Stressor Identification for Assessment Unit # ID17010104PN001_02
Lower Kootenai River Subbasin

February 12, 2009

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Summary

Assessment Unit #ID17010104PN001_02 includes a number of 1st and 2nd order tributaries to the Kootenai River between Shorty's Island and the Canadian border. Stressor identification for Assessment Unit #ID17010104PN001_02 was completed with aid from CADDIS (Causal Analysis/Diagnosis Decision Information System), EPA's *Stressor Identification Guidance Document* (EPA, 2000), and from physical, chemical and biological data collected in the unit.

Assessment Unit #ID17010104PN001_02 was listed in the Idaho DEQ 2002 Integrated Report Section 5 as impaired for reasons associated with temperature. In the Idaho DEQ 2008 Integrated Report Section 5, this assessment unit continued to be listed as impaired for temperature, however, it was also listed as impaired for reasons associated with combined biota/habitat assessments. This stressor identification analysis was initiated to elucidate the causes of the biological/habitat assessment test failure.

Eight candidate causes were identified and were analyzed based on the available data. Those causes that are unlikely to be involved in the habitat/biological impairments of the assessment unit will be eliminated from consideration. This analysis brings forth likely candidate causes for further in depth investigation.

It is difficult to draw conclusions about the entire Assessment Unit # ID17010104PN001_02. Most of what we know is about Fisher Creek and not other streams in the assessment unit. However, there is evidence that Fisher Creek in the lowland section has had channel alterations leading to downcutting, removal and replacement of natural tree/shrub riparian vegetation with grasses, and some bank stability issues. Flow alteration also appears to be an issue in Fisher Creek as there is evidence of concrete structures for diversion in the watershed.

Therefore, the most likely causes of low habitat/biological scores in Fisher Creek are flow and habitat alteration, and possibly excess sediment. Although what is happening in other streams in the assessment unit is unknown, based on similarity of landscape position and land use, we assume that other streams in the assessment unit are likely similarly impacted.

Section 1.0 Scope of Investigation

Assessment Unit #ID17010104PN001_02 includes a number of 1st and 2nd order tributaries to the Kootenai River between Shorty's Island and the Canadian border (see Figure 1). Several of these tributaries are larger named streams emanating from the National Forest lands on the west side of the Kootenai River valley (e.g. Lost Creek, Burton Creek, Farnham Creek, and Fisher Creek). Still more are smaller un-named tributaries on the valley floor or those that drain from Hall Mountain on the east side.

The Kootenai River from Shorty's Island to the Canadian border is in a broad agricultural valley and is very sinuous throughout (see Figure 2). On either side of this agricultural valley are forested hillsides and larger tributaries that are included in other assessment units. Most of this forest land is within the Kaniksu National Forest (Figure 1).

Many tributaries within this assessment unit under investigation are likely to experience a dichotomy of land use and activity. Upper portions of watersheds in forested lands can experience impacts from roads and timber harvest activities on slopes (sedimentation from erosion and runoff, road crossings, landslide and slumps, etc.). Whereas lower portions of tributaries will be depositional and exposed to a variety of agricultural related impacts (channelization, diversions, removal of vegetative cover, field runoff, etc.).

Stressor identification for Assessment Unit #ID17010104PN001_02 was completed with aid from the CADDIS (Causal Analysis/Diagnosis Decision Information System) program (http://cfpub.epa.gov/caddis/), EPA's *Stressor Identification Guidance Document* (EPA, 2000), and from physical, chemical and biological data collected by Idaho DEQ, Idaho Department of Lands (IDL), U.S. Forest Service (USFS) and others.

A map and an aerial photo view of the Assessment Unit are found in Figures 1 and 2.

Figure 1. Land Status Map for Assessment Unit #ID17010104PN001_02.

