



**UPPER GUNNISON RIVER
WATER CONSERVANCY DISTRICT**



**UPPER GUNNISON RIVER BASIN
WATERSHED ASSESSMENT AND MANAGEMENT PLANNING – PHASE I**

**Ohio Creek, East River, and the
Lake Fork of the Gunnison River Basins**

Final Report

DECEMBER 31, 2019

Prepared for Colorado Water Conservation Board

The Value of Water in the Upper Gunnison River Basin

In addition to being the foundation for all land-based life,
we value water as the foundation and lifeblood for
the ecological and economic qualities that we treasure:

The forests that hold the mountains together against erosion;

The streams and rivers and the life they contain,
and the spiritual, aesthetic and recreational gifts they provide;

The utility and beauty of the water and land together
when reunited for high-country pasturage agriculture;

The snow that accumulates as a natural reservoir of water
and also affords much recreational joy;

The too-taken-for-granted quality of the water we drink;

The food and the other agricultural and ecological services
the water supports, here and in the distant farms and cities
served by the water once it moves on from our valleys,
all of which enable our lives here.

***This plan is prepared to help preserve these values in the Upper Gunnison River Basin
in a time of increasing human population and permanently reduced water supplies.***

Nada sin aqua

List of Coordinators and Consultants:

Jesse Kruthaupt – Trout Unlimited – Ohio Creek Coordinator

Julie Nania – High Country Conservation Advocates - East River Coordinator

Camille Richard – Lake Fork Valley Conservancy - Lake Fork of the Gunnison River Coordinator

Wilson Water Group

Alpine Environmental Consulting

Table of Contents

List of Acronyms and Definitions.....	19
Definitions.....	20
Executive Summary	21
Chapter 1 - Introduction	24
Chapter 2 – The Legal and Regulatory Framework	27
Section 1. Colorado Water Law	27
1.1 The Legal Framework	27
1.2 Colorado's Instream Flow Program	29
Section 2. Regulation of Water Quality.....	30
Chapter 3 – Environmental Issues	33
1.1 Stream and Riparian Characteristics	33
1.2 Aquatic Life.....	33
1.3 Water Quality	34
1.4 Water Temperature.....	34
1.5 Flow Limited Areas.....	35
1.6 Environmental Flow Goals	35
Chapter 4 – Stakeholder Engagement	36
Chapter 5 – The Ohio Creek Basin	42
Section 1. Basin Characteristics.....	42
Section 2. Data Assessment.....	45
2.1 Streamflow Measurements.....	45
2.2 Climate Data.....	49
2.3 Irrigated Acreage.....	50
2.4 Water Rights.....	51

2.5	Diversion Records	55
2.6	Irrigation Practices	60
2.7	Return Flow Parameters	61
Section 3.	Water Use Assessment.....	61
Section 4.	Assessing Current Uses.....	65
4.1	Agricultural Water Use	65
4.2	Domestic Water Use.....	68
4.3	Environmental Water Use	68
4.3.1	Aquatic Life	68
4.3.2	Water Quality.....	68
4.3.3	Water Temperature	69
4.3.4	Existing Instream Flow Water Rights.....	69
4.3.5	Flow Limited Areas	69
4.3.6	Environmental Flow Goals	69
4.4	Recreational Water Use.....	71
4.5	Needs for each Reach; Issues Identified	71
Section 5.	Reach 1 - Pass Creek and Ohio Creek Upstream of Castle Creek.....	72
5.1	Agricultural Water Use	72
5.2	Domestic Water Use.....	77
5.3	Environmental Water Use and Needs	77
5.3.1	Stream and Riparian Characteristics.....	77
5.3.2	Aquatic Life	77
5.3.3	Water Quality.....	77
5.3.4	Water Temperature	80
5.3.5	Existing Instream Flow Water Rights.....	80
5.3.6	Flow Limited Areas	82
5.3.7	Environmental Flow Goals	82
5.4	Recreational Water Use.....	82
5.5	Needs for this Reach: Issues Identified	82
Section 6.	Reach 2 - Castle Creek	83

