Final Report

Summary Report on Trinity River Restoration Program Goals and Objectives

Including Components of Governance and Adaptive Management

Headwaters CORPORATION

Prepared for:	Trinity River Restoration Program (TRRP)
Project Name:	TRRP Refinements
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For more information, contact:
Chad Smith
Headwaters Corporation
smithc@headwaterscorp.com
402.432.7950

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Lewiston Dam, Trinity River, California (photo by Dan Bacher, accessed July 27, 2017)

Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, NE 68845
www.headwaterscorp.com

1.0 Table of Contents

2.0 Introduction

Headwaters Corporation was contracted by the U.S. Bureau of Reclamation to complete the seven tasks identified in the Trinity River Restoration Program Refinements Solicitation (#R17PS00533). As described in the Solicitation, the scope of this work is to review the goals and mandates of the Trinity River Flow Evaluation Study (TRFE) and Record of Decision (ROD), identify refinements to Trinity River Restoration Program (TRRP or Program) management and functions that will better serve those goals and mandates, and assist the Department of the Interior (DOI) in implementing the refinements. Specific tasks include:

Tasks 1-2	Review of Key TRRP Documents
Task 3	TRRP Interviews
Task 4	Summarize Strengths/Weaknesses of TRRP Organizational Structure
Task 5	Present Strengths & Weaknesses Document to Coordination Team and Develop Actionable Recommendations for Program Refinements
Task 6	Facilitate Discussion Among the Trinity Management Council (TMC), Trinity Adaptive Management Working Group (TAMWG), and TRRP on Actionable Items/Power Point Presentation/Final Report
Task 7	Remain Available to Assist with Oversight & Implementation of Recommendations

This report to the TRRP is the deliverable for Tasks 1-2 and summarizes our key findings. The purpose of Tasks 1-2 was to evaluate TRRP foundational, formative, and assessment documents to identify program goals and objectives, as well as key components and sub-components of both governance and adaptive management in accordance with implementing our Adaptive Management Program Evaluation Framework (AMPEF). The full AMPEF is described in detail in **Appendix A**.

Methodology

We developed a document review template to allow for consistent review and reporting of all TRRP documents, and to capture key aspects for reporting back to the TRRP. An example of that review template is included as **Appendix B**. In total, eighteen (18) documents were reviewed (see Section 6.0) with an initial focus on the three primary foundational documents:

- 1999 Trinity River Flow Evaluation Study (TRFE)
- 2000 Trinity River Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR)
- 2000 Record of Decision (ROD)

All documents were reviewed for language identifying TRRP goals and objectives. This review was comprehensive, but also informed by our previous experience with the TRRP and our work with other similar programs such as the Platte River Recovery Implementation Program (PRRIP). The documents were also reviewed for the governance components (and associated sub-components) of Legitimacy, Structure/Process, and the Decision-Making Process and the components (and associated sub-components) that correspond to the six steps of adaptive management (AM) – Assess, Design, Implement, Monitor, Evaluate, and Adjust.

This document review provided insight into the foundations of the TRRP and has helped to prepare our team for detailed evaluation and discussions during our work on the remaining tasks. Document review and reference will continue during the remainder of the tasks, particularly during Task 3 when we will pair information gathered so far and information gathered from in-depth interviews with TRRP decision-makers and participants.

Our philosophy in approaching review of a program like the TRRP is grounded in two main principles:

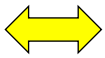
1) A focus on the question of "Why?" – Why does this Program exist? This means ensuring that management actions, adaptive management, and other Program activities are directed at helping decision-makers actually make decisions ("need to know" not "nice to know") that move the Program toward achieving its goals and objectives.

2) Determining if the Program is organized around negotiated and agreed-to goals and objectives.

Focusing on the "people issues" of governance, decision-making, and the composition of TRRP partners and affected resources can lead to a tangible set of questions and issues that best address the "Why?" question and will lead to a common of understanding of where the TRRP is headed (goals and objectives). Regarding adaptive management (AM), it is important for decision-makers to have a common understanding of an AM definition that best fits the purposes and goals of the Program. Application of AM at a large scale can only be effective when designed to help restoration programs with decision-making that leads to achieving goals and objectives.

To assist the TRRP with evaluting our initial assessments of goals and objectives and our scoping of critical components of governance and AM, the following icons and colors are used to visually summarize our basic findings. The icons and colors are intended to provided the TRRP with a quick and visual means to see where the Program stands and offer a simple tracking device as the Program moves forward. Categories include:

Purpose/goal/objective language present and clear and provides direction for the TRRP.
Governance/AM components – key indicators present.



Purpose/goal/objective language unclear and needs to be revised by the TRRP.
Governance/AM components – key indicators not clearly evident or in development.

Purpose/goal/objective language not present and needs to be developed by the TRRP.
Governance/AM components – key indicators absent.

A Review Draft of this report was distributed to the Coordination Team for their review and comment. **Appendix C** is a table of those comments with responses from the Headwaters Corporation Team to each comment.

3.0 TRRP Goals and Objectives

It is imperative for large-scale recovery/restoration/adaptive management programs like the TRRP to provide a clear articulation of their purpose and overall goal. All decisions made by a program's decision-making body should relate back to satisfying this purpose and goal, and more detailed objectives, management actions, and the overall AM framework should generate information important for this decision-making. Failure to clearly identify these key program building blocks is an early indicator that a program may be drifting away from a central focus that can account for measures of progress and success.

Our team used the following definitions to guide our review of TRRP documents:

Purpose – Descriptive statement of why the program exists and the context for program design and action.

Goal – A broad statement of desired outcomes that forms direction for the program and guides implementation. This may be somewhat intangible, while underlying objectives are tangible and measurable.

Objectives – The proposed means of achieving a goal. These disaggregate goals into a logical hierarchy of desired attributes of the system.

Management Objectives – Even more specific and measurable statements of outcomes the program is trying to achieve that should facilitate evaluation of adaptive management effectiveness.

The TRRP may utilize different definitions when evaluating its own work, but for our purposes we used the definitions above to help identify critical language. We reviewed TRRP documents for clear statements of the Program's purpose, goals, and objectives. Where we did not discover clear statements of these terms, we tried to identify language that could be categorized accordingly.

TRRP Purpose

We first reviewed TRRP documents to find language pointing to the highest-order purpose of the Program. In our experience, purpose language tends to be the plainest explanation of the negotiated context for the "Why?" question.[1] It is expected that the purpose language would encompass the underlying resource issues (e.g. anadromous fish populations), compliance (e.g. Endangered Species Act [ESA]), use (e.g. flow releases and fisheries), and the legitimacy of the program itself (e.g. organizational structure).

Appendix C of the Final EIS/EIR, commonly referred to as the "Implementation Plan," states the purpose of the TRRP is to *"restore the basin's fish and wildlife populations to those that existed prior to construction of the Trinity River Diversion (TRD) and to implement measures to restore fish and wildlife habitat in the Trinity River."* This language appears to be a derivation of the stated "Purpose and Need" language (a requirement of the National Environmental Policy Act process) in the Implementation Plan which is to "restore and maintain the natural production of anadromous fish on the Trinity River below the mainstem downstream of Lewiston Dam." The purpose language clearly captures the underlying resource issue, namely concern about fish populations, and touches on use issues ("implement measures"). There is no language regarding ESA or other compliance, and the purpose statement does not mention any kind of collaborative approach or organizational structure on which to build the TRRP and implement the plan. This language also does not specifically capture the legally-mandated requirement to uphold the federal government's tribal trust obligations regarding Trinity River fisheries.

[1] For example, a clear statement of purpose can be found on Page 1 of the Final Program Document for the Platte River Recovery Implementation Program (PRRIP) and bounds the entire set of goals, objectives, and management objectives that follow.

With the TRFE and the ROD generally silent on broad purpose language, the language from the EIS/EIR is the most direct for a TRRP purpose statement. Because the statement does not include all the expected components of a strong purpose statement, some discussion and editing among TRRP decision-makers is recommended to strengthen and broaden the language so it matches the intended direction of the TRRP. However, as discussed below, this same language is also identified as the long-term goal of the Program so work is recommended to clarify differences between the overall purpose of the Program and desired outcomes.

TRRP Goal

Our review of documents next focused on identifying goal language that directly relates to broad outcomes for the TRRP. It is expected that goal language would necessarily be more specific than purpose language and focused on achieving some result related to anadromous fisheries, habitat, and/or Trinity River function.

The three primary foundational documents provide mixed guidance on a clear statement of the overall Program goal. The TRFE concludes that *"a modified flow regime, a reconfigured channel, and strategy for sediment management are necessary to have a functioning alluvial river that will provide the diverse habitat required to restore and maintain the fishery resources of the Trinity River."* This could be construed as goal language that captures outcomes related both to fisheries and to river form/function. The TRFE is largely a technical report with recommendations that are more accurately described as objectives (see below). Additional references to Program goals in the TRFE circle back to the relevant Congressional legislation.

The Executive Summary of the Final EIS/EIR includes specific salmonid population numbers as "goals" for the TRRP. Those numbers are included in Table ES-2 which is reproduced below:

TABLE ES-2
Trinity River Restoration Program Goals and Recent Escapement Estimates

Population	Inriver Goals	Recent Escapements as Percentage of Goals	Hatchery Goals	Total Goals
Fall Chinook	62,000	20%	9,000	71,000
Spring Chinook	6,000	40%	3,000	9,000
Coho	1,400	14%	2,100	3,500
Winter Steelhead	40,000	5%	10,000	50,000

This table is not referenced later in Appendix C of the EIS/EIR (the Implementation Plan) or in the ROD so it is unclear whether these numbers remain a firm part of an overall Program goal, whether they are population targets used as metrics of Program progress, or whether they are used at all in Program decision-making.

The Implementation Plan refers to the "restoration goal"[2] as stated in the 1984 Trinity River Basin Fish and Wildlife Management Act and expanded in the 1996 re-authorization – "*to restore the basin's fish and wildlife populations to those that existed prior to construction of the TRD and implement measures to restore fish and wildlife habitat in the Trinity River, as measured by returning adult anadromous fish spawners and the ability of dependent tribal, commercial, and sport fishers to enjoy the benefits of restoration through a harvestable fishery resource."* There is also brief mention of this language in the TRFE as the long-term goal of the TRRP.

[2] The term "restoration goal" is also used as part of the settlement that established the San Joaquin River Restoration Program and prescribed flows from Friant Dam.

The ROD refers to the "ultimate goal" of the TRRP being *"restoring the fishery resources of the Trinity River."* There is also reference to the "restoration goal" as being implementation of the preferred alternative from the Implementation Plan as detailed in the Implementation Plan. The ROD then directs DOI agencies to implement the preferred alternative because it *"best meets the statutory and trust (Hoopa Valley and Yurok tribes) obligations of the Department to restore and maintain the Trinity River's anadromous fishery resources, based on the best available scientific information, while also continuing to provide water supplies for beneficial uses and power generation as a function of Reclamation's Central Valley Project (CVP)."*

The 2009 Integrated Assessment Plan (IAP) includes a draft Program goal statement that was used to guide development of the IAP but was never adopted by the TMC as the official Program goal:

"The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities. The Program strategy for accomplishing this goal restores and perpetually maintains fish and wildlife resources (including threatened and endangered species) by restoring the processes that produce a healthy alluvial river ecosystem. The above restoration strategy will be achieved by implementing management actions in a science-based adaptive management program."

This goal statement has been used as recently as 2017 as part of the TRRP Science Budget Briefing documents assembled for the July 27, 2017 TMC meeting. Interestingly, the IAP includes the following explanatory language:

"The first sentence of the goal statement focuses on fish, and incorporates the language of fishery goals from such foundational documents as the Trinity River Basin Fish and Wildlife Management Act (1984) amended in 1996, Central Valley Project Improvement Act (1992), and the ROD. The second sentence of the goal mentions both fish and wildlife, and very briefly describes the restoration strategy. Threatened and endangered species are mentioned to ensure compliance with the Endangered Species Act. The words on the restoration strategy (i.e., "restoring the processes that produce a healthy alluvial river ecosystem") are meant to concisely reflect the intent of the TRFE and ROD. The third sentence of the goal statement reflects the commitment in the ROD, TRFE, and Implementation Plan to a science-based, adaptive environmental assessment and management program."

