Wednesday	22 Jun			0.00	
	Thursday	23 Jun			0.00	
	Friday	24 Jun			0.00	
	Saturday	25 Jun			0.00	
W	Sunday	19 Jun	8:00 AM	4:00 PM	8.00	0
W	Monday	20 Jun	8:00 AM	4:00 PM	8.00	0
W	Tuesday	21 Jun	8:00 AM	4:00 PM	8.00	0
	Wednesday	22 Jun			0.00	
	Thursday	23 Jun			0.00	
	Friday	24 Jun			0.00	
	Saturday	25 Jun			0.00	
		TOTAL CATCH			**5 Bull Trout**	
		Total Op Time			**207.53 h**	

Surgical procedures were similar to those described in Adams et al. (1998), Martinelli et al. (1998), and Summerfelt and Smith (1990). A 3-4 cm incision was made 2 cm away from and parallel to the mid-ventral line starting approximately 3 cm anterior to the pelvic girdle (and only deep enough to penetrate the peritoneum). A PIT tag was placed into the body cavity. A shielded-needle catheter was then inserted through the incision, posteriorly between the pelvic girdle and viscera, to a point 5-10 cm off-center from the mid-ventral line and posterior to the origin of the pelvic fins. The catheter was then pulled back onto the needle shaft, exposing the point of the needle. Pressure was then applied until both the needle and catheter pierced the skin of the fish. The needle was pulled back out of the incision, leaving the catheter in position to guide the transmitter antenna through the body wall of the fish.

The radio transmitter was implanted by first threading the antenna through the incision end of the catheter. Both the antenna and catheter were then gently pulled posteriorly while the transmitter was inserted into the body cavity through the incision. The position of the transmitter inside the fish was adjusted by gently pulling on the antenna until the transmitter was resting horizontally in the body cavity directly under the incision. An intraperitoneal antibiotic was pipetted (50 μL) into the incision to prevent infection. The incision was closed with four to five interrupted, absorbable sutures (3-0 braided Coated Vicryl and taper RB-1 needle, Ethicon Corp.) evenly spaced across the incision. The antenna was then attached to the side of the fish with a single suture approximately 1 cm posterior to the antenna exit site. The incision site was cleaned, and a small amount of a cyanoadhesive compound (Vetbond) was applied to the incision and antenna exit site to secure the sutures in place. The fish was then transferred to a recovery tank (a cooler, supplied with flow-through river-water, and supplied with oxygen through an air stone) located on the back of a pickup truck. Note that approximately one minute before the procedure was complete, the MS-222 was removed from the water flushing over the gills to begin the recovery process. Surgical equipment was disinfected with a diluted germicidal solution before and after each fish.

After the surgical procedure was complete, the flow-though water was detached from the recovery tank, and the fish was quickly transported to the release site. At the release site, the air stone was removed and the recovery tank was placed into the river. The tank was gently rolled onto its side and the lid was opened allowing the fish to swim free of the vessel. The swimming behavior of the fish was observed and any abnormalities were noted. All fish were released at the Starr Boat Ramp, which was as close to the dam as possible, while still outside of the influence of the forebay hydraulics (including spill and bypass entrainment flows).

The goal for 2005 was to tag and release 10 adult bull trout. This number represents approximately 13% of the average annual ladder counts from May to July, 2000 to 2003. All tagged fish, released upstream of Wells Dam, were counted as a successful adult fishway passage event for the year it was tagged. Battery life for all tags is approximately two-years, but because of variable tag retention times in individual fish, and inherent inconsistencies in transmitter battery life, take levels were calculated using data from only the first year (365 days) of tag life for each tagged fish. Tag detections occurring outside of this period were not used for take monitoring, but were compiled (through July 2008) to assist the Service with characterizing movements of bull trout in the mainstem.

5.1.1.2 Telemetric monitoring

A combination of aerial and underwater antennas were used to document the presence of bull trout at the Project, identify passage times and determine their direction of travel (upstream/downstream). Three aerial antennas monitored the mainstem Columbia River 3 miles downstream of the dam to detect any movements of bull trout out of the study area. Two aerial stations, located immediately downstream of the dam on each side of the river, monitored movements within the Wells tailrace. Five combined aerial antennas monitored movements in the Wells forebay. Underwater dipole arrays were deployed into each of five spillbays (2, 4, 6, 8, and 10) where spring/summer bypass spill is typically released. In each spillbay, a dipole antenna was mounted on each of the left and right bulkhead tracks at approximately 10 ft off the bottom of the spill intake floor. In addition, on gates 2 and 10, paired dipole antennas were deployed approximately 10 ft below the water surface to monitor spill water passing via the sluice gates. Finally, nine underwater antennas were deployed within each fishway to monitor bull trout approach, ascent, and exit timing. To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers. For each tributary, a pair of antennas were deployed, one facing upstream and one facing downstream, in order to determine the direction of fish movements within the tributary. English et al. (1998, 2001) provided a description of the typical telemetry systems setup for Wells Dam and at the mouths of tributaries.

Radio-tagged bull trout were tracked while in the Wells Project (dam and reservoir) until a tributary entrance was observed, and after reservoir re-entry. Fixed-station receiver sites were operated to detect any upstream and downstream movement at tributary entrances. Periodic mobile tracking methods were also used to confirm the presence of bull trout within tributaries and to track fish within the reservoirs (Table 2, Table 3). Mobile methods included aircraft, boat, vehicle and/or foot surveys.

