White Salmon River Bull Trout: Patches, Occupancy and Distribution

2009 Progress Report

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Introduction

Bull trout (*Salvelinus confluentus*) were listed threatened in the coterminous United States November 1, 1999 (USFWS 1999). Previously, the Columbia River distinct population segment (DPS) of bull trout had been listed as threatened since June 10, 1998. Factors contributing to the listing of bull trout include range wide declines in distribution, abundance and habitat quality. Land and water uses that alter or disrupt habitat requirements of bull trout can threaten the persistence of the species. Examples of such activities include: dams as well as water diversions, timber extraction, mining, grazing, agriculture, nonnative fish competition and/or hybridization, poaching, past fish eradication projects, and channelization of streams. Threats to the persistence of bull trout are prevalent throughout the Columbia River basin (USFWS 2000, 2002).

Flowing from the south side of the 3,742 m peak of Mount Adams, the White Salmon River drains into the Columbia River at river km 269 (Figure 1). Many of the upper tributaries of the White Salmon River are high gradient seasonal streams created by snow and glacial run off. Relatively low gradient tributaries such as Trout Lake Creek enter the mainstem from the west. Within the drainage, Condit Dam lies approximately 5.3 km upstream from the Columbia River confluence. PacifiCorp, a utilities company that owns and operates Condit Dam, has proposed to decommission this dam and remove it in the fall of 2011. This dam was constructed in 1913 and has since been a barrier to fish migrating upstream. Upon removal, the subbasin will be reconnected with the Columbia River.

Core habitat, habitat that could supply all elements for the persistence of a species, has been identified for bull trout within the White Salmon River (USFWS 2002). Two sightings of bull trout in the White Salmon River above Condit Dam have been recorded in the past two decades by Washington Department of Fish and Wildlife biologists, one during a gillnet operation in 1986 and one during a creel census in 1989 (USFWS 2002). Recent investigations have yet to produce observations (Byrne et al. 2001, Silver et al. 2009a, Silver et al. 2009b, Thiesfeld et al. 2001).

One objective of our work is to delineate bull trout patches (putative population boundaries) in the White Salmon River subbasin (following Dunham and Rieman, 1999, as modified in RMEG 2008). Patches are intended to represent areas conducive to spawning and early rearing. In addition, bull trout occupancy of the patches as well as bull trout distribution within occupied patches will be determined both pre- and post-dam removal. Given the unique circumstances of this situation (i.e., removal of a dam behind which bull trout are likely, functionally extirpated), this initial work will provide a quantitative baseline against which to

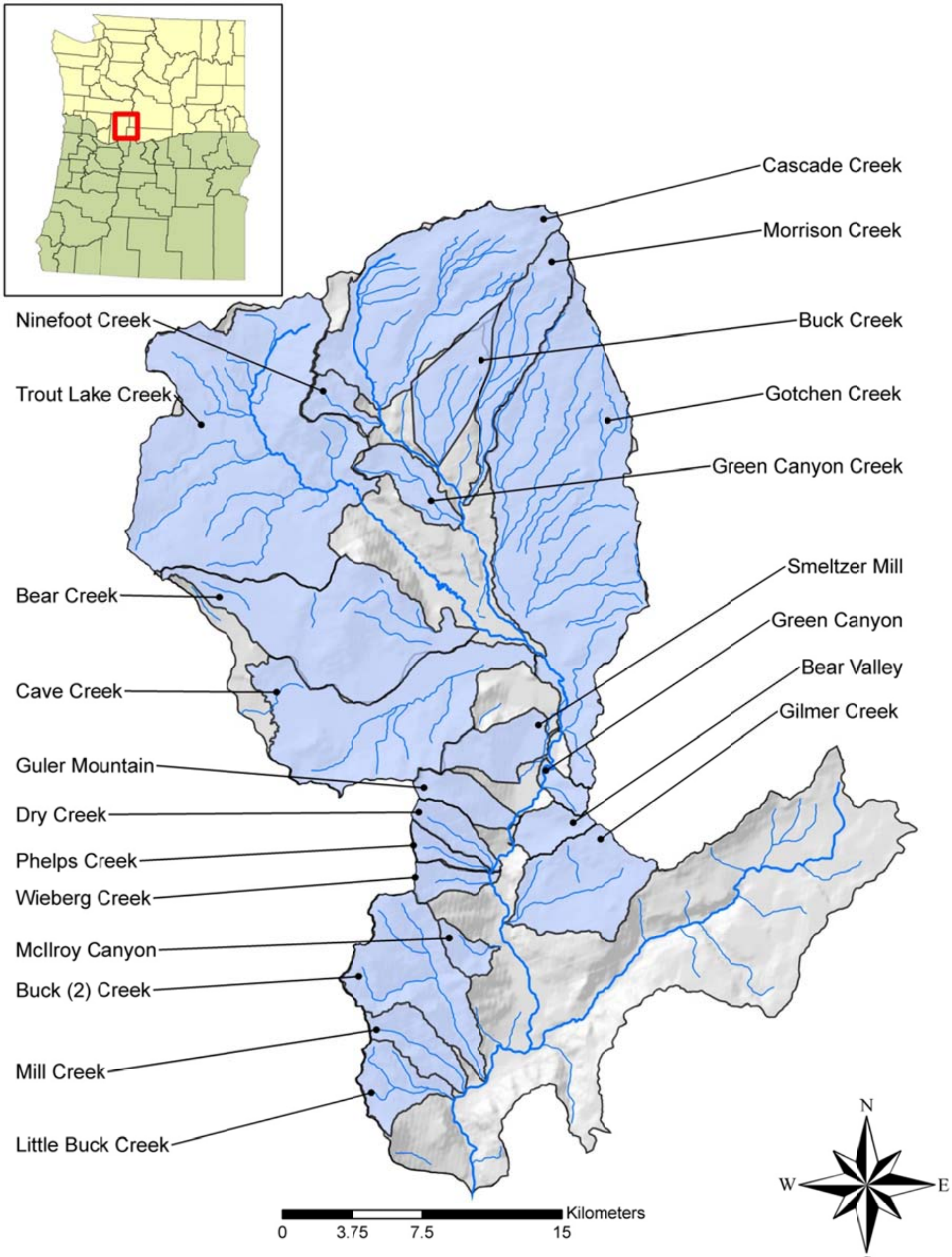

Figure 1. The White Salmon River subbasin and delineated patches.

compare changes in occupancy and distribution of bull trout in the White Salmon River subbasin subsequent to reconnection of the system with the mainstem Columbia River.

Guidance from the Bull Trout Recovery Monitoring and Evaluation Technical Workgroup (RMEG 2008) recommends utilizing maximum annual stream temperature, stream size and catchment area as filters for determining potential bull trout habitat. Many other factors identified by Dunham and Rieman (1999) may also influence bull trout distribution (e.g., connectivity, stream gradient, geology, hydrologic regimes, presence of nonnative species, road density, solar radiation). However, maximum annual stream temperature (and the corresponding elevation) effectively dictates the range of this species (Rieman and McIntyre 1995) and patch size (catchment area) may be the most important factor determining bull trout occurrence (Dunham and Rieman 1999). Utilizing these three filters, provides the opportunity to evaluate this approach as a tool using information that most managers can readily acquire.

