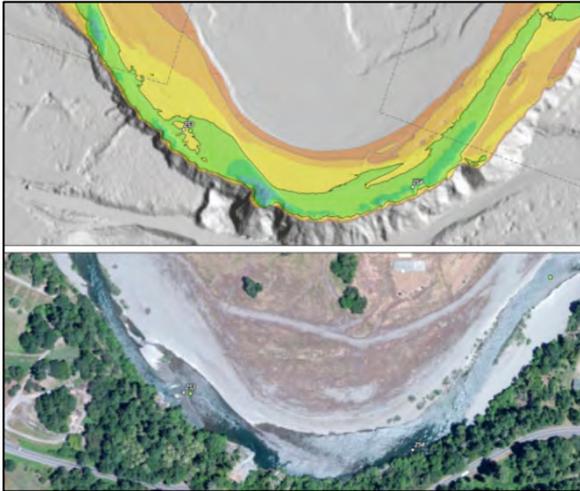


TECHNICAL MEMORANDUM • NOVEMBER 2021

Fisheries Restoration Framework for the Eel River Watershed and Phase 1 Scope of Work



PREPARED FOR

Two-Basin Solution Partners
California Trout
Humboldt County
Mendocino County Inland Water and Power
Commission
Round Valley Indian Tribes
Sonoma County Water Agency

PREPARED BY

Stillwater Sciences
850 G Street, Suite K
Arcata, CA 95521
and
McBain Associates
980 7th Street
Arcata, CA 95521

Suggested citation:

Stillwater Sciences and McBain Associates. 2021. Fisheries Restoration Framework for the Eel River Watershed and Phase 1 Scope of Work. Prepared for Two-Basin Solution Partners. November.

Cover photos: Upper left: relative elevation map of mainstem South Fork Eel River. Upper right: instream habitat restoration implementation on Redwood Creek, near Briceland, CA. Bottom: Middle Fork Eel River near Dos Rios.

Table of Contents

1	Introduction.....	1
1.1	Background.....	1
1.2	Purpose	1
1.3	Program Principles and Overall Approach	3
2	Eel River Fisheries Restoration Program Framework.....	4
2.1	Phase 1 - Planning.....	6
2.2	Phase 2 - Prioritization.....	6
2.3	Phase 3 - Design and Implementation	8
2.4	Phase 4 - Monitoring and Assessment.....	9
3	Scope of Work for Phase 1 - Planning	10
3.1	Task 1 - Define Program Goals and Objectives.....	10
3.2	Task 2 - Identify Limiting Factors and Data Gaps.....	11
3.2.1	Synthesize information and develop spatial analysis framework.....	11
3.2.2	Develop species-specific conceptual life cycle models and identify potential limiting factors	12
3.2.3	Identify key data gaps and study needs	13
3.3	Task 3 - Identify and Categorize Restoration and Conservation Actions.....	13
3.4	Task 4 - Develop Prioritization Framework	13
3.5	Task 5 - Develop Implementation Framework for Priority Actions.....	15
3.6	Task 6 - Develop Monitoring and Adaptive Management Framework.....	15
3.7	Task 7 - Develop Management Framework and Funding Strategy	16
3.7.1	Program Management Framework	16
3.7.2	Funding Strategy	18
3.8	Task 8 - Develop Fisheries Restoration and Conservation Plan for The Eel River Watershed	19
3.9	Task 9 – External Coordination and Outreach.....	19
3.10	Task 10 – Internal Coordination and Project Management	20
3.11	Estimated Schedule and Cost.....	20
3.11.1	Schedule	20
3.11.2	Estimated Cost.....	22
4	REFERENCES.....	23

Tables

Table 1. Federal and California State listing status of native anadromous fish in the Eel River.2

Table 2. Estimated cost for Phase 1 implementation22

Figures

Figure 1. Conceptual diagram of the Eel River Fisheries Restoration Program.5

Figure 2. Conceptual schedule for Phase 1 implementation.21

1 INTRODUCTION

1.1 Background

The Potter Valley Project (Project) is an inter-basin hydroelectric project in the upper Eel River and the upper Russian River watersheds, located 15 miles northeast of Ukiah. The Project annually diverts approximately 60,000 acre-feet (ac-ft) of water from the upper Eel River to the upper Russian River. Project features include Scott Dam, a 130-foot-tall concrete gravity dam that impounds Lake Pillsbury, a 2,300-acre storage reservoir with an initial storage capacity in 1922 of 94,400 ac-ft; Cape Horn Dam, which impounds the 106-acre Van Arsdale Reservoir; and a diversion system that diverts water from the Eel River at Van Arsdale Intake to the Project's powerhouse located in the headwaters of the Russian River watershed. The Project began diverting water in 1908 when Cape Horn Dam and the Van Arsdale Diversion were built. Scott Dam was built in 1922 approximately 12 miles upstream of Cape Horn Dam at river mile (RM) 168.5.

Pacific Gas and Electric Company's (PG&E's) Project license expires in 2022. PG&E filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to formally initiate the relicensing process for the Project in April 2017. PG&E withdrew its NOI and PAD and discontinued its efforts to relicense the Project in January 2019, and in March 2019, the Federal Energy Regulatory Commission (FERC) issued a notice soliciting interested potential applicants other than PG&E to file an NOI and PAD. In May 2019, the Two-Basin Solution Partners (Partners) entered into a Planning Agreement to explore pathways to obtain a new license for the Project. In June 2019, the Partners filed a NOI with FERC stating the intent to undertake a Feasibility Study of a potential licensing proposal for the Project. The Feasibility Study examined the practicability of potential actions in meeting agreed upon common goals and to inform the Partners of cost and performance tradeoffs associated with those actions. Phase 1 of the Feasibility Study, completed and filed with FERC in May 2020, included the following key elements: (1) a Regional Entity that will apply for the new license and assume the new license if issued, (2) a Project Plan, (3) a Fisheries Restoration Plan, (4) an Application Study Plan, and (5) a Financial Plan. Phase 2 of the Feasibility Study was initiated in April 2020 with grant funding from the California Department of Fish and Wildlife (CDFW) to supplement technical analyses conducted during Phase 1 and to conduct new technical analyses.

This Technical Memorandum was prepared for the Partners by the Consultant Team to supplement technical analyses performed during Phase 1 of the Feasibility Study. This Technical Memorandum reflects the consultant work product and is intended to be purely informational and is thus not binding of any of the Partners. In addition, this Technical Memorandum will not be filed with FERC as the basis for compliance under the Integrated License Process or other FERC regulations. While this Technical Memorandum contributes to the information available to the Partners, the Partners have not solely relied on this document for justification for any decision the Partners have made or will make regarding FERC filings or cooperative agreements. More detailed studies will be conducted through implementation of the FERC study plan, as well as additional engineering and environmental studies outside of the FERC process.

1.2 Purpose

Ecological restoration in the Eel River watershed to support recovery of native anadromous fish populations is central to the Partners' Shared Objectives of a Two-Basin Solution, and specifically included in the Feasibility Study filed with FERC. Phase 2 of the Feasibility Study

includes further developing technical elements of Phase 1, including outlining a fisheries restoration framework and providing a scope of work for developing a Fisheries Restoration and Conservation Plan for the Eel River Watershed (Restoration and Conservation Plan). That plan will guide implementation of the Eel River Fisheries Restoration Program (Restoration Program), with the goal of most effectively restoring native anadromous fish populations and ecological processes across the Eel River watershed. The Eel River Fisheries Restoration Program Framework is described in more detail in Section 2. The Restoration and Conservation Plan to be developed during Phase 1 of the Program is described in more detail in Section 3.

The need for a holistic, watershed-wide restoration program to support the recovery of native anadromous fish populations in the Eel River is well documented (CDFW 2014; NMFS 2014, 2016; Eel River Forum 2016, South Fork Eel River SHaRP Collaborative 2021). Aquatic habitats throughout much of the Eel River watershed have been significantly impaired from past and recent intensive land use practices, which has led to dramatic declines of anadromous fish populations that have resulted in state and federal listings to protect and facilitate recovery of these populations (Table 1) (CDFW 2014; NMFS 2014, 2016; Eel River Forum 2016). Notable recent and ongoing land uses in the watershed include grazing, industrial timber management, rural and residential development, gravel extraction, conversion of the estuary to agricultural land uses, and cannabis cultivation. These activities, along with historical widespread disturbance of the landscape from intensive logging, forest community alteration, and construction of roads and railways, followed by large floods in the 1955 and 1964, have caused extensive changes to much of the watershed. Impacts from these changes include increased sediment supply, channel aggregation and simplification, loss of riparian vegetation, increased water temperatures, and altered hydrology. Additionally, the United States Environmental Protection Agency (USEPA) has listed all Eel River subwatersheds as impaired on the federal Clean Water Act 303(d) list, primarily for excessive sediment and increased water temperatures (Eel River Forum 2016). The ecology of the Eel River watershed has also been fundamentally altered by presence of non-native species, most notably Sacramento Pikeminnow.

