Methow Wildlife Area Fish Retrofit

Habitat Program
Environmental Restoration Services Division
Salmonid Screening, Habitat Enhancement
and Restoration (SSHEAR) Unit

Submitted by

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INTRODUCTION

Over the past 62 years, the Washington Department of Fish and Wildlife (WDFW) has purchased approximately 840,000 acres of Wildlife Area land, scattered throughout almost every county in the state. Due to the increasing interest in fish passage issues, the Habitat and Lands Services Program initiated an inventory of fish passage barriers and water diversions on all agency owned and/or managed lands. The Salmonid Screening, Habitat Enhancement and Restoration Section (SSHEAR) was assigned this task. The purpose of the inventory is to document and prioritize for correction all fish passage problems including culverts, dams, lake screens and unscreened or inadequately screened water diversions to ensure compliance with Washington State laws. According to RCW 77.55.060, "All dams or obstructions across or in a stream shall be fitted with a durable and efficient fishway" and RCW 77.55.040 requires that water diversions be fitted with a screen to prevent fish from entering the diversion.

Salmonids of the Pacific Northwest have long been impacted by structures installed in streams incorrectly or with no regard to the salmonid life cycle. Thousands of juvenile salmonids are killed every year when they enter inadequately screened or unscreened water diversions, by mutilation from a pump turbine or being stranded in irrigation canals as the irrigation season comes to a conclusion. Culverts, dams, and abandoned lake outlet screens also have a very detrimental impact on salmonid populations. When these facilities result in a barrier to fish migration, spawning and rearing habitats become inaccessible.

Each year, more of these structures become barriers to fish migration and because watersheds are continually being altered (e.g., development, logging, roads etc.), the hydrological dynamics of the watershed are substantially altered as well. Culverts, fishways, lake outlet screens, and water diversions that were once designed for a defined annual flow, are now incapable of managing the increased flow. Culverts become velocity barriers and eventually scour huge plunge pools that in most circumstances result in large outfall drops. Even hydraulic drops less than one foot are a potential barrier to adult chum salmon, juvenile salmonids and other fish species. Recent studies have shown that these small hydraulic drops can limit juvenile production by rendering valuable rearing habitat inaccessible. Screened water diversions that are not properly maintained can also begin impinging salmonids, either killing them or carrying them into the diversion system.

In cooperation with the Lands Division, SSHEAR staff designed a Wildlife Area Scheduling Index to organize the inventory. To establish the scheduling index of wildlife areas, a questionnaire was designed to collect information on the number of known fish passage problems, stock status, stock mobility, and high profile fish passage issues of public interest. This enabled SSHEAR staff to gain the knowledge and expertise of Wildlife Area Managers. In December of 1997, the questionnaire was mailed to all Regional Lands Coordinators and Wildlife Area Managers. After the index was calculated for each area, they were stratified according to the time of year in which the inventory could be accomplished. Eastern areas will be scheduled in the spring and summer months and the western areas will be inventoried in the

fall and winter months. The Methow Wildlife Area ranked highest in priority for eastern Washington.

SITE DESCRIPTION

The numerous units of the Methow Wildlife Area are all located in Okanogan County of eastern Washington. A total of six different units (Big Buck, Big Valley, Chiliwist, Golden Doe, Methow and Rendezvous) comprises the 31,000 acre wildlife area. All of the units are within the Methow River watershed except the Chiliwist Unit which is in the Okanogan River watershed (Figure 1).

There are a number of creeks and lakes on the Methow Wildlife Area which support fisheries for resident rainbow trout, stocked rainbow trout and eastern brook trout, as well as a limited spiny ray fishery. They include Cougar and Campbell Lakes, Sullivan Pond, portions of Bear, Beaver, and Ramsey Creeks, and the Chewuch River on the Methow Unit; two small lakes on the Big Buck Unit; Chiliwist Creek on the Chiliwist Unit, the Methow River and a small impoundment on the Big Valley Unit (WDFW 1997).

Big Buck Unit

The Big Buck Unit (5,600 acres) is located west of the Methow River and north of the Twisp River (Figure 1). The land mass center is approximately four miles northwest of Twisp. United States Forest Service lands bound the area on the west while private lands bound the area on the north, east and south. The Big Buck Unit is managed primarily for mule deer, blue grouse and non-game species. It is also an integral part of the mule deer migratory corridor in and out of the Twisp River drainage. Water sources and wetter areas support deciduous riparian type vegetation. There are three small isolated lakes on the unit, but only Aspen Lake is stocked with fish (WDFW 1997).

Big Valley Unit

The Big Valley Unit (847 acres) is located 5.6 kilometers northwest of Winthrop and is bound on the east by State Highway 20 and on the west by the Methow River (Figure 1). Private lands surround most of the unit. Approximately 300 acres are irrigated, 200 acres are in dryland pasture and the rest is riparian river bottom. Cattle grazing is allowed on the irrigated and dryland portions. Along the south side of the unit, several sloughs exist adjacent to the Methow River, providing excellent habitat for chinook, steelhead and resident salmonids (WDFW 1997).

Chiliwist Unit

The Chiliwist Unit (6,400 acres) is located in the foothills west of the Okanogan River (Figure 1). It is accessed from the Chiliwist Road off Old Highway 97, 3.2 kilometers south of Malott.

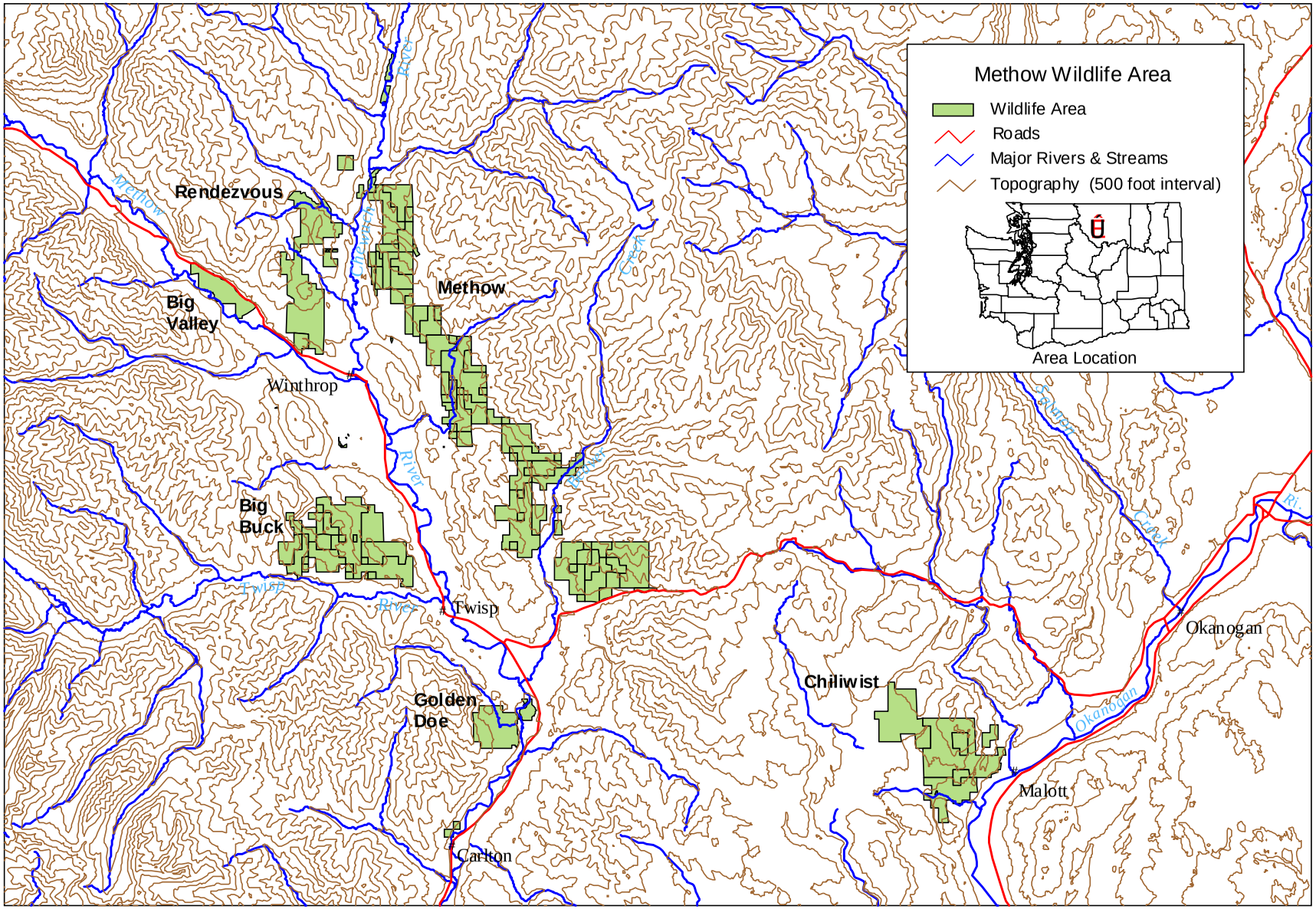


Figure 1: Methow Wildlife Area

State Department of Natural Resources (DNR) land bounds the area on the south, east and west, while private lands bound the area on the north. Chiliwist Creek flows through the southwest corner of the unit.

Due to a large waterfall approximately a half kilometer upstream of Old Highway 97, there is no anadromous salmonid access upstream of that point. However, the habitat for resident salmonids is excellent (WDFW 1997).

Golden Doe Unit

The Golden Doe Unit consists of 1,389 acres located approximately 8 kilometers south of Twisp on the west side of the Methow River in the Alder Creek drainage (Figure 1). The Methow River and the lower reaches of Alder Creek flow through the northwest corner of the unit. Anadromous fish species such as chinook and steelhead are known to spawn along the Methow River banks, but due to a large waterfall and cascades Alder Creek does not provide anadromous fish habitat. Resident fish on the other hand thrive in the backwaters created by several beaver dams on the system (WDFW 1997).

Methow Unit

The Methow Unit (Approx. 14,500 acres) is located to the east of the Methow River along the foothills of the Methow Valley (Figures 1). It is bound by Falls Creek on the north and the Loup Loup Highway (State Route 20) on the south. The Town of Twisp is located approximately 8 kilometers west of the southern boundary and Winthrop is located 8 kilometers west of the wildlife area headquarters. USFS lands bound the area on the east and private lands bound it on the west. The Methow Unit is managed primarily for mule deer and bluegrouse. Several lakes and intricate stream systems provide excellent fish habitat. Many systems such as Bear Creek would provide optimal spawning and rearing if the habitat was accessible to anadromous salmonids (WDFW 1997).

Rendezvous Unit

The Rendezvous Unit consists of 3,180 acres of land purchased between 1990 and 1994. These lands lay north of the confluence of the Methow and Chewuch River and about 3.2 kilometers northwest of Winthrop (Figure 1). Cub Creek flows through the northwest corner of the Rendezvous Unit. Within a half kilometer of the confluence with the Chewuch River, there is a series of large waterfalls which restricts anadromous salmonid access, though Cub Creek and its tributaries do provide several kilometers of excellent resident salmonid habitat (WDFW 1997).

METHODS

Feature Evaluation

The inventory included the Methow Wildlife Area and the Wildlife Access Areas directly associated with it. The Wildlife Area Manager identified each culvert, dam, fishway, and water diversion known to them.

The field crew then drove all roads and walked each drainage on the wildlife area to locate and evaluate any additional features. All human-made features were evaluated for fish passage (culvert, dams, fishways) or fish safety (water diversions). Evaluation methodologies for these features are described in the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000). Feature dimensions were measured in metric units, utilizing a Mound City stadia rod (Model 43623). Slope measurements were calculated using a laser from Laser Tech Inc. (Model Impulse 200) mounted on a Bogen Manfrotto monopod (Model 3218). Velocity readings were calculated using the three chip method.

The latitude and longitude of each feature was recorded using a Trimble GeoExplorer II. These positional data were differentially corrected and exported to SSHEAR's Fish Passage and Screening database using Trimble's Pathfinder Office software. Streams were identified by name and/or Water Resource Inventory Area (WRIA), if possible, using U.S.G.S quadrangle maps (1:24000), Atlas of Washington (DeLorme Mapping 1992), The Thomas Guide (Thomas Bros. Maps 1990), or the Columbia River Basin River Mile Index (Wa. Dept. of Ecology 1972). Fish species presence was determined using the Washington State Salmon and Steelhead Stock Inventory (WDF et.al.1992), Washington State Salmonid Stock Inventory Bull Trout/Dolly Varden Appendix (WDFW 1997), the Wildlife Area Manager, and the Regional Fish Biologist.

Barrier Prioritization

On streams where fish passage barriers were identified within WDFW property, habitat assessments, data analysis and barrier prioritization were completed per the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000). Potential habitat gain was calculated utilizing the Expanded Threshold Determination (ETD) methodology. This methodology was enhanced by walking the entire survey length to identify all barriers, and by establishing reach breaks in the field.

In watersheds that can provide habitat for anadromous salmonids, potential habitat gain is always calculated from the human-made barrier upstream to the first natural barrier. The net gain is represented by the connection of the smaller (upstream) segment of habitat with the larger (ocean access downstream). In those portions of a watershed that only support resident salmonids, barrier removal may not result in a net gain of habitat upstream because resident fish populations

can exist both up and downstream of a human-made barrier. Resident fish populations and habitat become fragmented and isolated by the human-made barriers because downstream migration is possible but upstream is not. This reduces genetic interchange and makes the fish susceptible to extinction within isolated reaches. Overall habitat quality from a fish standpoint is diminished as some habitat components are isolated from segments of the population. In addition, some reaches may not have all the habitat components necessary to sustain independent populations. What is gained by barrier removal is the reconnecting of fragmented fish populations and habitat by re-establishing the ability of fish to migrate upstream.

For the purposes of calculating a Priority Index (PI) value, the benefit to the resident fish population is represented by the habitat segment between the human-made barrier and the closest natural barrier, whether it be upstream or downstream. For example, if an impassable waterfall exists 500 linear meters downstream of a barrier and there is more than 500 linear meters of useable habitat upstream, the downstream habitat would be used to calculate habitat gain as it is the smallest. In this case the real benefit is to the smaller population segment provided by the access to the larger population/habitat component. Conversely, if there is an impassable cascade eight kilometers downstream of a barrier and there is less than eight kilometers of habitat upstream, the upstream habitat would be used to prioritize for barrier resolution. In this case the real benefit is to the larger population segment provided by the access to the smaller population/habitat component.

Screen Prioritization

The Screening Priority Index (SPI) model is a hybrid of the original quadratic formula used in prioritizing fish passage barriers. In the SPI, the habitat value (H) is replaced with flow (Q) as a surrogate estimating for the number of adult salmonids potentially killed by the unscreened diversion. The SPI is described in the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000). Flows used for the SPI were derived using the diversion ditch area method.

RESULTS

Inventory

On the Methow Wildlife Area a total of 185 features were evaluated. There are 144 culvert crossings, 22 dams, zero fishways, zero lake screens and 19 water diversions. Table 1 displays this information for each Wildlife Area Unit. Fifty-two features (26 culverts, 13 dams, 13 diversions) are considered to be in fish bearing streams or lakes. Twenty-five culverts and seven dams were identified as potential fish passage barriers. Three diversions are unscreened.

The inventory and physical habitat surveys for the 32 barrier features covered approximately 120 kilometers of stream. Habitat surveys revealed 17 of the 32 barrier features block sufficient

habitat to warrant repair and two require further review. The total potential gain in spawning and rearing habitat within the Methow Wildlife Area are 23,580 m^2 and 58,465 m^2, respectively. Table 2 lists the site identification number, unit, stream, tributary to, WRIA, feature type, and repair status of each feature located in fish bearing waters. Figures 2-9 show the location of features in fish bearing waters within each Wildlife Area Unit.

