

# Navarro River Instream Flow Study Plan Development Project Description

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**November 2017**

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## 1. BACKGROUND AND REASONS FOR STUDY

Land use practices including timber management and diversion of surface and ground waters for agricultural and other consumptive uses have been, and continue to be, important economically and socially to the communities living and working in the Navarro River basin. These activities have not gone on without impacting aquatic ecosystems within the watershed, however. In particular, reductions in stream flow, loss of riparian shading, and increases in fine sediment loading have been specific outcomes of land use that have adversely affected habitat for native fish species, including salmonids listed under the Endangered Species Act (ESA) and various California Fish Species of Special Concern. These impacts led to the listing of the Navarro River basin on the Clean Water Act 303(d) list of impaired water bodies for sediment and temperature impairments, and subsequent establishment of the Navarro River Total Maximum Daily Loads for Temperature and Sediment (Navarro TMDL) by the US Environmental Protection Agency in 2000. Temperature impacts in particular have been ranked by the North Coast Regional Water Quality Control Board (Regional Water Board) as a high priority for improvement since 2001 (Regional Water Board Resolution No. R1-2012-0013).

In 2015, the Regional Water Board approved an amendment to the Water Quality Control Plan for the North Coast Region (Basin Plan) that (i) established a regional Policy for the Implementation of the Water Quality Objectives for Temperature, and (ii) defined the Action Plan to Address Elevated Water Temperature in the Navarro River Watershed (Action Plan; Regional Water Board Resolution No. 2015-0020). The Action Plan identifies and directs the Water Boards to implement specific measures that contribute toward achieving the established TMDL allocations in the Navarro River basin (Regional Water Board Resolution No. R1-2014-0006 Attachment 3), including:

- Working with other agencies and non-governmental organizations to support instream flow studies to:
  1. Quantify flows necessary for beneficial use support,
  2. Quantify flow impacts to assist outreach and education efforts, or
  3. Identify opportunities to increase summer low flows;
- Coordinate with the California Department of Fish and Wildlife on the development, methodologies, and any criteria relevant to instream flow studies; and
- Consider all sources of water, including headwaters, groundwater, and waters flowing in subterranean streams.

These measures were evaluated and recommended as part of the 2014 Triennial Review of the Water Quality Control Plan for the North Coast Region (Regional Water Board Resolution No. R1-2015-0012). As part of the review process, the Navarro River basin was identified by Regional Water Board Staff and the Board as a High Priority Basin Plan Amendment Project location to identify instream flow needs at the basin scale (Regional Water Board 2014). In the same action, the Regional Water Board directed its staff to evaluate other rivers as candidates for future flow criteria development, as warranted (Regional Water Board 2015).

As part of Resolution No. 2015-0020, the Regional Water Board accordingly approved developing instream flow criteria<sup>1</sup> and narrative objectives for the Navarro River. To meet the directive, staff are proceeding with defining criteria in a two-phased study. The Policy for Maintaining Instream Flows in Northern California Coastal Streams that was enacted in February 2014 concerns new water right applications only and does not address existing legal water rights and instream flow needs (IFN) during low flow periods, and thus cannot satisfy the Action Plan directives solely.

The first phase, which comprises this project, is to develop a study plan for defining IFN criteria throughout the year in the Navarro River basin that can be incorporated into the Basin Plan. The study plan is to focus on evaluating and selecting implementation methodologies and procedures that (1) lead to defining the objectives and associated numeric criteria defining adequate fish habitat conditions, (2) are scientifically defensible, and (3) reflect stakeholder input. Part of the study plan will be to describe a methodology for assessing surface water hydrology, which is important for assessing the feasibility of meeting IFN. In a broader context, the study plan developed for the Navarro River basin is intended to be a test case, where the methods used in the Project may be considered for implementation in other basins.

The Regional Water Board also intends that the study plan will meet California Department of Fish and Wildlife (CDFW) needs. CDFW is mandated to identify streamflow criteria to protect all lifestages of fish and wildlife, and the habitats that they depend upon. In addition to identifying streamflow criteria providing sufficient habitat space for fish in streams with flows impaired by out-of-stream uses within the watershed, both the Regional Water Board and CDFW seek to develop numeric low-flow criteria for water temperature and dissolved oxygen (DO) because these parameters determine the suitability of that habitat space. Consistent with its own

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<sup>1</sup> The distinction is made between a narrative objective, which is a non-numeric, qualitative guideline that describes a desired water quality goal, and a numeric criterion that sets a measurable minimum or maximum level for a water quality or flow parameter.

instream flow program under the California Water Action Plan, Public Resources Code (§10000-10005), and Fish & Game Code §5937, CDFW desires a study plan that is based on defensible science and adheres to accepted guidelines involving appropriate, representative, and repeatable habitat modeling methods.