Table 1. Federal and California State listing status of native anadromous fish in the Eel River.

Species (population)	Listing status ¹
Fall-run Chinook Salmon (California Coastal ESU)	FT
Summer- and Winter-run Steelhead (Northern California DPS)	FT, SSC, SC
Coho Salmon (Southern Oregon/Northern California Coast ESU)	FT, ST
Pacific Lamprey	SSC, FSS
Green Sturgeon (Northern DPS)	FSC

Notes: ESU = evolutionarily significant unit; DPS = distinct population segment

¹ FT = Federally listed as Threatened, FE = Federally listed as Endangered, FSC = Federal Species of Concern, FC = Federal candidate species, ST = State Threatened, SSC = California Species of Special Concern, SC = State candidate species, FSS = USDA Forest Service Sensitive.

The fisheries restoration strategies to be addressed in the Restoration and Conservation Plan will focus on native anadromous fish species in the Eel River watershed with current or historical commercial, recreational, or tribal harvest values, including fall-run Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), summer-run/winter-run steelhead (*Oncorhynchus mykiss*), Pacific Lamprey (*Entosphenus tridentatus*), and Green Sturgeon (*Acipenser medirostris*). Restoration and preservation of habitats and ecological processes that benefit other native fish and aquatic species will also be considered as part of the restoration planning process.

The purpose of this Technical Memorandum is to describe a framework and overall process for the Eel River Fisheries Restoration Program (Section 2) and provide a scope of work for implementing the first phase of the program (Section 3), which entails developing the Restoration and Conservation Plan for the Eel River Watershed that will guide implementation of subsequent program phases. Implementation of the plan will require additional funding and commitment to a yet-to-be-determined level of effort (i.e., available funding will determine how the plan is implemented over time and level of restoration/conservation that can be achieved).

1.3 Relationship to Project Relicensing

In response to the pervasive fish habitat degradation and population declines, the Partners propose to investigate additional restoration and conservation opportunities within the Eel River watershed beyond the FERC Project boundary that will further contribute to the recovery and preservation of tribally, commercially, and recreationally important fisheries. Implementing a large-scale, coordinated restoration program throughout the Eel River watershed is critical for achieving recovery goals for native fish populations, and to restore a healthy and resilient Eel River ecosystem. These potential restoration and conservation actions would be in addition to the restoration actions slated to occur within the Project boundary under a new FERC license, and would likely be separate from agreements or measures required by a new license. Combined, these two fisheries restoration components are intended to improve fishery populations within the entire Eel River watershed, and benefit tribal, commercial, and recreational fisheries. Developing a restoration program to improve habitats in the Eel River watershed beyond the Project boundary is analogous to other components of the Shared Objectives being addressed outside of the FERC process, such as investigating solutions to ensure Potter Valley Irrigation District (PVID) water supply reliability.

1.4 Program Principles and Overall Approach

Native fish recovery in the Eel River watershed is more likely to succeed if restoration and conservation efforts are coordinated and use a common framework for identifying and prioritizing actions that will most effectively increase populations of focal species and restore ecological processes, and then monitoring system responses. For this reason, collaboration with watershed stakeholders and technical experts is a critical tenet of the overall approach for developing and implementing the Restoration Program. As described in Section 3, regular meetings with stakeholders and a technical work group (TWG) will be integral to the restoration planning process. The TWG will include agency and tribal representatives and individuals with technical expertise on restoration planning, fish population dynamics, ecology, and/or geomorphology of the Eel River watershed.

Importantly, the Restoration and Conservation Plan will build on and complement existing restoration planning frameworks for salmonids (e.g., Bradbury et al. 1995, Beechie et al. 2008 Rieman et al. 2015); fisheries recovery and restoration plans for the Eel River watershed (e.g., CDFG 2004; NMFS 2014, 2016; Eel River Forum 2016, McBain Associates 2017; South Fork Eel River SHaRP Collaborative 2021), and species management plans and conceptual models (e.g., Wiyot Tribe Natural Resources Department and Stillwater Sciences 2016).

The overall approach to developing the Restoration Program will be guided by a limiting factors approach that helps identify how physical and ecological conditions in the Eel River watershed influence population productivity (growth and survival) and abundance of the focal fish species. Restoration and conservation actions expected to provide the greatest benefit to population abundance and resiliency will be identified and prioritized.

Other guiding principles for a successful restoration program that will be incorporated into the overall approach include:

- Evaluating and implementing both physical habitat restoration and land and water conservation actions;
- Implementing a coordinated watershed-wide approach (or sub-basin approach) that is of a sufficiently large-scale and magnitude to help achieve recovery targets;
- Developing and implementing a science-driven prioritization process that identifies actions that most directly increase population productivity and resilience of focal species incorporated within a longer-term vision for recovering ecological processes;
- Applying a hierarchical spatial framework in the prioritization process (i.e., use spatial analysis tools to consider the range of spatial scales [from basin to site-specific] and provide context to allow actions targeted at specific species, life stage, or population to be most effective at the appropriate spatial scale);
- Integrating physical, ecological (e.g., food, predation), and economic elements into the prioritization process;
- Assigning value to life history diversity and population resiliency in addition to population size; and
- Ensuring that monitoring, assessment, and adaptive management are an integral component of the program.

Finally, as described in Section 3.7, developing a well-structured management framework and funding strategy early in the process is crucial for efficient, effective, and transparent implementation of all aspects of the Restoration Program.

2 EEL RIVER FISHERIES RESTORATION PROGRAM FRAMEWORK

The Eel River Fisheries Restoration Program can be divided into four phases: (1) Planning, (2) Prioritization, (3) Design and Implementation, and (4) Monitoring and Assessment (Figure 1). These phases will generally be conducted sequentially, although phases will likely overlap and may be conducted in parallel. Frequent feedback between phases through adaptive management will inform program implementation and help refine tools and approaches used in each phase. Phase 1 (Planning), which entails developing the Restoration and Conservation Plan in consultation with key stakeholders and topical experts, will provide a refined description of the overall program framework and process, and will guide implementation of subsequent phases. For example, the initial plan will include compilation of existing information, development of species-specific life cycle conceptual models to identify potential limiting factors and data gaps, and development of the overall prioritization process. These steps will directly inform development and implementation of more sophisticated prioritization tools during Phase 2. The outcome of Phase 2 (Prioritization) will be an Eel River Fisheries Restoration Priorities Action Plan (Action Plan) that includes a prioritized list of restoration and conservation actions and locations that most efficiently and cost-effectively lead to recovery of focal fish populations. Implementation of the Action Plan will occur in Phase 3 (Design and Implementation). Phase 4 (Monitoring and Assessment) includes implementation of a multi-faceted, long-term monitoring program that collects and analyzes the data needed to help develop and refine prioritization tools, evaluate restoration and conservation actions and program success, and refine each phase of the restoration program through an adaptive management process. An initial framework, components, and potential tools for developing and implementing each of phase of the Restoration Program are described below.