Tracking data were compiled continuously throughout the year to determine fish locations, tag status, and the need to deploy tag recovery operations in the Wells Project. The Service conducted several mobile surveys of the Methow River Core Area (Table 3), and provided Douglas PUD with the location and date of any records of bull trout detections (Nelson and Nelle 2006).

Table 2. Dates and locations of Douglas PUD sponsored mobile tracks of the Wells Dam reservoir and surrounding areas, 2005.

Date	Survey Type	Location	Detections	Note
20 Jul 2005	Boat	Wells tailrace to Gateway station (3 mi)	none	
27 Jul 2005	Boat	Wells forebay to Methow River	none	See App. Fig. A1
4 Aug 2005	Aerial	Mainstem Columbia, Methow, and Okanogan Rivers	none	See App. Fig. A2
19 Aug 2005	Boat	Wells tailrace to Gateway station (3 mi)	none	See App. Fig. A3
23 Dec 2005	Boat	Wells forebay to Methow River	none	

Table 3. Dates and locations of U.S. Fish and Wildlife Service (Service) mobile tracks of the Methow River Core Area in 2005.

Date	Survey Type	Location *	Douglas PUD Fish Detections
31 Aug to 1 Sep	Truck, Foot	M,T,B,C,Wl,E,WFl,Lol	1,2,3,6
12 to 13 Sep	Truck, Bike, Foot	M,G,W,WF,Lol	1
27 Sep	Aerial	M,C,La,WF,Lo,W	1,5
27 to 28 Sep	Truck, Foot	M,G,T,B,Gld	2,3,6
12 to 13 Oct	Truck, Foot	M,G,T,B,WFl,Lol	1,3,5,6
16 Nov	Truck, Foot	M,T,WFl,Lol	none

*** Abbreviations:** *B- Buttermilk Cr., C- Chewuch R., E- Early Winters Cr., G- Goat Cr., Gld- Gold Cr., La- Lake Cr., Lo- Lost R., Lol- Lower Lost R., M-entire mainstem Methow R., T- Twisp R., W- Wolf Cr, Wl- lower Wolf Cr., WF- West Fork Methow R., WFl- Lower West Fork Methow R.*

5.1.1.3 Data processing

Fish detection data were downloaded from the Lotek receivers a minimum of two times per month, and more often if receiver memory began to exceed capacity prior to the scheduled downloads. In addition, telemetry systems (i.e., antennas, amplifiers, power inserters and receivers) were tested periodically during the study period to ensure they were operational and functioning correctly.

Data logged by the Lotek receivers were downloaded to a laptop computer as hex-encoded files, which were converted to standard ASCII format using software developed by LGL Limited. This software assessed several diagnostics, including the number of invalid records. If the number of invalid records was large, the receiver was downloaded a second time. The program also displayed the distribution of antenna noise by power level, so that problems with specific antennas could be isolated, and the appropriate troubleshooting measures could be taken. Data files were then uploaded to the LGL FTP site and subsequently downloaded by staff at the LGL Limited office.

Data processing throughout the study period were performed using Telemetry Manager Version 3.0, and other computer programs developed in Visual FoxPro by LGL Limited. The Telemetry Manager imported raw ASCII data files downloaded from the Lotek SRX receivers, and constructed an initial database containing records for each logged data transmission from the tagged fish. The Telemetry Manager then edited the database to remove records that did not meet the criteria identified for valid data records. Examples of invalid data included background noise at the Project, records with a signal strength that is below a set threshold, single records for a given frequency-code-location combination, and records that were recorded before the official release time and date. The Telemetry Manager then constructed an operational database that summarized the time of arrival and departure from each zone of interest. Queries of the operational database specified subsets of tagged fish for use in specific comparisons and analyses.

5.1.1.4 Data analyses

At the end of the three-year study, upstream and downstream passage results will be included to calculate a 6-year-average incidental take level for the Project. The 6-year average take will be calculated by averaging the annual observed take levels for both three-year studies (i.e., 2001 to 2003; and May 2005 to July 2008). Total Project effect will be calculated for each passage route where feasible, by dividing the number of tagged fish "taken" via that route, by the total number of radio tagged fish. Data from each of the three year studies will be evaluated in this manner, and at the conclusion of the 2008 study, the results from all of the previous years of monitoring will be averaged to determine the Project's take level.

The incidental take for each passage route (if any and if feasible) is to be estimated by the number of observed mortalities to tagged fish that are attributable to that passage route divided by the total number of tagged fish known to have passed through that route. If the passage route was unknown, the route determination would default to downstream passage through the dam. If any take occurred, a statistical analysis would be used to detect if the level of incidental take for each passage route and for the total project exceeds the anticipated incidental take level documented in the applicable Service biological opinion. The statistical analysis would be a one-tailed test of the hypothesis that the anticipated incidental take level is not exceeded.

If Project effects were shown to be negligible as measured by incidental take monitoring, then the monitoring program will be repeated on a ten year interval, as described in the WBTMMP.

5.1.1.5 Results to 31 Jan 2006

Trapping efforts to target bull trout began on 26 May 2005, and continued for three days a week up to 16 hours per day until the end of June (
Table 1). The majority of trapping occurred in the East Ladder, though the West ladder was brought into operation for the last week of trapping. In total, 207 trap hours of effort were expended, yet the target of 10 bull trout was not reached. In 2005, a total of 5 bull trout were trapped, tagged and released during regular operations (
Table 1). A sixth bull trout was tagged after being trapped during Chinook brood stock collection efforts on 26 June 2005. Its length, weight and tagging duration were not recorded.

