

Table 1. Sites in the Learning By Doing study area (Fraser and Colorado Rivers) sampled in September 2018.

Station ID	Location	Latitude	Longitude	Elevation (m)
FR-27.2	Fraser River abv Jim Creek	39.84536	-105.75177	3048
SLC-0	Saint Louis Creek at Fraser River	39.95175	-105.81471	2630
FR-15	Fraser River abv Fraser Flats Restoration	39.981338	-105.824946	2580
RC-1.1	Ranch Creek blw Meadow Creek	39.99912	-105.82746	2561
WF-13.1	Williams Fork blw Henderson Mill	39.9092	-106.1029	2684
WF-5.5(mod)	Williams Fork abv Williams Fork Reservoir	39.99293	-106.17079	2399
WF-2(mod)	Williams Fork blw Williams Fork Reservoir	40.04308	-106.19832	2325
CR-9.1	Colorado River at CR39 Bridge - KB Ditch	40.05377	-106.28945	2285
CR-7.4	Colorado River blw Troublesome Creek	40.0509	-106.3112	2255
CR-1.7	Colorado River abv Blue River	40.0465	-106.373	2246

Table 2. Individual metrics and MMI scores from benthic macroinvertebrate samples collected in the Learning By Doing study area during September 2018. All metric scores based on MMI (v3) subsampling process.

Metric	Station ID									
	FR-27.2	SLC-0	FR-15	RC-1.1	WF-13.1	WF-5.5 (mod)	WF-2 (mod)	CR-9.1	CR-7.4	CR-1.7
Total Taxa	63.9	--	--	--	--	--	--	--	--	--
Predator-Shredder Taxa	64.3	100.0	50.0	100.0	92.9	71.4	42.9	71.4	92.9	50.0
Clinger Taxa	47.1	56.4	50.9	69.0	36.2	41.9	10.2	100.0	100.0	62.1
%Ephemeroptera	19.6	--	--	--	--	--	--	--	--	--
Beck's Biotic Index	75.8	--	--	--	--	--	--	--	--	--
EP Taxa	--	63.5	34.6	67.8	60.1	32.4	2.8	85.0	86.9	55.4
% Chironomidae	--	92.1	92.3	99.2	64.9	100.0	0.0	81.6	84.4	88.7
Sens. Plains Families	--	43.1	74.7	66.1	16.6	62.5	1.5	65.4	58.5	44.8
Non-Insect %	--	49.1	26.4	19.6	54.1	0.0	25.1	30.5	28.8	0.0
MMI	54.1	67.4	54.8	70.3	54.1	51.4	13.7	72.3	75.2	50.2
	Auxiliary Metrics									
Diversity	2.97	3.87	3.25	3.59	3.55	3.56	2.64	4.12	3.98	3.53
HBI	2.44	4.24	3.24	2.79	3.52	3.53	4.64	3.55	3.39	5.12