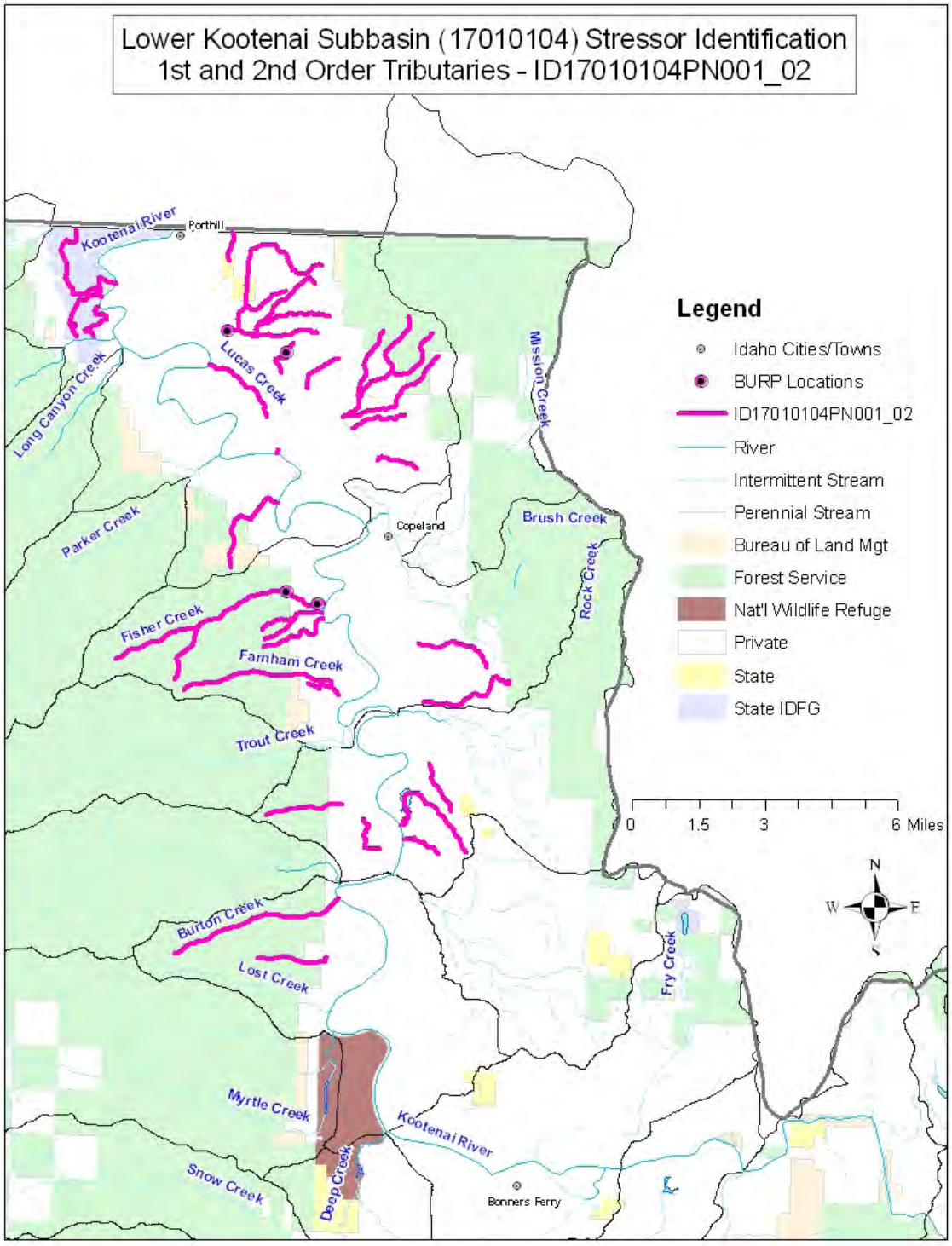
