

Technical Memorandum BCWA



Date: January 27, 2016
To: Bear Creek Watershed Association
From: Russell N. Clayshulte, Manager
Re: BCWA TM 2015.12 Macroinvertebrates

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2015 Stations

Since 2004, the BCWA has conducted macroinvertebrate sampling and data collection at up to 14 sites along the mainstem of Bear Creek (*BCWA Fact Sheet 32 Stream Macroinvertebrates*), including Colorado Parks and Wildlife fish survey sites along Bear Creek: Bear Creek Lake Park, Morrison (west end), Idledale, Lair o' the Bear Park, O' Fallon Park, Bear Creek Cabins, Main Street Evergreen (across from the Little Bear), above Evergreen Lake upstream within Dedisse Park, Singing River Ranch, Bear Tracks near Mount Evans Wilderness, above Singing River Ranch, and Golden Willow Bridge.

There was no macroinvertebrate sampling done in 2013 due to the September flood event (Fact Sheet 16 September 2013 Flood, Fact Sheet 14 Flood Recovery Tips, Fact Sheet 17 Health, Hydrology & Sediments, and Fact Sheet 18 Flood Score Card). The mainstem of Bear Creek was extensively altered by the flood event, with deep stream bed scouring. Macroinvertebrate habitat was clearly affected by the flood event. In 2014, the BCWA selected ten sample sites to continue the Macroinvertebrate sampling program (*BCWA TM 2014.13 Macroinvertebrates BCW*).

2015 was a record flow year with about 83,000 ac-feet flow on Bear Creek. The high flow began subsiding on Bear Creek by late August. The BCWA sampled for macroinvertebrates when the flow on the mainstem of segment 1e dropped to about 22-25 cfs on September 21 and 22, 2015, which was within the recommended sampling index period.

The WQCD recommended standard index period is July 1 to October 1 for the Bear Creek Watershed elevations (Sampling protocols outlined in Appendix B of Policy 10-1. Aquatic Life Use Attainment Methodology To Determine Use Attainment For Rivers And Streams). However, the division recognizes that uncharacteristic flow conditions, including but not limited to, seasonal irrigation releases and return flows, often preclude sample representativeness and sampler safety within the recommended index periods. In these circumstances, the division will consider samples collected up to four weeks after the recommended sampling season index period on a case by case basis.

The 2015 sampling sites replicated the 2014 sampling sites. There was considerable stream bed alteration at all sample sites due to the excessive high flows. There were no duplicates taken at the following sites in 2015:

1. Site 15a Bear Creek Park below bridge
2. Site 14a Morrison at gaging station
3. Site 13a Idledale, 200 feet upstream of sample site near bridge
4. Site 12 Lair O' Bear, 200 feet upstream of sample site
5. Site 9 O' Fallon Park, adjacent to the new parking lot
6. Site 8b BCC at Bridge, 50 feet downstream OWTS
7. Site 5 Little Bear, downtown and 50 feet downstream of sample site
8. Site 3a Keys on the Green, at bridge
9. Site 2a Golden Willow, 300 feet upstream of bridge
10. Site 58 Upper Bear Creek above SRR

Sample collection was done by the Water Quality Control Division timed-kick net methodology protocol (*WQCD SOP-001 Benthic Macroinvertebrate Sampling Protocols, May 2010; BCWA ME04 Macroinvertebrate Field Sample Method*). Only fast riffles were targeted for sampling. Riffle habitat refers to the portions of the stream where moderate velocities and substrate roughness produce turbulent conditions which break the surface tension of the water and may produce whitewater.

GEI Consultants analyzed samples collected by the BCWA for benthic macroinvertebrates. Samples collected by the Association follow the *BCWA M04 Macroinvertebrate Field Sample Method*. Data for samples are reported as number of organisms per square meter. Percent of total is also reported. The species are counted consistent with the CDPHE EDAS import columns for taxa and species. This data is then converted into MMI scores. MMI scores calculated using CDPHE EDAS Access database. All species confirmed to EDAS database.

Field Data

Sampling was done on September 21 and 22, 2015. Sampling was delayed until stream flows were low enough for effective sampling.