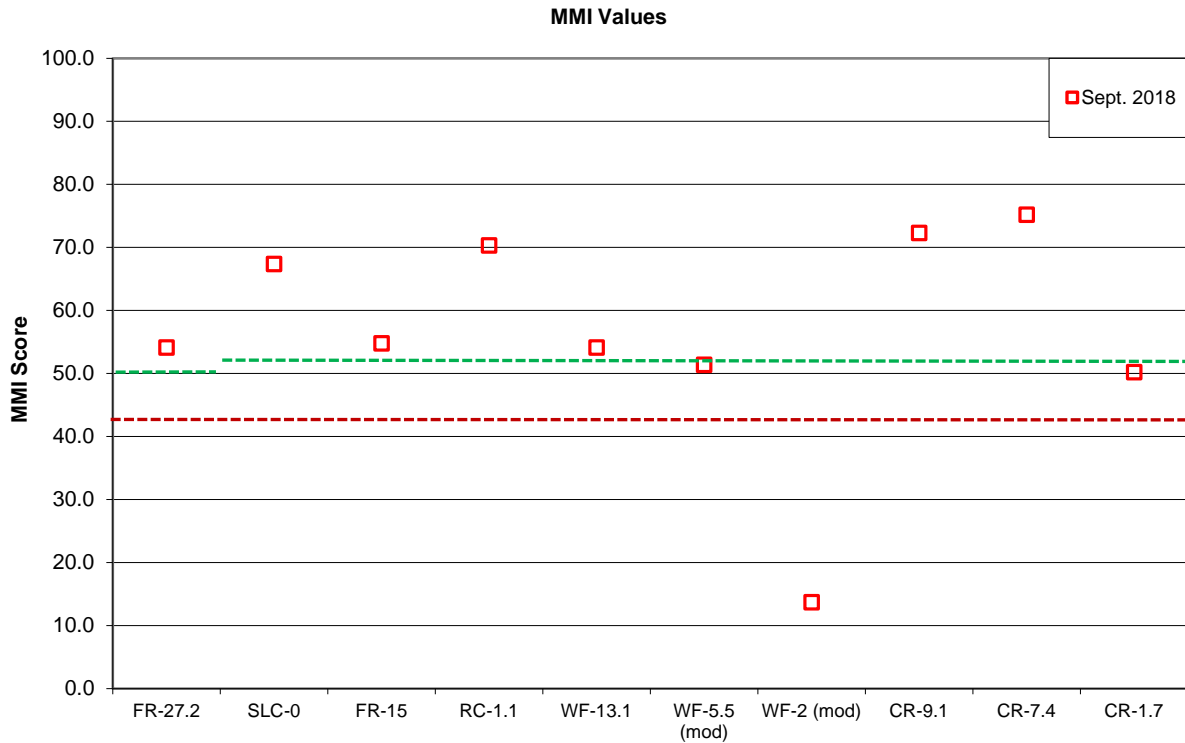


Figure 1. MMI (v3) scores from study sites in the Learning By Doing study area during September 2018. All scores based on MMI (v3) subsampling process.

Table 3. Aquatic life use designations based on MMI (v3) scores from samples at sites in the Learning By Doing study area during September 2018.

Aquatic Life Use Designations in 2018	
Site	
FR-27.2	Attainment
SLC-0	Attainment
FR-15	Attainment
RC-1.1	Attainment
WF-13.1	Attainment
WF-5.5(mod)	Attainment
WF-2(mod)	Impairment
CR-9.1	Attainment
CR-7.4	Attainment
CR-1.7	Attainment

Table 4. Individual metrics and MMI scores from benthic macroinvertebrate samples collected in the Learning By Doing study area during September 2018. All metric scores based on MMI (v4) subsampling process.

Metric	Station ID									
	FR-27.2	SLC-0	FR-15	RC-1.1	WF-13.1	WF-5.5 (mod)	WF-2 (mod)	CR-9.1	CR-7.4	CR-1.7
EPT Taxa	65.3	66.7	45.8	70.8	75.0	45.8	29.2	84.8	100.0	52.1
% EPT, no Baetidae	100.0	35.6	72.1	90.6	85.0	62.1	4.3	50.9	58.0	24.9
Clinger Taxa	65.0	81.7	67.3	67.3	72.1	57.7	33.7	100.0	100.0	57.8
Total Taxa	59.5	--	--	--	--	--	--	--	--	--
Intolerant Taxa	81.0	--	--	--	--	--	--	--	--	--
% Increasers, Mountains	63.9	--	--	--	--	--	--	--	--	--
Predator Taxa	61.5	--	--	--	--	--	--	--	--	--
% Scraper individuals	100.0	--	--	--	--	--	--	--	--	--
% Non-Insect individuals	--	70.4	82.2	74.3	86.5	66.6	92.3	76.7	81.7	30.4
% Coleoptera individuals	--	62.6	70.5	46.6	6.2	66.5	0.8	89.4	73.1	67.9
% Intolerant Taxa	--	65.6	62.2	76.8	94.4	43.4	51.8	79.0	94.9	55.0
% Increasers, Mid-Elev.	--	49.7	85.3	87.8	84.2	87.3	98.7	83.5	88.7	0.0
Predator/Shredder taxa	--	100.0	57.1	100.0	100.0	78.6	42.9	71.4	92.9	57.1
MMI	74.5	66.5	67.8	76.8	75.4	63.5	44.2	79.5	86.2	43.2
	Auxiliary Metrics									
Diversity	2.98	3.87	3.25	3.66	3.61	3.58	2.64	4.13	4.02	3.54
HBI	2.16	4.05	3.15	2.85	3.23	3.42	4.69	3.42	3.46	5.08
TIV	2.28	6.20	4.79	4.59	4.25	--	--	--	--	--