The radio-tagged bull trout ranged from 43 to 68 cm in fork length, and from 0.8 to 2.9 kg in weight. For the first fish, 1.5 h elapsed between capture and release, but for all subsequent fish, the procedure took less than 40 minutes.

The detection histories of the 6 radio-tagged bull trout (Table 4) are as follows:

- Fish 1 was released on 26 May, entered the Methow River 7 hours later, was detected on 1 Sep in the West Fork of the upper Methow River (Service mobile track), and was still in that location when it was last detected on 27 Sep (Service mobile track). The tag from this fish was recovered by Service staff in the West Fork Methow River on Oct 13. The associated fish was not found; it is not clear what happened to it;
- Fish 2 was released on 2 June, entered the Methow River 21 hours later, and was last detected on 31 Aug in the Twisp River above the confluence of Buttermilk Creek

(Service mobile track). It has not been detected on any of the Service's mobile surveys since that date;

- Fish 3 was released on 3 June, and entered the Methow River 4 days later. It was detected on 31 Aug in the Twisp River above the confluence of Buttermilk Creek (Service mobile track). It then moved down river and was detected on 10 Nov on the receiver at the mouth of the Methow River. This fish may have moved out of the Methow system. The channel and code combination that corresponds to this fish was recorded on four occasions (26 Nov, 1 Dec, and twice on 22 Dec) on the Wells Dam forebay aerial receiver. All records were of good power, but were "single hits". Single hits are typically ignored (single "detections" are easily the product of environmental noise – if the fish were truly present in the forebay, we would expect to detect it over and over). However, if the fish was in deep water, it may have avoided being detection in the standard manner. The records of this tag in the forebay could be spurious noise-related hits (e.g., some mechanical source producing sound that happens to correspond to the channel and code). However, the detections were recorded during completely "noise-free" periods. That is, there were no other noise events at the time of the detections. This would make the spurious-noise theory less likely. On 23 December, LGL staff conducted a boat-based mobile track of the Wells Reservoir (between the dam and Pateros). The area was well covered, but the tag was not detected;
- Fish 4 was released on 7 June, and entered the Methow River approximately 12 hours later. It has not been detected on any of the Service's mobile surveys of the Methow system;
- Fish 5 was released on 7 June, and entered the Methow River approximately 12 days later. It was detected on 27 September in the Lost River gorge (Service mobile track), and was last detected on 13 October in Lost River near Lost River Road bridge (Service mobile track). It has not been detected on any of the Service's mobile surveys since that date;
- Fish 6 was released on 28 June, and 3 hours later was detected in the Wells forebay, where it remained for under an hour. The fish entered the Methow River without being detected, and was last detected 2 months later (on 31 Aug) in the Twisp River above the confluence of Buttermilk Creek (Service mobile track). It has not been detected on any of the Service's mobile surveys since that date.

There were no downstream passage events in 2005. No tagged fish moved downstream past the dam after being released. A single tagged fish (Fish 6) was detected in the Wells forebay for under an hour on the night that it was released, before moving upstream into the Methow system. For the 5 other fish, there were no forebay detections between release and Methow River entry.

All of the radio-tagged bull trout entered the Methow River system. Travel time between release and Methow River entry ranged from 7 hours to 12 days (Table 4). At the Methow River mouth receiver, all fish were last detected on the upstream antenna, indicating that the fish were moving up into the Methow system at the time of detection.

Table 4. Release date, Methow River entry date (travel time between the two), and data and location of mobile detections within the Methow system for the 6 bull trout that were radio-tagged and released at Wells Dam in 2005.

Fish	Release Date	Methow Entry	Travel Time to Methow	Mobile Detections within Methow	Methow Exit
1 *	26 May 12:54	26 May 19:53	6:59 h	1 Sep and 27 Sept in the West Fork	
2	2 Jun 14:40	3 Jun 11:29	20:49 h	31 Aug in the Twisp	
3	3 Jun 17:15	7 Jun 15:26	3.9 d	31 Aug in the Twisp	? 10 Nov
4	7 Jun 13:05	8 Jun 0:20	11:15 h	-	
5	7 Jun 20:21	19 Jun 11:27	11.6 d	27 Sept and 13 Oct in Lost River	
6	28 Jun 17:06	pwd	pwd	31 Aug in the Twisp	

pwd = passed without detection

* tag from this fish was recovered by WDFW staff in the West Fork Methow River on Oct 13

5.1.1.6 Conclusions

The 2005 radio-tagging of adult bull trout was implemented to identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and to monitor any incidental take of bull trout. To date, no radio-tagged bull trout have been recorded moving up or downstream past Wells Dam since their initial capture and tagging event. Given that all 6 radio-tagged bull trout survived to enter the Methow River, there has been no incidental take.