The use of these three filters provides a starting point for determining a framework by which the distribution of bull trout within a subbasin can be evaluated. There may be exceptions to the potential distribution identified using this tool. Some bull trout populations may exist outside these patches due to geologic anomalies or other factors in the subbasin. Bull trout distribution within an identified patch may be limited or nonexistent due to barriers, hydrologic regimes or other factors. However, by using this tool, it is possible to implement a sampling approach that focuses limited resources in areas that may have a higher probability of supporting bull trout populations in a subbasin.

By investigating the possible distribution of bull trout within the White Salmon River drainage, we can improve our understanding of this threatened species. This work will establish a quantitative baseline for bull trout occupancy and distribution in this subbasin prior to the removal of Condit Dam. Implementation of this approach through a long-term monitoring program subsequent to dam removal will provide information on recolonization of bull trout. This understanding will allow us to work towards restoration and recovery of bull trout populations within the Lower Columbia Recovery Unit as well as range wide. Specific tasks for 2009 were to assess bull trout occupancy in six patches within the White Salmon River subbasin.

Methods

Patch Delineation

Based on water temperature, catchment area and stream size, eighteen patches were initially delineated in 2007 (Figure 1, Table 1) (methods and results presented in Silver et al. 2009a). This patch delineation was revised to seventeen patches using the same method with more current information (catchment area, stream size, and water temperature) collected during the 2009 field season.

Table 1. Delineated patches and number of sample sites drawn.

Patch Name	Total Number of Sites Drawn 2007	Total Number of Sites Drawn 2009
Bear Creek	240	240
Bear Valley	39	39
Buck (2) Creek	34	34
Buck Creek	34	34
Cascade Creek	134	134
Cave Creek	282	22
Dry Creek	10	10
Gilmer Creek	26	26
Gotchen Creek	281	14
Green Canyon	14	14
Green Canyon Creek	-	23
Guler Mountain	40	40
Little Buck Creek	19	19
McIlroy Canyon	-	6
Mill Creek	8	8
Morrison Creek	67	67
Ninefoot Creek	-	8
Phelps Creek	8	8
Smeltzer Mill	61	61
Trout Lake Creek	166	166
Wieberg Creek	7	7

Occupancy and Distribution

Randomly selected, spatially balanced sample sites (50 m reaches) were determined for all patches in 2007 (Table 1; Silver et al. 2009a). Using backpack electrofishing, the site-specific detection probability for bull trout in the Lewis River, a similar subbasin, was 37.5% (Cook et al. 2009). No site-specific detection probability information is available specifically for the White Salmon River, so available data from the Lewis River was used as a surrogate. Given this detection probability, guidance provided by RMEG (2008) indicates that if three sites per patch were sampled with a backpack electrofisher and less than two age classes of bull trout were captured, we could be 80% (95% when seven sites are sampled) certain that the patch was unoccupied by a population of bull trout. Given the lack of empirical information in the White Salmon subbasin, the first seven viable sites were sampled in an attempt to ensure at least an 80% confidence level that bull trout were not present when not detected. If at least two age classes (as determined by size classes > 30 mm different in fork length) of bull trout were captured within the patch, it was considered occupied by a population.

Sampling was conducted for occupancy and distribution assessments using backpack electrofishing. Each 50 m reach was sampled by a crew of two from the downstream to the upstream boundary without a blocknet (Silver et al. 2009a). All fish captured were identified. Length and mass were documented to facilitate size class determination. *Salvelinus* species were carefully scrutinized for distinguishing features before identification, as both bull trout and brook trout (*Salvelinus fontinalis*) may inhabit these watersheds and hybridization between the two could occur. Trout fry (TF) were identified as *Oncorhynchus* spp. when too small to reliably differentiate as *O. clarki* or *O. mykiss*. All fish captured were released alive within the sampled reach.

After the completion of fish sampling, habitat data was collected from the study reach. The gradient of each sampling site was measured using a hand-held clinometer. Gradient was measured and recorded twice at each site, from the top of the reach to the middle, and again from the middle to the bottom of the reach. The eye level height of the person sighting the gradient was measured against the person standing downstream. One surveyor stood level with the water's surface upstream and measured the percent gradient against the second surveyor standing downstream at level with the water's surface.

Transects were flagged along the thalweg at every 10 meter mark from 0 to 50 meters. Channel dimensions were then measured along each of the six designated transects within the 50 meter sampling reach. For each transect, measurements were completed for the current wetted width, maximum depth along the transect line, and depth recordings at ¼, ½, and ¾ distance across the wetted width. Total length of the reach measured along the bank was also recorded as an index of sinuosity.

Within each reach, large woody debris (LWD) was categorized and counted. Wood was classified into four categories: LWD > 10 cm in diameter and > 3 m in length, LWD > 60 cm in diameter and > 10 m in length, root wads and LWD piles (aggregates of > 4 pieces of wood together). Only pieces of wood directly within the channel or within one meter of the water's surface were considered.

The number, type and size of undercut banks were measured along both sides of the sampling reach. Undercuts were defined as areas under boulders, banks, wood, or bedrock along the stream bank that were > 5 cm deep, > 10 cm in length, and > 5 cm in height (e.g., PIBO; Kershner et al. 2004). Only undercuts within 0.5 meter of the stream surface were considered.

Thermographs

To further improve the understanding of water temperature characteristics in the White Salmon River subbasin, 19 individual HOBO Water Temp Pro thermographs were deployed in summer 2009 (Table 2, Figure 2). These thermographs record water temperatures every 30 minutes. They will be collected and information downloaded in summer 2010.

Table 2. 2009 thermograph deployment within the White Salmon River subbasin.

Site ID #	Location	Date	Time	Temp.	Serial #	Comments
1	Buck Creek below dam	7/31	11:26	12.0	2400220	20m d/s bridge, Next to pipe
2	Lower Middle Fork Buck Creek	7/31	10:02	12.8	2400231	10m below old road crossing
3	Middle Fork Buck Creek	7/31	10:38	12.5	2400226	Upstream of culvert
4	Upper Middle Fork Buck Creek	7/31	10:59	13	2400225	End of road walk right to ck.
5	Cave Creek (Rd. 86)	7/22	13:58	N/A	2400235	Downstream of culvert
6	Cave Creek (Rd. 8620)	7/22	14:22	N/A	2400236	Upstream of culvert
7	Lemei Trailhead	7/24	10:59	N/A	N/A	Dry-Not deployed
8	Cultis Creek Campground	7/24	11:20	8.8	2400219	Downstream of culvert
9	Meadow Creek Campground	7/24	11:47	8.0	2400230	Upstream of culvert
10	Little Goose Creek (Rd. 88)	7/24	9:55	13.0	2400229	Downstream of culvert
11	Cultis Creek (Rd. 88 & 081)	7/24	10:26	10.6	2400227	Upstream of culvert
12	Trout Lk Ck Trailhead 2000	7/23	14:32	15.9	2400224	Upstream of bridge
13	Wicky Cr. (Rd. 8031)	7/22	10:48	N/A	2400232	Downstream of culvert
14	Morrison Cr. (Rd. 775)	7/22	11:58	N/A	2400233	End of road, below trib.
15	Crofton Ridge East Trailhead	7/22	12:44	N/A	2400234	Downstream of culvert
16	Salt Creek Trailhead	7/23	12:06	11.5	2400217	Downstream of bridge
17	Cascade Creek Trail	7/23	10:54	9.7	2400218	Wired to tree root near trail
18	Lower Ninefoot Cr.	7/23	12:40	11.0	2400222	Tied into a log jam
19	Middle Ninefoot Cr. (Rd. 2360)	7/23	13:04	10.7	2400228	Wired to rebar in bank
20	Upper Ninefoot Cr. (Rd. 041)	7/23	13:22	10.9	2400223	Upstream of road