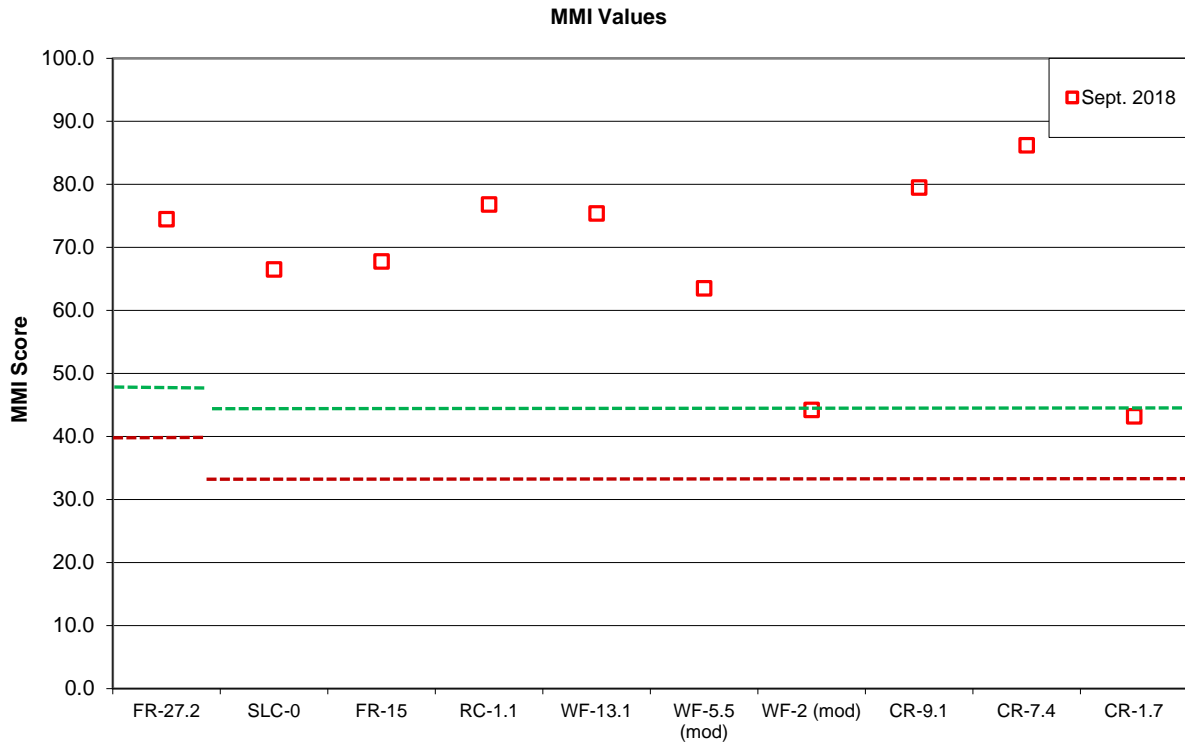


Figure 2. MMI (v4) scores from study sites in the Learning By Doing study area during September 2018. All scores based on MMI (v4) subsampling process.

Table 5. Aquatic life use designations based on MMI (v4) scores from samples at sites in the Learning By Doing study area during September 2018.

Aquatic Life Use Designations in 2018	
Site	
FR-27.2	Attainment
SLC-0	Attainment
FR-15	Attainment
RC-1.1	Attainment
WF-13.1	Attainment
WF-5.5(mod)	Attainment
WF-2(mod)	Attainment
CR-9.1	Attainment
CR-7.4	Attainment
CR-1.7	Attainment

Table 6. Additional metrics and comparative values for macroinvertebrate samples collected from the Learning By Doing study area in September 2018. All additional metrics based on full count Hess samples.

