Phase 2 of River Health Assessment in the Poudre: Finalizing One River Health Assessment to Prioritize Restoration Opportunities in the Poudre Basin

Final Report

Prepared for: Colorado Watershed Restoration Grant Program

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Coalition for the Poudre River Watershed

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Table of Contents

Introduction & Background

In 2016, CPRW & stakeholders developed the Upper Poudre Resiliency Plan (CPRW 2016), prioritizing which sub drainages were least resilient to high priority threats such as wildfire & floods. The plan sought to identify where stressors like wildfires & floods would have the greatest negative impact on rivers, water quality, & communities. Over the course of the planning effort, data related to upland condition was readily accessible. However, our planning team could not access consistent, relevant data for riparian and stream condition across the upper watershed. Although we were able to incorporate key flood hazard indicators like roads, culverts, and crossings in the floodplain, the lack of other river related data limited our ability to prioritize stream restoration needs and opportunities.

During this period, our stakeholders were also interested in developing a tool that would allow us to monitor how conditions in the watershed change over time. We wanted to be able to understand if our collective work was leading to greater watershed resilience. Although we had protocols and datasets to track this for upland conditions, these needs were limited by the lack of baseline data sets for the river corridor. Our stakeholders concluded that further planning work would benefit from having a better assessment of baseline conditions in the riparian corridor of the primary tributaries (mainstems, North Fork, South Fork) of the Cache la Poudre River (Poudre River, Poudre). Our stakeholder team began reviewing approaches, especially previous work completed in the watershed, that would reflect the full set of riparian conditions.

A year prior, in 2015, the City of Fort Collins developed the preliminary River Health Assessment Framework (RHAF). The RHAF was originally modified specifically for the Poudre from the Functional Assessment of Colorado Streams (Beardsley 2015). FACStream is a stream health assessment that was developed for the federal Clean Water Act program. The RHAF was customized to fit the Poudre and was intended to inform stream management plans on high priority restoration and project areas for ecological uplift. This methodology includes 11 indicators which reflect the physical, chemical, & biological elements of the river. Each indicator is then further described by several metrics that are measurable aspects of the river ecosystem. The RHAF describes a range of potential conditions for each indicator and then goes on to prescribe recommended ranges for each indicator. The RHAF's recommended ranges describe conditions that would ensure a functioning, resilient river that meets critical thresholds and supports watershed values such as clean water, recreation, and reliable water supply. stormwater conveyance and floodplain resilience, and river ecology. The ranges help to support goal setting for resource management. The City of Fort Collins applied the RHAF from the City's water supply intake at Gateway Natural Area to I-25 (Middle Watershed, Middle). The River Network identified the RHAF as meeting many of the core components of a Stream Management Plan because of its comprehensive nature that facilitates decision making and river management.

Following the implementation of the RHAF in the Middle Watershed, the City of Fort Collins developed the State of the Poudre Report and Poudre River Report Card highlighting the findings of the RHAF and health of the Poudre River (FOCO 2015). In 2017, CPRW and stakeholders utilized a revised version of the RHAF and FACStream to conduct a river health assessment from I-25 to the confluence of the South Platte River (Lower Watershed, Lower) and developed the Lower Poudre River Flood Recovery and Resilience Master Plan (CPRW 2017). The final segment of the three initial

RHAF assessments was completed in 2020 when CPRW and stakeholders completed the State of the Upper Poudre River Watershed (CPRW 2020), conducted from the headwaters of the Poudre River to Gateway Natural Area (Upper Watershed, Upper), including all major tributaries.

In reviewing the RHAF and its three initial installments in the Upper, Middle, and Lower Poudre regions, our stakeholder committee agreed that the protocol would need revision to be consistent and repeatable across all regions of the Poudre Watershed (Upper, Middle, and Lower). The RHAF is intended to be repeated on a timescale that aligns with the metrics and the management questions at hand. The City of Fort Collins began planning for a repeat assessment of the Middle Watershed in 2020, considering it had been five years since the State of the Poudre River report was finalized. As part of the planning effort, the City of Fort Collins staff began refining the methodologies for some indicators. This presented a unique and time sensitive opportunity for partners to align all three 'pieces' of the previous RHAF methods and develop a basin-wide, unified protocol and assessment plan that can guide restoration and management actions for the entire Poudre basin. The project required partners and stakeholders to review and refine standard operating procedures, identify long-term assessment reaches, and prioritize reaches for restoration, protection, and/or management. The final deliverable of this effort is a science-based and stakeholder driven, basin-wide RHAF implementation tool to assess river function and guide restoration applications in the Poudre watershed. Ultimately, this project can address how watershed stakeholders move forward to better understand the health of the basin and work towards shared management and restoration goals.