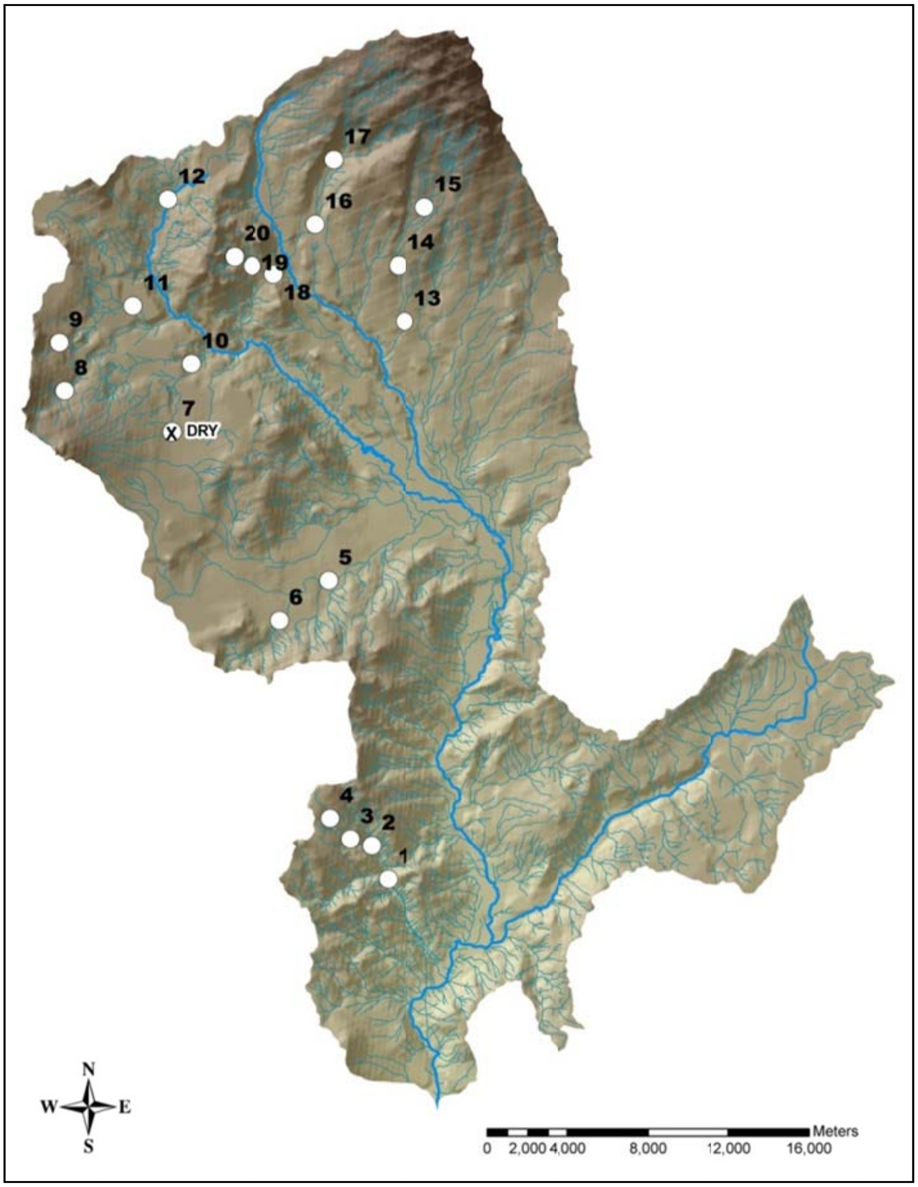

Figure 2. Thermograph locations within the White Salmon River subbasin.

Results

Patch Delineation

Patch delineations were revised in 2009 resulting in the addition of three new patches, the elimination of ten previous patches, and redrawing one patch (Figure 3). Green Canyon Creek, McIlroy Canyon, and Ninefoot Creek met the above criteria and were added to the subbasin. Based on sampling in 2007, 2008, and 2009, seven patches were removed from consideration (Bear Cr., Bear Valley, Buck Cr., Dry Cr., Gotchen Cr., Guler Mtn., and Smeltzer Mill) because they do not appear to contain water all year, two were undersized (Green Canyon and Wieberg Creek), and one had water temperatures exceeding the maximum criteria (Gilmer Creek). The Cave Creek patch was redrawn to exclude the dry tributary, Coyote Creek.

Figure 3. White Salmon revised patch delineation 2009

Occupancy and Distribution

Field work in the White Salmon River basin occurred between May 6 and June 26, 2009. Six patches were sampled completely (Bear Creek, Buck (2) Creek, Cave Creek, Gilmer Creek, Smeltzer Mill, and Wieberg Creek; Figure 4). Among these patches, 33% (14/42) of sites were sampled (Table 3). Eighteen sites were not sampled due to lack of water. Ten sites were not sampled because they were on private property. Salmonids were found in 29% (4/14) of the sites sampled, but no bull trout were present. Electrofishing efforts for all reaches of the White Salmon subbasin totaled 3,019 seconds, with an average of 216 seconds electrofished in each site.

Table 3. Sites sampled and species found 2009.

Patch	Site(s)	Date	Sample Status	Species	Non-Salmonid Species	Comments
Bear Creek	1, 2, 3, 4, 5, 6, 7	6/26/2009	Not Sampled	-	-	Dry
Buck (2) Creek	1	5/6/2009	Sampled	-	Dicamptodon	-
	2	5/6/2009	Sampled	*O. mykiss*	Dicamptodon, Tadpoles	-
	3	6/5/2009	Sampled	*O. mykiss*	Dicamptodon, Tadpoles	-
	4	5/29/2009	Sampled	-	Dicamptodon	-
	5	6/4/2009	Sampled	-	Dicamptodon	-
	6	6/4/2009	Sampled	*O. mykiss*	Tadpoles	-
	7	5/29/2009	Sampled	-	Cottid sp.	-
Cave Creek	3, 4, 18	6/26/2009	Not Sampled	-	-	Dry
Gilmer Creek	1	6/22/2009	Sampled	-	-	No Fish
	3	6/22/2009	Sampled	-	-	No Fish
	5	6/26/2009	Sampled	-	-	No Fish
	10	6/26/2009	Sampled	-	-	No Fish
	12	6/29/2009	Sampled	*O. mykiss*	Dicamptodon	-
	15	6/29/2009	Sampled	-	Speckled Dace	-
	19	6/29/2009	Sampled	-	Speckled Dace	-
	2, 4, 6, 7, 9, 11, 13, 14, 16, 18	6/22/2009	Not Sampled	-	-	Private Property
	8, 17	6/22/2009	Not Sampled	-	-	Dry
Smeltzer Mill	7, 10, 12	6/26/2009	Not Sampled	-	-	Dry
Wieberg Creek	1, 3, 6	6/30/2009	Not Sampled	-	-	Dry