Metric	FR-27.2	SLC-0	FR-15	RC-1.1	WF-13.1	WF-5.5 (mod)	WF-2 (mod)	CR-9.1	CR-7.4	CR-1.7
Density (#/m²)	3,862	3,524	8,770	8,566	3,231	6,429	8,755	7,037	7,384	6,197
Taxa Richness	33	46	42	42	37	45	25	55	56	42
EPT	19	22	16	22	20	12	9	28	28	15
Density of <i>Pteronarcys californica</i> (#/m²)	0	0	0	0	0	0	0	19	0	0
Percent EPT excluding Baetidae	78.85%	28.73%	54.32%	64.10%	61.93%	46.34%	2.62%	35.23%	43.58%	17.68%
Percent Chironomidae	2.01%	5.75%	6.02%	2.77%	23.25%	1.57%	74.34%	12.09%	10.16%	11.72%

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	CR-1.7	Sample Date:	9/20/2018		
Waterbody Name:	Colorado River				
Location:	abv Blue River				
Latitude:	40.0465	Reference Status:	Not Reference or Degraded		
Longitude:	-106.373	BenSampID:	1	RepNum:	1
Site Classification:	1	Summer Temp:	14.29	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 43.2

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	11	52.1
Non-Insect, percent individuals:	33.6	30.4
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	18.2	24.9
Coleoptera, percent individuals:	26.1	67.9
Intolerant, percent taxa *:	31	55
Increasers, Mid-Elevation, percent individuals:	27.3	0
Clinger taxa *:	11	57.8
Predator + Shredder taxa:	8	57.1
Total taxa:	29	0
Intolerant taxa:	9	0
Increasers, Mountain Trn, percent individuals:	31.2	0
Predator taxa:	6	0
Scraper, percent individuals:	44.3	0
Non-Insect, percent taxa:	37.9	0
Sprawler taxa *:	2	0
Increasers, plains, percent individuals:	0	0
Total individuals:	253	ok

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	WF-5.5	Sample Date:	9/21/2018		
Waterbody Name:	Williams Fork				
Location:	abv Williams Fork Reservoir				
Latitude:	40.0004	Reference Status:	Not Reference or Degraded		
Longitude:	-106.17975	BenSampID:	10	RepNum:	1
Site Classification:	1	Summer Temp:	13.48	JulianDay:	263

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 63.5

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	11	45.8
Non-Insect, percent individuals:	16.1	66.6
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	45.3	62.1
Coleoptera, percent individuals:	25.5	66.5
Intolerant, percent taxa *:	26.5	43.4
Increasers, Mid-Elevation, percent individuals:	3	87.3
Clinger taxa *:	12	57.7
Predator + Shredder taxa:	11	78.6
Total taxa:	34	0
Intolerant taxa:	9	0
Increasers, Mountain Trn, percent individuals:	29.2	0
Predator taxa:	7	0
Scraper, percent individuals:	27.1	0
Non-Insect, percent taxa:	35.3	0
Sprawler taxa *:	1	0
Increasers, plains, percent individuals:	0	0
Total individuals:	329	LARGE

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	CR-7.4	Sample Date:	9/20/2018		
Waterbody Name:	Colorado River				
Location:	blw Troublesome Creek				
Latitude:	40.0509	Reference Status:	Not Reference or Degraded		
Longitude:	-106.3112	BenSampID:	2	RepNum:	1
Site Classification:	1	Summer Temp:	15.39	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 86.2

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	20	100
Non-Insect, percent individuals:	8.8	81.7
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	42.3	58
Coleoptera, percent individuals:	28.1	73.1
Intolerant, percent taxa *:	47.5	94.9
Increasers, Mid-Elevation, percent individuals:	2.7	88.7
Clinger taxa *:	18	100
Predator + Shredder taxa:	13	92.9
Total taxa:	40	0
Intolerant taxa:	19	0
Increasers, Mountain Trn, percent individuals:	39.6	0
Predator taxa:	9	0
Scraper, percent individuals:	35.8	0
Non-Insect, percent taxa:	20	0
Sprawler taxa *:	5	0
Increasers, plains, percent individuals:	0	0
Total individuals:	260	ok