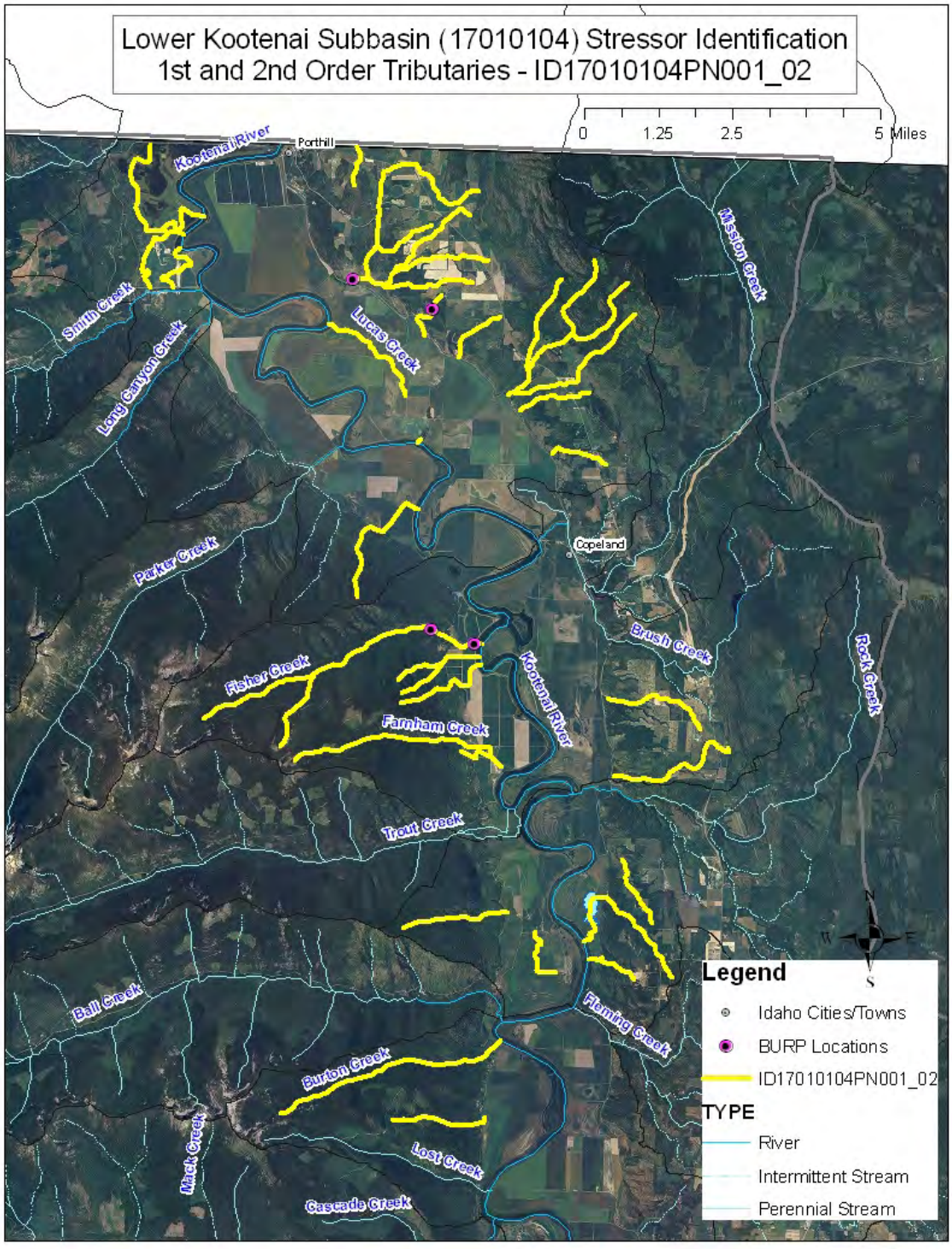