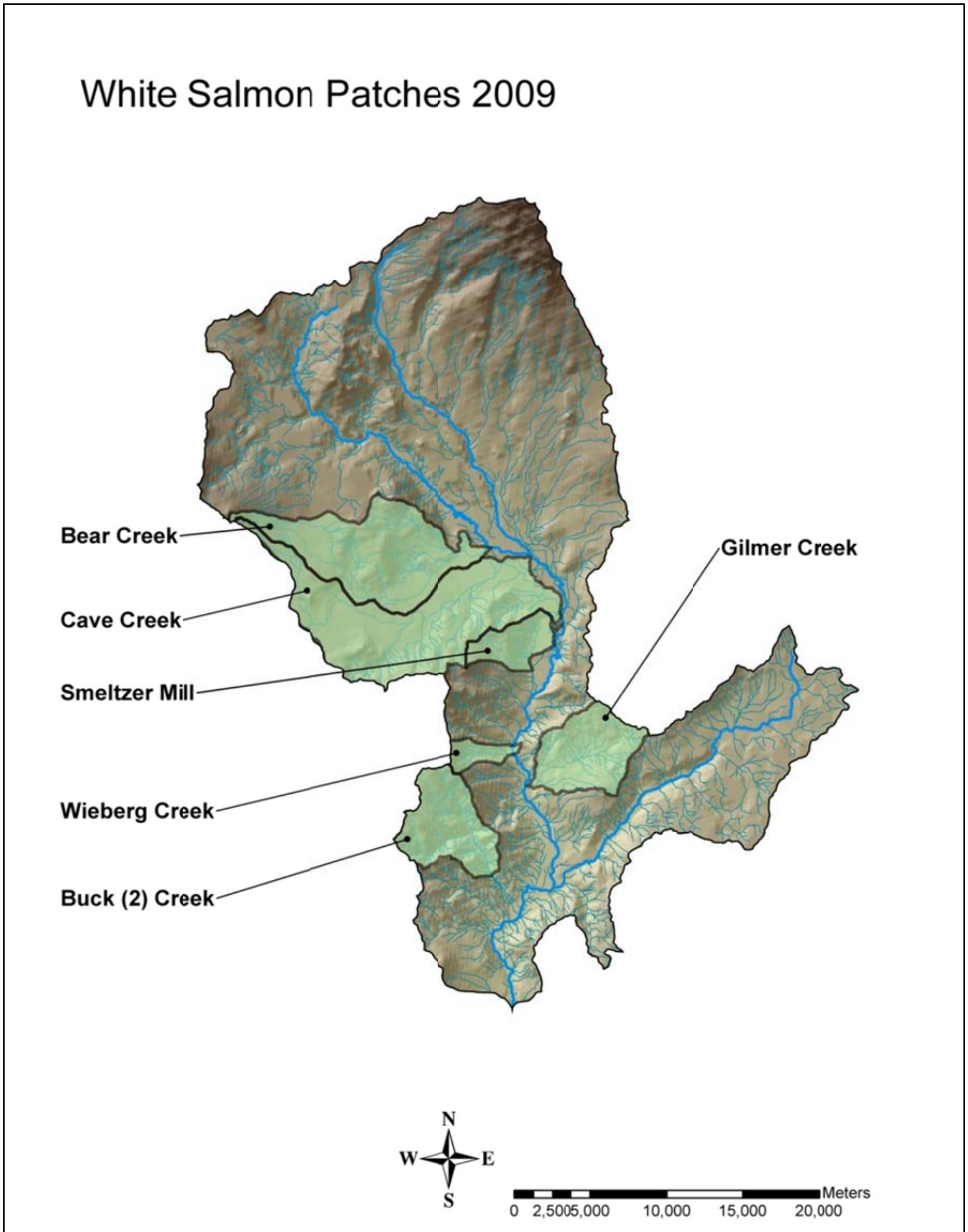

Figure 4. Patches sampled in the White Salmon subbasin in 2009.

The Bear Creek patch was dry from the headwaters (site 1) to its confluence with the White Salmon River (site 2). The patch was searched for standing water at road crossings over primary tributaries, none was found; no sites were sampled (Figure 5).

