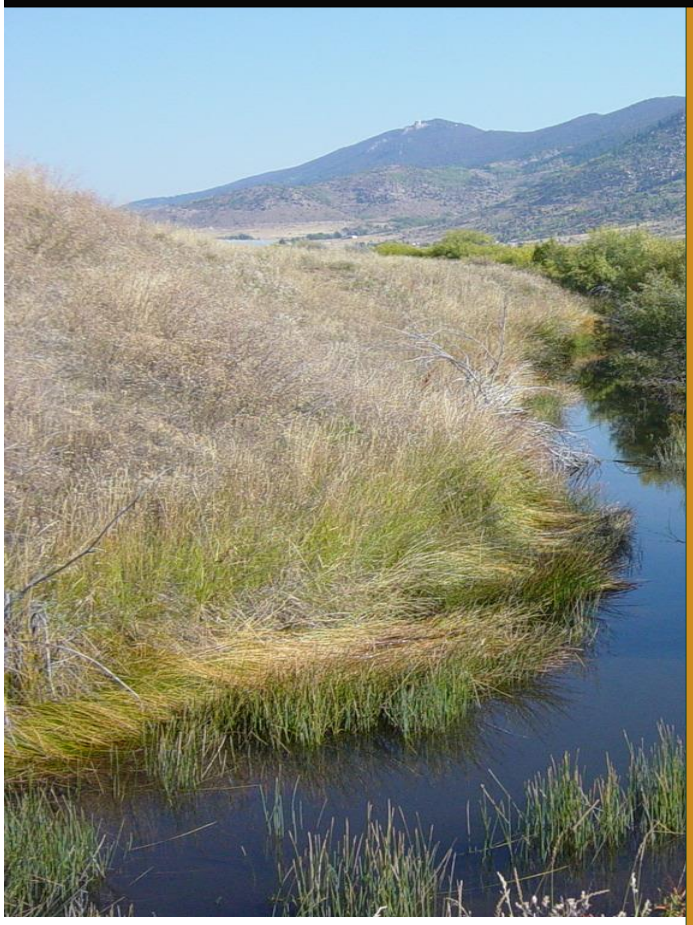
2013

Blacktail Creek Assessment



Capri Gillam, Tom Waring, Seth Reedy

Principle Investigator: Dr. Kumar Ganesan

Department of Environmental Engineering

Montana Tech of The University of Montana

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1.0 INTRODUCTION

The Environmental Engineering Department of Montana Tech was contracted by the Natural Resource Damage Program (NRPD) to conduct and document a riparian assessment on a portion of Blacktail Creek.

Blacktail Creek runs through south-east of Butte, Montana. Its headwaters originate at the continental divide in the Highland Mountains and flows approximately 17 miles northward before entering Silver Bow Creek in Butte, Montana.

This assessment report identifies the main issues affecting the stream corridor and fish habitat health in an 8.7 mile section – starting at Highway 2 crossing northward to its end at George Street in Butte. The Water Resources Council, the NRDP and partners will use this assessment and other information to prioritize possible restoration projects.

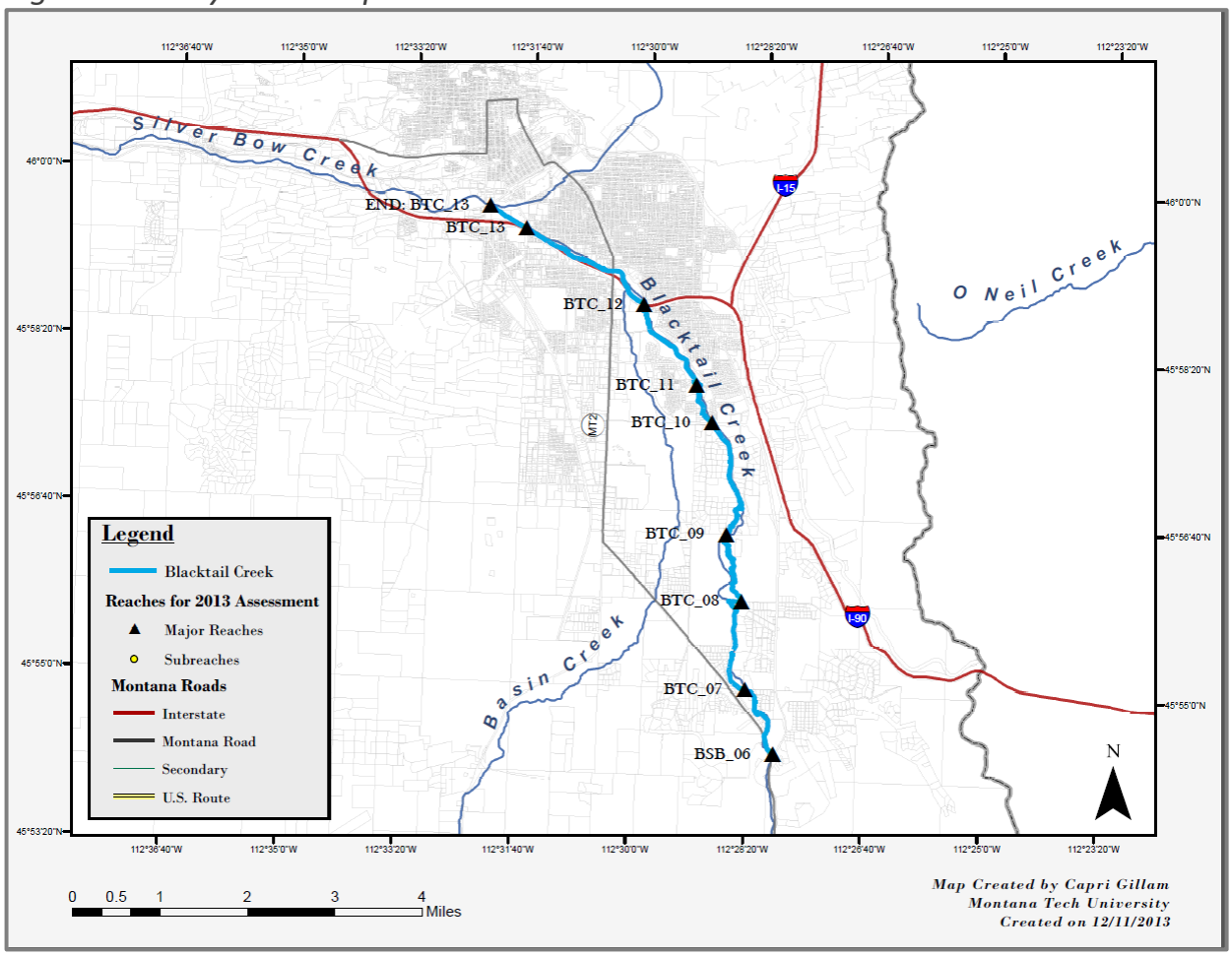
This study was done by faculty and students from Montana Tech with oversight and field training from Will McDowell for the WRC. This assessment builds upon prior work in 2005 and 2012 by the NRDP and in 2009 by Pioneer Technical Services, Inc.

The purpose of this assessment was fourfold: (1) to inspect and describe the geomorphology of the current channel and its associated banks and riparian zone; (2) to compare the current conditions with those reported in earlier studies; (3) to identify disturbances and their likely causes from what would be expected in non-disturbed channels and riparian zones; and (4) to identify possible projects for remediating the identified disturbances.

1.1 Established Reaches

The assessment was done in the lower 8.7 miles of Blacktail Creek starting where the stream crosses Montana Highway 2 (Nine Mile crossing) and proceeding northerly downstream approximately 6.5 miles before turning westerly (Interstate 90 crossing) to where the stream ends at George Street in Butte. The two prior studies divided the stream section above I-90 into six reaches (Montana NRDP, 2005; Pioneer Technical, 2009). For continuity, this assessment uses the same six sections used in the previous studies. In addition, this assessment includes an additional 2.2 miles downstream in two new reaches ; to where it crosses Interstate 90 and to where it crosses George Street in Butte (Figure 1).

Figure 1: Study Area Map



1.2 Assessment Personnel

Capri Gillam, a graduate biologist and environmental engineering graduate student, directed the field assessment. She was field trained in the USDA Natural Resources Conservation Service (NRCS) Montana Riparian Assessment Methodology (USDA, 2004) by Will McDowell (WRC) and Molly Staats (professor, Univ. of Montana) during their 2013 field assessment of Browns Gulch. Ms. Gillam was assisted in the field by Dr. Tom Waring, Professor Emiratis of Montana Tech as consultant, and by graduate students Eric Larson and Seth Reedy. Kumar Ganesan supervised the overall project, coordinated meetings with state and local government personnel, and provided vital project support.

2.0 METHODOLOGY

2.1 Riparian Assessment

The USDA/NRCS Montana Riparian Assessment Methodology (USDA, 2004) was used to assess the riparian zone for each reach. The majority of the assessment entailed a visual examination of stream channel and riparian character/condition followed by a field recording of the qualitative observations onto field data sheets (Appendices A & B). Quantitative measurements of width and depth of stream channel were also recorded. Stream slope was obtained using elevation data maps and a hand held GPS. Stream sinuosity was

estimated from visual observation and map data. A Rosgen (1996) channel type classification was determined from the visual observations and the recorded measurements.

The USDA/NRCS method provides a quick, qualitative evaluation of riparian condition by defining the stability and sustainability of current physical and ecological processes observed in a stream reach. The methodology results in a stream health rating score from 0-100% with the score corresponding to one of three categories:

- Sustainable – Scores 80-100% of potential – The reach is functioning as it should give the inherent potential conditions imposed by the environment and setting. All necessary attributes and processes (flood plain access, water storage, sediment transport, energy dissipation, etc.) are in place and functioning properly to assure long-term stability and recovery following a disturbance.