This project had 4 main objectives:

- Evaluate and determine technical process improvements for individual metrics
- Finalize a common protocol for a subset of metrics – headwaters to confluence – for spatial and temporal alignment of higher resolution data
- Develop a river-wide prioritization tool (RHAF) that includes opportunities and constraints analysis
- Integrate stakeholder input and establish stakeholder communication tools

These four objectives are interrelated and together will equip watershed stakeholders with a common framework and tool, the RHAF, to assess, prioritize, and communicate river health and track the basin's collective effort to restoring, protecting and managing the Poudre River. Ultimately, this project will take the datasets that have been produced to date by the various RHAFs, combine them into one cohesive RHAF implementation plan, and produce a communication vehicle to allow stakeholders and other audiences access to information as the data is collected. Having this dataset for the entire watershed will help facilitate river-based management and collaborative decision making for a cohesive watershed health vision.

Methods

Over the last decade, three unique river health assessment frameworks have been developed and implemented within the Poudre Watershed. Although each framework was unique, many of the aspects including indicators, assessment methods, and grading, were similar. In order to create a single, unified RHAF for the entire Poudre River, which can be repeated and implemented under

multiple conditions, a dissection and re-creation of all previous frameworks into a single manual was required. Throughout the last three years, a steering committee consisting of experts from within the region examined and discussed ecosystem indicators and metrics, stressors and grading scales, and a communication plan to inform results. The culmination of these efforts resulted in the RHAF manual which was further examined by a group of technical editors. Finally, the manual was professionally formatted and altered for effective use in the field and digital display.

Combining Previous Efforts

In previous years, the RHAF has been used to assess all three regions of the Poudre Watershed – Upper, Middle, and Lower – although each region utilized a unique assessment framework, limiting management comparisons and analysis of river health across the different regions. After review from stakeholders, it was agreed that a single, common framework to assess river health and prioritize future projects in the Poudre would lead to a basin-wide benefit for management and restoration activities. In order to create a single assessment framework that would work from headwaters of the Poudre River to the confluence of the South Platte River, the project team would need to evaluate and improve previous RHAF metrics, finalize a common protocol for a subset of metrics for higher resolution data, develop the final basin-wide RHAF, and integrate stakeholder input and communication strategies.

The initial step in forming a basin-wide assessment method was to design the protocol and confirm assessment metrics and indicators. Much of this information was already developed during the previous RHAF efforts (Upper, Middle, Lower) and FACStream, but did not have a consistent protocol across regions. A steering committee team consisting of members from the City of Fort Collins, CPRW, Stillwater Sciences, and Johnson Environmental Consulting began working on a common protocol that would cover all three regions. Stakeholders met on a bi-weekly basis for nearly three years designing field procedures, grading criteria, and assessment indicators and stressors. Additionally, management implications and a communication strategy for the report were developed alongside the main components of the RHAF.

Indicators and Metrics

The RHAF is at its core a stressor-based assessment. The diagnostic evidence used in stream health assessments are the presence and severity of stressors. Stressors are human created features or conditions that impair stream health and cause habitat to depart from its *Reference Standard,* or ideal condition. Stressor-based assessments identify the direct link between the causes of impairment and their implications on ecological health and point to the ways in which health can be improved through restoration activities.

Simplifying the health and function of an entire river ecosystem into a single grade is a challenging endeavor and requires assessing numerous factors affecting the system. With contribution from a team of Subject Matter Experts (SME's), scientific literature, and relevance to the Poudre Watershed regional management goals, the steering committee team designed a grading system consisting of 8 indicators and 21 metrics (Table 1). These indicators and metrics are specific parameters that provide measurable qualitative and/or quantitative information about the various processes that contribute to river health. Together, the indicators provide a holistic view of river health, while indicator-specific metrics can be used for a detailed assessment of any aspect of river health. An important aspect to consider when deciding on indicators and metrics was the versatility between river regions. The Poudre River spans multiple river regions including remote canyon areas near the headwaters, followed by an urban-plains interface towards the confluence. Indicators and subsequent metrics in the RHAF require flexibility to accurately assess numerous river environments and ultimately, unique stressors impacting different regions.

Table 1: Final list of indicators and indicator-specific metrics included within the River Health Assessment Framework.

Indicator	Metrics
Flow Regime	Peak flow, base flow, flow rate of change
Sediment Regime	Watershed supply, local supply, continuity, transport
Wood Regime	Recruitment, transport/storage
Water Quality	Temperature, nutrients, pH, dissolved oxygen
Riparian Floodplain Condition	Riparian vegetation, floodplain physical condition, riparian habitat connectivity, contributing area
River Dynamics	Channel planform, channel profile
Aquatic Habitat	Coarse-scale, fine-scale
Aquatic Life	Macroinvertebrates

SME's from Alpine Eco, City of Greeley Water and Sewer, Colorado State University, University of Northern Colorado, Colorado Department of Transportation, Colorado Natural Heritage Program, and Timberline Aquatics provided valuable expert insight and recommendations to both the indicators and metrics, as well as their respective grading system. The grading system varies between each indicator whether its metrics are qualitative, quantitative, or a combination of both. For example, the quantitative grading system for the Water Quality indicator relies heavily on input from the Colorado Department of Public Health (CDPHE) Water Quality Control Division (WQCD). Grades (A-F) refer directly to the CDPHE water quality thresholds and standards and directly correlates with grading percentiles. Conversely, the qualitative grading system for Wood Regime combines expert knowledge from SME's, scientific literature, and natural resource references to represent the grading system.

