Blue River Integrated Water Management Plan

Final Report

Prepared for: Water Fund Grant
Attn: Chris Sturm

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BRIWMP Overview

The purpose of the Blue River Integrated Management Plan (BRIWMP) is to balance consumptive and non-consumptive water use, to understand and quantify current and future use, and integrate those uses for the maximum benefit of all users while protecting the existing water resource.

The project will compile, review and integrate existing basin studies, plans and other information regarding physical and biological aspects of the Blue River basin water resources for the purpose of formulating objectives and goals that will guide future water management and restoration decisions.

Summary of the Phase 2 Project Goals & Method

The goal of Phase 2 for the Blue River Integrated Management Plan (BRIWMP) is to understand the potential causes of the declining fishery between Dillon and Green Mountain reservoirs and determine whether (and how) the decline can be reversed or mitigated.

The method to determine the cause of the unproductive and declining fishery is to focus on a scientific approach of identifying and ranking the limiting factors below Dillon Reservoir. This will be accomplished by collecting additional data in numerous sites to assess ecological function and interferences. Each defined limiting factor will offer suggestions on effective strategies to address the declining fishery between Dillon and Green Mountain Reservoirs.

Summary of Phase 2 Work Completed

- A geomorphology assessment was completed from Dillon Dam approximately three miles north, downstream, to assess fish habitat and create a list of recommended restoration projects.
- Ten sites within the Blue River were monitored over three seasons to evaluate the health of the macroinvertebrate communities and assess any anthropogenic impacts.
- Ten sites within the Blue River were monitored over three seasons to understand biological production as a measure of total Chlorophyll A as the presence of robust populations of endemic algae which are crucial to the overall productivity and biological potential of the Blue River.
- Eight sites within the Blue River were monitored throughout the year to determine the impacts of Dillon Reservoir on river temperature as temperature monitoring to date indicates values are below narrative standards recommended by USFWS with large fluctuations during dam top spill events.
- The team involved and engaged the Advisory Committee and a broad stakeholder group to support the goal of creating a non-biased assessment of ecosystem function, research procedures, and drawing collaborative conclusions.
- Reports and research figures were shared with the public at the State of the Blue River in May 2022 and published on the Blue River Watershed Group website.

Detailed Status of Phase 2 Tasks Identified in the Statement of Work

Task 1: Geomorphology assessment to develop recommended restoration projects

Purpose

Assess the relationship between geomorphology, stream flows, and timing of seasonal flows within the Blue River to develop a list of recommended restoration projects to improve the health and function of the aquatic habitat.

Sub-Tasks

Within the scope of work of Task 1, there are a multitude of sub-tasks. Each sub-task's status is listed in the bullet points below.

- Field assessments
    - Completed initial site visit in mid-July to conduct preliminary site reconnaissance and locate study sites
    - Selected three aquatic habitat assessment sites and selected cross section locations targeting desired aquatic habitats
    - Completed second site visit to quantified habitat types and characterize substrate classifications and sizes at the surveyed sections for each site
    - Completed cross section surveys
    - Completed post-processing of surveyed positions
- Hydraulic model
    - Developed HEC-RAS model using surveyed cross sections and existing available models
    - Completed preliminary testing and hydraulic calibration
    - Identified need to incorporate additional cross sections from FEMA FIS model between study sites
- Calculate Weighted Usable Area of stream segment - completed
- Assess flushing flow needs at each site - completed
- Hydrologic evaluation of flow trends at key seasonal times
    - Compiled available flow records in water year 2021 for a preliminary comparison of releases from Dillon Reservoir (USGS Gage No. 09050700) to inflows to Green Mountain Reservoir (USBR Hydromet Station GRERESCO)
    - Evaluated releases from Dillon Reservoir (USGS Gage No. 09050700, available starting 1/1/1960) and flows recorded on Straight Creek near Dillon (USGS Gage No. 09051050, available starting 10/3/1986).
    - Reviewed available information (Colorado River Cooperative Agreement) regulating low flows.
    - Developed monthly and annual flow duration curves for the Blue River upstream of Straight Creek and for the Blue River downstream of Straight Creek using USGS records from WY88 through WY21, inclusive.
    - Preliminarily identified targeted flows for evaluating hydraulics: 50, 75, 100, 200, and 400 cfs.
    - Coordinated externally with Denver Water concerning power plant operations.
- Flow-Temperature relations

    - Temperature data from 2021 collected and downloaded
- Evaluation of projects completed for the EIS for DW in 1985
    - Background review completed and report created

Task 1: Issues/Changes/Adjustments to Scope of Work

Initially Blue River Watershed Group planned the following in the Scope of Work, 'A minimum of two locations are proposed for detailed assessments to develop recommended restoration projects that will optimize conditions under current stream flows. This includes one site located in Reach 1 between Dillon Reservoir and the confluence with the Swan River and a second site in Reach 2 that will be located downstream of Dillon Reservoir'. After speaking with the Miller Ecological Consultants, we were advised to assess three locations all within Reach 2 to provide greater detail and analysis of the river. The Scope has thus changed accordingly with the goal of focusing on the significantly more degraded Reach 2 and conduct no detailed assessments or restoration project recommendations in the upstream section of the river, Reach 1, at this time.