6.1	Agricultural Water Use	83
6.2	Domestic Water Use.....	88
6.3	Environmental Water Use and Needs	88
6.3.1	Stream and Riparian Characteristics.....	88
6.3.2	Aquatic Life	89
6.3.3	Water Quality.....	89
6.3.4	Water Temperature	91
6.3.5	Existing Instream Flow Water Rights.....	91
6.3.6	Flow Limited Areas	93
6.3.7	Environmental Flow Goals	93
6.4	Recreational Water Use and Needs.....	93
6.5	Needs for this Reach: Issues Identified	94
Section 7.	Reach 3 - Carbon Creek.....	95
7.1	Agricultural Water Use	95
7.2	Domestic Water Use.....	100
7.3	Environmental Water Use	100
7.3.1	Stream and Riparian Characteristics.....	100
7.3.2	Aquatic Life	100
7.3.3	Water Quality.....	101
7.3.4	Water Temperature	101
7.3.5	Existing Instream Flow Water Rights.....	101
7.3.6	Flow Limited Areas	103
7.3.7	Environmental Flow Goals	103
7.4	Recreational Water Use.....	103
7.5	Needs for this Reach: Issues Identified	103
Section 8.	Reach 4 - Ohio Creek from Castle Creek to Mill Creek.....	104
8.1	Agricultural Water Use	104
8.2	Domestic Water Use.....	109
8.3	Environmental Water Use	109
8.3.1	Stream and Riparian Characteristics.....	109

8.3.2	Aquatic Life	109
8.3.3	Water Quality.....	109
8.3.4	Water Temperature	112
8.3.5	Existing Instream Flow Water Rights.....	112
8.3.6	Flow Limited Areas	114
8.3.7	Environmental Flow Goals	114
8.4	Recreational Water Use.....	114
8.5	Needs for this Reach: Issues Identified	114
Section 9.	Reach 5 - Mill Creek.....	115
9.1	Agricultural Water Use	115
9.2	Domestic Water Use.....	119
9.3	Environmental Water Use	119
9.3.1	Stream and Riparian Characteristics.....	119
9.3.2	Aquatic Life	119
9.3.3	Water Quality.....	120
9.3.4	Water Temperature	122
9.3.5	Existing Instream Flow Water Rights.....	122
9.3.6	Flow Limited Areas	124
9.3.7	Environmental Flow Goals	124
9.4	Recreational Water Use.....	124
9.5	Needs for this Reach: Issues Identified	124
Section 10.	Reach 6 - Ohio Creek from Mill Creek to the Gunnison River	125
10.1	Agricultural Water Use	125
10.2	Domestic Water Use.....	130
10.3	Environmental Water Use	130
10.3.1	Stream and Riparian Characteristics.....	130
10.3.2	Aquatic Life	131
10.3.3	Water Quality.....	131
10.3.4	Water Temperature	134
10.3.5	Existing Instream Flow Water Rights.....	134

10.3.6	Flow Limited Areas	136
10.3.7	Environmental Flow Goals	136
10.4	Recreational Water Use and Needs.....	137
10.5	Needs for this Reach: Issues Identified.....	137
Chapter 6 – The East River Basin.....	139	
Section 1. Basin Characteristics.....	139	
Section 2. Data Assessment.....	141	
2.1	Streamflow Measurements.....	141
2.2	Climate Data.....	145
2.3	Irrigated Acreage.....	147
2.4	Water Rights.....	148
2.5	Diversion Records.....	153
2.6	Irrigation Practices	158
2.7	Return Flow Parameters	159
Section 3. Water Use Assessment.....	159	
Section 4. Assessing Current Uses.....	162	
4.1	Agricultural Water Use	162
4.2	Domestic Water Use.....	164
4.3	Environmental Water Use	165
4.3.1	Stream and Riparian Characteristics	165
4.3.2	Aquatic Life	165
4.3.3	Water Quality.....	165
4.3.4	Existing Instream Flow Water Rights.....	166
4.3.5	Flow Limited Areas	168
4.3.6	Environmental Flow Goals	168
4.4	Recreational Water Use.....	168
4.5	Needs for each Reach; Issues Identified	171
Section 5. Reach 1 - East River Headwaters and Copper Creek	172	
5.1	Agricultural Water Use	172