Indicators may include more than one metric requiring a comprehensive grade calculated from multiple metrics, weighted based on ecological importance to river health. The Aquatic Habitat indicator includes two grading metrics, course- and fine-scale aquatic habitat. Each metric was deemed equally important to the overall health of the indicator, and thus weighed 50% of the total grade. In contrast, Riparian Floodplain Condition includes four unique grading metrics not equally weighted to each other. Riparian vegetation was deemed a more critical factor for stream health and given a weight of 65%, compared to the contributing area of the floodplain which is weighted at 10% of the total indicator grade.

Grading System

Coinciding with FACStream and the previous RHAF efforts, the grading scale was to remain an academic grading system (A-F, 0-100) where an 'A' grade indicates an optimal functioning system while an 'F' grade indicates a non-functioning system with profound impairments due to stressors (Table 2). The scoring system combines a range of scientific factors into a limited grading system; therefore, pluses and minuses are used to further refine the grading system (eg. B-, C+). The grading system is a cumulative score indicating river function, the severity of stressors impacting river health, and the amount of management that may be required to sustain or improve river health.

Table 2: Academic grading scale (A-F) revised for use in the RHAF ranging from Optimally Functional to Non-Functional steam ecosystems.

Grade	Scale	Descriptor	Explanation
A	90-100	Optimally Functional	The indicator is self-sustaining and supports functional characteristics appropriate to sustain river health.
B	80-89	Highly Functional	The indicator maintains essential qualities that support a high level of function, but there is some influence of stressors at a detectable, yet minor, level.
C	70-79	Functional	The indicator is altered by stressors that substantially impair functionality, but basic natural river functions are still sustained.
D	60-69	Functionally Impaired	The indicator is severely altered by stressors that impair basic natural river functions and overall river health.
F	50-59	Non-Functional	The indicator is profoundly impaired by massive or overwhelming stressors that render it incapable of supporting basic natural river functions, or it is unable to sustain biological river communities.

One of the main reasons for adapting the grading scale to an academic, A-F, grade level was for public communication. Results compiled from each river assessment that utilizes the RHAF are not directed solely towards stakeholders and members of the assessment team, but also to the general public and community members located in the assessment watershed. The academic grading scale is an all-encompassing method to communicate results in an efficient and effective manner in which the general public can understand with ease.

Assessment Level Intensity

During the process of merging all previous RHAF methods and protocols, it became clear that this newly formed manual should have the flexibility to be used dependent on a stream managers project. For example, some uses of the framework will require the assessment of all eight indicators beginning at the headwaters and ending at the confluence, or an entire basin-wide evaluation of river health. Alternatively, other uses may only require a subset of indicators assessed within a short stretch of a stream reach before and after a restoration project is constructed. The difference between these uses of the RHAF is vast and alters the assessment level intensity throughout each use.

To accommodate this flexibility, assessment level intensity refers to an evaluation's level of detail, effort, and complexity based on the three levels established by the National Wetlands Monitoring Group of the United States Environmental Protection Agency. The levels of intensity included are as follows:

- **Level I assessments** are predominantly implemented through desktop evaluations. Their scope is usually broad and uses coarse landscape level information. River health is assessed using the practitioner's best professional judgment.

- **Level II assessments** are typically rapid field evaluations that may involve basic data collection and desktop analyses as well as observation.
- **Level III assessments** are more detailed, systematic evaluations involving the collection and analysis of specific quantitative data and information as well as extensive field surveys, studies, and modeling.

The level of intensity will be the project team's discretion depending on the type of assessment conducted, funding available, and any other constraints considered.

Communication and Assessment Results

The versatility of the RHAF to assess a specific river restoration project reach, assess an entire segment of a river corridor, or a comprehensive assessment from headwaters to confluence makes this framework a unique tool for stream management. Depending on the type of implementation (project site, reach, etc.), the results and findings of the RHAF can differ. If the RHAF is used as a pre- and post-project monitoring tool, results will be indicator specific and may need little grade adjustment. For example, a river restoration project may focus directly on riparian zone vegetation enhancement resulting in a single grade before and after project completion. Alternatively, an intensive headwater-to-confluence assessment requires the roll-up of all metrics and indicator grades within each graded reach to form a single grade for the segment, and ultimately, the entire river (Figure 1).

