Montana Fish, Wildlife & Parks

2015 Lower Belt Creek – Coal Acid Mine Drainage Sampling Report

Final Report for Montana Department of Environmental Quality

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Introduction

Acid mine drainage (AMD) from past coal mining activities currently results in exceedances of Montana Water Quality Standards for iron and aluminum in Belt Creek, in the town of Belt, Montana. Numerous other metals exceed the water quality standards in the AMD water itself. Montana Department of Environmental Quality (MDEQ) is proposing to construct a water treatment plant in the area of Coke Oven Flats to treat several sources of AMD water prior to it reaching Belt Creek and thereby improve water quality in Belt Creek.

Currently, water quality monitoring is being conducted by MDEQ; however, no aquatic life (fish and benthic invertebrate) monitoring had been conducted in Belt Creek in this area. Montana Fish, Wildlife and Parks (MFWP) sought to begin fish and benthic invertebrate monitoring to document the level of impact prior to construction of the treatment plant. With continued monitoring following the construction of the treatment plant, MFWP will provide documentation of the response in the aquatic life, which is one of the designated beneficial uses of Belt Creek.

Methods and Study Area

Fish Sampling

We sampled fish populations in the sections immediately upstream (control) and downstream (impact) from the AMD site (considered the Anaconda discharge for this report) in Belt Creek on November 2, 2015 (Figure 1 and Table 1). The control section is located approximately 100 m upstream from the AMD site and measured 229 m in length, while the impact section is located approximately 600 m downstream from the AMD site and measured 205 m in length.

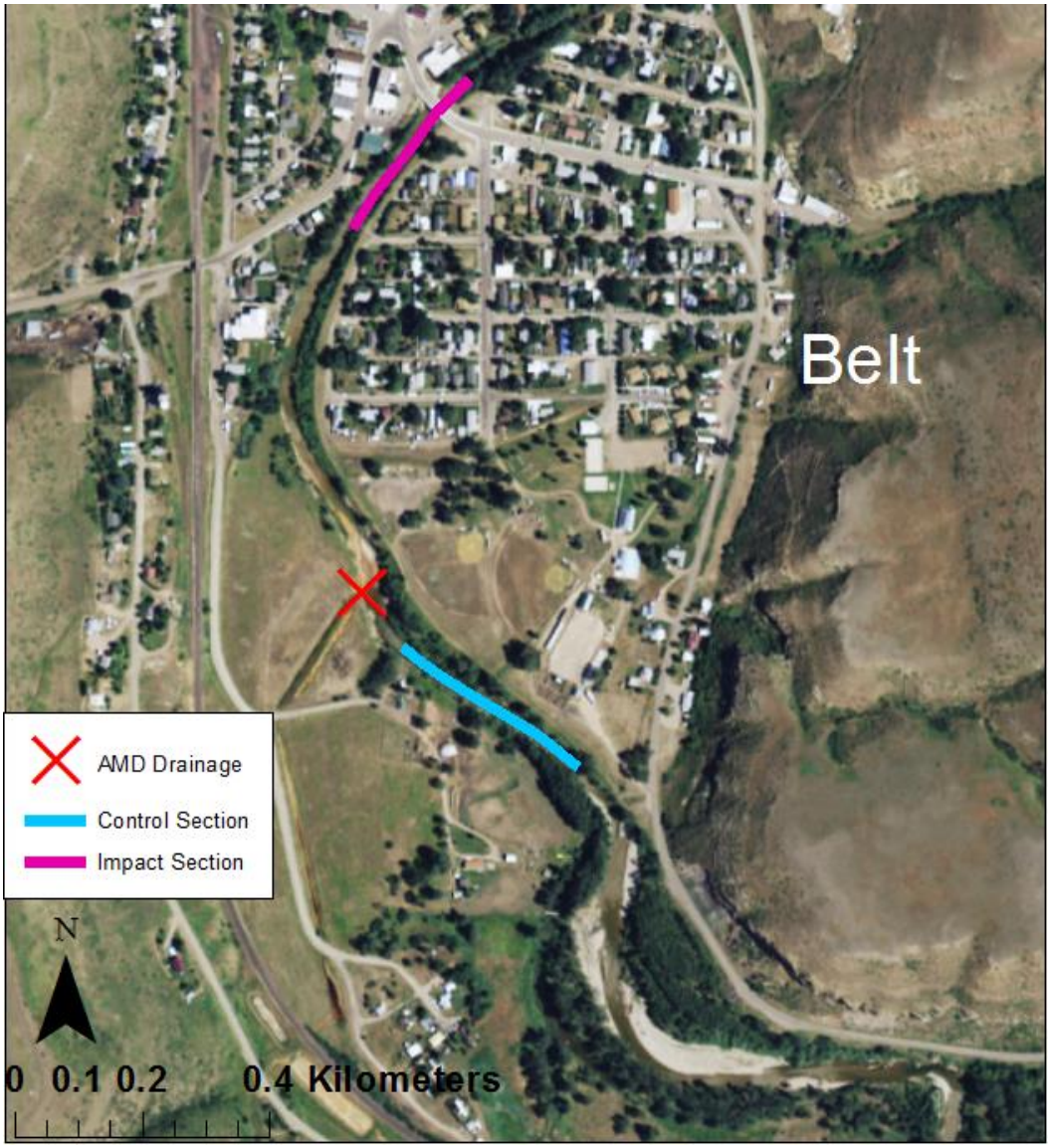

Figure 1. Map of fish sampling locations upstream of AMD (control) and downstream of AMD (impact).

Fish were temporarily stunned using a backpack electrofishing unit (Smith-Root LR-24) (Appendix, Photo A, additional sampling and site photos in Appendix), subsequently captured by two netters, and temporarily placed in a holding net. Two passes through the section were completed and fish captured from each pass were kept separate to allow for population estimates. All captured fish were identified to species, enumerated, measured, weighed, and released. Population estimates were later computed using the Zippin's depletion model (Zippin 1956). Model outputs were automatically computed per section length and were then standardized to 100 m.

Benthic Invertebrate Sampling

Benthic invertebrates were collected at a total of four sites (Figure 2 and Table 1) on September 30, 2015. The three sites that were located downstream from the AMD were established longitudinally to evaluate the downstream extent of impacts. A site upstream from the AMD was used to represent a control site. All site locations were selected at accessible riffle areas to represent optimal invertebrate habitat.

Table 1. Fish and benthic invertebrate sampling site descriptions and locations.

Site Name	Description		Longitude	Latitude
Control Section	Fish sampling section upstream of AMD	*Upstream Extent*	-110.92496	47.38073
		Downstream Extent	-110.92744	47.38189
Impact Section	Fish sampling section downstream of AMD	*Upstream Extent*	-110.92812	47.38589
		Downstream Extent	-110.92645	47.38733
IS 1	Control invertebrate site in riffle upstream of AMD		-110.92529	47.38099
IS 2	Invertebrate site in first riffle downstream of AMD		-110.92767	47.38239
IS 3	Invertebrate site in 'Impact Section' downstream of AMD		-110.92811	47.38529
IS 4	Invertebrate site farthest downstream of AMD		-110.92226	47.44090

Establishment of additional longitudinal sites was limited by large areas of dry streambed at the time of sampling. For example, the streambed was dry with the exception of several isolated pools in much of Belt Creek between sites IS 3 and IS 4. At each site, benthic invertebrates were collected by taking three Hess samples (Appendix, Photo B) and one traveling kick sample. The Hess sampler (600 µm mesh) measured 40 cm in height, 33 cm in diameter, and covered 858 sq. cm bottom area. The three Hess samples were collected at one representative riffle for each site. The traveling kick samples were taken in the riffle area for approximately 30 seconds with a D-frame kick net (900 µm mesh; 20 cm width, 25 cm length). All samples were placed in Nalgene bottles with 95% ethanol. Each sample was labeled with site, date, and sample type. The alcohol was replaced within 24 hours due to organic material in the jars.

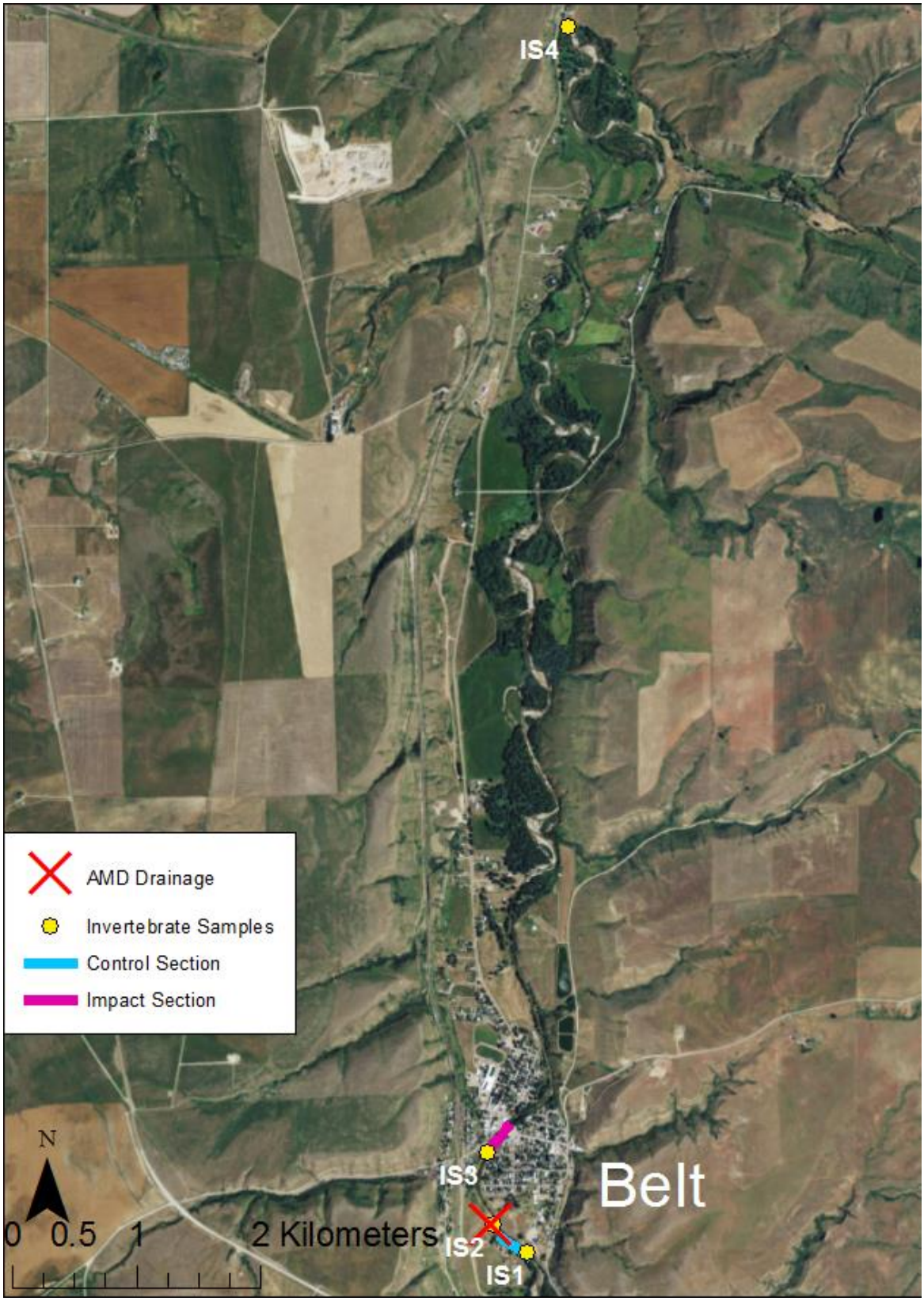

Figure 2. Map of invertebrate (yellow circles) and fish sampling (colored lines) locations on Belt Creek.