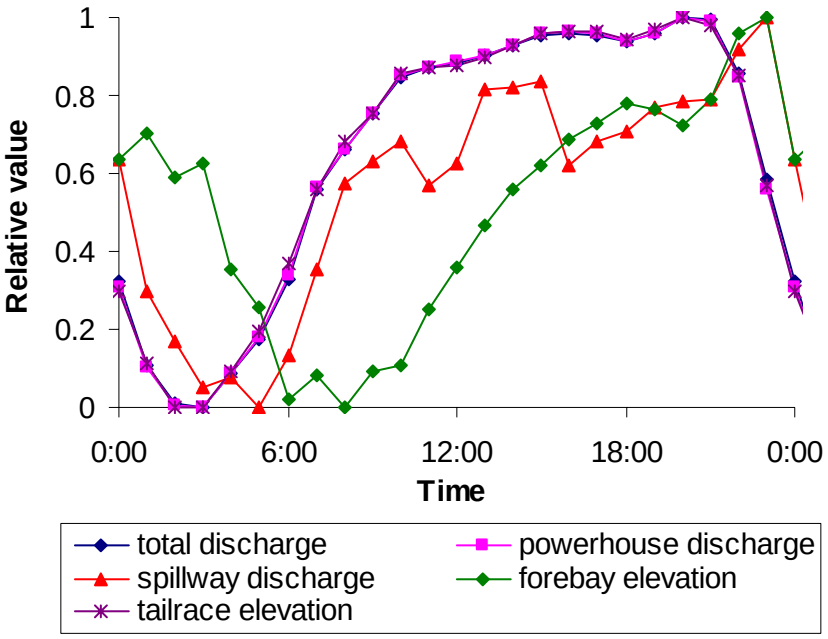
5.1.2 Strategy 1-2: Correlations between passage events and project operations

In order to assess potential impacts of Project operations on the passage of adult bull trout, correlations were generated between passage events and a suite of metrics of Project operations. These included flow through spillways and turbines, reservoir elevations, total dissolved gas (TDG) levels and data on ladder operations.

Since no upstream or downstream passage events were recorded for radio-tagged fish to date, no correlations between passage events and project operations could be evaluated for this report. However, non-tagged bull trout passage times (from video monitoring data) were analyzed for associations with Project operations.

The five available metrics of Project operations were total, powerhouse and spillway discharge; and forebay and tailrace elevations. Hourly data (from 1 May to 31 July 2005) were averaged across days to calculate hourly means (Figure 1). Lags times of -8 to +8 hours were considered for each variable to find the strongest correlations. Total discharge, powerhouse discharge and tailrace elevation tracked each other, whereas spillway discharge was lagged by 1 hour, and forebay elevation by 5 hours (Figure 1).

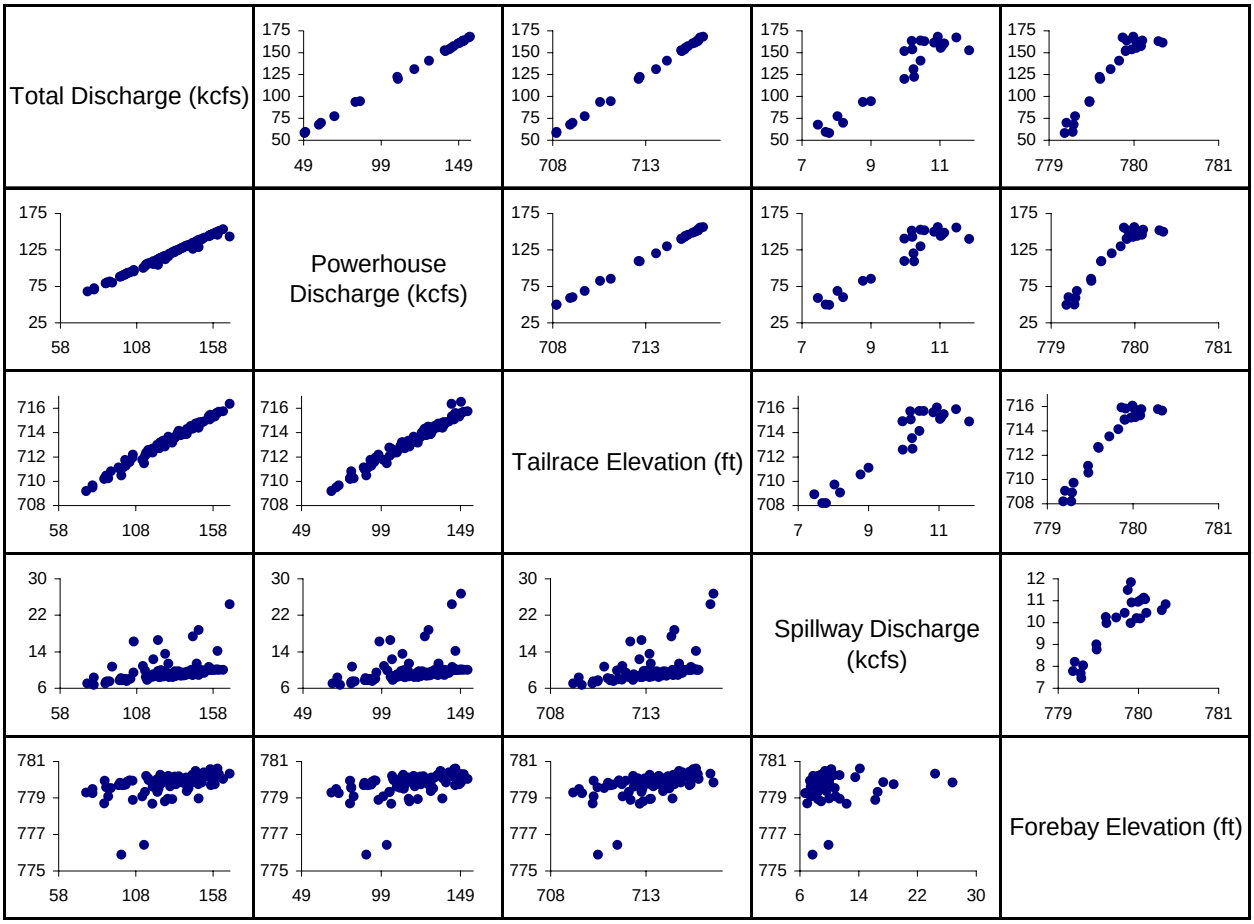
Figure 1. **Diurnal trends in Wells Project operations data, averaged from 1 May to 31 July, 2005. For comparison, the five Project operation metrics have been standardized (each observation is shown as a proportion of the range between the minimum and maximum observed values for that metric).**