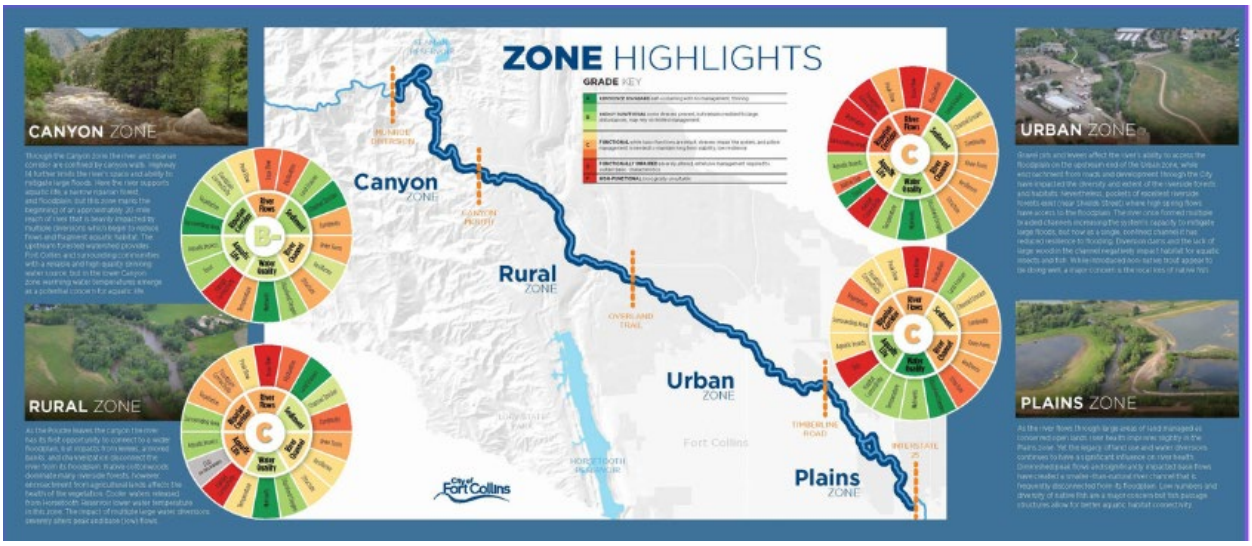

Figure 1: State of the Poudre report card communication tool highlighting the grading roll-up of four assessment zones (canyon, rural, urban and plains), six indicators, and 18 indicators of river health.

Implementing this tool in the Poudre Watershed from headwaters-to-confluence involves separating the watershed into three regions, Upper, Middle, and Lower, coinciding with previous versions of the RHAF. Within the three regions, standardized assessment units, or stream segments, are created based on natural reach breaks such as diversion structures, roads, or easily identifiable breaks during field assessments (See Appendix).

Assessment results are compiled across standardized assessment units and equivalent reaches to ensure consistency in river health grading. To merge indicator grades from smaller reaches, weighted averages can be used that account for the reach's relative length (the reach's length divided by the total length of all reaches being merged within a standardized assessment unit). Each standardized assessment unit can be graded by multiplying the numerical score for each indicator grade by an indicator-specific weighting factor reflecting the indicator's influence on overall river health, function, and valley type. Implementing the RHAF in a watershed without previous efforts will require managers to segment the stream into assessment units. After assessment, a similar method of grade compilation can be used to form unit- and reach-based grades.

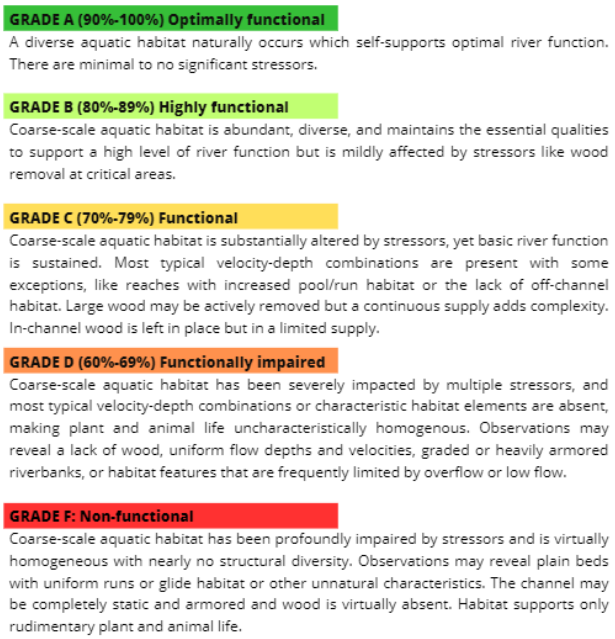

Figure 2: Color coordinated grading scales (A-F) to assist with the communication of results and quickly identify regional grades based on color.