Task 2: Macroinvertebrate Sampling

Purpose

Monitor the health of the macroinvertebrate communities in the study area of the Blue River and assess any anthropogenic impacts.

Sub-Tasks

Within the scope of work of Task 2, there are a multitude of sub-tasks. Each sub-task's status is listed in the bullet points below.

- Macroinvertebrate Sampling
    - Completed three sampling trips. April 24, 2021; August 12, 2021; October 25, 2021
    - Each sampling trip sampled at ten sites and collected three replicate samples each site. A total of 30 samples per season with a total of 90 samples in 2021.
- Map of the Sampling Sites – completed
- Sorting and identification of samples – completed
    - 100% of the samples have been processed
    - All benthic macroinvertebrate specimens have been sorted and identified
- MMI v4 data analysis – completed
- Dry weights for all orders of aquatic insects at each site – completed
- Functional feeding group analysis – completed
- Report and conclusions – completed and delivered

Task 2: Issues/Changes/Adjustments to Scope of Work

None.

Task 3: Periphyton Sampling

Purpose

Expand on the initial 2020 sampling effort to understand biological production as a measure of total Chlorophyll A as the presence of robust populations of endemic algae is crucial to the overall productivity and biological potential of the Blue River

Sub-Tasks

Within the scope of work of Task 3, there are a multitude of sub-tasks. Each sub-task's status is listed in the bullet points below.

- Periphyton Sampling
  - Completed three sampling trips. April 21, 2021; August 12, 2021; October 28, 2021
  - Each sampling trip sampled at nine sites and collected three replicate samples each site. A total of 18 samples per season with a total of 54 samples in 2021.
- Map of the Sampling Sites – complete
- Measure Chlorophyll A – Data was received from the lab on December 3rd, 2021. Preliminary calculation and concentrations have been analyzed. Conclusions listed in the Report.
- Ash Free Dry Weight – Data was quantified from each subsample across all seasonal samples and received from the lab on December 3rd, 2021.
- Report and conclusions – complete

Task 3: Issues/Changes/Adjustments to Scope of Work

Summer rains allowed for increased surface water spill at Dillon Dam and increased stream flows downstream of Dillon Reservoir. Because of this, our summer sample was collected at higher-than-normal discharge and may have led to a misrepresentation of the standing crop of periphyton

Task 4: Temperature Profiles (NOTE: $0 funded by CWCB)

Purpose

Expand on the initial 2020 sampling effort to continue monitoring water temperatures in Reach 2. Temperature monitoring to date indicates values are below narrative standards recommended by USFWS with large fluctuations during dam top spill events. 2021 surveys will continue monitoring 6 main stem sites and ad two prominent tributaries as comparison.

Sub-Tasks

Within the scope of work of Task 4, there are a multitude of sub-tasks. Each sub-task's status is listed in the bullet points below.

- Deploy two additional temperature loggers in prominent tributaries originating from the Gore Range
  - Loggers were placed in Willow Creek and Boulder Creek, with the deployment date of June 14, 2021 – complete
  - Six main stem temperature loggers maintained and monitored – complete
  - Hourly temperature logger data collection – complete
  - Report and conclusions of temperature profile analysis – complete

Task 4: Issues/Changes/Adjustments to Scope of Work

Temperature gaps exist in two of the HOBO Tidbit MX loggers are a result of public tampering. Data from the United States Forest Service was not received, as was expected, due to a lack of maintenance and monitoring of the loggers owned by the USFS.

Task 5: Stakeholder Outreach/Advisory Committee

Purpose

Maintain involvement and communication with key stakeholders to ensure the project aligns with the community's priorities and concerns.

Sub-Tasks

- Advisory Committee updates have been provided. Meetings and communication to the entire stakeholder group are listed below
    - January 26, 2022: Focused advisory team meeting, next steps, data gaps discussion, priorities, needs, general impressions of 2021 data
    - December 6, 2021: update and planning for 2022
    - September 30, 2021: Virtual Update presentation with question and answer. Recorded and published on website.
    - September 24, 2021: Invite to a Fall virtual update on the BRIWMP
    - July 22, 2021: Advisory Committee meeting, post-review modifications invitation to discuss with project team
    - July 20, 2021: Advisory Committee feedback submission deadline revised from July 13th due to AC extension request.
    - June 25, 2021: Invitation to edit, comment, and provide feedback on Phase 1 of BRIWMP
    - June 16, 2021: AC virtual meeting
    - May 12, 2021: AC save the date for the AC June meeting
- Project team meetings run every-other week to ensure the partners are helping the project progress. Check-ins discuss consultant work, project timeline and funding, needs, goals, challenges, opportunities, and outreach communication.