5.2	Domestic Water Use.....	172
5.3	Environmental Water Use	173
5.3.1	Stream and Riparian Characteristics.....	173
5.3.2	Aquatic Life	174
5.3.3	Water Quality.....	175
5.3.4	Water Temperature	178
5.3.5	Existing Instream Flows	178
5.3.6	Flow-limited Areas	180
5.3.7	Environmental Flow Goals	180
5.4	Recreational Water Use.....	180
5.5	Needs for this Reach; Issues Identified.....	181
Section 6.	Reach 2 - East River from Copper Creek to Brush Creek	182
6.1	Agricultural Water Use	182
6.2	Domestic Water Use.....	187
6.3	Environmental Water Use	190
6.3.1	Stream and Riparian Characteristics.....	190
6.3.2	Aquatic Life	190
6.3.3	Water Quality.....	190
6.3.4	Water Temperature	193
6.3.5	Existing Instream Flow Water Rights.....	194
6.3.6	Flow-limited Areas	196
6.3.7	2018 R2CROSS Analyses.....	196
6.3.8	Environmental Flow Goals	197
6.4	Recreational Water Use.....	198
6.5	Needs for this Reach: Issues Identified.....	199
Section 7.	Reach 3 - Brush Creek Basin.....	200
7.1	Agricultural Water Use	200
7.2	Environmental Water Use	204
7.2.1	Stream and Riparian Characteristics.....	204
7.2.2	Aquatic Life	205

7.2.3	Water Quality.....	206
7.2.4	Existing Instream Flows	208
7.2.5	Flow-limited Areas	210
7.2.6	Environmental Flow Goals	210
7.3	Recreational Water Use.....	211
7.4	Needs for this Reach: Issues Identified	211
Section 8.	Reach 4 - Farris Creek	212
8.1	Agricultural Water Use	212
8.2	Domestic Water Use.....	214
8.3	Environmental Water Use	214
8.3.1	Stream and Riparian Characteristics.....	214
8.3.2	Aquatic Life	214
8.3.3	Water Quality.....	214
8.3.4	Water Temperature	217
8.3.5	Existing Instream Flow Rights.....	217
8.3.6	Flow-limited Areas	219
8.3.7	Environmental Flow Goals	219
8.4	Recreational Water Use and Needs.....	219
8.5	Needs for this Reach: Issues Identified	219
Section 9.	Reach 5 - East River from Brush Creek to Slate River.....	220
9.1	Agricultural Water Use	220
9.2	Domestic Water Use.....	224
9.3	Environmental Water Use and Needs	227
9.3.1	Stream and Riparian Characteristics.....	227
9.3.2	Aquatic Life	227
9.3.3	Water Quality.....	227
9.3.4	Water Temperature	230
9.3.5	Existing Instream Flow Rights.....	230
9.3.6	Flow-limited Areas	232
9.3.7	Environmental Flow Goals	232

9.4	Recreational Water Use.....	232
9.5	Needs for this Reach: Issues Identified	233
Section 10.	Reach 6 - Washington Gulch and Mt. Crested Butte.....	235
10.1	Agricultural Water Use	235
10.2	Domestic Water Use.....	240
10.3	Environmental Water Use	241
10.3.1	Stream and Riparian Characteristics	241
10.3.2	Aquatic Life	242
10.3.3	Water Quality.....	242
10.3.4	Water Temperature	244
10.3.5	Existing Instream Flow Rights.....	245
10.3.6	Flow-limited Areas	247
10.3.7	Environmental Flow Goals	247
10.4	Recreational Water Use.....	247
10.5	Needs for this Reach: Issues Identified	247
Section 11.	Reach 7 - Slate River Headwaters to Oh-Be-Joyful Creek	249
11.1	Agricultural Water Use	249
11.2	Domestic Water Use.....	249
11.3	11.3 Environmental Water Use	249
11.3.1	Stream and Riparian Characteristics	250
11.3.2	Aquatic Life	251
11.3.3	Water Quality.....	253
11.3.4	Water Temperature	256
11.3.5	Existing Instream Flow Rights.....	256
11.3.6	Flow-limited Areas	258
11.3.7	Environmental Flow Goals	258
11.4	Recreational Water Use.....	258
11.5	Needs for this Reach: Issues Identified	259
Section 12.	Reach 8 - Oh-Be-Joyful Creek	261
12.1	Agricultural Water Use	261