One of the most important objectives of a river health assessment is communicating the results to the general public and community members located in the river system. The academic grading scale of A-F is easy to understand and is one of the most effective ways to communicate a poor versus a good grade. Along with this scale, the steering committee agreed to color coordinate grades in both the RHAF manual and the results to more effectively display results (Figure 2).

Each letter grade represents a level of ecosystem function, from optimally functional to non-functional. The chosen color system equally represents the level of ecosystem function and letter grade and can be displayed across all communication formats, where green represents an A and red represents an F. Further enhancement of results can be created where each assessment unit is represented as a color grade on a map, geographically displaying river function.

Technical Editing and Formatting

The final step in completing the RHAF manual was to rigorously edit and format the document for clarity. The steering committee determined that an outside editing agency would be more appropriate than an internal editor to avoid authorship bias. An outside perspective would also provide insight on the level of jargon incorporated within the document. The framework is an adaptable methodology and can be used in a broader geography than just the Poudre Watershed. Much of the editing process was spent reducing the amount of spatial jargon, simplifying complex scientific language, and combining multiple author's voices into a single, coherent voice. Additionally, each indicator chapter was formatted into a similar structure so they could be used independently in the field. This was done due to the variety of applications of the RHAF. The

similarities of structure in the RHAF manual allow for the document to be segmented and separated based on the practitioners need.

Garfinkel and Associates were chosen as the outside editing agency due to their experience with technical, scientific documents. The main focus during this stage of editing was to unify the voice of the document and standardize the chapters into similar structures. Editing occurred for a duration of four months with bi-weekly check-ins and iterative review from the steering committee. Once a final draft was completed, the steering committee and Garfinkel and Associates completed a final review and wrap-up meeting discussing any remaining recommendations to the document.

Subject Matter Experts were then sent the final draft to ensure no technical information and language was altered from the original versions. Their comments and suggestions were incorporated into the final version which was sent for internal formatting by CPRW. The final version of the RHAF will be hosted digitally by both CPRW and the City of Fort Collins on their respective websites. Formatting changes were made so the digital version was both easier to read and pleasing to the viewer. For example, a cohesive color, graphic, and diagram scheme was incorporated for a better online viewing experience. Additionally, a field packet was formatted which included an overview of the RHAF manual and the 8 indicators and 21 metrics to be used directly in the field. The indicators were separated by chapter tabs so specific indicator pages can be turned to and used in a quick and efficient manner. Lastly, the indicators and metrics were also formatted to be used in tablet version for practitioners who use field tablets.

Results

The results of unifying the previous river health assessment frameworks conducted within the last decade in the Poudre Watershed include two stand-alone documents that highlight what the RHAF is, the importance of river health assessments, and a manual to conduct river health assessments. Individually, these documents can be split into an introduction (RHAF Introduction) and a user guide to implementing a river health assessment (RHAF User Manual). By separating the document into two individual reports, we can target the general public on an introduction to river health assessments as well as target practitioners and stream managers on river health and a framework for assessment.

RHAF Introduction

The RHAF introduction report serves as an easy access, simplified version of the RHAF User's Manual in which community members and the general public can read to gain an understanding of a river health assessment. Instead of going into detail on how to assess each indicator, this document provides a high-level overview of the RHAF, what has been completed to date, and what is included in the user manual.

Figure 3: Example figures, pictures, and diagrams displayed within the River Health Assessment Framework to better communicate methods and reach a broader audience.

Following an overview of the contributing authors, funders, and partners of the project, a description of the Poudre River and its importance to the area is detailed. The previous evaluations of the last eight years are then described, highlighting each region of the watershed – upper, middle, and lower – including their unique features. Lastly, this introductory report provides a simplified brief of the assessment framework and what can be expected in the User Manual. This easy-to-understand report is written alongside figures, diagrams, and images to assist comprehension for the audience (Figure 3).

RHAF User Manual

The RHAF User Manual is the guide authored for practitioners and stream managers to utilize when conducting river health assessments, project monitoring, or stream management practices. This manual is a step-by-step guide on how to conduct assessments for vital river health indicators and metrics, and how to score and report findings of the assessment.

After three different iterations of river health assessment across the Poudre River basin, the resulting manual includes an all-encompassing implementation plan relying on standardized functional levels directly related to an academic grading scale. Stressor-based indicators, some of which included within the previous iterations of the RHAF, were rigorously selected through scientific literature, subject matter expertise, and the combination of knowledge from the steering committee. Ultimately, the RHAF evaluates eight indicators and 21 metrics that are both quantitative and qualitative measurable parameters informative of river health through a common implementation protocol across the three regions. By unifying the indicators, metrics, grading scale, and assessment protocol, the RHAF Manual can now be implemented across the three regions, headwaters-to-confluence, and serve as a correlative tool of river health to stream managers.

