Stressor Identification for Assessment Unit # ID17010104PN009_03
Lower Kootenai River Subbasin

February 24, 2009

Prepared for:

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814

Prepared by:

State Technical Services Office
Idaho Department of Environmental Quality
1410 N. Hilton St.
Boise, ID 83706

Table of Contents

List of Tables

List of Figures

Summary

Assessment Unit #ID17010104PN009_03 includes the last 950 meters of Parker Creek from the last intermittent tributaries to the Kootenai River. Stressor identification for Assessment Unit #ID17010104PN009_03 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 #ID17010104PN009_03 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 was no longer listed as impaired for temperature, however, it was also listed as impaired for reasons associated with benthic macroinvertebrate bio-assessments. This stressor identification analysis was initiated to elucidate the causes of the biological 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.

The agricultural lowland portion of Parker 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 Parker 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. Therefore, the most likely causes of low habitat/biological scores in lower Parker Creek are habitat alteration and possibly excess sediment.

Section 1.0 Scope of Investigation

Assessment Unit #ID17010104PN009_03 includes the last 950 meters of Parker Creek in the lowland agricultural area between the last two intermittent tributaries and the Kootenai River (see Figure 1). The land is entirely private and used primarily for row crops and grazing pastures.

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). The Parker Creek watershed is located on the west side of the valley between Fisher Creek to the south and Long Canyon Creek to the north. Parker Creek above this assessment unit is primarily forested and in the Kaniksu National Forest, although there are smaller patches of BLM and private forest as well (Figure 1).

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 Parker Creek 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 #ID17010104PN009_03 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 #ID17010104PN009_03.