The second phase will involve implementing the study plan to develop the numeric criteria for instream flows. The results of the second phase will be instrumental in implementing another directive in the Action Plan to support third-party efforts to address temperature related concerns, including:

- Education of water users on the importance of water conservation efforts;
- Education of water users on water conservation practices and opportunities;
- Assistance for water users in the implementation of water conservation practices;
- Restoration of riparian vegetation; and
- Other efforts that address water temperature-related concerns.

The reason for proceeding with the project in two phases is that the Regional Water Board wants to ensure the study results are as representative as possible of beneficial use needs related to instream flows throughout the basin. Developing a study plan in consultation with stakeholders, at a well thought out and modulated pace, gives highest confidence that the study results will be meaningful and appropriate.

The project will address uncertainties in a way that improves knowledge of what the IFN are for fish in the Navarro River basin. This knowledge is critical for balancing multiple beneficial uses in the context of water availability, and identifying effective means for conserving water and restoring riparian zones. An overall goal is to obtain information that will facilitate effective future actions addressing low flow impacts to water quality, ecological sustainability of the watershed, and beneficial uses. The study will accordingly be implemented under the Regional Water Board's Basin Plan authority; any resulting regulatory actions would be administered later via the State Water Resource Control Board's Division of Water Rights.

This document provides an executive summary overview of the study plan development. The remainder is organized into two parts: Overview of Study Plan Formulation, and Assessment of Stakeholder Goals and Constraints.

## **2. OVERVIEW OF STUDY PLAN FORMULATION**

The study plan development phase consists of 7 tasks:

1. Development of Project Description
2. Navarro River Watershed Study Reach Designation
3. Development of Hydrologic Analysis Study Plan Component
4. Development of Habitat Analysis Study Plan Component
5. Development of Habitat Suitability Criteria Study Plan Component
6. Development of Hydraulic-Habitat Modeling Study Plan Component
7. Final Combined Report & Draft Study Plan Updates/Reconciliation

In each of the first six Tasks, an outline document will be prepared that lays out a proposed table of contents, the questions being addressed, and the general approach(es) under consideration, followed by a draft report that provides the resulting details for the respective study plan component. The seventh, final task is to bring all of the preceding task work products together into a final comprehensive study plan document. Each task is described in detail below.

The tasks were conceived to identify instream flow needs in a way that factors in the interconnected relationship between instream flows providing fish habitat space, and the extent to which water quality (i) influences the availability of that habitat and (ii) affects individual fish and population health. The cost to implement each study plan component will also be estimated, to ensure feasibility. In developing the study plan components, it is recognized as a governing principle that it will not be feasible to restore fish habitat back to pre-development conditions. Instead, the aim is to develop feasible study plan components that will facilitate identification of where and how currently degraded instream habitat conditions can be improved so that healthy fish populations can coexist in the future with land use in the Navarro River basin.

A consultant team has been contracted by the Regional Water Board to perform the study plan development phase of the Project, consisting of R2 Resource Consultants, Inc. (R2) as the lead. R2 is a respected west coast fisheries and water resources engineering firm. Three subcontractors will support R2: (i) Kearns & West will provide facilitation services; (ii) Paradigm Environmental, Inc. (Paradigm) will provide hydrologic assessment and modeling services and technical support on other tasks; and (iii) Stillwater Sciences (Stillwater) will provide habitat analysis services and technical support on other tasks. All four firms have extensive experience working in the region and have staff familiar with the Navarro River basin.