Prioritization

Table 3 lists the fish passage barriers requiring repair within the Methow Wildlife Area. Barriers are sorted by unit and total PI. The table includes: stream/tributary to, barrier type, potential spawning and rearing habitat gain, estimated passability, number of additional human-made barriers within the drainage (including non-WDFW ownership), and species specific and total PI values. Species benefitting from repair are indicated by a PI value. Table 4 lists the unscreened water diversions requiring repair within the Methow Wildlife Area. Unscreened diversions are sorted by unit and total SPI. The table includes; stream/tributary to, diversion type, associated dam, intake dimensions and cross-sectional area, and species specific and total screening PI values.

The PI and SPI values are only intended as a guide to prioritizing projects. Other factors can and need to be considered. For example, the PI values do not reflect the possibility of additional human-made barriers. The true habitat gain can only be realized if all other human-made barriers within the drainage are repaired. The PI and SPI should be regarded as a dynamic index as it can change as new information becomes available and inputs are refined.

Table 1. Numbers of fish passage features and fish screening features (water diversions) at each Methow Wildlife Area Unit.

Unit	Culverts			Dams			Water Diversions		
	Total	Fish Bearing	Barriers	Total	Fish Bearing	Barriers	Total	Fish Bearing	Unscreened
Big Buck	9	4	4	2	2	2	2	1	0
Big Valley	4	3	2	0	0	0	1	1	0
Chiliwist	15	0	0	2	1	1	1	1	1
Golden Doe	2	2	2	2	2	2	2	2	2
Methow	96	14	14	14	8	2	10	7	0
Rendezvous	18	3	3	2	0	0	3	1	0
Totals	**144**	**26**	**25**	**22**	**13**	**7**	**19**	**13**	**3**

Table 2. The location, type and repair status of features in fish bearing waters within the Methow Wildlife Area. Repair status indicates whether the site has no significant habitat gain (NG), the site requires repair (RR), the site does not require repair (OK), or the status is undetermined (UD).

Site ID	Unit	Stream	Tributary To	Feature Type	Repair Status
980352	Big Buck	Unnamed	Twisp R	culvert	RR
980354	Big Buck	Unnamed	Twisp R	culvert	UD
980355	Big Buck	Big Buck	Unnamed	dam	UD
980358	Big Buck	Big Buck	Unnamed	dam/diversion	NG/OK
980359	Big Buck	Unnamed	Twisp R	culvert	RR
980362	Big Buck	Unnamed	Twisp R	culvert	NG
980374	Big Valley	Unnamed	Methow R	culvert	RR
980375	Big Valley	Unnamed	Methow R	culvert	RR
980376	Big Valley	Unnamed	Methow R	diversion	OK
980381	Big Valley	Unnamed	Methow R	culvert	OK
980608	Chiliwist	Chiliwist Cr	Okanogan	dam/diversion	RR/RR
980099	Golden Doe	Alder Cr	Methow R	culvert	NG
980100	Golden Doe	Alder Cr	Methow R	dam/diversion	NG/RR
980101	Golden Doe	Alder Cr	Methow R	dam/diversion	RR/RR
980102	Golden Doe	Alder Cr	Methow R	culvert	RR
980103	Methow	Bear Cr	Methow R	culvert	RR
980478	Methow	Bear Cr	Methow R	dam/diversion	OK/OK
980501	Methow	Bear Cr	Methow R	culvert	RR
980122	Methow	Beaver Cr	Methow R	dam/diversion	OK/OK
980135	Methow	Beaver Cr	Methow R	dam/diversion	OK/OK
980105	Methow	Bowen Cr	Johnson Cr	culvert	NG
980628	Methow	Chewuch R	Methow R	diversion	OK
980486	Methow	Cougar Cr	Bear Cr	culvert	RR
980490	Methow	Cougar Cr	Bear Cr	culvert	RR
980651	Methow	Cougar Cr	Bear Cr	dam/diversion	OK/OK
980652	Methow	Cougar Cr	Bear Cr	dam	OK
980653	Methow	Cougar Cr	Bear Cr	dam	OK
980104	Methow	Johnson Cr	Bear Cr	culvert	RR
980106	Methow	Johnson Cr	Bear Cr	culvert	NG
980107	Methow	Johnson Cr	Bear Cr	culvert	NG
980650	Methow	Johnson Cr	Bear Cr	diversion	OK
980649	Methow	Pearrygin Cr	Pearrygin Lk	culvert	RR
980458	Methow	Ramsey Cr	Chewuch R	culvert	RR
980133	Methow	Unnamed	Frazer Cr	culvert	NG
980447	Methow	Unnamed	Unnamed	dam	NG
980545	Methow	Unnamed	Beaver Cr	culvert	NG
980626	Methow	Unnamed	Frazer Cr	culvert	NG
980627	Methow	Unnamed	Frazer Cr	culvert/dam/diversion	NG/NG/OK
980390	Rendezvous	Cub Cr	Chewuch R	culvert	RR
980406	Rendezvous	Cub Cr	Chewuch R	diversion	OK
980398	Rendezvous	Little Cub Cr	Cub Cr	culvert	RR
980404	Rendezvous	Little Cub Cr	Cub Cr	culvert	RR

Table 3. Fish passage barriers requiring repair within the Methow Wildlife Area. Barriers are sorted by unit and total PI. Included are; stream/ tributary to, barrier type, potential spawning and rearing habitat gain, estimated passability, number of additional human-made barriers within the drainage (including non-WDFW ownership) and species specific and total PI values.

Site ID	Stream/Tributary to	Barrier Type	% Passable	Habitat Gain (m^2)		Additional Barriers		Priority Index						
				Spawning	Rearing	Upstream	Downstream	Total	CO	CK	SH	CT	RB	DB
Big Buck														
980355	Unnamed/Twisp R	dam	0			0	6	Pending						
980354	Unnamed/Twisp R	culvert	0			1	5	Pending						
980352	Unnamed/Twisp R	culvert	33	331	354	2	4	8.17	2.72		1.23	2.02	1.21	0.99
980359	Unnamed/Twisp R	culvert	67	27	218	0	0	3.47				1.7	1	0.81
Big Valley														
980375	Unnamed/Methow R	culvert	0	169	342	3	0	10.86	3.92		1.78	2.5	1.47	1.19
980374	Unnamed/Methow R	culvert	67	150	322	2	1	8.06	2.92		1.32	1.83	1.10	0.89
Chiliwist														
980608	Chiliwist Cr/Okanogan	dam	0	733	1930	10	3	7.13				3.41	2.05	1.67
Golden Doe														
980102	Alder Cr/Methow R	culvert	33	257	495	4	1	5.08				2.43	1.46	1.19
980101	Alder Cr/Methow R	dam	67	156	301	5	0	3.76				1.80	1.08	0.88
Methow														
980649	Pearrygin Cr/Pearrygin Lk	culvert	0	4,422	10,468	2	*	30.06	7.93	5.96	4.13	5.76	3.46	2.81
980103	Bear Cr/Methow R	culvert	33	7,224	13,746	3	13	28.04	7.82	5.88	3.81	5.05	3.03	2.46
980458	Ramsey Cr/Chewuch R	culvert	33	1,197	4075	2	*	16.52	4.80		3.13	4.12	2.47	2.01
980501	Bear Cr/Methow R	culvert	33	2176	4605	1	0	19.90	5.13	3.86	2.90	3.84	2.30	1.87
980104	Johnson Cr/Bear Cr	culvert	0	435	1133	0	1	15.24	3.83	2.88	2.29	2.99	1.79	1.46
980490	Cougar Cr/Bear Cr	culvert	0	539	906	0	1	6.53				3.13	1.88	1.53
980486	Cougar Cr/Bear/Cr	culvert	0	506	861	1	0	5.82				2.79	1.67	1.36
Rendezvous														
980390	Cub Cr	culvert	0	8,598	26,345	19	7	13.70				6.56	3.94	3.20
980404	Little Cub Cr	culvert	0	2,257	17,085	5	1	13.60				6.52	3.91	3.18
980398	Little Cub Cr	culvert	33	1,633	15,796	4	2	12.07				5.78	3.47	2.82

CH = chum, **CO** = coho, **CK** = chinook, **SH** = steelhead, **CT** = cutthroat, **RB** = rainbow, **DB** = Dolly Varden/bull.
* Barriers unknown due to land owner denying access, no data collected.

Table 4. Unscreened water diversions requiring repair within the Methow Wildlife Area. Unscreened diversions are sorted by total SPI. Included are; stream/tributary to, diversion type, associated dam, intake dimensions, cross-sectional area, estimated flow and species specific and total SPI values. Species benefitting from repair are indicated by an SPI value.

Site ID	Stream/Tributary to	Diversion Type	Associated Dam	Intake Specifications			Screening Priority Index						
				Dimensions (ft)	Area (ft^2)	Flow (gpm)	Total	CO	CK	SH	CT	RB	DB
Chiliwist													
980608	Chiliwist Cr/Okanogan	pump	yes	0.67 x 0.67	0.45	152	4.23				2.03	1.22	0.99
Golden Doe													
980101	Alder Cr/Methow R	gravity	yes	3.0 x 2.0	6.00	2021	7.30				3.50	2.10	1.71
980100	Alder Cr/Methow R	gravity	no	0.25 x 0.25	0.06	21	2.33				1.12	0.67	0.54

CH = chum, **CO** = coho, **CK** = chinook, **SH** = steelhead, **CT** = cutthroat, **RB** = rainbow, **DB** = Dolly Varden/bull.

DISCUSSION

The fact that most of the Methow Wildlife Area was originally used for cattle range and agricultural purposes in the late 1800's and early 1900's, then purchased by Washington Department of Fish and Wildlife primarily to provide for deer migration habitat and public recreation area, can make characterization and prioritization of correction to fish passage barriers and screening issues very complex. Before most of the barrier corrections on Methow Wildlife Area can be initiated, the agency must establish what the wildlife area management priorities are, fish, wildlife or both. The ideal plan would be to protect and preserve fish, wildlife, and their habitats. The following is a brief unit-by-unit discussion of fish passage structures and water diversions identified in fish bearing streams. All photos referenced in the text can be found in Appendix I.

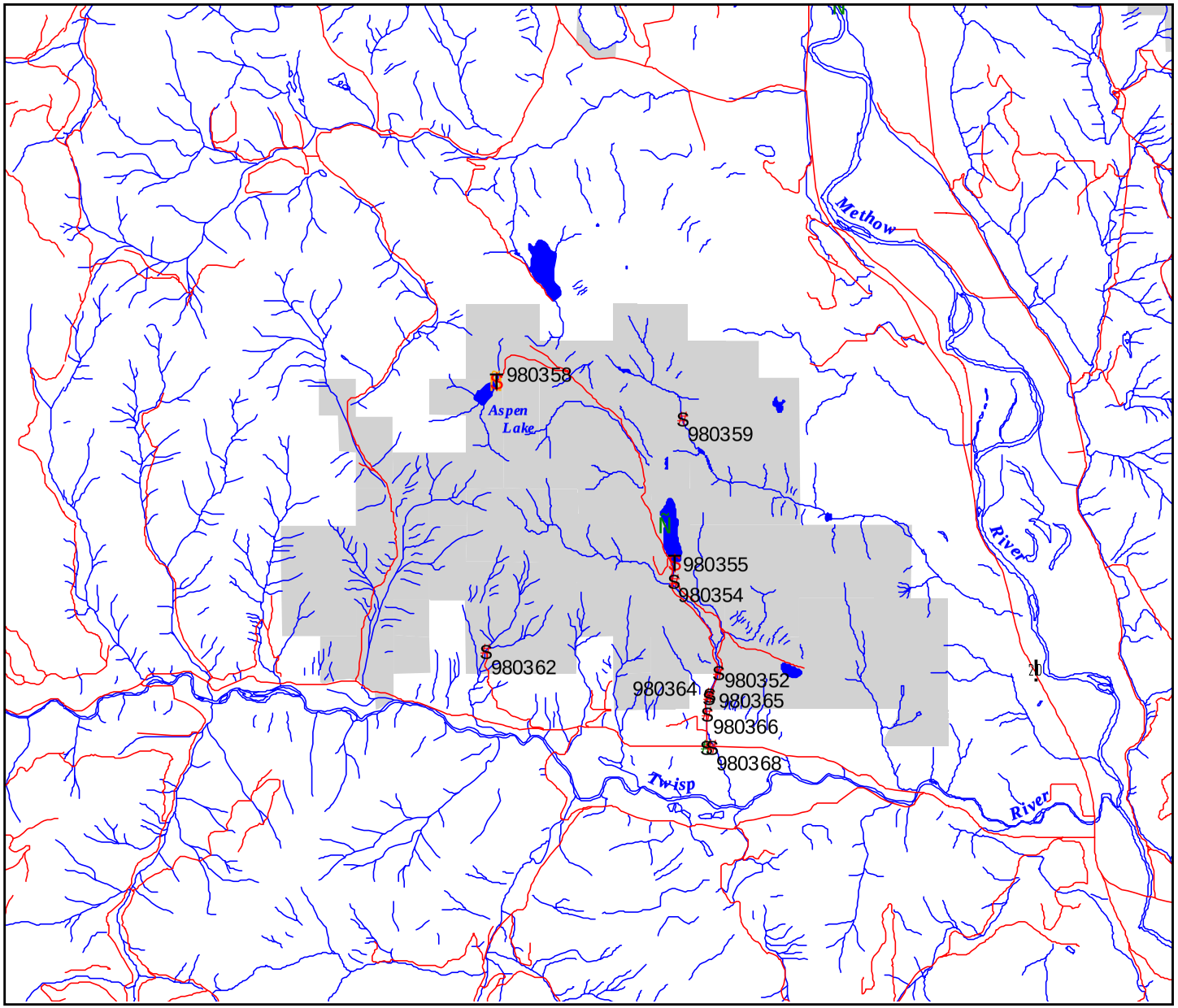
Big Buck

Fish passage barriers and/or surface water diversions were encountered on four streams within the Big Buck Unit (Figure 2). All the streams on this unit where determined to be fish bearing based on their physical parameters. For the most part, these streams are small and barely meet the minimum fish bearing stream width threshold.

The dam at the outlet of Aspen Lake (980358), while technically a barrier, does not need to be repaired as the stream reach below the dam is steep enough to be considered a natural barrier. The culvert (980362) located on an unnamed tributary to the Twisp River is also a barrier but does not warrant repair due to a lack of habitat upstream.

One barrier culvert (980359) was located on an unnamed tributary to the Methow River in the northeast corner of the unit. Although it has a small potential gain of 27 m^2 of spawning and 218 m^2 of rearing habitat, it meets SSHEAR criteria for repair. Because this stream provides habitat for resident species only, the smallest habitat segment was used to calculate habitat gain, which in this instance was upstream of the crossing.

Several barriers were documented on an unnamed tributary to the Twisp River which flowed roughly adjacent to the Frost Road. Approximately 600 meters upstream from the mouth, the first barrier encountered was a debris jam on private property which appeared to be caused by the dumping of miscellaneous debris into the stream. At this point, the majority of the flow percolates through the fill and resurfaces downstream. Proceeding upstream, there were four additional fish passage barriers within the 900 meters of stream prior to entering WDFW property. These include; a culvert (980368) located on a private driveway; a culvert (980366) which conveys the entire stream 390 meters alongside Frost Road; a culvert (980365) on an abandoned private road; and a culvert (980364) under the Frost Road. The first culvert encountered on WDFW property (980352) is a partial barrier located on Frost Road. The next culvert upstream (980354) (Photo 1) is on a spur to Frost Road where the majority of the flow



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

Figure 2: Big Buck

percolates through the road fill creating a total barrier. The last structure inventoried on this system (980355) is a small earthen dam that was constructed to impound water for irrigation. The dam also aids in retaining fish stocked for recreational fisheries.