Table 1 BCWA Macroinvertebrate Sampling

BCWA Site	Description	Stream Segment	WQCD Timed Kicknet	Habitat	Collected by	Date Collected	Time	Channel width (ft), embeddedness (%), algal cover (%), water clarity	Flow, cfs
15a	BCLP @ bridge	1b	Yes	Fast Riffle	RC/TL	9/22/2015	8:20AM	24/14/6%/ C	24
14a	Morrison @ Gage	1e	Yes	Fast Riffle	RC/TL	9/22/2015	9:10AM	28/15/5%/ SM	26
13a	Idledale	1e	Yes	Fast Riffle	RC/TL	9/22/2015	10:00AM	26/15/5%/ SM	23
12	Lair O' Bear	1e	Yes	Fast Riffle	RC/TL	9/22/2015	10:26AM	28/16/3%/ SM	24
9	O' Fallon	1e	Yes	Fast Riffle	RC/TL	9/22/2015	10:58AM	25/16/2%/SM	22
8b	BCC @ Bridge	1e	Yes	Fast Riffle	RC/TL	9/22/2015	11:28AM	30/10/2%/SM	22
5	Little Bear	1e	Yes	Fast Riffle	RC/TL	9/21/2015	11:30AM	23/10/5%/SM	25
3a	Keys @ Bridge	1a	Yes	Fast Riffle	RC/TL	9/21/2015	11:00AM	23/15/3%/SM	24
2a	Golden Willow	1a	Yes	Fast Riffle	RC/TL	9/21/2015	10:25AM	25/15/2%/ C	23
58	Mt Evans Wilderness	1a	Yes	Fast Riffle	RC/TL	9/21/2015	9:30AM	19/14/2%/ C	15
Sunny, Clear, 60's									

Table 2 Field Parameters of Stream

Site 15a-BCP @ Bridge		Site 14a-Morrison		Site 13a-Idledale		Site 12-Lair O' Bear	
pH	7.48	pH	7.81	pH	7.78	pH	7.85
Temp	10.7	Temp	10.5	Temp	10.1	Temp	10.7
DO	8.18	DO	10.39	DO	10.71	DO	10.32
SC	315	SC	215	SC	212	SC	319
Site 9-O'Fallon		Site 8b BCC @ Bridge		Site 5 Little Bear		Site 3a Keys	
pH	7.91	pH	7.82	pH	7.64	pH	7.75
Temp	12.0	Temp	13.4	Temp	12.5	Temp	7.4
DO	8.55	DO	8.61	DO	9.28	DO	10.92
SC	147	SC	116	SC	89	SC	73
Site 2a- Golden Willow		Site 58- Above SRR					
pH	7.68	pH	8.29				
Temp	6.8	Temp	3.6				
DO	12.25	DO	11.24				
SC	67	SC	45				

Table 3 WQCD Station Identifications Linked with BCWA Sites

WQCD Station ID	BCWA Station ID	Location	Biotpe
5756a	15a	BCLP @ Bridge	Transition
122	14a	Morrison @ Gage	Transition
122a	12	Idledale	Transition
122b	9	Lair O' Bear	Transition
122C	13a	O'Fallon Park	Transition
5762	8	BCC @ Bridge	Transition
5763	5	Little Bear	Transition
5764	3a	Keys @ Bridge	Mountain
5768d	2a	Golden Willow	Mountain
5768c	58	Mt Evans Wilderness	Mountain

Table 4 Biotpe Thresholds

Biotpe		Attainment Threshold	Impairment Threshold
1	Transition	52	42
2	Mountains	50	42
3	Plains & Xeric	37	22

MMI 2015

Table 5 2015 MMI Scores and Total Taxa – Attainment All Sites

WQCD Station ID	BCWA Station ID	Location	Total Taxa	MMI
5756a	15a	BCLP @ Bridge	27	59.1
122	14a	Morrison @ Gage	23	73.5
122C	13a	Idledale	21	59.2
122a	12	Lair O' Bear	22	72.2
122b	9	O'Fallon Park	22	59.1
5762	8	BCC @ Bridge	23	62.3
5763	5	Little Bear	21	68.9
5764	3a	Keys @ Bridge	34	63.6
5768d	2a	Golden Willow	32	56.6
5768c	58	Mt Evans Wilderness	27	53.8

Historic Comparison Six-Year

WQCD Station ID	BCWA Station ID	Location	Biotype	MMI					
				2015	2014	2012	2011	2010	2009
5756a	15a	BCLP @ bridge	Transition	59.1	66.4				
122	14a	Morrison @ Gage	Transition	73.5	48.8	72.9	74.5	80.5	69.8
122C	13a	Idledale	Transition	59.2	59.3	68.0	57.1	69.8	62.1
122a	12	Lair O' Bear	Transition	72.2	49.5	51.3	56.4	62.2	58.5
122b	9	O' Fallon	Transition	59.1	44.8	49.9	45.5	57.7	53.6
5762	8b	BCC @ Bridge	Transition	62.3	49.6	44.3	51.1	39.1	55.6
5763	5	Little Bear	Transition	68.9	56.2	40.0	42.9	56.6	52.3
5764	3a	Keys @ bridge	Mountain	63.6	43.9	46.9	45.3	36.9	38.6
5768d	2a	Golden Willow	Mountain	56.6	60.8	71.9			
5768c	58	Mt Evans Wilderness	Mountain	53.8	67.0	72.5	55.5		