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	CR-9.1	Sample Date:	9/20/2018		
Waterbody Name:	Colorado River				
Location:	at CR39 Bridge - KB Ditch				
Latitude:	40.05377	Reference Status:	Not Reference or Degraded		
Longitude:	-106.28945	BenSampID:	3	RepNum:	1
Site Classification:	1	Summer Temp:	13.62	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 79.5

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	20	84.8
Non-Insect, percent individuals:	11.2	76.7
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	37.1	50.9
Coleoptera, percent individuals:	34.3	89.4
Intolerant, percent taxa *:	47.6	79
Increasers, Mid-Elevation, percent individuals:	4	83.5
Clinger taxa *:	21	100
Predator + Shredder taxa:	10	71.4
Total taxa:	42	0
Intolerant taxa:	20	0
Increasers, Mountain Trn, percent individuals:	41.9	0
Predator taxa:	8	0
Scraper, percent individuals:	37.1	0
Non-Insect, percent taxa:	19	0
Sprawler taxa *:	5	0
Increasers, plains, percent individuals:	0	0
Total individuals:	329	LARGE

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	FR-15	Sample Date:	9/20/2018		
Waterbody Name:	Fraser River				
Location:	abv Fraser Flats Restoration				
Latitude:	39.981338	Reference Status:	Not Reference or Degraded		
Longitude:	-105.824946	BenSampID:	4	RepNum:	1
Site Classification:	1	Summer Temp:	11.94	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 67.8

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	11	45.8
Non-Insect, percent individuals:	8.6	82.2
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	52.5	72.1
Coleoptera, percent individuals:	27.1	70.5
Intolerant, percent taxa *:	37.9	62.2
Increasers, Mid-Elevation, percent individuals:	3.5	85.3
Clinger taxa *:	14	67.3
Predator + Shredder taxa:	8	57.1
Total taxa:	29	0
Intolerant taxa:	11	0
Increasers, Mountain Trn, percent individuals:	59.6	0
Predator taxa:	8	0
Scraper, percent individuals:	29.6	0
Non-Insect, percent taxa:	20.7	0
Sprawler taxa *:	4	0
Increasers, plains, percent individuals:	0	0
Total individuals:	314	LARGE

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	FR-27.2	Sample Date:	9/20/2018		
Waterbody Name:	Fraser River				
Location:	abv Jim Creek				
Latitude:	39.84536	Reference Status:	Not Reference or Degraded		
Longitude:	-105.75177	BenSampID:	5	RepNum:	1
Site Classification:	2	Summer Temp:	8.73	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 74.5

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	16	65.3
Non-Insect, percent individuals:	11.3	0
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	85.2	100
Coleoptera, percent individuals:	0.6	0
Intolerant, percent taxa *:	68	0
Increasers, Mid-Elevation, percent individuals:	0	0
Clinger taxa *:	13	65
Predator + Shredder taxa:	11	0
Total taxa:	25	59.5
Intolerant taxa:	17	81
Increasers, Mountain Trn, percent individuals:	46.2	63.9
Predator taxa:	8	61.5
Scraper, percent individuals:	46.5	100
Non-Insect, percent taxa:	12	0
Sprawler taxa *:	6	0
Increasers, plains, percent individuals:	0	0
Total individuals:	318	LARGE

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	RC-1.1	Sample Date:	9/20/2018		
Waterbody Name:	Ranch Creek				
Location:	blw Meadow Creek				
Latitude:	39.99912	Reference Status:	Not Reference or Degraded		
Longitude:	-105.82746	BenSampID:	6	RepNum:	1
Site Classification:	1	Summer Temp:	12.24	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 76.8

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	17	70.8
Non-Insect, percent individuals:	12.4	74.3
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	66.1	90.6
Coleoptera, percent individuals:	17.9	46.6
Intolerant, percent taxa *:	46.9	76.8
Increasesers, Mid-Elevation, percent individuals:	2.9	87.8
Clinger taxa *:	14	67.3
Predator + Shredder taxa:	14	100
Total taxa:	32	0
Intolerant taxa:	15	0
Increasesers, Mountain Trn, percent individuals:	30.3	0
Predator taxa:	11	0
Scraper, percent individuals:	15.3	0
Non-Insect, percent taxa:	21.9	0
Sprawler taxa *:	2	0
Increasesers, plains, percent individuals:	0	0
Total individuals:	274	ok