For prioritization purposes this stream was treated as potential habitat for anadromous salmonids since the only barriers to migration were human-made. However, several stream reaches were encountered where the flow was subsurface during early summer. If these reaches are dry the majority of the year they may constitute natural barriers to fish migration. If this is the case, these barriers would need to be re-prioritized based on resident fish species only, which could affect their repair status. Prior to repairing any of these barriers the flow regime of the stream should be verified. Also, the lake upstream of the dam (980355) was not included in the estimated habitat gain used for prioritization as it would overestimate the PI value. Barrier dams are repaired by removal or the addition of a fishway. Dam removal would result in the elimination of the lake, invalidating its inclusion in habitat gain. The addition of a fishway at this site may be infeasible due to insufficient water to generate proper attraction flows. As such, the repair status of the dam (980355) has been left as undetermined until further site reviews are undertaken. The repair status of the culvert (980354) immediately downstream of the dam is also undetermined as the habitat needed to warrant repair is upstream of the dam. With this in mind, the total potential habitat gain for this system if all other barriers are fixed is estimated at 906 m^2 of spawning and 779 m^2 of rearing habitat. Repair of the WDFW culvert (980352) would account for approximately 50% of the rearing and 45% of spawning habitat gain. The habitat gain associated with the WDFW culvert is contingent upon repair of the downstream barriers.

Big Valley

Within the boundaries of the Big Valley Unit (Figure 3) there is one small unnamed stream which is tributary to the Methow River. There are no natural barriers on this stream precluding anadromous salmonid access. Five barrier culverts were identified on this stream of which two are on WDFW land. The first two barrier culverts (980374 and 980375, Photo 2) encountered are approximately 1500 meters upstream of the mouth and only 50 meters apart. Both are on WDFW land. Continuing upstream approximately 320 meters is a partial barrier culvert (980378) under SR 20 and 65 meters further upstream is a barrier culvert (980379) under a private driveway. The last barrier culvert (980380) on this stream has less than 200 meters of habitat upstream and therefore does not have sufficient gain to warrant repair. Correcting both culverts on the Big Valley Unit (980374 and 980375) and the additional state (980378) and private (980379) culverts, would allow access for coho, steelhead and resident species to 169 m^2 and 342 m^2 of spawning and summer rearing habitat, respectively. One non-barrier culvert (980381) was located on another unnamed stream (not shown on the map) in the southeast corner of the unit.

The only water diversion located on the Big Valley Unit was an adequately screened pump system (980376, Photos 3& 4). The pump was located in a small lagoon which is on the same stream as the aforementioned culverts.

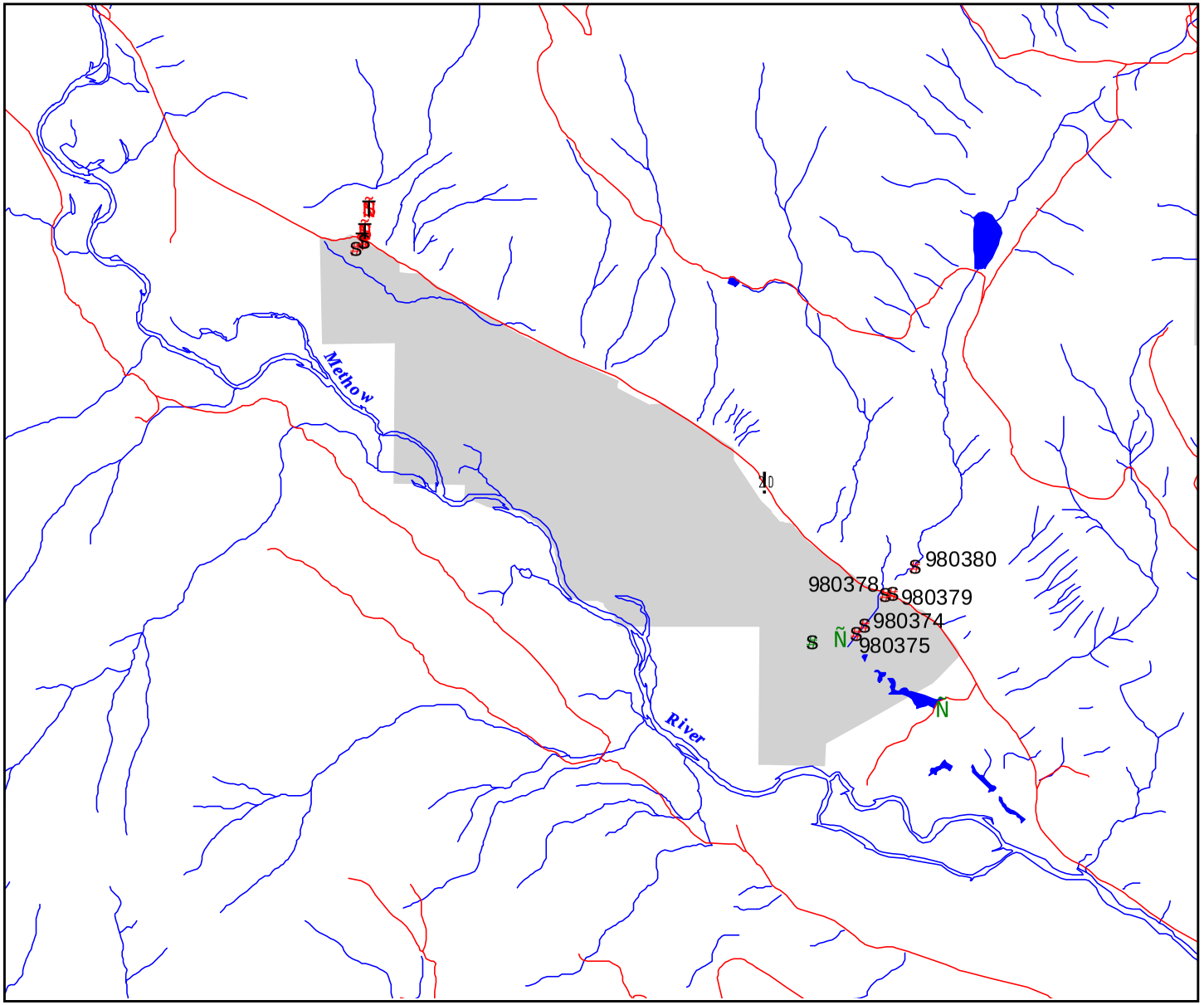


Figure 3: Big Valley

Chiliwist

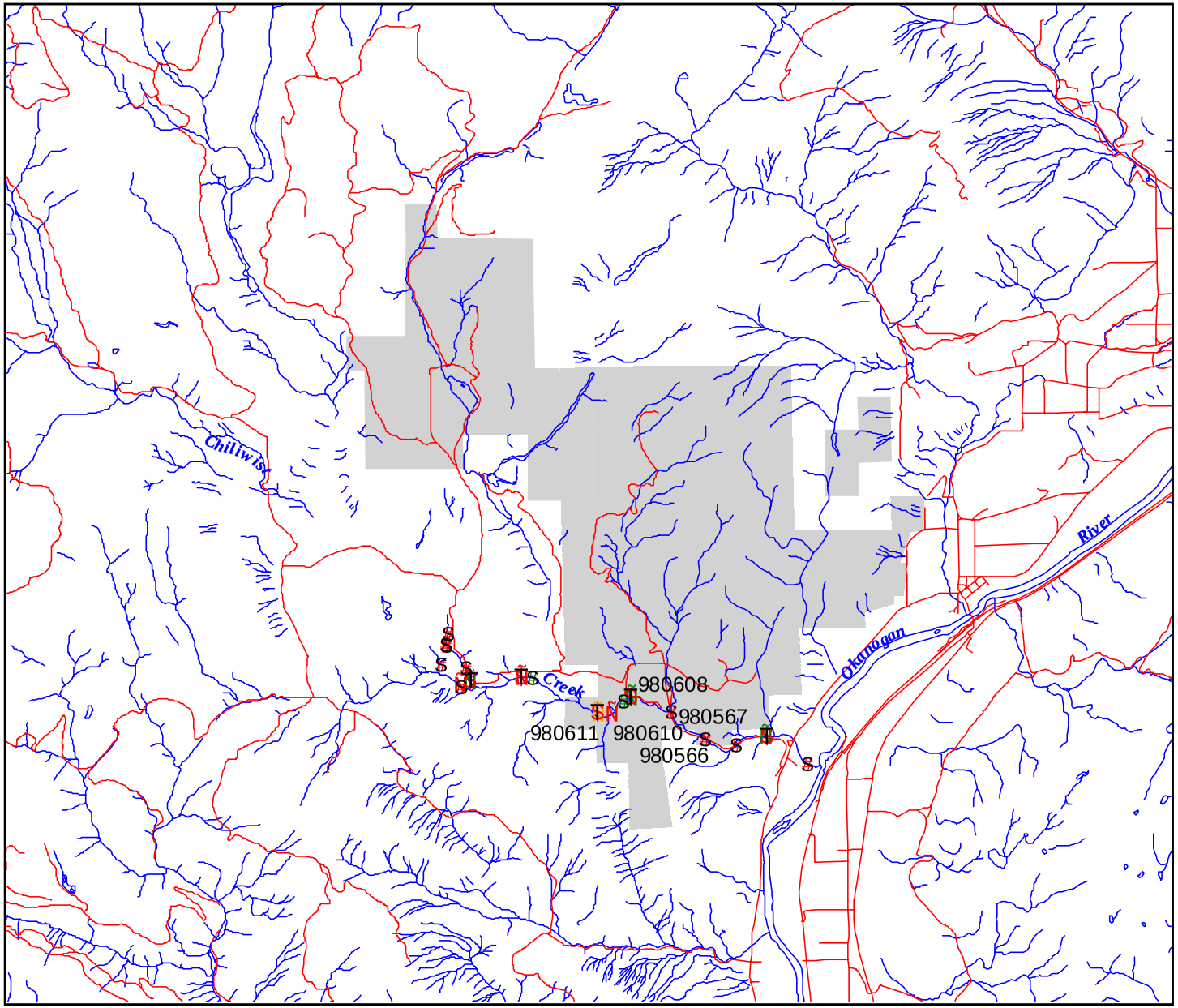
Chiliwist Creek, a tributary to the Okanogan River, was the only stream on the Chiliwist Unit (Figure 4) where fish passage and screening problems were identified. The physical survey of Chiliwist Creek revealed 14 fish passage barriers and six inadequately screened water diversions. Of these, only one fish passage barrier (a diversion dam) and one unscreened pump diversion are owned by WDFW (980608, Photo 5). Within the unit boundaries depicted in Figure 4 are two barrier culverts (980566, 980567) on the county road, one barrier dam (980611) and two unscreened diversions (980610, 980611) located on private property.

Three natural falls were identified downstream of the wildlife area, all of which are barriers to upstream fish migration. As such, all barrier prioritization within the Chiliwist unit is based on resident salmonid species only. The PI for the dam (980608) was calculated based on the amount of habitat downstream to the falls. This represents a potential gain of 733 m^2 and 1,930 m^2 of spawning and rearing habitat, respectively. To realize the full potential gain, ten upstream and three downstream fish passage barriers need to be repaired. Additionally, two upstream and one downstream water diversions need to be adequately screened.

Golden Doe

All fish passage barriers and unscreened surface water diversions within the Golden Doe unit were located on Alder Creek (Figure 5). The first barrier culvert (980099) was located approximately 100 meters upstream of the confluence with the Methow River immediately above Twisp-Carlton Road. Less than 100 meters upstream of this site is a waterfall creating a natural barrier to fish passage. The potential habitat gain for this barrier is less than the minimum threshold (200 m). Therefore, the culvert does not require repair. A small dam (980100) was built upon the waterfall to create a reservoir for the intake of a gravity fed surface water diversion. This diversion is an auxiliary input to a large irrigation canal that flows along the Methow River. The diversion (Photo 6), consisting of a 4" polyvinylchloride pipe, is unscreened. The dam does not warrant repair due to its location on the waterfall, but the diversion requires screening or removal. A timber dam and unscreened gravity fed surface water diversion were located at site 980101. The dam is a partial barrier to fish passage and needs to be repaired. The diversion was not in use at the time of inventory but should be screened if it is to be used in the future. If it is not going to be utilized, both the dam and the diversion should be removed. Approximately 488 meters further upstream a barrier culvert (980102, Photo 7) was located. There is sufficient habitat gain associated with this culvert to warrant repair.

The elimination of fish passage barriers at sites 980101 and 980102 would result in a total gain of 257 m^2 of spawning and 495 m^2 of rearing habitat. Since Alder Creek only support's resident fish species upstream of the falls and the habitat above the barriers is greater than below, the habitat gain was calculated downstream to the falls. Three privately owned barriers, two culverts and one dam exist further upstream off WDFW property. These barriers do not need to be fixed to realize the gain associated with fixing the WDFW owned barriers.



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

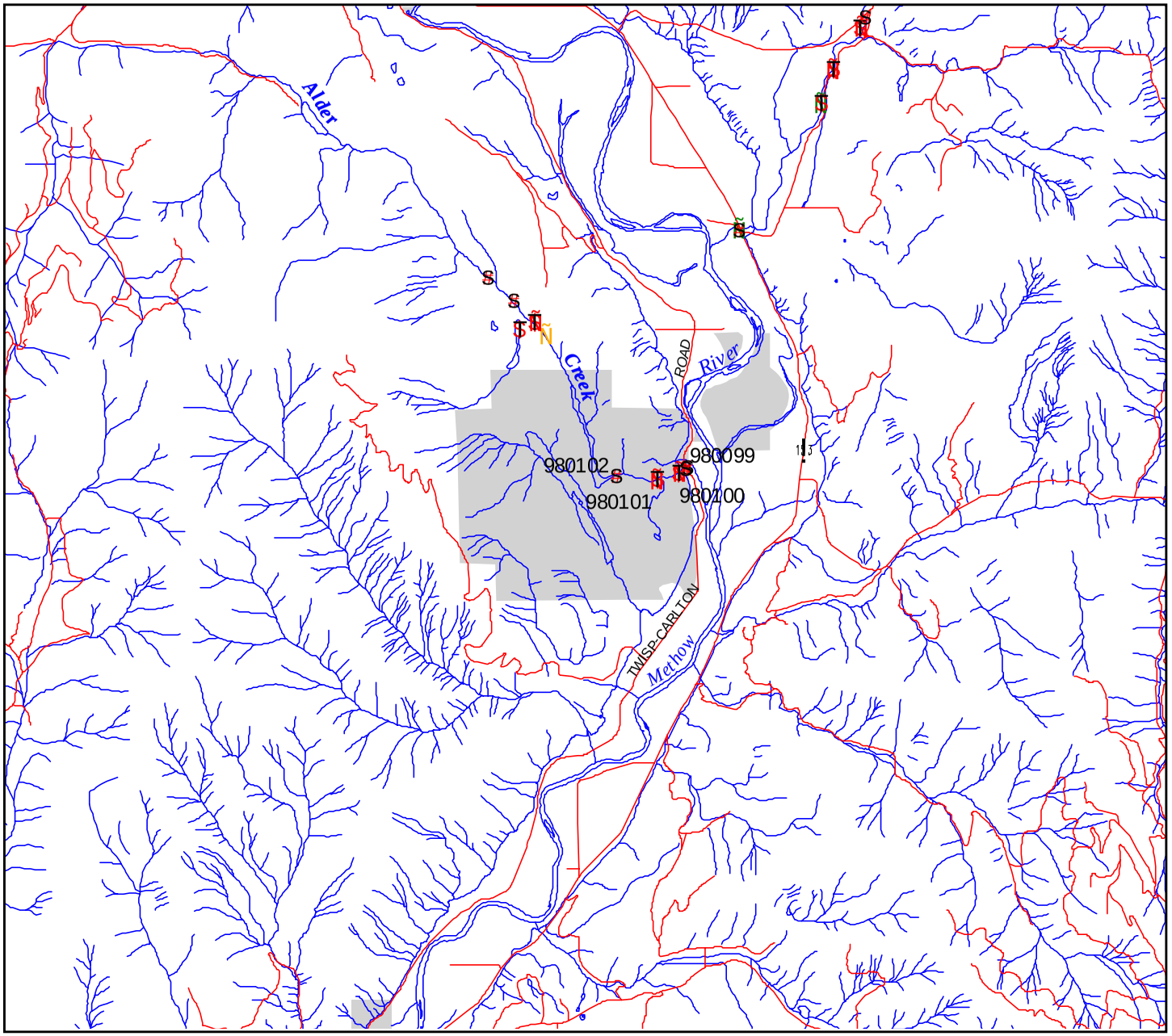
Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

N

2000 0 2000 4000 Meters

Figure 4: Chiliwist



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

N

2000 0 2000 4000 Meters

Figure 5: Golden Doe

Methow

The Methow Unit is the largest unit of the Methow Wildlife Area and has the highest number of problem culverts, dams, and diversions. Five major streams flow through the unit including, Ramsey, Pearrygin, Bear, Beaver, and Frazer Creeks. Each drainage is discussed below working from north to south through the unit.