Figure 2. Aerial View of Assessment Unit #ID17010104PN001_02.



Section 2.0 Description of the Impairment

Assessment Unit #ID17010104PN001_02 was listed in the Idaho DEQ 2002 Integrated Report Section 5 as impaired for reasons associated with temperature. In the Idaho DEQ 2008 Integrated Report Section 5, this assessment unit continued to be listed as impaired for temperature, however, it was also listed as impaired for reasons associated with combined biota/habitat assessments. Essentially, this second listing indicates that BURP sampling in the assessment unit revealed that streams failed to pass assessment tests conducted on biological and habitat data.

Table 1 shows the index scores for BURP sites in the assessment unit. These scores were generated using the Idaho DEQ Water Body Assessment Guidance (WBAG) protocols (Grafe et al., 2002). Multimetric indices were generated from macroinvertebrate, fish and stream habitat data collected at BURP sites. These indices are then rated based on their values relative to bio-regional values calculated for least disturbed sites (Table 2). Ratings (0 to 3) for the macroinvertebrate index (SMI), the fish index (SFI), and the habitat index (SHI) are then combined to form an overall rating (also 0 to 3). In order to pass an assessment test the overall rating needs to be 2 or greater.

Table 1. Assessment Scores and Rating for AU #ID17010104PN001_02.

Assessment Unit	Stream	BURP ID	SMI (rating)	SFI (rating)	SHI (rating)	Overall Rating
ID17010104PN001_02	Fisher Creek	2001SCDAA011	30.59 (0)	83.71 (3)	65 (2)	0
ID17010104PN001_02	Fisher Creek	2001SCDAA023	36.2 (1)	N/A	29 (1)	1
ID17010104PN001_02	UnNamed Trib	2001SCDAA040	N/A	N/A	N/A	N/A
ID17010104PN001_02	UnNamed Trib	2005SCDAA017	N/A	N/A	10 (1)	N/A

Note that in this assessment unit only two BURP sites, both of which are on the same stream (Fisher Creek), had sufficient data to calculate index scores. For the other BURP sites in Table 1, one site (2001SCDAA040) was on private property where access was restricted and the other site (2005SCDAA017) had insufficient water for sampling the biological community. Therefore, the assessment unit's biological/habitat impairment rating is solely based on results obtained from Fisher Creek. The upper most BURP site on Fisher Creek (2001SCDAA011, see Photo 1) failed as a result of poor macroinvertebrate scores, although both the fish index and the habitat index would have been sufficient to pass the impairment test. The lower site (2001SCDAA023, see Photo 2) in the agricultural lowland failed as a result of both low macroinvertebrate scores and low habitat scores. There were no fish encountered at this lower site.

Table 2. Index Rating for Northern Idaho Streams.

Condition Category	SMI (Northern Mountains)	SFI (Forest)	SHI (Northern Rockies)	Condition Rating
Above 25th percentile of reference condition	≥65	≥81	≥66	3
10th to 25th percentile of reference condition	57-64	67-80	58-65	2
Minimum to 10th percentile of reference condition	39-56	34-66	<58	1
Below minimum of reference condition	<39	<34	N/A	0

Photo 1. BURP Site 2001SCDAA011. Concrete structure at top of sampled reach.

Photo 2. BURP Site 2001SCDAA023.