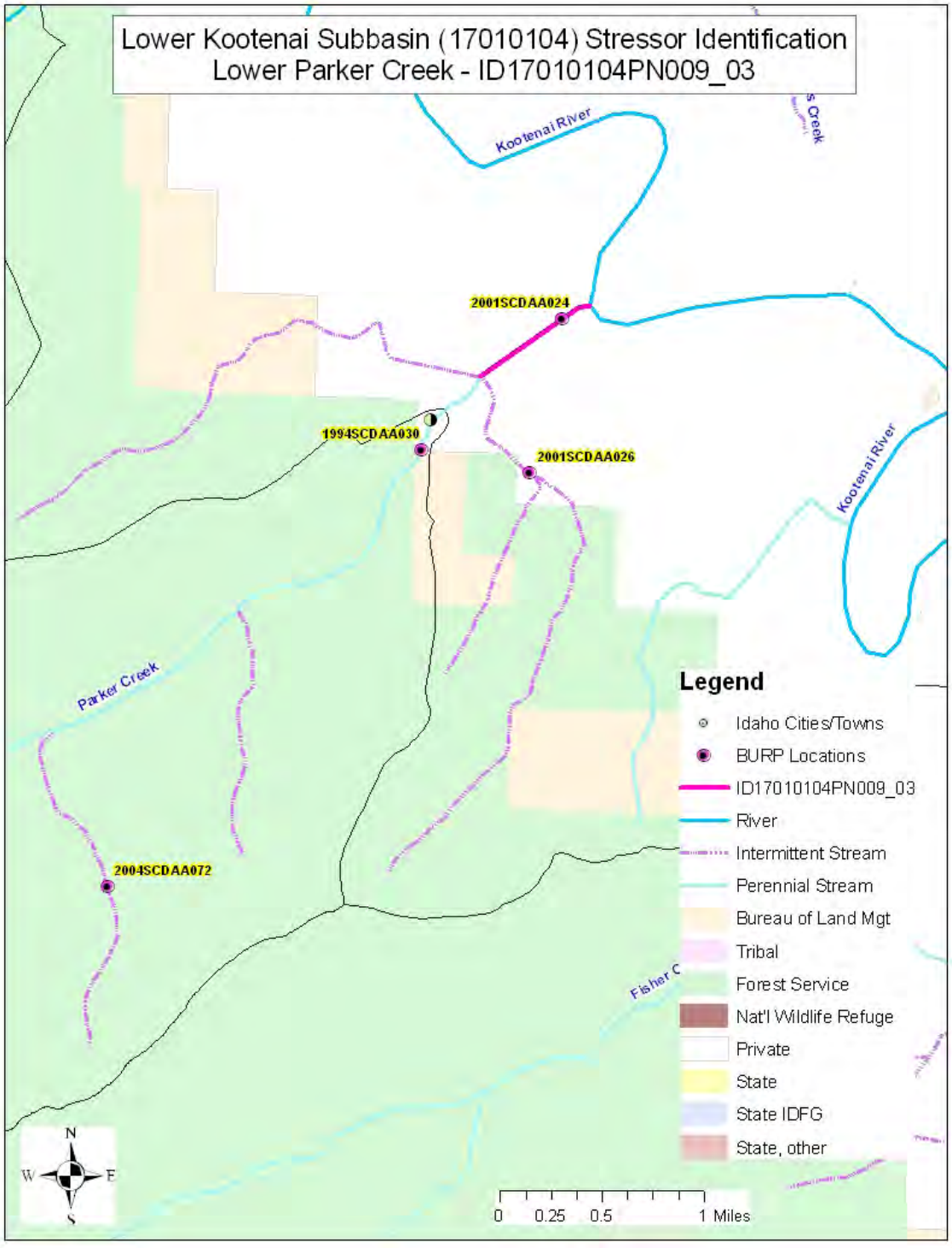
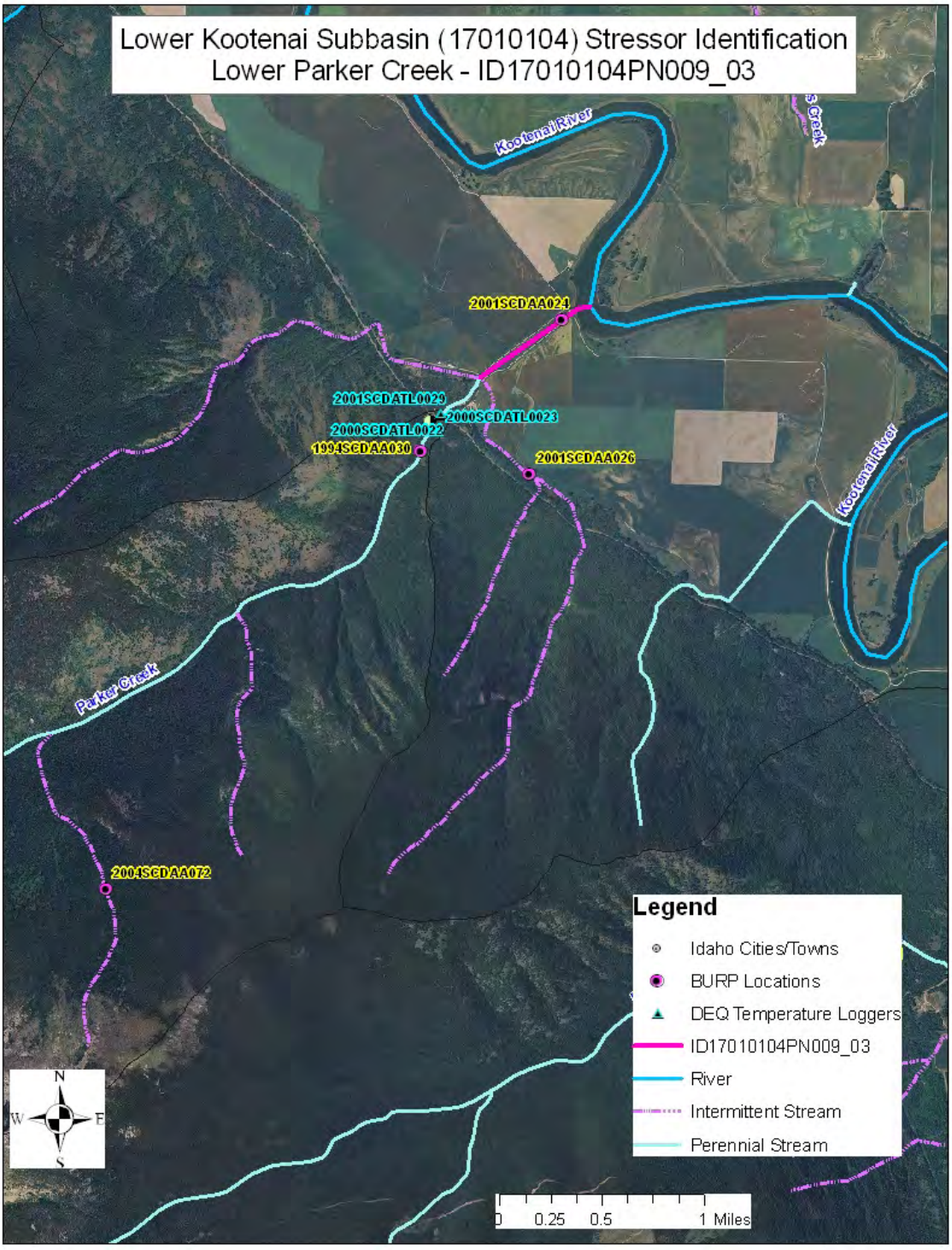