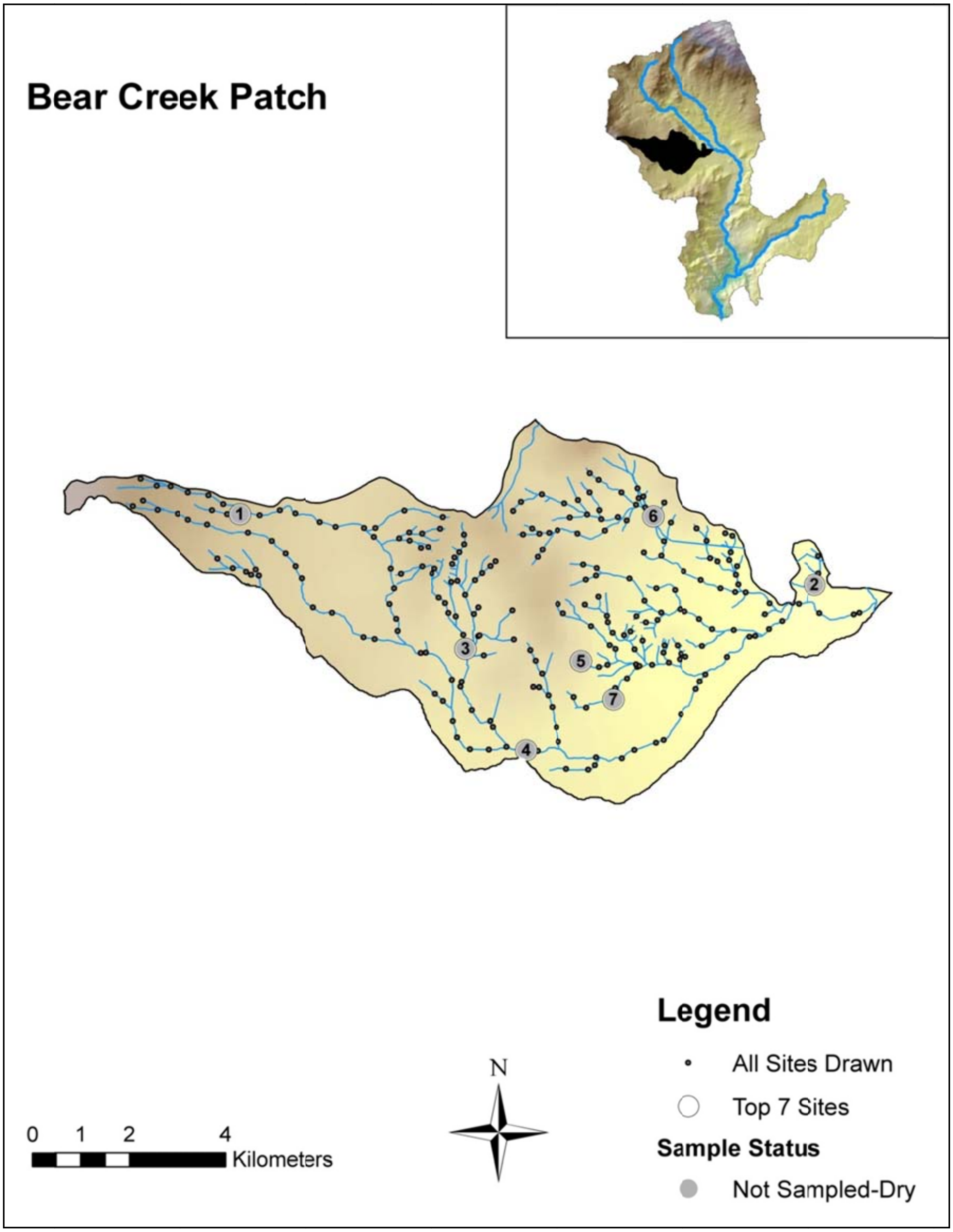

Figure 5. Sites in the Bear Creek Patch.

Seven sites in the Buck (2) Creek patch were sampled (Figure 6). *O. mykiss* were observed in three sites; species of cottids, dicamptodons and tadpoles were found throughout the watershed. Water temperatures were relatively cold (5.5 - 9.8 °C) (Table 4). A barrier 10 m waterfall is located approximately 200 m below site seven.

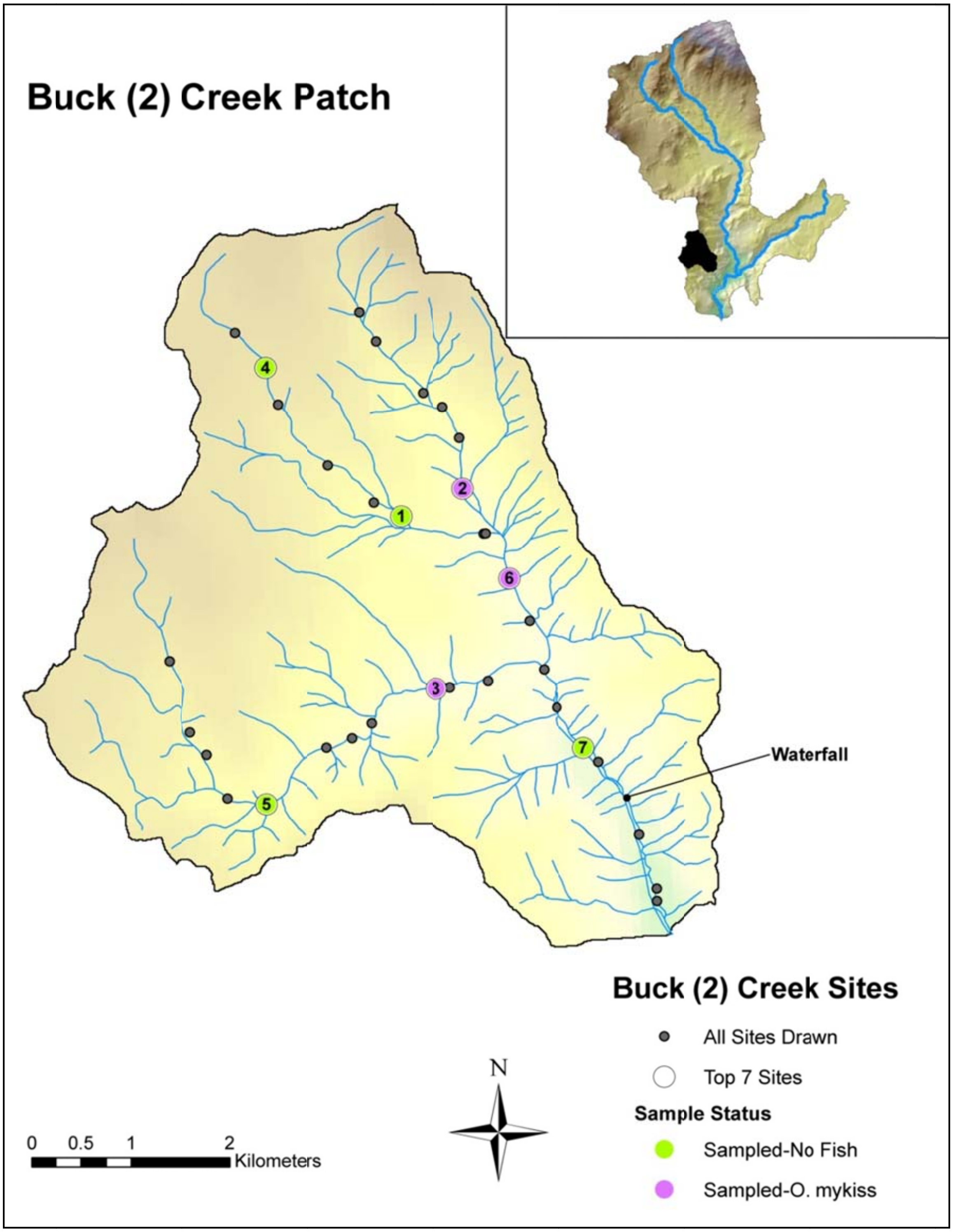

Figure 6. Sites in the Buck (2) Creek Patch 2009.

Table 4. Habitat data collected in 2009.

Buck (2) Creek							
Site	1	2	3	4	5	6	7
Date	5/6	5/6	6/5	5/29	6/4	6/4	5/29
Time Start	10:00	12:23	10:30	12:45	12:41	9:59	10:09
Time End	10:54	13:15	11:25	13:50	13:20	11:03	11:17
Temperature (°C)	5.5	6.6	9.5	9.8	9.4	9.4	9.5
Conductivity (µs)	28.4	62.8	59.5	32.5	35.0	63.5	58.4
Bank Length	50	50	50	50	50	50	50
Thalweg Length	50	50	50	50	50	50	50
Pools?	Y	Y	N	Y	N	N	Y
Clinometer Top (%)	16	11	6	7	2	9.5	4
Clinometer Bottom (%)	15	8	3	9	9	9	4
Clinometer Average (%)	15.5	9.5	4.5	8	5.5	9.25	4
# >3m length >10cm diameter	6	11	2	6	2	8	1
LWD Piles (>4 pieces of LWD together)	0	1	0	2	0	1	0
# >10 m in length >60 cm diameter	3	3	6	5	5	6	2
# Root Wads	2	1	1	0	0	3	1
Mean Wetted Width (m)	3.18	3.85	5.15	2.47	3.17	6.03	6.53
Mean Depth (m)	0.27	0.26	0.24	0.16	0.17	0.19	0.47