Using the lagged raw operations data, hourly means were calculated for each metric. All five hourly-mean metrics were strongly collinear ($r^2 = 0.86$ to 0.99; $P < 0.0001$; Figure 2), thus not independent. As such only one metric was considered (total discharge) during subsequent analyses of diurnal trends.

Daily-mean values showed very strong correlations among total discharge, powerhouse discharge and tailrace elevation ($r^2 = 0.99$; $P < 0.0001$; Figure 2), weaker relationships between all other variables ($r^2 = 0.34$ to 0.50; $P \leq 0.001$; Figure 2), and no significant relationship between spillway discharge and forebay elevation ($r^2 = 0.08$; $P = 0.45$; Figure 2). As such, total discharge, spillway discharge and forebay elevation were all considered during subsequent analyses of seasonal trends.

Figure 2. **Correlation matrix for Wells Project operations data, 1 May to 31 July, 2005. Graphs above the diagonal show correlations among average hourly metrics (note spillway discharge is lagged by -1 h; and forebay elevation by -5 h); those below the diagonal show correlations among average daily metrics (no lags).**



Diurnal trends in total discharge were correlated with bull trout passage ($r^2 = 0.44$; $P = 0.032$; Figure 3a). Both metrics followed a strong diurnal pattern, showing little activity in the hours before dawn, and a general increase throughout the morning. Bull trout passage events decreased quickly in the afternoon, whereas discharge increased more slowly until dusk, then dropped off precipitously. In general, upstream movements were less likely during periods of low discharge (Figure 3b). Note that this correlation may be coincidental (i.e., not causal), because power use (and hence Project operations) declines at night, and because fish migrations might be inhibited during darkness (i.e., not because of reduced discharge).

Seasonal trends in bull trout passage were not correlated with daily average total discharge ($r^2 = 0.14$; $P = 0.18$; Figure 4a), spillway discharge ($r^2 = 0.10$; $P = 0.36$; Figure 4a) or forebay elevation ($r^2 = 0.00$; $P = 1.00$; Figure 4a). The largest bull trout passage event in 2005 (4-5 per day on 24-25 June) occurred during a period of relatively large total discharge (150 – 164 kcfs; Figure 4b).

Figure 3. **Relationship between diurnal trends in total discharge and bull trout passage at Wells Dam, 1 May to 31 July, 2005. a) Average values, plotted as time series, were standardized for ease of comparison (each observation is shown as a proportion of the range between the minimum and maximum observed values for that metric); b) Scatter-plot of bull trout passage as a function of average hourly total discharge.**