## 2.1 EXPECTED APPROACH

The steps that will comprise the overall study plan to be implemented in Phase 2 are presently expected to include:

- Identify representative and/or ecologically/economically/sociologically important study sub-basins;
- Compile hydrology data in study sub-basins and develop hydrologic models of each study sub-basin;
- Compile temperature and dissolved oxygen data, and further develop water quality models of each study sub-basin that are linked to the hydrology model(s);
- Compile, develop (as needed), and select appropriate biological habitat suitability criteria for use in hydraulic-habitat modeling;
- Perform analysis of flow availability as it influences habitat availability and quality, including:
  - Identify Points of Interest (POIs) in each study sub-basin defined as locations in a stream where the instream flow needs are evaluated;
  - Generate simulated unimpaired and impaired flow time series at POIs;
  - Collect physical habitat, hydraulic and water quality data at POIs at different flow levels, including when stream disconnectivity occurs;
  - Develop physical habitat-flow relationships at each POI, and evaluate and compare unimpaired and impaired passage, spawning, incubation, and juvenile habitat; and
  - Develop temperature-dissolved oxygen vs. flow relations at each POI, and evaluate and compare chronic and acute conditions.
- In addition, to the extent feasible, evaluate and compare unimpaired and impaired natural flow variability at POIs in relation to channel and riparian maintenance needs following North Coast Instream Flow Policy methodology.

To meet the overall Project objective of obtaining meaningful and appropriate results, the development of study plans depends inherently on interaction with regulatory, scientific, and community stakeholders. Two types of meetings have been planned for this project, in which different levels of stakeholder input will help define and refine study plan development. The attendees and purpose of these two types of meetings are as follows:

- Joint Agency Stakeholder (JAS) Meeting – Attended by the R2 Team, the Regional Water Board, and all stakeholders including local agencies, NGOs, and citizens. The

purpose is to provide an update of project status, and review project work products in outline and draft Study Plan stages as they become available.

- Technical Working Group (TWG) Meeting – Attended by the R2 Team, Regional Water Board staff, CDFW, and potentially any other specified technical specialists from agencies (e.g., NOAA Fisheries) and stakeholder groups. The purpose is to address specific technical habitat modeling details; the results will be presented at the subsequent JAS meeting.

The purpose of reviewing task deliverable outlines first is to ensure we are moving in the right direction and that we have identified relevant goals and constraints. The purpose of reviewing the subsequent task deliverable draft reports is to identify any missing or incomplete information that stakeholders believe should be in the Final Combined Report. Stakeholders will be given sufficient time to review report sections and Study Plans and provide comment; the length of time for comment will be defined in consultation with the Water Boards, and is expected to be at least one month for each round of review.

An overview is provided below of Project task goals and expected work products.

## **2.2 TASK 1 – DEVELOPMENT OF PROJECT DESCRIPTION**

This document is the product of Task 1. The text will be integrated into the Final Report Executive Summary, Introduction, and other sections.

## **2.3 TASK 2 – NAVARRO RIVER WATERSHED STUDY REACH DESIGNATION**

Task 2 will consist of defining study reaches of the Navarro River and its major tributaries that will be used as the basis of sampling, extending results to other locations, and reporting in other Study Plans. The goal is to choose study reaches that are representative of the Navarro basin with regard to basin geomorphology, hydrology, and fisheries habitat, are accessible, and are acceptable to stakeholders. There are three main steps in this task: (1) literature review, (2) identification of candidate study reaches, and (3) selection of study reaches.

The literature review step will include compilation of existing published studies and information on hydrology and Geographic Information Systems (GIS) coverages of watershed characteristics, fish distribution, and impairment, in conjunction with Task 4. This initial effort will consist of a targeted web-based search which will include a review and compilation of historical streamflow records, hydrography (i.e., basin delineations and identification of hydrologic nodes), water usage (i.e., water rights data, water use analyses, large diversions or water projects, etc.), passage barriers, GIS channel gradient, geomorphology (e.g., channel typing and order), fish distribution,

and impaired water bodies as defined by the Clean Water Act 303d list. Potential sources for these types of information include the United States Geological Survey (USGS), NMFS, USFWS, the Water Boards, California Cooperative Anadromous Fish and Habitat Data Program (CalFish), and the Navarro River Watershed Plan for Streamflow Optimization and Enhancement (Mendocino County Resource Conservation District/The Nature Conservancy/Trout Unlimited), among others. In addition, the Navarro Watershed Restoration Plan (Entrix et al. 1998) provides a comprehensive accounting of important tributaries and mainstem reaches. This information will be used as the basis for a report outline that will be shared and discussed in a JAS Meeting. Access will be a key topic for discussion during this meeting, as it will likely be a limiting factor in reach selection.