Results

Six species of fish were collected including brown trout, rainbow trout, longnose sucker, mountain sucker, sculpin, and longnose dace. Four of the six species were sampled in both sections, with mountain whitefish only collected in the control section, and white suckers only collected in the impact section. Population estimates were conducted on all species collected except for sculpin and longnose dace. Hundreds of sculpin and longnose dace of all size classes (young-of-year to adult) were observed in control and treatment sections, but their small size prohibited accurate population estimates.

Overall, we estimated approximately 2.4 times as many fish in the control section compared to the impact section (Figure 3). Population estimates were higher in the control than impact section for brown trout (1.8 times), rainbow trout (9.0 times), and mountain sucker (6.0 times). However, this trend was not true for longnose sucker, which were much more abundant (22 times) in the impact than the control section.

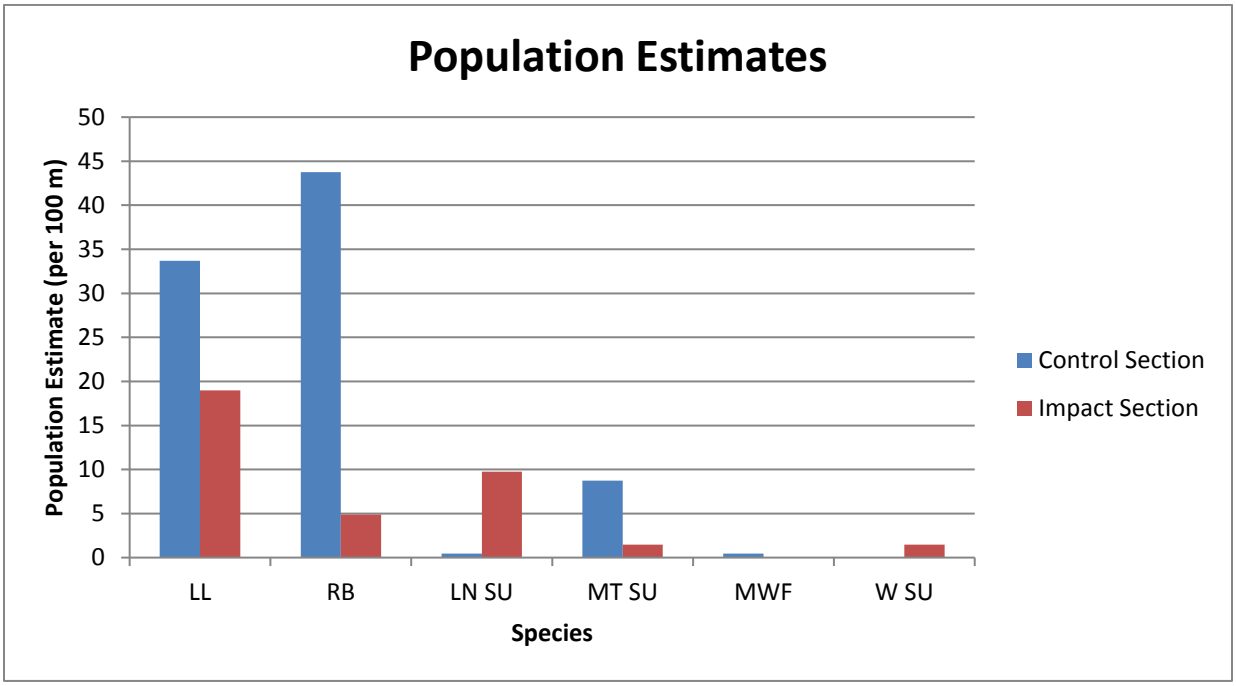

Figure 3. Population estimates for all species sampled in the control and impact sections of Belt Creek (excluding sculpin and longnose dace). No mountain whitefish were collected in the impact section and no white suckers were collected in the control section. Fish species abbreviations provided in Table 2.

Sampling abundance results were related to fish tolerance levels to anthropogenic disturbances as quantified by Barbour et al. (1999) and Whittier et al. (2007). Relative tolerance values indicate that the more tolerant species (longnose suckers and white suckers) were captured in greater abundance in the impact section, while less tolerant species (trout, mountain whitefish, and mountain sucker) were captured in greater abundances in the control section (Table 2).

Table 2. Abbreviations, tolerance values, and tolerance categories (intolerant, intermediate, or tolerant) of species sampled in the control and impact sections of Belt Creek. Possible tolerance values range from 0.0 – 10.0, with higher values indicating increased tolerance to anthropogenic disturbances.

Species	**Abbreviation**	**Tolerance Value** *(Whittier et al. 2007)*	**Tolerance Category** *(Barbour et al. 1999)*
Rainbow Trout	RB	2.1	Intolerant - Intermediate
Mountain Whitefish	MWF	2.5	Intolerant
Brown Trout	LL	2.7	Intolerant - Intermediate
Mountain Sucker	MT SU	4.4	Intermediate
Longnose Sucker	LN SU	4.6	Intolerant - Intermediate
White Sucker	W SU	7.6	Tolerant

Overall, trout sampled in the control section were larger than those sampled in the impact section (Figure 4). Medium-to-large size rainbow trout were absent in the impact section (no rainbow trout were sampled over 100 mm), whereas a fairly continuous range of rainbow trout sizes were sampled in the control section (approximately 21% were over 100 mm, with a maximum size of 315 mm) (Appendix, Figure A). We also sampled an abundance of small young-of-year rainbow trout in the control section compared to only a few in the impact section. Furthermore; young-of-year brown trout were generally smaller in the impact than control section (Appendix, Figure B).

We also observed that fish in the impact section were noticeably lighter in color than fish in the control section. This observation may be related to the difference in water clarity between the two sections, as we observed much higher turbidity in the impact than control section (Appendix, Photos F and G).

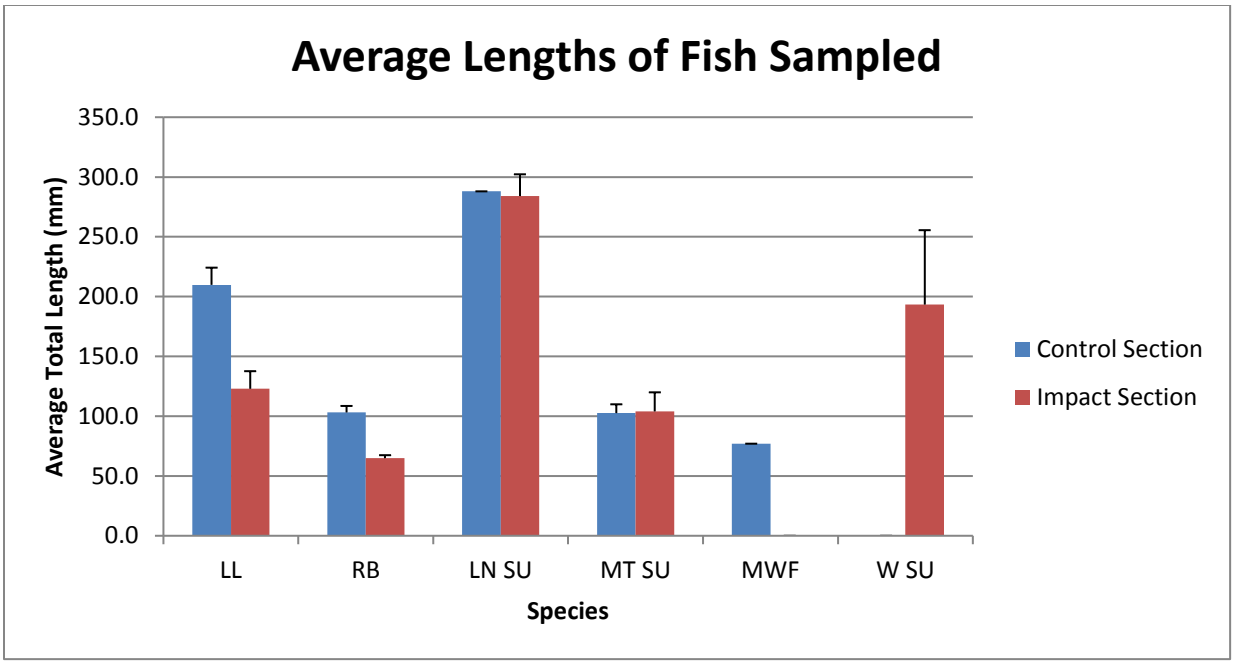

Figure 4. Average lengths of all species sampled (excluding sculpin and longnose dace). Bars represent standard error. No mountain whitefish were collected in the impact section and no white suckers were collected in the control section. Fish species abbreviations provided in Table 2.

Benthic Invertebrates

Overall, 57 unique invertebrate taxa were obtained from 12 macroinvertebrate Hess samples collected from Belt Creek both above (Control) and below (Impact) the AMD in 2015. The Control site (IS 1) and the site located farthest downstream from the AMD (IS 4) reported the highest benthic densities of invertebrates, averaging 13,093 and 14,557 individuals per square meter, respectively. High macroinvertebrate densities corresponded with taxa rich macroinvertebrate communities (Figure 5), with the Control site reporting the highest taxa richness at 38.3, followed by IS 4 at 30.7. The two sites located directly downstream of the AMD reported the lowest macroinvertebrate densities with IS 2 averaging 383 individuals per square meter and IS 3 averaging 867 individuals per square meter, and lower taxa richness at both sites (9.7 taxa per site).