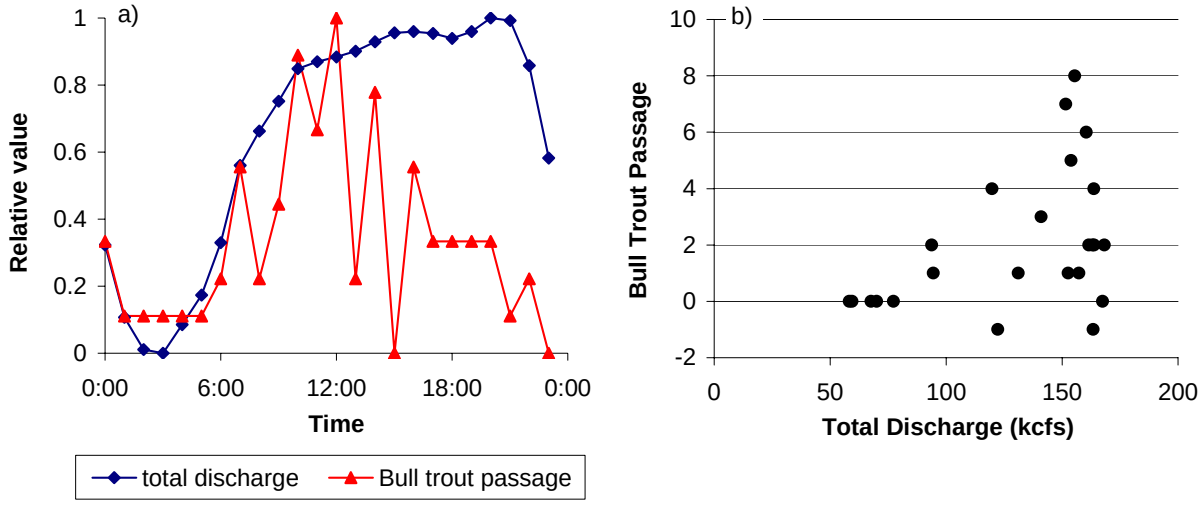
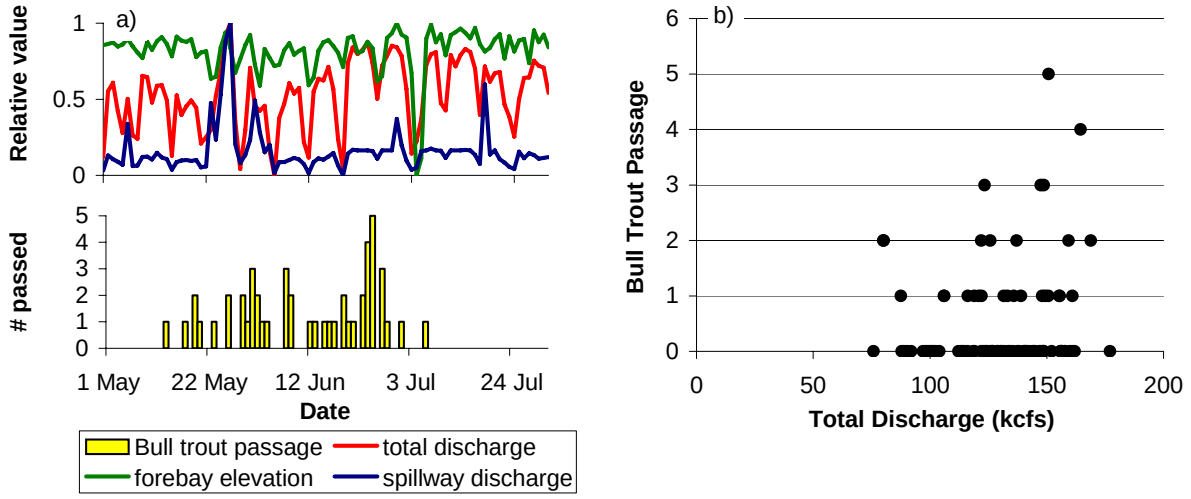


Figure 4. **Seasonal time series of bull trout passage events, average daily total discharge, spillway discharge, and forebay elevation at Wells Dam, 1 May to 31 July, 2005. a) Average values, plotted as time series, were standardized for ease of comparison (each observation is shown as a proportion of the range between the minimum and maximum observed values for that metric); b) Scatter-plot of bull trout passage as a function of average daily total discharge.**



5.1.3 Strategy 1-3: Off-season fishway passage of adult bull trout

Off-season video monitoring of both Wells Dam fishways for the 2004-2005 winter period began on November 16, 2004 and continued until April 30, 2005. During this period no adult bull trout were observed utilizing the fishways.

5.1.4 Strategy 1-4: Modifications to passage facilities or operations

To date, there have been no problems identified as impacting upstream or downstream passage of adult bull trout. As such, there is no need for Douglas PUD to develop modifications to current passage operations.

5.2 Objective 2

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout. The stakeholders agree at this time that because of the inability to collect a sufficient sample size of sub-adult bull trout, it is not feasible to assess sub-adult passage at Wells. As such, the second objective was addressed using two strategies: (1) sub-adult bull trout were PIT tagged opportunistically when encountered at the Project, or in tributary traps; and (2) video monitoring was used to determine off-season sub-adult bull trout passage through the adult fishways at Wells for an experimental period 2004 to 2005.

5.2.1 Strategy 2-1: Sub-adult PIT tagging program

Due to the inability to collect a sufficient sample size of sub-adult bull trout and because sub-adult bull trout are not large enough to be radio-tagged, it is not currently feasible to assess effects of Wells Dam on sub-adult bull trout passage. However, Douglas PUD has agreed to indirectly monitor take for sub-adult bull trout through PIT-tagging. This effort included providing PIT-tags, equipment and facilitated training to enable PIT-tagging of sub-adult bull trout when these fish are incidentally encountered during certain fish sampling operations. Fish sampling operations that could have incidental captures of sub-adult bull trout included the Wells adult fishway, Methow brood stock traps, and juvenile salmonid trapping activities on the Methow and Twisp rivers. Different entities conduct these fish sampling operations, thus the provision of tags, equipment and methodology was standardized.

Douglas PUD passively collected information from all PIT-tagged bull trout as they passed through the fishways at Wells Dam. The District also scanned all bull trout incidentally captured at the screw traps and adult brood collection facilities. The information collected at the dam and in the tributaries were posted on the PTAGIS website, which is operated and maintained by the Pacific States Marine Fisheries Commission.

To date, no sub-adult bull trout have been PIT-tagged during tagging operations at Wells Dam. As previously mentioned, Douglas PUD provides support for PIT-tagging of bull trout collected at several off-site smolt collection facilities (Twisp and Methow rivers). In 2005, these operations PIT-tagged 16 sub-adult bull trout (all at the Twisp weir).

5.2.2 Strategy 2-2: Off-season fishway passage of sub-adult bull trout

Off-season video monitoring of both Wells Dam fishways for the 2004-2005 winter period began on November 16, 2004 and continued until April 30, 2005. During this period no sub-adult bull trout were observed utilizing the fishways.

5.3 Objective 3

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of the Wells Reservoir. This objective was addressed by evaluating Wells inflow patterns, reservoir elevations, and backwater curves to determine the extent of stranding or entrapment of bull trout (if any).