Figure 2. Aerial View of Assessment Unit #ID17010104PN009_03.



Section 2.0 Description of the Impairment

Assessment Unit #ID17010104PN009_03 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 was no longer listed as impaired for temperature, however, it was listed as impaired for reasons associated with benthic macroinvertebrate bio-assessments. Essentially, this second listing indicates that BURP sampling in the assessment unit revealed that streams failed to pass assessment tests conducted on biological data.

Table 1 shows the index scores for the BURP site 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 #ID17010104PN009_03.

Assessment Unit	Stream	BURP ID	SMI (rating)	SFI (rating)	SHI (rating)	Overall Rating
ID17010104PN009_03	Parker Creek	2001SCDAA024	48.2 (1)	77 (2)	28 (1)	1.33

Note that in this assessment unit only one BURP site had sufficient data to calculate index scores. Therefore, the assessment unit's biological/habitat impairment rating is solely based on results obtained from the one location on Parker Creek. The BURP site on Parker Creek (2001SCDAA024, see Photos 1 & 2) failed as a result of poor macroinvertebrate (SMI) and habitat (SHI) scores, although the fish index (SFI) would have been sufficient to pass the impairment test.

In 1994 a BURP location several hundred meters upstream of this assessment unit produced relatively high value index scores with an overall rating of 2.33. Although considerably older information, it suggests that the upper portion of the watershed was not impacted at that time.

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 2001SCDAA024. Looking downstream through sampled reach.

Photo 2. BURP Site 2001SCDAA024. Looking upstream through sampled reach.