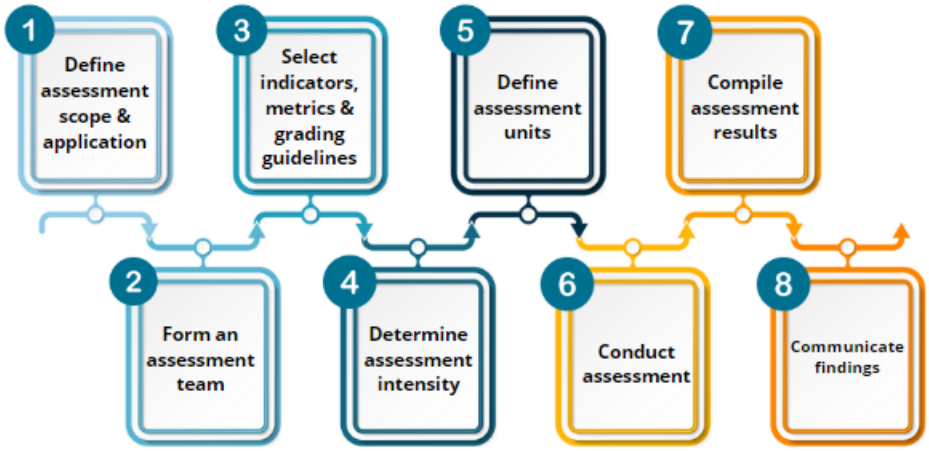

Figure 4: River Health Assessment Framework implementation steps.

Planning and implementing the river health assessment are laid out as follows (Figure 4); see RHAF (2024) for more details:

1. **Define assessment scope and application**
    a. Goals, objectives, audiences and need
    A well-defined scope for a specific application will determine the river health indicators to be evaluated, the required resources, and the assessment's effort, cost, and complexity.

2. **Form an assessment team**
    a. Ecologist, hydrologist, fluvial geomorphologist, water quality specialist, entomologist, and other relevant professionals

    Forming an interdisciplinary team is important for larger-scale river health assessments due to the complex nature of river ecosystems and the factors that contribute to overall river health.

3. **Select indicators, metrics and grading guidelines**
    a. Eight indicators, 21 indicator-specific metrics

b. Grading guidelines on an A-F, 0-100 scale

Qualitative criteria such as descriptions, narratives, and observations, as well as potential stressors. River health assessments can also be done with a mixture of qualitative, quantitative, and hybrid criteria.

Quantitative grading involves the collection of numerical data and, in some cases, statistical methods for analyzing and interpreting the information. Hybrid grading involves both quantitative and qualitative criteria. Specific indicator grades can then be combined for an overall grade of river health.

Indicator	Metrics
Flow Regime	Peak flow, base flow, flow rate of change
Sediment Regime	Watershed supply, local supply, continuity, transport
Wood Regime	Recruitment, transport/storage
Water Quality	Temperature, nutrients, pH, dissolved oxygen
Riparian Floodplain Condition	Riparian vegetation, floodplain physical condition, riparian habitat connectivity, contributing area
River Dynamics	Channel planform, channel profile
Aquatic Habitat	Coarse-scale, fine-scale
Aquatic Life	Macroinvertebrates

4. **Determine assessment level intensity**
   a. Level I, II, or III

   The level of intensity will rely upon the assessment teams discretion based on the assessment units and area, objectives of the project, cost, funding, and other constraints or considerations.

5. **Define assessment units**
   a. River segments, reaches, polygons, and zones of assessment

   A variety of existing boundaries can be used to delineate an assessment unit including but not limited to bridges, roads, diversion structures, or natural boundaries including tributaries or changes in the river's hydrology, geology, etc.

6. **Conduct the assessment**

   Each of the eight river health indicators include grading guidelines and methods that can be used in an assessment. After conducting the evaluation, data should be reviewed for quality assurance and control.

7. **Comple assessment results**
    a. Results are compiled across standardized assessment units and equivalent reaches to ensure consistency in river health grading

       Weighted averages can be used that account for the reach's relative length (the reach's length divided by the total length of all reaches being merged within a standardized assessment unit). Each standardized assessment unit can be graded by multiplying the numerical score for each indicator grade by an indicator-specific weighting factor reflecting the indicator's influence on overall river health, function, and valley type.

8. **Communicate findings**

   Assessment results can be shared with stakeholders, decision-makers, and the public. Findings can be clearly explained, including potential management implications, and recommendations. Communications can include a technical report, simple report card, or online mapping tool.

Conclusions & Discussion

Inspiration for the original three RHAF reports conducted between 2015 and 2019 was centered around basin-wide river health as a guide for restoration and management activities that would increase overall functionality of the Poudre River and its streams. Uses of this framework range from basin-wide river health trends and baseline data to specific reach alterations due to river restoration projects.