- Sustainable at Risk – Scores 50-79% of potential – Most of the normal stream processes and attributes are in place and working at present. However one, or more, component that is critical to continued reach stability is lacking or diminished compared to the potential.

- Not Sustainable – Scores less than 50% of potential – The stream and riparian area lack adequate vegetation and/or functional characteristics and are not able to dissipate energy, trap sediment, build banks, or display other stream processes that are expected given the potential.

These categories show which reaches are in the most need of restoration and thereby help to identify areas for potential remediation projects.

2.2 Fish Habitat Assessment

The USDA/NRCS method was modified to include a scored component evaluating the relative condition of fish habitat for each reach and sub-reach. The NRCS guidelines were used for fish habitat scoring. The field procedure involved qualitative assessment of channel substrate, undercut banks, percent cover shading, pools, beaver dams, and large (greater than 15 cm diameter)woody debris. Field observations were recorded on forms (Appendices C &D).

2.3 Percentage of Linear Bank Erosion

The percentage of linear bank erosion was calculated using the WRC Rapid Bank Erosion technique. A description of the WRC Rapid Bank Erosion Inventory as given by Staats and McDowell (2013) follows:

> "The Rapid Bank Erosion Inventory was completed using a method developed by the WRC in 2011 and 2013. The inventory is intended to quantify actively eroding banks in each reach, so that the relative importance of each reach to watershed sediment supply can be evaluated. The primary bank erosion processes noted by this type of assessment are annually recurring fluvial entrainment, surface erosion and dry ravel, although recent mass failures and other types of recent (fresh) bank failures are counted if bank soils are still bare. Hence, some areas of long-term instability which have begun revegetating, and older erosion scars generally are not included. The method simply compares amounts of active annual erosion by reaches, it does not quantify annual sediment supply as does the Bank Erosion Hazard Index (Rosgen & Silvey, 1996).

The methodology involves measuring the height and length of all eroding banks along a given reach using a measuring tape/stick (to the nearest foot). Eroding banks were defined as banks that directly delivered sediment to the stream through light prodding with a wading staff. Erosion measurements were delineated by right and left bank. Each segment of bank erosion was given a visually determined cause of erosion (see erosion inventory codes on the field assessment form in Appendix D). The quantitative measurements result in total bank area (ft^2) erosion for the left, right and entirety of a given reach. Additionally, the percentage of linear erosion occurring along the reach can be calculated:

$$\%\ Linear\ Erosion = \left(\frac{(Length\ of\ LEW\ Erosion) + (Length\ of\ REW\ Erosion}{2\ \times Length\ of\ Reach}\right) \times 100$$

The resulting percent of linear bank erosion corresponded with one of three categories:

- Minimal Bank Erosion: 0-6%: The reach has a normal/natural amount of erosion with minimal to non-existent human induced erosion. Any excess sedimentation on channel bed is due to upstream sources of erosion.

- Moderate Bank Erosion: 6-12%: The reach has a moderate amount of current and/or past human induced erosion. The majority of erosion is on outside banks or along straightened sections. Excess sedimentation is primarily due to local sources, resulting in channel bed siltation up to 6 inches in pools and glides.

- Extensive Bank Erosion: > 12%: The reach has an extensive amount of current and/or past human induced erosion. Erosion is occurring on outside and inside banks and along straightened sections. Excess sedimentation is mainly due to local sources, resulting in bed siltation greater or equal to 12 inches.

Appendix A also shows the WRC rapid bank erosion field data sheet.

Similar to the riparian assessments, these categories show which reaches are in the most need of channel stabilization or renaturalization and thereby helped to identify potential restoration projects.

2.4 Photographic Documentation

Digital photographs were taken at the upstream and downstream ends of all reaches and most property boundaries within reaches. These photos depict the general character of the stream channel and riparian areas for each reach. Additional photographs were used to provide visual evidence of current conditions such as man-made structures, erosional banks, beaver dams, channel incisement, substrates and point bars, aquatic vegetation, etc. All photos were labeled by reach, current property ownership and GPS coordinates.

3.0 RESULTS & NARRATIVES

Tables 1 and 2 summarize the assessment results. A key result is the NRCS riparian assessment score for each reach or sub-reach. These scores are compiled in the second to last column of Table 1. Color codes for NRCS scores, used only to facilitate interpretation, are "green=sustainable," "yellow=at risk," and "pink=unsustainable." Table 1 also includes comparative data compiled by Pioneer Technical (2009) and the

NRDC FWP 2009 Report by Liermann et. al. The detailed location with GPS coordinates are provided in an electronic file.

Table 1: Summary of NRCS Field Data

Reach Code	Property Owner	Plant Community	Primary Land Use	2013 Rosgen Channel Type	2009 Rosgen Channel Type - Pioneer	Reach Length (mi)	2009 Pioneer Aquatic Habitat Score	2013 NRCS Score	2013 Fish Habitat Score	2009 FWP Score **
BTC_06	Redfern	Willow Alder Sedge	Irrigated Hayland	E	N/A	0.49	62.5%	80.0%	1*	70%
BTC_06	Vainio	Willow Alder/Sedge	Irrigated Hayland	E		0.28		93.0%	2*	
BTC_07	Vainio & Butte Silver Bow	Willow Alder Sedge Dogwood	Natural	E	B5c	0.34	48.1%	93.0%	2*	-
BTC_07	Murray	Willow Alder Sedge	Residential /Horse Grazing	E		0.18		68.3%	1*	
BTC_07	Butte Silver Bow	Willow Alder Sedge	Natural	E/G		0.04		95.0%	2*	
BTC_07	Carruthers/ Erikson/ Hislop	Willow Alder Sedge	Residential /Horse Grazing	E/G		0.41		95.0%	2*	
BTC_07	Radoman	Willow Sedge	Residential	E/G		0.07		-	-	
BTC_07	Black	Willow Sedge	Residential	E/G		0.17		68.3%	2*	
BTC_07	Brock	Willow Sedge	Residential	E/G		0.11		83.3%	2*	
BTC_07	Nehls & Armstrong	Willow Alder Sedge	Residential /Horse Grazing	E/G		0.15		81.7%	2*	
BTC_08	Harrington I	Willow Sedge	Horse Grazing	E/G	E5, C5	0.09	56.3%	96.7%	2*	-
BTC_08	Harrington III	Willow Sedge	Horse Grazing	E		0.37		91.7%	3*	
BTC_08	Harrington III	Willow Sedge	Horse Grazing	E		0.64		91.7%	3*	
BTC_08	Harrington IV	Willow Sedge	Horse Grazing	E		0.44		56.7%	3*	

Reach Code	Property Owner	Plant Community	Primary Land Use	2013 Rosgen Channel Type	2009 Rosgen Channel Type - Pioneer	Reach Length (mi)	2009 Pioneer Aquatic Habitat Score	2013 NRCS Score	2013 Fish Habitat Score	2009 FWP Score
BTC_09	Keck/ Bennet	Willow Sedge	Residential	E/G	E5, B5c	0.11	53.8%	88.3%	2*	30%
BTC_09	McGrath	Willow Sedge	Horse Grazing	E		0.05		45.0%	2*	
BTC_09	Lynch	Willow Sedge	Horse Grazing	E/G		0.23		30.0%	2*	

BTC_09	DeWolf & Maloney	Willow Sedge	Horse Grazing	E		0.03		66.7%	2*	
BTC_09	Kinevil	Willow Sedge	Horse Grazing	E/G		0.19		51.7%	2*	
BTC_09	Silk	Willow Sedge	Horse Grazing	E/G		0.19		60.0%	0*	
BTC_09	Kane & Soult-Pagan	Willow Sedge	Horse Grazing	E		0.19		78.3%	2*	
BTC_09	Apple	Willow Sedge	Natural	E		0.08		86.0%	2*	
BTC_09	Paffhausen	Willow Sedge	Horse Grazing	E/G		0.08		41.7%	2*	
BTC_09	Gilman	Willow Sedge	Horse Grazing	E/G		0.13		80.0%	2*	
BTC_09	Harrington	Willow Sedge	Natural	E/G		0.36		93.3%	2*	
BTC_10	Micho/McBride Miller /Jense CR Holdings Thurmond McGrath Anderson Debathy	Willow Sedge Rose	Residential	DA	N/A	0.40	56.9%	95.0%	2*	-
BTC_10	Richards	Willow Sedge/Rose	Residential Historic Ag	E		0.27		83.0%	8*	
BTC_10	Brennick	Willow Sedge/Rose	Residential	E		0.15		87.0%	2*	
BTC_11	Butte Country Club I	Willow Sedge	Recreational	E/G	E4, F4, B4c	0.30	34.4%	36.7%	2*	-
BTC_11	Butte Country Club II	Willow Sedge	Recreational	E/G		0.32		43.3%	2*	
BTC_11	Butte Country Club III	Willow/ Sedge	Residential Natural	E/G		0.23		80.0%	2*	
BTC_11	O'Neil	Willow	Recreational	G		0.10		70.0%	2*	
BTC_12	Butte Silver Bow	Willow/Sedge/Rose	Recreational	G	N/A	1.87	-	70.0%	3*	-
BTC_13	Butte Silver Bow	Willow/Sedge	Recreational	G	N/A	0.41	-	90.0%	2*	-
BTC_13	Butte Silver Bow	Some Willow	Recreational	G		0.01		60.0%	3*	