This explanatory language mirrors our description above of what strong Program purpose language should include. Given that this is largely the language of the purpose statement in the Implementation Plan, there is a mixing of purpose and goal language in the TRRP foundational documents. In most cases, language identified as a "goal" for the TRRP is more accurately defined as a purpose statement for the Program. The IAP "goal statement" quoted above is best identified as a more complete statement of the TRRP purpose. Frequent references to restoring Trinity River fisheries appears in most forms of both purpose and goal statements in various documents – the ROD identifies this as the Program's ultimate goal and the EIS/EIR identifies specific fish population numbers as goals. So, is the goal to "restore Trinity River fisheries"? Is it to "restore and sustain natural production of five anadromous fish populations downstream of Lewiston Dam to pre-dam levels"? Is it to "restore the processes that produce a healthy alluvial river ecosystem"? Is it just to hit the fish population numbers identified in Table ES-2 of EIS/EIR? This lack of clarity is likely a tripping point for the Program and certainly is a driver of the what the 2008 CDR Situation Assessment identified as "fundamental disagreement" over the goal of the TRRP. <u>We note this as an early and critical red flag and recommend this be addressed by the TRRP.</u>

TRRP Objectives

Our review of documents next focused on identifying specific and measurable objectives and detailed management objectives for the TRRP. At this stage, language should provide quantitative guidance and metrics for reporting progress toward achieving the Program's goal and evaluating the effectiveness of AM actions.

The foundational documents and other important TRRP documents do provide information that could be construed as guidance for set of higher-order objectives related to more specific management objectives (see below). We initially identified three "objectives":

Annual Flow Regime

The ROD includes a total volume of water released annually from the Trinity River Division (TRD) ranging from 369,000-815,000 acre-feet. That annual volume is further specified in the ROD based on water-year class as described in Table 1 (reproduced below):

ROD TABLE 1
Annual Flow Volumes

Water-Year Class	Volume (acre-feet)	Peak Flow (cfs)	Peak Flow Duration (days)
Critically Dry	369,000	1,500	36
Dry	453,000	4,500	5
Normal	647,000	6,000	5
Wet	701,000	8,500	5
Extremely Wet	815,000	11,000	5

These annual flow volumes are based on TRFE recommendations and are included in the Implementation Plan, which also provides guidance on Trinity River temperature objectives and ramping rate criteria for Lewiston Dam. The ROD states that the daily release schedule "may be adjusted" according to annual hydrology but the annual flow volumes specified above "may not be changed."

Mechanical Channel Rehabilitation

The ROD and Implementation Plan identify channel rehabilitation at 44 project sites and side-channel rehabilitation at three project sites.

Sediment Management

As with the flow objective, the ROD includes a range of coarse sediment introductions from 0-67,000 cubic yards annually. That annual volume is further specified in the ROD based on water-year class as described in Table 2 (reproduced below):

ROD TABLE 2
Annual Coarse Sediment Introduction

Water-Year Class	Volume (yd^3/year)
Critically Dry	0
Dry	150-250
Normal	1,800-2,200
Wet	10,000-18,000
Extremely Wet	31,000-67,000

The Implementation Plan further refines the Table 2 ranges by estimating a specific volume of annual coarse sediment augmentation for each water-year class. A footnote to Table 5 in the Implementation Plan (which provides the specific estimated annual volumes) states: *"The AEAM process will monitor and test these hypotheses and recommend augmentation volumes on an annual basis based upon the results of previous years augmentation and monitoring."* This suggests the recommend volumes are to be seen more as hypotheses rather than actual Program objectives.

While these appear to be a starting point for Program objectives, the language is treated differently in among TRRP documents. The TRFE identifies annual water volumes and flow recommendations, channel rehabilitation, and sediment management as "management actions" that are part of an overall management strategy. Similarly, the IAP refers to this same set of items as "management actions."

Regarding more specific management objectives, TRRP documents appear to provide ample guidance on specific management objectives that can lead into development and implementation of an AM Plan. In some cases, those management objectives are explicit and can simply be organized and renamed specifically as TRRP management objectives. In other cases, the language may not be presented as a management objective but metrics are provided that could be re-worded as a measurable objective for Program management actions.

The TRFE includes a set of what can best be described as management objectives. For example, the flow-related management objectives specified in the TRFE are:

1) *Releases to provide suitable salmonid spawning and rearing habitat,*
2) *Releases to mimic the spring snowmelt hydrograph (the high flow in the spring resulting from the melting snowpack and the gradual decrease in flow following the peak) to satisfy flow-related geomorphic and riparian vegetation objectives necessary for the creation and maintenance of diverse salmonid habitats and assist smolt outmigration, and*
3) *Releases to meet appropriate water-temperature objectives for holding/spawning adult salmonids and outmigrating salmonid smolts.*

The IAP recommends a set of six "primary objectives" that can best be identified as management objectives for the Program. These objectives include:

1) *Create and maintain spatially complex channel morphology.*
2) *Increase/improve habitats for freshwater life stages of anadromous fish to the extent necessary to meet or exceed productions goals.*
3) *Restore and maintain natural production of anadromous fish populations.*
4) *Restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities.*
5) *Establish and maintain riparian vegetation that supports fish and wildlife.*
6) *Rehabilitate and protect wildlife habitat and maintain or enhance wildlife populations following implementation.*

While all this language is instructive in terms of TRRP objectives, there are some outstanding issues:

1) Are these truly objectives to be achieved over a certain time, or are they mandates that must be met in perpetuity? Though the flow and sediment objectives are initially presented as a range, that range is then followed by specific volumes according to multiple water-year classes. That suggests volumes mandated by conclusions from the TRFE that must be adhered to in terms of implementation, as opposed to negotiated volumes that the Program will attempt to meet over a negotiated period of time. Dam releases and sediment augmentation are variably referred to in the foundational documents as "components," "elements," and "management actions." That suggests these items may exist more as mandated management actions rather than negotiated TRRP objectives.

2) How, or if, these objectives are linked to negotiated, numerical goals for anadromous fish populations (i.e. Table ES-2 from the EIS/EIR included above) is not entirely clear.

3) The path from Program objectives to hypotheses in an Adaptive Management Plan for the TRRP is not clear. With at least one foundational document referring to objective numbers as “hypotheses” and with the specificity of annual volumes, it is unclear how much flexibility exists within the objectives of the Program to implement true adaptive management.

Establishing higher-order but specific objectives is an important step to ensure that management actions and associated TRRP science learning can be communicated back to decision-makers and effectively linked to the TRRP goal. We recommend some attention be paid by the Program to ensure language related to Program objectives is clear and linked back to the overall goal. While management objective language can be found in several TRRP documents, multiple sets of management objectives need to be unified and tightly linked not only to TRRP goals and objectives but also uncertainties, hypotheses, and other aspects of the as-yet-to-be developed TRRP AM Plan.

4.0 Key Findings

Based on our review of TRRP documents, these are our primary initial findings regarding the status of goal and objective language in the TRRP. Interestingly, each of these issues came up as a challenge to forward progress within the Program during the July 27, 2017 TMC Budget Meeting. Our review and understanding of Program goals and objectives will continue during subsequent tasks so these initial findings may adjust as we continue the TRRP Refinements work.

1) *Existence* – Why does the TRRP exist? This is an existential question that requires some attention. Does the TRRP exist merely to implement the technical flow recommendations (and other management actions) specified in the TRFE and mandated by legislation, the Implementation Plan, and the ROD? If so, opportunities for AM may be limited as may the ability of the TRRP to operate as a truly collaborative program with inclusive decision-making. Or, does the TRRP exist to implement a negotiated set of goals, objectives, and actions as a collaborative program, and as a program implementing a true AM Plan? Are the specifics such as annual flow and sediment volumes flexible enough to accommodate implementation of AM? We are not clear on the answers to these questions, but those answers will drive what steps the TRRP takes to address the issues identified with the presence and clarity of statements of Program purpose, goals, and objectives.

2) *Document cascade* – Current statements of goals and objectives are disaggregated into multiple foundational documents and related supporting documents. In some cases, that language is either absent or unclear. To move forward, the Program needs a single foundational document that pulls this information and guidance together with clarity and that represents a negotiated way forward.

3) *Negotiation* – The statements of goals and objectives are not currently negotiated by TRRP decision-makers and partners. Objectives and management actions have been prescribed through Congressional action, the TRFE, the Implementation Plan, and the ROD. These documents are not clearly unified. Based on our experience, we would expect a single, negotiated Final Program Document that provides all the structure and function for the Program and that is cross-linked as the true Preferred Alternative in the EIS/EIR and ROD. The "Implementation Plan" would be part of the Final Program Document, not an Appendix in the EIS/EIR. This step will require substantial work by and trust on the part of the TMC to fix, but would put the TRRP on more solid footing in terms of vision, direction, and action.

4) *"Science pile"* – The TRRP is bounded by mandated science documents. Ideally, science should be applied through AM but implemented within the negotiated context of the Program. Science is just one input to decision-making and should not be determinative to the entire Program. Applying science without clear goals/objectives or a clear collaborative structure means building a "science pile" – a Program will conduct good science and collect substantial data, but why? What do you do with it? Why/how does it matter to decision-makers? This appears to be a fundamental challenge with the TRRP based on our work so far. We will explore this more during the interviews in Task 3.

5) The TRRP should be empowered to negotiate and settle on these key components:

WHY

→ Purpose
→ Long-term goal
→ Long-term and time-specified objectives

HOW

→ Elements (including descriptors of water, land, time, and ability to modify TRRP or be flexible in response to learning)

→ Implementation framework (AM Plan, management objectives, management strategies)

WHAT

→ Management actions

5.0 TRRP Governance and Adaptive Management

Tasks 1-2 also served as part of the initial scoping step for implementing our Adaptive Management Program Evaluation Framework (AMPEF; see **Appendix A**). Scoping is focused on key governance components and sub-components that appear to be critical. The initial set of components/sub-components expected to be of particular relevance for the TRRP are based on a literature review of governance analyses, legislative and implementation reviews of several large adaptive management plans across the U.S., discussions with governance and adaptive management experts from many of these programs, and from personal experience implementing adaptive management for the PRRIP and working on adaptive management and governance issues in the Middle Rio Grande, Everglades, and other systems.

The information below is our initial rapid qualitative assessment of key governance and AM components of the TRRP based so far only on our review of TRRP documents and our general understanding of the Program. This is just our initial insight and represents introductory thinking about the health of these components and their possible relationship to TRRP success or failure. This early thinking will be paired with information from the TRRP interviews in Task 3 to achieve a deeper understanding.

Governance Components

The discussion and tables below describe three governance components and their sub-components that regularly stand out as imperative in matching "good governance" with adaptive management in programs like the TRRP. Key sub-components and indicators are also identified that would be expected for the TRRP to be successful in establishing and maintaining a functioning governance structure. Refinements will occur during implementation of the AMPEF in the TRRP through document review, subsequent interviews, and overall evaluation of the Program.

Legitimacy

This component means a Program is accountable and enabled with decision responsibility. As implementation occurs and decisions are made, the Program is responsive to constituencies both above and below the level of the decision-making body (e.g. both elected or appointed officials and stakeholders).

Governance Component	Sub-Components	Key Indicators – Initial Insight
Legitimacy	☐ Accountability ☐ Responsiveness to constituencies	• The TRRP is legitimate as directed by legislation and related statutory authority, as noted in the Implementation Plan – *"the proposed action is supported by legislative, executive, and judicial authorities and decisions."* • Authorizing legislation and a set of foundational documents provide guidance for the development and implementation of the TRRP. • The life-cycle of the TRRP is not clearly specified, but annual appropriations have kept the Program moving forward. • There is a mix of goal and objective language in the foundational documents. Clarification, revision, and specification is required, but the raw materials are present.