12.2 Domestic Water Use.....	261
12.3 Environmental Water Use	261
12.3.1 Stream and Riparian Characteristics.....	261
12.3.2 Aquatic Life	262
12.3.3 Water Quality.....	263
12.3.4 Water Temperature	268
12.3.5 Existing Instream Flow Rights.....	268
12.3.6 Environmental Flow Goals	270
12.4 Recreational Water Use.....	270
12.5 Needs for this Reach: Issues Identified.....	271
Section 13. Reach 9 - Slate River from Oh-Be-Joyful Creek to Coal Creek	273
13.1 Agricultural Water Use	273
13.2 Domestic Water Use.....	276
13.3 Environmental Water Use	276
13.3.1 Stream and Riparian Characteristics.....	276
13.3.2 Aquatic Life	279
13.3.3 Water Quality.....	280
13.3.4 Water Temperature	283
13.3.5 Existing Instream Flow Rights.....	283
13.3.6 Flow-limited Areas	285
13.3.7 Environmental Flow Goals	285
13.4 Recreational Water Use.....	285
13.5 Needs for this Reach: Issues Identified.....	289
Section 14. Reach 10 - Coal Creek	291
14.1 Agricultural Water Use	291
14.2 Domestic Water Use.....	295
14.3 Environmental Water Use	296
14.3.1 Stream and Riparian Characteristics.....	296
14.3.2 Aquatic Life	297
14.3.3 Water Quality.....	298

14.3.4	Water Temperature	309
14.3.5	Existing Instream Flow Rights.....	309
14.3.6	Flow-limited Areas	311
14.3.7	Environmental Flow Goals	311
14.4	Recreational Water Use.....	313
14.5	Needs for this Reach: Issues Identified	313
Section 15.	Reach 11 - Slate River from Coal Creek to Highway 135 Bridge.....	316
15.1	Agricultural Water Use	316
15.2	Domestic Water Use.....	321
15.3	Environmental Water Use	322
15.3.1	Stream and Riparian Characteristics	322
15.3.2	Aquatic Life	322
15.3.3	Water Quality.....	323
15.3.4	Water Temperature	326
15.3.5	Existing Instream Flow Rights.....	327
15.3.6	Flow-limited Areas	330
15.3.7	Environmental Flow Goals	330
15.4	Recreational Water Use.....	330
15.5	Needs for this Reach: Issues Identified	332
Section 16.	Reach 12 - Slate River from Highway 135 Bridge to East River	334
16.1	Agricultural Water Use	334
16.2	Domestic Water Use.....	338
16.3	Environmental Water Use	338
16.3.1	Stream and Riparian Characteristics	338
16.3.2	Aquatic Life	339
16.3.3	Water Quality.....	340
16.3.4	Water Temperature	342
16.3.5	Existing Instream Flows	342
16.3.6	Flow-limited Areas	343
16.3.7	Environmental Flow Goals	343

16.4	Recreational Water Use.....	344
16.5	Needs for this Reach: Issues Identified	344
Section 17.	Reach 13 - Cement Creek.....	345
17.1	Agricultural Water Use	345
17.2	Domestic Water Use.....	349
17.3	Environmental Water Use	349
17.3.1	Stream and Riparian Characteristics	349
17.3.2	Aquatic Life	350
17.3.3	Water Quality.....	350
17.3.4	Water Temperature	351
17.3.5	Existing Instream Flows	351
17.3.6	Flow-limited Areas	353
17.3.7	Environmental Flow Goals	353
17.4	Recreational Water Use.....	353
17.5	Needs for this Reach: Issues Identified	354
Section 18.	Reach 14 - East River from Slate River to Alkali Creek	357
18.1	Agricultural Water Use	357
18.2	Domestic Water Use.....	361
18.3	Environmental Water Use	362
18.3.1	Stream and Riparian Characteristics	362
18.3.2	Aquatic Life	363
18.3.3	Water Quality.....	363
18.3.4	Water Temperature	363
18.3.5	Existing Instream Flows	363
18.3.6	Flow-limited Areas	365
18.3.7	Environmental Flow Goals	365
18.4	Recreational Water Use.....	369
18.5	Needs for this Reach: Issues Identified	370
Section 19.	Reach 15 - East River from Alkali Creek to Gunnison River.....	372
19.1	Agricultural Water Use	372