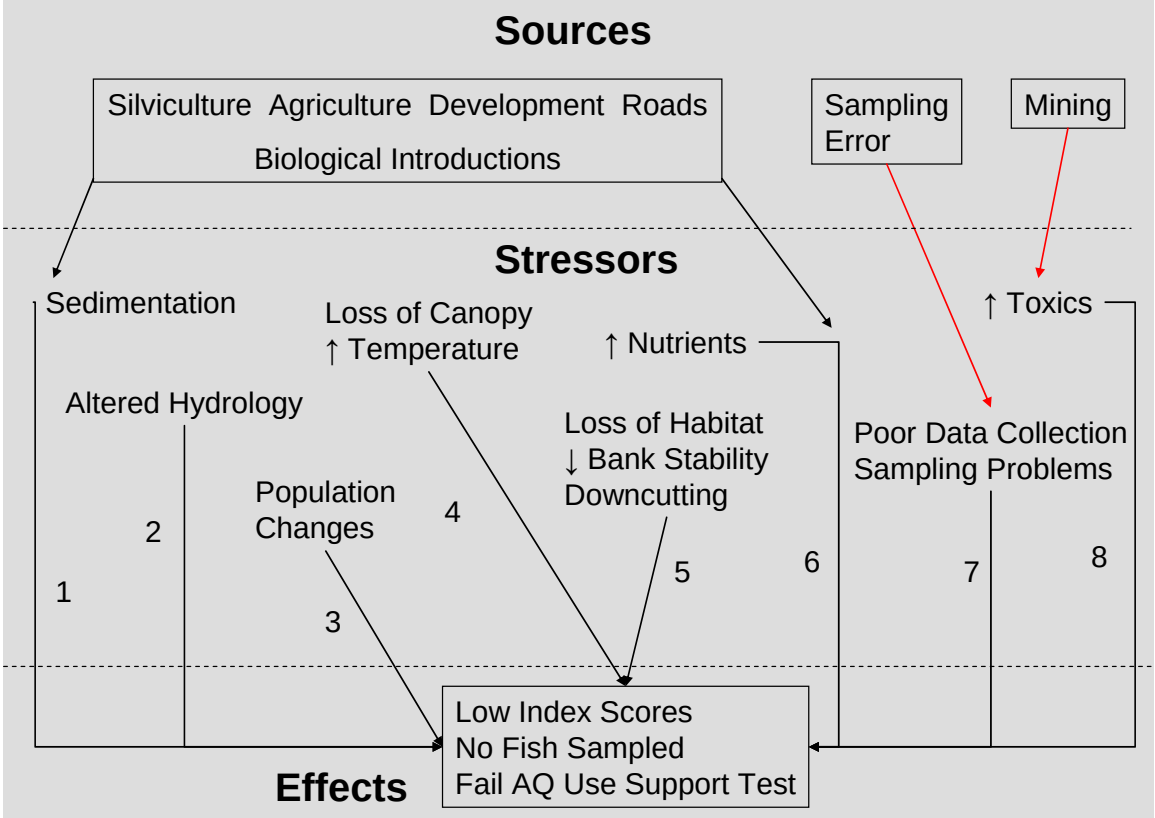
Section 3.0 Candidate Causes

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 #ID17010104PN009_03.



Section 4.0 Existing Data

Existing data for AU #ID17010104PN009_03 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 Parker Creeks in the late 1970s by USGS, all the data are from the lower reach of Parker Creek collected by DEQ.

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 BURP site on lower Parkerer Creek. Its metric values are relatively inconsistent with the average of all BURP sites in the Lower Kootenai subbasin with passing SHI scores (Ave Supporting). The lower BURP site (2001SCDAA024) had poor scores for bank cover and stability, canopy, percent fines, embeddedness, and width/depth ratio. These data suggest that sediment from bank erosion and temperature are likely to be impacting the lower segment of Parker Creek.

Table 3. Habitat Metrics for BURP Sites in AU #ID17010104PN009_03.

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
2001SCDAA024	0	0	2.5	30	4	6	0.77	7	0.16	44.8	1.59	28
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

The BURP site on lower Parker 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), with exception of percent sensitive native species that was unusually low. .

Table 4. Fish Metrics for BURP Sites in AU #ID17010104PN009_03.

BURP ID	Cold Water Taxa	% Cold Water	% Sensitive	Sculpin Age Classes	Salmonid Age Classes	CPUE	SFI
2001SCDAA024	3	91.5	5.1	3	3	11.9	77
Ave Supporting	1.97	93.9	59.3	1.1	3.1	8.7	81.1

Macroinvertebrate metrics (Table 5) for the site on lower Parker Creek showed a lack of species especially stonefly and caddisfly (Plecoptera and Trichoptera) 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 higher than the average supporting sites in the subbasin suggesting that pollution tolerant organisms were dominating the system. The loss of scrappers and clingers suggests that sedimentation is the driving mechanism inflicting macroinvertebrate impairment.