Structure/Capacity

This component refers to a polycentric organizational structure with a centralized decision-making body but with explicit support from advisory committees and appropriate levels of authority. There is clear coordination among governance levels within the Program (e.g. coordination and communication between the decision-making body and supporting advisory committees). The scale of the Program represents manageable geography on the ground but is also tied to relevance of key decision-makers. Ideally, stakeholders are directly involved in decision-making. Overall, there is clear and regular communication among and between decision-makers, technical personnel, Program staff, and independent science advisors. Technical capacity is present and adequate within the Program to deliver information useful to decision-makers.

Governance Component	Sub-Components	Key Indicators – Initial Insight
Structure/Capacity	☐ Polycentric ☐ Coordination ☐ Scale (geography) ☐ Scale (time) ☐ Stakeholders involved in decision-making ☐ Communication ☐ Technical capacity	• The decision-making body should be the TMC but there is some language in documents that suggests decision-making by both the TMC and the Executive Director. The TMC is inclusive of key tribal, federal, state, and local agencies, but does not engage other stakeholders directly in decision-making. • The geographic scale of the TRRP is relevant and manageable. The time scale of the TRRP is not specified. • The TRRP has technical staff capacity related to the most relevant data needs for decision-making. • There appears to be regular communication within the TRRP and among decision-making entities but that communication does not appear to always be effective. Communication between the TMC and the TAMWG and other advisory committees needs work. This is a significant issue for the TRRP. • The Program does maintain a web site with current and historic information.

Decision-Making Process

This component refers to shared decision-making among management agencies and stakeholders with a fair and transparent process for making decisions by consensus. Decisions should be tied to the processes described in the foundational document and linked to Program goals and objectives. There is a means for resolving disputes and decisions that do not reach consensus. The Program can respond to change and surprise (uncertainty) and incorporate learning into decision-making.

Governance Component	Sub-Components	Key Indicators – Initial Insight
Decision-Making Process	☐ Shared decision-making ☐ Fair and transparent ☐ Consensus ☐ Decisions linked to goals/objectives ☐ Dispute resolution ☐ Adapt to surprises ☐ Ability to incorporate learning into decision-making	• Decision-making is not shared, at least not inclusive of some level of stakeholders beyond agencies. • It is not clear how or if the TMC works to achieve consensus with all decisions. • With a lack of clarity on goals and objectives and without an AM Plan, it is not clear how science is moved out of the "science pile" and into decision-making. • This also relates to uncertainty about how the TRRP responds to science learning and surprises in the response of anadromous fisheries and the form/function of the Trinity River to management actions.

Adaptive Management (AM) Components

The second category of evaluation in this step is built around the structure of AM itself. This scoping step centers on a hybrid approach of evaluating AM against implementation of each of the six key steps. The discussion and tables below describe the six steps or components of AM that, if present, are considered to constitute successful AM. Key sub-components and indicators are also identified that would be expected for the TRRP to be successful in implementing a full cycle of AM through the 'Adjust' component with a clear indication of the learning from AM being utilized in the decision-making process. As with the governance components, refinements will occur during implementation of the AMPEF in the TRRP through document review, subsequent interviews, and overall evaluation of the Program.

General Observation

The TRFE, Implementation Plan, and ROD all call for development of an AEAM Program, or AM Program. While documents like the IAP contain some of the important details that are necessary to build a true AM Plan, the TRRP does not appear to be operating under or implementing a negotiated and agreed-to AM Plan. With no Program AM Plan, there is no agreed-to definition of AM for the Program that is written down in a TRRP foundational or guidance document. All of this means the TRRP is being challenged by a lack of direction in its science program and decision-making is most likely disconnected from data that is being collected. This challenge is exacerbated by ambiguity in Program goals and objectives. The Implementation Plan does provide an example set of hypotheses and objectives for

implementing peak flows during an Extremely Wet Year. The IAP builds on this kind of detail for a series of Program hypotheses, management objectives, and management actions. However, it is not clear what the standing of the IAP is within the Program, whether it has been officially adopted, and how it relates to the TRRP foundational documents. Ideally, this kind of detail would be wrapped up within a TRRP AM Plan. We note the lack of an AM Plan and a definition of AM as critical red flags for the TRRP that we recommend addressing.

Assess

This component addresses problem definition and agreement. Decisions will be affected by science information so a roadmap of goals, objectives, hypotheses, and actions is established accordingly. There is a collaborative process for agreement and decisions. This component represents the building blocks of AM.

AM Component	Sub-Components	Key Indicators – Initial Insight
Assess	☐ Problem definition and agreement ☐ Roadmap of goals, objectives, hypotheses ☐ Decisions affected by information ☐ Collaborative process to develop this information	• Goals and objectives not clear. • No AM Plan, Program definition of AM not agreed to and written down. • Critical uncertainties (what don't we know but want to learn) and Conceptual Ecological Models (CEM) and/or conceptual management models can be found in documents like the IAP, but are not finalized and agreed-to by the TMC/TRRP. • Similar for other AM specifics (alternative management actions, indicators/triggers, spatial and temporal bounds, assumptions). • No clear indication of how what is learned will be used for decisions. • Largely technical information mandated from top-down or only science teams, not developed and negotiated collaboratively.

Design

This component addresses explicit management objectives, management actions, and monitoring/research protocols designed to deliver information relative to priority hypotheses and questions from decision-makers.

AM Component	Sub-Components	Key Indicators – Initial Insight
Design	☐ Management objectives ☐ Management actions ☐ Monitoring/research protocols tailored to hypotheses and key questions from decision-makers	• Active or passive AM? – driven by the overall structure of the TRRP and whether the Program is going to just implement mandated actions or operate as a collaborative program with an AM Plan that includes alternative management actions. • Lack of clarity about measurable objectives/management actions. • Modeling, monitoring, and data management plans may be present but are not tied to a TRRP AM Plan (it does not exist). • TRRP time scale and budget processes seem to focus just on annual appropriations without a long-term plan.

Implement

This component represents the machinery of AM on the ground. The program has a clear process for implementation of management actions and monitoring (implementation, effectiveness, and validation) with project oversight.

AM Component	Sub-Components	Key Indicators – Initial Insight
Implement	☐ Plan for implementation of management actions and monitoring ☐ Project oversight	• Management action and monitoring are being implemented, just not according to an AM Plan. • TRRP staff retain project oversight.

Monitor

This component means the Program is conducting the monitoring (implementation, effectiveness, validation) and research necessary to provide data most responsive to answer AM hypotheses and decision-maker questions.

AM Component	Sub-Components	Key Indicators – Initial Insight
Monitor	☐ Effectiveness monitoring ☐ Validation monitoring ☐ Plan for analysis of monitoring data	• Monitoring is being implemented, just not according to an AM Plan. • No document has been developed or agreed-to by the TMC/TRRP that guides all levels of monitoring and that contains regularly-updated protocols.

Evaluate

This component represents a critical element – this is the path from data collection to management decision-making. Clear statements of what was learned and what it means for Program goals, objectives, hypotheses, and decision-making.

AM Component	Sub-Components	Key Indicators – Initial Insight
Evaluate	☐ Data analysis ☐ Data synthesis ☐ Telling the "story" of AM ☐ Independent science review ☐ Reporting	• The TRRP has conducted a good amount of data analysis to date, but no true synthesis; discussions about synthesis are underway, but without a clear direction in terms of goals/objectives and an AM Plan it is hard to see how synthesis documents can be developed. • The SAB provides some independent science review. Not clear what the current mission and focus of the SAB is and what regular reporting and communication to the TMC occurs. • Discussions ongoing about annual review of Program materials, but not sure to what end.

Adjust

This component represents the final step of AM. Clear management decisions are made, with AM results used to help guide those decisions.

AM Component	Sub-Components	Key Indicators – Initial Insight
Adjust	☐ Clear management decisions are made ☐ AM results used in decision-making ☐ Communication to decision-makers ☐ Documentation of decision-making results	• This component is in limbo unless and until an AM Plan is developed and process is determined for synthesizing Program data, communicating it to the TMC, and having the TMC make decisions with this information as an input.

5.0 Next Steps

Our team will now move to Task 3 of the TRRP Refinements work and conduct interviews with the TMC and many other Program participants and partners to expand our knowledge about the Program, its foundations, and components of governance and AM in the TRRP. Knowledge gained thus far will allow us to refine the set of questions to be used in the interviews so we are sure to touch on aspects of the TRRP that most need to be evaluated.

Items identified as red flags or areas of concern in this report will be discussed as part of the interview process and will remain as priorities to investigate and address during completion of the remaining tasks. Our expectation is that these items will remain on our list of possible recommended refinements and will not be directly addressed by the TRRP until the end of the first year of our TRRP Refinement work.

6.0 TRRP Documents Reviewed (presented in order of review)

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Appendix A – Adaptive Management Program Evaluation Framework

Appendix A describes in detail the Adaptive Management Program Evaluation Framework (AMPEF) that will be utilized by Headwaters Corporation in completing the TRRP Refinements tasks. This robust framework was developed by Chad Smith as part of his in-progress PhD dissertation at the University of Nebraska-Lincoln. The five-step framework was created to serve as a repeatable tool for programs like the TRRP, PRRIP, and other large-scale restoration programs utlizing adaptive management to assess components/sub-components of governance and adaptive management and point to recommendations for refinement to help those programs move forward in achieving their goals and objectives. In regard to the PWS described in this Solicitation and as noted in Section 5.0 (Factor C – Proposed Technical Approach) of this Proposal, specific survey questions and implementation/evaluation methods associated with the framework will be tailored to meet the needs of the TRRP and best address key areas for refinement.

Background

The evaluation framework arose out of experience with the PRRIP, TRRP, and other large-scale restoration programs around the country working through challenges related to successful implementation of adaptive management and achievement of goals and objectives. In addition, while adaptive mangement is ubiquitous in most large restoration programs as the management framework of choice, few, if any, examples of successful adaptive management at a large scale exist. Given the amount of federal money spent annually on large restoration programs and the promise of adaptive management, it is curious that examples of success are in short supply. There has been a good deal of recent scholarship on governance and its components and separately on adaptive management but no examples of assessment frameworks that capture the linkages between governance structure/function and adaptive management. The evaluation framework is presented as a practical tool to assess the governance structure and operation of a large-scale program, as well as the structure and operation of adaptive management within the program.

The underpinnings of the evaluation framework draw heavily from both recent scholarship on governance analysis and more formal risk analysis. Strong links between governance structure and adaptive management point to the overlap between organizational processes and risk management (Loftin, 2014). For any risk management project, risk analysis is a first step in evaluating threats and helping decision-makers prioritize and make more informed choices (Dale et al., 2013). In an adaptive management program, this approach is important in helping determine what it means to sufficiently resolve an uncertainty (Loftin, 2014). This raises the concepts of the probability of failure and the consequences of that failure for the program (Loftin, 2014). As Dale et al. (2013) describe, these are critical concepts in conducting a risk analysis and need specific definition:

- Likelihood – The idea that something is likely to happen or have happened. A failure of governance or adaptive management with a low likelihood of occurring would present a low risk to a manager or decision-maker.
- Consequence – The importance of a result of something that occurred earlier. A governance or adaptive management component with a high likelihood of failure could have substantial negative consequences on the overall success of a program.

Using likelihood and consequence provides an analytical tool for assessing the health of important governance and adaptive management components and suggest a means for at least initial insight into the potential for program success and recommendations to avoid program failure. Dale et al. (2013) developed a matrix for assigning likelihood and consequence ratings to governance domains in the Great Barrier Reef. That matrix and the related process have been adapted for use in this evaluation tool to provide a specific risk analysis of important components/subcomponents of governance and adaptive management and begin

to shed light on the relationship between "good governance," implementation of adaptive management, and ultimately success of large-scale programs.

Conducting this kind of analysis and responding with changes is not common in large-scale adaptive management programs (Loftin, 2014). However, given that adaptive management is largely an exercise in embracing uncertainty it seems logical that risk management and associated risk analysis hold promise as investigative tools for the prospects of ensuring adaptive management success. Loftin (2014) notes that adaptive management can only be successful *"if applied under and supported by a governance structure that understands AM".* This evaluation framework is an attempt to provide decision-makers and managers in existing or proposed large-scale programs with a tool to explore that governance-AM relationship in their own programs.