5.3.1 Strategy 3-1: Inflow patterns, reservoir elevations, and backwater curves

In beginning to address Strategy 3-1, Douglas PUD contracted with GeoEngineers in March 2005 to develop detailed bathymetric maps of the Wells Project. The maps were produced at a 1-foot contour interval and will be combined with Wells Dam operational data to assess potential areas of sub-adult entrapment. In 2006, the identified areas will be evaluated during times when Wells Dam operations affect reservoir elevations such that these areas may be disconnected from the main channel.

5.4 Objective 4

The fourth objective was to identify the Core Areas and Local Populations, as defined in the Service's Draft Bull Trout Recovery Plan, of those bull trout that utilize the Project area. This objective was addressed using 2 strategies: (1) genetic samples were gathered from radio tagged and PIT tagged fish for comparison to baseline genetic samples from local populations and core areas; and (2) in cooperation with other agencies, the locations of radio-tagged fish outside the Project area were recorded, and related to the distribution of local populations.

5.4.1 Strategy 4-1: Genetic sampling program

Douglas PUD provided the equipment and facilitated training to enable genetic sampling of bull trout during bull trout radio-tagging operations and when bull trout were incidentally collected during other fish sampling operations (on-site and off-site). Fish sampling operations that could have incidental captures of bull trout included the Wells adult fishway and juvenile and sub-adult salmonid trapping activities on the Methow and Twisp rivers. Since different entities conduct these fish sampling operations, provision of equipment and methodology was standardized. Ideally these genetic samples will be compared to genetic baseline samples when those baselines become available.

To date, six genetic samples have been collected from adult bull trout during radio-tagging operations at Wells Dam. Additionally, sixteen genetic samples were collected from smolt trapping operations conducted by the WDFW on the Twisp and Methow rivers. Currently, a genetic baseline for mid-Columbia River basin bull trout populations has not yet been developed. More work is required to generate useful information from the collected genetic data.

5.4.2 Strategy 4-2: Destination locations of Wells Dam bull trout

The destinations of Wells Dam bull trout were evaluated from the results of the adult radio-tagging program (see Strategy 1-1). In brief, the program involves the capture and radio-tagging of 10 adult bull trout each year for three years (May 2005 through July 2007). These fish were tracked in the Wells Reservoir, and into tributary rivers. Since other agencies were performing mobile tracking in areas outside of the Wells Reservoir, Douglas PUD worked cooperatively with these agencies to obtain more detailed locations of the radio-tagged fish.

In 2005, six adult bull trout were trapped in the East fishway, radio-tagged and released at Starr Boat Launch. All six of these fish were tracked into the Methow River, and travel times between release and Methow entry ranged from 7 hours to 12 days. Within the Methow system, five of the six fish were detected during Service aerial tracking surveys of the Methow watershed.

The results of the 2005 radio-telemetry tracking suggest that all bull trout tagged in 2005 were associated with the Methow River Core Area. As 8 local populations have been identified as using the Methow River Core Area (USFW 2002), the precise locations obtained from the Service's aerial surveys (Nelson and Nelle 2006) will be helpful in assessing which local bull trout populations could potentially be impacted by Well Project operations.

6.0 CONCLUSIONS AND RECOMMENDATIONS

As part of the first objective, 10 adult bull trout were to be radio-tagged each year for three years. In the first year, only 6 bull trout were radio-tagged, despite trapping for the maximum allowable number of days per week. Limitations to trapping effort were imposed by the HCP coordinating committee in order to minimize incidental take and passage delays on spring Chinook. As video-monitoring data showed, bull trout passage occurs more often between certain hours, then it may be more effective to trap for fewer hours a day, but for more days per week. Given the overall low numbers of bull trout that pass Wells Dam, and given the low numbers tagged in 2005, exploring alternative bull trout trapping operations should be explored with the HCP coordinating committee toward meeting the goal of tagging 10 bull trout in 2006.

In 2005, all six radio-tagged bull trout traveled upstream into the Methow River. Travel time from release to Methow River entry ranged from 7 hours to 12 days. None of the radio-tagged fish have yet to pass upstream or downstream past Wells Dam since their initial encounter at the Project. As such, we could not conduct an assessment of project effects on upstream and downstream passage during 2005.

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout. To this end, opportunistic PIT tagging of sub-adults was successfully completed during 2005 and should be continued in order to increase the probability of gaining useful data on migrations in the future.

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir. Essential bathometric data was collected and analyzed during 2005. Activities to address this objective will continue in 2006 with field evaluation of potential entrapment areas schedule for 2006.

The fourth objective was to identify the Core Areas and Local Populations of those bull trout that utilize the Project area. To date, a total of 22 genetic samples have been collected from bull trout during radio-tagging operations at Wells Dam and off-site HCP related fish sampling activities. Genetic samples collected from various sites will be used to develop a genetic baseline against which the data from which bull trout passing Wells Dam may eventually be compared. These samples were turned over to the Service for analysis. Genetic samples will again be collected from adult and sub-adult bull trout during the 2006 field season.

The 2005 radio-telemetry data indicate that the Core Areas associated with all six radio-tagged bull trout was the Methow River. Three of the six radio-tagged fish utilized the Twisp River during part of their migration. The other three fish utilized either the mainstem Methow or upper Methow River tributaries including the Lost River and the West Fork of the Upper Methow River.