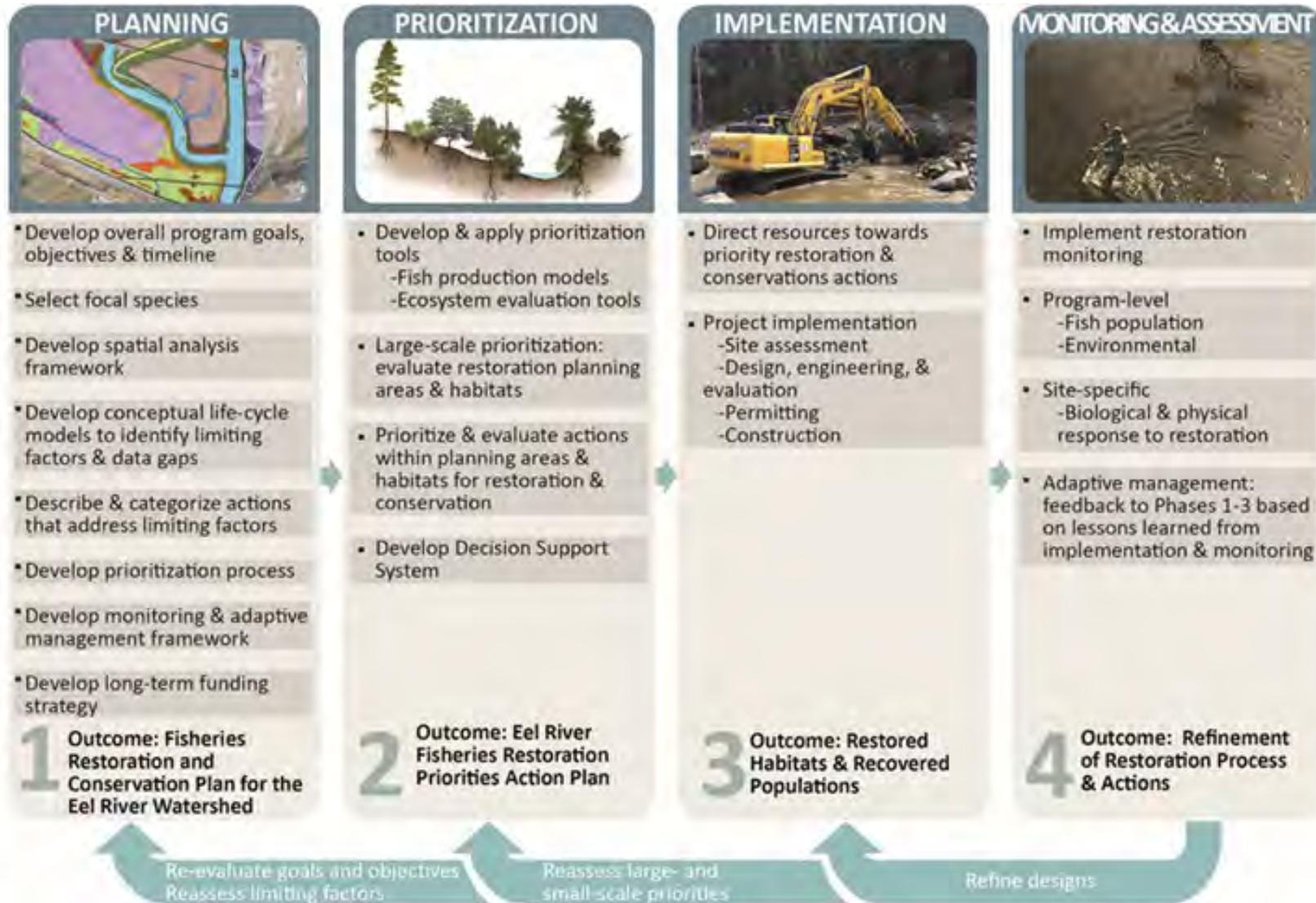


Figure 1. Conceptual diagram of the Eel River Fisheries Restoration Program.

2.1 Phase 1 - Planning

The overall Eel River Fisheries Restoration Program will be guided by the Fisheries Restoration and Conservation Plan for the Eel River Watershed developed during Phase 1. As described in Section 3 of this document, the Restoration and Conservation Plan will be developed in close consultation with watershed stakeholders and technical experts. Development of the Restoration and Conservation Plan will include the following primary tasks, which will likely constitute chapters in the plan:

- Define Program Goals and Objective
- Identify Limiting Factors and Data Gaps
- Identify and Categorize Restoration and Conservation Actions
- Develop Prioritization Framework
- Develop Implementation Framework
- Develop Monitoring and Adaptive Management Framework
- Develop Management Framework and Funding Strategy

Section 3 of this document describes the proposed approaches for developing each of these plan components in coordination with watershed stakeholders and technical experts and drafting the Restoration and Conservation Plan.

2.2 Phase 2 - Prioritization

Phase 2 of the Restoration Program entails developing and implementing a process that identifies and prioritizes restoration and conservation actions that will most efficiently and cost-effectively achieve restoration objectives. Ideally, the overall approach to prioritization will integrate population, ecological, and economic information across the watershed. The process will draw broadly from existing guidance on the topic and restoration prioritization approaches applied in other large watersheds (e.g., Bradbury et al. 1995, Beechie et al. 2008, Roni et al. 2013, Reiman et al. 2015, ESSA et al. 2019, White et al. 2021). The approach will also leverage existing Eel River restoration planning efforts and associated documents (NMFS 2014, 2016; Eel River Forum 2016; McBain Associates 2017; South Fork Eel River SHaRP Collaborative 2021). The final product of Phase 2 will be an Eel River Priorities Action Plan that lists prioritized conservation and restoration actions in the Eel River watershed. Outlined herein are the key components of the prioritization process and the types of tools that may be developed and applied; however, the process ultimately applied will be developed in accordance with the prioritization framework developed during Phase 1 in collaboration with the TWG (Section 3.4).

A variety of approaches can be used to evaluate and prioritize restoration and conservation actions, ranging from simple ranking systems to complex quantitative life-cycle models (Bradbury et al. 1995, Beechie et al. 2008, Roni et al. 2013). Depending on input from the TWG and the prioritization framework developed during Phase 1 and available resources, the prioritization process implemented in Phase 2 will likely include a three-tiered approach. The first tier would involve developing a list of potential restoration and conservation actions using spatial analyses tools and/or models to identify specific locations in the watershed where they are most likely to alleviate key limiting factors and increase population productivity and resilience of focal species. This step would build on a section of the Restoration and Conservation Plan that identifies the types of actions expected to address key limiting factors and the general parts of the watershed where they are most appropriate to implement (Section 3.3). The second tier of the prioritization process would involve ranking identified actions based on magnitude of biological

benefits to focal fish species (e.g., increase in habitat area, smolt production, or smolt-to-adult survival due to enhanced juvenile growth, or other metrics that align with overall restoration goals) predicted from a series of qualitative or quantitative tools. The third tier would involve adjusting and finalizing rankings based on overall ecological benefits, cost, feasibility, support from stakeholders, and other societal considerations using a decision support system (DSS). The prioritization process and the outcomes of the three-tiers would be detailed in the Action Plan.

Building on the framework developed during Phase 1, an additional series of technical workshops will be held with experts (comprising the TWG) in restoration planning, fish population dynamics, ecology, spatial analysis, and economics during Phase 2 to support full development and application of prioritization tools. These tools will either be adapted from previous efforts or developed specifically for the Restoration Program. Some of the key components anticipated to be incorporated into these tools are described below, but the final tools will be developed with TWG input and adaptively refined through the life of the Restoration Program.

The tools developed for the first tier (identifying a list of potential locations and actions for restoration) and section tier (evaluating biological benefits of actions to focal species) of the prioritization process would build on spatial analyses, species conceptual models, limiting factors evaluations, and ecological analyses generated during Phase 1. Depending on information and resources available to support development and application, these tools may be based on expert opinion or mechanistic models but are generally expected to operate hierarchically, whereby species and ecosystem benefits can be assessed across a range of scales (e.g., watershed to reach). The tools would likely integrate components of the spatial analysis framework developed in Phase 1 (Section 3.2.1), which will include a watershed-wide channel network attributed with geomorphic, habitat, and environmental data such as channel gradient and width, fish distribution and passage barriers, and water temperature. These tools would also incorporate information on population-specific limiting factors, habitat carrying capacity, ecosystem productivity, fish bioenergetics, and predation (pikeminnow). For example, the tools may help identify locations and times where different species or life history strategies that can take advantage of habitats with high productivity with minimal risk from predation. Ideally, the tools applied would be sufficiently complex to capture the concepts and mechanisms needed to evaluate and prioritize actions in terms of fish population and ecosystem response, but also transparent and easily interpreted.

The DSS applied in the third tier of prioritization would be designed to evaluate restoration and conservation actions from cost:benefit, social/political support, and feasibility standpoints. A key objective of the DSS would be to document each step of the decision process and provide transparency in how actions are prioritized and why decisions are made when implementing the Restoration Program.

A critical component of the prioritization process and the larger Restoration Program is adaptive management. Restoration priorities will be periodically reevaluated as new information becomes available, projects are completed, funding levels change, or new restoration approaches and opportunities are identified. Importantly, the prioritization phase will be integrated with Phase 4 (Monitoring and Assessment) to ensure that the biological benefit and decision support tools applied in Phase 2 undergo periodic validation and updates based on assessment of both biological monitoring data and data collected to monitor the success of restoration and conservation actions.