19.2 Domestic Water Use.....	376
19.3 Environmental Water Use	376
19.3.1 Stream and Riparian Characteristics.....	377
19.3.2 Aquatic Life	377
19.3.3 Water Quality.....	378
19.3.4 Water Temperature	378
19.3.5 Existing Instream Flows	378
19.3.6 Flow-limited Areas	381
19.3.7 Environmental Flow Goals	381
19.4 Recreational Water Use.....	382
19.5 Needs for this Reach; Issues Identified.....	382
Chapter 7 – The Lake Fork Basin.....	384
Section 1. Basin Characteristics.....	384
Section 2. Data Assessment.....	386
2.1 Streamflow Measurements.....	386
2.2 Climate Data.....	389
2.3 Irrigation Acreage	390
2.4 Water Rights.....	391
2.5 Diversion Records.....	398
2.6 Return Flow Parameters	403
Section 3. Needs Assessment Methods.....	403
Section 4. Assessing Current Uses.....	406
4.1 Agricultural Water Use	406
4.2 Domestic Water Use.....	408
4.3 Environmental Water Use	409
4.3.1 Stream and Riparian Characteristics.....	409
4.3.2 Aquatic Life	409
4.3.3 Water Quality.....	409
4.3.4 Existing Instream Flow Water Rights.....	409

4.3.4	412
4.3.5 Environmental Flow Goals	412
4.4 Recreational Water Use.....	412
Section 5. Reach 1 - Upper Lake Fork to Lake San Cristobal.....	414
5.1 Agricultural Water Use	414
5.2 Domestic Water Use.....	418
5.3 Environmental Water Use	418
5.3.1 Stream and Riparian Characteristics	418
5.3.2 Aquatic Life	420
5.3.3 Water Quality.....	420
5.3.4 Water Temperature	423
5.3.5 Existing Instream Flows	423
5.3.6 Flow-limited Areas	425
5.3.7 Environmental Flow Goals	425
5.4 Recreational Water Use.....	425
5.4.1 Fish Pond Diversions	425
5.5 Needs for this Reach: Issues Identified.....	428
Section 6. Reach 2 - Lake San Cristobal	429
6.1 Agricultural Water Use	430
6.2 Domestic Water Use.....	430
6.3 Environmental Water Use	431
6.3.1 Stream and Riparian Characteristics	431
6.3.2 Aquatic Life	431
6.3.3 Water Quality.....	431
6.3.4 Water Temperature	432
6.3.5 Existing Natural Lake Level Right	432
6.3.6 Environmental Flow Goals	432
6.4 Recreational Water Use.....	432
6.5 Needs for this Reach: Issues Identified.....	433
Section 7. Reach 3 - Lake Fork from Lake San Cristobal to Lake City.....	434