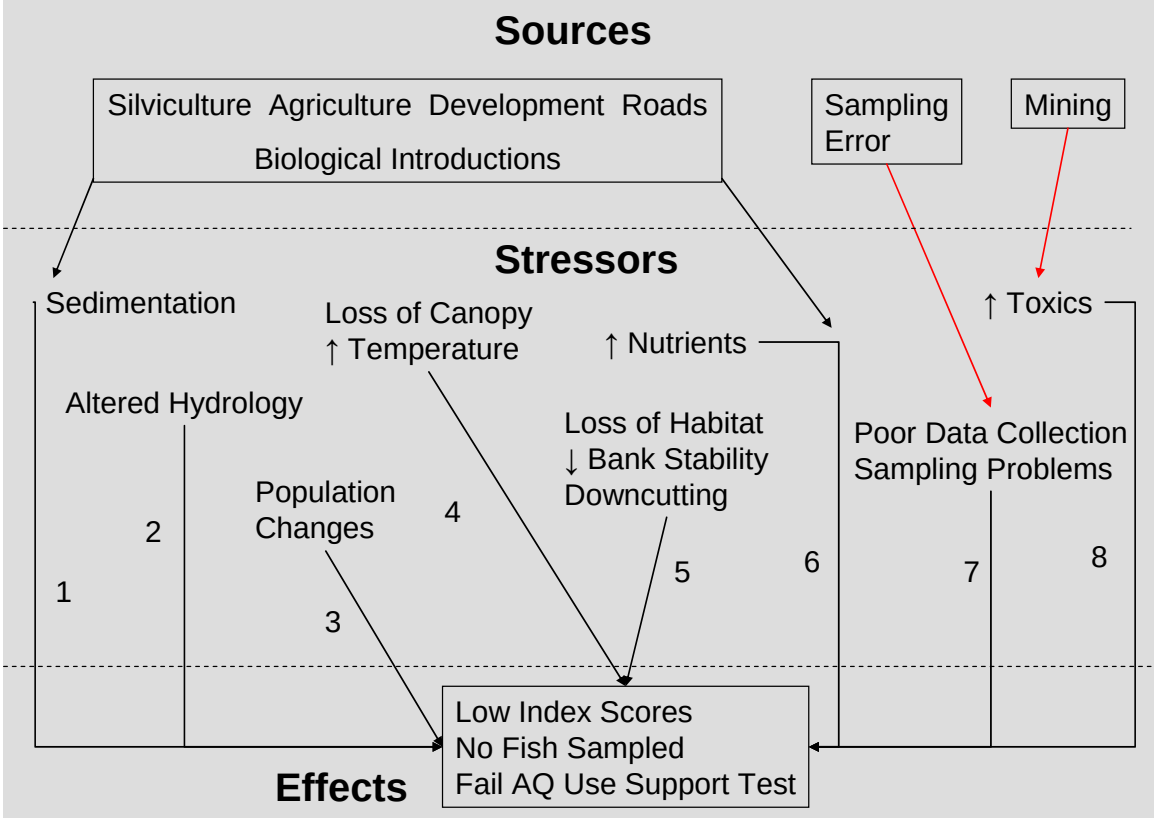
Section 3.0 Candidate Causes

In order to suggest what may affect index scores for the assessment unit in question, a list of possible causes needs to be constructed. Figure 3 presents a simple conceptual model of candidate causes that may lead to poor biological/habitat scoring. The model presents eight candidate causes as stressors that include:

1. Increased **sedimentation** (bedload and suspended) from many of the activities that could occur in the watershed (silviculture, agriculture, rural development, and roads) may result from field and trail runoff, mass failures, road cuts and fills, etc. Excess sediment leads to loss of habitat for macroinvertebrates and fish by the filling of gravel spaces with sand and silt. An over-abundance of sediment can decrease intergravel dissolved oxygen needed for fry development and drive sensitive macroinvertebrates out of the system to be replaced by more tolerant species.
2. Many activities that change the face of the land and increase runoff can alter the hydrology. An **altered hydrology** affects the streams ability to maintain flow and prevent bank erosion and downcutting. Streams can lose baseflow resulting in insufficient water during dry season for aquatic life. Streams can over-widen and increase width/depth ratios resulting in decreased shade and increased water temperatures resulting in loss of cold water species.
3. **Population changes** can result from a variety of interspecies conflicts that result from introductions of alien species including competition, parasitism and predation. Additionally, population changes can result from complications due to small populations (genetic loss, inbreeding, genetic alteration, etc.). Small populations result from habitat loss and loss of connectivity to regional populations.
4. Many activities and natural wildfire can cause a **loss of canopy** shade through direct removal of riparian vegetation. Again, this can result in increased water temperatures that affect biological communities.
5. **Loss of instream habitat** and bank stability can result from modifications to the channel (channelization, trenching and field draining, dikes, berms, instream structures) and changes to the hydrology of the system (see #2). This in turn affects the ability of some species to remain in the system due to loss of habitat, sedimentation, temperature increases, etc.
6. Certain kinds of activities may lead to **increased nutrients** (phosphorus and nitrogen) in the water column. Increased nutrients can cause algae blooms and other un-wanted plant growth instream, the decomposition of which uses up valuable dissolved oxygen, cause warming and can eliminate habitat.
7. Poor macroinvertebrate and fish scores may result from **sampling errors** where field methods are not followed correctly resulting in poor collection events. Sample containers may leak or be inadvertently destroyed resulting in a loss of data.
8. **Toxic pollutants** that are heavy metals may be introduced into the system from mining operations or legacy mine problems should they exist in the watershed. Other toxic pollutants may occur but are unlikely given the rural setting, unless