** 3 = excellent 1-2 = fair 0 = poor*

*** Liermann et. al. (2009)*

Reach Code	Reach Length (mi)	Reach Length (ft)	Property Owner	Total Bank Erosion 2013 (ft2)	Percent Linear Bank Erosion 2013 (%)*
BTC_06	0.492	2600	Redfern	32	0.62%
BTC_06	0.277	1462	Vainio	0	0.00%
BTC_07	0.338	1785	Vainio & Butte Silver Bow	0	0.00%
BTC_07	0.182	960	Murray	150	7.81%
BTC_07	0.036	188	Butte Silver Bow	0	0.00%
BTC_07	0.406	2144	Carruthers/Erikson/Hislop	26	0.61%
BTC_07	0.071	373	Radoman	-	-
BTC_07	0.173	913	Black	0	0.00%
BTC_07	0.108	569	Brock	0	0.00%
BTC_07	0.146	772	Nehls & Armstrong	180	11.66%
BTC_08	0.094	498	Harrington I	51	5.12%
BTC_08	0.371	1959	Harrington III	0	0.00%
BTC_08	0.641	3387	Harrington III	0	0.00%
BTC_08	0.436	2301	Harrington IV	204	4.43%
BTC_09	0.108	572	Keck/Bennet	0	0.00%
BTC_09	0.054	286	McGrath	150	26.22%
BTC_09	0.233	1228	Lynch	2451	99.80%
BTC_09	0.032	167	DeWolf & Maloney	33	9.88%
BTC_09	0.187	988	Kinevil	0	0.00%
BTC_09	0.187	987	Silk	105	5.32%
BTC_09	0.189	1000	Kane & Soult-Pagan	0	0.00%
BTC_09	0.083	437	Apple	0	0.00%
BTC_09	0.082	432	Paffhausen	520	60.19%
BTC_09	0.126	666	Gilman	45	3.38%
BTC_09	0.357	1885	Harrington	0	0.00%
BTC_10	0.404	2134	Micho/ McBride/ Miller/ CR Holdings/ Thurmond/ McGrath/ Anderson/ Jense/ Debathy	0	0.00%
BTC_10	0.267	1409	Richards	115	4.08%
BTC_10	0.149	787	Brennick	120	7.62%
BTC_11	0.549	2901	Butte Country Club I	3750	64.63%
BTC_11	0.316	1670	Butte Country Club II	660	19.76%
BTC_11	0.228	1205	Butte Country Club III	320	13.28%
BTC_11	0.103	543	O'Neil	0	0.00%
BTC_12	1.872	9882	Butte Silver Bow	0	0.00%
BTC_13	0.413	2183	Butte Silver Bow	0	0.00%
BTC_13	0.009	45	Butte Silver Bow	0	0.00%

Table 2: Bank Erosion by Sub-Reach

3.1 Reach Narratives

For each reach or sub-reach, the narratives cover six areas: (1) an overview; (2) channel and erosional characteristics; (3) riparian vegetation; (4) fish habitat; (5) comparisons and issues; and (6) possible projects. These narratives were constructed from the information gathered and recorded in the field observations that include: information from the riparian and erosional assessments; photographs; narrative field sheets; and information from past field assessments. Each narrative also references photographs taken in that specific reach.

The observed problems pertaining to the channel and its associated riparian zone were also included in the narrative. In some instances, possible remediation projects intended to resolve identified problems are suggested. The reader is also referred to the Pioneer Technical Study (2009) for other suggested remediation projects.

To facilitate interpretation of the various data sources, data from each reach and some sub-reaches were summarized into an individual reach narrative. The Bank Erosion Inventory, NRCS Riparian Assessments, photographic documentations, and Narrative Field Sheets (see Appendix A-D_) were used to compile reach narratives. Theses narratives contain a description of geomorphic, riparian vegetation, erosion, and fish habitat characteristics derived from the data sheets. They also contain a comparison of findings to earlier studies along with reach issues. Finally, for each reach, possible types of restoration projects are given.

Additional narratives can be found in the Pioneer Technical Report (2009).

REACH 6

BTC *06_01 and* BTC *06_02*

(Junction of Hwy 2 downstream to entry of Little Blacktail Creek)

Overview: This uppermost reach of stream starts at the junction with Hwy 2 and precedes downstream for about one mile (**Photo 1**) showing downstream view. Historically, this reach has been heavily impacted by highway construction and agricultural use which has resulted in the stream being moved and straightened to accommodate the highway and hay meadows. The stream was moved many years ago and, now, channel vegetation is well established. The channel shows signs of trying to increase its sinuosity by eroding some of its outside banks.

In the upper part of the reach, there is an irrigation ditch which is fed from the stream by an iron pipe and water diversion structure (**Photo 2**). This structure and pipe are impacted by flood flows and there is evidence that they have been rebuilt in the past.

Channel and Erosional Characteristics: The channel is incised from 5-7 feet in this reach and has no access to its floodplain (**Photo 3**). The channel material is predominantly sand and fine gravel **(Photo 4).** A three-quarter inch diameter walking stick can easily be pushed 2 feet deep into this substrate. The source of this excess sand and gravel must be from upstream and out of the assessment area because the reach itself shows only slight erosion. A few outer banks have eroded and fallen helping the stream to form a new lower floodplain but most of the channel has steep banks and no lower floodplain shelf. One landowner has planted willow cuttings on some turns and these cuttings have grown into young willows that are starting to provide erosion protection **(Photo 5).**

Riparian Vegetation: The stream banks have a high percentage of cover by willows and alder, plus there is scattered dogwood and wild rose. A few lower and reestablishing channel banks are growing sedges and water tolerant grasses **(Photos 3-6).** On the eastern side, the irrigated wet meadows also have scattered patches of sedge.

Fish Habitat: The reach has some large woody debris (presumably washed down from upstream since there are no sizable trees in the riparian zone) with mostly shallow pools and runs with few riffles. The high percentage of shrub cover provides good shade and there are some undercut banks providing fish habitat. The diversion structure into the irrigation ditch prevents fish passage during low flows. The sandy and fine gravel bottom is embedded with fines and provides a very poor substrate for either aquatic invertebrate growth or for fish spawning. Large woody debris is present as well as undercut banks in patches **(Photo 1 & 4).** Periodic low or no flow conditions may also restrict fish populations. Liermann et al (2009) categorized the fish habitat in this reach at 70 percent of potential.

Comparisons & Issues: This study assessments reconfirm the Pioneer Technical (2009) and Liermann et al. (2009) report findings. This stream reach is in relatively good shape except for the lack of riffles and the loosely embedded sand and small gravel substrate.

Possible Projects: A permanent diversion structure and water pipe into the irrigation ditch, just downstream of the nine mile junction, could be constructed. This construction would prevent long term erosion around the diversion and could be built to provide low flow fish passage which the current structure does not allow.

Reach 6 Photos:

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

REACH 7

Overview: This reach is highly variable; (**Photo 7**) shows the downstream view. Its' upper end is in its original channel with access to its floodplain and has extensive willow cover**.** From the middle to the lower end, the channel was historically moved to the west bank of the floodplain where it now sits 4-8 feet above and, in places, hundreds of feet westward from its original channel. (**Photo 8**). It is contained in its elevated channel by an embankment on its eastern side. In one spot, that embankment has been recently breached **(Photo 9)** which allows high water flows to move eastward across the floodplain toward the historic channel. Because the bottom of this breach remains above the bottom of the constructed channel, the old channel still carries a considerable amount of flow. Some residents have surface water rights from the constructed channel along this reach.

BTC 07_01 and BTC 07_02

(Upper End of Reach 7)

Channel and Erosional Characteristics: The channel on these properties appears stable, is not incised and has access to its floodplain. There is little to no erosion of banks and presents an extensive willow cover. The streambed is mostly sand and fine gravels with some embedded silt. There are a few undercut banks and some large woody debris. A few beaver dams have created small pools above and scour pools below the dams. Excess sediment from upstream is causing the stream to shallow and form midstream bars**.** There is some large woody debris present. The riparian zone has sedges and meadow grasses in lower areas and scattered upland grasses and a few scattered patches of noxious weeds on the drier banks.

Riparian Vegetation: At least four species of willow are common along this reach. There are occasional occurrences of alder and dogwood. Sedges are frequent. The shrub canopy is frequently dense and continuous over and away from the channel**.**

Fish Habitat: Like reach 6, this reach has some large woody debris (presumably washed down from upstream since there are no sizable trees in the riparian zone) with mostly shallow pools and runs with few riffles. The density of shrub cover provides good shade and there are some undercut banks and beaver dams (**photo 10**) providing fish habitat. Here too, the bottom substrate is sand and fine gravels embedded with fines which provide a poor substrate for either aquatic invertebrate growth or for fish spawning. Periodic low or no flow conditions may also restrict fish populations. In late August, 2013 the flow in this reach was estimated to be less than 0.5 cfs. Nonetheless, three to six inch fish were frequently observed.

Comparisons and Issues: There were no differences noted in this reach from the Pioneer Technical Study (2009) and the reach was not reported on by Liermann et al (2009).

Possible Projects: An old, closed, head gate is present on the east bank just below the junction with Little Blacktail Creek**.** Further investigation could reveal whether or not it is possible or desirable to either remove or renovate this structure.

BTC 07_03 to BTC 07_08

(Mid-Lower End of Reach 7)

Channel and Erosional Characteristics:

The channel on these six properties has been straightened, moved to the western edge of the floodplain, and diked with a berm which increases in height as one moves down the reach. Throughout this middle and lower part of Reach 7, the stream resembles a dug ditch channel because it is contained by a berm on its eastern edge and by the higher ground on the western edge of the original floodplain. The constructed channel is mostly 5-10 feet wide, widest in the lower portion, with few pools and mostly shallow, sandy runs. It can reach its floodplain in only three places along this stretch. The bottom substrate is sand and fine gravel.

Riparian Vegetation:

In general, the constructed channel has less riparian vegetation than the natural channel above - although there are stretches with considerable willow cover over the stream. The willows are, in general, sparser and grow only in the narrow corridor formed by the streams banks. There are few shrubs other than willows. Where there is horse grazing, the willow cover has become sparser, and grazing induced erosion of banks is also present**.** Patches of noxious weeds are scattered on most banks along these sections.