A candidate list of study reaches will be developed, drawing heavily on input from the JAS Meeting and associated stakeholder outreach. Candidate study reaches will be established based on access and evaluation of physical characteristics that relate to salmonid habitats and life stage specific instream flow needs (e.g., spawning, rearing, migration), such as gradient, confinement, geologic setting, vegetation, and other attributes. As a first cut, fisheries management objectives will certainly factor into study reach selection. For example, the North Fork Navarro River in particular is a CDFW priority watershed stronghold for Coho salmon, and thus it is highly likely that reaches within this sub-basin will be identified for inclusion in the study.

In addition, limited access to field sites along the Navarro River and its tributaries due to extensive private landownership could also influence the analysis methods that will be selected.

## **2.4 TASK 3 – DEVELOPMENT OF HYDROLOGIC ANALYSIS STUDY PLAN**

This task will involve (i) a comprehensive compilation and analysis of GIS and hydrologic data available for the watershed, and (ii) development of a hydrologic analysis approach for estimating unimpaired and managed flows, quantifying groundwater contributions, and assessing subterranean processes. This information will be important for several reasons:

1. To identify which streams provide perennial vs. ephemeral habitat;
2. To develop as accurate an assessment as is feasible of the amount of stream flow available for all beneficial uses; and
3. To serve as input to habitat-flow modeling (see Task 6), the output of which will be assessed both biologically and hydrologically meaningful instream flow needs.

Selection of hydrologic analysis approach will be dependent upon the available data that may be used, whether it will be for model configuration and calibration/validation, or simpler statistical

approaches. As a result, a thorough assessment of flow gage data and well logs will be performed to determine if a non-modeled approach is sufficient for hydrologic analysis, and if not, the appropriate modeling approach needed to perform the necessary analysis. The method for hydrologic analysis for the Navarro River Watershed will need to provide the ability to estimate average daily (or hourly) flows at specific POIs for both natural and impaired conditions. Following the same principles used to develop the North Coast Instream Flow Policy for newly permitted diversion applications, POIs are specific locations within tributaries and mainstem river segments where hydrologic flow parameters and instream flow rates are evaluated. Their locations may be in the vicinity of critically important fish habitats, such as key spawning grounds, upstream passage restrictions, and/or juvenile rearing refuge reaches, or they may be selected at readily accessible locations to represent longer reaches extending upstream and downstream between significant tributary confluences.

This task will be constrained by a relatively limited amount of publicly available gaged flow data in Navarro River tributaries, uncertainty regarding the influence of groundwater use on surface flows, uncertainty associated with the extent of hyporheic flow inputs through subterranean flow paths including in areas that remain aggraded from historic land use impacts (e.g., Entrix et al. 1998), and access for collecting new data. To the extent possible, proprietary data sharing efforts will be established with local agencies and permittees to increase the flow data set available and reduce data gaps. Where proprietary or other economic sensitivity concerns exist, the Regional Water Board has confirmed that such data transmitted to the R2 team would not be subject to discovery by or sharing with the Regional Water Board and other parties.

## **2.5 TASK 4 – DEVELOPMENT OF HABITAT ANALYSIS STUDY PLAN**

In support of Task 2 efforts to identify candidate study reaches, a special effort will be undertaken to define general distributions of important fish species and their habitat where beneficial use instream flow needs should be considered. In this first phase of the Project, an approach will be developed for mapping general fish habitat distributions throughout the Navarro River basin, to a level where concentrations of more important habitat types can be discerned.

The study plan will involve two parts: (1) salmonid habitat distribution analysis, and (2) stream habitat spatial database. The salmonid habitat distribution analysis will be used to help define the spatial extent of the channel network to be considered for the instream flow study, and will include methods to identify the upstream limit to anadromy (i.e., historically accessible salmon and steelhead habitat). Additionally, a preliminary delineation will be prepared of potential fish distribution within the Navarro River Watershed to inform development of the Study Plan. The stream habitat spatial database component of the Study Plan will describe: (1) mesohabitat (e.g.,

pool, riffle, run) characterization for fish bearing streams within the Navarro River basin, and (2) development of a spatial database to document the frequency and spatial distribution of mesohabitats throughout the watershed. The Study Plan will describe the mesohabitat characterization approach including specific habitat type definitions that will be used.

For efficiency, this task will be completed simultaneous with the Study Reach Designation Task (Task 2), prior to completion of the Hydrology Study Plan Development (Task 3), where the results will be used to help define Points of Interest (POIs) and better inform the selection of appropriate and feasible data and methods.