Framework Process

The AMPEF is structured around five steps:

Step 1 *– Key components and sub-components of governance and adaptive management*

This is a scoping step focused on key governance components and sub-components that appear to be critical. The initial set of components/sub-components expected to be of particular relevance for the TRRP are based on a literature review of governance analyses, legislative and implementation reviews of several large adaptive management plans across the U.S., discussions with governance and adaptive management experts from many of these programs, and from personal experience implementing adaptive management for the PRRIP and working on adaptive management and governance issues in the Trinity River, Middle Rio Grande, Everglades, and other systems. **Table 1** describes three governance components and their sub-components that regularly stand out as imperative in matching "good governance" with adaptive management. Key indicators are also identified that would be expected in the TRRP or any adaptive management program to be successful in establishing and maintaining a functioning governance structure. Refinements will occur during implementation of the AMPEF in the TRRP through document review and subsequent interviews.

Table 1. Governance components and relevant indicators.

Governance Component	Definition	Sub-Components	Key Indicators
Legitimacy	Accountable and enabled with decision responsibility; responsive to constituencies above and below	☐ Accountability ☐ Responsiveness to constituencies	• Negotiated or legislated context for decision-making; foundational (program) document or some other kind of legislative authority • Authority for program and management actions extends for a minimum of 5-7 years with options for extension • Stable source of funding tied to program goals and objectives
Structure/Capacity	Polycentric structure with centralized decision-making body but with explicit support from committees and levels of authority; clear coordination among governance levels; scale of program represents manageable geography on the ground but also tied to relevance of key decision-makers; stakeholders directly involved in decision-making; clear and regular communication; technical capacity within program to deliver information useful to decision-makers	☐ Polycentric ☐ Coordination ☐ Scale (geography) ☐ Scale (time) ☐ Stakeholders involved in decision-making ☐ Communication ☐ Technical capacity	• Decision-making body described in foundational document that includes stakeholders making decisions • All program information is public and available electronically via a central database and web site • Geographic scale clearly defined • Program scale can result in measured benefits for species or resources in question • Program scale includes all relevant parties to decision-making • Constant and consistent communication within the program, with authorities, and with the public • Interdisciplinary committees/teams
Decision-making Process	Shared decision-making; fair and transparent process for making decisions by consensus; decisions tied to process described in foundational document and linked to program goals and objectives; means for resolving disputes and decisions that do not reach consensus; ability to respond to change and surprise (uncertainty) and to incorporate learning into decision-making	☐ Shared decision-making ☐ Fair and transparent ☐ Consensus ☐ Decisions linked to goals/objectives ☐ Dispute resolution ☐ Adapt to surprises ☐ Ability to incorporate learning into decision-making	• Program goals and objectives clearly spelled out in foundational document and agreed upon by all parties; understanding of methods for measuring these and reporting progress • Decision-makers agree on and understand questions to be addressed • Group votes recorded, record of consensus and/or successfully dealing with issues that do not result in consensus • Means for adjusting management based on program learning • Clear communication of useful technical information to decision-makers

The second category of evaluation in this step is built around the structure of AM itself. This scoping step centers on a hybrid approach of evaluating AM against implementation of each of the six key steps and then later categorizing a program's AM progress against a proposed ideal typology. **Table 2** describes the six steps or components of AM that, if present, are considered to constitute successful AM. Key indicators are also identified that would be expected in the TRRP or any adaptive management program to be successful in implementing a full cycle of AM through the 'Adjust' component with a clear indication of the learning from AM being utilized in the decision-making process. These indicators are adapted from Murray et al. (2011). As with the governance components, refinements will occur during implementation of the AMPEF in the TRRP through document review and interviews.

91 **Table 2.** Adaptive management components and relevant indicators.
92

AM Component	Definition	Sub-Components	Key Indicators
Assess	Problem definition and agreement; decisions will be affected by information so a roadmap of goals, and objectives, hypotheses is established accordingly; collaborative process for development and agreement; these are the building blocks of AM	☐ Problem definition and agreement ☐ Roadmap of goals, objectives, hypotheses ☐ Decisions affected by information ☐ Collaborative process to develop this information	• Agreed-upon goals and objectives • Definition of AM written down • Identify critical uncertainties – what don't we know but want to learn? • Conceptual Ecological Models (CEM) and/or conceptual management models • Alternative management actions • Identify indicators/triggers, spatial and temporal bounds • State assumptions • Clear indication of how what is learned will be used for decisions • Collaborative process to develop this information, not mandated from top-down or only science teams
Design	Explicit management objectives, management actions, and monitoring/research protocols designed to deliver information relative to priority hypotheses and questions from decision-makers	☐ Management objectives ☐ Management actions ☐ Monitoring/research protocols tailored to hypotheses and key questions from decision-makers	• Decide on active or passive AM • Statement of measurable objectives/management actions • Contrasting treatments if possible (with replication and control) • Modeling to predict outcomes • Data management plan • Monitoring plan • Design is linked to time and budget authority for program
Implement	The machinery of AM on the ground; implementation of management actions and monitoring, with project oversight	☐ Plan for implementation of management actions and monitoring ☐ Project oversight	• Management actions and monitoring implemented • Explicit project oversight with staff dedicated to AM program
Monitor	Conduct monitoring and research necessary to provide the correct data to answer AM program hypotheses and decision-maker questions	☐ Effectiveness monitoring ☐ Validation monitoring ☐ Plan for analysis of monitoring data	• Monitoring protocols developed that provide data to answer key questions and link to decisions • Baseline monitoring, or agreement on the starting condition of the system in question • Effectiveness (achieve project objectives?) monitoring and validation (species response and progress toward objectives) monitoring
Evaluate	Critical element – the path from date to management decision-making; statements of what was learned and what it means for goals, objectives, hypotheses, and decision-making	☐ Data analysis ☐ Data synthesis ☐ Telling the "story" of AM ☐ Independent science review ☐ Reporting	• Compare monitoring results against objectives, hypotheses, uncertainties, and decision-maker questions • Compare results against model predictions • Use of peer review or other independent science review • Annual data synthesis reporting
Adjust	Clear management decisions are made, with AM results used to help guide those decisions	☐ Clear management decisions are made ☐ AM results used in decision-making ☐ Communication to decision-makers ☐ Documentation of decision-making results	• Clear and regular communication of synthesis to decision-makers • Record of decision-makers using information to help make decisions • Documentation of decisions and how AM information was used in the decision-making process • Documentation of changes to management actions at least in part because of program learning • Information updated regularly and made public

Step 2 *– Health assessment – governance and adaptive management components/sub-components*

This step focuses on assessing the structure and function of each governance and adaptive management component and related sub-components identified in Step 1. In the TRRP, this information will be obtained through structured face-to-face interviews with program staff, partners, and stakeholders from the TMC and other affiliated groups. **Tables 3 and 4** detail potential survey questions to be administered in the TRRP.

Table 3. Survey questions for governance components.

Governance Component	Survey Questions
Legitimacy	1) Was the program formed by negotiation, legislation, or another mandate? 2) Were stakeholders involved in development of the program? How? 3) Is there a foundational program document that describes goals, objectives, and hypotheses? 4) Is there an Adaptive Management Plan? 5) How long is the program currently authorized to operate? 6) Is there a process in place for extending the program if more time is needed? 7) How is the program funded? 8) What are annual appropriations? 9) Who makes decisions about developing and spending the annual budget? 10) Is the budget tied to program goals and objectives? 11) What is the overall program budget? 12) To whom are decision-makers accountable above them (governors, agency heads, federal administration, etc.)? 13) To whom are decision-makers accountable below them (constituencies)? 14) Does the program involve endangered/threatened species? 15) If the program is engaged in species recovery, is there a clear statement of what recovery means and how it will be measured?
Structure & Capacity	16) Is the decision-making body described in the foundational document? 17) Is there a process for filling spots on the decision-making body specified in the foundational document? 18) Are stakeholders explicitly part of the decision-making body or do they just serve an advisory role? 19) Is there a committee structure specified in the foundational document to assist the decision-making body with policy matters, technical matters, and program operation? 20) How are the different levels of the program coordinated and by whom? 21) What is the geographic scale of the program? 22) What is the approved time scale of the program? 23) Are all the relevant entities to the program encompassed by these scales of time and space? 24) Can measurable gains for the aquatic system and the species involved be achieved in the time and space defined? 25) Does the program include the technical capacity to deliver useful information to decision-makers? 26) Are technical teams/committees interdisciplinary, and do those disciplines cover the important technical topical areas for the program? 27) How is communication handled within the program? 28) How is communication handled with authorities? 29) How is communication handled with the public? 30) What is the level of trust among the decision-makers?
Decision-making Process	31) Who makes the decisions? 32) Is decision-making shared with stakeholders or are decision ultimately made unilaterally by a single agency? 33) Are program goals and objectives clearly detailed in the foundational document? 34) Do all decision-makers agree on the goals and objectives? 35) Is there agreement to utilize adaptive management? 36) What do the key questions decision-makers have that relate to program scientific information and adaptive management? 37) Do all decision-makers agree on these key questions? 38) Is there a clear understanding of the data collection methods relevant to these questions and reporting progress? 39) Does the decision-making body operate by consensus? 40) Does the program have a history of successfully reaching consensus? 41) If consensus is not reached, what is process for resolution? 42) Does the program have a history of using this resolution method? 43) Are group votes recorded? 44) Is there a process spelled out for adjusting management based in part on program learning? 45) Is there regular clear communication of scientific and technical information to decision-makers? 46) Is the program prepared to respond to changing conditions or surprises? 47) Have any surprises occurred, and if so how did the program deal with them? 48) Does the program have a record of incorporating learning into decision-making?

104 **Table 4.** Survey questions for adaptive management components.
105

AM Component	Survey Questions
Assess	1) What are the key questions important to decision-makers? 2) Do all decision-makers know what those questions are and agree those are the right questions? 3) What information do decision-makers need? 4) What are the program's goals and objectives? 5) What is the program's definition of AM? 6) Is the AM definition written down and does everyone know it? 7) Are objectives measurable? Are hypotheses testable? 8) Does the program have CEMs and/or conceptual management models? 9) Are alternative management actions/treatments defined? 10) Are decision triggers/indicators defined for the appropriate geographic scale and time? 11) Is there a clear statement of assumptions for program hypotheses and management actions? 12) Is a process specified for communicating learning to decision-makers and how that learning will be used to help make decisions? 13) Were stakeholders involved in development of the Adaptive Management Plan, including specifying objective, hypotheses, and management actions? 14) Was the Adaptive Management Plan developed through a collaborative process?
Design	15) Does the program utilize passive or active AM, and do the decision-makers understand the difference? 16) What are the proposed management actions? 17) Is there contrast in the management actions, how they are implemented, and expected results? 18) Does the program conduct modeling to predict the possible outcomes of management actions? 19) If used, how are models developed and refined? 20) Who conducts modeling for the program? 21) Is there a Data Management Plan? 22) Does the program have specific monitoring protocols for data collection? 23) How were these protocols developed, and who developed them? 24) Is there a process for changing these monitoring protocols? 25) Is the design of AM linked to the program's time and budget authority?
Implement	26) Who leads the implementation effort? 27) Are staff employees of any of the program's decision-making entities? 28) Are there staff assigned to the program that work on the program full time? 29) How are management actions implemented? 30) How are the results of implementation monitored and reported to the decision-makers? 31) Are there sufficient time and budget resources available for full program implementation?
Monitor	32) Is monitoring and research tailored to decision-maker questions and information needs? 33) Do program staff direct monitoring? 34) Is monitoring conducted by staff, by other parties, or a combination? 35) Is there baseline monitoring data? 36) Is there agreement in the program on baseline conditions? 37) Does the program conduct effectiveness monitoring (how did aquatic system respond)? 38) Please describe the program's effectiveness monitoring. 39) Does the program conduct validation monitoring (species response to management actions)? 40) Please describe the program's validation monitoring.
Evaluate	41) Are monitoring results compared against objectives, hypotheses, and uncertainties? 42) Are monitoring results compared against model predictions? 43) How is this information reported, by whom, and how often? 44) Does the program use independent peer review? 45) If so, what documents or items are peer reviewed? 46) Does the foundational program document include details of the program's peer review process? 47) Does the program use an independent science review panel? 48) If so, what are the science panel's responsibilities? 49) Does the foundational program document detail how science review panel members are appointed? 50) Does the program conduct data synthesis? 51) How is data synthesis reported? 52) Who is responsible for developing and reporting program data synthesis? 53) Does the program generate an annual data synthesis report? 54) Does the program host an annual adaptive management/data synthesis workshop?
Adjust	55) Is there regular communication of relevant scientific and technical information to decision-makers? 56) How is AM information communicated to decision-makers and used to adjust management actions? 57) Has your program successfully adjusted using AM information as part of the decision-making process? 58) How are decisions documented? 59) How are changes to management based on program learning documented? 60) Is program information updated regularly and made public? 61) Is all program information available electronically?