Fish Habitat:

The artificial nature of this stream section limits the fish habitat. The constructed channel has a monotonous bottom of sand and small gravel with very few pools. Because of the straightened channel there are very few undercut banks. There is very little large woody debris. In a few places, the overhead canopy is dense providing cover and possibly an insect food source. A couple of landowners have placed structures across the stream to create small upstream pools. Some small fish were observed in these pools **(Photos 11 & 12).** The long term stability of a constructed channel could make it problematic to maintain good fish habitat in the future.

Comparisons and Issues: The stream channel has been historically altered. Below the Butte Silver Bow property, the direction is altered from north to northwest across the valley to the west slope in a fairly straight line. At the western valley edge, the constructed channel turns northward for approximately 1 mile. During construction, and as the elevation increased in the north-westerly direction, a berm was placed on the eastern side of the newly "elevated" channel. This berm keeps the flow in the constructed channel and remains mostly intact today. By the end of the reach this berm which starts quite low is approximately six feet high. There are three areas along the reach where high flows reach the historic flood plain through alterations of the berm.

Possible Projects: A recent breach has occurred in the eastern berm at a point that is due east of the south end of Trenton Street. This breach allows high water to flow east across the original floodplain. It is likely that in the future, this breach will enlarge and a new channel cut will develop and move easterly until it reaches the low point of the valley. The natural cutting by such a new channel could add considerable sediment to the flow. Currently, it appears that sediment is being deposited in the floodplain near the breach. Further study is needed to see if a structure or new channel could or should be created to reduce the erosion being created by this breach.

The use of Best Management Practices (BMP's) by landowners along the reach could help protect the stream. Urban owners with yards could leave wider un-mowed strips of vegetation along the stream to help reduce sediment and nutrient entry to the stream. Owners with grazing animals could use protective fencing for riparian areas and/or stream crossings.

Reach 7 Photos:

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

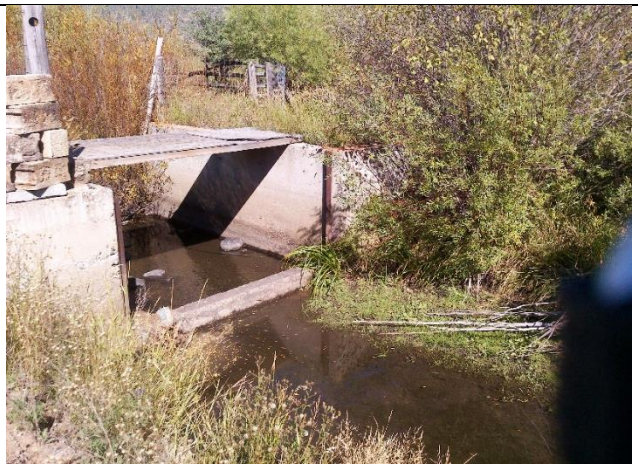


Photo 12

REACH 8

Overview: This reach was divided into three different sub-reaches. The first sub-reach apparently originated from the discharge of a ten inch diameter pipe through the constructed east berm from a pool created by a water diversion structure. Recently, the berm has been breached immediately downstream of the pipe rendering the pipe non-functional **(photos 13 & 14).** Now the stream flow goes through this breach and into the channel formed from the pipe discharge. The water diversion structure originally directed some water into the pipe while directing most of the water northward into the constructed channel. The diversion structure is now non-functional due to the breach of the eastern berm. During August, 2013 water was not flowing into the constructed channel.

The sub-reach from the breach flows eastward until it enters the original streambed. The second sub-reach flows from this point northward and is characterized by sporadic willow cover and dense sedge and grass cover in the riparian zone. The third sub-reach is characterized by a lack of willows but still with dense sedge and grass cover. All of the sub-reaches have ready access to their floodplain. Wetlands and/or wet meadows are present along all three reaches.

BTC 08_01

(East Flowing Section)

Overview: This sub-reach flows eastward through a breach from the constructed channel. The channel is well formed and has ready access to its floodplain. The upper part of the reach has scattered willow cover while the bottom part where it enters the original stream bottom has more extensive willow cover.

Channel and Erosion Characteristics: This channel seems to be functioning normally. It is not eroding or cutting deeper. It has access to its floodplain. It has frequent shallow pools and riffles. It appears to be stable. Although the recent breach may increase the flow into this channel and has the potential to alter it, the channel has ready access to its floodplain and that could protect its current character. This sub-reach has a higher gradient than the constructed channel above and consequently the flow is faster. The channel has more riffles and less fines embedded in the sand and gravel substrate than does the upper channel.

Riparian Vegetation: The vegetation is characterized by two species of willows and abundant sedges and some bulrush. Near the breach, willows are scattered and only about 30 percent of the cover **(Photo 15)** but, near the end of the sub-reach, willows provide nearly continuous cover (**Photo 16**).

Fish: This sub-reach channel has a higher flow velocity that the constructed stream. In the upper part there are numerous riffles, shallow pools, and undercut banks. The only large woody debris observed was a sawn wooden beam washed in from above. The substrate was not as embedded with fines. A walking stick could only be pushed into the substrate 3-5 inches. Low or no water could be a periodic issue. During observations in August 2013, there was some observable flow from the breach but that flow disappeared where the sub-reach entered the original streambed which also had no observable flow.

Comparisons and Issues: This sub-reach was not characterized in the Pioneer report (2009).

Possible Projects: The flow through the levy breach is causing some bank erosion immediately downstream **(Photo 17).** This erosion could be stemmed via construction of a new water control structure with an engineered outlet or through bioengineering treatment of the eroding banks. Further study and consultation with the landowner is recommended.

BTC 08_02 and BTC 08_03

(North Flowing Sections)

Overview: These sub-reaches flow northward across land now used primarily for horse grazing. A fairly extensive wetland, estimated to be 25 acres, borders most of their length (Pioneer Technical, 2009).

Channel and Erosional Characteristics: These sub-reaches have slightly incised channels with access to their floodplains. Their streambeds are similar to higher reaches with a sand and small gravel bottom embedded with silt. A walking stick can be pushed 5-8 inches into the substrate along these reaches. The sub-reaches are characterized by long runs with undercut banks but few riffle sections (Pioneer, 2009). In August, 2013 there was no surface flow in the channel. The channels are sinuous and show little, if any, past alteration. The only bank erosion occurs where livestock cross the stream. However, point and mid-stream bar formation increases in the downstream direction indicating an aggrading channel with an excessive fine sediment load (Pioneer, 2009).

Riparian Vegetation: The vegetation along the upper sub-reach is comprised almost entirely of sedges. Further downstream, this pattern changes to scattered willows and dense sedges in the wet meadows. Some willows have been lightly grazed by livestock or moose, and there are few new willows resulting in a low structural diversity. The lowest section is again dominated by sedges and with very few willows. It is likely that willows were historically removed from these sub-reaches because there is substantial willow cover just above both the upper sub-reach and below the lower sub-reach.

Fish: These sections lack riffles, large woody debris and overhanging cover. The bottom is mostly embedded sand and fine gravel that offers little habitat diversity. Both sections have some 2-4 foot deep pools with undercut banks with overhanging grasses and sedges. In late August, 2013 there was **no flow** in these sections (**Photo 18**). Liermann et al (2009) rated the fish habitat in the middle section at 30 percent and noted that it was below its potential.

Comparisons and Issues: These reaches have not noticeably changed from either the 2009 Pioneer study or the Liermann et al (2009) report.

Possible Projects: The stream and adjoining wetlands could likely be improved through active grazing management of the pastures including fencing at livestock crossings.

Reach 8 Photos:

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

REACH 9

The sub-reaches examined shared numerous common attributes and are discussed below as a group.

BTC 09_01 to BTC 09_11

(1/4 Mile South of Blacktail Loop Rd. to Mt. Highland Drive)

Overview: After leaving the grazing pastures of reach 8, the stream enters a "rural residential" setting just upstream of the Blacktail Loop crossing. In this reach, because landowner practices vary, the conditions along the creek are highly variable (Pioneer Technical, 2009). This assessment confirms that variability. In general, where livestock grazing is restricted or absent, the complexity of the vegetation structure is higher which results in stable banks and reduced soil erosion. Where grazing is heavy, woody species cover is reduced and usually results in a dominance of non-native herbaceous species and more eroding banks (Pioneer Technical, 2009).

The lowest section of the reach above the Mount Highland Drive crossing is an ungrazed wetland with scattered beaver dams. It is partially covered with water during normal water flow years. In September, 2013 it was mostly dry with a distinct channel.

Channel and Erosional Characteristics: The lower most section of this reach (just above Mount Highland Drive) had a stable channel with very low bank erosion and was characterized by extensive riparian vegetation including willows and sedges. Upstream, each owner's land management practices impacted the stream. Heavily grazed areas have a high percentage of eroding and slumping banks and, in places, a widened channel. The streambed is predominantly sand and fine gravels with embedded fines although some larger gravels were observed in two riffles.

Riparian Vegetation: Just South of Blacktail Loop Road, the willows are thinned or not present due to grazing practices. Grazed areas have little willow cover, some eroding and fallen banks, and livestock trampling **(Photos 19 & 20).** Comparatively, ungrazed properties have more willow cover and stable banks (**Photos 21 & 22).** Some fallen banks are revegetating with riparian vegetation (**photo 23).** The lowest section of the reach has the most riparian vegetation with abundant willows and sedges present in the adjacent wetland.

Fish: This reach again has few riffles and an embedded sand and fine gravel substrate. There are some undercut banks and abundant willow cover in ungrazed parcels. Some deep scour pools occur below beaver dams **(photo 24)** while a couple of riffles have some larger gravel. Large woody debris is scarce.