## **2.6 TASK 5 – DEVELOPMENT OF HABITAT SUITABILITY CRITERIA STUDY PLAN**

Habitat Suitability Criteria (HSC) are one of the drivers of instream flow studies that essentially integrate various biologically relevant/flow sensitive parameters into a modeling framework. Criteria can be developed specific to a wide variety of flow-related habitat characteristics for one or more species and life stages, including physical habitat availability, cover, food sources, habitat connectivity, habitat creation and maintenance processes, and water quality. The criteria represent various biological and physical habitat needs, and are compared against measurements, estimates, or predictions of physical characteristics such as stream flow, water temperature, and dissolved oxygen levels in the case of the Navarro River basin. The criteria can be developed for specific target species and life stages, or for broader collective groups (or, ‘guilds’) of species and/or life stages with generally similar habitat requirements.

In this study, the Regional Water Board’s primary goal is to identify HSC that can be used to define minimum instream flow needs that are protective and allow for salmonids in the basin fish to grow and thrive in the presence of diversions. Where possible, other fish and amphibious species instream flow needs may also be considered as the data allow. The Regional Water Board has accordingly identified three levels of criteria defining suitability of instream flows according to level of effect on the continued viability (in the sense of PRC 10000-10005) of salmonid populations:

- Flow Criterion 1: Identification of the lowest stream flows at which water diversion will not have an appreciable, measurable effect on the migration, spawning, and abundance and growth of juvenile salmonids (i.e., minimum instream flow levels needed to sustain healthy populations and allow population persistence).
- Flow Criterion 2: Identification of sub-optimal flow condition thresholds that are stressful and likely result in poor growth and success of juvenile salmonids as a result of

degraded dissolved oxygen and temperature conditions, higher risk of disease, greater risk of predation, shrinking habitat area, and heightened competition for limited food (i.e., instream flow levels that are associated with chronic conditions adversely affecting salmonid population biology but that may still allow population persistence).

- Flow Criterion 3: Identification of a streamflow at which juvenile salmonids are at risk of mortality due to stream disconnectivity (isolated pools with no surface flow over riffles), and the associated lack of benthic food productivity and drift, increased predation and (potentially) elevated water temperatures (i.e., instream flow levels that prevent the persistence of salmonid populations).

The three levels reflect concepts in establishing water quality criteria, where reductions in instream flow levels lead to progressive degradation of habitat quantity and quality, ranging from conditions where populations are generally not adversely affected, to chronic conditions stressing populations, to acute conditions adversely affecting survival and population persistence.

This task will develop a scientifically defensible, cost-effective and transparent approach to determine these three flow criteria objectives as they apply to fish native to the Navarro River Watershed.

Substantial input under this task is expected from CDFW and other natural resource agencies with technical expertise in evaluating instream flow needs, although other stakeholders will be given an opportunity to comment on and potentially contribute to the development of the study methodology.

## **2.7 TASK 6 – DEVELOPMENT OF HYDRAULIC-HABITAT MODELING STUDY PLAN**

Development of hydraulic-habitat models is the final analysis step for identifying instream flow needs. This task involves developing a Study Plan for modeling fish habitat suitability at specific locations within the Navarro River and its tributaries. The study plan is intended to identify instream flow rates that are protective of anadromous salmonids and their habitat at three levels of impact avoidance within the Navarro River Watershed, to the extent that impact is influenced by flow rate. These three levels are reflected in the definition of the three respective flow criteria identified above under Task 5. Correspondingly, this task will be closely linked with the identification of Habitat Suitability Criteria in Task 5, and will be performed concurrently. The nature and values of the criteria that comprise the deliverable for Task 5 will be influenced directly by the selection of hydraulic and habitat modeling approach. The review process will occur in conjunction with Task 5.