Step 3 *– Risk assessment – likelihood and consequence rating of governance and adaptive management components/sub-components*

Adapted from the Dale et al. (2013) risk analysis of governance in the Great Barrier Reef and building off the call from Loftin (2014) to integrate risk management concepts into the development and implementation of adaptive management, the evaluation framework incorporates a likelihood and consequence risk rating matrix to provide a more quantitative factor to accompany the qualitative health assessment. The matrix will be applied to all governance and adaptive management components and their related sub-components. As a first step, **Tables 5 and 6** detail standardized criteria utilized to develop the likelihood and consequence ratings. These rating scales were adapted from Dale et al. (2013) to fit the evaluation framework approach developed for large-scale aquatic adaptive management programs. This approach provides an easy and quick assessment of potential governance or adaptive management component/sub-component failures that are likely to occur, program strengths and weaknesses, and potential implications for overall program success or failure. This leads more readily to identification of potential program reform measures in the next step of the evaluation framework.

Table 5. Rating scale for likelihood of governance or adaptive management component/sub-component failure.

Risk Rating	Decision Rule
(1)	The governance or AM component/sub-component is in excellent overall health and will not fail to deliver its intended outcomes.
(2)	The governance or AM component/sub-component is in good overall health and is not likely to fail to deliver its intended outcomes.
(3)	The governance or AM component/sub-component is in marginal health and could fail to deliver its intended outcomes.
(4)	The governance or AM component/sub-component is in poor overall health and is likely to fail to deliver its intended outcomes.
(5)	The governance or AM component/sub-component is dysfunctional or absent and will fail to deliver its intended outcomes.

Table 6. Rating scale for consequences of governance or adaptive management component/sub-component failure.

Risk Rating	Decision Rule
(1)	Failure of the governance or AM component/sub-component will have no consequences for intended outcomes.
(2)	Failure of the governance or AM component/sub-component will have limited consequences for intended outcomes.
(3)	Failure of the governance or AM component/sub-component will have consequences of concern for intended outcomes.
(4)	Failure of the governance or AM component/sub-component will have significant consequences for intended outcomes.
(5)	Failure of the governance or AM component/sub-component will have severe consequences for intended outcomes.

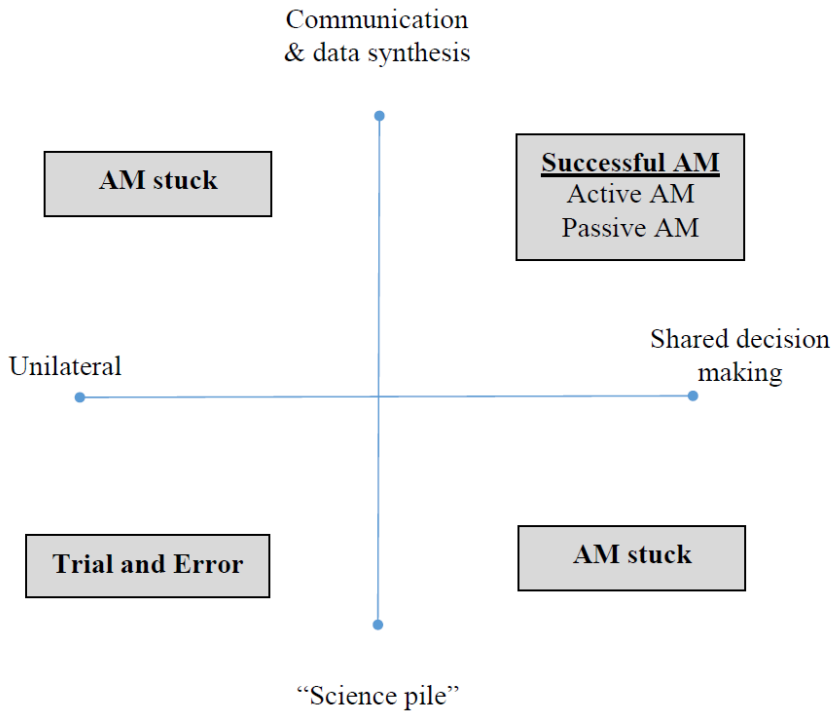
The next step is developing an overall risk rating for the component/sub-component in question. As in Dale et al. (2016), the more complex set of sub-components evaluated in this chapter are paired with a more complex rating scale for likelihood and consequences. **Figure 1** is reproduced from Dale et al. (2016) and reflects a rating scale based on multiplying the rating for likelihood of failure and the rating for consequences of that failure. This method allows for more accurate ranking and clustering of sub-components to reveal more significant areas for program reform (Dale et al., 2016). This matrix also employs a color scale as a quick-reference guide to the degree of severity of risk.

Figure 1. Rating scale (likelihood x consequence) for governance and adaptive management sub-component risk, reproduced from Dale et al., 2016.

Step 4 *– Program "fit" in the ideal adaptive management typology*

Figure 2 presents an ideal typology for adaptive management in large-scale aquatic recovery programs that is adapted from the coordination and polycentricity characteristics of a proposed ideal typology of governance regimes developed by Pahl-Wostl and Knieper (2014). The typology serves as an attempt to merge governance and adaptive management components to provide qualitative insight into the hypothesis that good governance through a strong process of shared decision making and communication is likely to promote successful adaptive management at a large scale. High levels of communication and data synthesis, but unilateral decision making is expected to predict adaptive management being "stuck" in the six-step cycle well before the 'Adjust' step. A similar condition is expected for low levels of communication and data synthesis even in shared decision-making contexts. Little communication and data synthesis (resulting in a "science pile" where data is collected but not analyzed, synthesized, or otherwise communicated to decision-makers) and unilateral decision-making is expected to promote conditions that do not enable adaptive management and instead revert management back to trial and error.

Figure 2. An ideal typology for large-scale adaptive management. The two-dimensional grid is based on the categories of decision-making centralization and the level of communication/data synthesis occurring within the adaptive management program. Shaded boxes indicate the level of adaptive management performance.



Step 5 *– Recommendations for program reform/refinement*

Based on results of the program health assessment; development of likelihood, consequence, and risk ratings for each governance and adaptive management component and sub-component; and qualitative placement of each program in the proposed ideal adaptive management typology, recommendations for TRRP reform and refinement will be proposed. Suggested program refinements will be a starting point for improvement to provide a benchmark to monitor to see how the TRRP adjusts over time. **Table 7** is an example of an output table for each governance and adaptive management component and sub-component that will be provided to the TRRP in addition to an overall summary of results.

Table 7. Example governance component and sub-component output table from implementation of the AMPEF in the TRRP.

Component Legitimacy **Sub-Component** Accountability	Sub-component description: Defined by results of TRRP document review and interviews and experience from other restoration programs	
Health assessment	Structural considerations: • Summarized from TRRP document review and interviews	Functional considerations: • Summarized from TRRP document review and interviews
Likelihood of failure:	Qualitative assessment based on considerations from the health assessment	
Likelihood rating	Full Component Rating **4**	Sub-Component Rating **4**
Consequences of failure:	Qualitative assessment based on considerations from the health assessment	
Consequence Rating	Full Component Rating **4**	Sub-Component Rating **4**
Risk Rating	Full Component Risk Rating **8** (Likelihood + Consequence)	Sub-Component Rating **16** (Likelihood x Consequence)
Ideal AM Typology Fit	Categories of fit include successful AM, AM being "stuck", or AM being absent (just implementing trial and error)	
Program reform recommendations	Suggestions based on health assessment, risk rating, application of the ideal AM typology, and overall TRRP evaluation	

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Appendix B – TRRP Document Review Template

TRRP Refinements

Document # - Title	Type of Document	Version of Document	Date of Publication
01 – Trinity River Flow Evaluation Study (TRFE)	Foundational; report to the Secretary of the Interior	Final	April 1999
Name and Affiliation of Document Author(s)	U.S. Fish and Wildlife Service – Arcata Fish and Wildlife Office Hoopa Valley Tribe		
Date of Review	07/03/2017		

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
xxv	surplus water could be exported to the Central Valley without harm to the fish and wildlife resources of the Trinity River	Objective of the TRD
xxv	have a functioning alluvial river (mixed-size rock, gravel, and sand deposited by river flow) that will provide the diverse habitats required to restore and maintain the fishery resources of the Trinity River	Restoration goal
xviii	restoring the gradually sloping bars provided stable amounts of rearing habitat throughout a wide range of flows	Flow and sediment objective
xviii	Rehabilitating the confined, trapezoidal channel to restore the pre-TRD channel morphology will provide high quality, stable habitat conditions that should greatly benefit young salmon and steelhead until they are ready to migrate to the ocean.	Flow, sediment, and mechanical objective
xviii	ten fundamental alluvial river attributes. These attributes are: (1) the channel morphology is spatially complex; (2) flows and water quality are predictably variable; (3) the channel bed surfaces are frequently mobilized; (4) the channel-bed surfaces are periodically scoured and refilled; (5) fine and coarse sediment supplies are approximately balanced in the upper Trinity River below Lewiston Dam ; (6) the channel location periodically migrates; (7) the channel has a functional floodplain; (8) the channel is occasionally “reset” during very large floods; (9) riparian plant communities are diverse and self-sustaining; and (10) the groundwater table (subsurface water level that surrounds rock, gravel and sand along the side of the river) fluctuates naturally with changing stream flows.	River restoration objectives

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
xxix	Year-round releases of 300 cfs to provide suitable spawning and rearing habitat for salmon and steelhead within the existing channel	Spawning habitat
xxix	Releases of 450 cfs from July 1 to October 14 to meet the summer/fall temperature objectives	Manage river temperature
xxix	Spring/summer releases that would provide improved conditions for smolt outmigration	Fish migration
xxix	Releases necessary to achieve flow-related geomorphic processes that create and maintain river habitats	River restoration
xxix	A fundamental conclusion of this and other studies is that the present channel morphology, a direct result of TRD construction and operation, is inadequate to meet salmonid production objectives. If naturally produced salmonid populations are to be restored and maintained, the habitats on which they depend must be rehabilitated.	Population and restoration objective
xxix	Recommended future management to restore the fishery resources of the Trinity River must include reshaping selected channel segments, managing coarse and fine sediment input, prescribing reservoir releases to allow flow-related geomorphic processes to reshape and maintain a new dynamic channel condition, providing suitable spawning and rearing microhabitat, and providing favorable water temperatures for salmonids. This new channel morphology will be smaller in scale than that which existed pre-TRD, but it will exhibit the essential attributes of a dynamic alluvial river.	Restoration objective
xxx	(1) releases to provide suitable salmonid spawning and rearing habitat, (2) releases to mimic the spring snowmelt hydrograph (the high flow in the spring resulting from the melting snowpack and the gradual decrease in flow following the peak) to satisfy flow-related geomorphic and riparian vegetation objectives necessary for the creation and maintenance of diverse salmonid habitats and assist smolt outmigration, and (3) releases to meet appropriate water-temperature objectives for holding/spawning adult salmonids and outmigrating salmonid smolts.	Flow-related management objectives
xxx	Some processes and habitat conditions, such as favorable spawning and rearing microhabitat, are recommended for all water-year classes while others, such as floodplain inundation, are expected to be achieved only during the wetter water-year classes. Annual release schedules were developed by integrating the information requirements to meet spawning and rearing microhabitat, flow related geomorphic processes, and water temperature management objectives for the different water-year classes.	Flow objectives
xxx	maintaining 300 cfs as the fall/winter baseflow provides suitable spawning habitat throughout the chinook salmon, coho salmon, and steelhead spawning seasons and provides habitat for rearing salmon and steelhead.	Spawning habitat
xxx	The short, 5-day, peak release during all water-year classes (except Critically Dry) provides sufficient duration to initiate targeted flow related geomorphic processes and transport coarse bed material originating from tributaries in most years.	SDHF release objective
xxx-xxxi	The recommended Extremely Wet and Wet spring snowmelt hydrographs also have two distinct segments while flows are decreasing after the spring snowmelt peak flow (referred to as the “descending limb of the spring snowmelt hydrograph”). These periods are separated by a short-duration “bench” at 6,000 cfs. The “bench” promotes transport of fine sediment once peak flows have mobilized the surface layer of the channel bed. Another “bench”, at 2,000 cfs, is recommended for Extremely Wet, Wet, and Normal water years to inundate portions of alternate	Flow release objectives