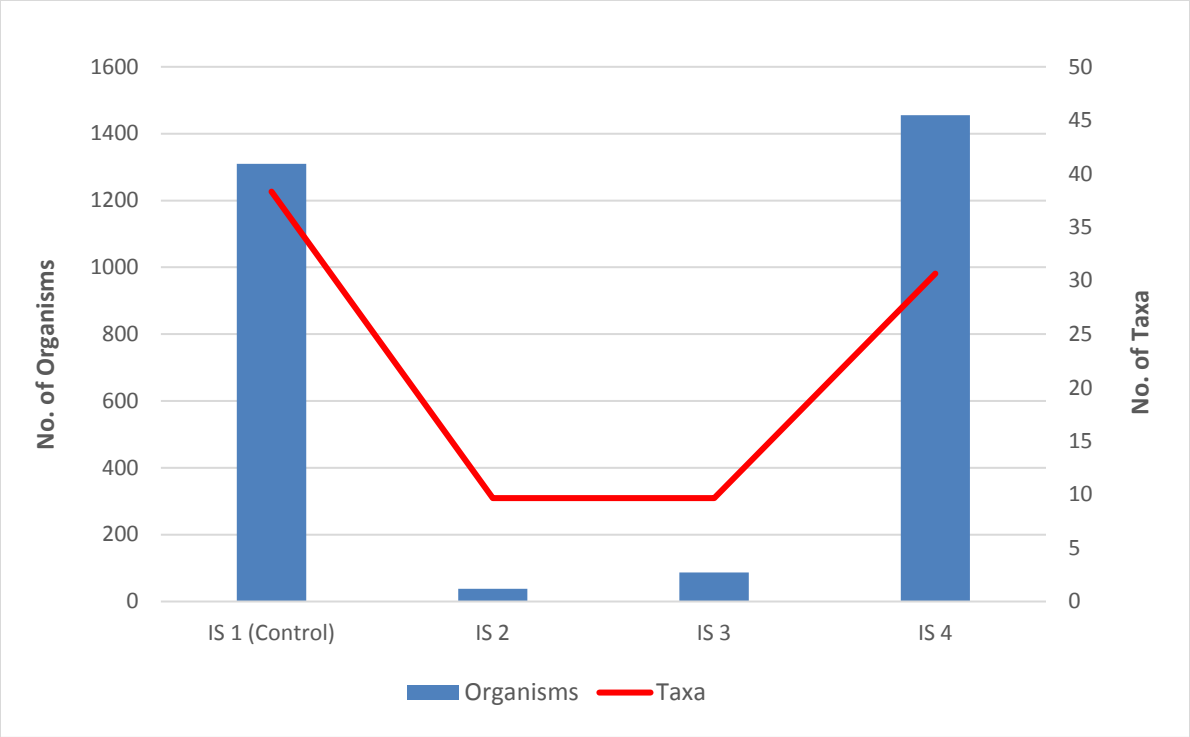

Figure 5. Average number of benthic macroinvertebrates and benthic macroinvertebrate taxa sampled at each site.

A substantial decrease in number of EPT taxa and the percent EPT density was observed directly downstream of the AMD (Figure 6). The two sites immediately downstream averaged 2.7 EPT taxa/11% EPT density (IS 2), and 2.0 EPT taxa/11% EPT density (IS 3), compared to 23.0 EPT taxa/55% EPT density observed at the Control site above the AMD. The decrease in EPT taxa and the percent EPT density at IS 2 and IS 3 coincided with a substantial increase in Coleoptera (beetles) at these sites. Similar to the Control site, higher EPT taxa richness (16.7 EPT taxa) and percent EPT density (53%) were observed at the site located farthest downstream from the AMD (IS 4).

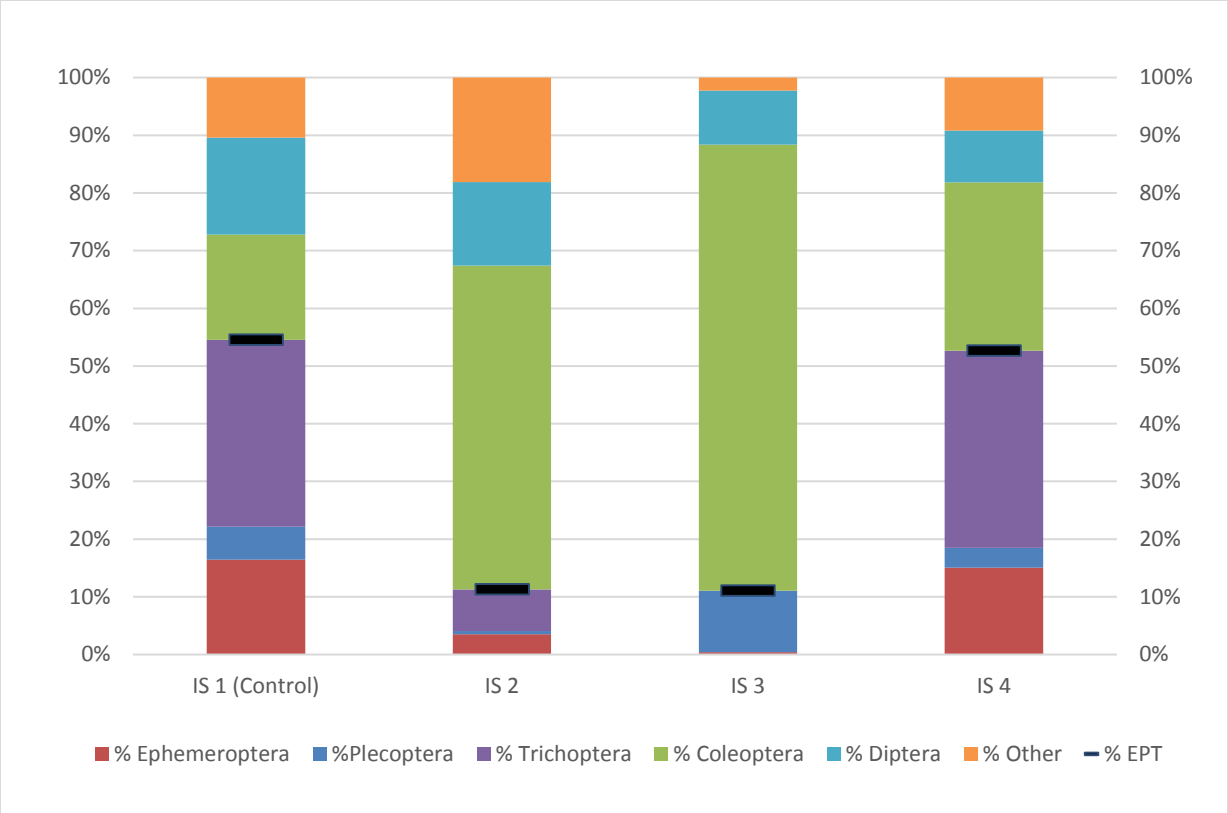

Figure 6. Composition of benthic macroinvertebrates sampled at each site. Percent EPT density is highlighted black.

Conclusions

Results from fish sampling indicate that the AMD-impacted section of Belt Creek does support aquatic life despite poor water quality and apparent impaired habitat. However, the AMD appears to affect fish distribution, size, and condition. Sensitive fish species (trout, mountain whitefish, and mountain suckers) were less abundant in the impact section than the control section and the most tolerant species (white and longnose suckers) were more abundant in the impact section than the control section. Furthermore, growth appears to be inhibited by the AMD. Young-of-year trout were smaller in the impact than control section. Also, for species with adequate data, the condition and relative weights were lower for fish in the impact section than those in the control section (Appendix, Table A), indicating

that overall fish health is adversely affected by the AMD. The benthic invertebrate community was clearly impacted by the AMD, as shown by the lower density, lower taxa richness, lower EPT richness, and lower percentage of EPT individuals at the two treatment sites immediately downstream of the AMD compared to the control site and the impact site farther downstream that was separated by a dry stretch of streambed.

Prior to AMD treatment, we recommend a study that documents baseline metal content in fish tissue in the control and impact sections. We also recommend continued monitoring of fish and benthic invertebrate populations after construction of the treatment plant to monitor the recovery of the aquatic community.

References

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Appendix

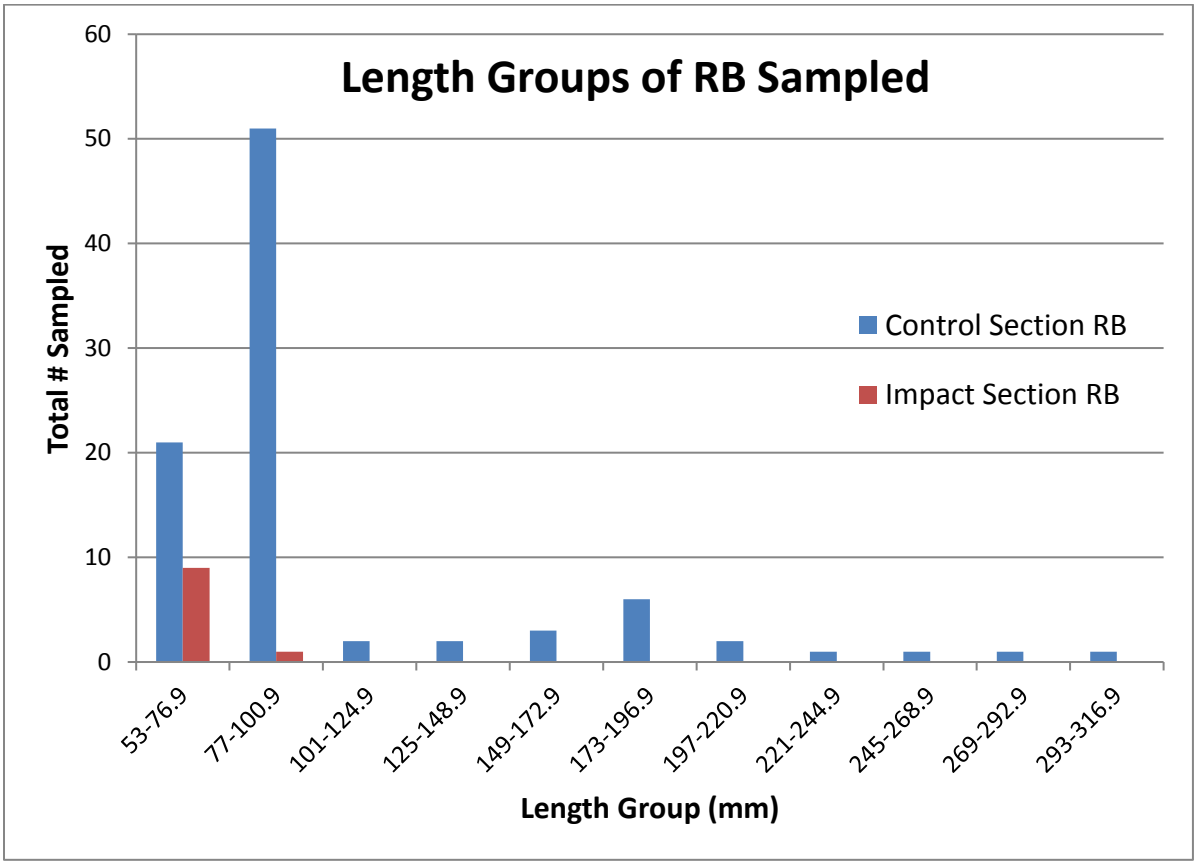

Figure A. Length groups of rainbow trout sampled in the control and impact sections of Belt Creek. RB = rainbow trout.