Ramsey Creek flows through the northern part of the Methow Unit and is tributary to the Chewuch River (Figure 6). Within WDFW property one barrier culvert (980458) was identified approximately 2,000 meters upstream of the property line. Two additional barrier culverts (980442 and 980623) were located 1,332 and 1,550 meters further upstream on USFS roads. The number of downstream barriers and anadromous access is presently unknown due to a land owner denying access for the downstream survey. Ramsey Creek is believed to have had anadromous access historically, therefore, the habitat gain was calculated upstream and anadromous salmonids were included in the PI calculation. Repair of these barriers would allow access for chinook, coho, steelhead, and resident salmonids to 1,197 m^2 and 4,044 m^2 of spawning and rearing habitat, respectively.

A barrier dam (980447) was identified at the outlet of Sullivan Pond. Repair is not required as the outlet stream, which flows into the Chewuch Canal, is considered non-fish bearing based on physical parameters. As such, there would be no habitat gain.

Pearrygin Creek flows through the Pearrygin Lake Access Area in addition to the Methow Wildlife Area (Figure 6). It is tributary to Pearrygin Lake and the Chewuch River via Lake Creek. A barrier culvert (980649) was identified within the access area which blocks fish access to an estimated 4,432 m^2 and 10,467 m^2 of spawning and rearing habitat, respectively. Approximately 2800 meters upstream, just within the wildlife area boundary (as shown in figure 6), there is a barrier culvert (980603) and barrier dam with an associated unscreened gravity diversion (980604). The ownership of these are undetermined and they have not been included in the WDFW ownership results. Due to a land owner denying access to the stream, the number of barriers downstream of the access area and between the access and wildlife areas is unknown. Pearrygin Creek is believed to have had anadromous access historically. Therefore, the habitat gain was calculated upstream and anadromous salmonids were included in the PI calculation. Some of the species that would potentially benefit from fish passage restoration in this stream include ESA listed chinook, steelhead, and bull trout.

Bear Creek, a tributary to the Methow River, flows in a southerly direction through the unit (Figure 7). It has two large tributaries, Johnson Creek and Cougar Creek. Bear and Johnson Creeks have no natural barriers to anadromous salmonid migration within the unit. Cougar Creek, however, flows subsurface approximately 400 meters before reaching Bear Creek and is considered a resident salmonid only stream. Cougar Creek is discussed independently below and is not included in the habitat gain estimates for Bear Creek.

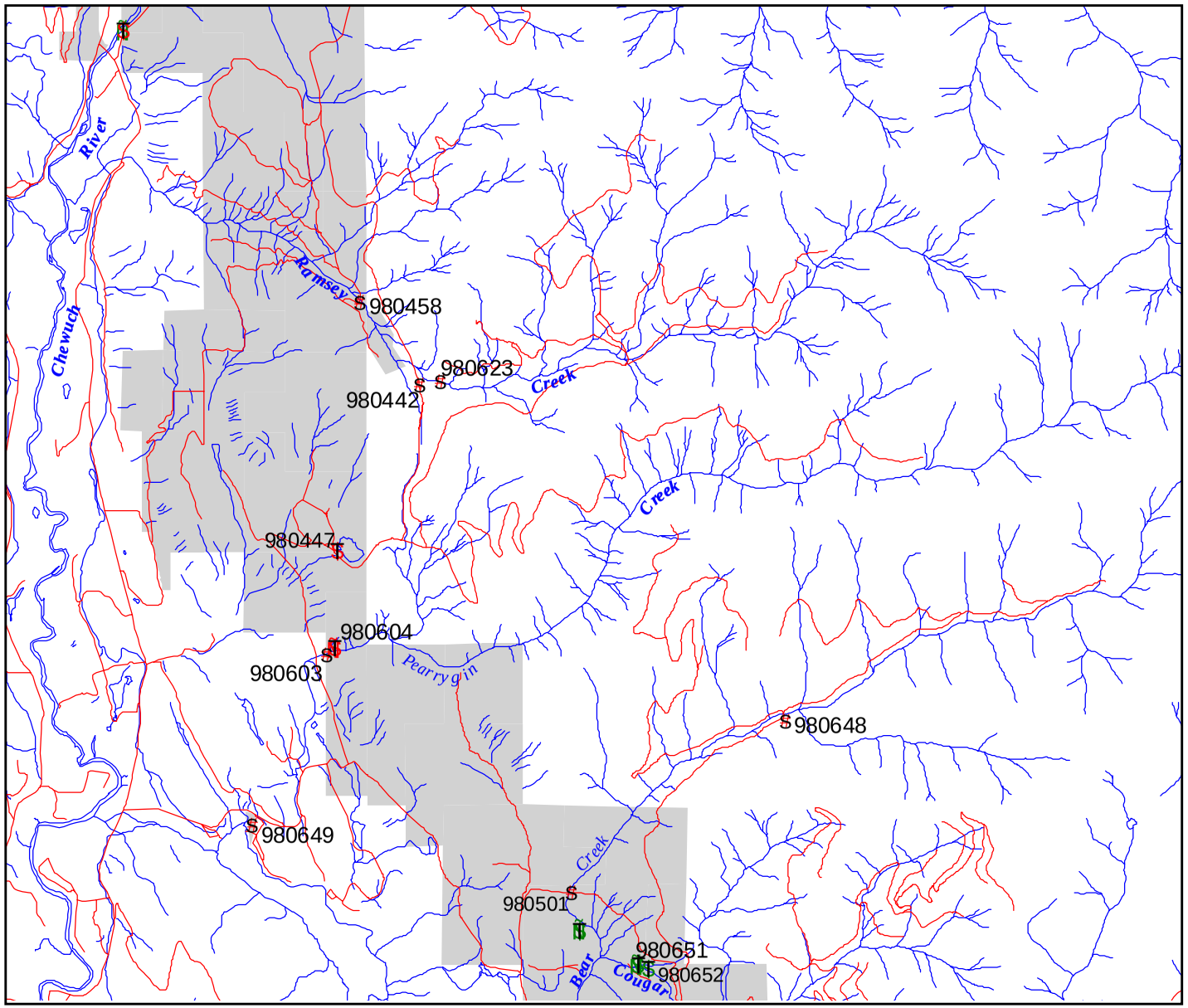
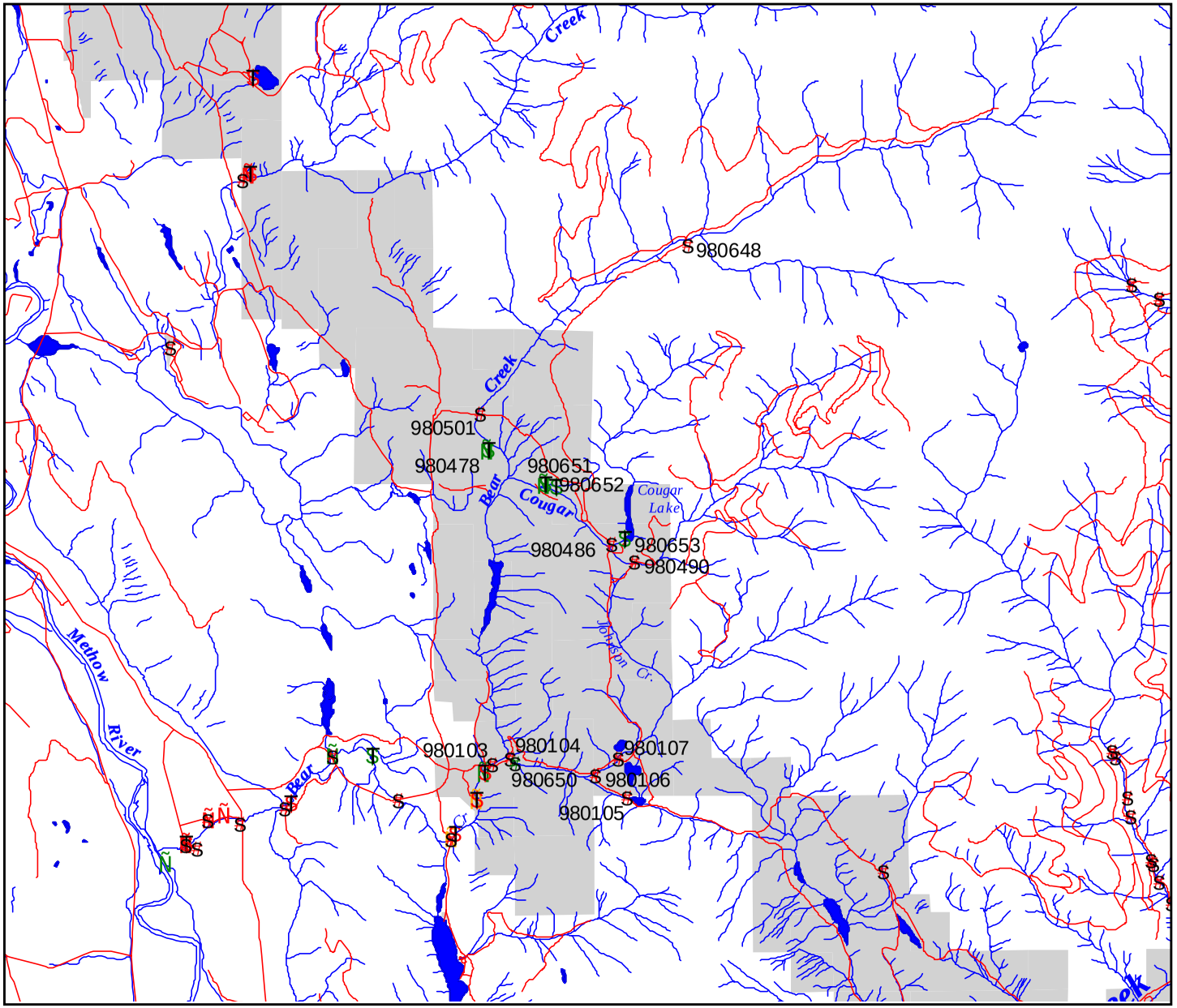


Figure 6: Methow



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

N

Figure 7: Methow

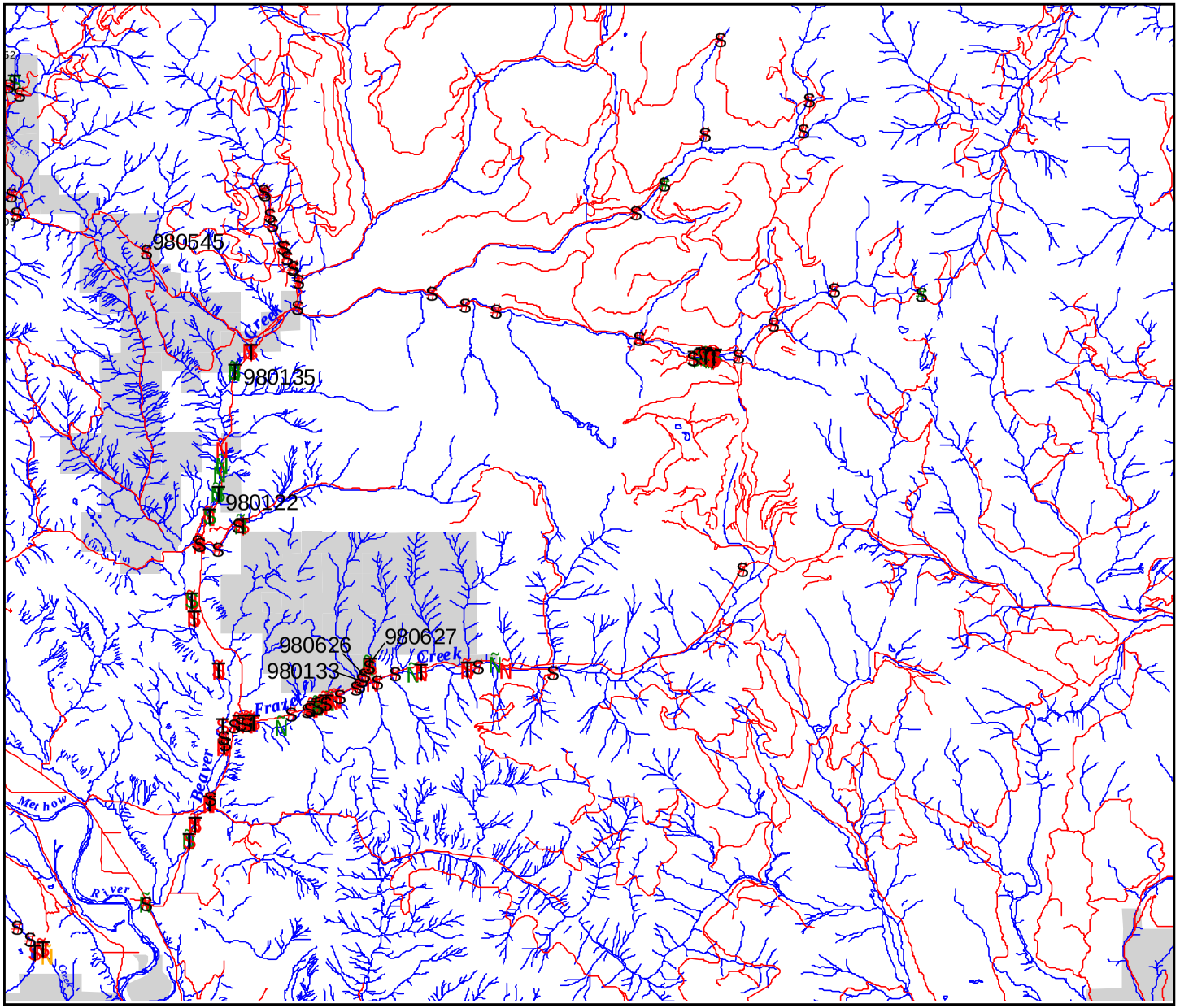
Twenty potential fish passage barriers (15 culverts and 5 dams) were identified on Bear and Johnson Creeks. Of these, six are WDFW owned and include two barrier culverts (980103 and 980501) on Bear Creek, three barrier culverts (980104, 980106, and 980107) on Johnson Creek, and one barrier culvert (980105) on Bowen Creek, a tributary to Johnson Creek (Figure 7). Two culverts (980106 and 980107) on Johnson Creek do not require repair as they are located near the headwaters and would not provide sufficient habitat gain. The culvert on Bowen Creek (980105) does not need repair due to insufficient habitat gain resulting from subsurface flow. The two culverts (980103 and 980501) on Bear Creek (Photos 8 and 9) and one on Johnson Creek (980104) require repair. The potential habitat gain associated with these culverts is 7,223 m^2 and 13,745 m^2 of spawning and rearing habitat, respectively. To realize the potential habitat gain, thirteen additional downstream barriers (eight culverts and five dams) and one upstream barrier (culvert) need to be repaired. Benefitting species include chinook and coho salmon, steelhead, cutthroat, rainbow, bull and brook trout.