Comparisons and Issues: This reach has not changed substantially since the 2009 Pioneer study. The reach has many eroding and collapsing banks due to livestock grazing. Some homeowners mow to the edge of the stream bank.

Possible Projects: Assistance in developing BMP'S for grazing and for protecting the stream corridors and riparian zone should be provided to interested landowners. This could include fencing, protection of banks through bioengineering or plantings, etc.

Reach 9 Photos:

Photo 19

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24

BTC 10_01 to BTC 10_03

(Mt. Highland Drive to the Butte Country Club)

Overview: This reach is from Mount Highland Drive to the southern edge of the Butte Country Club. The upper half of this reach is often flooded, and marshy wetland with many beaver dams which cause the channel to be braided and, in places, difficult to identify. The lower portion is ungrazed and has a stable sinuous channel with typical riparian vegetation. A water control structure just above the golf course blocks fish passage and is causing some lateral bank erosion immediately downstream.

Channel and Erosional Characteristics: The original channel in the wetland portion has been and continues to be heavily impacted by beaver dams (**Photo 25**). In some places, erosion has occurred where water has flowed around dams and formed a new channel. There are multiple channels in this area some or most of which are ephemeral or carry water only during high water flow (**photos 26-28).**

Below the wetland, the channel is stable with access to its floodplain. Deep and shallow pools are abundant. There is some large woody debris. Undercut banks are present. The substrate is mostly embedded sand and gravel.

The stream is encroaching into one yard (**photo 29)** and the water control structure is causing some lateral bank erosion **(photo 30).**

Riparian Vegetation: Several species of structurally diverse willows plus sedges and wild rose grow in the riparian zone. The floodplain has some Canadian thistle and non-native grasses.

Fish: The occurrence of deep and shallow pools, undercut banks, some large woody debris, and willow cover provide fish habitat along this reach. As above, the streambed is the largest negative for fish because it is mostly an embedded sand and fine gravel substrate. The water control structure is a likely barrier to fish passage.

Comparisons and Issues: There were no observed differences in this reach since the 2009 Pioneer study. The water control structure likely prevents fish passage.

Possible Projects: Remove the concrete water control structure and restore the eroded banks below the structure. Work with landowners to use BMP's for stream protection.

Reach 10 Photos:

Photo 25

Photo 26

Photo 27

Photo 28

Photo 29

Photo 30

BTC 11_01 to BTC 11_04

(Butte Country Club to I-90)

Overview: Reach 11 runs from where Blacktail Creek enters the Butte Country Club golf course to the Interstate 90 highway. Four sub-reaches were evaluated. The upper three were in the golf course and the third immediately upstream of I-90. In the golf course, the creek has been highly altered by straightening and it is entrenched most of its length. From the start to the crossing of Elizabeth Warren Avenue, the stream is entrenched but has substantial willow cover. Downstream from Elizabeth Warren Avenue, the stream remains entrenched much of the way and willows become scarce while larger cottonwood and evergreen trees are scattered along the banks. Just before leaving the Country Club property the stream has access to its floodplain and more willows are present. The entire reach has the highest erosion in the study area with a high number of eroding banks (**Photo 31-34**). The banks on the eastern edge of the creek have been heightened by a berm which, in places, is also eroding. The sub-reach just above I-90 is also entrenched with some eroding banks. In this reach the floodplain area is very limited or non-existent and is inadequate to dissipate energy. Flood and overflow channels do not exist. Some noxious weeds were observed in the riparian zone of all three sub-reaches.

Channel Characteristics: Except for the short reach near where the creek exits the golf course, it is entrenched. The channel is incised from 3-6 feet in this reach and has no access to its floodplain (**Photo 35).** Like higher reaches, the channel material is predominantly sand and fine gravel**.** A three- quarter inch diameter walking stick can be pushed about 12 inches into this substrate. One source of this excess sand and gravel is erosion within the reach. Some outer banks have fallen helping the stream to form a new lower floodplain but most of the channel has steep banks and no lower floodplain shelf. There are very few riffles but many long shallow pools and some shorter, up to four feet deep, pools. For most of the distance along the golf course, the creek is contained within its channel by a berm or berms built on its banks (**Photo 36**). The streams natural tendency towards sinuosity and forming a floodplain is eroding its banks and some of the berms.

Within the golf course, some regeneration of willows is occurring on mid-stream bars and on slumped banks. However, in most places, the channel does not appear wide enough to support a stable channel because of its inability to reach its floodplain and the resulting higher velocity and erosion forces.

Riparian Vegetation: Along the upper sub-reach in the golf course there are two species of willow that form a fairly dense cover in places. Sedges are rare and non-riparian grasses predominate on the banks where willows are absent. These shallow rooted grasses provide little erosion protection for the banks. The willow zone in this sub-reach is confined to within a few feet of the channel. Some honeysuckle and rose bushes also grow on drier banks.

Scattered patches of noxious weeds including Canadian thistle, knapweed and toadflax were growing along the stream banks in both golf course reaches.

Below Elizabeth Warren Avenue the riparian vegetation is poorer than above. There is little willow cover for most of this sub-reach. There are a few larger cottonwood and evergreen trees growing in places along the creek banks. A few point bars and fallen banks are being revegetated by sedges and willows. The channel is incised 6-9 feet below the berm(s) in this section and is actively trying to widen. Under these current conditions, the confined flow is likely to keep removing the rebuilding areas and the channel will remain

unstable. At the lower end of this sub-reach and below the irrigation pond, the stream has access to its floodplain. This short area has an abundant cover of three willow species which show structural diversity.

Abundant algae and rooted vascular aquatic plants suggest nutrient loading above or in this reach.

Fish: Positive fish habitat features along the golf course sub-reaches include short areas with willow cover and a few undercut banks, some short riffles with larger gravels which would likely allow successful spawning, plus beaver dams and short runs that provide some deeper pools. Like in other reaches, the largest negative feature for fish is the monotonous bottom of embedded sand and fine gravel. Also, the many long, sunny, shallow runs of one-half to one foot depth provide little cover and likely cause increases in the water temperature. Even with these negatives, many fish, most less than 7 inches, were observed in these reaches.

Comparisons and Issues: There were no substantial differences in the creek from the 2009 Pioneer report. Similarly, the issues Pioneer report identified then remain today. Erosion of banks is the primary channel problem. The lack of a floodplain and riparian zone along the channel is causing excess flow energy which, in turn, is causing bank erosion.

Possible Projects: Reestablishment of a stable creek channel through the country club would require extensive bio-engineering planning and close cooperation among all parties involved, as the golf course itself would need to be altered in places. A stable creek channel would require more area, at least during high flows, than the creek now occupies.

BMP's for weed management and bank protection should be part of any restoration efforts.

Reach 11 Photos:

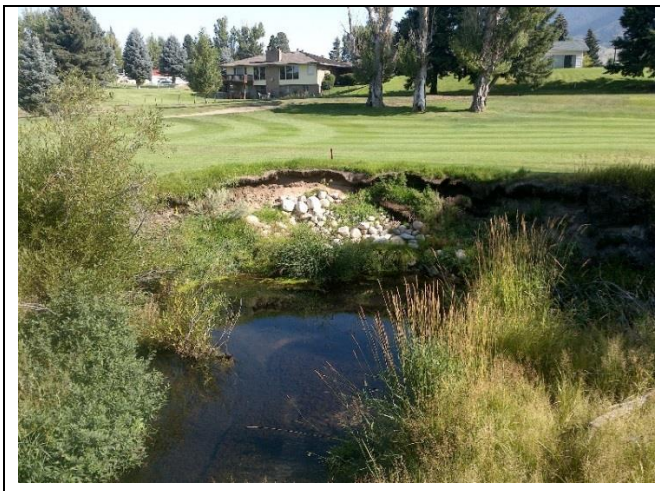


Photo 31

Photo 32

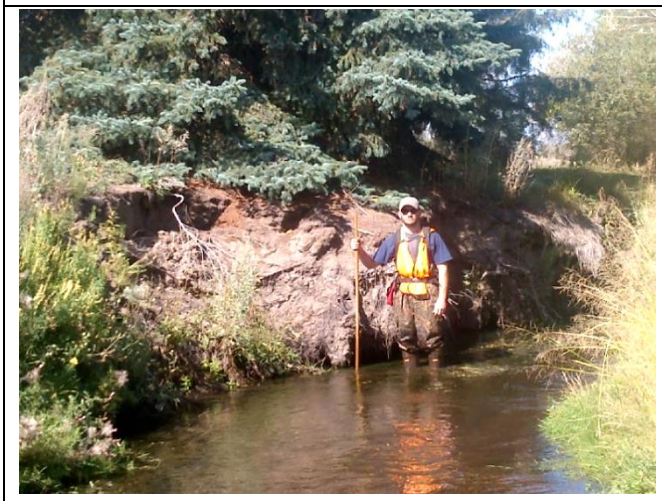


Photo 33

Photo 34

REACH 12

BTC_12_01

(I-90 to Kaw Avenue)

Photo 35

Photo 36

Overview: Reach 12 runs from the Interstate 90 crossing downstream to Kaw Avenue. The stream flows northward under the interstate into a westward ninety degree turn where large boulders have been placed to prevent erosion (**Photo 37**). It then flows through the southern part of Father Sheehan Park paralleling Interstate 90 to the west edge of the park where a walking trail also parallels the creek on the south side. A few large boulders were scattered randomly along the park portion of the reach. As the creek follows the interstate the left bank has been built up and only allows access to the floodplain on the north side. Once west of Harrison Avenue, the creek has access to the flood plain on both sides. Further down, on the west side of Oregon Avenue, the stream channel runs between I-90 and the walking trail. Here, flood plain access is very limited except for culvert access to the riparian area to the north of the walking trail. Some noxious weeds were observed in the riparian zone along the entire section of the reach.