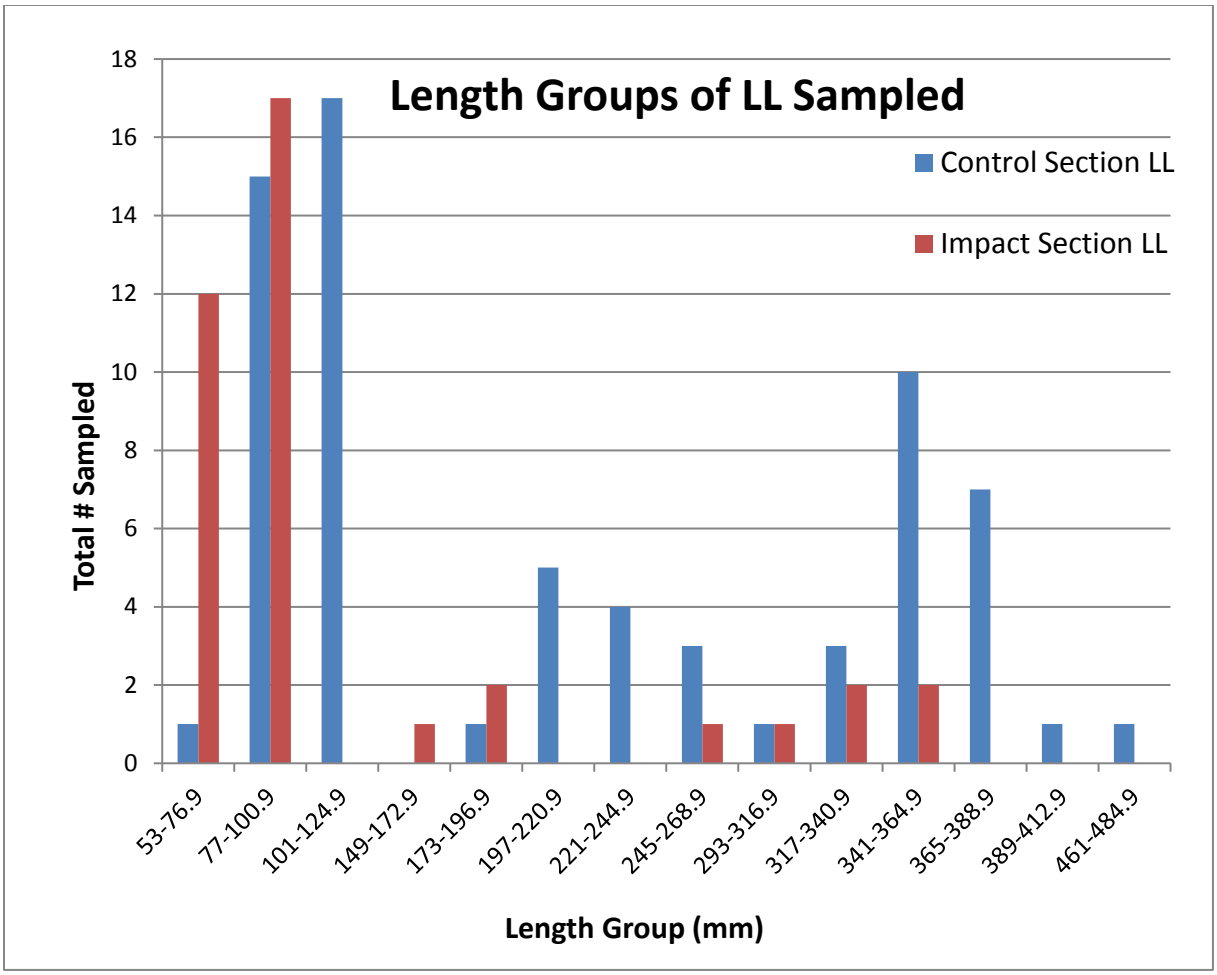

Figure B. Length groups of brown trout sampled in the control and impact sections of Belt Creek. LL = brown trout.

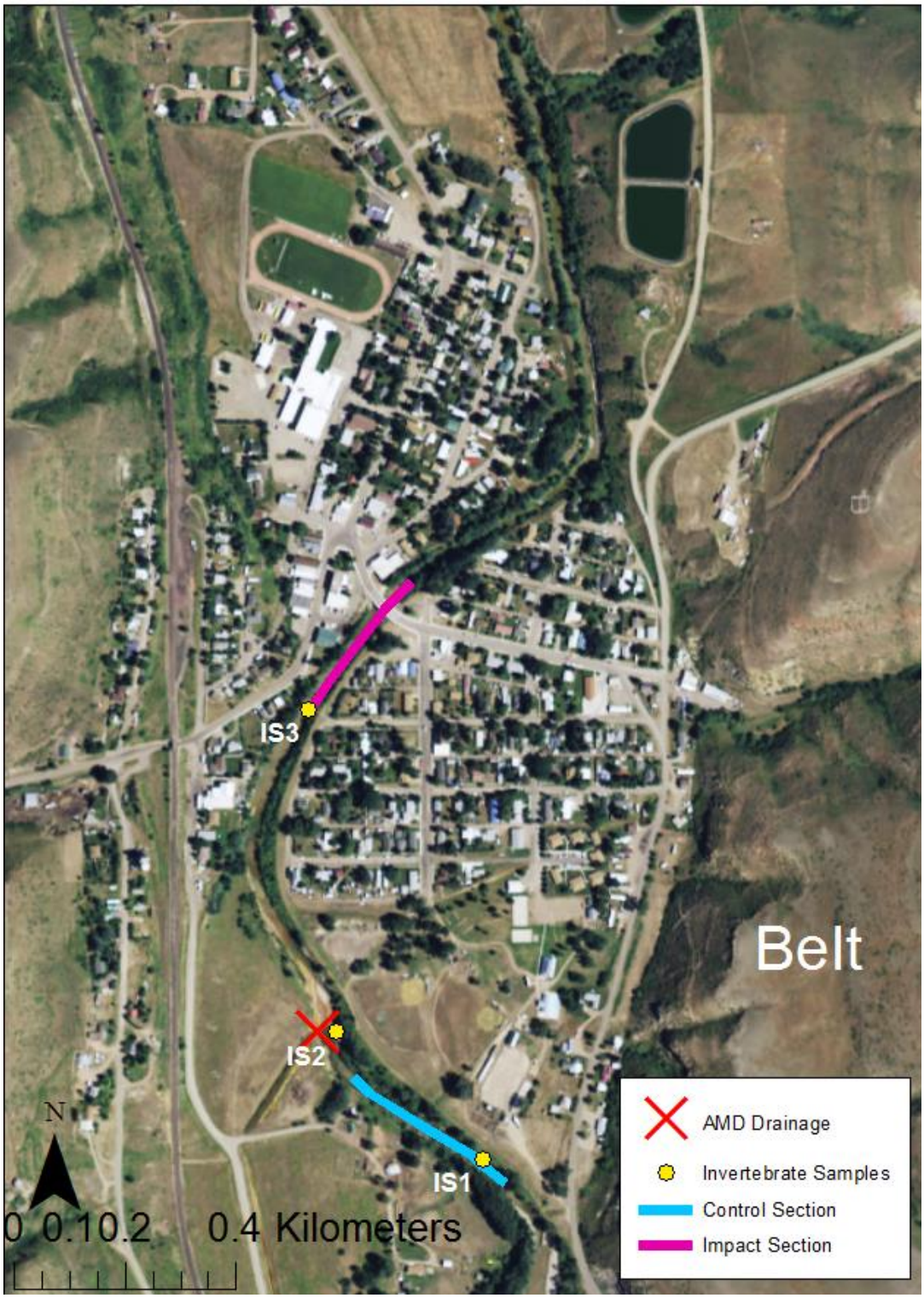

Figure C. Upper sampling sites in Belt Creek adjacent to the town of Belt.

Table A. Summary statistics for fish sampled in control and impact sites. Weights were only included for fish of at least 100 mm in total length. Condition factor was calculated as (CF = weight/length^3 * 100,000). Sources for relative weight formulas are a) Milewski and Brown (1994), b) Simpkins and Hubert (1996), and c) Bister et al. (2000).

Control Site	Total Sampled	Length Avg.	Length S.D.	Weight Avg.	Weight S.D.	Condition Factor Avg.	Condition Factor S.D.	Relative Weight Avg.	Relative Weight S.D.
LL	69	209.8	120	250.7	236	0.95	0.20	87.1[a]	18.7
RB	91	103.2	52	77.1	76	0.89	0.13	82.9[b]	64.9
LN SU	1	288.0	0	245.0	0	1.03	0.00	-	-
MT SU	13	102.6	26	21.4	7	1.12	0.11	-	-
MWF	1	77.0	0	-	-	-	-	-	-
W SU	0	-	-	-	-	-	-	-	-
Impact Site									
LL	38	122.9	91	197.7	135	0.87	0.22	79.91[a]	19.8
RB	10	64.9	8	-	-	-	-	-	-
LN SU	18	284.1	77	249.7	188	0.88	0.14	-	-
MT SU	3	104	28	12.5	4	0.75	0.09	-	-
MWF	0	-	-	-	-	-	-	-	-
W SU	3	193.3	108	147.5	152	0.77	0.19	60.61[c]	283.2

Photo A. Backpack electrofishing in impact section on November 2, 2015.

Photo B. Hess sample collection on September 30, 2015 at site IS2, immediately downstream of AMD.