Task 5: Issues/Changes/Adjustments to Scope of Work

A Technical Advisory Team was assembled to review the preliminary results of Phase 2 research (2021 surveys) with the goal of adding diplomacy to the project's decision-making to ensure stakeholder input and shared responsibility. The first meeting was held on January 26th and included, CPW, USFS, Denver Water, Blue River Watershed Group, Blue Valley Ranch, Trout Unlimited with presentations on 2021 survey methods and preliminary findings by all consultant groups for tasks one through four. The team was asked to provide input on analysis, project direction, and prioritize 2022 surveys and projects.

The Technical Advisory Team heavily

Task 6: Integration of Results into BRIWMP Document

Purpose

Update the working document of the Blue River Integrated Water Management Plan (BRIWMP). Provide recommendations for solutions that will improve the health of the Blue River.

Sub-Tasks

Integrate the following into the BRIWMP

- Maps, tables, figures, plates – created by each consultant and included in consultant reports, not integrated into the BRIWMP
- Add attachments – created by each consultant and included in consultant reports, not integrated into the BRIWMP Expand conclusions – not started
- Communicate results – The public was given the 2021 season results summary at the State of the Blue River free event in May 2022.

Task 6: Issues/Changes/Adjustments to Scope of Work

The Technical Advisory Team suggested an additional year of research and surveys in order to accurately draw conclusions on the limiting factors. With the need to update the BRIWMP after one more year of research, the team determined a public intermediate update will not be necessary. Reports will remain separate from the BRIWMP document but reports are published on the Blue River Watershed Group Website.

Stakeholders and the technical advisory team were informed of the timeline change.

An update to the Blue River Integrated Water Management Plan will be completed and publicly communicated in May 2023.

Access to Phase 2 Results:

Phase 2 consultant reports are made publicly available on the Blue River Watershed Group Website.
https://www.blueriverwatershed.org/iwmp-910563-666782.html

Budget Summary Including Matching Funds:

A 25% match requirement for plans and studies applies to the BRIWMP Phase 2 project.

				Budget			Actual		
Task No.	Task Description	Task Start Date	Task End Date	Grant Funding Request	Match Funding	Total	CWCB Watershed Restoration Grant Funding	Match Funding	Total
1	Develop recommended restoration strategies	1-Jul-21	1-Jun-22	$68,860	$30,760	$99,620	68860	$ 31,257	$ 100,117
2	Macroinvertebrate sampling	20-Apr-21	1-Jun-22	$19,200	$33,000	$52,200	19200	$ 29,263	$ 48,463
3	Periphyton sampling	20-Apr-21	1-Jun-22	$7,645	$30,100	$37,745	7645	$ 24,251	$ 31,896
4	Temperature profiles	1-Nov-21	1-Jun-22	$0	$3,680	$3,680	0	$ 3,080	$ 3,080
5	Stakeholder Outreach	1-Jul-21	1-Jun-22	$600	$5,420	$6,020	600	$ 3,252	$ 3,852
6	Study Integration	15-Nov-21	1-Jun-22	$3,695	$9,040	$12,735	3695	$ 12,875	$ 16,570
			Total	$100,000	$112,000	$212,000	$100,000	$103,978	$203,978

Budget Variance	
Budget	$ 212,000.00
Amount Under Budget	$ 8,022.45
Percent below budget	4%

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Consultant Expense by Task

			Consultant						
Task	Description	Budgeted Project Cash Expenses	Timberline	Trout Unlimited	Miller	Tetra Tech	BRWG admin fee	To Date Project Cash Expense	Percent of Task Complete
1	Develop recommended restoration strategies	$ 99,620			$ 40,600	$ 56,017	$ 3,500	$ 100,117	100%
2	Macroinvertebrate sampling	$ 52,200	$ 48,463					$ 48,463	100%
3	Periphyton sampling	$ 37,745		$ 31,896				$ 31,896	100%
4	Temperature profiles	$ 3,680				$ 3,080		$ 3,080	100%
5	Stakeholder Outreach	$ 6,020				$ 3,852		$ 3,852	100%
6	Study Integration	$ 12,735				$ 16,570		$ 16,570	90%
	Total Project	**$ 212,000**	**$ 48,463**	**$ 31,896**	**$ 40,600**	**$ 79,519**	**$ 3,500**	**$ 203,978**	