they are localized introductions of farm chemicals. Increased concentrations of metals and other toxic pollutants can lead to reduction or elimination of sensitive species.

Figure 3. Conceptual Model of Candidate Causes for AU #ID17010104PN001_02.



Section 4.0 Existing Data

Existing data for AU #ID17010104PN001_02 are very limited. No data have been acquired from Idaho Department of Lands, Idaho Fish and Game, or U.S. Forest Service. Other than some water chemistry data collected on Farnham and Fisher Creeks in the late 1970s by USGS, all the data are from the lower reaches of Fisher Creek collected by DEQ. Most of the streams in this assessment unit are similar in location to Fisher Creek so it is likely, although not guaranteed, that conditions are similar among all streams in the assessment unit.

4.1 Physical Habitat Data

The habitat metrics that go into the formulation of the Stream Habitat Index (SHI) are presented in Table 3 for the two BURP sites on Fisher Creek. Note that the upper site (2001SCDAA011) had an SHI score high enough to pass the assessment test. Its metric values are relatively consistent with the average of all BURP sites in the Lower Kootenai subbasin with passing SHI scores (Ave Supporting). The lower BURP site (2001SCDAA023) had poor scores for bank cover and stability, canopy and percent fines. These data suggest that sediment from bank erosion and temperature are likely to be impacting the lower segment of Fisher Creek.

Table 3. Habitat Metrics for BURP Sites in AU #ID17010104PN001_02.

BURP ID	Bank Cover (%)	Bank Stability (%)	Canopy (%)	Fines (%)	Embedded Score	Channel Shape Score	Pool/Riffle Ratio	Ave Wetted Width (m)	Ave Wetted Depth (m)	Width/ Depth Ratio	Discharge (cfs)	SHI
2001SCDAA011	100	100	59.5	4.5	3	5	0.5	2.7	0.1	27.8	3.6	65
2001SCDAA023	5.5	5.5	15.5	48.5	5	6	0.3	2.2	0.3	7.7	0.5	29
Ave Supporting	98.2	99.3	65.7	5.6	14.6	5.3	0.75	6.6	0.04	18.7	5.9	78.4

4.2 Biological Data

Only the upper BURP site on Fisher Creek produced fish when electrofished in 2001. The site's scores matched the average of all BURP sites in the Lower Kootenai subbasin with passing SFI scores (Ave Supporting). No SFI was generated for the lower BURP site on Fisher Creek as no fish were encountered during the field visit.

Table 4. Fish Metrics for BURP Sites in AU #ID17010104PN001_02.

BURP ID	Cold Water Taxa	% Cold Water	% Sensitive	Sculpin Age Classes	Salmonid Age Classes	CPUE	SFI
2001SCDAA011	2	100	96.9	1	3	14.4	83.71
Ave Supporting	1.97	93.9	59.3	1.1	3.1	8.7	81.1

Macroinvertebrate metrics (Table 5) for both sites on Fisher Creek showed a lack of species especially mayfly, stonefly and caddisfly (EPT) taxa when compared to the average of all BURP sites in the Lower Kootenai subbasin with passing SMI scores (Ave Supporting). Hilsenhoff Biotic Index (HBI) was not different from average supporting sites in the subbasin suggesting that pollution tolerant organisms were not dominating the system. Thus, chemical pollution is less likely the cause of the impairment. The loss of

scrappers and, to a lesser extent, clingers suggests that sedimentation is the driving mechanism inflicting macroinvertebrate impairment.