2.3 Phase 3 - Design and Implementation

Phase 3 includes moving selected high-priority restoration and conservation actions through a design and implementation process, including permitting and construction where appropriate. The steps required for design and implementation will depend on the type of actions being considered.

Potential types of actions, which will be further identified during Phase 1 and Phase 2, may include:

- Sediment source reduction, revegetation, and/or other types of actions intended to reduce suspended sediment concentrations and/or improve water quality;
- Water conservation, storage, and/or other actions that improve hydrologic function and enhance and protect instream flow;
- Riparian restoration
- Estuarine and tidal wetland habitat restoration;
- Fish passage improvement and other actions that improve connectivity between habitats within migratory corridors;
- Floodplain and/or other types of off-channel habitat enhancement;
- In-channel habitat enhancement;
- Large wood addition and other actions intended to invigorate geomorphic processes that improve channel texture, form, and function;
- Non-native predator fish suppression;
- pathogen control; and
- Land conservation through conservation easements or purchases.

The design and implementation process will vary depending on the type of restoration or conservation action, but typically involves the following elements:

- Developing a long-term funding strategy and securing funding for initial phases of implementation, including: (1) identifying relevant state and federal grants and private and non-profit funding sources, (2) understanding the requirements and priorities of the funding sources, and (3) confirming that the proposed project type and location are within the focus and meet eligibility requirements;
- Conducting outreach and coordination with local stakeholders and resource agencies to secure landowner cooperation and develop project concepts that (1) address specific recovery objectives, (2) build on and link to other related recovery efforts in the area, (3) are consistent with existing land use constraints, and (4) are broadly supported;
- Coordinating with technical experts to ensure that the project planning and design processes incorporate the best available science and technical approaches consistent with similar projects that were successful;
- Assessing existing and historical site conditions (e.g., land use, geology and geomorphology, hydrology and hydraulics, vegetation, and aquatic and riparian biology) to inform the type and magnitude of landscape and/or process alternation, the legacy impacts of historical changes, the current conditions within the system and its trajectory, and opportunities and constraints to restoration and enhancement;
- Developing engineering design plans, specifications, and construction cost estimates that are suitable for permitting and implementation and supported by appropriate analyses and evaluation of uncertainties and risk;

- Satisfying programmatic and site-specific permitting required by local, state, and federal agencies;
- Bidding and selection of qualified construction contractors;
- Project construction implementation;
- Monitoring and assessment (informed by Phase 4, and guidance included in the Restoration and Conservation Plan), including disseminating project information and outcomes to help inform future restoration projects; and
- Long-term maintenance (10–25-year timescale) of project objectives and evolving ecological conditions, especially on private properties.

2.4 Phase 4 - Monitoring and Assessment

Phase 4 of the Restoration Program includes implementing a Monitoring and Adaptive Management (M&AM) Framework designed to evaluate (1) whether individual restoration and conservation actions achieve their objectives and (2) the overall success of the Restoration Program at restoring native anadromous fish populations and ecological processes in the Eel River watershed. In addition to evaluating restoration effectiveness, collection and assessment of physical, fish population, and ecological data is critical for filling key gaps, identifying locations to target for habitat enhancement or conservation, and adaptively refining restoration planning, prioritization, and implementation processes. While implementing the M&AM is Phase 4 of the Restoration Program, it will be beneficial to initiate various monitoring components early in the process to help describe baseline conditions, fill important data gaps, and develop and parameterize prioritization tools.

As described in Section 3.6, a draft M&AM Framework will be developed during Phase 1 through a collaborative process with the TWG and included in the Fisheries Restoration and Conservation Plan. The M&AM Framework will outline key elements and considerations of a holistic monitoring and adaptive management strategy for fisheries restoration in the Eel River watershed. This framework will be refined as additional monitoring needs are identified and tailored to monitoring effectiveness of priority restoration actions identified during Phase 2. It is anticipated that the M&AM Framework will describe both site-specific and program-level monitoring components. Both components will be designed to directly answer identified monitoring questions and will be coordinated with ongoing monitoring efforts in the Eel River watershed.

Site-specific monitoring will be designed to evaluate success of individual restoration actions and include the following categories (Duffy 2006):

- *Implementation monitoring*: monitoring to document the fulfillment of contract or grant agreement obligations, or compliance with permitting requirements, regulations, or laws.
- *Effectiveness monitoring*: monitoring to document trends in resource condition following a management action. Effectiveness monitoring is most often associated with physical or chemical processes and habitats.
- *Validation monitoring*: monitoring to document the response of biota to restoration actions. Validation monitoring ideally establishes cause-and-effect relationships between restoration actions and biota.

Program-level monitoring, designed to establish baseline conditions and evaluate overall success of the Restoration Program and fill key data gaps, will involve long-term and large-scale monitoring of (1) fish populations (e.g., adult escapement, juvenile production, and juvenile

distribution and life history diversity) and (2) environmental and habitat variables (e.g., water temperature, stream flows, fine sediment, fish food resources). Program-level monitoring would integrate and build on ongoing monitoring being conducted by state and federal agencies and others.

A critical part the M&AM Framework will entail periodic assessment and synthesis of monitoring data to describe project success and fish and habitat response to restoration. This evaluation of monitoring data will be used to refine each phase of the Restoration Program, including the Restoration and Conservation Plan, restoration and conservation prioritization, project implementation, and the M&AM Framework.

3 SCOPE OF WORK FOR PHASE 1 - PLANNING

This section describes the primary components of the fisheries restoration framework that will be expanded during implementation of Phase 1 and is intended to be the scope of work describing how Phase 1 will be implemented. The primary outcome of Phase 1 is the Restoration and Conservation Plan for the Eel River Watershed.

As described above in Section 1.2, developing and implementing the Restoration Program is intended to be a collaborative process and will rely heavily on interactions with and input from watershed stakeholders and technical experts. The approach for including stakeholders and technical experts in the process is two-tiered. The first tier involves early participation from a broad range of stakeholders and the second tier involves workshops with technical experts focused on developing specific elements of the Restoration and Conservation Plan.

Two stakeholder meetings that include a broad range of participants are proposed for Phase 1, one at the beginning of the process and a second when the draft Restoration and Conservation Plan is complete and available for review. Seven technical workshops are proposed during Phase 1, each focusing on major components of the Restoration and Conservation Plan (Sections 3.1–3.7). A Technical Working Group (TWG) will be convened to participate in these workshops and provide input on plan development. The TWG will include academic, agency and tribal representatives and other individuals with particular expertise in restoration planning, fish population dynamics, ecology, and/or geomorphology of the Eel River watershed. In addition, CalTrout will host six Eel River Forum meetings to provide progress updates and engage with stakeholders on a regular basis.

Stillwater Sciences and McBain Associates (Stillwater/McBain Team), and potentially other collaborators, will support the Partners with implementing Phase 1 of the program and developing the Restoration and Conservation Plan, including: coordinating with Stakeholders and technical experts, preparing technical information to inform technical workshops, leading technical workshops, and drafting components of and producing the final Restoration and Conservation Plan.

3.1 Task 1 - Define Program Goals and Objectives

The first step in developing the Restoration and Conservation Plan is to define overall program goals and objectives and establish the general timeline for implementing each component of Phase 1. Clearly defining restoration goals is critical for guiding each step of the Restoration and Conservation Plan, particularly for developing a project prioritization framework that will lead to a process of identifying actions that most directly address those goals (Beechie et al. 2008).

The overarching goal of the Restoration Program is to efficiently restore self-sustaining native anadromous fish populations and ecological processes in the Eel River watershed. However, more specific goals and associated objectives that guide program implementation will be established during an initial TWG workshop.

Prior to the first TWG workshop, a suite of fisheries restoration goals for focal fish species in the watershed and more specific and measurable tasks that must be accomplished to achieve each goal (i.e., objectives) will be collaboratively identified by the Stillwater/McBain Team. These draft goals and objectives will be presented to the TWG at the workshop and refined based on their input. The refined goals and objectives will be presented to a larger group of watershed stakeholders at a subsequent meeting and participants will have the opportunity to provide input. After integrating TWG and stakeholder input, these program goals and objectives will be finalized and used to guide development of subsequent components of the Restoration and Conservation Plan.