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
	bars during the time-period when riparian vegetation releases seeds. This inundation prevents riparian encroachment along the low-flow channel and provides suitable temperatures for chinook salmon smolts, which outmigrate later in year than other salmonid species. A 36-day, 1,500-cfs "bench" during Critically Dry water years will discourage seedling germination on alternate bar flanks through inundation and provide some temperature benefits for outmigrating chinook salmon smolts.	
xxxi	Recommended releases for Extremely Wet, Wet, and Normal water years provide optimal salmonid smolt temperatures (Table ES4). Marginal smolt temperatures will be provided throughout much of the outmigration period during Dry and Critically Dry water years. The lower releases during these year classes will allow mainstem water temperatures to warm earlier in the outmigration period, which will cue salmonids to outmigrate (warming temperatures are an important physiological signal to begin smoltification and outmigration) before water temperatures in the lower watershed are likely to become too warm to insure smolt survival. Following smolt temperature control releases, 450 cfs releases will be maintained to provide suitable temperature regimes for holding and spawning adult spring-run and fall-run chinook (Table ES5).	Flow release objectives
xxxi	The intent of channel rehabilitation is to selectively remove the fossilized riparian berms (berms that have been anchored by extensive woody vegetation root systems and consolidated sand deposits) and recreate alternate bars. Channel rehabilitation is not intended to completely remove all riparian vegetation, but to remove vegetation at strategic locations to promote alluvial processes necessary for the restoration and maintenance of salmonid populations.	Mechanical action objective
xxxii	Therefore, construction of 24 of the 44 channel-rehabilitation sites in the first 3 years of implementation is recommended. The remaining projects may proceed following evaluation by the AEAM program	First mention of where/how AM may be used, everything else appears to be written in stone.
xxxii	Sediment-management recommendations include (1) immediate placement of more than 16,000 cubic yards of properly graded coarse sediment (5/16 to 5 inches) between Lewiston Dam and Rush Creek to restore the spawning gravel deficit caused by the elimination of upstream coarse sediment supply by the TRD; (2) annual supplementation of coarse sediment to balance the coarse sediment supply along the Lewiston Dam to Rush Creek segment; (3) reduction of fine sediment (<5/16 inch) storage in the mainstem via recommended flow releases; (4) prevention of fine sediment input from tributaries by mechanical removal from sedimentation ponds; and (5) reduction of fine sediment storage in the mainstem via mechanical removal.	Sediment management objectives
xxxiii	Prevention of germination/establishment of riparian vegetation low on alternate bars	1,500 cfs flow objective
xxxiii	Mobilization of spawning gravels, Sand transport All effects realized at lower flow level	4,500 cfs flow objectives
xxxiii	Channel bed surface mobilization Significant mobilization of spawning gravels Fine sediment movement Channel migration Floodplain inundation Scour of 1-2-year-old seedlings Groundwater recharge of floodplain	6,000 cfs flow objectives

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
	All effects realized at lower flow levels	
xxxiii	Surface mobilization of alternate bars Scour of bar margins Coarse sediment movement Scour of 2-3-year-old seedlings All effects realized at lower flow levels	8,500 cfs flow objectives
xxxiii	Significant scour of alternate bars Large coarse sediment movement Floodplain scour Side-channel formation/maintenance Sapling removal from alternate bars All effects realized at lower flow levels	11,000 cfs flow objectives
xxxiii	Water temperature objectives for the Trinity River salmonid smolts at the confluence of the Klamath and Trinity rivers for Extremely Wet, Wet, and Normal water year classes. These objectives are not met in Dry and Critically Dry water year classes because of the need to better synchronize Trinity River temperatures with those lower in the system. Water temperature objectives for the Trinity River during the summer, fall, and winter. Objectives are for the protection of holding and spawning salmon and steelhead.	SEE TABLE ON PAGE xxxiii
xxxiii	Use of AEAM will assure restoration and maintenance of the fishery resources of the Trinity River and wise use of available water.	AM objective
227	At least a two-fold increase in smolt production is a desirable goal to restore and maintain anadromous salmonid populations toward pre-TRD levels.	Fish population objective – increase productivity
227	The carrying capacity for fry and juvenile salmonids cannot be substantially increased within the confined riparian berms of the existing channel through reservoir releases alone. Flows that only mobilize spawning gravels cannot reshape channel morphology to significantly improve spawning habitat and do little to increase rearing habitat.	Fish population objective – increase carrying capacity
228	Several habitat types are now rare in the mainstem above the North Fork Trinity River confluence as a result of unnatural channel confinement by riparian berms. Specifically, the limited availability of suitable low-velocity habitats severely limits fry survival from midwinter through spring.	Fish population objective – increase survival
228	Management of TRD releases to provide optimal seasonal temperature regimes within the existing channel as a singular management action cannot increase smolt production necessary to restore and maintain salmonid populations.	Fish population objective – increase productivity
228-229	Only through the combination of mechanical reconstruction, managed releases, and sediment management can the alluvial channel be rehabilitated and maintained. The anticipated alluvial channel, however, will be a smaller version of the pre-TRD channel.	Channel restoration objective – create a more ‘natural’ river channel
229	This new, but smaller, channel morphology should increase rearing habitat, allowing at least a doubling of anadromous salmonid smolt production.	Fish population objective – increase productivity
229	Prescribe flows based on a water year classification to restore inter-annual flow variation	Flow objective – increase inter-annual variability
229	Restore snowmelt hydrograph components	Flow objective – recreate pulse flow

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
229	Prescribe variable releases to rejuvenate and maintain alluvial processes	Flow objective – create functional river
229	Prescribe releases that provide suitable habitat for all life stages of anadromous salmonids	Flow objective – provide salmonid habitat year-round
230	Prescribe releases that meet salmonid temperature needs	Flow objective – increase productivity and survival of salmonids
230	The mainstem below Lewiston Dam must (1) provide suitable seasonal water temperatures for holding and spawning of anadromous salmonids down to the North Fork Trinity River confluence, (2) improve growth and survival of smolt outmigrants by providing a suitable temperature regime for all three species to Weitchpec, and (3) provide a seasonal thermal regime suitable for year-round rearing of juvenile steelhead and coho salmon.	Flow objective – increase productivity and survival of salmonids
230	Mainstem channel modification will be required in selected reaches to encourage alluvial processes, such as frequent channelbed mobilization and alternate bar formation.	Mechanical objective – increase alluvial processes
230	preventing excess fine sediment from entering the mainstem must remain a priority. Coarse bed material supplementation upstream from Rush Creek will be required to rehabilitate a dynamic alluvial channel morphology.	Sediment management objective – increase large (>5/16 inch) sediment while decreasing amounts of fine sediments
230	A dynamic alluvial channel morphology cannot be accomplished solely by prescribing releases. Mechanically removing riparian berms, minimally reshaping the existing channel in selected reaches, introducing coarse bed material above Rush Creek, and reducing or preventing sand input from tributaries also will be necessary.	Restoration objective – improve river function and alluvial processes
234	a 300-cfs release provides suitable microhabitat and macrohabitat for spawning and rearing chinook salmon, coho salmon, and steelhead in the Trinity River above the North Fork Trinity River in the current channel morphology.	Flow release objective – fish habitat
234	Flow-related management objectives: (1) releases to provide suitable salmonid spawning and rearing microhabitat, (2) snowmelt peak and recession hydrograph components to satisfy fluvial geomorphic and woody riparian objectives that are necessary for the creation and maintenance of diverse salmonid habitats, and (3) releases to meet appropriate water-temperature objectives for holding/spawning chinook salmon and outmigrating salmonid smolts.	Flow-related management objectives
234	On the basis of the analysis of habitat availability in the existing channel, and considering all anadromous salmonid life stages, a release of 150 cfs provides the greatest amount of microhabitat in the mainstem Trinity River from Lewiston Dam to Weitchpec	Flow-related management objective – improve microhabitats
235	Maintaining 300 cfs as the winter baseflow provides spawning habitat throughout the chinook salmon, coho salmon, and steelhead spawning seasons and protects early life stages throughout incubation and emergence periods for all salmonid species.	Flow-related management objective – improve spawning habitat
235	Fluvial geomorphic management objectives are based on the alluvial-attribute thresholds.	Restoration objective – improve river function and alluvial processes

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
236	· Mobilization of matrix particles (D84) on alternate bar surfaces (Attribute 3) · Channelbed scour greater than 2 D84's depth and redeposition of gravels on face of alternate bars · Transport sand out of the reach at a volume greater than input from tributaries to reduce instream sand storage · Transport coarse bed material at a rate near equal to input from tributaries to route coarse sediment, create alluvial deposits, and eliminate tributary aggradation (Attribute 5) · Periodic channel migration · Floodplain creation, inundation, and scour · Channel avulsion · Woody riparian mortality on lower alternate bar surfaces and woody riparian regeneration on upper alternate bar surfaces and floodplains · Maintain variable water table for off-channel wetlands and side channels	Fluvial geomorphic management objectives - extremely wet year
236	· Mobilization of matrix particles (D84) on alternate bar surfaces · Channelbed scour greater than 1 D84's depth and redeposition of gravels · Transport sand out of the reach at a volume greater than input from tributaries to reduce instream sand storage · Transport coarse bed material at a rate near equal to input from tributaries to route coarse sediment, create alluvial deposits, and eliminate tributary aggradation · Periodic channel migration · Floodplain creation, inundation and occasional scour · Woody riparian mortality on lower alternate bar surfaces and woody riparian regeneration on upper alternate bar surfaces and floodplains · Maintain fluctuating water table for off-channel wetlands and side channels (Attribute 10)	Fluvial geomorphic management objectives – wet year
236	· Mobilization of matrix particles (D84) on general channelbed surface and along flanks of alternate bar surfaces · Channelbed scour and redeposition of gravels · Transport sand out of the reach at a volume greater than input from tributaries to reduce instream sand storage · Transport coarse bed material at a rate near equal to input from tributaries to route coarse sediment, create alluvial deposits, and eliminate tributary aggradation · Frequent floodplain inundation) · Woody riparian vegetation mortality along low water edge of alternate bar surfaces and woody riparian regeneration on upper alternate bar surfaces and floodplains) · Maintain fluctuating water table for off-channel wetlands and side channels	Fluvial geomorphic management objectives – normal year
236	· Channelbed surface mobilization of in-channel alluvial features (e.g., spawning gravel deposits) · Transport sand out of the reach at a volume greater than input from tributaries to reduce instream sand storage · Transport coarse bed material at a rate near equal to input from tributaries to route coarse sediment, create alluvial deposits, and eliminate tributary aggradation · Discourage germination of riparian plants on lower bar surfaces for a portion of the seed release period · Maintain variable water table for off-channel wetlands and side channels	Fluvial geomorphic management objectives – dry year