The newly formed RHAF takes a holistic and comprehensive approach to evaluating and monitoring the health of the Poudre River and streams within its watershed. It provides a structured and scientifically grounded foundation for assessing a river system's ecological condition and overall well-being. The RHAF is intended to foster cross-community dialogue, informing decision-makers, water resource managers, academics, and community members about the river's health and driving data-based decisions to maintain and improve it.

The RHAF stands apart from other form-based river assessment tools by focusing on the functions of the river system. It considers a variety of river health indicators and metrics and directly links declines in any of these indicators to stressors, allowing for targeted management efforts to mitigate impact. Moreover, the RHAF provides a consistent lens for viewing river health over time, one which allows for consistent tracking of river health trends and management efforts.

Future intentions for the RHAF are to conduct basin-wide assessments of all three regions – Upper, Middle, Lower – on a bi-decadal time scale beginning in the year 2025. Results compiled by these assessments will guide stream managers, including City of Fort Collins, City of Greeley, Town of Windsor, CPRW, and others, on prioritized restoration projects and management activities to increase river function of the Poudre River. Additional benefits for continued stream monitoring using the RHAF Manual include assisting CPRW's ability to track our watershed resilience work, it would facilitate the creation of comparable baseline river health data for the whole watershed, and

it would help provide information that could form the basis of a Stream Management Plan in any part of the watershed.

Coinciding with the basin-wide assessments, the RHAF will also be used as a pre- and post-implementation monitoring tool on river restoration projects occurring within the Poudre Watershed. CPRW, City of Fort Collins, and City of Greeley are currently involved in numerous river restoration design projects or previously implemented restoration projects with plans to monitor using the newly formed RHAF. Implementing a standardized monitoring procedure both pre- and post-construction will create a basin-wide unified adaptive management protocol benefiting stakeholders, management agencies, and the general public interested in stream health.

Stream management in Colorado, especially in the Poudre River basin, is of the utmost importance as it alone provides drinking water to more than 300,000 people in Northern Colorado. With the newly developed, basin-wide RHAF, management agencies and local organizations can now monitor and maintain river function from the headwaters in Rocky Mountain National Park to the confluence at the South Platte River, providing a holistic view of Poudre River health.

Actual Expense Budget

CWCB grant expenses totaled: $84,464.00

Match funding for the project included the following:

- $ 37,369.00 in-kind match from the City of Fort Collins Utilities collaborative Upper Poudre Water Quality Monitoring program
- $16,500 of cash match from the City of Fort Collins Utilities to participate as a partner and subject matter expert during the development of the RHAF
- $2,517.75 of cash match from the City of Fort Collins Natural Areas to supplement the consultants' expenses writing the report
- $16,132.50 cash match from the City of Fort Collins to hire and pay for a professional editing company to finalize the RHAF report
- $25,458 of cash match from Mighty Arrow Family Foundation for CPRW staff time to manage and lead the project
- $202 of in-kind stakeholder meeting time was accounted for in the grant RFR reporting.

Description	subtotal	CWCB Req. Funds	Match- City of Ft Collins	CPRW Co Water Plan	In-Kind*	Total	CWCB Funds	Match- CFC cash	Match- CFC InKind	Match- Mighty Arrow	Other Funding In-Kind*	Total
Task 1- Align RHAF across basin							$42,380.00					$ 42,380.00
City of Fort Collins NA staff (300 hrs)	$45,305	$0	$45,305			$14,990						
City of Fort Collins UT staff (600 hrs)	$30,315	$0	$30,315			$30,315			$ 37,369.00			$ 37,369.00
Consultant costs (technical, geom/ecologist)	$37,380	$27,380	$10,000			$37,380						
CPRW staff	$15,000	$15,000		$0		$15,000				$ 19,989.50		$ 19,989.50
subtotal	$128,000	$42,380	$85,620	$0	$0	$97,685						
Task 2-Prioritization and Implementation Plan						$0	$10,800.00					$10,800.00
GIS support	$1,600	$1,600				$1,600						
establish implementation plan	$4,200	$4,200				$4,200						
constraint analysis (social/econ, legal, admin, constraints)	$5,000	$5,000				$5,000						
subtotal	$10,800	$10,800	$0	$0	$0	$10,800						
Task 3- Analyze data & draft report						$0	$19,800.00	$ 35,018.75		$ 1,932.58		$ 56,751.33
Consultant labor	$5,600	$5,600				$5,600						
CPRW Proj Manager	$3,200	$3,200				$3,200						
CPRW ExDir labor	$1,000	$1,000				$1,000						
data display & graphic design	*$10,000*	*$10,000*				*$10,000*						
corporate citsci data in to analysis & narrative	$0	$0										
subtotal	$19,800	$19,800	$0	$0	$0	$19,800						
Task 4- Stakeholder outreach												
CPRW staff time - ExDir	$4,800	$0		$4,800		$4,800						
CPRW staff time - Proj Manager	$3,840	$0		$3,840		$3,840						
VISTA time	$4,178	$0			$4,178	$4,178						
stakeholder time	$11,569	$0			$11,569	$11,569					$ 202.00	$ 202.00
community mtgs	$4,820	$0			$4,820	$4,820						
subtotal	$29,207	$0		$8,640	$20,567	$29,207						
Task 5- Project coordination/admin							$11,484.00			$ 3,536.43		$ 15,020.43
CPRW ExDir labor	$6,000	$6,000				$6,000						
CPRW proj manager	$1,440	$1,440				$1,440						
Other Than Direct Costs (staff & consultant)												
mileage	$1,044	$1,044				$1,044						
meeting support	$1,000	$1,000				$1,000						
printing	$2,000	$2,000				$2,000						
subtotal	$11,484	$11,484	$0	$0	$0	$11,484						
TOTALS	$199,291	$84,464	$85,620	$8,640	$20,567	$168,976						
TOTALS	$168,976	$84,464	$55,305	$8,640	$20,567	$168,976	$ 84,464.00	$ 35,018.75	$ 37,369.00	$ 25,458.51	$ 202.00	$ 182,512.26