Table 5. Macroinvertebrate Metrics for BURP Sites in AU #ID17010104PN009_03.

BURP ID	Total Taxa	Ephemeroptera Taxa	Plecoptera Taxa	Trichoptera Taxa	% Plecoptera	HBI	% Dominance of top 5 taxa	% Scraper	% Clinger	SMI
2001SCDAA024	31	10	3	1	1.8	6.2	57.8	6.4	25	48.2
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, with the exception of a relatively high total coliform count recorded on August 15, 2001. However, the E. coli count did not exceed the single value action level to suggest potential violation of recreation criteria. There were three temperature loggers placed in Parker Creek above this assessment unit, two were paired together in 2000 and a third was placed in 2001. The 15.2 °C maximum daily maximum temperature (MDMT) is the highest of a series of temperatures recorded with a temperature logger by DEQ in the vicinity of this assessment unit. All loggers showed 11 or more consecutive days of exceedance of the 13 °C fall salmonid spawning maximum temperature criterion applied to the default time period starting on August 1st. No loggers showed any exceedances of cold water aquatic life criteria.

Table 6. Water Chemistry Data Collected in AU #ID17010104PN009_03.

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)
4/13/1976	Parker Creek	4.5			24					57
6/3/1976	Parker Creek	5			20					77
9/9/1976	Parker Creek	8			30					13
6/5/1979	Parker Creek	9			17					120
8/1/2000	Parker Creek	14.8 (MDMT)								
8/25/2000	Parker Creek	15.2 (MDMT)								
8/13/2001	Parker Creek	19.5								1.59
8/14/2001	Parker Creek	14.9 (MDMT)								
8/15/2001	Parker Creek							170	>2400	

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 Parker 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 that are generally sensitive to excess sediment. There is no information to suggest that the upper portion of the Parker Creek watershed is impacted or contributing excess sediment to the system. However, this portion of Parker 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. 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 from the aerial photo that this section of Parker Creek has been channelized. Whether or not flow diversion or field draining has taken place to affect hydrology is unknown. 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. Fish species encountered include rainbow trout and brook trout, both of which may have been introduced.
4. Water temperature maybe a problem in the Parker 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 and September, then water temperature in Parker Creek may not be impairing uses.
5. We have indicated that bank instability and channelization are likely occurring in the lower portion of the Parker 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 Parker 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. To our knowledge, there are not current or legacy mining activities in the assessment unit. There is one uranium mine or exploration in the Parker Creek watershed just south of site 1994SCDAA030. However, no water chemistry sampling has taken place to confirm a lack of toxic pollutants. The introduction of agricultural chemicals or other accidental spills cannot be ruled out.

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 lower Parker Creek. It is likely that biological invasion by alien species is not prominent enough to cause low scores either. Temperature also does not appear to be playing a big role in Parker 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 20 °C. It is more likely that excess sediment and channel alteration are leading causes of habitat and macroinvertebrate loss.

Section 6.0 Conclusions

Assessment Unit # ID17010104PN009_03 is a small 950 meter stretch of Parker Creek in the Kootenai River valley. One BURP site represents the condition and the majority of the data about this stretch of creek.

The agricultural lowland portion of Parker 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 Parker 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. Therefore, the most likely causes of low habitat/biological scores in lower Parker Creek are habitat alteration and possibly excess sediment.

Section 7.0 References

EPA. 2000. Stressor Identification Guidance Document. Office of Water and Office of Research and Development, U.S. Environmental Protection Agency. Washington, D.C. EPA/822/B-00/025.

Grafe, C.S., C.A. Mebane, M.J. McIntyre, D.A. Essig, D.H. Brandt, and D.T. Mosier. 2002. The Idaho Department of Environmental Quality Water Body Assessment Guidance, Second Edition-Final. Idaho Department of Environmental Quality; Boise, Idaho.