Table 5. Macroinvertebrate Metrics for BURP Sites in AU #ID17010104PN001_02.

BURP ID	Total Taxa	Ephemeroptera Taxa	Plecoptera Taxa	Trichoptera Taxa	% Plecoptera	HBI	% Dominance of top 5 taxa	% Scraper	% Clinger	SMI
2001SCDAA011	13	6	1	2	3	4.72	82.5	0.8	52.5	30.59
2001SCDAA023	21	5	4	0	6.23	5.02	80.1	13.1	26.1	36.2
Ave Supporting	34.3	9.2	6.9	7.5	13.3	4.97	67.2	25.3	58.3	68.1

4.3 Water Chemistry

Water chemistry data for the assessment unit are extremely limited. Most data points in Table 6 were taken at USGS temporary gage stations in the late 1970s. Data are not remarkable, except for an instantaneous water temperature reading of 27.5 °C in Farnham Creek on June 5, 1979. Since discharge is reasonably high during that period and June temperatures are normally very cold as they were in 1976, it is likely that the measurement was not accurate. The 15.6 °C maximum daily maximum temperature (MDMT) is the highest of a series of temperatures recorded with a temperature logger by DEQ. The logger showed 12 consecutive days of exceedance of the 13 °C fall salmonid spawning maximum temperature criterion applied to the default time period starting on August 1st.

Table 6. Water Chemistry Data Collected in AU #ID17010104PN001_02.

Date	Stream	Temperature* (°C)	pH	Dissolved Oxygen (mg/L)	Specific Conductance (µs/cm)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	E. coli (#/100mL)	Total Coliform (#/100mL)	Discharge (cfs)
8/7/2001	Fisher Creek	15.6 (MDMT)								
8/9/2001	Fisher Creek							29	920	
8/16/2001	Fisher Creek							6	460	
4/13/1976	Fisher Creek	3.5			28					11
6/2/1976	Fisher Creek	4			20					20
9/9/1976	Fisher Creek	7.5								3.4
6/5/1979	Fisher Creek	7.5			19					22
4/13/1976	Farnham Creek	3.5			31					3.3
6/2/1976	Farnham Creek	4			22					6.9
9/9/1976	Farnham Creek	11			55					0.69
6/5/1979	Farnham Creek	27.5			22					4.1

*Temperatures are instantaneous readings unless otherwise noted.

Section 5.0 Analysis

The eight candidate causes identified in Section 3.0 are analyzed here based on the available data. Those causes that are unlikely to be involved in the habitat/biological impairments of the assessment unit will be eliminated from consideration. This analysis brings forth likely candidate causes for further in depth investigation.

5.1 Stressor Refinement

1. There is some evidence that sedimentation is occurring in the lower reach of Fisher Creek that are likely to result in poor habitat scores and poor macroinvertebrate scores. Habitat metrics such as percent fines, bank cover and bank stability suggest that excess sediment is in place and erosion maybe occurring, which would in turn cause a loss of EPT taxa and fish that are generally sensitive to excess sediment. However, this portion of Fisher Creek is a low gradient depositional area that one would expect to find sediment deposition occurring. To what degree agricultural related land uses are exacerbating sedimentation has not been determined. Since habitat metrics are normal at the edge of the forest where the upper BURP site is located, one could suggest that sediment is not coming from the upper portions of the watershed. However, low macroinvertebrate scores at the upper site may indicate excess suspended sediment has moved through this system and eliminated sensitive taxa. Regarding habitat and biological index scores, the lowland depositional areas are being held to the same test as the higher gradient forested portion of these streams, which may not be appropriate.
2. Hydrological alteration cannot be ruled out. There was evidence of flow control structures in the Fisher Creek watershed (see Photo 1) and water maybe diverted for agricultural purposes. The high banks and lack of bank stability suggest that the stream has downcut considerably in the lowland section and there is likely a loss of connection with its flood plain.
3. Although it is a possible cause, there is no evidence of biological invasions that maybe affecting macroinvertebrate populations. The lack of fish in the lower reach of Fisher Creek maybe the result of barriers to fish migration.
4. Water temperature maybe a problem in the Fisher Creek watershed. Habitat metrics suggest that the lower reach lacks adequate canopy cover. Measured temperature was not extremely high but did exceed salmonid spawning criteria in early fall. If it can be demonstrated that early fall spawning does not occur in these waters and is not appropriate to evaluate in August, then water temperature in Fisher Creek may not be impairing uses.
5. We have indicated that bank instability and flow alteration are likely occurring in the lower portion of the Fisher Creek watershed. Channelization, dikes or berms, and downcutting may have occurred as suggested by photographs. These activities can lead to loss of habitat and a reduction in biological communities.
6. There is no evidence that nutrients are in excess in the Fisher Creek watershed. To our knowledge visible slime growth, excess algae and other macrophytes have