In addition to the features above a passable dam and properly screened gravity diversion (980478) were located on Bear Creek. On Johnson Creek (Figure 7), a section of precast concrete culvert standing vertically (980650) was encountered. The purpose was assumed to be for a temporary pump diversion reservoir. No pump or pipe existed at the time of inventory. It is recommended that this potential diversion be investigated further.

Two culverts (980486 and 980490), three dams (980651, 980652, 980653), and one gravity diversion (980651) were located on Cougar Creek (Figure 7). The dams are all 100% passable and the diversion is properly screened. Both culverts are barriers and require repair. One was downstream of Cougar lake, the other upstream. As this is a resident salmonid only stream, habitat gain for PI purposes was estimated based on the smallest stream segment affected by the repair, whether up or downstream. The culvert (980486) downstream of the lake has a potential gain (downstream) of 506 m^2 and 861 m^2 of spawning and rearing habitat, respectively, while the culvert upstream (980490) has a potential of 539 m^2 and 906 m^2 of spawning and rearing habitat, respectively (upstream).

Beaver Creek, tributary to the Methow River, flows along the eastern side of the Methow Unit (Figure 8). The entire Beaver Creek drainage was surveyed in 1998 as part of a separate inventory effort. This survey identified 75 potential fish passage barriers and 25 unscreened water diversions throughout the Beaver Creek drainage. Detailed results of this inventory are presented in Appendix II. The survey identified two diversions and associated dams (980122 and 980135) on Beaver Creek within WDFW property. At the time of inventory one diversion (980122) was unscreened, however, it was corrected shortly after discovery. The associated dams were considered 100% passable to salmonids. One barrier culvert (980545) was located on an unnamed tributary to Beaver Creek. It did not have sufficient habitat gain to warrant repair.

Three barrier culverts (980133, 980626, 980627), one barrier dam (980627), and one screened pump diversion (980627) were identified within the Methow Unit on an unnamed tributary to Frazer Creek (Figure 8), which is a tributary to Beaver Creek. During the physical survey an



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

N

4000 0 4000 8000 Meters

Figure 8: Methow

impassable cascade was encountered 58 meters upstream from the mouth. Usable habitat upstream of this point was estimated at 400 lineal meters. All the barriers are upstream of the cascade, and the minimum habitat gain threshold could not be met for any of them. As such, none require repair due to insufficient habitat gains.

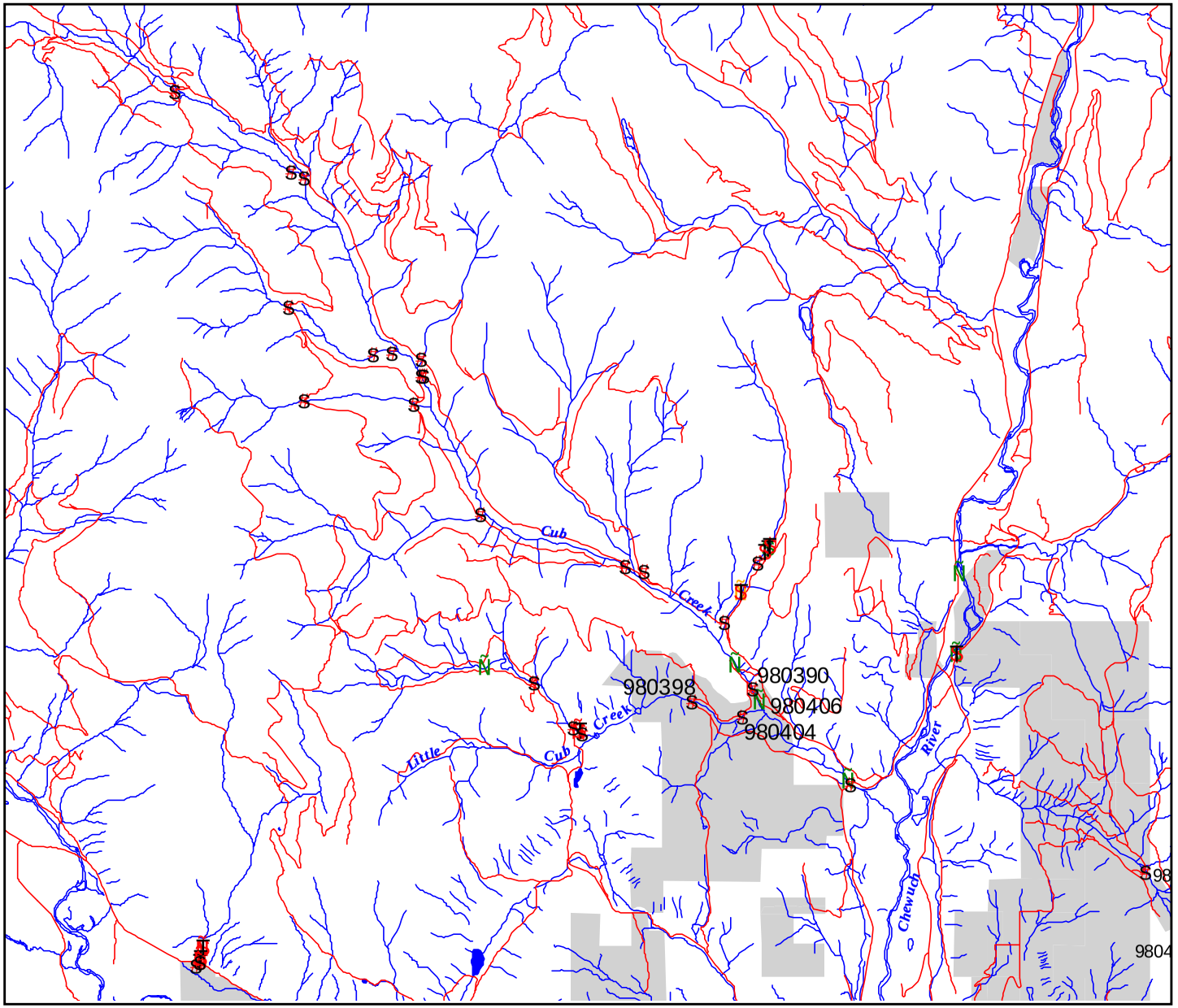
Rendezvous

Cub Creek, a tributary to the Chewuch River, is the main stream system that flows through the northern end of the Rendezvous Unit (Figure 9). Cub Creek has numerous tributaries one of which, Little Cub Creek, also flows through WDFW land. Approximately 500 meters upstream from the mouth is a series of waterfalls with an overall drop of 10 meters, creating a barrier to anadromous fish migration. As such, all barrier prioritization in this system is based on resident salmonid species only. Twenty-six fish passage barriers were identified on Cub Creek and it's tributaries of which three are on WDFW property.

Of the three barriers on WDFW land, one is on Cub Creek (980390, Photo 10) and two are on Little Cub Creek (980404 and 980398). All have sufficient potential habitat gain to warrant repair. Culvert 980390 is located approximately 2300 meters upstream of the falls. Culvert 980404 and culvert 980398 are located 320 and 1200 meters, respectively, upstream from the confluence with Cub Creek.

For the Cub Creek culvert, the habitat above the crossing was greater than below. Therefore, the habitat gain was calculated downstream to the falls and includes Little Cub Creek. For the Little Cub Creek culverts, the habitat above the crossings were less than below. Therefore, the habitat gain was calculated upstream to the headwaters or a natural barrier. As a result, the habitat gain for Little Cub Creek is a subset of the gain listed for the Cub Creek culvert. The total potential gain for the Little Cub Creek culverts is 2,256 m^2 and 17,085 m^2 of spawning and rearing habitat, respectively. Four non-WDFW owned culverts would have to be fixed upstream to realize the full gain. For the Cub Creek culvert, the total potential gain is 8,597 m^2 and 26,344 m^2 of spawning and rearing habitat, respectively. In addition to the barrier repairs on Little Cub Creek, 20 (19 upstream and one downstream) non-WDFW owned fish passage barriers need to be repaired to realize the full gain. However, the incremental gain associated with these three barriers is sufficient to warrant repair independent of the non-WDFW owned barriers.

The only water diversion located on the Rendezvous Unit was a large twin pump system (980406, Photo 11). Both pumps are sufficiently screened.



Map Features

Fish Passage Features

Culverts

- Barrier
- Non Barrier

Dams

- Barrier
- Non Barrier

Fish Screening Features

Surface Water Diversions

- Unscreened
- Screened
- Screen Unknown

Other Map Features

- Roads
- Streams/Lakes
- WDFW Managed

N

2000 0 2000 4000 Meters

Figure 9: Rendezvous

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APPENDIX I

Photographs of Barriers and Diversions
on the Methow Wildlife Area

Methow Wildlife Area / Big Buck Unit / Site 980354

Photo 1. An unnamed tributary to the Twisp River. Although anadromous species are not present at this particular site, slope alone renders this pipe a total passage barrier for resident salmonids. The majority of flow percolates through the road fill.

Methow Wildlife Area / Big Valley Unit / Site 980375

Photo 2. An unnamed tributary to the Methow River. Due to the inadequate size and slope of this culvert a large outfall drop has developed creating a near total fish passage barrier to resident fish. If the culvert was made passable, it is likely that anadromous species would utilize the habitat as well.

Methow Wildlife Area / Big Valley Unit / Site 980376

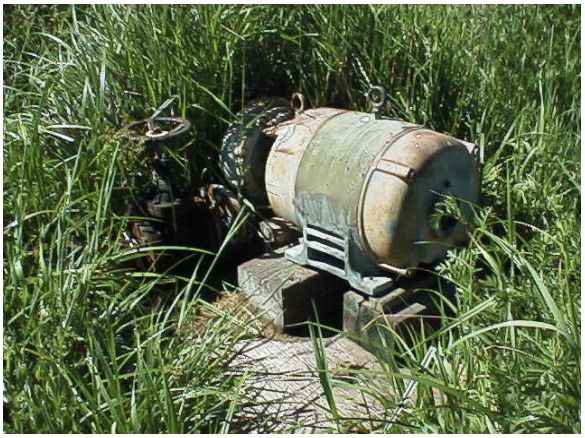

Photo 3 & 4. Unnamed pond and tributary to the Methow River. An illustration of the large 50 horsepower pump and small priming pump needed to irrigate the large plot of land WDFW manages. The intake at this site was considered to be adequately screened.

Methow Wildlife Area / Chiliwist Unit / Site 980608

Photo 5. Chiliwist Creek (49.0034). The dam at the point of diversion was a total barrier to fish migration at the time of inventory and requires redesign to allow for 100% fish passage throughout the year.

Methow Wildlife Area / Golden Doe Unit / Site 980100

Photo 6. Alder Creek (48.0296). A perfect example of the various types of unscreened hydraulic diversions located within the Methow Valley. This diversion is utilized as an auxiliary water source to a much larger diversion from the Methow River. The 4 inch pvc pipe is diverting water into the larger canal downstream.

Methow Wildlife Area / Golden Doe / Site 980102

Photo 7. Alder Creek (48.0296). With the series of three culverts being installed at this crossing, it was inevitable that is would eventually become a fish passage barrier for resident salmonids.

Methow Wildlife Area / Methow Unit / Site 980103

Photo 8. Bear Creek (48.0708). It is obvious, with this large of a plunge pool, that the culvert is undersized and was placed at an incorrect slope. This crossing alone renders 7,223 and 13,745 square meters inaccessible to several ESA listed salmonids.

Methow Wildlife Area / Methow Unit / Site 980501

Photo 9. Bear Creek (48.0708). Due to the culvert being severely undersized and having a slope of approximately 7%, it has probably been a fish passage barrier since the time of installation. Notice the waterline on the inside of the culvert.

Methow Wildlife Area / Rendezvous Unit / Site 980390

Photo 10. Cub Creek (48.0737). This culvert is the largest of all fish passage barriers on the Methow Wildlife Area. A slope greater than 1% and being undersized, designated the culvert a fish passage barrier. There is a series of large waterfalls several hundred meters downstream creating an anadromous barrier.

Methow Wildlife Area / Rendezvous Unit / 980406

Photo 11. Cub Creek (48.0737). A good example of large pump diversions that are located throughout the Methow Valley. Several similar pump diversions were inventoried off WDFW property.

APPENDIX II

Beaver Creek Fish Passage and Water Diversion Inventory

Beaver Creek Fish Passage and Water Diversion Inventory

Habitat and Lands Services Program
Salmonid Screening, Habitat Enhancement and Restoration (SSHEAR) Division

January 1999

Eric Gower
Ethan Espie

Washington Department of FISH and WILDLIFE

Introduction

The Washington Department of Fish and Wildlife's (WDFW) Salmonid Screening, Habitat Enhancement and Restoration Division (SSHEAR), in cooperation with the Methow Wildlife Area Manager, Enforcement Program officers, and numerous property owners, conducted an inventory of fish passage barriers and water diversions throughout the Beaver Creek drainage. Beaver Creek is a tributary of the Methow River in eastern Washington. The purpose of the inventory was to document and prioritize for correction all fish passage problems and unscreened water diversions. Correction of these problems is necessary to ensure compliance with Washington State laws and support the salmonid restoration effort.

Methods

The inventory included Beaver Creek and all its tributaries beginning at the confluence with the Methow River. Proceeding upstream, all human-made structures were evaluated for fish passage (culverts and dams) or fish safety (water diversions). Culvert evaluation methods are described in the Fish Passage Barrier Assessment and Prioritization Manual (WDFW, 1998). All dams were also assessed for passability. Dams with absolutely no plunge pool and a hydraulic drop less than 0.8 feet and dams with hydraulic drops greater than 0.8 feet were considered partial or total barriers, respectively. Water diversions were evaluated for compliance with WDFW fish screening criteria. Data collected for each feature type are described in the *Snoqualmie Wildlife Area Fish Retrofit* report (WDFW, 1998)

Beaver Creek habitat assessment began at the first barrier upstream from the confluence with the Methow River. An expanded threshold determination (ETD) methodology was used for habitat quantification and is described in the Fish Passage Barrier Assessment and Prioritization Manual (WDFW, 1998). The ETD was augmented with reach break and natural barrier information collected in the field.

A standard Priority Index (PI) was calculated for each fish passage barrier. This index is described in the Fish Passage Barrier Assessment and Prioritization Manual (WDFW,1998). In order to prioritize unscreened diversions the Screening Priority Index (SPI) model was developed based on the original formula used in prioritizing fish passage barriers. In the SPI the habitat gain variable was replaced with the cross-sectional area of the water diversions intake. The rational being that the size of the intake is proportional to the risk to fish. Additionally the cost modifier was adjusted to reflect costs appropriate to screening projects. Thus a larger water diversion would have a higher SPI value. The SPI is calculated as follows:

$$SPI = \sum_{all\,species} \sqrt[4]{(A)(M)(D)(C)}$$

Where:

SPI = Priority Index

- Relative project benefit considering cost.
- The SPI is actually the sum ($\sum_{\text{all species}}$)of individual SPI values, one of which is calculated for each species present in a stream (e.g., SPI_{coho} is added to SPI_{chum} to obtain $SPI_{\text{all species}}$).

A = Area of Intake

- Cross-sectional area of the water diversion intake expressed in square feet.
- Intake area is used as an estimate of potential fished saved (i.e. more flow is related to more fish).