Photo C. Hess sample collection on September 30, 2015 at site IS1, upstream of AMD.

Photo D. Control section, looking downstream to AMD.

Photo E. Impact section below AMD, looking downstream though fish sampling site.

Photo F. Overhead view of control section showing substrate characteristics.

Photo G. Overhead view of impact section showing substrate characteristics

Photo H. AMD (from Anaconda discharge) entering Belt Creek.

Photo I. Belt Creek where AMD (from Anaconda discharge) is entering on river-left bank. Foreground shows water clarity and substrate characteristics of the control section meeting the poor water quality and substrate characteristics of the AMD impact section.

Photo J. Belt Creek just below AMD (from Anaconda discharge), looking upstream towards control section.

Photo K. Overhead view of AMD (from Anaconda discharge) entering Belt Creek during relatively high flows.

PROJECT: Belt Creek AML **DATE:** 9.30.2015

SITE: AML 1 (Control) **SAMPLE:** All

Lat:

Long: **METHOD:** Hess(3)/Kick(1)

TAXON	*ABUNDANCE*				
PLECOPTERA (stoneflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Capniidae				*0*	
Capniidae				*0*	
Chloroperlidae immature			3	*3*	
Chloroperlinae				*0*	
Katheroperla sp.				*0*	
Neaviperla/Suwallia sp.				*0*	
Paraperla sp.				*0*	
Sweltsa sp.	23	21	22	*66*	1
Leuctridae				*0*	
Despaxia augusta				*0*	
Moselia sp.				*0*	
Nemouridae				*0*	
Amphinemura sp.				*0*	
Malenka sp.				*0*	
Soyedina sp.				*0*	
Visoka cataractae				*0*	
Zapada cincitipes	4		1	*5*	
Zapada columbiana				*0*	
Zapada frigida				*0*	
Zapada oregonensis				*0*	
Peltoperlidae				*0*	
Soliperla sp.				*0*	
Yoraperla sp.				*0*	
Yoraperla brevis				*0*	
Perlidae immature			2	*2*	
Calineuria californica				*0*	
Claassenia sp.	17	17	6	*40*	4
Claassenia sabulosa				*0*	
Doroneuria sp.				*0*	
Hesperoperla pacifica	2	2	2	*6*	2
Perlodidae immature	31	9	35	*75*	15
Frisonia sp.				*0*	
Isoperla sp.		2	17	*19*	4
Megarcys sp.				*0*	
Kogotus sp.				*0*	
Setvena sp.				*0*	
Setvena bradleyi				*0*	
Skwala sp.		1	2	*3*	
Pteronarcyidae				*0*	
Pteronarcella sp.	3		1	*4*	
Pteronarcella badia				*0*	
Pteronarcys sp.	1		2	*3*	
Pteronarcys californica				*0*	
Taeniopterygidae				*0*	

Taeniopterygidae				*0*	
TOTAL	*81*	*52*	*93*	*226*	*26*

EPHEMEROPTERA (mayflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Ameletidae				*0*	
Ameletus sp.	4	1	3	*8*	2
Baetidae				*0*	
Acentrella insignificans				*0*	
Acentrella sp.				*0*	
Baetis bicaudatus				*0*	
Baetis tricaudatus	1			*1*	
Callibaetis sp.				*0*	
Diphetor hageni		2	*5*	*7*	
Ephemerellidae				*0*	
Attenella sp.				*0*	
Caudatella hystrix				*0*	
Caudatella sp.				*0*	
Drunella coloradensis/flavensis				*0*	
Drunella doddsi				*0*	
Drunella grandis				*0*	
Drunella spinifera	2	2		*4*	2
Ephemerella/Seratella immature				*0*	
Ephemerella excrucians	11	10	26	*47*	9
Serratella sp.				*0*	
Serratella tibialis				*0*	
Ephemeridae				*0*	
Ephemera sp.				*0*	
Heptageniidae immature				*0*	
Cinygma sp.				*0*	
Cinygmula sp.	7		9	*16*	3
Epeorus albertae				*0*	
Epeorus deceptivus				*0*	
Epeorus grandis				*0*	
Epeorus longimanus				*0*	
Epeorus sp.				*0*	
Heptagenia sp.		13	13	*26*	
Nixe sp.				*0*	
Rhithrogena sp.	7	8	13	*28*	1
Leptophlebiidae				*0*	
Paraleptophlebia sp.	88	112	150	*350*	24
Leptohyphidae				*0*	
Tricorythodes expicatus	44	43	56	*143*	11
TOTAL	*164*	*191*	*275*	*630*	*52*

COLEOPTERA (beetles)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Amphizoidae (Trout-Stream Beetles)				*0*	
Amphizoa sp.				*0*	
Curculionidae				*0*	
Dryopidae (Long-Toed Water Beetles)				*0*	
Helichus sp.				*0*	
Dytiscidae (Diving Water Beetles)				*0*	
Celina sp.				*0*	
Deronectes sp.				*0*	
Ilybius sp.				*0*	

Oreodytes sp.				*0*	
Elmidae (Riffle Beetles)				*0*	
Cleptelmis sp.				*0*	
Cleptelmis ornata				*0*	
Heterlimnius sp.				*0*	
Heterlimnius corpulentus				*0*	
Lara avara				*0*	
Microcylleopus sp.	1		1	*2*	5
Narpus concolor				*0*	
Optioservus sp.	182	107	116	*405*	18
Stenelmis sp.				*0*	
Zaitzevia sp.	174	84	52	*310*	17
Haplidae				*0*	
Halipus sp.	3			*3*	
Hydraenidae				*0*	
Ochthebius sp.				*0*	
Hydrophilidae (Crawling Water Beetles)				*0*	
Hydrophilidae				*0*	
TOTAL	*360*	*191*	*169*	*720*	*40*

TRICHOPTERA (caddisflies)	Hess 1	Hess 2	Hess 3	Total	Kick
Apataniidae				*0*	
Apatania sp.				*0*	
Brachycentridae immature		3	3	*6*	
Amiocentrus sp.				*0*	
Brachycentrus americanus				*0*	
Brachycentrus occidentalis	7	12	4	*23*	4
Micrasema sp.				*0*	
Micrasema bactro				*0*	
Glossosomatidae				*0*	
Agapetus sp.				*0*	
Anagapetus sp.				*0*	
Glossosoma sp.				*0*	
Helicopsychidae				*0*	
Helicopsyche sp.	47	32	21	*100*	
Hydropsychidae immature		11	24	*35*	3
Arctopsyche grandis				*0*	
Ceratopsyche sp.	132	31	63	*226*	5
Ceratopsyche oslari				*0*	
Cheumatopsyche sp.	131	59	100	*290*	11
Hydropsyche sp.	133	55	81	*269*	36
Parapsyche almota				*0*	
Parapsyche sp.				*0*	
Parapsyche elsis				*0*	
Hydroptilidae				*0*	
Agrayela sp.				*0*	
Hydroptila sp.			1	*1*	
Mayatrichia sp.				*0*	
Lepidostomatidae				*0*	
Lepidostoma sp.	14	25	20	*59*	6
Leptoceridae				*0*	
Nectopsyche sp.				*0*	
Oecetis sp.	88	84	92	*264*	16
Limnephilidae				*0*	
Chryandra sp.				*0*	
Cryptochia sp.				*0*	
Desmona sp.				*0*	
Dicosmoecus sp.				*0*	

Ecclisomyia sp.				*0*	
Glyphopsyche sp.				*0*	
Limnephilus sp.				*0*	
Psychoglypha sp.				*0*	
Philopotamidae				*0*	
Dolophilodes sp.				*0*	
Wormaldia sp.				*0*	
Polycentropodidae				*0*	
Polycentropus sp.	1	4	3	*8*	
Psychomyiidae				*0*	
Psychomyia sp.				*0*	
Rhyacophilidae				*0*	
Rhyacophila Angelita gr.				*0*	
Rhyacophila Betteni gr.				*0*	
Rhyacophila Brunnea/Vemna grs.				*0*	
Rhyacophila Grandis gr.				*0*	
Rhyacophila Hyalinata gr.				*0*	
Rhyacophila Iranda/Vofixa gr.				*0*	
Rhyacophila Lieftincki gr.				*0*	
Rhyacophila Sibirica gr.				*0*	
Rhyacophila blarina				*0*	
Rhyacophila narvae				*0*	
Rhyacophila pellisa				*0*	
Rhyacophila Vagrita gr.				*0*	
Rhyacophila Verrula gr.				*0*	
Uenoidae				*0*	
Neophylax sp.				*0*	
Neothremma sp.				*0*	
Oligophlebodes sp.				*0*	
TOTAL	*553*	*316*	*412*	*1281*	*81*

DIPTERA (true flies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Athericidae				*0*	
Atherix sp.	1			*1*	
Ceratopogonidae				*0*	
Ceratopogoninae	3		1	*4*	
Chironomidae	143	136	278	*557*	46
Empididae				*0*	
Chelifera sp.			4	*4*	2
Clinocera sp.				*0*	
Hemerodromia sp.	15	9	11	*35*	5
Oreogeton sp.				*0*	
Limoniidae				*0*	
Hesperoconopa sp.				*0*	
Rhabdomastix sp.				*0*	
Muscidae				*0*	
Limnophora sp.			1	*1*	1
Pelecorhynchidae				*0*	
Glutops sp.				*0*	
Psychodidae				*0*	
Pericoma sp.				*0*	
Simuliidae				*0*	
Prosimulium sp.				*0*	
Simulium spp. (Eusimulium)				*0*	
Stratiomyidae				*0*	
Stratiomyidae				*0*	

Tanyderidae				*0*	
Protanyderus sp.				*0*	
Tipulidae				*0*	
Antocha sp.	1	2	3	*6*	
Dicranota sp.				*0*	
Hexatoma sp.	11	3	1	*15*	1
Ormosia/Limonia sp.	5	11	7	*23*	2
Tipula sp.	4	3	5	*12*	3
TOTAL	*183*	*164*	*311*	*658*	*60*

NON-INSECT TAXA	Hess 1	Hess 2	Hess 3	Total	Kick
Annelida				*0*	
Enchytraeidae				*0*	
Lumbricidae				*0*	
Oligochaeta (earthworms)				*0*	
Bivalvia				*0*	
Sphaeriidae/Pisidiidae				*0*	
Pisidium sp.		1		*1*	
Gastropoda				*0*	
Lymnaeidae	8	16		*24*	15
Physidae				*0*	
Physella sp.	15	10	3	*28*	10
Planorbidae				*0*	
Planorbella sp.				*0*	1
Nematoda				*0*	
Nematoda				*0*	
Platyhelminthes				*0*	
Turbellaria		3		*3*	
TOTAL	*23*	*30*	*3*	*56*	*26*