Appendix

Upper Watershed	
Code	Name
U1	US La Poudre Pass Creek
U2	Big South Meadows
U3	Big South US Peterson Lake Trib
U4	Big South DS Peterson Lake Trib
U5	Big South Fork HWY 14 Bridge
U6	Big South DS HWY 14 Bridge
U7	DS Big South Fork
U8	HWY 14 Bridge 2
U9	DS HWY 14 Bridge 2
U10	Sportsman's Lodge
U11	Sleeping Elephant
U12	US Kinikinik
U13	Big Bend Campground
U14	Fish Hatchery
U15	DS Fish Hatchery
U16	Homestead Trailer Park Bridge
U17	Washout Gulch
U18	Black Hollow Road Bridge
U19	Profile Rock
U20	Profile Rock Road Bridge
U21	DS Profile Rock Road
U22	Private Bridge 3
U23	US Archers Resort
U24	Rustic
U25	DS Rustic
U26	HWY 14 Bridge Rustic
U27	Indian Meadows
U28	DS Indian Meadows
U29	HWY 14 Bridge
U30	DS HWY 14 Bridge
U31	Pingree Park Road Bridge
U32	DS Pingree Park Road
U33	Kelly Flats Bridge
U34	Kelly Flats to Private Bridge 2
U35	Private Bridge 2
U36	US Little South Fork
U37	DS Little South Fork
U38	Big Narrows
U39	DS Big Narrows
U40	Stove Prairie Road to Mishawaka
U41	Mishawaka to Poudre Park
U42	Poudre Park
U43	DS Poudre Park
U44	Private Bridge 1
U45	DS Private Bridge 1
U46	Manners Lane Bridge
U47	DS Manners Lane
U48	Smith Bridge Road Bridge
U49	US Munroe Diversion

Middle Watershed	
Code	Name
M1	Munroe Canal Diversion to North Fork Poudre River
M2	North Fork Poudre River to Poudre Valley Canal
M3	Poudre Valley Canal to Greeley Diversion
M4	Greeley Diversion to County Road 54
M5	County Road 54 to Rist Canyon Road
M6	Rist Canyon Road to DS Overland Trail
M7	DS Overland Trail to Larimer Weld Canal
M8	Larimer Weld Canal to Shields Street
M9	Sheilds Street to College Avenue
M10	College Avenue to Lincoln Street
M11	Lincoln Street to Mulberry Street
M12	Mulberry Street to Timnath Reservoir Inlet Canal
M13	Timnath Reservoir Inlet Canal to Timberline Road
M14	Timberline Road to Prospect Road
M15	Prospect Road to Fossil Creek Reservoir Inlet Canal
M16	Fossil Creek Reservoir Inlet Canal to Boxelder Creek
M17	Boxelder Creek to Rail Road Bridge
M18	Rail Road Bridge to Interset - 25

Lower Watershed	
Code	Name
L1	East Interstate - 25
L2	Harrison
L3	North Greeley No. 2 Ditch
L4	South Greeley No. 2 Ditch
L5	River Bluffs
L6	Frank State Wildlife Area
L7	Whitney Ditch
L8	Eastman Park
L9	Pelican Lake
L10	Kodak Watchable Wildlife Area
L11	Windsor WWTP
L12	Broe Bluffs
L13	Broe-Marietta-Orr
L14	Poudre Learning Center
L15	Signature Bluffs West
L16	Signature Bluffs East
L17	Sheep Draw
L18	Cottonwood Bend West
L19	Cottonwood Bend East
L20	Great Western Railway
L21	Poudre Ponds
L22	25th Avenue
L23	Island Grove
L24	6th Avenue
L25	Greeley WWTP
L26	Varra
L27	Fern Avenue
L28	Confluence with South Platte River

References

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