Gilmer Creek							
Site	1	2	3	4	5	6	7
Date	6/22	6/22	6/26	6/26	6/29	6/29	6/29
Time Start	12:45	11:35	9:30	10:45	12:05	10:00	11:00
Time End	13:19	12:06	10:15	11:23	12:52	10:41	11:40
Temperature (°C)	12.0	10.4	10.4	10.3	11.2	12.5	12.4
Conductivity (µs)	99.1	102.4	103.2	83.3	114.8	122.6	107.2
Bank Length	50	50	50	50	50	50	50
Thalweg Length	50	50	50	50	50	50	50
Pools?	Y	Y	Y	Y	Y	Y	Y
Clinometer Top (%)	2	5	2	13	12	1.5	1
Clinometer Bottom (%)	1.5	5	4	6	7	1.5	1.5
Clinometer Average (%)	1.75	5	3	9.5	9.5	1.5	1.25
# >3m length >10cm diameter	0	3	2	5	15	1	0
LWD Piles (>4 pieces of LWD together)	0	0	0	0	2	0	0
# >10 m in length >60 cm diameter	0	0	1	1	3	0	0
# Root Wads	0	1	0	0	2	0	0
Mean Wetted Width (m)	1.35	1.72	1.78	1.02	1.59	2.28	1.57
Mean Depth (m)	0.16	0.03	0.06	0.04	0.09	0.42	0.10

The lower portion of the Cave Creek patch was dry due to irrigation and the upper tributary (Coyote Creek) was dry (Figure 7). Cave Creek and its headwaters join with Beaver Creek to create the only wetted part of the patch. This patch will be reassessed to ensure it meets the minimum catchment area requirement and appropriate sample sites identified.

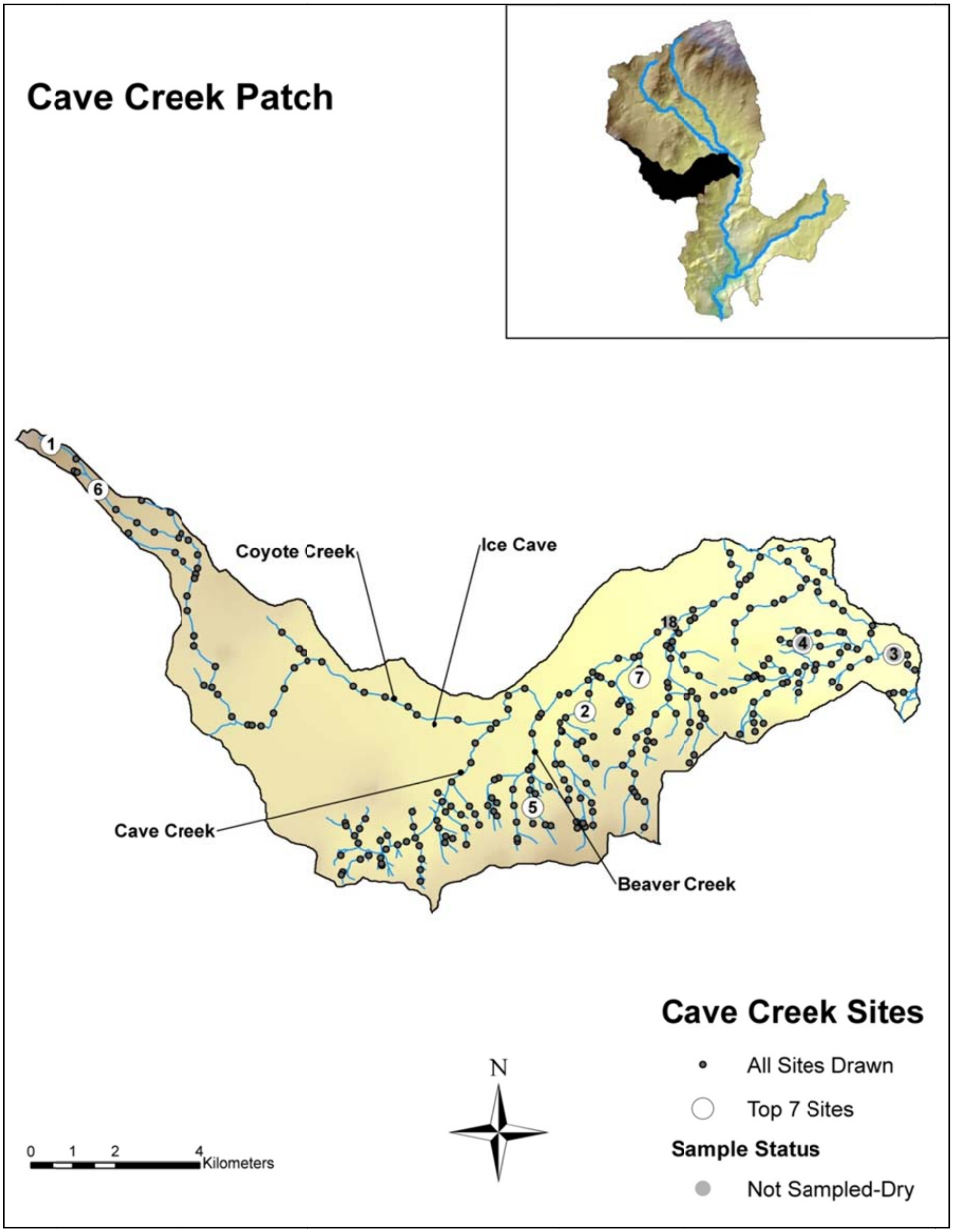

Figure 7. Sites in the Cave Creek Patch.

Seven sites were sampled in the Gilmer Creek patch (Figure 8). Much of the property lower in the patch was private land and access was not permitted (eliminating ten sites); Kline Creek was dry (eliminating two sites). *O. mykiss* were found in one site, speckled dace were found in two other sites. There was little water throughout the watershed (mean depth 0.03 - 0.42) and high water temperatures (10.3 - 12.5ºC) (Table 4).