not been reported for streams in the assessment unit. However, no data have been collected on water chemistry to confirm normal nutrient status.

7. To our knowledge, BURP sampling occurred in an appropriate manner and there were no problems, sample mishandling nor loss of data.
8. There may be current or legacy mining activities in the assessment unit. There a number of mines in the Olds Creek/Hall Creek area of Hall Mountain including Montgomery and Trust Mining companies in the Hall Creek drainage (copper, nickel, gold, & silver), a number of rare earth/thorium mines and explorations on the ridge above Olds Creek headwaters (Lucky Seven Prospect, Schiller and Dougherty, Wawa Prospect, Hall Mountain Thorium Group, Hall Mountain #1, & Golden Sceptre). However, it is not know if any water chemistry sampling has taken place to confirm a lack of toxic pollutants. The two BURP sites in that area were either inaccessible or dry and were not sampled. The introduction of agricultural chemicals or other accidental spills cannot be ruled out either.

5.2 Candidate Cause Elimination

There is a lack of information and data about this assessment unit, so ruling out candidate causes is difficult. We feel somewhat confident that excess nutrients, sampling error and toxic pollutants are not causing the problems associated with low biological/habitat scores in Fisher Creek. It is possible that some toxic pollutants exist in streams near the Hall Mountain mining area, however no data have been explored at this time. It is likely that biological invasion by alien species is not prominent enough to cause low scores either. However, there is evidence that fish migration barriers maybe present and affecting the lack of fish in lower reaches of Fisher Creek. Temperature also does not appear to be playing a big role in Fisher Creek. Although there are some fall salmonid spawning criteria issues, this may result from improper application of spawning time intervals. Measured temperatures in general were not excessive, less than 16 °C. It is more likely that excess sediment, flow and channel alteration are leading causes of habitat and macroinvertebrate loss.

Section 6.0 Conclusions

It is difficult to draw conclusions about the entire Assessment Unit # ID17010104PN001_02. Most of what we know is about Fisher Creek and not other streams in the assessment unit. Two BURP sites on Fisher Creek, one in the agricultural lowland and one just above the valley floor inside the National Forest boundary, revealed low macroinvertebrate and habitat scores to fail assessment tests. The lower site also had no fish present at sampling time.

The agricultural lowland portion of Fisher Creek to some extent would be expected to be a depositional area with high sediment bedload. The lower BURP site has index scores that are held to the same test as higher gradient, forested sites which maybe misleading. However, there is evidence that Fisher Creek in this lowland section has had channel alterations leading to downcutting, removal and replacement of natural tree/shrub riparian vegetation with grasses, and some bank stability issues. Flow alteration also appears to

be an issue in Fisher Creek as there is evidence of concrete structures for diversion in the watershed.

Therefore, the most likely causes of low habitat/biological scores in Fisher Creek are flow and habitat alteration, and possibly excess sediment. Although what is happening in other streams in the assessment unit is unknown, based on similarity of landscape position and land use, we assume that other streams in the assessment unit are likely similarly impacted.

Section 7.0 References

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