HEMIPTERA	Hess 1	Hess 2	Hess 3	Total	Kick
Corixidae				*0*	
Corixidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

LEPIDOPTERA	Hess 1	Hess 2	Hess 3	Total	Kick
Cramidae				*0*	
Petrophila sp.	5	3	12	*20*	
TOTAL	*5*	*3*	*12*	*20*	*0*

ODONATA	Hess 1	Hess 2	Hess 3	Total	Kick
Zygoptera				*0*	
Coenagrionidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

TROMBIDIFORMES	Hess 1	Hess 2	Hess 3	Total	Kick
Hydrachnidia				*0*	
Hydrocarina (water mite)	149	64	124	*337*	15
TOTAL	*149*	*64*	*124*	*337*	*15*

FINAL SAMPLE TOTALS	***1518***	***1011***	***1399***	***3928***	***300***

PROJECT: Belt Creek AML **DATE:** 9.30.2015

SITE: AML 2 **SAMPLE:** All

Lat:

Long: **METHOD:** Hess(3)/Kick(1)

TAXON	*ABUNDANCE*				
PLECOPTERA (stoneflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Capniidae				*0*	
Capniidae				*0*	
Chloroperlidae immature				*0*	1
Chloroperlinae				*0*	
Katheroperla sp.				*0*	
Neaviperla/Suwallia sp.				*0*	
Paraperla sp.				*0*	
Sweltsa sp.				*0*	16
Leuctridae				*0*	
Despaxia augusta				*0*	
Moselia sp.				*0*	
Nemouridae				*0*	
Amphinemura sp.				*0*	
Malenka sp.				*0*	
Soyedina sp.				*0*	
Visoka cataractae				*0*	
Zapada cincitipes			1	*1*	
Zapada columbiana				*0*	
Zapada frigida				*0*	
Zapada oregonensis				*0*	
Peltoperlidae				*0*	
Soliperla sp.				*0*	
Yoraperla sp.				*0*	
Yoraperla brevis				*0*	
Perlidae immature				*0*	
Calineuria californica				*0*	
Claassenia sp.				*0*	
Claassenia sabulosa				*0*	
Doroneuria sp.				*0*	
Hesperoperla pacifica				*0*	
Perlodidae immature				*0*	
Frisonia sp.				*0*	
Isoperla sp.				*0*	
Megarcys sp.				*0*	
Kogotus sp.				*0*	
Setvena sp.				*0*	
Setvena bradleyi				*0*	
Skwala sp.				*0*	
Pteronarcyidae				*0*	
Pteronarcella sp.				*0*	
Pteronarcella badia				*0*	
Pteronarcys sp.				*0*	
Pteronarcys californica				*0*	
Taeniopterygidae				*0*	

Taeniopterygidae				*0*	
TOTAL	*0*	*0*	*1*	*1*	*17*

EPHEMEROPTERA (mayflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Ameletidae				*0*	
Ameletus sp.				*0*	
Baetidae				*0*	
Acentrella insignificans				*0*	
Acentrella sp.				*0*	
Baetis bicaudatus				*0*	
Baetis tricaudatus				*0*	
Callibaetis sp.				*0*	
Diphetor hageni				*0*	
Ephemerellidae				*0*	
Attenella sp.				*0*	
Caudatella hystrix				*0*	
Caudatella sp.				*0*	
Drunella coloradensis/flavensis				*0*	
Drunella doddsi				*0*	
Drunella grandis				*0*	
Drunella spinifera				*0*	
Ephemerella/Seratella immature				*0*	
Ephemerella excrucians	1			*1*	1
Serratella sp.				*0*	
Serratella tibialis				*0*	
Ephemeridae				*0*	
Ephemera sp.				*0*	
Heptageniidae immature				*0*	
Cinygma sp.				*0*	
Cinygmula sp.				*0*	
Epeorus albertae				*0*	
Epeorus deceptivus				*0*	
Epeorus grandis				*0*	
Epeorus longimanus				*0*	
Epeorus sp.				*0*	
Heptagenia sp.				*0*	
Nixe sp.				*0*	
Rhithrogena sp.				*0*	
Leptophlebiidae				*0*	
Paraleptophlebia sp.				*0*	
Leptohyphidae				*0*	
Tricorythodes expicatus	1			*1*	
TOTAL	*2*	*0*	*0*	*2*	*1*

COLEOPTERA (beetles)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Amphizoidae (Trout-Stream Beetles)				*0*	
Amphizoa sp.				*0*	
Curculionidae				*0*	
Dryopidae (Long-Toed Water Beetles)				*0*	
Helichus sp.				*0*	1
Dytiscidae (Diving Water Beetles)				*0*	
Celina sp.				*0*	
Deronectes sp.				*0*	
Ilybius sp.				*0*	

Oreodytes sp.				*0*	
Elmidae (Riffle Beetles)				*0*	
Cleptelmis sp.				*0*	
Cleptelmis ornata				*0*	
Heterlimnius sp.				*0*	
Heterlimnius corpulentus				*0*	
Lara avara				*0*	
Microcylleopus sp.				*0*	1
Narpus concolor				*0*	
Optioservus sp.	1	13	14	*28*	43
Stenelmis sp.				*0*	
Zaitzevia sp.	*7*	8	27	*42*	43
Haplidae				*0*	
Halipus sp.				*0*	
Hydraenidae				*0*	
Ochthebius sp.				*0*	
Hydrophilidae (Crawling Water Beetles)				*0*	
Hydrophilidae				*0*	
TOTAL	*8*	*21*	*41*	*70*	*88*

TRICHOPTERA (caddisflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Apataniidae				*0*	
Apatania sp.				*0*	
Brachycentridae				*0*	
Amiocentrus sp.				*0*	
Brachycentrus americanus				*0*	
Brachycentrus occidentalis				*0*	1
Micrasema sp.				*0*	
Micrasema bactro				*0*	
Glossosomatidae				*0*	
Agapetus sp.				*0*	
Anagapetus sp.				*0*	
Glossosoma sp.				*0*	
Helicopsychidae				*0*	
Helicopsyche sp.	1		2	*3*	5
Hydropsychidae immature				*0*	1
Arctopsyche grandis				*0*	
Ceratopsyche sp.		1		*1*	1
Ceratopsyche oslari				*0*	
Cheumatopsyche sp.				*0*	1
Hydropsyche sp.				*0*	1
Parapsyche almota				*0*	
Parapsyche sp.				*0*	
Parapsyche elsis				*0*	
Hydroptilidae				*0*	
Agrayela sp.				*0*	
Hydroptila sp.				*0*	
Mayatrichia sp.				*0*	
Lepidostomatidae				*0*	
Lepidostoma sp.				*0*	
Leptoceridae				*0*	
Nectopsyche sp.				*0*	
Oecetis sp.	1		3	*4*	4
Limnephilidae				*0*	

Chryandra sp.				*0*	
Cryptochia sp.				*0*	
Desmona sp.				*0*	
Dicosmoecus sp.				*0*	
Ecclisomyia sp.				*0*	
Glyphopsyche sp.				*0*	
Limnephilus sp.				*0*	
Psychoglypha sp.				*0*	
Philopotamidae				*0*	
Dolophilodes sp.				*0*	
Wormaldia sp.				*0*	
Polycentropodidae				*0*	
Polycentropus sp.				*0*	
Psychomyiidae				*0*	
Psychomyia sp.				*0*	
Rhyacophilidae				*0*	
Rhyacophila Angelita gr.				*0*	
Rhyacophila Betteni gr.				*0*	
Rhyacophila Brunnea/Vemna grs.				*0*	
Rhyacophila Grandis gr.				*0*	
Rhyacophila Hyalinata gr.				*0*	
Rhyacophila Iranda/Vofixa gr.				*0*	
Rhyacophila Lieftincki gr.				*0*	
Rhyacophila Sibirica gr.				*0*	
Rhyacophila blarina				*0*	
Rhyacophila narvae				*0*	
Rhyacophila pellisa				*0*	
Rhyacophila Vagrita gr.				*0*	
Rhyacophila Verrula gr.				*0*	
Uenoidae				*0*	
Neophylax sp.				*0*	
Neothremma sp.				*0*	
Oligophlebodes sp.				*0*	
TOTAL	*2*	*1*	*5*	*8*	*14*

DIPTERA (true flies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Athericidae				*0*	
Atherix sp.				*0*	
Ceratopogonidae				*0*	
Ceratopogoninae		2		*2*	8
Chironomidae	2	4		*6*	12
Empididae				*0*	
Chelifera sp.				*0*	
Clinocera sp.				*0*	
Hemerodromia sp.				*0*	
Oreogeton sp.				*0*	
Limoniidae				*0*	
Hesperoconopa sp.				*0*	
Rhabdomastix sp.				*0*	
Muscidae				*0*	
Limnophora sp.				*0*	1
Pelecorhynchidae				*0*	
Glutops sp.				*0*	
Psychodidae				*0*	
Pericoma sp.				*0*	

Simuliidae				*0*	
Prosimulium sp.				*0*	
Simulium spp. (Eusimulium)				*0*	
Stratiomyidae				*0*	
Stratiomyidae				*0*	
Tanyderidae				*0*	
Protanyderus sp.				*0*	
Tipulidae				*0*	
Antocha sp.				*0*	
Dicranota sp.				*0*	
Hexatoma sp.	1		2	*3*	1
Ormosia/Limonia sp.	1	1		*2*	3
Tipula sp.				*0*	2
TOTAL	*4*	*7*	*2*	*13*	*27*

NON-INSECT TAXA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Annelida				*0*	
Enchytraeidae				*0*	
Lumbricidae				*0*	
Oligochaeta (earthworms)				*0*	
Bivalvia				*0*	
Sphaeriidae/Pisidiidae				*0*	
Pisidium sp.				*0*	
Gastropoda				*0*	
Lymnaeidae	1	2	5	*8*	71
Physidae				*0*	
Physella sp.	2	5	4	*11*	79
Planorbidae				*0*	
Planorbella sp.				*0*	
Nematoda				*0*	
Nematoda			1	*1*	2
Platyhelminthes				*0*	
Turbellaria				*0*	
TOTAL	*3*	*7*	*10*	*20*	*152*

HEMIPTERA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Corixidae				*0*	
Corixidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

LEPIDOPTERA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Cramidae				*0*	
Petrophila sp.				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

ODONATA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Zygoptera				*0*	
Coenagrionidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