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
236	· Discourage germination of riparian plants on lower bar surfaces for the early portion of the seed release period · Minimally recharge groundwater	Fluvial geomorphic management objectives – critically dry year
237	Provide the greatest amount of spawning and rearing microhabitat for anadromous salmonids in the existing channel, given the needs of the various life-stages.	Salmonid microhabitat objectives – extremely wet, wet, and normal water years
237	Provide the greatest amount of spawning and rearing microhabitat for anadromous salmonids in the existing channel, given the needs of the various life-stages.	Salmonid microhabitat objectives – dry and critically dry water years
237	Provide suitable temperatures for holding spring chinook and spawning spring and fall chinook by meeting temperature standards of: <60º F from July 1 to September 14 at Douglas City (RM 93.7), <56º F from September 15 to September 30 at Douglas City, and <56º F from October 1 to December 31 at the North Fork Trinity River confluence (RM 72.4). Provide optimal temperatures for anadromous salmonids throughout their outmigration by meeting temperature targets at Weitchpec (RM 0.0) of: <55.4º F prior to May 22 for steelhead smolts, < 59.0º F prior to June 4 for coho salmon smolts, and <62.6º F prior to July 9 for chinook salmon smolts.	Temperature objectives – extremely wet, wet, and normal water years
237	Provide suitable temperatures for holding spring chinook and spawning spring and fall chinook by meeting temperature standards of: <60º F from July 1 to September 14 at Douglas City (RM 93.7), <56º F from September 15 to September 30 at Douglas City, and <56º F from October 1 to December 31 at the North Fork Trinity River confluence (RM 72.4). Facilitate early outmigration of smolts by allowing water temperatures to warm and provide at least marginal temperatures for anadromous salmonids throughout most of their outmigration by meeting temperature targets at Weitchpec (RM 0.0) of: <59.0º F prior to May 22 for steelhead smolts, <62.6º F prior to June 4 for coho salmon smolts, and <68.0º F prior to July 9 for chinook salmon smolts.	Temperature objectives – dry and critically dry water years
240	From July through mid-October a release of at least 450 cfs provides suitable water temperatures for holding and spawning spring-run chinook salmon and spawning fall-run chinook salmon in the Trinity River, above the confluence with the North Fork Trinity River	Temperature objective – extremely wet, wet, and normal water years
241	A release of 450 cfs from October 1 through October 15 maintains water temperatures suitable for spawning spring-run chinook salmon and holding fall-run chinook salmon in the Trinity River above the confluence with the North Fork Trinity River.	
241	A release of 300 cfs from October 16 through April 21 provides suitable microhabitat for spawning and rearing chinook salmon, coho salmon, and steelhead within the existing channel.	Habitat objective – microhabitat
241	A release of 500 cfs from April 22 through April 28 provides optimal temperatures for steelhead (< 55.4° F), as well as for coho salmon (< 59.0° F) and chinook salmon (< 62.6° F) smolts.	Temperature objective
241	A release of 1,500 cfs from April 29 through May 5 provides optimal temperatures for steelhead, coho salmon, and chinook salmon smolts throughout the mainstem.	Temperature objective
242	A release of 2,000 cfs from May 6 through May 19 provides optimal temperatures for steelhead, coho salmon, and chinook salmon smolts throughout the mainstem.	Temperature objective

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
242	A 5-day peak release of 11,000 cfs from May 24 to May 28 targets fluvial geomorphic processes that will create major alterations in the channel and channelbed. This release magnitude and duration will mobilize most alluvial features, scour the channelbed to a depth >2D84, transport sediment and route bedload, cause mortality of channel-encroaching plants and prevent germination of riparian plants, promote periodic channel migration and avulsion, and build floodplain features. This release magnitude will also provide optimal temperatures for coho salmon and chinook salmon smolts throughout the mainstem.	Fluvial geomorphic process objective
242 & 245	A 5-day release of 6,000 cfs from June 6 to June 10 facilitates the transport of fine bed material (sand) once higher flows have mobilized the surface layer of the general channelbed and alternate bars, while minimizing transport of coarse bed material. This release will transport fine sediment (sand), cause mortality of riparian vegetation seedlings, and inundate the flanks of bars to discourage germination and prevent encroachment of riparian plants. This release provides optimal temperatures for chinook salmon smolts throughout the mainstem.	Sediment transport, vegetation management, and temperature objective
245	A release of 2,000 cfs from June 30 to July 9 provides optimal temperatures for chinook salmon smolts throughout the mainstem. Alternate bar features will be inundated, causing mortality of riparian vegetation seedlings and preventing germination of riparian vegetation on lower bar surfaces. Some fine sediment (sand) transport occurs at this release magnitude.	Sediment transport, vegetation management, and temperature objective
246	Recommended releases decrease from 2,000 cfs on July 9 to 450 cfs on July 22 to reach summer temperature-control releases. The gradual decrease minimizes stranding of fry and juvenile salmonids and allows gradual warming of the mainstem to provide outmigration cues to any remaining smolts. A release of 450 cfs from July through September 30 maintains suitable water temperatures for holding and spawning spring-run chinook salmon in the Trinity River above the confluence with the North Fork Trinity River.	Temperature objective
246	A 5-day peak release of 8,500 cfs from May 17 to May 21 targets several fluvial geomorphic processes. This release magnitude and duration will mobilize most alluvial features, scour channelbed to a depth >1D84, transport fine sediment and route bedload, cause mortality of channel-encroaching plants and prevent germination on bar surfaces, initiate periodic channel migration, and inundate/create floodplains.	Fluvial geomorphic process objective
273	Sediment management recommendations involve four separate actions: (1) immediate placement of coarse sediment (>5/16 inch) to restore spawning gravels lost through mainstem transport between Lewiston Dam and Rush Creek, (2) annual supplementation of coarse sediment (>5/16 inch) to balance the coarse sediment budget in the Lewiston Dam to Rush Creek reach, (3) fluvial reduction of fine sediment (<5/16 inch) storage in the mainstem, and (4) mechanical reduction of fine sediment (<5/16 inch) storage in the mainstem.	Sediment management objectives
276	Bank rehabilitation on a forced-meander bend, alternate bar rehabilitation over longer reaches, side channel construction over short reaches, and tributary delta maintenance (local removal of the very coarse sediment (boulders) that causes aggradation and hydraulic backwater effects upstream from deltas).	Channel restoration objectives

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
279	Revegetate reconstructed floodplains with native woody riparian species, emphasizing black cottonwood (Populus balsamifera) and Fremont cottonwood (Populus fremontia) to increase the seed source for natural regeneration.	Floodplain restoration objective
280	The primary hypothesis is that a combination of managed high-flow releases, mechanical riparian berm removal, and gravel augmentation will redirect geomorphic processes so that a more complex channel form will evolve, creating the mosaic of aquatic habitats necessary to enhance freshwater salmonid production.	Channel restoration objective
281	Reservoir releases and channel-rehabilitation projects should substantially increase carrying capacity (usable salmonid rearing habitat area) within the rehabilitated channel.	Habitat objective
281	the development of recommendations regarding permanent instream fishery flow requirements and Trinity River Division operating criteria and procedures for restoration and maintenance of the Trinity River fishery	Program Objective
281	Manage the reservoir releases to provide a much improved (near optimum) temperature regime. An optimum temperature regime increases fish residence time and growth rates, resulting in larger smolts exiting the system. Larger smolts have better survival leading to an increase in numbers of returning adults.	Temperature objective
281	Manage the river corridor to increase the shallow edge water and backwater habitats necessary for many anadromous young-of-year salmonids.	Habitat objective
281	Manage reservoir releases to control vegetation establishment on alluvial features. Schedule reservoir releases to scour seedlings on bars following the seed fall during the spring-summer period. Investigate superimposing reservoir releases on tributary flows when the opportunity is present.	Vegetation control objective
281	Manage reservoir releases within the evolving channel to optimize hydraulic conditions for spawning, incubation, and young-of-year production for a given water year and channel form. As the channel changes from the present trapezoidal form toward the desired alternating point bar configuration, the slope of the hydrograph should be adjusted annually to maximize suitable conditions for a given year.	Habitat objective
285	the objective of the AEAM Program is to prescribe the precise magnitude and duration of reservoir releases confirming or modifying the OCAP for that year.	Adaptive management
287 & 289	The program would be directed by the Secretary through a designee, who would serve as the principal contact for the AEAM and as the focal point for issues and decisions associated with the program. His/her responsibility would include ensuring that the Department of the Interior fulfills its obligations to restore and maintain the Trinity River Fishery. Components of the Trinity AEAMP include a Trinity Management Council (TMC) supported by a Technical Modeling and Analysis Team (TMAT) and a rotating Scientific Advisory Board (SAB). The program would include consultation with other agencies and interested groups through periodic interaction through a Stakeholders Group. Scientific credibility would be assured through external peer review of operating plans, models, sampling designs, and projections	Governance structure

Page No. and Relevance Goals/Objectives Governance Adaptive Management	Document Text	Summary
289	The TMC would be composed of fishery agency representatives. The Secretary's designee would serve as Executive Director. The TMC would approve fishery restoration plans and any proposed changes to annual operating schedules (described earlier in this chapter) submitted by the Technical Modeling and Analysis Team. The TMC would be the focal point for issues and decisions associated with the program. The Executive Director's responsibilities would include ensuring that the Department of the Interior fulfills its obligations for streamflow releases and rehabilitation of the river corridor habitats. The Executive Director in consultation with the Council members would review, modify, accept, or remand the recommendations from the TMAT in making decisions about any changes in reservoir releases, dam operations, and other management actions.	Governance structure
289	The TMAT would consist of a permanent group of 4 to 8 scientists selected to represent the interdisciplinary nature of the decision process. Collectively, they must possess the skills and knowledge of several disciplines: water resources, engineering, geomorphology, water quality, fish population biology, riparian ecology, computer modeling, and data management. The TMAT responsibilities include design for data collection, methodology, analyses, modeling, predictions, and evaluating hypotheses and model improvements. This Team would have delegated from the Executive Director a budget and the responsibility for preparing requests for proposals (RFP) to conduct specialized data collections for model input and validation. Spatial coverage and sampling designs for long-term monitoring for status and trends would be developed in consultation with the management agencies and specific recommendations made to the TMC for funding. Funding for the long-term monitoring would remain with the TMC.	Governance structure
289 & 291	The SAB would be appointed by the Executive Director. This group would be composed of prominent scientists appointed and appropriately compensated for 2- to 3-year rotating terms. The SAB would be responsible for semiannual review of the analyses, models, and projections of the TMAT as well as providing a science review of the overall management plans and implementation of the annual operating criteria and procedures as directed by the TMC. The SAB would also select outside peer reviewers and conduct the review and selection process for any contracted data collection, research, or model development.	Governance structure

Appendix C – Coordination Team Comments on Review Draft and Headwaters Corporation Team Responses

The Coordination Team was provided with a Review Draft of this Goals and Objectives summary report. We addressed all substantive comments received and recorded both the comment and our response below. The page number noted for each comment refers to the original position of the text in the Review Draft; edits to this Final Report altered that position in some cases.

Comment ID #	Organization	Section	Page and Line	Comment	Response
1	NOAA	3.0 – Goals & Objectives	Overall	There have been attempts to refine the program objectives, such as the workshop that was held in 2013 (I forwarded you some information on that workshop) and various documents produced subsequent to that. All program partners did agree at that time to 2 new program goals that largely rehashed the ones you found in the foundational documents. However, I don't think that the results of that objectives refinement workshop was memorialized and ratified properly and put into use, and that is likely part of the problem. We agree these are often not clear in the various documents and could be better laid out in a single document.	Noted, but it is not clear what the status of these documents is within the Program or relative to the foundational documents.
2	NOAA	3.0 – Goals & Objectives	6	Paragraph on page 188 (Pages 6-8 in the report)-There are clear metrics for the numbers of salmonids to be restored, (page 3-157 in the Draft EIS, Table 3-12), specific water volumes to be applied (Page 12 ROD, also in TRFE) and specific gravel volumes to be augmented (Page 14 ROD, also in TRFE). The report as it's written seems to imply or state that these are nowhere to be found. Part of the problem with the TRRP is monitoring things for which we do not have clear metrics (e.g. rotary screw traps for smolt numbers and redd and carcass surveys for redd and carcass numbers and distribution) as you point out in the paragraph starting on line 359.	Revisions made to text to address this.
3	NOAA	4.0 – Key Findings	9	Line 255. It seems like the existence of the TRRP is to fulfill the goal of restoring fisheries. Not sure if that's circular or not but just seems natural that the TRRP exists to restore the fisheries and river. Existence on line 255 starts out asking "Why" but the line starting with "Or,..." on line 259, is not an answer to a why question. Consider revising.	Revisions made to text to address this.