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Appendix A

Examples of Douglas PUD Sponsored mobile tracks of the Wells Dam reservoir and surrounding areas

120°20'0"W
120°0'0"W
48°0'0"N
47°40'0"N
helan
Wells Dam
748
38
688
Rocky Reach Dam

Bull Trout Detections
Mobile Survey

2005-07-27

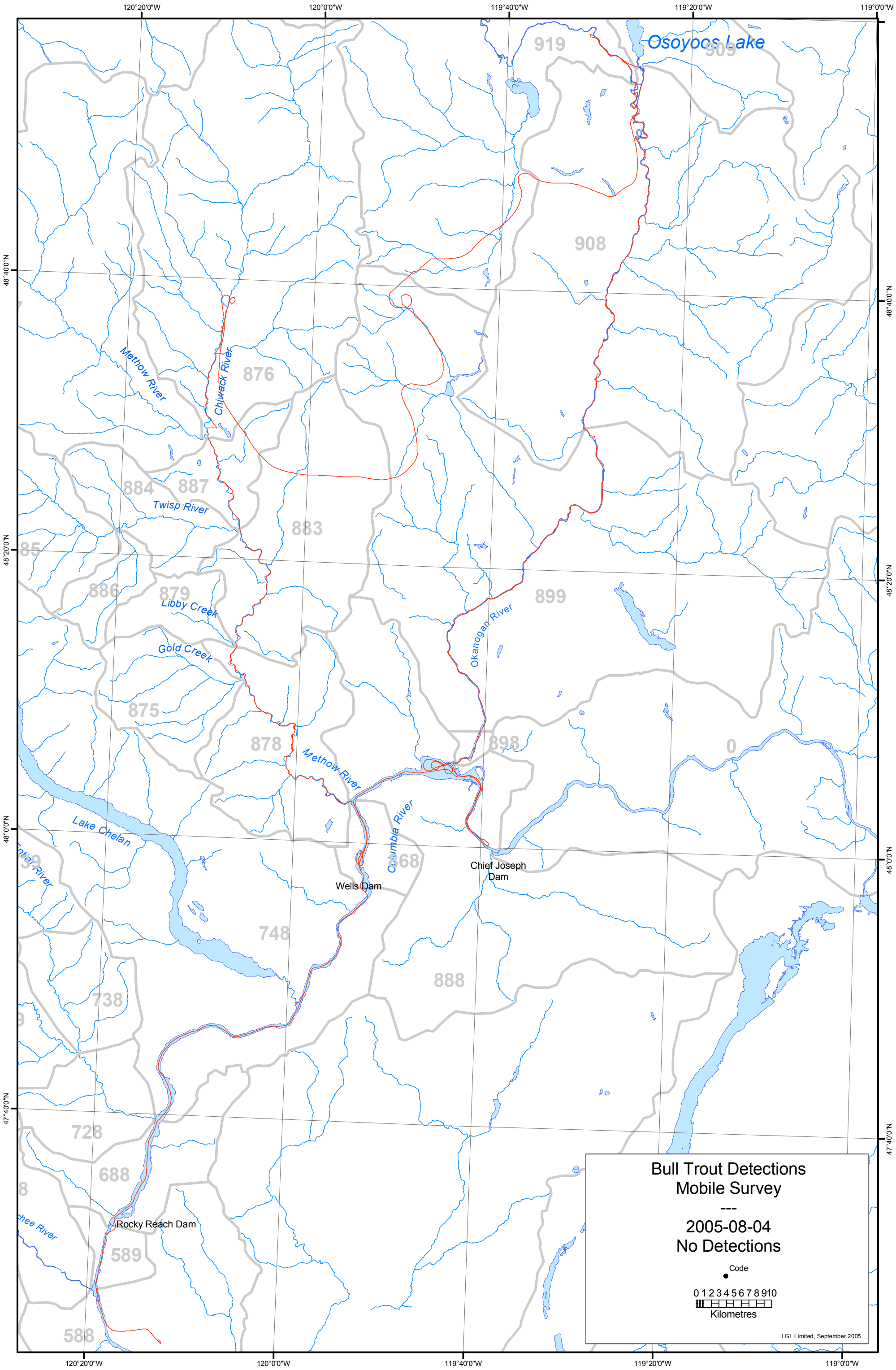
No Detections

Code

0 1 2 3 4 5 6 7 8 9 10

Kilometres

LGL Limited, September 2005


120°20'0"W
120°0'0"W
119°40'0"W
119°20'0"W
119°0'0"W
48°40'0"N
48°20'0"N
48°0'0"N
47°40'0"N
Osoyoos Lake
919
909
908
876
884
887
883
885
886
879
899
875
878
898
0
868
748
888
738
728
688
589
588
Methow River
Chiwack River
Twisp River
Libby Creek
Gold Creek
Okanogan River
Lake Chelan
Columbia River
Wells Dam
Chief Joseph Dam
Rocky Reach Dam
Bull Trout Detections
Mobile Survey

2005-08-04
No Detections
Code
0 1 2 3 4 5 6 7 8 9 10
Kilometres
LGL Limited, September 2005

120°20'0"W
120°0'0"W
48°0'0"N
47°40'0"N
helan
Wells Dam
748
38
688
Rocky Reach Dam

Bull Trout Detections
Mobile Survey

2005-08-19
No Detections
Code
0 1 2 3 4 5 6 7 8 9 10
Kilometres
LGL Limited, September 2005