7.1	Agricultural Water Use	434
7.2	Domestic Water Use.....	438
7.3	Environmental Water Use	440
7.3.1	Stream and Riparian Characteristics.....	440
7.3.2	Aquatic Life	442
7.3.3	Water Quality.....	442
7.3.4	Water Temperature	444
7.3.5	Existing Instream Flows	445
7.3.6	Flow Limited Areas	445
7.3.7	Environmental Flow Goals	446
7.4	Recreational Water Use.....	447
7.4.1	Fish Pond Diversions	447
7.5	Needs for this Reach: Issues Identified.....	450
Section 8.	Section 8. Reach 4 - Henson Creek.....	451
8.1	Agricultural Water Use	451
8.2	Domestic Water Use.....	451
8.3	Environmental Water Use	452
8.3.1	Stream and Riparian Characteristics.....	452
8.3.2	Aquatic Life	453
8.3.3	Water Quality.....	454
8.3.4	Water Temperature	458
8.3.5	Existing Instream Flows	459
8.3.6	Flow-limited Areas	461
8.3.7	Environmental Flow Goals	461
8.4	Recreational Water Use.....	461
8.5	Needs for this Reach: Issues Identified.....	461
Section 9.	Section 9. Reach 5 - Lower Lake Fork: Lake City to Blue Mesa	463
9.1	Agricultural Water Use	463
9.2	Domestic Water Use.....	469
9.3	Environmental Water Use	469

9.3.1	Stream and Riparian Characteristics	469
9.3.2	Aquatic Life	471
9.3.3	Water Quality.....	471
9.3.4	Water Temperature	474
9.3.5	Existing Instream Flows	475
9.3.6	Flow-limited Areas	479
9.3.7	Environmental Flow Goals	479
9.4	Recreational Water Use.....	479
9.4.1	Fish Pond Diversions	480
9.5	Needs for this Reach: Issues Identified.....	484
Section 10.	Reach 6 - Lower Lake Fork Tributaries	485
10.1	Agricultural Water Use	485
10.2	Domestic Water Use.....	493
10.3	Environmental Water Use	493
10.3.1	Stream and Riparian Characteristics	493
10.3.2	Aquatic Life	493
10.3.3	Water Quality.....	493
10.3.4	Water Temperature	494
10.3.5	Existing Instream Flows	494
10.4	Recreational Water Use.....	496
10.5	Needs for this Reach: Issues Identified.....	496
Chapter 8 – Identification of Potential Demonstration Projects	497	
Chapter 9 – Option for Improved Water Use Efficiency	507	
Appendix A	509	

List of Acronyms and Definitions

The following acronyms and definitions are used frequently in this Report:

303(d) List	Colorado List of Impaired Waters
µg/L	Micrograms per liter
BMPs	Best management practices
CCWC	Coal Creek Watershed Coalition
CDPHE	Colorado Department of Public Health and Environment
CDSS	Colorado Decision Support System
CNHP	Colorado Natural Heritage Program
CoAgMet	Colorado Agricultural Meteorological Network
CPW	Colorado Parks and Wildlife
CU	Consumptive Use
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWP	Colorado's Water Plan
District	Upper Gunnison River Water Conservancy District
DRMS	Division of Reclamation, Mining, and Safety
DWR	Colorado Division of Water Resources
EPA	Environmental Protection Agency
GBIP	Gunnison Basin Implementation Plan
HCCA	High County Conservation Advocates
M&E List	Colorado Monitoring and Evaluation List
MEMC	Mt. Emmons Mining Company
MLP WTP	Meridian Lake Park Water Treatment Plant
MMI	Macroinvertebrate Multimetric Index
NWS Coop	National Weather Service Cooperative Observer Station
OHV	Off Highway Vehicles
PCA	Potential Conservation Areas
RMBL	Rocky Mountain Biological Laboratory
StateCU	CDSS Consumptive Use Model
StateMOD	CDSS Water Rights Allocation Model
SUP	standup paddle boarding
SWSI	Statewide Water Supply Initiative
UGRWCD	Upper Gunnison River Water Conservancy District
USFS	US Forest Service
USGS	US Geological Survey
WMP	Watershed Management Plan
WMPC	Watershed Management Planning Committee
WQCD	Water Quality Control Division
WTP	Water Treatment Plant
WWTF	Wastewater Treatment Facility

Definitions

As used in this Report, these terms are defined as follows:

“Domestic use” includes the use of water for household, municipal, and industrial purposes.

“Pasture grass” is forage grown in irrigated meadows that is mowed for livestock feed (haying) or grazed.

“Watershed Management Planning Committee” is a committee formally sanctioned by the Board of Directors of the Upper Gunnison River Water Conservancy District consisting of Board members, District staff, consultants, and interested stakeholders. The Committee is chaired by a member of the Board.