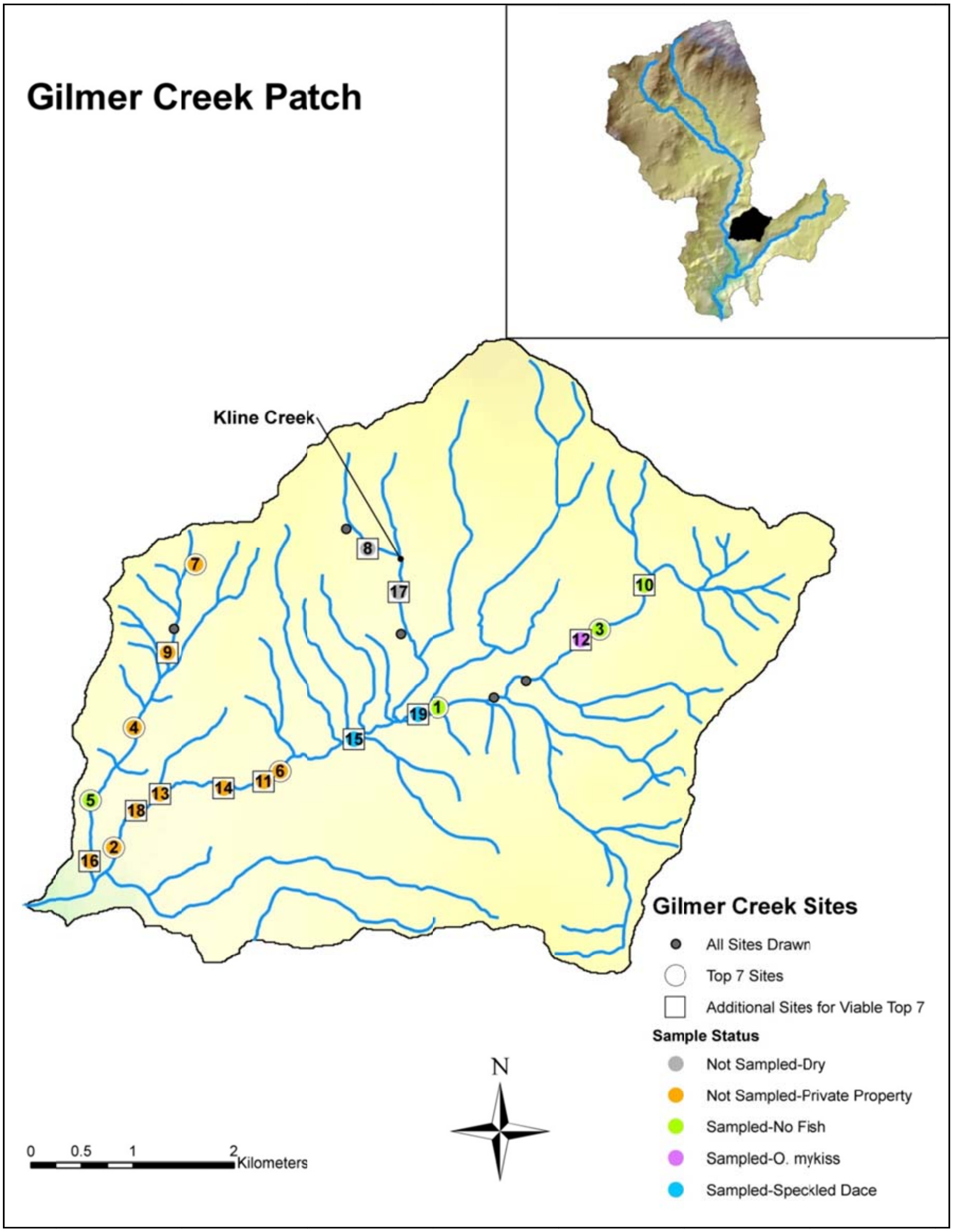

Figure 8. Sites in the Gilmer Creek Patch.

The Smeltzer Mill patch was dry. No sites were sampled (Figure 9). Anecdotal information indicates wetted areas are seasonally intermittent.

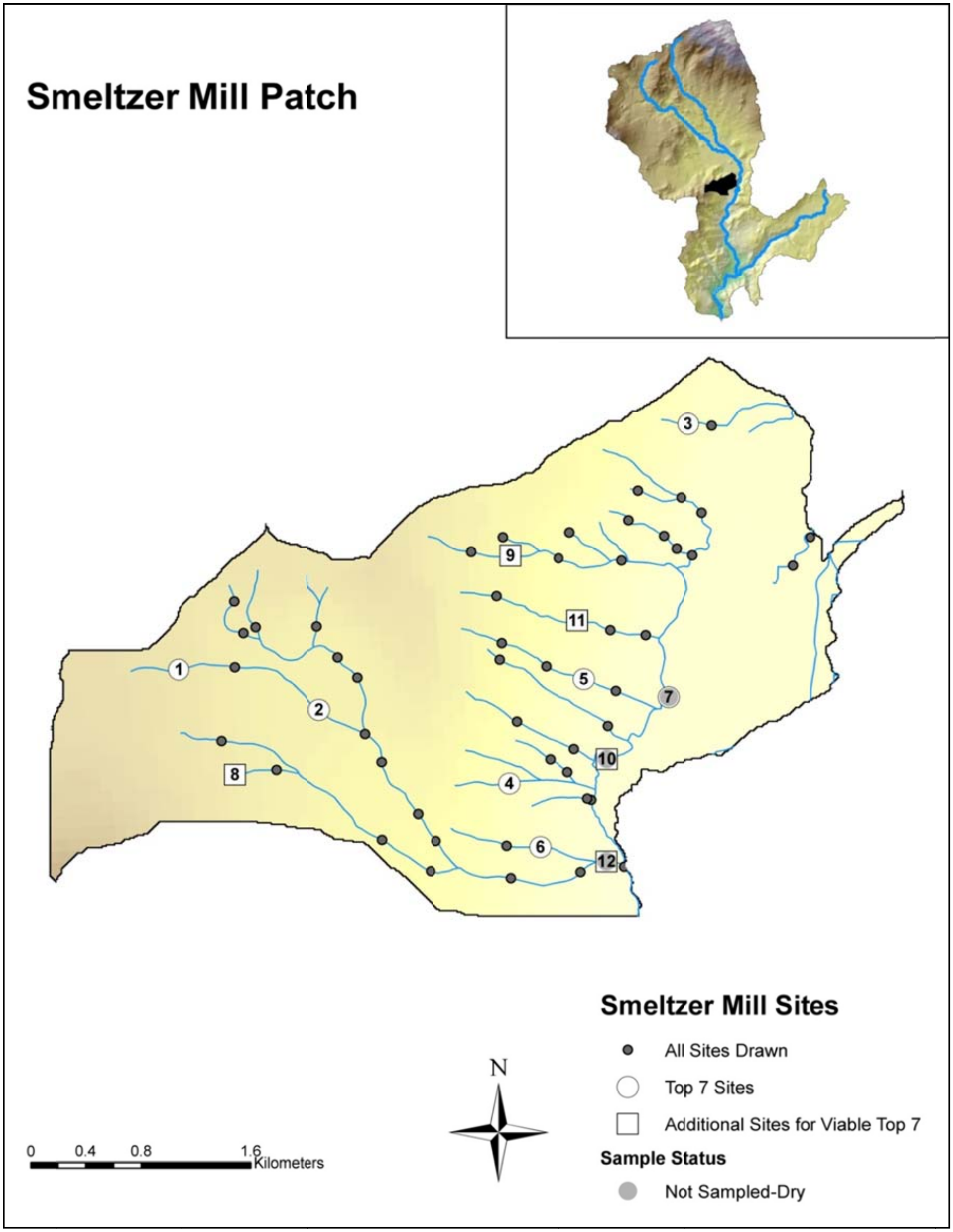

Figure 9. Sites in the Smeltzer Mill Patch 2009.

Three sites above the Wieberg Creek barrier observed in 2008 (Silver et al. 2009b) were dry, no sites were sampled (Figure 10).