TROMBIDIFORMES	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Hydrachnidia				*0*	
Hydrocarina (water mite)		1		*1*	1
TOTAL	*0*	*1*	*0*	*1*	*1*
FINAL SAMPLE TOTALS	***19***	***37***	***59***	***115***	***300***

PROJECT: Belt Creek AML **DATE:** 9.30.2015

SITE: AML 3 **SAMPLE:** All

Lat:

Long: **METHOD:** Hess(3)/Kick(1)

TAXON	*ABUNDANCE*				
PLECOPTERA (stoneflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Capniidae				*0*	
Capniidae				*0*	
Chloroperlidae immature				*0*	
Chloroperlinae				*0*	
Katheroperla sp.				*0*	
Neaviperla/Suwallia sp.				*0*	
Paraperla sp.				*0*	
Sweltsa sp.	22		5	*27*	11
Leuctridae				*0*	
Despaxia augusta				*0*	
Moselia sp.				*0*	
Nemouridae				*0*	
Amphinemura sp.				*0*	
Malenka sp.				*0*	
Soyedina sp.				*0*	
Visoka cataractae				*0*	
Zapada cincitipes				*0*	1
Zapada columbiana				*0*	
Zapada frigida				*0*	
Zapada oregonensis				*0*	
Peltoperlidae				*0*	
Soliperla sp.				*0*	
Yoraperla sp.				*0*	
Yoraperla brevis				*0*	
Perlidae immature				*0*	
Calineuria californica				*0*	
Claassenia sp.				*0*	
Claassenia sabulosa				*0*	
Doroneuria sp.				*0*	
Hesperoperla pacifica	1		1	*2*	1
Perlodidae immature				*0*	
Frisonia sp.				*0*	
Isoperla sp.				*0*	
Megarcys sp.				*0*	
Kogotus sp.				*0*	
Setvena sp.				*0*	
Setvena bradleyi				*0*	
Skwala sp.				*0*	
Pteronarcyidae				*0*	
Pteronarcella sp.				*0*	
Pteronarcella badia				*0*	
Pteronarcys sp.				*0*	
Pteronarcys californica				*0*	
Taeniopterygidae				*0*	

Taeniopterygidae				*0*	
TOTAL	*23*	*0*	*6*	*29*	*13*

EPHEMEROPTERA (mayflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Ameletidae				*0*	
Ameletus sp.				*0*	1
Baetidae				*0*	
Acentrella insignificans				*0*	
Acentrella sp.				*0*	
Baetis bicaudatus				*0*	
Baetis tricaudatus				*0*	
Callibaetis sp.				*0*	
Diphetor hageni				*0*	
Ephemerellidae				*0*	
Attenella sp.				*0*	
Caudatella hystrix				*0*	
Caudatella sp.				*0*	
Drunella coloradensis/flavensis				*0*	
Drunella doddsi				*0*	
Drunella grandis				*0*	
Drunella spinifera				*0*	
Ephemerella/Seratella immature				*0*	
Ephemerella excrucians				*0*	
Serratella sp.				*0*	
Serratella tibialis				*0*	
Ephemeridae				*0*	
Ephemera sp.	1			*1*	
Heptageniidae immature				*0*	
Cinygma sp.				*0*	
Cinygmula sp.				*0*	
Epeorus albertae				*0*	
Epeorus deceptivus				*0*	
Epeorus grandis				*0*	
Epeorus longimanus				*0*	
Epeorus sp.				*0*	
Heptagenia sp.				*0*	
Nixe sp.				*0*	
Rhithrogena sp.				*0*	
Leptophlebiidae				*0*	
Paraleptophlebia sp.				*0*	
Leptohyphidae				*0*	
Tricorythodes expicatus	1			*1*	1
TOTAL	*2*	*0*	*0*	*2*	*2*

COLEOPTERA (beetles)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Amphizoidae (Trout-Stream Beetles)				*0*	
Amphizoa sp.				*0*	
Curculionidae				*0*	
Dryopidae (Long-Toed Water Beetles)				*0*	
Helichus sp.			**1**	*1*	
Dytiscidae (Diving Water Beetles)	1			*1*	
Celina sp.				*0*	
Deronectes sp.				*0*	
Ilybius sp.				*0*	

Oreodytes sp.				*0*	
Elmidae (Riffle Beetles)				*0*	
Cleptelmis sp.				*0*	
Cleptelmis ornata				*0*	
Heterlimnius sp.				*0*	
Heterlimnius corpulentus				*0*	
Lara avara				*0*	
Microcylleopus sp.	1			*1*	
Narpus concolor				*0*	
Optioservus sp.	43	18	6	*67*	33
Stenelmis sp.	3		2	*5*	7
Zaitzevia sp.	64	46	16	*126*	48
Haplidae				*0*	
Halipus sp.				*0*	
Hydraenidae				*0*	
Ochthebius sp.				*0*	
Hydrophilidae (Crawling Water Beetles)				*0*	
Hydrophilidae				*0*	
TOTAL	*112*	*64*	*25*	*201*	*88*

TRICHOPTERA (caddisflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Apataniidae				*0*	
Apatania sp.				*0*	
Brachycentridae				*0*	
Amiocentrus sp.				*0*	
Brachycentrus americanus				*0*	
Brachycentrus occidentalis				*0*	
Micrasema sp.				*0*	
Micrasema bactro				*0*	
Glossosomatidae				*0*	
Agapetus sp.				*0*	
Anagapetus sp.				*0*	
Glossosoma sp.				*0*	
Helicopsychidae				*0*	
Helicopsyche sp.				*0*	
Hydropsychidae immature				*0*	
Arctopsyche grandis				*0*	
Ceratopsyche sp.				*0*	
Ceratopsyche oslari				*0*	
Cheumatopsyche sp.				*0*	
Hydropsyche sp.				*0*	
Parapsyche almota				*0*	
Parapsyche sp.				*0*	
Parapsyche elsis				*0*	
Hydroptilidae				*0*	
Agrayela sp.				*0*	
Hydroptila sp.				*0*	
Mayatrichia sp.				*0*	
Lepidostomatidae				*0*	
Lepidostoma sp.				*0*	
Leptoceridae				*0*	
Nectopsyche sp.				*0*	
Oecetis sp.				*0*	
Limnephilidae				*0*	
Chryandra sp.				*0*	
Cryptochia sp.				*0*	
Desmona sp.				*0*	
Dicosmoecus sp.				*0*	

Ecclisomyia sp.				*0*	
Glyphopsyche sp.				*0*	
Limnephilus sp.				*0*	
Psychoglypha sp.				*0*	
Philopotamidae				*0*	
Dolophilodes sp.				*0*	
Wormaldia sp.				*0*	
Polycentropodidae				*0*	
Polycentropus sp.				*0*	
Psychomyiidae				*0*	
Psychomyia sp.				*0*	
Rhyacophilidae				*0*	
Rhyacophila Angelita gr.				*0*	
Rhyacophila Betteni gr.				*0*	
Rhyacophila Brunnea/Vemna grs.				*0*	
Rhyacophila Grandis gr.				*0*	
Rhyacophila Hyalinata gr.				*0*	
Rhyacophila Iranda/Vofixa gr.				*0*	
Rhyacophila Lieftincki gr.				*0*	
Rhyacophila Sibirica gr.				*0*	
Rhyacophila blarina				*0*	
Rhyacophila narvae				*0*	
Rhyacophila pellisa				*0*	
Rhyacophila Vagrita gr.				*0*	
Rhyacophila Verrula gr.				*0*	
Uenoidae				*0*	
Neophylax sp.				*0*	
Neothremma sp.				*0*	
Oligophlebodes sp.				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

DIPTERA (true flies)	Hess 1	Hess 2	Hess 3	Total	Kick
Athericidae				*0*	
Atherix sp.		1		*1*	
Ceratopogonidae				*0*	
Ceratopogoninae	4	4		*8*	6
Chironomidae	3	1	1	*5*	2
Empididae				*0*	
Chelifera sp.				*0*	
Clinocera sp.				*0*	
Hemerodromia sp.				*0*	
Oreogeton sp.				*0*	
Limoniidae				*0*	
Hesperoconopa sp.				*0*	
Rhabdomastix sp.				*0*	
Muscidae				*0*	
Limnophora sp.				*0*	
Pelecorhynchidae				*0*	
Glutops sp.				*0*	
Psychodidae				*0*	
Pericoma sp.				*0*	
Simuliidae				*0*	
Prosimulium sp.				*0*	
Simulium spp. (Eusimulium)				*0*	
Stratiomyidae				*0*	
Stratiomyidae				*0*	
Tanyderidae				*0*	

Protanyderus sp.				*0*	
Tipulidae				*0*	
Antocha sp.				*0*	
Dicranota sp.				*0*	
Hexatoma sp.	2	2	3	*7*	2
Ormosia/Limonia sp.				*0*	
Tipula sp.				*0*	
TOTAL	*9*	*8*	*4*	*21*	*10*

NON-INSECT TAXA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Annelida				*0*	
Enchytraeidae				*0*	
Lumbricidae				*0*	
Oligochaeta (earthworms)			1	*1*	1
Bivalvia				*0*	
Sphaeriidae/Pisidiidae				*0*	
Pisidium sp.				*0*	
Gastropoda				*0*	
Lymnaeidae				*0*	
Physidae				*0*	
Physella sp.				*0*	
Planorbidae				*0*	
Planorbella sp.				*0*	
Nematoda				*0*	
Nematoda	1			*1*	
Platyhelminthes				*0*	
Turbellaria				*0*	
TOTAL	*1*	*0*	*1*	*2*	*1*

HEMIPTERA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Corixidae				*0*	
Corixidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

LEPIDOPTERA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Cramidae				*0*	
Petrophila sp.				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

ODONATA	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Zygoptera				*0*	
Coenagrionidae				*0*	
TOTAL	*0*	*0*	*0*	*0*	*0*

TROMBIDIFORMES	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Hydrachnidia				*0*	
Hydrocarina (water mite)	5			*5*	5
TOTAL	*5*	*0*	*0*	*5*	*5*

FINAL SAMPLE TOTALS	***152***	***72***	***36***	***260***	***119***

PROJECT: Belt Creek AML **DATE:** 9.30.2015

SITE: AML 4 **SAMPLE:** All

Lat:

Long: **METHOD:** Hess(3)/Kick(1)