Channel Characteristics: The stream bank on the south side of the creek along the interstate is impacted by highway infrastructure from the I-90 crossing downstream to Kaw Avenue. Like higher reaches, the channel material is predominantly sand and fine gravel however large boulders sporadically appear throughout the upper part of the reach and were apparently placed as part of earlier erosion control efforts. Some of the bank has had riprap? material added for stabilization. Visible erosion is present where the channel comes into and immediately above Father Sheehan Park (**Photo 38**)**.** West of Harrison Avenue, the banks are more natural allowing access to the flood plain on the north bank. It is likely that historic highway and road construction has straightened and moved the channel into its present location. High water access to the marshy floodplain is limited to culverts between Oregon and Kaw Avenues. Some silt deposition is occurring along the reach as evidenced by mid-stream bars and edge deposits.

Riparian Vegetation: Vegetation along this reach is dominated by willows with five species being observed. Older generation cottonwoods are also present. Shallow rooted grasses planted in Father Sheehan Park provide little erosion protection for the banks. The willow zone in this reach is anywhere from 5 to 20 feet outside the channel. Some honeysuckle and rose bushes also grow on drier banks. In the riparian areas west of Harrison Avenue, the slower backwaters have an excessive amount of floating algae and rooted vascular aquatic plants are numerous. Abundant algae and rooted vascular aquatic plants suggest strong nutrient loading (**Photos 39 & 40**).

Scattered patches of noxious weeds including Canadian thistle, knapweed and toadflax were growing along the stream banks in the reach, being dominant along roadways and other human disturbance.

Fish: Positive fish habitat exists along this reach. A considerable number of shallow and deep pools are present. With the willow dominated vegetation, shading and cover is provided in most places. Like other reaches, the largest negative feature for fish is the monotonous bottom of embedded sand and fine gravel. The other observed negative observation was the increase in aquatic vegetation, indicating an increase in nutrient loading. Many fish, most less than 7 inches, were observed in this reach.

Iron oxidizing bacteria could be impacting water quality where seeps enter the creek (**Photos 41 &42**).

Possible Projects: Where the channel enters and above Father Sheehan Park there is erosion occurring. This will require channel and bank stabilization efforts. BMP's for weed management and bank protection should be part of restoration efforts along the entire reach. Vigorous algal and vascular aquatic plant growth, along the reach below Harrison Avenue, suggests that nutrient enrichment is occurring and the origin(s) of the nutrients could be investigated further.

Reach 12 Photos:

Photo 37

Photo 38

Photo 39

Photo 40

Photo 41

Photo 42

BTC 13 _01 to BTC 13_02

(Kaw Avenue to Silver Bow Creek)

Overview: As the channel leaves the double culvert under Kaw Avenue it enters a gentle meander with a walking trail on the north side and I-90 on the south side of the channel bank. There is a large pool created by an older beaver dam below the double culvert. The channel then flows past the Butte Chamber of Commerce parking lot and a USGS monitoring station before it flows under the bridge at George Street. Below George Street large rock has been placed on both banks to help control erosion from past disturbances. Large patches of Canadian thistle were observed on the upper section of the reach (**Photo 43**).

Channel Characteristics: The stream channel is restricted by highway infrastructure on the south bank and a walking trail on the north bank. At the point where the stream flows in front of the Butte Chamber of Commerce Building, a dike has been constructed on the south side for approximately 200 feet until reaching George Street. This dike has a small triangular shaped wetland situated between it and I-90. The stream bed appears to be stable with very little erosional down cutting and minimal lateral erosion. Numerous pools of varying depth were observed along the reach. The channel bed is comprised of fine sands and gravel. Downstream from George Street the banks have been covered with large rocks and the channel has been straightened until it enters Silver Bow Creek.

Riparian Vegetation: The upper section of the reach is dominated by willow, with four species and varying age classes present (**Photo 44 & 45**). Sedges are abundant here also, along with a few cottonwood trees and a variety of riparian grasses. Below George Street, where rocks cover the reconstructed banks, there are currently two species of sapling willows present and there is a noticeable lack of sedges in this lowest section (**Photos 46 & 47**). Here, there is an abundance of short non-native grasses which do not provide much erosion protection during high water events. Heavy patches of Canadian Thistle are present on the upper section of the reach.

Fish: Positive fish habitat exists within this reach with a variety of pools and runs being present throughout the reach. On the upper portion of the reach an abundance of willow and sedge provide good shading and cover which help support fish habitat. Trout species were observed in this reach varying in size but being predominately less than 8 inches in length. The reach substrate is fine sands and gravels with some silt deposition.

Possible Projects: During the study, a local environmental professional with knowledge of the area, told us that the south dike in front of the Chamber of Commerce Building may have been constructed from mine processing waste materials and we observed possible mine processing waste along the South bank (**Photo 48)**. Further study of the materials in this dike may be warranted. BMP's for weed management and bank protection should be part of any restoration efforts along this reach.

Reach 13 Photos:

Photo 43

Photo 44

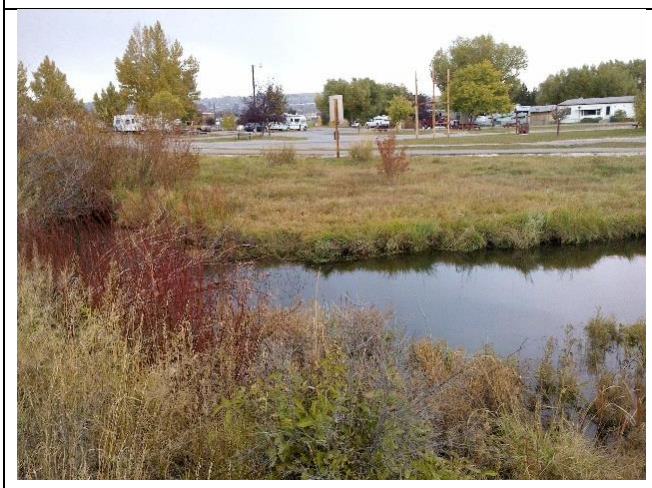


Photo 45

Photo 46

Photo 47

Photo 48

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APPENDICIES

Appendix A: General/Photo Documentation Field Form

Blacktail Creek Assessment Survey August 2013

Reach ID:	

Date:		Primary Land Use:		Lead Observer:		Begin Lat:	
Substrate:		Nez Perce Veg Code:		BF Width (ft):		Begin Long:	
		Plant Community:		BF Depth(ft):		Ending Lat:	
Rosgen Channel:				W/D Ratio (ft2):		Ending Long:	

Photo 1 (top of reach) Description	
Photo 2 Description	
Photo 3 Description	
Photo 4 Description	
Photo 5 Description	

NRCS Assessment Summary:

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Riparian Health Score (%)	S1	S2, Fish Habitat Notes

Narrative/Notes:

Appendix A: Rapid Bank Erosion Inventory Field Form

Bank Erosion Inventory							
LEW				**REW**			
Height (ft)	Length (ft)	LEW Total (ft2)	Notes	Height (ft)	Length (ft)	REW Total (ft2)	Notes
TOTAL:				TOTAL:			

Notes/Codes	Description
RD	Road Erosion
BR	Bridge Erosion
CR	Cropland Encroachment: Lack of Riparian Veg
LS-P	Physical Livestock Erosion
LS-B	Livestock Browse: Lack of Riparian Veg
TP	Trampled by livestock, no height of erosion
I	Geomorph Incisement
NC	New channel
HS	Hillside erosion, cutting into valley walls

Appendix B: Riparian Assessment Worksheet (MT-1A to MT-5A)

Environment Worksheet MT-1A

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

RIPARIAN ASSESSMENT WORKSHEET

NAME OF STREAM:_____ REACH LOC OR ID:_____

DATE:_____ ID TEAM/OBSERVERS:_____

LENGTH OF REACH:_____ LAT/LONG - BEGIN/END:_____

MAP OR QUAD NAME: _____ PHOTO #S:_____ PRIMARY LAND USE:_____

PLANT COMMUNITY:_____ ROSGEN CHANNEL TYPE:_____ BFDEPTH:_____ BFWIDTH:_____

WIDTH/DEPTH RATIO:_____ CHANNEL SUBSTRATE : _____

Geomorphic Considerations

Question 1. Stream Incisement (Downcutting):

8 = Channel stable, no active downcutting occurring; or, old downcutting apparent but a new, stable riparian area has formed within the incised channel. There is perennial riparian vegetation well established in the riparian area (Stage 1 and 5, Schumm's Model Figure 2).

6 = Channel has evidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base of the falling banks, soil disturbance evident (Stage 4, Schumm's Model Figure 2).

4 = Small headcut, in early stage, is present. Immediate action may prevent further degradation (Early Stage 2, Schumm's Model Figure 2).

2 = Unstable, channel incised, actively widening, limited new riparian area/floodplain, floodplain not well vegetated. The vegetation that is present is mainly pioneer species. Bank failure is common (Stage 3, Schumm's Model Figure 2).

0 = Channel deeply incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasional or rare flood events access the flood plain. Tributaries will also exhibit downcutting or signs of downcutting (Stage 2, Schumm's Model Figure 2).

The presence of active headcuts should nearly always keep the stream reach from being rated Sustainable.

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

_____

_____

Question 2. Streambanks with Active Lateral Cutting (inspect banks on both sides of the stream):

8 = Lateral bank erosion is in balance with the stream and its setting.

5 = There is a minimal amount of human-induced, active lateral bank erosion occurring, primarily limited to outside banks.

3= There is a moderate amount of human-induced active lateral bank erosion occurring on either or both outside and inside banks.

0 = There is extensive human-induced lateral bank erosion occurring on outside and inside banks and straight sections.