3.2 Task 2 - Identify Limiting Factors and Data Gaps

A critical early step in realizing a successful fisheries restoration program is identifying the primary factors limiting population productivity and resilience of focal species so that restoration actions that most efficiently address those limiting factors can be prioritized and implemented. Early identification of key data gaps that limit understanding of population dynamics and limiting factors for focal species is imperative so that studies can be conducted to fill those data gaps. Key limiting factors and data gaps will be initially identified by organizing available information from the watershed within a spatial analysis framework and developing conceptual models that systematically describe each species' life history and habitat and biological constraints affecting survival of each life stage. The process for carrying out these steps during development of the Restoration and Conservation Plan is summarized in the sections that follow.

3.2.1 Synthesize information and develop spatial analysis framework

An integral first step in identifying key limiting factors and data gaps is compilation of available information and development of a watershed-wide spatial analysis framework that integrates physical and geomorphic data such as channel slope, drainage area, and geomorphic terrains with biological and environmental data such as fish abundance and distribution, migration barriers, habitat conditions, water temperature, and food resources. The spatial analysis framework will include compilation of spatial data within GIS that will inform understanding physical processes and biological conditions across the Eel River watershed. This framework can be used to identify site-specific limiting factors for each species based on the conceptual life cycle models (Section 3.2.2). Data compiled for the spatial analysis framework will also inform development of a spatial hierarchical approach for restoration prioritization across the Eel River watershed and will be used for various analyses during Phase 2 of the Restoration Program to help identify and prioritize locations most suitable for various restoration and/or conservation actions that address key limiting factors.

The spatial analysis framework will integrate relevant information for the Eel River watershed, where available, including:

- Watershed and Subbasin boundaries
- Topography
- Geology and geomorphic terrain

- Channel attributes, including channel gradient and confinement, and contributing drainage area
- Riparian vegetation and forest structure
- Fish distribution
- Fish habitat
- Stream flow
- Water temperature
- Land ownership, land use, road density etc.

In addition to compiling and organizing spatial data on the attributes listed above, output from existing relevant spatial models (e.g., NorWest stream temperature model) and analyses (e.g., Cooper et al. 2020, FitzGerald et al. 2020) will be utilized where possible.

3.2.2 Develop species-specific conceptual life cycle models and identify potential limiting factors

Conceptual life cycle models will be developed for each focal species and used to characterize the overall population dynamics of each species and help identify the factors most likely limiting their population productivity and resilience based on current knowledge. These species-specific conceptual models will describe life history timing, spatial distribution, and habitat requirements and constraints for each life stage across the watershed. Based on these conceptual models and information compiled for the spatial analysis framework, the most likely density-dependent (habitat carrying capacity) and density-independent (e.g., water temperature, disease, predation) mechanisms regulating population productivity for each species will be identified. Where possible, these conceptual models will also describe how interannual variability in streamflow (e.g., wet versus dry) and other environmental conditions are expected to contribute to interannual differences in spatial distribution and population dynamics of each species. Likewise, these models will describe expected differences in life history strategies and limiting factors for each species between different portions of the watershed (e.g., interior versus coastal streams).

The conceptual life cycle models will be developed in close collaboration with the TWG and experts on the population dynamics of focal species and the ecology of the Eel River watershed. Three 1-day workshops, organized to facilitate focused discussions of each species, are proposed for this purpose. The Stillwater/McBain Team will compile relevant data and develop initial model frameworks for each species, which will be refined with TWG input. The models will build on available information from previous efforts, including work by federal and state agencies to develop species-specific conceptual models initiated during PG&E relicensing. The models will also integrate information from other recent efforts to describe life cycles and limiting factors for focal species in the Eel River watershed (e.g., Stillwater Sciences 2014, Stillwater Sciences and Wiyot Tribe Natural Resources Department 2017, South Fork Eel River SHaRP Collaborative 2021). Additionally, to the extent possible, this work will be coordinated with Project relicensing Study AQ 9 – Fish Populations, that includes development of species conceptual models for the upper Eel River (upstream of the Middle Fork Eel River).

Finally, these conceptual models will provide an important foundation both for developing the restoration prioritization framework described in Section 3.4 and for developing and applying more quantitative population or ecological models that will be used to refine understanding of population dynamics and evaluate different restoration actions or strategies during the prioritization process (Phase 2).

3.2.3 Identify key data gaps and study needs

Understanding limiting factors is an iterative process of hypothesis development, testing, and refinement. Development of both the spatial analysis framework and the species-specific conceptual models will facilitate systematic identification of critical data gaps that contribute uncertainty to identifying limiting factors and prioritizing restoration actions. Examples of critical data gaps include limited understanding of a species' life history timing, life history diversity, habitat requirements, or factors impacting growth and survival of a given life stage.

Studies and monitoring needed to address each critical data gap identified during information synthesis and development of species conceptual models will be listed and summarized in the Restoration and Conservation Plan. When conducted, these studies will enable refinement of the species conceptual models and improve understanding of limiting factors, and the prioritization process can be refined accordingly.

3.3 Task 3 - Identify and Categorize Restoration and Conservation Actions

General types of restoration and conservation actions most likely to address key limiting factors and increase abundance and resilience of focal fish species will be identified, described, and categorized based on existing information and the species-specific conceptual models described above. The product of this step would essentially be: (1) a menu of the primary options for fisheries restoration and conservation for the Eel River watershed, (2) a general description of the channel characteristics or locations where actions are most appropriate to apply, and (3) a list of the limiting factors addressed by each action. The list of primary options for restoration and conservation actions for the Eel River watershed would be drafted and presented to the TWG during a half-day workshop. Input received during the workshop would be incorporated into a chapter in the Restoration and Conservation Plan and used as a starting point for subsequent evaluations and refinement of restoration actions and strategies during the prioritization process (Phase 2).

For example, key restoration and conservation actions within each of the following broad categories that are expected to directly address one or more key limiting factors for the one or more of the focal species would be identified, listed, and described:

- Fish passage improvement
- Instream habitat restoration
- Floodplain/off-channel habitat restoration
- Riparian habitat restoration
- Estuary Habitat Restoration
- Instream flow protection and enhancement
- Upslope sediment control/management
- Land conservation
- Predator/pathogen control
- Water quality improvement

3.4 Task 4 - Develop Prioritization Framework

A well-developed, science-driven prioritization process is critical for implementation of a restoration program that will lead to ecosystem and fish population recovery. An effective

prioritization approach will include a systematic, replicable, and transparent process for making decisions on restoration and conservation actions (Beechie et al. 2008; ESSA et al. 2019). Outcomes of the prioritization process will guide decision making processes for funders, agencies, tribes, and other stakeholders on where, how, and when restoration and conservation actions will occur. The goals of this important section of the Restoration and Conservation Plan are: (1) to answer foundational questions about the approach to prioritization, and to (2) develop a framework that describes the prioritization process that will be implemented during Phase 2 of the Restoration Program. Building this framework in the planning phase ensures that there is sufficient time to collect stakeholder input and incorporate the best available science into the prioritization process. The products from this phase will be: (1) a review and evaluation of possible prioritization approaches and tools and (2) a proposed framework of prioritization to be implemented in Phase 2 of the Restoration Program. Development of the framework will be conducted in two primary steps, facilitated during a two-day workshop with TWG members and potentially others with particular expertise in restoration prioritization and knowledge of the Eel River watershed. The steps include:

Step 1 – Develop and answer foundational questions for prioritization:

A series of foundational questions will be developed and distributed to TWG members prior to the two-day workshop. On the first day of the workshop, participants will discuss and answer the foundational questions to support development of a prioritization framework on day two.

Examples of potential questions that will help lay the foundation for the prioritization phase include:

- Should the prioritization process be focused on species-specific recovery or restoration of ecological processes?
- Should a logic (non-quantitative) or analytical (quantitative) approach be used for prioritization?
- Based on the answers to #1 and #2, what will the tools used for prioritizing restoration and conservation actions consist of? Will an approach based on expert ranking or quantitative/mechanistic modeling be applied?
- What metrics will be used to evaluate different actions? For example, some programs use habitat carrying capacity or overall adult escapement while others may use smolts/spawning adult metrics or integrate metrics such as juvenile growth.
- What key data gaps exist that may dictate the approach selected. Are there critical data gaps and model assumptions that require field validation? And how frequently will the prioritization process and tools applied be reevaluated and refined?
- How will prioritization be evaluated and integrated with M&AM Phase (Phase 4)?