TAXON	*ABUNDANCE*				
PLECOPTERA (stoneflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Capniidae				*0*	
Capniidae				*0*	
Chloroperlidae immature	5	7	7	*19*	
Chloroperlinae				*0*	
Katheroperla sp.				*0*	
Neaviperla/Suwallia sp.				*0*	
Paraperla sp.				*0*	
Sweltsa sp.	24	42	51	*117*	5
Leuctridae				*0*	
Despaxia augusta				*0*	
Moselia sp.				*0*	
Nemouridae				*0*	
Amphinemura sp.				*0*	
Malenka sp.				*0*	
Soyedina sp.				*0*	
Visoka cataractae				*0*	
Zapada cincitipes				*0*	
Zapada columbiana				*0*	
Zapada frigida				*0*	
Zapada oregonensis				*0*	
Peltoperlidae				*0*	
Soliperla sp.				*0*	
Yoraperla sp.				*0*	
Yoraperla brevis				*0*	
Perlidae immature				*0*	
Calineuria californica				*0*	
Claassenia sp.			1	*1*	
Claassenia sabulosa				*0*	
Doroneuria sp.				*0*	
Hesperoperla pacifica	1			*1*	
Perlodidae immature				*0*	
Frisonia sp.				*0*	
Isoperla sp.				*0*	
Megarcys sp.				*0*	
Kogotus sp.				*0*	
Setvena sp.				*0*	
Setvena bradleyi				*0*	
Skwala sp.				*0*	
Pteronarcyidae				*0*	
Pteronarcella sp.				*0*	
Pteronarcella badia				*0*	
Pteronarcys sp.				*0*	
Pteronarcys californica				*0*	
Taeniopterygidae				*0*	
Taeniopterygidae				*0*	

TOTAL	*30*	*49*	*59*	*138*	*5*

EPHEMEROPTERA (mayflies)	Hess 1	Hess 2	Hess 3	Total	Kick
Ameletidae				*0*	
Ameletus sp.			1	*1*	1
Baetidae				*0*	
Acentrella insignificans				*0*	
Acentrella sp.				*0*	
Baetis bicaudatus				*0*	
Baetis tricaudatus	1			*1*	1
Callibaetis sp.				*0*	
Diphetor hageni				*0*	
Ephemerellidae				*0*	
Attenella sp.				*0*	
Caudatella hystrix				*0*	
Caudatella sp.				*0*	
Drunella coloradensis/flavensis				*0*	
Drunella doddsi				*0*	
Drunella grandis				*0*	
Drunella spinifera				*0*	
Ephemerella/Seratella immature				*0*	
Ephemerella excrucians	23	9	17	*49*	8
Serratella sp.				*0*	
Serratella tibialis				*0*	
Ephemeridae				*0*	
Ephemera sp.	16	12	56	*84*	2
Heptageniidae immature				*0*	
Cinygma sp.				*0*	
Cinygmula sp.				*0*	
Epeorus albertae				*0*	
Epeorus deceptivus				*0*	
Epeorus grandis				*0*	
Epeorus longimanus				*0*	
Epeorus sp.				*0*	
Heptagenia sp.		1	1	*2*	
Nixe sp.				*0*	
Rhithrogena sp.	3	5	14	*22*	4
Leptophlebiidae				*0*	
Paraleptophlebia sp.	45	57	99	*201*	43
Leptohyphidae				*0*	
Tricorythodes expicatus	153	70	60	*283*	17
TOTAL	*241*	*154*	*248*	*643*	*76*

COLEOPTERA (beetles)	Hess 1	Hess 2	Hess 3	Total	Kick
Amphizoidae (Trout-Stream Beetles)				*0*	
Amphizoa sp.				*0*	
Curculionidae				*0*	
Dryopidae (Long-Toed Water Beetles)				*0*	
Helichus sp.				*0*	
Dytiscidae (Diving Water Beetles)				*0*	
Celina sp.				*0*	
Deronectes sp.				*0*	
Ilybius sp.				*0*	
Oreodytes sp.				*0*	

Elmidae (Riffle Beetles) immature	13	8		*21*	
Cleptelmis sp.				*0*	
Cleptelmis ornata				*0*	
Heterlimnius sp.				*0*	
Heterlimnius corpulentus				*0*	
Lara avara				*0*	
Microcylleopus sp.	84	7	7	*98*	5
Narpus concolor				*0*	
Optioservus sp.	336	162	158	*656*	56
Stenelmis sp.	19	15	6	*40*	6
Zaitzevia sp.	178	160	147	*485*	21
Haplidae				*0*	
Halipus sp.				*0*	
Hydraenidae				*0*	
Ochthebius sp.				*0*	
Hydrophilidae (Crawling Water Beetles)				*0*	
Hydrophilidae				*0*	
TOTAL	*630*	*352*	*318*	*1300*	*88*

TRICHOPTERA (caddisflies)	**Hess 1**	**Hess 2**	**Hess 3**	**Total**	**Kick**
Apataniidae				*0*	
Apatania sp.				*0*	
Brachycentridae				*0*	
Amiocentrus sp.				*0*	
Brachycentrus americanus				*0*	
Brachycentrus occidentalis	28	8	25	*61*	4
Micrasema sp.				*0*	
Micrasema bactro				*0*	
Glossosomatidae				*0*	
Agapetus sp.				*0*	
Anagapetus sp.				*0*	
Glossosoma sp.				*0*	
Helicopsychidae				*0*	
Helicopsyche sp.	24	2	130	*156*	4
Hydropsychidae immature	13	8	9	*30*	3
Arctopsyche grandis				*0*	
Ceratopsyche sp.	258	69	99	*426*	24
Ceratopsyche oslari				*0*	
Cheumatopsyche sp.	108	94	80	*282*	23
Hydropsyche sp.	53	11	28	*92*	15
Parapsyche almota				*0*	
Parapsyche sp.				*0*	
Parapsyche elsis				*0*	
Hydroptilidae				*0*	
Agrayela sp.				*0*	
Hydroptila sp.	4	2	2	*8*	
Mayatrichia sp.				*0*	
Lepidostomatidae				*0*	
Lepidostoma sp.	1	2	4	*7*	1
Leptoceridae				*0*	
Nectopsyche sp.	5			*5*	
Oecetis sp.	184	185	66	*435*	14
Limnephilidae				*0*	
Chryandra sp.				*0*	
Cryptochia sp.				*0*	
Desmona sp.				*0*	
Dicosmoecus sp.				*0*	

Ecclisomyia sp.				*0*	
Glyphopsyche sp.				*0*	
Limnephilus sp.				*0*	
Psychoglypha sp.				*0*	
Philopotamidae				*0*	
Dolophilodes sp.				*0*	
Wormaldia sp.				*0*	
Polycentropodidae				*0*	
Polycentropus sp.				*0*	
Psychomyiidae				*0*	
Psychomyia sp.				*0*	
Rhyacophilidae				*0*	
Rhyacophila Angelita gr.				*0*	
Rhyacophila Betteni gr.				*0*	
Rhyacophila Brunnea/Vemna grs.				*0*	
Rhyacophila Grandis gr.				*0*	
Rhyacophila Hyalinata gr.				*0*	
Rhyacophila Iranda/Vofixa gr.	2			*2*	
Rhyacophila Lieftincki gr.				*0*	
Rhyacophila Sibirica gr.				*0*	
Rhyacophila blarina				*0*	
Rhyacophila narvae				*0*	
Rhyacophila pellisa				*0*	
Rhyacophila Vagrita gr.				*0*	
Rhyacophila Verrula gr.				*0*	
Uenoidae				*0*	
Neophylax sp.				*0*	
Neothremma sp.				*0*	
Oligophlebodes sp.				*0*	
TOTAL	*680*	*381*	*443*	*1504*	*88*

DIPTERA (true flies)	Hess 1	Hess 2	Hess 3	Total	Kick
Athericidae				*0*	
Atherix sp.	1			*1*	
Ceratopogonidae				*0*	
Ceratopogoninae	6	2		*8*	
Chironomidae	80	169	55	*304*	16
Empididae				*0*	
Chelifera sp.				*0*	
Clinocera sp.				*0*	
Hemerodromia sp.	4	5	3	*12*	1
Oreogeton sp.				*0*	
Limoniidae				*0*	
Hesperoconopa sp.				*0*	
Rhabdomastix sp.				*0*	
Muscidae				*0*	
Limnophora sp.				*0*	
Pelecorhynchidae				*0*	
Glutops sp.				*0*	
Psychodidae				*0*	
Pericoma sp.				*0*	
Simuliidae				*0*	
Prosimulium sp.				*0*	
Simulium spp. (Eusimulium)				*0*	
Stratiomyidae				*0*	
Stratiomyidae				*0*	
Tanyderidae				*0*	

Protanyderus sp.				*0*	
Tipulidae				*0*	
Antocha sp.				*0*	
Dicranota sp.				*0*	
Hexatoma sp.	15	22	5	*42*	5
Ormosia/Limonia sp.			1	*1*	
Tipula sp.				*0*	
TOTAL	*106*	*198*	*64*	*368*	*22*

NON-INSECT TAXA	Hess 1	Hess 2	Hess 3	Total	Kick
Annelida				*0*	
Enchytraeidae				*0*	
Lumbricidae				*0*	
Oligochaeta (earthworms)		1	1	*2*	
Bivalvia				*0*	
Sphaeriidae/Pisidiidae				*0*	
Pisidium sp.				*0*	
Gastropoda				*0*	
Lymnaeidae				*0*	
Physidae				*0*	
Physella sp.		1	2	*3*	
Planorbidae				*0*	
Planorbella sp.				*0*	
Nematoda				*0*	
Nematoda	3	2	2	*7*	
Platyhelminthes				*0*	
Turbellaria	1	5		*6*	1
TOTAL	*4*	*9*	*5*	*18*	*1*

HEMIPTERA	Hess 1	Hess 2	Hess 3	Total	Kick
Corixidae				*0*	
Corixidae		1		*1*	
TOTAL	*0*	*1*	*0*	*1*	*0*

LEPIDOPTERA	Hess 1	Hess 2	Hess 3	Total	Kick
Cramidae				*0*	
Petrophila sp.	25	38	17	*80*	6
TOTAL	*25*	*38*	*17*	*80*	*6*

ODONATA	Hess 1	Hess 2	Hess 3	Total	Kick
Zygoptera				*0*	
Coenagrionidae			1	*1*	
TOTAL	*0*	*0*	*1*	*1*	*0*

TROMBIDIFORMES	Hess 1	Hess 2	Hess 3	Total	Kick
Hydrachnidia				*0*	
Hydrocarina (water mite)	181	41	92	*314*	14
TOTAL	*181*	*41*	*92*	*314*	*14*

FINAL SAMPLE TOTALS	***1897***	***1223***	***1247***	***4367***	***300***