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

_____

_____

_____

NRCS, MT
September 2004

Environment Worksheet MT-2A

NAME OF STREAM:_____ REACH ID:_____ DATE:_____

Question 3. The Stream is in Balance with the Water and Sediment Supplied by the Watershed:

6 = The width to depth ratio appears to be appropriate for the stream type and its geomorphic setting. There is no evidence of excess sediment removal or deposition. There are no indications that the stream is widening or getting shallower. There may be some well-washed gravel and cobble bars present. Pools are common. Rosgen "B" and naturally occurring "D" channel types are exceptions.

4 = The stream has widened and/or has become shallower due to disturbances that have caused the banks to become unstable or from dewatering which reduces the amount of water and energy needed to effectively move the sediment through the channel. *(Note: Sediment sources may also be from offsite sources.)* Point bars are often enlarged by gravel with silt and sand common, and new bars are forming. Pools are common, but may be shallow. Rosgen "B" and naturally occurring "D" channel types are exceptions.

2 = The width to depth ratio exceeds what is appropriate for the stream type. Point bars are enlarged by gravel with abundant sand and silt, and new bars are forming that often force lateral movement of the stream. Mid channel bars are often present. For prairie streams there is often a deep layer of sediment on top of the gravel substrate. The frequency of pools is low. Rosgen "B" and naturally occurring "D" channel types are exceptions.

0 = The stream has poor sediment transport capability which is reflected by poor channel definition. The channel is often braided having at least 3 active channels. Naturally occurring Rosgen "D" channels types are exceptions. Pools are filled with sediment or are not existent.

SCORE: **Potential**_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

_____

_____

_____

Vegetative Considerations

Question 4. Streambank with Vegetation (Kind) having a Deep, Binding Rootmass:

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.

(See Appendix I for stability ratings for most riparian, and other, species.)

6 = The streambank vegetative communities are comprised of at least four plant species with deep, binding root masses.

4 = The streambank vegetative communities are comprised of at least three plant species with deep, binding root masses.

2 = The streambank vegetative communities are comprised of two plant species with deep, binding root masses.

0 = The streambank vegetative communities are comprised of one or no plant species with deep, binding root masses.

SCORE: **Potential**_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

_____

_____

Question 5. Riparian/Wetland Vegetative Cover (Amount) in the Riparian/Floodplain Area:

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.

6 = More than 85% of the riparian/wetland canopy cover has a stability rating $\geq$ 6

4 =75%-85% of the riparian/wetland canopy cover has a stability rating $\geq$ 6

2 =65%-75% of the riparian/wetland canopy cover has a stability rating $\geq$ 6

0 = Less than 65% of the riparian/wetland canopy cover has a stability rating $\geq$ 6

NOTE: A low score for this item may be enough to keep the stream reach from being rated Sustainable

SCORE: **Potential**_____ **Actual**_____

NAME OF STREAM:_____ REACH ID:_____ DATE:_____

NRCS, MT
September 2004

Question 5. Continued:
Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.
Comments:_____
_____
_____
_____

Question 6. Noxious Weeds in the Riparian Area:

3 = None of the riparian area has noxious weeds present.

2 = Up to 5% of the riparian area has noxious weeds (a few are present).

1 = Up to 10% of the riparian area has noxious weeds present (abundant).

0 = Over 10% of the riparian area has noxious weeds (very apparent and extensive distribution).

SCORE: **Potential**_____ **Actual**_____
Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.
Comments: (NOTE: List all noxious weed species)_____
_____
_____
_____

Question 7. Disturbance-Caused Undesirable Plants in the Riparian Area:

3 = 5% or less of the riparian area with undesirable plants (very few present).

2 = 5-10% of the riparian area with undesirable plants (few are present).

1 = 10-15% of the riparian area with undesirable plants (commonly distributed).

0 = Over 15% of the riparian area with undesirable plants (abundant over much of the area).

SCORE: **Potential**_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.
Comments: (NOTE: List all nuisance weeds and undesirable plants)_____
_____
_____
_____

Question 8. Woody Species Establishment and Regeneration: *Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.*

8 = All age classes of desirable woody riparian species present (see Table 3).

6 = One age class of desirable woody riparian species is clearly absent, all others well represented. Often, it will be the middle age group(s) absent. For sites with potential for both trees and shrubs there may be one age class of each absent. Having mature individuals and at least one younger age class present indicates the potential for recovery.

4 = Two age classes (seedlings and saplings) of native riparian shrubs and/or two age classes of native riparian trees are clearly absent, or the stand is comprised of mainly mature species. Other age classes well represented.

2 = Disturbance induced, (i.e. facultative, facultative upland species such as rose, or snowberry) or non-riparian species dominate. Woody species present consist of decadent/dying individuals. (Refer back to Question 1 if this is the situation. The channel may have incised.)

0 = A few woody species are present (<10% canopy cover), but herbaceous species dominate (at this point, the site potential should be re-evaluated to ensure that it has potential for woody vegetation); or, the site has at ≥ 5% canopy cover of Russian olive and/or salt cedar. On sites with long-term manipulation or disturbance, woody species potential is easily underestimated.

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NAME OF STREAM:_____ REACH ID:_____ DATE:_____

Question 8. Woody Species Establishment and Regeneration (cont'd.):

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

Functional Considerations

Question 9. Utilization of Trees and Shrubs: *Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.*

4 = 0-5% of the available second year and older stems are browsed.

3 = 5%-25% of the available second year and older stems are browsed (lightly).

2 = 25%-50% of the available second year and older stems are browsed (moderately..

1 = More than 50% of the available second year and older stems are browsed (heavily). Many of the shrubs have either a "clubbed" growth form, or they are high-lined or umbrella shaped .

0 = There is noticeable use (10% or more) of unpalatable and normally unused woody species

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate

Comments:_____

Question 10. Floodplain Characteristics for Dissipating Energy and Capturing Sediment.

8 = Active flood or overflow channels exist in the floodplain. Large rock, woody debris, and/or riparian vegetation appropriate for the setting are sufficient to adequately dissipate stream energy and trap sediment on the floodplain. There is little evidence of excessive erosion or disturbance that reduces energy dissipation and sediment capture on the floodplain. There are no headcuts where either overland flow and/or flood channel flows return to the main channel.

6 = The floodplain meets the characteristics of the description in Question 8 above, but demonstrates slight limitations in the kind and amount of large rock, woody debris, and/or riparian vegetation present. Riparian vegetation structure is below that required to dissipate energy. There may be occasional evidence of surface erosion and disturbance, but generally not extensive enough to have affected channel development.

4 = Large rock, woody debris, and/or riparian vegetation is present, but generally insufficient (quality or quantity) to fully dissipate stream energy. Some sediment may be captured, but greater evidence of incipient erosion and/or headcuts is readily present.

2 = Inadequate Large rock, woody debris, and/or riparian vegetation is available for dissipation of energy or sediment capture. There is very little evidence of sediment capture. There is some streambank erosion due to human disturbance or alterations, and occasional headcuts where overland flows or flood channel flows return to the main channel.

0 = Floodplain area reflects the following conditions: 1) The floodplain area is very limited or not present and is inadequate to dissipate energy; 2) flood or overflow channels do not exist; and 3) large rock, woody debris, and/or riparian vegetation is not adequate to dissipate stream energy and trap sediment on the floodplain. Streambank and/or floodplain erosion and/or evidence of human alteration are common. "G"- and "F"-type channels (Rosgen) typically reflect these conditions.

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

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Comments:_____

SUMMARY

		SCORE POTENTIAL	SCORE ACTUAL	POSSIBLE
QUESTION 1:	Stream Incisement	____	____	0, 2, 4, 6, 8
QUESTION 2:	Lateral Cutting	____	____	0, 3, 5, 8
QUESTION 3:	Stream Balance	____	____	0, 2, 4, 6
QUESTION 4:	Deep, Binding Rootmass	____	____	N/A, 0, 2, 4, 6
QUESTION 5:	Riparian/Wetland Vegetative Cover *	____	____	N/A, 0, 2, 4, 6
QUESTION 6:	Noxious Weeds	____	____	0, 1, 2, 3
QUESTION 7:	Undesirable Plants	____	____	0, 1, 2, 3
QUESTION 8:	Woody Species Establishment	____	____	N/A, 0, 2, 4, 6, 8
QUESTION 9:	Browse Utilization	____	____	N/A, 0, 1, 2, 3, 4
QUESTION 10:	Riparian Area/Floodplain Characteristics *	____	____	N/A, 0, 2, 4, 6, 8
	TOTAL	____	____	(60 total possible)

(POTENTIAL SCORE FOR MOST BEDROCK OR BOULDER STREAMS) (36)
(questions 1, 2, 3, 6, 7, 10)
(POTENTIAL SCORE FOR MOST LOW ENERGY "E" STREAMS) (48)
(questions 1 – 7, 10)

RATING: = $\frac{\text{Actual Score}}{\text{Potential Score}}$ X 100 = % rating

80-100% = SUSTAINABLE
50-80% = AT RISK
LESS THAN 50% = NOT SUSTAINABLE

* Only in certain, specific situations can both of these receive an "N/A".

Please clarify the rationale for your rating, including comments regarding potential. Can the limitations be addressed by the decisionmaker?

NOTES_____

TREND: Does the reach appear to be improving or declining? Explain. _____

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Appendix C: Blacktail Creek Narrative

Blacktail Creek Narrative: Paragraph Description of Reach

Part 1: General Classification of Reach

1) This sub-reach was visually classified as a _____ Rosgen channel type located within a _____Rosgen valley type. This classification is based on a bankfull width- to-depth ratio estimate of _____, a sinuosity of _____, a _____dominated channel bed, and an estimated channel gradient of _____.