The questions above are not exhaustive, but rather a starting point that will be expanded and discussed with the TWG during the workshop.

Step 2 – Review and discuss existing restoration programs and prioritization approaches and tools:

During the second day of the workshop, examples of existing large watershed restoration programs and prioritization processes and potential prioritization approaches and tools will be presented to the TWG. Pros and cons of different approaches and applicability to the Eel River

Restoration Program will be discussed with the TWG to receive feedback on the most suitable approach or suite of approaches for the program.

The proceedings of the workshop will be used to draft a prioritization framework and conceptual approach for the restoration prioritization process. A range of suitable approaches and tools for the Eel River watershed may be presented, with the final approach selected during Phase 2 based on resources available for the prioritization process. A draft of the prioritization framework will be provided to the TWG for review. After integrating TWG input, the prioritization framework will be included as a chapter of the Restoration and Conservation Plan and will serve as the guiding document for implementing Phase 2 (Prioritization).

3.5 Task 5 - Develop Implementation Framework for Priority Actions

During Phase 1, a project implementation framework that describes key steps and considerations for implementing different types and scales of restoration and conservation actions will be developed. This framework will draw from successful existing restoration programs and guidance documents in California and serve as a road map for efficiently implementing various project types from start to finish. A draft framework will be developed and presented to the TWG during a half-day workshop, then refined based on input provided by the TWG.

The framework will describe the primary elements of the project implementation process, including:

- Funding procurement
- Stakeholder outreach and coordination
- Technical advisory input
- Assessment of existing and historical site conditions
- Engineering design and analysis
- Site-specific permitting
- Construction implementation
- Monitoring project effectiveness (Phase 4)
- Disseminating project information and results (as part of the M&AM Framework, Section 3.6).

3.6 Task 6 - Develop Monitoring and Adaptive Management Framework

A critical component of the Restoration and Conservation Plan is developing an initial Monitoring and Adaptive Management (M&AM) Framework designed to guide evaluation of (1) the success of individual restoration projects in achieving their objectives and (2) the overall success of the restoration program at restoring native anadromous fish populations and ecological processes in the Eel River watershed. In addition to evaluating restoration effectiveness, collection and assessment of physical, ecological, and fish population data is critical for filling key gaps (Section 3.2.3) and adaptively refining restoration planning, prioritization, and implementation processes. Monitoring data will also help establish baseline conditions prior to initiating the restoration program and contribute to development of the prioritization process.

The M&AM Framework will be developed through a collaborative process that includes a TWG workshop to solicit input and TWG review of a final draft of the framework. The M&AM Framework will spell out the fundamental restoration monitoring questions for the watershed and be designed to collect information that will help most directly answer those questions. The

M&AM Framework will describe key elements and considerations for both site-specific monitoring intended to evaluate project success and watershed-scale fish population, habitat, and environmental monitoring intended to evaluate overall restoration program success. The framework will describe overall timeframe and appropriate scales for implementing primary monitoring components, but for various restoration projects or program-level monitoring elements (e.g., species-specific population monitoring), more specific monitoring plans that are consistent with the M&M Framework but provide more detailed information on field methods, scale, timing, periodicity, and analytical methods will likely need to be developed. The M&AM Framework will also include a list of the relevant past and ongoing monitoring programs in the watershed and describe considerations for coordinating with and integrating information from those programs into the framework.

The M&AM Framework will also describe how monitoring results should be used to assess project and program success and to refine each phase of the Restoration Program through the adaptive management process. Importantly, after completion the Action Plan (Phase 2) that identifies more specific restoration actions, the draft M&AM Plan would likely be reviewed, expanded, and tailored to collect the information needed to monitor high priority actions and to fill key data gaps.

3.7 Task 7 - Develop Management Framework and Funding Strategy

A restoration strategy provides no benefits if it cannot be successfully implemented. Many large-scale restoration programs struggle not because of the quality of the science or the strategic plan for restoration; they struggle due to implementation challenges. These challenges can come from a variety of sources, including stakeholder coordination, staffing, administration, funding, and social sciences (i.e., interpersonal conflict, conflicting objectives). For an Eel River Restoration Program to be successful in achieving its goals, a substantial and thoughtful effort must be conducted at the beginning of the planning process to develop a program function and funding structure, including developing roles and responsibilities for program participants. This program and funding structure needs to be tailored specifically for the management issues, scale, participants, and other characteristics specific to the Eel River.

3.7.1 Program Management Framework

A management framework will be needed to implement the Restoration Plan, as well as oversee implementation of the individual restoration projects. A specific structure for the program management framework is not recommended here; rather, the need for developing it is highlighted, and some of the key elements that the program management framework that should be considered are described. This management framework will improve the ability of the restoration plan to be implemented consistently, cost effectively, and achieve the intended goals and objectives of the plan.

The scale of the restoration effort often dictates the scale of the restoration program, and the corresponding complexity of the program. A small watershed restoration effort could have a restoration program of one individual person, while a larger watershed restoration effort (e.g., San Joaquin River) may have a staff of 100. Given the scale of the Eel River watershed, it is anticipated that an effective Eel River Restoration Program will require substantial effort (i.e., larger scale), and thus require some careful thought and planning on how to create and manage the program. An effective large scale restoration program needs structure, procedures, qualified staffing, stable budgets, and clear vision for what their mission is to achieve the goals and objectives of the program. Fundamentally, a successful program needs to contain the following attributes:

Governance

- A structured leadership that includes input from scientists and stakeholders;
- A clear, logical, and transparent decision-making process;
- A clear, logical, and transparent funding process;
- Clear mission statement, vision, goals, and objectives that keeps the program focused on priority tasks, and provides sideboards for the scope of what the program does;
- Clear definition of the roles and responsibilities of program participants;
- A checks-and-balances process that includes meaningful stakeholder participation in input and decision-making, as well as periodic independent review/oversight of program activities (science, implementation, and program function); and
- A clearly defined process to refine program function based on learning to allow rapid improvement of the program function and effectiveness.

Science and Planning

- A clear, logical, and transparent process for conducting science that is both backwards looking (monitoring, assessment, learning) and forward looking (strategic planning);
- An efficient process for good science to inform decision-makers, including monitoring, assessment, adaptive management, and strategic planning; and
- Build upon efforts of previous and ongoing restoration organizations (Eel River Forum, SHARP process, Eel River Recovery Program, Eel River Salmon Restoration Project, and others) and recovery plans/strategies (NMFS, CDFW).

Outreach

- Close coordination with resource and regulatory agency specialists on resource management issues and restoration implementation issues;
- Close coordination with tribal resource specialists and tribal councils on resource management issues, restoration implementation issues, and cultural resource issues;
- Outreach and information transfer to stakeholders in the watershed;
- Outreach and information transfer to local, state, and federal legislators; and
- Integration with grassroots-based efforts, and consideration of citizen science programs.

Again, a specific program structure is not recommended here, but instead a process to develop one (i.e., a Program Plan) is recommend. It is recommended that a small panel of program structure experts be convened to develop a structure for the Eel River Restoration Program based on the unique characteristics of the Eel River watershed and the anticipated participants in the Restoration Program. This small panel of experts should include both local representatives as well as outside experts, such that the lessons of other regional restoration programs can be combined with local knowledge to develop a draft program structure that is suited to the management issues, scale, and stakeholders specific to the Eel River watershed. This draft Program Plan should address the bullets above (and others), and be developed in consultation with local resource agencies, tribes, stakeholders, and elected officials. It is also recommended that the draft Program Plan include a review of other similar large-scale restoration programs components for potential application to the Eel River (i.e., what works and doesn't work, and what could work best for the Eel River).

3.7.2 Funding Strategy

Achieving the goals of substantial fishery recovery on the Eel River will require large scale funding due to the large-scale effort and time needed to restore the watershed. The funding strategy should be substantial enough to support both restoration and conservation/preservation efforts in the Eel River. These conservation/preservation efforts could include large scale land purchases or conservation easements to preserve those watersheds that are still highly productive, which is more cost effective than allowing disturbance and then conducting restoration. The scale of restoration funding needed to achieve substantial recovery of the Eel River fishery is anticipated to be in the tens of millions of dollars or more. The funding will also need to be sustainable, without consistent and reliable annual funding, the Restoration Program is unlikely to be successful.