Comment ID #	Organization	Section	Page and Line	Comment	Response
4	TAMWG	3.0 – Goals & Objectives	6	Regarding fishery restoration goals, specific numeric goals do exist for natural and hatchery spring and fall Chinook, coho and steelhead. These goals were first stated in the attached January 22, 1979 letter from EC Fullerton, Director of the California Department of Fish and Game (now CA Dept of Fish and Wildlife). Those numeric goals were then incorporated into the 1983 EIS (see http://www.trrp.net/library/document/?id=1415) for the Trinity River Basin Fish and Wildlife Program that was the basis for the 1984 Trinity River Basin Fish and Wildlife Management Act (as amended in 1996), as well as the 1992 CVPIA (PL 102-575) and Trinity EIS/ROD. However, subsequent founding TRRP documents references to restoring fisheries to pre-dam levels do not include that level of specificity and likely should.	Revisions made to text to address this.
5	TAMWG	4.0 – TRRP Governance & Adaptive Management	11	Page 13, first table on structure/capacity: "*There appears to be regular communication within the TRRP and among decision-making entities but that communication does not appear to always be effective. Communication between the TMC and the TAMWG and other advisory committees needs work. This is a significant issue for the TRRP."* I agree that communication does not appear to be effective between the TMC and TAMWG; however, I don't think it's a matter of communication skills or tools. I believe it is because the stakeholders have been disenfranchised by the TRRP framework that has intentionally relegated the stakeholders to an advisory position. There is no incentive for the TMC to accept the TAMWG's recommendations because there are no negative ramifications except the "nuclear option" described below. The stakeholders feel disenfranchised and many important recommendations are rejected by the TMC. Some TAMWG members and non-TAMWG stakeholders (NOT including myself) no longer support the program and would like to see its funding significantly reduced or eliminated altogether. This is the direct result of disenfranchisement and quite frankly, one of the few options (nuclear option) available for stakeholders to have their voices really heard. I don't believe that any method of increased communication, facilitated meetings or other tools would improve this situation. Stakeholders should be given a seat at the table with an expanded TMC that is subject to the Federal Advisory Committee Act.	Noted. We will explore this issue more during the interviews in Task 3.

Comment ID #	Organization	Section	Page and Line	Comment	Response
6	Yurok Tribe	2.0 – Introduction	3	A critical component of the review that is missing is governance. Governance is only partially considered e.g. do we agree on the restoration goals and objectives. The real governance issues (organizational structure, roles and responsibilities, and work planning processes) should be explicitly added as a third primary principal of the review.	Governance is a critical part of the TRRP Refinements process. An initial assessment of governance components is included in Section 4.0 of this document, but the overall purpose of this document and Tasks 1-2 was to review TRRP foundational documents and asses the Program's goals and objectives. We will be digging much deeper into governance issues in subsequent tasks.
7	Yurok Tribe	3.0 – TRRP Goals & Objectives	5	Foundational documents of the TRRP clearly state that a primary purpose of the program is to meet the federal government's tribal trust obligations.	Revisions made to text to address this.
8	Yurok Tribe	3.0 – TRRP Goals & Objectives	5	What about the numerical goals for natural populations, by species.	Revisions made to text to address this.
9	Yurok Tribe	3.0 – TRRP Goals & Objectives	6	I thought this was approved via motion by the TMC, but could be wrong.	We found no mention of such a motion, and certainly it has not been codified in the TRRP foundational documents (i.e. we did not find an updated foundational document containing this definition).
10	Yurok Tribe	3.0 – TRRP Goals & Objectives	6	We do have numeric goals for natural fish populations (TRFE)– whether these are most appropriately considered goals or objectives is worthy of discussion. • 62,000 naturally produced Fall run Chinook adult in-river spawners in the Trinity Basin (TRFE page E2) • 6,000 naturally produced Spring Run Chinook adult in-river spawners in the Trinity Basin (TRFE page E3) • 1,400 naturally produced in-river adult Coho (TRFE page E3) • 40,000 naturally produced Steelhead spawners (TRFE page E3) • There are additional quantitative goals for smolt production and rearing habitat ○ two fold increase in smolt production (TRFE page 227). An actual numeric goal has yet to be formally adopted. ○ four fold increase in rearing habitat (TRFE page 282). An actual numeric goal has yet to be formally adopted.	Revisions made to text to address this.
11	Yurok Tribe	3.0 – TRRP Goals & Objectives	6	We have the ROD volumes of water, by water year type.	Revisions made to text to address this.

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12	Yurok Tribe	3.0 – TRRP Goals & Objectives	6	Tthe list of documents reviewed should be expanded to include the 2013 objectives refinement meeting summary (sent from Andreas Krause) which separates fundamental from means objectives and identifies two fundamental objectives: • Restore and sustain natural production of anadromous fish populations downstream of Lewiston dam to pre-dam levels. • Restore the processes and attributes of a healthy alluvial river system.	Noted, but it is not clear what the status of this document is within the Program or relative to the foundational documents.
13	Yurok Tribe	4.0 – TRRP Governance & Adaptive Management	10	What do you consider to be constituencies of the Program? Seems another important Sub-Component for the TRRP is "Responsiveness to the Federal Government's Tribal Trust obligations"	Noted. We will explore this issue more during the interviews in Task 3.
14	Yurok Tribe	4.0 – TRRP Governance & Adaptive Management	10	That is not how the TRRP was intended to be structured. It was structured for stakeholders to give input to the Govt. entities on the TMC, who then make decisions based on input received. It was not intended for various stakeholder interests (e.g. Trinity Lake levels for recreation, stability of pools from year to year for fishing guides, etc….) to be given the same amount of weight as the federal government's tribal trust obligations to restore the fishery.	Noted. We will explore this issue more during the interivews in Task 3.
15	Yurok Tribe	4.0 – TRRP Governance & Adaptive Management	11	There is a role for stakeholders to give input in the decision making process, however there are deliberate rationale for not including stakeholders on the decision making body (the TMC). An example being that Tribal trust obligations are a federal mandate, not to be balanced/compromised with considerations for things such as Trinity Lake levels.	Noted. We will explore this issue more during the interviews in Task 3.
16	USFWS	Overall		This seems like a pretty cursory review of the program. But the document generally accurately summarizes the lack of a cohesive understanding and agreement on the goals and objectives of the Program and the lack of adaptive management. This permeates throughout the TRRP organizational structure from DOI/TMC down through the workgroups and partner agencies. With the organizational components of the program are not aiming for the same target and using the same play book there is no wonder why we have different design teams with different restoration philosophies designing different projects, fish people cannot agree what are the appropriate metrics to evaluate to determine effectiveness of management actions, and so on-etc.	These issues will be explored more during the interviews in Task 3. This report is only an initial review of TRRP goals and objectives based on a reading of documents, our understanding of Program goals and objectives will continue to grow as we work through subsequent tasks.

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17	USFWS	Overall		We are providing the attached files as they contain documents pertaining to the Objectives Refinement Exercise, Big Questions, Technical WG structure and procedures, and the TRRP Scientist Retreat 2010 files. These should have been provided and hopefully they will be incorporated into future efforts to get the program on track. A lot of work was put into all of these efforts but as has been characteristic throughout the history of this program - there is little to no follow through.	Noted, but it is not clear what the status of these documents is within the Program or relative to the foundational documents.
18	USFWS	Overall		There was a major divergence in the program established under the ROD which proposed a centralized science core team (the TMAG) that would be the focus of the science program. For a variety of reasons this did not work, leading to FWS staffing the science coordinator and the establishment of a more formal technical WG procedures that was intended to have a more distributed science program across the TRRP partnership but still with the science coordination roll resting with DOI staff - this is documented in the Scientists Retreat information. This is important for the Headwaters Corporation to understand because that is where the program currently is at. It seems like oversights like this were the reason the "Coordination Team" was established.	Noted. We will explore this issue more during the interviews in Task 3.
19	USFWS	2.0 – Introduction	2	I've forwarded documents/files pertaining to the objectives refinement, big questions and Scientists' Retreat that would be useful for this review/evaluation.	Noted, but it is not clear what the status of these documents is within the Program or relative to the foundational documents.
20	USFWS	3.0 – TRRP Goals & Objectives	6	Natural spawning escapement targets are included in the IAP.	Noted, but it is not clear what the status of the IAP is within the Program or relative to the foundational documents.
21	USFWS	3.0 – TRRP Goals & Objectives	6	It is unclear what this means – there are annual, water year specific volumes of water to be released to meet objectives identified in the TRFE…please explain what is meant here.	Revisions made to text to address this.
22	USFWS	3.0 – TRRP Goals & Objectives	6	Need to review the objectives refinement document as well as the Big Questions that were developed.	Noted, but it is not clear what the status of these documents is within the Program or relative to the foundational documents.

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23	USFWS	4.0 – TRRP Governance & Adaptive Management	11	The TAMWG is the FACA chartered stakeholder group that was established to provide stakeholder input to the TMC. The previous incarnation of the Trinity Restoration Program had a Task Force that was composed of agencies as well as stakeholder representatives. In the establishment of the current Program, the Task Force was separated into the TMC composed of agencies with management authorities and the TAMWG composed of stakeholders/interest groups. The TAMWG regularly provides input on the decisions that are made by the TMC. See the TAMWG web site and the action tracker that documents TAMWG activities (https://www.fws.gov/arcata/fisheries/tamwg.html)	Noted. We will explore this issue more during the interviews in Task 3.
24	USFWS	4.0 – TRRP Governance & Adaptive Management	11	See previous comment pertaining to the TAMWG. TAMWG charter and by-laws dictate how their decision making process is implemented. https://www.fws.gov/arcata/fisheries/tamwg.html	Noted. We will explore this issue more during the interviews in Task 3.
25	USFWS	4.0 – TRRP Governance & Adaptive Management	11	Provided the objectives refinement and big questions documents that were attempts to refine goals and objectives.	Noted, but it is not clear what the status of these documents is within the Program or relative to the foundational documents.

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26	Hoopa Valley Tribe	Overall		• B-23 is the reason and the major objective of the Program; meet federal trust responsibilities • 1983 USFWS EIS identifies escapement goals; process Reclamation took for Central Valley project in general; used escapement goals for PAR process; want to get to harvestable surplus • Check with Reclamation and policy/legal counsel on fall flow issue; court ruled there is an ongoing obligation for a fish protection clause; not limited to ROD volume (ROD volumes static); new concepts of thinking about flow variability • This is an opportunity to evaluate and have a comprehensive review. The IAP was a big project with a lot of work but still need to sort through issues related to this with the USFWS and Reclamation. It is important to look at the list of TMC's "52 issues". That was a roundtable to get all the issues out on the table to try to address. When the IAP was being drafted with its goal statement, each TMC member was given the chance to look at how that goal statement might affect each partner's legal requirements. There were things left out of the goal statement because of legal concerns. HVT developed a Joint Directorate that introduces the concept of co-management.	These comments were offered during the Coordination Team conference call on August 23, 2017 and are all noted. We did make revisions in this final document to address the fish population goals (escapement). The TMC "52 issues" were reviewed while developing this report and we will continue to refer to that document in subsequent tasks. We will certainly look into the recent legal ruling that may shed light on new concepts for flow variability and the HVT Joint Directorate.