M = Mobility Modifier

- Accounts for benefits to each fish stock for increased mobility (access to habitat being evaluated); gives greater weight to projects that increase productivity of species that are highly mobile and subject to geographically diverse recreational and commercial fisheries by providing access to habitat currently limiting productivity.
- 2 = Highly mobile stock subject to geographically diverse recreational and commercial fisheries (anadromous species)
- 1 = Moderately mobile stock subject to local recreational fisheries (resident species)

D = Species Condition Modifier

- Representation of status of species present; gives greater weight to less healthy species as listed in the Washington State Salmon and Steelhead Stock Inventory (SASSI) report, (WDF, et. al., 1992), Salmonid Stock Inventory Bull Trout and Dolly Varden Appendix, (WDFW, et. al., 1997) and Salmonid Stock Inventory Cutthroat Trout Appendix, (WDFW, et. al., 1998). In the absence of a SASSI assignment, stock condition should be estimated using the best available information.

  3 = Condition of species considered critical.

  2 = Condition of species considered depressed or stock of concern.

  1 = species not meeting the conditions for 2 or 3.

C = Cost Modifier

- Representation of projected cost of project; gives greater weight to less costly projects.

  3 = incremental funds needed ≤ $1,000...

  2 = incremental funds needed >$1,000 and ≤$5,000...

  1 = incremental funds needed >$5,000...

Results and Discussion

The inventory and physical habitat surveys covered approximately 58 lineal miles of stream including Beaver Creek and 18 tributaries. A total of 143 features (68 culverts, 40 dams, 23 gravity diversions and 12 pump diversions) were identified and evaluated within the drainage. Fifty-eight culverts and all the other features were considered to be in fish bearing streams. The total potential spawning and summer rearing habitat gains for the drainage are estimated at 51,338 and 114,336 square meters, respectively. Anadromous fish access extended to the very headwaters of all streams within the Beaver Creek drainage, except for the furthest upstream reaches of South Fork Beaver Creek and Volstead Creek. Table 1 summarizes the total number of culverts, dams, and water diversions evaluated, the number of fish passage barriers, and the number of screened and unscreened diversions. Figure 1 displays the locations of each feature. The site ID numbers shown on the map are WDFW reference numbers used to track the features in the inventory database.

Of the 58 culverts in fish bearing waters, only three were considered to be 100% passable to salmonids. The remaining 55 culverts, comprising 52 stream crossings, were identified as potential barriers to fish passage. Of the 40 dams, 23 were for irrigation, 16 for channel rehabilitation and one for recreational purposes. Thirty-six of the dams are full spanning of which 23 were identified as barriers to upstream migration with the remaining 13 being 100% passable. The four partially spanning dams were considered 100% passable to salmonids. Analysis of habitat surveys indicated that significant habitat or fish production gain would be realized at all barriers except for two culvert crossings (sites 980165 and 980228). These two sites were considered to have no significant habitat gain upstream. Table 2 lists all fish passage barriers including site ID, stream name, WRIA, tributary to, river mile, barrier type, spawning and rearing area, numbers of additional human-made barriers, percent passability, and PI.

Thirty-six water diversions, consisting of 24 gravity and 12 pump, were evaluated. Four gravity and six pump diversions were properly screened. The remainder were unscreened. Twenty-three of the diversions have associated diversion dams (included in dam figures above), of which 13 are fish passage barriers. Table 3 lists all unscreened diversions including stream name, WRIA, tributary to, river mile, diversion type, the intake dimensions, cross-sectional area and the SPI.

Table 1. Total culverts, dams, gravity diversions and pump diversions evaluated within the Beaver Creek drainage.

	Culverts	Dams	Gravity Diversions	Pump Diversions
Features Evaluated	68	40	23	12
Features in Fish Bearing Streams	58	40	23	12
Number of Total Barriers	35	4		
Number of Partial Barriers	20	19		
Screened			4	6
Unscreened			19	6

Table 2. List of all fish passage barriers including: site ID, owner type, stream name, WRIA, tributary to, river mile, barrier type, spawning and rearing area, numbers of additional human-made barriers, passability and PI.

SiteID	Owner	Stream	TribTo	WRIA	River Mile	Barrier Type	Spawning Area (m^2)	Rearing Area (m^2)	Upstrm Barriers	Dwnstrm Barriers	Pass %	PI
980108	state	Beaver Cr	Methow R	48.0307	0.26	culvert	51,337.92	114,336.14	72	0	0	50..49
980111	private	Beaver Cr	Methow R	48.0307	1.38	dam	51,224.44	108,910.89	71	1	33	44.89
980112	private	Beaver Cr	Methow R	48.0307	1.64	dam	50,715.17	107,606.71	70	2	33	44.70
980113	private	Beaver Cr	Methow R	48.0307	2.06	dam	49,878.19	105,463.32	69	3	0	49.04
980114	state	Beaver Cr	Methow R	48.0307	2.14	culvert	49,721.20	105,061.30	68	4	33	48.97
980115	private	Beaver Cr	Methow R	48.0307	2.91	dam	48,227.54	102,651.58	67	5	33	43.92
980116	private	Beaver Cr	Methow R	48.0307	2.96	culvert	48,114.61	102,474.03	66	6	67	36.77
980117	private	Beaver Cr	Methow R	48.0307	3.26	dam	39,188.37	89,373.93	40	7	0	46.70
980118	private	Beaver Cr	Methow R	48.0307	4.16	dam	37,797.08	85,811.02	39	8	67	34.84
980119	private	Beaver Cr	Methow R	48.0307	5.00	dam	3,6851.21	82,649.21	38	9	33	40.97
980136	private	Beaver Cr	Methow R	48.0307	8.99	dam	30,816.87	67,994.26	32	10	67	31.57
980137	federal	Beaver Cr	Methow R	48.0307	9.93	culvert	9,567.59	24,505.23	13	11	0	30.83
980148	federal	Beaver Cr	Methow R	48.0307	16.90	culvert	345.76	1,810.13	0	12	67	7.21
980163	federal	Blue Buck Cr	Beaver Cr	48.0366	2.32	culvert	2,034.66	4,530.52	0	12	0	12.10
980166	federal	Unnamed	Blue Buck Cr	48.0366a	0.58	culvert	29.78	131.23	0	12	33	4.51
980165	federal	Unnamed	Blue Buck Cr	48.0366a	0.80	culvert	0	0	0	13	33	0
980147	private	Frazer Cr	Beaver Cr	48.0309	0.10	culvert	8,406.32	11,965.15	24	7	67	21.84
980126	private	Frazer Cr	Beaver Cr	48.0309	0.26	culvert	8,059.02	11,475.36	23	8	67	23.82
980125	private	Frazer Cr	Beaver Cr	48.0309	0.32	dam	7,973.40	11,354.61	22	9	0	28.29
980124	state	Frazer Cr	Beaver Cr	48.0309	0.35	culvert	7,911.08	11,266.72	21	10	67	21.38

Table 2. (continued) List of all fish passage barriers including: site ID, owner type, stream name, tributary to, WRIA, river mile, barrier type, spawning and rearing area, numbers of additional human-made barriers, passability and PI.

SiteID	Owner	Stream	TribTo	WRIA	River Mile	Barrier Type	Spawning Area (m^2)	Rearing Area (m^2)	Upstrm Barriers	Dwnstrm Barriers	Pass %	PI
980127	private	Frazer Cr	Beaver Cr	48.0309	0.44	culvert	7,786.49	11,097.21	20	11	33	25.38
980129	private	Frazer Cr	Beaver Cr	48.0309	0.49	dam	7,594.88	10,831.98	19	12	67	21.08
980149	private	Frazer Cr	Beaver Cr	48.0309	0.52	dam	7,549.79	10,773.38	18	13	67	21.04
980151	private	Frazer Cr	Beaver Cr	48.0309	1.16	culvert	6,585.61	9413.62	17	14	0	26.36
980152	private	Frazer Cr	Beaver Cr	48.0309	1.39	culvert	6381.11	9,120.23	16	15	67	19.72
980153	private	Frazer Cr	Beaver Cr	48.0309	1.40	culvert	6,358.03	9,087.54	15	16	67	19.70
980154	private	Frazer Cr	Beaver Cr	48.0309	1.45	dam	6,287.06	8,987.01	14	17	67	15.60
980157	private	Frazer Cr	Beaver Cr	48.0309	1.57	dam	6,119.47	8,749.64	13	18	67	19.38
980158	private	Frazer Cr	Beaver Cr	48.0309	1.63	culvert	6,037.87	8,634.07	12	19	67	19.27
980198	private	Frazer Cr	Beaver Cr	48.0309	1.66	dam	5,994.38	8,573.88	11	20	67	19.21
980199	private	Frazer Cr	Beaver Cr	48.0309	1.66	culvert	5,980.51	8,554.23	10	21	67	19.19
980203	private	Frazer Cr	Beaver Cr	48.0309	1.90	culvert	5,620.44	8,084.29	9	22	33	22.32
980132	private	Frazer Cr	Beaver Cr	48.0309	2.13	culvert	5,304.37	7,636.61	8	23	0	24.00
980205	private	Frazer Cr	Beaver Cr	48.0309	2.46	culvert	4,098.27	5,808.98	5	24	0	21.47
980206	private	Frazer Cr	Beaver Cr	48.0309	2.73	culvert	3,755.15	5,323.61	4	25	0	20.01
980208	private	Frazer Cr	Beaver Cr	48.0309	3.10	dam	3,332.10	4,725.17	3	26	33	11.06
980210	private	Frazer Cr	Beaver Cr	48.0309	3.80	dam	2,543.51	3,541.70	2	27	0	11.37
980211	private	Frazer Cr	Beaver Cr	48.0309	3.97	culvert	2,425.42	3,374.66	1	28	33	10.16
980215	federal	Frazer Cr	Beaver Cr	48.0309	5.11	culvert	1,406.33	1,877.94	0	29	0	9.70

Table 2. (continued) List of all fish passage barriers including: site ID, owner type, stream name, tributary to, WRIA, river mile, barrier type, spawning and rearing area, numbers of additional human-made barriers, passability and PI.

SiteID	Owner	Stream	TribTo	WRIA	River Mile	Barrier Type	Spawning Area (m^2)	Rearing Area (m^2)	Upstrm Barriers	Dwnstrm Barriers	Pass %	PI
980131	state	Unnamed	Frazer Cr	48.0309a	0	culvert	737.39	1,161.03	1	24	0	15.17
980133	state	Unnamed	Frazer Cr	48.0309a	0.10	culvert	670.86	1,062.17	0	25	0	14.54
980167	federal	MF Beaver Cr	SF Beaver Cr	48.0342a	0.00	culvert	7,277.08	16,716.68	4	11	0	16.70
980195	federal	MF Beaver Cr	SF Beaver Cr	48.0000	3.11	culvert	3,335.91	8,674.67	3	12	0	14.13
980197	federal	MF Beaver Cr	SF Beaver Cr	48.0342a	5.98	culvert	19.50	113.53	0	13	0	4.81
980227	federal	Unnamed	MF Beaver Cr	48.0342a1	0.19	culvert	613.56	1,579.18	0	13	0	8.95
980226	federal	Unnamed	MF Beaver Cr	48.0342a1	0.62	culvert	440.53	1,208.59	0	13	33	7.86
980228	federal	Unnamed	MF Beaver Cr	48.0342a1	1.63	culvert	0	0	0	14	33	0
980168	federal	SF Beaver Cr	Beaver Cr	48.0342	2.57	culvert	5,877.32	10,188.66	12	11	0	14.80
980169	federal	SF Beaver Cr	Beaver Cr	48.0342	3.03	culvert	5,148.51	8,833.49	11	12	0	14.28
980177	federal	SF Beaver Cr	Beaver Cr	48.0342	5.91	culvert	1,484.97	2,595.1	9	13	67	7.96
980179	federal	SF Beaver Cr	Beaver Cr	48.0342	6.14	dam	1,296.98	2,284.81	8	14	67	7.71
980183	federal	SF Beaver Cr	Beaver Cr	48.0342	6.18	dam	1,266.16	2,236.71	7	15	67	7.67
980188	federal	SF Beaver Cr	Beaver Cr	48.0342	6.23	dam	1,228.31	2,174.23	6	16	33	9.09
980190	federal	SF Beaver Cr	Beaver Cr	48.0342	6.25	dam	1,213.52	2,149.82	5	17	33	9.06
980191	federal	SF Beaver Cr	Beaver Cr	48.0342	6.26	dam	1,206.19	2,137.72	4	18	67	7.58
980192	federal	SF Beaver Cr	Beaver Cr	48.0342	6.27	dam	1,198.9	2,125.69	3	19	67	7.57
980170	federal	SF Beaver Cr	Beaver Cr	48.0342	6.67	culvert	883.9	1605.81	2	20	0	9.31
980171	federal	SF Beaver Cr	Beaver Cr	48.0342	7.33	culvert	570.34	1,015.31	1	21	0	8.29

Table 2. (continued) List of all fish passage barriers including: site ID, owner type, stream name, tributary to, WRIA, river mile, barrier type, spawning and rearing area, numbers of additional human-made barriers, passability and PI.

SiteID	Owner	Stream	TribTo	WRIA	River Mile	Barrier Type	Spawning Area (m^2)	Rearing Area (m^2)	Upstrm Barriers	Dwnstrm Barriers	Pass %	PI
980194	federal	SF Beaver Cr	Beaver Cr	48.0342	8.34	culvert	163.82	303.48	0	22	0	6.07
980218	federal	Unnamed	SF Beaver Cr	48.0342a	0.02	culvert	305.03	804.35	0	13	0	17.30
980219	county	Storer Cr	Beaver Cr	48.0335	0.10	culvert	565.87	1,213.89	4	10	0	16.17
980222	county	Storer Cr	Beaver Cr	48.0335	0.12	culvert	535.83	1,144.22	3	11	33	13.19
980223	private	Storer Cr	Beaver Cr	48.0335	0.39	culvert	398.27	888.12	2	12	0	8.60
980224	private	Storer Cr	Beaver Cr	48.0335	0.78	culvert	253.95	572.36	1	13	0	7.20
980225	private	Storer Cr	Beaver Cr	48.0335	0.83	dam	235.27	537.59	0	14	67	5.38
980140	federal	Volstead Cr	Beaver Cr	48.0356	0.10	culvert	1,721.91	3,081.17	9	12	0	19.07
980141	federal	Volstead Cr	Beaver Cr	48.0356	0.25	culvert	1,480.03	2,695.39	8	13	0	17.69
980216	federal	Volstead Cr	Beaver Cr	48.0356	0.31	culvert	1,396.16	2,570.40	7	14	0	17.12
980217	federal	Volstead Cr	Beaver Cr	48.0356	0.41	culvert	1,272.12	23,72.57	6	15	0	15.97
980142	federal	Volstead Cr	Beaver Cr	48.0356	0.54	culvert	1,126.67	2,140.58	5	16	0	13.05
980143	federal	Volstead Cr	Beaver Cr	48.0356	0.56	culvert	1,107.4	2,115.04	4	17	0	9.64
980144	federal	Volstead Cr	Beaver Cr	48.0356	0.88	culvert	793.21	1,785.31	3	18	0	9.16
980145	federal	Volstead Cr	Beaver Cr	48.0356	1.05	culvert	640.27	1,483.52	2	19	0	8.62
980146	federal	Volstead Cr	Beaver Cr	48.0356	1.34	culvert	376.2	962.45	1	20	0	7.05
980159	federal	Volstead Cr	Beaver Cr	48.0356	1.38	culvert	350.57	977.85	0	21	0	5.91

Table 3. List of unscreened water diversions including: site ID, owner type, stream name, tributary to, WRIA, river mile, diversion type, intake dimensions, intake cross-sectional area and SPI.