Part 2: Geomorphology

1) Geomorphically this channel is…
    a. Stream Incisement (circle one)
        i. Appears stable, having little to no active/current downcutting,
        ii. stabilizing, having old downcutting that is now stabilizing through regeneration of vegetation,
        iii. in the early stages of downcutting, with small head cuts present,
        iv. fairly unstable, with active and noticeable incisement,
        v. extremely unstable, with deep incision/little to no stream access to the floodplain,
    b. Lateral Cutting (circle one)
        i. and minimal lateral erosion (balanced: erosion of outside/cut banks equal the deposition at point bars)
        ii. and some human induced erosion of outside banks
        iii. and a moderate amount of human induced erosion of inner and outer banks
        iv. and extensive human induced erosion along a large proportion of banks.
    c. Water and Sediment Balance
        i. In general there is no evidence of widening or shallowing of the stream channel—there are and numerous pools of good depth.
        ii. There is some evidence of widening or shallowing, resulting in enlarged point bars.
        iii. There is excessively large point bars, formation of midstream bars, and loss of pool depth.
        iv. There is heavy sedimentation causing a braided channel formation, with few to no pools.

Part 3: Flow and Floodplain Function (Circle both, one, or none)

1) During the time of this assessment there were several indicators, such as: _____ _____ that the stream has access to its floodplain.
2) During the time of this assessment stream flow appeared (Circle One: low, high, or normal), with an estimated discharge of _____cfs and a wetted width of _____ ft.

Part 4: Riparian Vegetation and Browse

1) Density of woody riparian vegetation within this sub-reach is (Circle One: low, moderate, or high) and dominated by (genera) _____ _____ _____ (Nez Perce Code :_____).
2) There is (Circle One: little to no, little, moderate, intensive) browsing occurring via (Circle One: cattle, horses, sheep, other :_____), with (Circle One: no, minimal, moderate) regeneration at this time, and a _____ (poor, mod., good) distribution of age classes of woody species like_____.

Part 5: Impacts to Reach (Circle all that apply)

1) The primary problems noted within this sub-reach consist of …….
    a. Historical mechanical channel modifications such as: channel straightening/channelization, or other_____

b. Bank and bed form alterations caused by livestock:
   i. trampling of the bed and banks
   ii. over-widening channel
   iii. other
c. Erosion/sedimentation due to:
   i. road encroachment into riparian corridor
   ii. bridges/culverts/crossing
   iii. agricultural encroachment into riparian (or other removal of vegetation)
   iv. upstream land use sediment sources
   v. historic mining
   vi. other causes (_____)
d. Water quality degradation due to nutrients or other contamination
   i. Indicated by overgrowth of aquatic vascular plants
   ii. Excessive algae on rocks
   iii. Other water quality indicators_____
e. Removal, damage or degradation of riparian vegetation reducing habitat, cover and shade:
   i. indicated by vegetation type/land use: _____
   ii. Weeds: _____
   iii. Other: _____
f. Low flows or dewatering:
   i._____

2) There are no apparent problems with this reach

Part 6: Fish Habitat

1) These issues result in (Circle One: poor, fair, good) fish habitat, as evident in…
   a. (Low/High) number of (Shallow/Deep) pool habitat elements
   b. (Low, medium, high) Substrate quality
   c. (Small/Large) amounts of cover/shading due to riparian vegetation and overhanging banks
   d. (Low/Medium/High) percentage of large woody debris
   e. (Sufficient/Deficient) flow
   f. Impassable fish barriers
   g. _____
   h. _____
   i. _____

Part 7: Potential Projects (Circle all that apply)

1) There are no recommended restoration projects at this time
2) Potential restoration projects include
   a. Change of grazing regime (water/fencing/etc.)
   b. Weed management
   c. Road/bridge/culvert improvement or maintenance
   d. Removal or re-design of fish barriers (irrigation diversions or other)
   e. Channel or bank stabilization_____
   f. Channel re-naturalization:_____
   g. Other: _____

Part 8: Other Notes

_____
_____
_____
_____
_____
_____
_____

Appendix D: Major Stream Types Using Rosgen Classification

Environment Worksheet MT-8A

APPENDIX 2: ROSGEN STREAM CLASSIFICATONS.

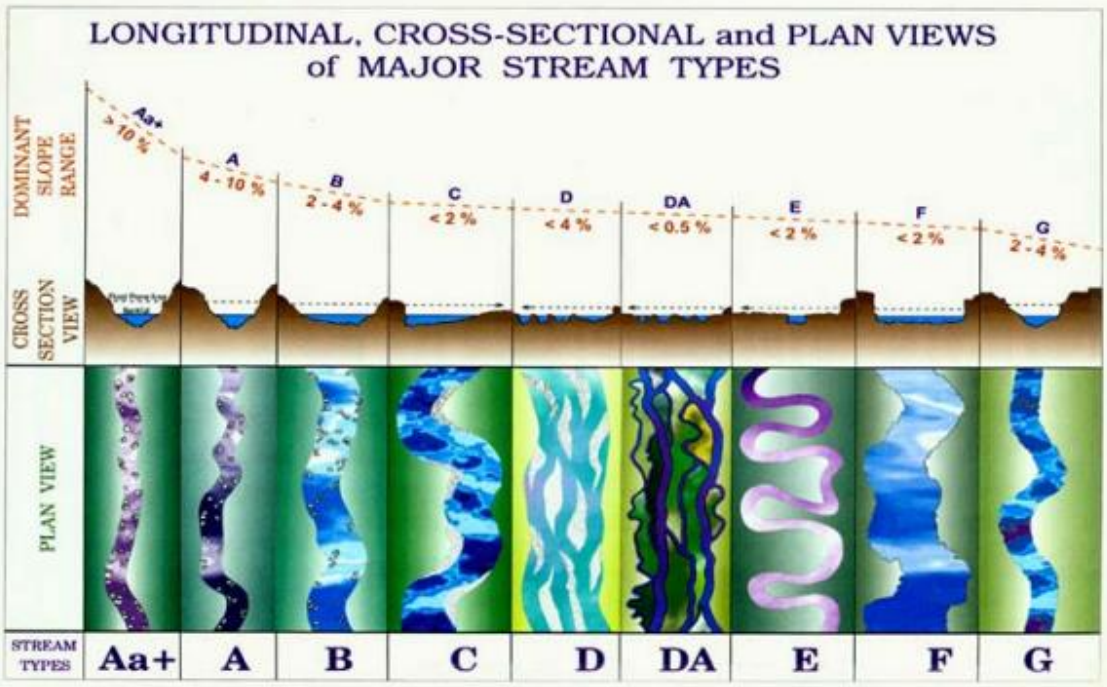

FIGURE 2. Broad level stream classification delineation showing longitudinal, cross-sectional and plan views of major stream types. (from Rosgen, 1994)

FIELD GUIDE FOR STREAM CLASSIFICATION by ROSGEN (1998) DRC

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Appendix E: Fish Habitat Assessment Form (Modified)

Environment Worksheet MT-1B

NAME OF STREAM:_____ REACH ID:_____ DATE:_____

NRCS RIPARIAN ASSESSMENT - SUPPLEMENTAL ATTRIBUTES

Note: These attributes are used to help characterize the condition of aquatic habitat and water quality associated with the riparian reach. As appropriate, complete a separate form for each reach. Check the most appropriate narrative criterion for the reach along with entering notes to explain the rationale for the value. A score is not calculated for this supplemental assessment. Please clarify the rationale for your rating, including comments regarding potential and document with photograph(s), if appropriate.

1) AQUATIC LIFE SUBSTRATE HABITATS

Excessive sediment deposited on the substrate often suffocates fish eggs and destroys macroinvertebrate habitat, especially if it occurs in fast moving/riffle dominated streams. For prairie streams the excessive sediment may also bury the aquatic vegetation. Excessive silt and sand often fills the interstices between the cobbles and gravel causing them to become embedded (cemented together or difficult to move).

Stream Bottom (For Fast moving/Riffle dominated streams)

___ Stony substrate of several sizes packed together, interstices obvious. Some silt may be present. Substrate is easily moved.
___ Stony substrate is interspersed with silt and sand. Cobbles are partially embedded and not easily moved. There are also usually slight depositions of sand and silt at the fringes of the stream channel and in the pools.
___ Bottom of silt, gravel and sand, cobbles are fully embedded and extremely difficult to move.
___ Uniform bottom of sand and silt loosely held together, stony substrate absent or buried.

Stream Bottom (For slow moving/pool dominated streams)

___ Mixture of substrate material with gravel or firm sand prevalent and/or vascular root mats and submerged vegetation abundant.
___ Mixture of gravel with soft sand and silt common; and/or some vascular root mats and submerged vegetation.
___ Mixture of soft sand, silt or clay; gravel is not common and little or no vascular root mats or submerged vegetation present.
___ All mud or clay, or channelized with sand bottom and no vascular root mats or submerged vegetation

Comments:

_____
_____
_____
_____

2) FISH HABITATS

Fish and their fry need a variety of habitat types to flourish. This usually includes a mix of deep and shallow pools and security cover that are created by vegetation, woody debris, boulders, undercut banks, etc. The type of habitat that is important is dependant of the stream type. For example, woody debris and overhanging vegetation are often important for small Rosgen "A" and "B" streams that are in a forested environment while large deep pools and aquatic vegetation are important for Rosgen "C" channels in the prairie. Please note that short-term climatic effects such as high flows or drought should be considered when assessing fish habitat.

___ Even mix of deep, shallow, large and small pools (prairie streams would expect long deep pools); habitats created by woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or abundant aquatic vegetation.
___ Shallow pools more prevalent than deep pools; limited habitats created by woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or aquatic vegetation are limited.
___ Majority of pools are small and shallow or pools are absent; Habitats created by woody debris, overhanging vegetation, boulders, root wads, or undercut banks and/or aquatic vegetations are rare or nonexistent.
___ There is not enough water to support a fishery due to human-induced dewatering
___ Streams would not support fish under natural conditions due to insufficient flow.

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