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	SLC-0	Sample Date:	9/20/2018		
Waterbody Name:	Saint Louis Creek				
Location:	at Fraser River				
Latitude:	39.95175	Reference Status:	Not Reference or Degraded		
Longitude:	-105.81471	BenSampID:	7	RepNum:	1
Site Classification:	1	Summer Temp:	11.1	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 66.5

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	16	66.7
Non-Insect, percent individuals:	14.3	70.4
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	26	35.6
Coleoptera, percent individuals:	24	62.6
Intolerant, percent taxa *:	40	65.6
Increasesers, Mid-Elevation, percent individuals:	12	49.7
Clinger taxa *:	17	81.7
Predator + Shredder taxa:	16	100
Total taxa:	35	0
Intolerant taxa:	14	0
Increasesers, Mountain Trn, percent individuals:	35.1	0
Predator taxa:	12	0
Scraper, percent individuals:	7.8	0
Non-Insect, percent taxa:	14.3	0
Sprawler taxa *:	3	0
Increasesers, plains, percent individuals:	0	0
Total individuals:	308	LARGE

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	WF-13.1	Sample Date:	9/20/2018		
Waterbody Name:	Williams Fork				
Location:	blw Henderson Mill				
Latitude:	39.9092	Reference Status:	Not Reference or Degraded		
Longitude:	-106.1029	BenSampID:	8	RepNum:	1
Site Classification:	1	Summer Temp:	12.31	JulianDay:	262

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 75.4

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	18	75
Non-Insect, percent individuals:	6.5	86.5
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	62	85
Coleoptera, percent individuals:	2.4	6.2
Intolerant, percent taxa *:	57.6	94.4
Increasesers, Mid-Elevation, percent individuals:	3.8	84.2
Clinger taxa *:	15	72.1
Predator + Shredder taxa:	14	100
Total taxa:	33	0
Intolerant taxa:	19	0
Increasesers, Mountain Trn, percent individuals:	50	0
Predator taxa:	13	0
Scraper, percent individuals:	23.3	0
Non-Insect, percent taxa:	12.1	0
Sprawler taxa *:	5	0
Increasesers, plains, percent individuals:	0	0
Total individuals:	292	ok

* = score (not value) adjusted by Summer temperature or Julian day

Colorado Department of Public Health and Environment

Water Quality Control Division

Benthic Macroinvertebrate Bioassessment Report

StationID:	WF-2	Sample Date:	9/21/2018		
Waterbody Name:	Williams Fork				
Location:	blw Williams Fork Reservoir				
Latitude:	40.036201	Reference Status:	Not Reference or Degraded		
Longitude:	-106.204893	BenSampID:	9	RepNum:	1
Site Classification:	1	Summer Temp:	12.95	JulianDay:	263

Predictive Model Results

O/E (p>half):

Model Test:

Multimetric Index Model Results

MMI: 44.2

Metric Name	Metric Value	Metric Score
Ephemeroptera + Plecoptera + Trichoptera taxa *:	7	29.2
Non-Insect, percent individuals:	3.7	92.3
Ephemeroptera + Plecoptera + Trichoptera, no Baetidae, percent individuals:	3.1	4.3
Coleoptera, percent individuals:	0.3	0.8
Intolerant, percent taxa *:	31.6	51.8
Increasers, Mid-Elevation, percent individuals:	0.3	98.7
Clinger taxa *:	7	33.7
Predator + Shredder taxa:	6	42.9
Total taxa:	19	0
Intolerant taxa:	6	0
Increasers, Mountain Trn, percent individuals:	2.5	0
Predator taxa:	4	0
Scraper, percent individuals:	31.8	0
Non-Insect, percent taxa:	21.1	0
Sprawler taxa *:	2	0
Increasers, plains, percent individuals:	0	0
Total individuals:	321	LARGE

* = score (not value) adjusted by Summer temperature or Julian day