To the extent feasible, development of the Hydraulic-Habitat Modeling Study Plan will entail identifying quantitative computer models that simulate fish habitat attributes controlled by instream flow rate, such as physical habitat space, upstream fish passage conditions, and water quality parameters (namely, temperature and dissolved oxygen), for different fish species and life stages. The selected models will be established using reliable software that is available commercially and in the public domain. The Study Plan will lay out how each habitat suitability criterion will be evaluated for magnitude, frequency, and duration of exceedances by comparing flow and water quality time series against habitat-flow relationships developed for each life stage/habitat attribute, and how to interpret the results to infer impacts and population viability under current flow regime. For example, development and evaluation of the protectiveness of the North Coast Instream Flow Policy relied on identifying the number of days that upstream passage opportunities and spawning and incubation habitat were available under a given flow regime, and identified cases where a 10 percent reduction in the number of days constituted a potential impact to anadromous salmonid population viability. A similar approach may be part of the Navarro River Hydraulic Habitat Modeling Study Plan.

## **2.8 TASK 7 – FINAL COMBINED REPORT & DRAFT STUDY PLAN UPDATES / RECONCILIATION**

A final external JAS Meeting will be held to present each individual draft Study Plan. This meeting will be used to solicit a final round of stakeholder input and provide recommendations on Study Plan finalization to the project team. Since all of the task deliverables are interrelated elements of an approach to define instream flow needs for the Navarro River basin, the respective task study plan documents will be combined into a single, Final Combined Report. This report will be the basis to implement the study in Phase 2 of the project.

## **3. ASSESSMENT OF STAKEHOLDER GOALS AND CONSTRAINTS**

Beneficial uses in the Navarro River basin have been subject to an imbalance between water availability and needs for a long time. Consumptive, out-of-stream beneficial uses influence the amount of water available for meeting instream beneficial use needs such as fish habitat, TMDLs and other water quality criteria. Existing permitted water right diversion rates cumulatively exceed the amount of water available during low flow months (McGourty et al. 2013). Accordingly, there has been a history of conflicting competing uses, including litigation regarding the State of California fulfilling its public trust responsibilities on behalf of salmonid and other aquatic species. The Regional Water Board desires to move forward in a way that minimizes the potential for such conflict and finds an appropriate balance between competing beneficial uses.

The various stakeholder concerns and constraints at the outset of the study planning process will accordingly be important for contributing to the long-term success of the Regional Water Board's efforts. To assist in this identification, Kearns & West conducted a stakeholder assessment, consisting of 16 interviews to date with key individuals including private landowners, farm service organizations, non-governmental organizations, and local, state, and federal agencies. Interview results were aggregated into the list of findings below, and used to develop recommendations for future stakeholder engagement.

### **3.1 FINDINGS**

- Interview participants had three primary roles regarding protecting flows: regulatory managers, permit holders with existing water rights, or project/study proponents to improve flow conditions. Nearly all interviewees had participated directly in one or more previous studies regarding fish habitat improvement, temperature issues, or flow management.
- Participants universally agreed that the most important areas for fish flows include the North Fork of the Navarro, Mill Creek, and Indian Creek. One participant noted that steelhead have been observed throughout the entire system historically.
- All participants stressed the importance of coordinating this effort with other studies in the Navarro Basin to eliminate overlap and minimize requests to private landowners for monitoring access.
- Participants also expressed a number of specific considerations for the study:
  - A belief exists that legal water rights holders are often penalized by new regulatory efforts; unpermitted marijuana grows often go unregulated;
  - Landowners want assurances that the actions taken by the Regional Water Board will improve flows; the Board should be realistic about what can/can't be done in the Basin regarding flows;
  - Some properties may be subject to overlapping requirements from different Regional Water Board programs (vineyard/timber/other); and
  - Consider the impacts of non-agricultural issues and evapotranspiration from increased tree growth on flows in the historically logged area.

### **3.2 RECOMMENDATIONS**

Based on these findings, Kearns & West provided the following stakeholder recommendations to the Regional Water Board:

- Engage stakeholder early and inform them of study developments throughout the process, but limit in-person engagement when possible to reduce "meeting fatigue";

- Consider developing a newsletter (print *and* electronic), summarizing all regulatory and technical studies in the Basin;
- Establish a coordinating body to share findings between existing studies and projects;
- Hold/rotate meetings throughout the Navarro Basin (e.g., Boonville, Philo, Navarro);
- Hold landowner-specific meeting before in-stream monitoring begins;
- Consider establishing a formal peer review process for the study;
- Avoid any pre-existing assumptions: e.g., many tributaries of the Navarro are ephemeral and don't support fish year round; and
- The Navarro River is a unique, undammed watershed- ensure assumptions from other rivers are applicable.

These findings will be considered during the development of the study plan.

#### 4. REFERENCES

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