SiteID	Owner	Stream	TribTo	WRIA	River Mile	Diversion Type	Intake Dimensions	X-sect (ft^2)	SPI
980112	private	Beaver Cr	Methow R	48.0307	1.64	gravity	8.0 x 4.0 (ft)	32.0	5.03
980113	private	Beaver Cr	Methow R	48.0307	2.06	gravity	4.0 x 4.0 (ft)	16.0	4.22
980115	private	Beaver Cr	Methow R	48.0307	2.91	gravity	2.5 x 3.0 (ft)	7.5	3.50
980118	private	Beaver Cr	Methow R	48.0307	4.16	gravity	4.0 x 2.0 (ft)	8.0	3.56
980119	private	Beaver Cr	Methow R	48.0307	5.00	gravity	3.0 x 2.0 (ft)	6.0	3.31
980120	private	Beaver Cr	Methow R	48.0307	5.27	gravity	3.0 x 2.0 (ft)	6.0	3.31
980121	private	Beaver Cr	Methow R	48.0307	6.64	gravity	6.0 x 3.0 (ft)	18.0	4.36
980122	state	Beaver Cr	Methow R	48.0307	6.92	gravity	3.0 x 3.0 (ft)	9.0	3.66
980139	private	Beaver Cr	Methow R	48.0307	7.36	gravity	2.5 x 0.5 (ft)	1.25	2.24
980136	private	Beaver Cr	Methow R	48.0307	8.99	gravity	2.5 x 3.0 (ft)	7.5	3.50
980125	private	Frazer Cr	Beaver Cr	48.0309	0.32	gravity	4.3 x 3.5 (ft)	15.05	4.17
980127	private	Frazer Cr	Beaver Cr	48.0309	0.44	gravity	3.0 x 3.0 (ft)	9.0	4.82
980128	private	Frazer Cr	Beaver Cr	48.0309	0.47	pump	3.5 (in) dia.	0.3	1.52
980129	private	Frazer Cr	Beaver Cr	48.0309	0.49	gravity	3.3 x 2.5 (ft)	8.25	4.72
980154	private	Frazer Cr	Beaver Cr	48.0309	1.45	gravity	2.5 x 1.0 (ft)	2.5	3.16
980157	private	Frazer Cr	Beaver Cr	48.0309	1.57	pump	2.0 (in) dia.	0.15	1.08
980198	private	Frazer Cr	Beaver Cr	48.0309	1.66	gravity	1.8 x 1.0 (ft)	1.8	2.45
980201	private	Frazer Cr	Beaver Cr	48.0309	1.76	pump	2.0 (in) dia.	0.15	1.08
980202	private	Frazer Cr	Beaver Cr	48.0309	1.82	gravity	0.5 x 0.5 (ft)	0.25	1.97
980204	private	Frazer Cr	Beaver Cr	48.0309	2.44	pump	1.0 (in) dia	0.05	0.62
980209	private	Frazer Cr	Beaver Cr	48.0309	3.11	pump	2.0 (in) dia.	0.15	1.08
980210	private	Frazer Cr	Beaver Cr	48.0309	3.80	gravity	0.7 x 0.7 (ft)	0.49	2.33
980214	private	Frazer Cr	Beaver Cr	48.0309	4.44	gravity	0.2 x 0.2 (ft)	0.04	2.21
980220	private	Storer Cr	Beaver Cr	48.0309	0.11	pump	6.0 (in) dia.	0.5	1.97
980221	private	Storer Cr	Beaver Cr	48.0335	0.12	gravity	4.0 x 3.0 (ft)	12.0	3.94

Recommendations

The primary purpose of this report is to provide guidance in the effort to restore salmonids to Beaver Creek. Methow Basin spring chinook are proposed as "endangered", steelhead are listed as "endangered", and bull trout are listed as "threatened" under the federal Endangered Species Act. The WDFW has taken a proactive approach in restoring fish passage and protecting fish from unscreened water diversions to help restore these and other salmonids.

The WDFW proposes a phased approach, spanning several years, to correcting fish passage and water diversion problems in the Beaver Creek drainage. Corrections will begin at the downstream-most problem and proceed upstream on a reach by reach basis. The reaches will typically be defined as the area between total fish passage barriers. As fish passage is provided into a reach, unscreened water diversions within that reach need to be corrected to ensure that no fish are put at risk. For each phase, correction efforts will be based on stock status, habitat gain, fish protection, logistics, and funding. This approach does not preclude landowners from fixing problems prior to the phase associated with their structure(s).

Phase I. Frazer Creek and Bear Creek Diversions - WDFW Owned

WDFW completed screening of Frazer Creek and Bear Creek diversions in 1997.

Phase II. Inventory and Habitat Surveys

During the summer of 1998, WDFW completed an inventory of all fish passage structures and water diversions. Concurrently, WDFW evaluated the habitat within the Beaver Creek drainage. The surveys provided evidence of excellent fish habitat, free of natural fish passage barriers.

Phase III. Beaver Creek Diversion - WDFW / Private Owned

For 1999, WDFW has scheduled construction for screening the Beaver Creek diversion at river mile 6.92 (site 980122).

Phase IV. Beaver Creek from SR 153 to SR 20

The WDFW and WSDOT are planning to correct the barrier culvert at SR 153 (980108) in 2000. At the same time all unscreened water diversions and fish passage barriers between SR 153 and SR 20 (980114) will need to be corrected. There are two unscreened water diversions (980112, 980113) and three dams (980111, 980112, 980113) which require correction.

Phase V. Beaver Creek from SR 20 to Site 980116 & Frazer Creek Site 980126

Phase V begins with the correction of the barrier culvert at SR 20 (980114) and includes one dam (980115) and one culvert crossing (980116) on Beaver Creek and two culvert crossings (980147, 980126) on Frazer Creek.

Phase VI. Beaver Creek from Site 980117 to 980136

In this reach there are six unscreened gravity diversions (980118, 980119, 980120, 98121, 980136, 980139) and four dams (980117, 980118, 980119, 980136) which require correction.

Phase VII. Frazer Creek from Site 98125 to Site 980149

This reach contains two culverts crossings (980124, 980127), three dams (980125, 980129, 980149), and four unscreened gravity diversions (980125, 980127, 980128, 980129) which need correction.

Phase VIII. Frazer Creek from Site 980151 to Site 980204

Within this reach there are six culvert crossings (980151, 980152, 980153, 980158, 980199, 980203), three dams (980154, 980157, 980198), three unscreened gravity diversions (980154, 980198, 980202), and three unscreened pump diversions (980157, 980201, 980204) which need correction.

Phase IX. Frazer Creek from Site 980132 to Site 980214

This section contains six culvert crossings (980132, 980131, 980133, 980205, 980206, 980211), two dams (980208, 980210), two unscreened gravity diversions (980210, 980214), and one unscreened pump diversion (980209) which need correction. Culverts 980131 and 980133 are on tributaries to Frazer Creek and may be done at different time.

Phase X. Storer Creek

Storer Creek has four culvert crossings (980219, 980222, 980223, 980224), one dam (980225), one unscreened gravity diversion (980221), and one unscreened pump diversion (980220) which need correction.

Phase XI. U.S. Forest Service Structures

All structures upstream of site 980136 on Beaver Creek are owned and managed by the Methow Valley Ranger District, as is site 980215 on Frazer Creek. Correction of these structures is the responsibility of the federal government.

Literature Cited

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Washington Department of Fish and Wildlife. 1998. Salmonid Screening, Habitat Enhancement and Restoration Division, Fish Passage Assessment and Prioritization Manual. Olympia. 57 pp.

Washington Department of Fish and Wildlife. 1998. Salmonid Stock Inventory Cutthroat Trout Appendix. Olympia.

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Beaver Creek Fish Passage and Screening Inventory

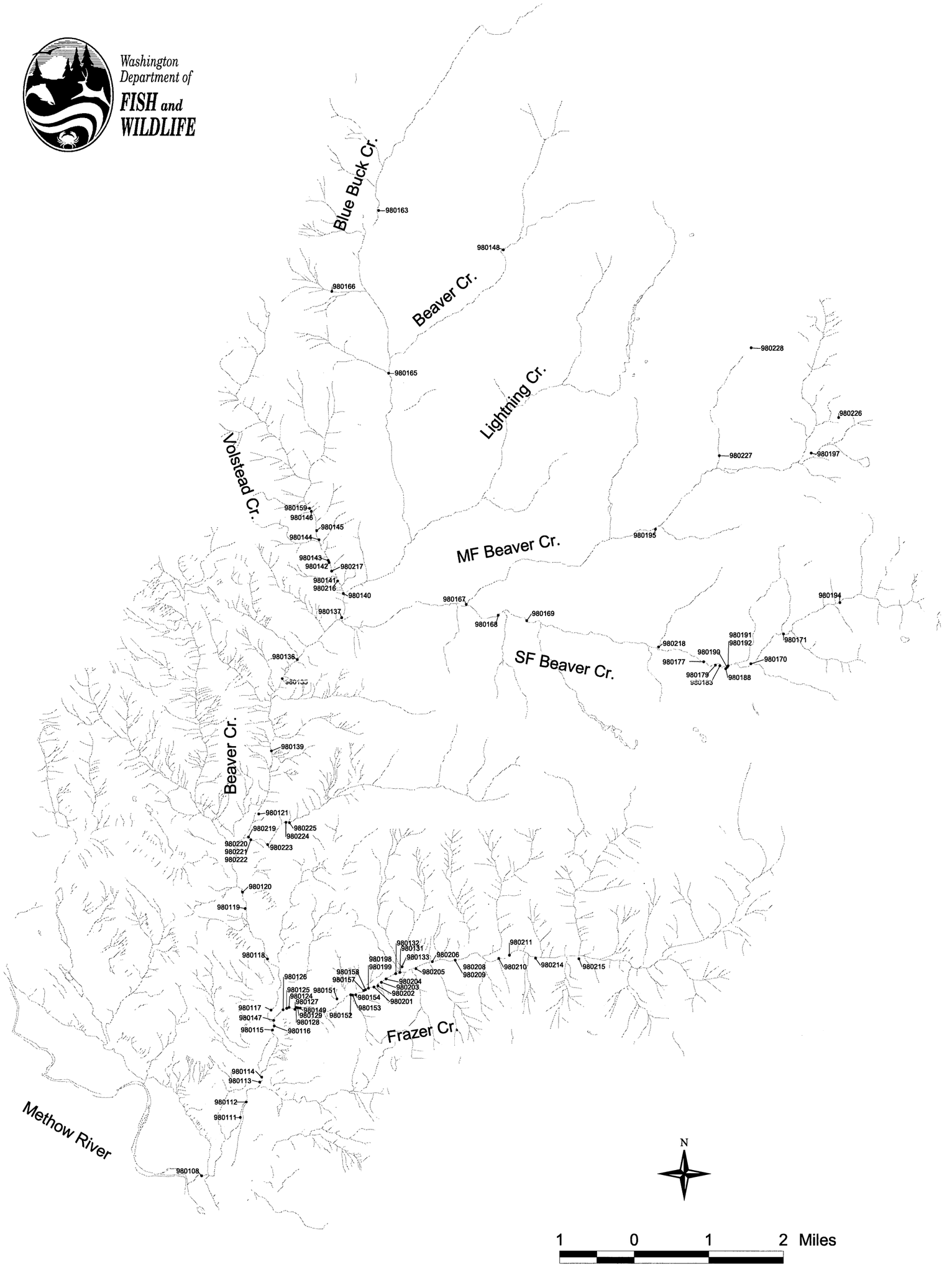

Figure 1. Location of fish passage barriers and unscreened water diversions in the Beaver Creek drainage. The numbers associated with each point refer to the Site ID in tables 2 and 3.

APPENDIX III

Complete List of Structures Inventoried on the Methow Wildlife Area

List of all features evaluated during the Methow Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. The list is sorted by Site ID. Latitude/Longitude are in decimal degrees (WGS84). Easting/Northing are State Plane Coordinates in feet (NAD27, Washington South).

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980099	48.3071327	120.0691986	2105173	1084996	Golden Doe	Alder Cr	Methow R	48.0296	yes	x			
980100	48.3066177	120.070137	2104946	1084807	Golden Doe	Alder Cr	Methow R	48.0296	yes		x	x	
980101	48.3059998	120.0731354	2104216	1084578	Golden Doe	Alder Cr	Methow R	48.0296	yes		x	x	
980102	48.3064957	120.0788498	2102824	1084752	Golden Doe	Alder Cr	Methow R	48.0296	yes	x			
980103	48.4561844	120.1146164	2093848	1139338	Methow	Bear Cr	Methow R	48.0708	yes	x			
980104	48.45681	120.1122055	2094433	1139569	Methow	Johnson Cr	Bear Cr	48	yes	x			
980105	48.4531403	120.0958786	2098404	1138250	Methow	Bowen Cr	Johnson Cr	48	yes	x			
980106	48.4552269	120.1003494	2097315	1139006	Methow	Johnson Cr	Bear Cr	48	yes	x			
980107	48.4567184	120.0972214	2098072	1139555	Methow	Johnson Cr	Bear Cr	48	yes	x			
980122	48.402359	120.0416412	2111680	1119788	Methow	Beaver Cr	Methow R	48.0307	yes		x	x	
980133	48.3686028	120.0028076	2121196	1107525	Methow	Unnamed	Frazer Cr	48	yes	x			
980135	48.424366	120.0372391	2112703	1127826	Methow	Beaver Cr	Methow R	48.0307	yes		x	x	
980352	48.381546	120.1778793	2078602	1112028	Big Buck	Unnamed	Twisp R	48	yes	x			
980353	48.3900795	120.1846237	2076949	1115136	Big Buck	Unnamed	Unnamed	48	no	x			
980354	48.3905983	120.1843948	2077005	1115325	Big Buck	Unnamed	Twisp R	48	yes	x			
980355	48.3922882	120.1845322	2076968	1115943	Big Buck	Unnamed	Twisp R	48	yes		x		
980356	48.4003448	120.1887054	2075943	1118878	Big Buck	Unnamed	Unnamed	48	no	x			
980357	48.4041481	120.1905365	2075493	1120265	Big Buck	Unnamed	Twisp R	48	no	x			
980358	48.410244	120.2105865	2070611	1122470	Big Buck	Unnamed	Unnamed	48	yes		x	x	
980359	48.4064941	120.1830063	2077318	1121128	Big Buck	Unnamed	Twisp R	48	yes	x			
980360	48.39011	120.2284927	2066285	1115107	Big Buck	Unnamed	Unnamed	48	no	x			
980361	48.4085846	120.2321396	2065377	1121847	Big Buck	Unnamed	Twisp R	48	no	x		x	
980362	48.3837395	120.2121811	2070259	1112797	Big Buck	Unnamed	Twisp R	48	yes	x			
980374	48.5124321	120.2657166	2057104	1159724	Big Valley	Unnamed	Methow R	48	yes	x			