Similar to the Program Plan described in the previous section, the Funding Strategy will need to be developed as part of the next stage of development and is not proposed here in detail. Instead, components of a Funding Strategy are recommended that will need to be developed in parallel with the Program Management Framework described above. Ideally, a single large source of funding would be secured that could serve as an endowment to fund the Eel River Restoration Program over the long term (e.g., state bond, federal appropriation, and/or large settlement agreement that could function like the Headwaters Fund). There may be options for this type of large-scale funding, but in its absence, funding will have to come from a variety of smaller sources (e.g., state and federal restoration grants, tribal grants, state appropriations, private foundations). How the funds are managed by the restoration program will need to be developed in the Program Management Framework (e.g., directed actions, unsolicited proposals, directed proposals, or combination).

Once funding is received for the Restoration Program, it is fundamental to program success that implementation funding focuses on a rigorous, science-based prioritization process for allocating that funding to achieve the most cost-effective fishery recovery and resilience for the Eel River (see Prioritization – Phase 2). Many large-scale restoration programs struggle with becoming entrenched in recurring annual funding allocations and entrenched monitoring programs, and the ability to be flexible and adaptable with funding (science and implementation) with evolving priorities can be impaired. Therefore, the funding allocation process needs to strike a balance between retaining funding flexibility and providing funding consistency to priority projects in a transparent way.

A key part of this funding allocation process will be to develop funding processes that allow: 1) directed implementation and science projects to be conducted that are based on the strategic plan and a logical prioritization process, 2) a Request for Proposals process that focuses on those prioritized projects, and/or 3) a Request for Proposals process that isn't necessarily confined by the prioritized list of implementation and science projects, such that new and innovative ideas can be developed and considered by the program. A funding process should be part of the Program Plan.

Cumulatively, the Program Plan should develop the Program Management Framework, Funding Strategy, and Funding Allocation Process that will implement the Fisheries Restoration and Conservation Plan for the Eel River Watershed, described in the following section.

3.8 Task 8 - Develop Fisheries Restoration and Conservation Plan for The Eel River Watershed

The Fisheries Restoration and Conservation Plan for the Eel River Watershed will be the primary outcome and product of implementing Phase 1. The Fisheries Restoration and Conservation Plan is intended to be a living/working document that will guide future implementation of the plan and be revised/updated as needed to remain current by incorporating new information, novel approaches, and lessons learned. In developing the draft document, each of the Phase 1 elements described above (Sections 3.1–3.7) will be specifically addressed and developed into one or more sections (or chapters) of the plan. In application, each of the Phase 1 elements will be addressed in collaboration with the TWG during a series of workshops (See Section 4 for conceptual schedule). Each workshop will focus on specific Phase 1 elements with the intent of informing drafting each respective section of the Fisheries Restoration and Conservation Plan.

The Stillwater/McBain Team will prepare materials to support TWG workshops and promote productive discussions for developing each plan element and drafting the plan document. The intent of the workshops is to discuss each plan element in sufficient detail to inform drafting the description of the plan section (or chapter). Subsequent to the TWG workshop, the Stillwater/McBain Team will prepare a draft of the plan element(s) based on the direction provided during the workshop. Draft sections of the plan will be distributed to TWG for review.

The supporting elements of the Plan described above will be compiled into a Draft Fisheries Restoration and Conservation Plan document as sections are completed. The draft document will include introduction and background descriptions that provide an overview of the entire plan and describes the document structure and elements. The completed draft Plan will be provided to TWG participants for review prior to broader distribution. Feedback on the draft plan will be incorporated into the final plan document.

3.9 Task 9 - External Coordination and Outreach

Implementing a collaborative process to develop the Fisheries Restoration and Conservation Plan for the Eel River watershed as outlined in this scope of work will require substantial outreach to Eel River stakeholders and coordination among Stillwater/McBain Team members, Partners, Stakeholders, TWG members, and other technical experts. Effective planning and coordinated outreach will be required to keep stakeholders informed, allow input throughout the process, and to provide sufficient time for meeting preparation and follow-up, and review of materials developed during the process.

Two 2-hour stakeholder meetings that include a broad range of participants are proposed for Phase 1, one at the beginning of the process and a second when the draft Restoration and Conservation Plan is complete and available for review. The first stakeholder meeting is intended to provide an overview of the plan components and development process and an opportunity for stakeholders to ask questions and provide input. The second stakeholder meeting is intended to provide stakeholders an overview of the resulting draft Restoration and Conservation Plan, and another opportunity to ask questions and provide input.

To supplement the two broad stakeholder meetings, CalTrout will convene the Eel River Forum (approximately quarterly) to provide progress updates and engage with stakeholders on a regular basis. The Eel River Forum is a coalition of public agencies, Indian tribes, conservation partners, and other stakeholders with interest in or responsibility for the environmental stewardship of the Eel River, with a mission to coordinate and integrate conservation and recovery efforts in the Eel

River watershed to conserve its ecological resilience, restore its native fish populations, and protect other watershed beneficial uses. The Stillwater/McBain Team will assist CalTrout with coordinating the Eel River Forum meetings during Phase 1 implementation.

3.10 Task 10 - Internal Coordination and Project Management

This task is intended to keep Phase 1 implementation moving forward on schedule and within budget through internal Team coordination, scheduling and logistics support, and project billing.

3.11 Schedule and Estimated Cost

3.11.1 Schedule

The conceptual schedule presented in Figure 2 provides a schematic overview of how Phase 1 is generally proposed to be implemented. This draft schedule will be reviewed and revised in collaboration with the TWG during the first technical workshop (Define Program Goals and Objectives). The intent of the conceptual schedule is to provide an overview of the Phase 1 implementation process, potential topic groupings for technical workshops, and an approximate timeline. In addition, the conceptual schedule informed developing estimated cost for each task (Section 3.9.2). The frequency of technical workshops was assumed to be about one workshop every 2.5 months to allow time for preparing workshop materials, convening the workshop, follow-up from the workshop to draft sections of the Restoration and Conservation Plan, and to not overburden the schedules of TWG participants. The conceptual schedule indicates that Phase 1 implementation and development of the Fisheries Restoration and Conservation Plan will likely require 2–3 years to complete.

Key elements of the conceptual schedule include:

- Two stakeholder meetings – one early in the process and one when a draft Fisheries Restoration and Conservation Plan is available for review;
- Seven technical workshops – each focusing on specific technical topics identified as components of the Restoration Program;
- Six Eel River Forum meetings – convened to provide approximately quarterly progress updates; and
- Draft and final Fisheries Restoration and Conservation Plan, which is the primary product of Phase 1.