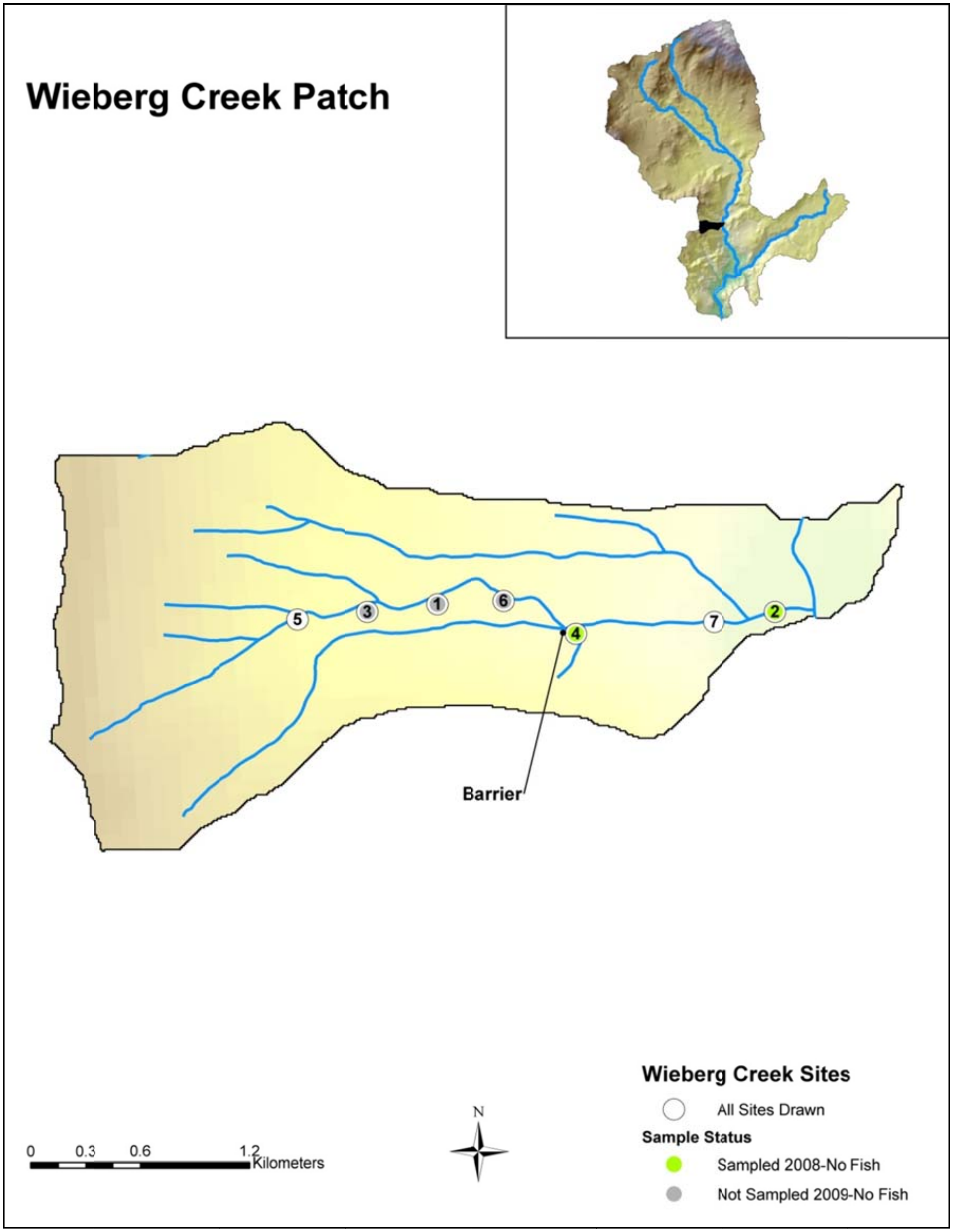

Figure 10. Sites in the Wieberg Creek Patch.

Findings

- Bull trout have not been collected in the White Salmon River subbasin through these efforts to date. Thus, we conclude that 0% (0 of 6) of the patches completed in 2009 and 0% (0 of 14) of the patches sampled since 2007 in the White Salmon River subbasin are occupied by bull trout (see Silver et al. 2009a, 2009b).

- Field work resulted in documentation of fish passage barriers and lack of water within patches, resulting in presumed patches no longer being considered a patch due to a size less than 400 hectares.

- Based on water temperatures, catchment areas and stream size, 11 patches have now been identified as potential habitat to support bull trout in the White Salmon River subbasin (Table 5).

- Big Brother Falls is a 7 m waterfall located on the White Salmon River at river km 26.1 and is a likely migration barrier to fluvial bull trout due to its height. If bull trout are not found above the falls, it is not likely they will reestablish naturally. Reintroduction efforts involving transplants and/or hatchery stocking would be needed for six patches above the falls (Cascade Cr., Cave Cr., Green Canyon Cr., Morrison Cr., Ninefoot Cr., and Trout Lake Cr.) to become colonized with bull trout.

Table 5. Patches identified since 2007 and sampled.

Patch Name	Year Delineated	Year Sampled	Sample Status	Sample Results	Status Reason	Patch Status
Bear Cr.	2007	2009	Not sampled	Dry Connection	Unviable habitat	**Eliminated**
Bear Valley	2007	N/A	Not sampled	Dry	Unviable habitat	**Eliminated**
Buck (2) Cr.	2007	2009	Sampled	No bull trout	7 Sites sampled	**Complete**
Buck Cr.	2007	2007	Sampled	Dry	Unviable habitat	**Eliminated**
Cascade Cr.	2007	2007	Sampled	No bull trout	7 Sites sampled	**Complete**
Cave Cr.	2007	2009	Not sampled	Dry	Unviable habitat	**Eliminated**
Cave Cr.	2009	-	-	-	Sample in 2010	-
Dry Cr.	2007	2008	Not sampled	Dry	Unviable habitat	**Eliminated**
Gilmer Cr.	2007	2009	Sampled	Water temp. too high	Unviable habitat	**Eliminated**
Gotchen Cr.	2007	2007	Not sampled	Dry	Unviable habitat	**Eliminated**
Green Canyon Cr.	2009	-	-	-	Sample in 2010	-
Green Canyon	2007	N/A	Not sampled	Undersized catchment area	Unviable habitat	**Eliminated**
Guler Mountain	2007	N/A	Not sampled	Dry	Unviable habitat	**Eliminated**
Little Buck Cr.	2007	2008	Sampled	No bull trout	7 Sites sampled	**Complete**
Mc Ilroy Canyon	2009	-	-	-	Sample in 2010	-
Mill Cr.	2007	2008	Sampled	No bull trout	7 Sites sampled	**Complete**
Morrison Cr.	2007	2007	Sampled	No bull trout	7 Sites sampled	**Complete**
Ninefoot Cr.	2009	-	-	-	Sample in 2010	-
Phelps Cr.	2007	2008	Sampled	Additional sites to sample above barrier	Complete in 2010	**Incomplete**
Smeltzer Mill	2007	2009	Not sampled	Dry	Unviable habitat	**Eliminated**
Trout Lake Cr.	2007	2007	Sampled	No Bull Trout	7 Sites sampled	**Complete**
Wieberg Cr.	2007	2008, 2009	Sampled	Barrier/Dry Undersized	Unviable habitat	**Eliminated**

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