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980375	48.5120354	120.2663422	2056954	1159579	Big Valley	Unnamed	Methow R	48	yes	x			
980376	48.511734	120.2674942	2056674	1159469	Big Valley	Unnamed	Methow R	48	yes				x
980381	48.5115967	120.2696609	2056149	1159417	Big Valley	Unnamed	Methow R	48	yes	x			
980382	48.5136948	120.2771454	2054332	1160177	Big Valley	Unnamed	Methow R	48	no	x			
980383	48.5048485	120.209549	2070737	1157002	Rendezvous	Unnamed	Methow R	48	no	x			
980384	48.504837	120.2098007	2070675	1156997	Rendezvous	Unnamed	Unnamed	48	no	x			
980385	48.505703	120.213356	2069812	1157310	Rendezvous	Unnamed	Unnamed	48	no	x			
980386	48.4952354	120.223938	2067258	1153480	Rendezvous	Unnamed	Methow R	48	no	x			
980387	48.4954414	120.2250061	2067000	1153554	Rendezvous	Unnamed	Methow R	48	no		x		
980388	48.5189285	120.2312775	2065449	1162121	Rendezvous	Unnamed	Methow R	48	no	x			
980389	48.5177307	120.2316895	2065351	1161685	Rendezvous	Unnamed	Methow R	48	no	x			
980390	48.562603	120.2099915	2070551	1178082	Rendezvous	Cub Cr	Chewuch R	48.0737	yes	x			
980391	48.5632324	120.2113724	2070217	1178310	Rendezvous	Unnamed	Cub Cr	48	no	x			
980392	48.560154	120.2110367	2070301	1177188	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980393	48.5628242	120.2103043	2070475	1178162	Rendezvous	Unnamed	Cub Cr	48	no	x			
980394	48.5600815	120.2122726	2070003	1177160	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980395	48.5603561	120.2166595	2068939	1177256	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980396	48.5608139	120.2173767	2068765	1177422	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980397	48.5629387	120.2204361	2068021	1178195	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980398	48.5611916	120.2203369	2068048	1177558	Rendezvous	Little Cub Cr	Cub Cr	48	yes	x			
980399	48.5466881	120.2030029	2072266	1172279	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980400	48.5458336	120.2071228	2071269	1171964	Rendezvous	Unnamed	Unnamed	48	no		x		
980401	48.5475197	120.2183914	2068536	1172569	Rendezvous	Unnamed	Chewuch R	48	no			x	
980402	48.5518188	120.2197037	2068213	1174137	Rendezvous	Unnamed	Little Cub Cr	48	no	x			
980403	48.5495224	120.2193222	2068308	1173300	Rendezvous	Unnamed	Unnamed	48	no			x	
980404	48.5594025	120.2118835	2070098	1176912	Rendezvous	Little Cub Cr	Cub Cr	48	yes	x			
980405	48.5645905	120.1827621	2077145	1178833	Methow	Unnamed	Chewuch R	48	no	x			

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980406	48.561142	120.2090225	2070789	1177549	Rendezvous	Cub Cr	Chewuch R	48.0737	yes				x
980424	48.5697823	120.1455612	2086150	1180766	Methow	Unnamed	Unnamed	48	no	x			
980425	48.5690002	120.1452866	2086218	1180481	Methow	Unnamed	Unnamed	48	no	x			
980426	48.5667877	120.1460419	2086038	1179673	Methow	Unnamed	Unnamed	48	no	x			
980427	48.5659332	120.1464233	2085947	1179360	Methow	Unnamed	Boulder Cr	48	no	x			
980428	48.565361	120.1472092	2085757	1179150	Methow	Unnamed	Unnamed	48	no	x			
980429	48.564827	120.1499405	2085098	1178953	Methow	Unnamed	Unnamed	48	no	x			
980430	48.562973	120.1502838	2085017	1178276	Methow	Unnamed	Unnamed	48	no	x			
980431	48.5607834	120.1492615	2085268	1177477	Methow	Unnamed	Unnamed	48	no	x			
980432	48.5595169	120.1492233	2085280	1177015	Methow	Unnamed	Unnamed	48	no	x			
980433	48.5561218	120.1485367	2085451	1175777	Methow	Unnamed	Ramsey Cr	48	no	x			
980434	48.5539093	120.1478653	2085619	1174969	Methow	Unnamed	Unnamed	48	no	x			
980435	48.5520439	120.1474915	2085712	1174290	Methow	Unnamed	Unnamed	48	no	x			
980436	48.5508347	120.1459808	2086080	1173850	Methow	Unnamed	Unnamed	48	no	x			
980437	48.5505219	120.1434708	2086689	1173738	Methow	Unnamed	Unnamed	48	no	x			
980440	48.5390778	120.1391983	2087743	1169565	Methow	Unnamed	Ramsey Cr	48	no	x			
980441	48.5365219	120.1371078	2088253	1168635	Methow	Unnamed	Ramsey Cr	48	no	x			
980443	48.5339279	120.1360626	2088512	1167689	Methow	Unnamed	Ramsey Cr	48	no	x			
980444	48.5186768	120.1434479	2086747	1162114	Methow	Unnamed	Sullivans Pond	48	no	x			
980445	48.5181198	120.1457367	2086193	1161909	Methow	Unnamed	Sullivans Pond	48	no	x			
980446	48.5190926	120.1476517	2085727	1162262	Methow	Unnamed	Unnamed	48	no	x			
980447	48.5193634	120.1474075	2085785	1162361	Methow	Unnamed	Unnamed	48	yes		x		
980448	48.5201378	120.1531982	2084379	1162637	Methow	Unnamed	Unnamed	48	no	x			
980449	48.5205917	120.1547012	2084014	1162802	Methow	Unnamed	Unnamed	48	no	x			
980450	48.5186272	120.1542969	2084117	1162085	Methow	Unnamed	Unnamed	48	no	x			
980451	48.517662	120.1529388	2084447	1161734	Methow	Unnamed	Unnamed	48	no	x			
980452	48.5172768	120.1524811	2084558	1161594	Methow	Unnamed	Unnamed	48	no	x			

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980453	48.5166817	120.1521301	2084644	1161377	Methow	Unnamed	Unnamed	48	no	x			
980454	48.5159416	120.1518021	2084726	1161107	Methow	Unnamed	Unnamed	48	no	x			
980455	48.5149193	120.1516876	2084755	1160733	Methow	Unnamed	Unnamed	48	no	x			
980456	48.5129585	120.1514816	2084807	1160018	Methow	Unnamed	Unnamed	48	no	x			
980457	48.5055847	120.148056	2085650	1157331	Methow	Unnamed	Pearrygin Cr	48	no	x			
980458	48.541893	120.1441803	2086531	1170588	Methow	Ramsey Cr	Chewuch R	48.0761	yes	x			
980476	48.5294113	120.1719131	2079827	1166003	Methow	Unnamed	Chewuch R	48	no	x			
980477	48.4823265	120.1225662	2091874	1148871	Methow	Unnamed	Unnamed	48	no	x			
980478	48.4850311	120.1150894	2093683	1149866	Methow	Bear Cr	Chewuch R	48.0708	yes		x	x	
980479	48.4814911	120.1193542	2092654	1148569	Methow	Irrigation Cl	Unnamed	48	no	x			
980480	48.4826431	120.1226883	2091843	1148985	Methow	Unnamed	Bear Cr	48	no	x			
980481	48.4894295	120.1235886	2091613	1151462	Methow	Unnamed	Pearrygin Lk	48	no	x			
980482	48.489521	120.1214981	2092121	1151498	Methow	Unnamed	Pearrygin Lk	48	no	x			
980483	48.4878044	120.1145935	2093798	1150879	Methow	Unnamed	Bear Cr	48	no	x			
980485	48.4784241	120.1011124	2097086	1147471	Methow	Unnamed	Cougar Cr	48	no	x			
980486	48.4764595	120.0978851	2097873	1146759	Methow	Cougar Cr	Bear Cr	48	yes	x			
980490	48.4748306	120.0947495	2098638	1146168	Methow	Cougar Cr	Bear Cr	48	yes	x			
980491	48.4525986	120.0924606	2099234	1138057	Methow	Bowen Cr	Johnson Cr	48	no	x			
980493	48.4955444	120.1379013	2088130	1153678	Methow	Unnamed	Pearrygin Lk	48	no	x			
980494	48.489006	120.1311569	2089778	1151298	Methow	Unnamed	Pearrygin Lk	48	no	x			
980495	48.4834785	120.128273	2090487	1149284	Methow	Unnamed	Pearrygin Lk	48	no	x			
980496	48.4840202	120.1228714	2091797	1149488	Methow	Unnamed	Unnamed	48	no	x			
980497	48.485508	120.1230087	2091760	1150030	Methow	Unnamed	Unnamed	48	no	x			
980498	48.4865875	120.1227417	2091824	1150425	Methow	Unnamed	Unnamed	48	no	x			
980499	48.488472	120.121788	2092051	1151114	Methow	Unnamed	Unnamed	48	no	x			
980500	48.4887924	120.1203995	2092388	1151233	Methow	Unnamed	Pearrygin Lk	48	no	x			
980501	48.4884758	120.1160812	2093436	1151123	Methow	Bear Cr	Methow R	48.0708	yes	x			

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980502	48.4885025	120.1146698	2093779	1151133	Methow	Unnamed	Bear Cr	48	no	x			
980503	48.4883842	120.1132736	2094117	1151092	Methow	Unnamed	Bear Cr	48	no	x			
980504	48.488327	120.1123886	2094332	1151072	Methow	Unnamed	Bear Cr	48	no	x			
980505	48.4872131	120.1109619	2094681	1150667	Methow	Unnamed	Bear Cr	48	no	x			
980506	48.486454	120.1091003	2095134	1150393	Methow	Unnamed	Bear Cr	48	no	x			
980507	48.4855385	120.1075211	2095519	1150061	Methow	Unnamed	Bear Cr	48	no	x			
980508	48.4843636	120.1070633	2095632	1149631	Methow	Unnamed	Bear Cr	48	no	x			
980509	48.4830704	120.1063766	2095800	1149161	Methow	Unnamed	Cougar Cr	48	no	x			
980510	48.4826775	120.1052704	2096069	1149020	Methow	Unnamed	Cougar Cr	48	no	x			
980511	48.4821892	120.1037903	2096430	1148842	Methow	Unnamed	Cougar Cr	48	no	x			
980512	48.4820213	120.1019516	2096876	1148784	Methow	Unnamed	Cougar Cr	48	no	x		x	
980513	48.4802055	120.1020126	2096865	1148121	Methow	Unnamed	Cougar Cr	48	no	x			
980514	48.4792404	120.1017685	2096925	1147769	Methow	Unnamed	Cougar Cr	48	no	x			
980515	48.4791183	120.1013718	2097023	1147725	Methow	Unnamed	Cougar Cr	48	no	x			
980516	48.4809799	120.1016693	2096947	1148404	Methow	Unnamed	Cougar Cr	48	no	x			
980519	48.4836655	120.1025848	2096719	1149383	Methow	Unnamed	Cougar Cr	48	no	x			
980520	48.4853249	120.1045074	2096249	1149986	Methow	Unnamed	Bear Cr	48	no	x			
980521	48.4868393	120.1035995	2096467	1150540	Methow	Unnamed	Bear Cr	48	no	x			
980522	48.4919701	120.1060333	2095868	1152410	Methow	Unnamed	Bear Cr	48	no	x			
980523	48.4943275	120.1045303	2096228	1153272	Methow	Unnamed	Bear Cr	48	no	x			
980524	48.4947662	120.1041412	2096322	1153432	Methow	Unnamed	Bear Cr	48	no	x			
980525	48.4968071	120.1036453	2096439	1154178	Methow	Unnamed	Bear Cr	48	no	x			
980526	48.4900703	120.1039734	2096371	1151719	Methow	Unnamed	Bear Cr	48	no	x			
980527	48.4888	120.1032257	2096554	1151256	Methow	Unnamed	Bear Cr	48	no	x			
980528	48.4870911	120.1021423	2096821	1150634	Methow	Unnamed	Bear Cr	48	no	x			
980529	48.4389	120.0656052	2105782	1133092	Methow	Unnamed	Beaver Cr	48.0326	no		x		
980530	48.4038086	120.0673599	2105426	1120281	Methow	Unnamed	Unnamed	48	no		x		

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980533	48.4046669	120.0693054	2104953	1120593	Methow	Unnamed	Unnamed	48	no		x		
980536	48.4005241	120.0625992	2106591	1119089	Methow	Unnamed	Beaver Cr	48.0326	no		x	x	
980545	48.4462662	120.0606308	2106975	1135786	Methow	Unnamed	Beaver Cr	48.0326	yes	x			
980546	48.4308357	120.0302048	2114397	1130198	Methow	Unnamed	Beaver Cr	48	no	x			
980547	48.4321213	120.0374298	2112639	1130657	Methow	Unnamed	Beaver Cr	48	no	x			
980549	48.4530602	120.0766296	2103077	1138244	Methow	Unnamed	Unnamed	48	no		x		
980550	48.4347954	120.0240021	2115895	1131651	Methow	Unnamed	Beaver Cr	48.0341	no	x			
980551	48.4359322	120.0214386	2116516	1132070	Methow	Unnamed	Beaver Cr	48	no	x			
980552	48.4371262	120.0192947	2117033	1132509	Methow	Unnamed	Beaver Cr	48	no	x			
980553	48.4382019	120.0195312	2116974	1132902	Methow	Unnamed	Beaver Cr	48	no	x			
980554	48.439537	120.0199432	2116871	1133388	Methow	Unnamed	Beaver Cr	48	no	x			
980555	48.4235649	120.0373383	2112681	1127533	Methow	Irrigation Cl	NA	48	no	x			
980556	48.4224205	120.0375595	2112629	1127116	Methow	Unnamed	Beaver Cr	48	no	x			
980560	48.3793831	119.9980087	2122337	1111467	Methow	NA	Unnamed	48	no			x	
980568	48.2730751	119.755188	2181739	1073138	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980569	48.2755547	119.7556839	2181609	1074042	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980570	48.2755737	119.7574692	2181174	1074044	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980571	48.2755699	119.7584839	2180927	1074040	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980572	48.2737579	119.7635269	2179705	1073368	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980573	48.2741089	119.7654419	2179236	1073492	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980574	48.2753563	119.7549362	2181793	1073971	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980575	48.271225	119.7575989	2181158	1072456	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980576	48.27034	119.7546997	2181866	1072140	Chiliwist	Unnamed	Chilliwist Cr	49	no	x			
980577	48.3084564	119.7916718	2172734	1085967	Chiliwist	Unnamed	Unnamed	49	no		x		
980578	48.3157387	119.7958145	2171702	1088616	Chiliwist	Unnamed	Unnamed	49	no	x			
980579	48.3186417	119.7970886	2171383	1089673	Chiliwist	Unnamed	Unnamed	49	no	x			
980580	48.3225975	119.7941437	2172087	1091123	Chiliwist	Unnamed	Unnamed	49	no	x			

Site ID	Geographic Coordinates				WLA Unit	Stream	Tributary To	WRIA	Fish Use	Feature Type			
	N-Latitude	W-Longitude	Easting	Northing						Culvert	Dam	Gravity Diversion	Pump Diversion
980581	48.3256454	119.7935944	2172210	1092237	Chiliwist	Unnamed	Unnamed	49	no	x			
980582	48.3019676	119.7879562	2173660	1083607	Chiliwist	Unnamed	Unnamed	49	no	x			
980592	48.296608	119.7563934	2181364	1081723	Chiliwist	Unnamed	Unnamed	49	no	x			
980608	48.2717094	119.7609787	2180332	1072627	Chiliwist	Chiliwist Cr	Okanogan R	49.0034	yes		x		x
980624	48.5262566	120.1629028	2082017	1164861	Methow	Unnamed	Chewuch R	48	no		x		
980626	48.3696365	120.0022583	2121325	1107903	Methow	Unnamed	Frazer Cr	48	yes	x			
980627	48.3710289	120.001091	2121606	1108413	Methow	Unnamed	Frazer Cr	48	yes	x	x		x
980628	48.5752754	120.1751404	2078976	1182740	Methow	Chewuch R	Methow R	48.0728	yes			x	
980649	48.4947243	120.1589279	2083030	1153355	Methow	Pearrygin Cr	Chewuch R	48.0730	yes	x			
980650	48.4562798	120.1119995	2094484	1139376	Methow	Johnson Cr	Bear Cr	48	yes				x
980651	48.4818497	120.1072922	2095581	1148714	Methow	Cougar Cr	Bear Cr	48	yes		x	x	
980652	48.4815712	120.1057968	2095945	1148614	Methow	Cougar Cr	Bear Cr	48	yes		x		
980653	48.4767952	120.0962143	2098279	1146884	Methow	Cougar Cr	Bear Cr	48	yes		x		