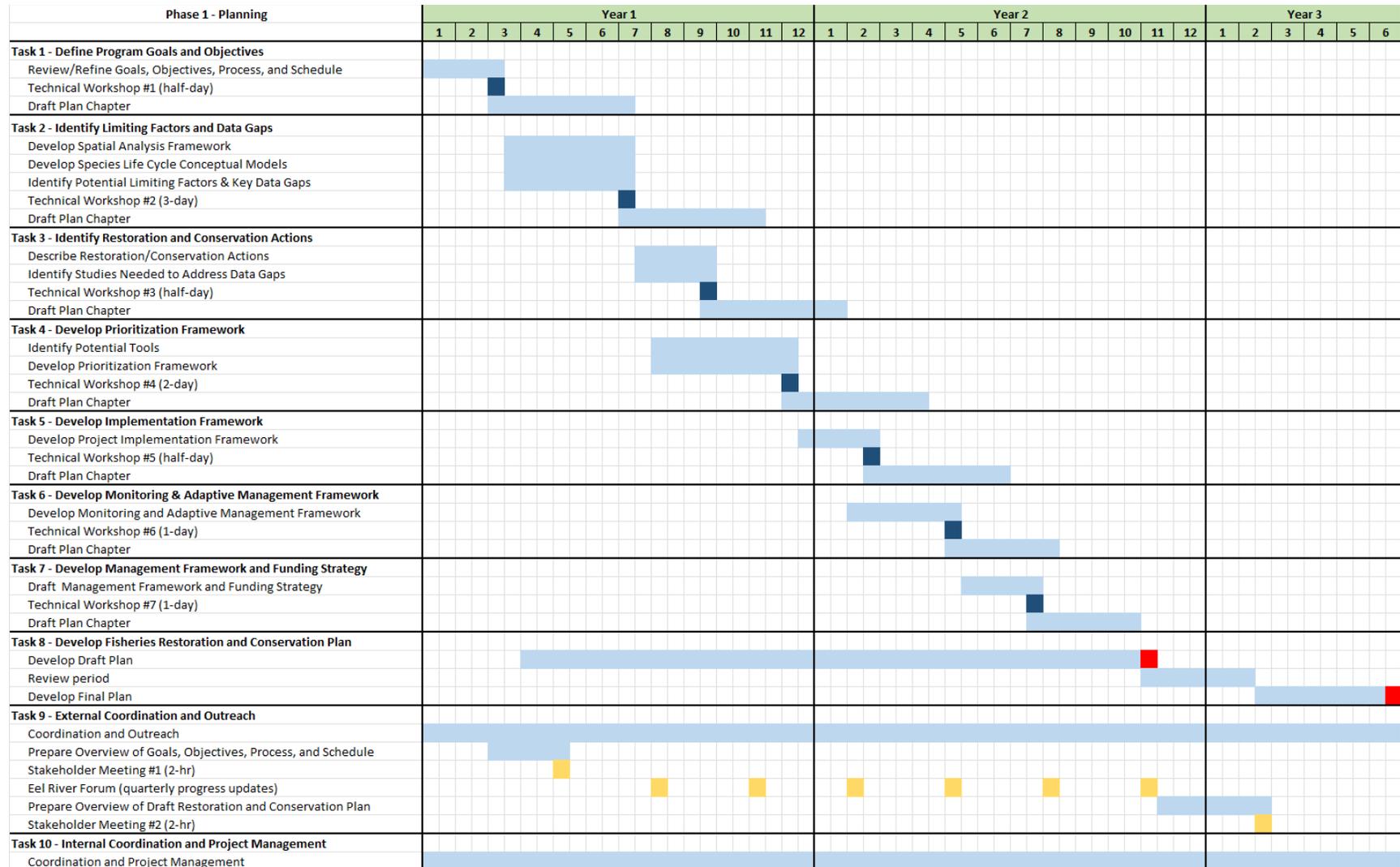


Figure 2. Conceptual schedule for Phase 1 implementation.

3.11.2 Estimated Cost

The estimated cost for Phase 1 implementation (Table 2) is based on the process outlined above in Sections 3.1–3.8 and the conceptual schedule (Figure 2).

Table 2. Estimated cost for Phase 1 implementation.

Task #	Task Description	Year 1	Year 2	Year 3	Total
1	Define Program Goals and Objectives	\$ 27,000			\$ 27,000
2	Identify Limiting Factors and Data Gaps	\$119,000			\$119,000
3	Identify Restoration and Conservation Actions	\$ 46,000			\$ 46,000
4	Develop Prioritization Framework	\$ 51,000	\$ 22,000		\$ 73,000
5	Develop Implementation Framework for Priority Actions	\$ 12,000	\$ 30,000		\$ 42,000
6	Develop Monitoring & Adaptive Management Framework		\$ 59,000		\$ 59,000
7	Develop Management Framework and Funding Strategy		\$ 30,000		\$ 30,000
8	Develop Fisheries Restoration and Conservation Plan	\$ 12,000	\$ 53,000	\$ 29,000	\$ 94,000
9	External Coordination and Outreach	\$ 67,000	\$ 66,000	\$ 46,000	\$179,000
10	Internal Coordination and Project Management	\$ 42,000	\$ 37,000	\$ 14,000	\$ 93,000
	Total	\$376,000	\$297,000	\$89,000	\$762,000

Cost assumptions:

- Phase 1 implementation and development of the Fisheries Restoration and Conservation Plan is completed in 2.5 years (i.e., 30 months) (Figure 2).
- Two 2-hr stakeholder meetings, seven technical workshops (three half-day, two 1-day, one 2-day, and one 3-day), and six 4-hour Eel River Forum meetings.
- Stakeholder meetings and Technical Workshops will be held in-person at a range of locations. Estimated cost for attending meetings and workshops assumes meetings occur on a rotating basis in the following locations: Fortuna, Benbow, and Willits.
- Draft Fisheries Restoration and Conservation Plan will receive one-round of stakeholder review and comment. Comments received will be addressed to the extent practicable and appropriate in the final Fisheries Restoration and Conservation Plan.

4 REFERENCES

- Bradbury, B., W. Nehlsen, T. E. Nickelson, K. M. S. Moore, R. M. Hughes, D. Heller, J. Nicholas, D. L. Bottom, W. E. Weaver, R. L. Beschta. 1995. Handbook for prioritizing watershed protection and restoration to aid recovery of native salmon. Pacific Rivers Council. Portland, OR.
- Beechie, T., G. Pess, P. Roni, G. Giannico. 2008. Setting river restoration priorities: a review of approaches and general protocol for identifying and prioritizing actions. *North American Journal of Fisheries Management* 28: 891–905.
- CDFW (California Department of Fish and Wildlife). 2014. South Fork Eel River Watershed Assessment. Coastal Watershed Planning and Assessment Program. Fortuna, CA.
- Cooper, E. J., A. P. O’Dowd, J. J. Graham, D. W. Mierau, W. J. Trush, R. Taylor. 2020. Salmonid habitat and population capacity estimates for Steelhead trout and Chinook salmon upstream of Scott Dam in the Eel River, California. *California Northwest Science* 94(1): 70–96.
- Eel River Forum. 2016. The Eel River Action Plan: A Compilation of Information and Recommended Actions.
- ESSA. 2019. Klamath Basin Integrated Fisheries Restoration and Monitoring Plan (IFRMP): Phase 2 Draft. 167 pp.
- FitzGerald, A., D. Boughton, J. Fuller, S. John, B. Martin, L. Harrison, N. Mantua. 2020. Thermal and habitat suitability for anadromous salmonids in the dammed and inaccessible Upper Mainstem Eel River sub-basin in the Eel River watershed, California, Fisheries Ecology Division, Southwest Fisheries Science Center, National Marine Fisheries Service, Santa Cruz, CA.
- NMFS (National Marine Fisheries Service). 2014. Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NMFS, Arcata, California.
- NMFS. 2016. Coastal Multispecies Recovery Plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California.
- McBain Associates 2017. Eel River Fishery Restoration Strategy. Prepared by McBain Associates for Round Valley Indian Tribes.
- Roni, P., T. Beechie, S. Schmutz, and S. Muhar. 2013. Prioritization of watersheds and restoration projects. Pages 189–214 *in* P. Roni and T. Beechie, editors. *Stream and watershed restoration: a guide to restoring riverine processes and habitats*. Wiley-Blackwell, Chichester, UK.
- Reiman B. E., C. L. Smith, R. J. Naiman, G. T. Ruggerone, C. C. Wood, N. Huntly, E. N. Merrill, J. R. Alldredge, P. A. Bisson, J. Congleton, K. D. Fausch, C. Levings, W. Pearcy, D. Scarnecchia, and P. Smouse. 2015. A Comprehensive Approach for Habitat Restoration in the Columbia Basin. *Fisheries* 40(3): 124-135.

- Stillwater Sciences. 2014. A conceptual framework for understanding factors limiting Pacific lamprey production in the Eel River basin. Prepared by Stillwater Sciences, Arcata, California for Wiyot Tribe, Loleta, California.
- Stillwater Sciences and Wiyot Tribe Natural Resources Department. 2017. Status, distribution, and population of origin of green sturgeon in the Eel River: results of 2014–2016 studies. Prepared by Stillwater Sciences, Arcata, California and Wiyot Tribe, Natural Resources Department, Loleta, California, for National Oceanic and Atmospheric Administration, Fisheries Species Recovery Grants to Tribes, Silver Springs, Maryland.
- South Fork Eel River SHaRP Collaborative. 2021. SHaRP Plan for the South Fork Eel River. 274 pages.
- White S. M., S. Brandy, C. Justice, K. A. Morinaga, L. Naylor, J. Ruzycski, E. R. Sedell, J. Steele, A. Towne, J. G. Webster, and I. Wilson. 2021. Progress Towards a Comprehensive Approach for Habitat Restoration in the Columbia Basin: Case Study in the Grande Ronde River. *Fisheries* 46(5): 229–243.
- Wiyot Tribe Natural Resources Department and Stillwater Sciences. 2016. Wiyot Tribe Pacific Lamprey adaptive management plan framework. Prepared by Wiyot Tribe Natural Resources Department, Table Bluff Reservation, Loleta, California and Stillwater Sciences, Arcata, California for U.S. Fish and Wildlife Service, Sacramento, California.