**Department of Fish and Wildlife**

**Instream Flow Program**



**Instream Flow Study Plan**

**Originated by:**

[Organization]

[Address]

[Month xx, 201X]

# 

**Executive Summary**

Please provide a brief statement summarizing the reason for conducting the study and the projected outcomes.

**Table of Contents**

This element assists the study reader in navigating the document’s text, graphics, appendices, and addenda. Documents created in Microsoft Word may adopt the table of contents that is automatically generated by the software. Regardless of how the table of contents is created, it should include:

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**1. Background**

**1.1 Project Overview**

This section gives the project context; it should highlight why the project is needed, define the specific problem to be solved, describe decisions, and/or define the outcome to be achieved. It should summarize any background information leading to the project. This may include:

* Evolution of the project (i.e., why is it being performed and what are the critical issue(s) to be addressed)
* How the project became a priority not Public Resources Codes, but to California Department of Fish and Wildlife (CDFW) Instream Flow Program, e.g., ongoing fish rescues required and recent restoration funding available, but flow determination required first)
* Identifying and analyzing previous *related* studies, if any. (This should be a literature review discussing studies that lead us to our current knowledge base)
* Identifying similar or complimentary projects in the same watershed, if any. (This section should be a literature review of similar methods, watersheds, analysis; it should give context and support to the study design)

**1.2 Watershed Description**

This section describes the watershed (e.g., location, size, elevation, etc) to be studied. It should provide an overview of the watershed and its resources, and provide a basic description. A more detailed site description can be addressed in a later section of the document. Please include:

* Detailed map of the watershed
* History of the study area
* Description of the general setting and/or stream (e.g., physical, biological, climatic)
* Past and present land use and development

**1.3 General Approach**

This section includes a description of the conceptual approach to the study (both methods and modeling). It also discusses any uncertainties with the method, sampling protocol, contract, etc.

**2. Project Organization**

**2.1 Project Personnel**

This section identifies key individuals involved in all aspects of the study and its associated organizations. It also identifies the lines of authority and reporting between these individuals and organizations. While personnel involvement varies among studies, coverage may be given to:

* Program management
* Program quality assurance (QA) staff
* CDFW technical staff
* Grant program staff
* Field staff

Each party’s contact information may also be included such as:

* Title
* Organization
* Address
* Phone number
* Email address

Table X: Involved Parties

|  |  |
| --- | --- |
| **Program Organization** | |
| **Contact Information** | **Organization’s Mailing Address** |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| **Project Organization** | |
| **Contact Information** | **Organization’s Mailing Address** |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| **Group/Organization** | |
| **Contact Information** | **Organization’s Mailing Address** |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| **Contractors** | |
| **Contact Information** | **Organization’s Mailing Address** |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

|  |  |
| --- | --- |
| Contact: [Insert] | [Organization] |
| Position: [Insert] | [Branch] |
| Phone: [Insert] | [Street Address] |
| Email: [Insert] | [City, State, Zip Code] |

**2.2 Roles and Responsibilities**

This section addresses the roles and responsibilities of the personnel previously identified. An organizational chart is often used as a part of this section. The organizational chart should show the relationships and lines of communication among all study personnel.

**Table X: Organizational Chart**



**3. Project Task Description**

**3.1 Study Goals and Objectives**

This section clearly states the purpose of the study, including a list of objectives to be met and decisions to be made based on data collected. It should include a general statement of CDFW or other agency goals and objectives. It may include references to CDFW code sections as appropriate.

**3.2 Project Timeline**

This section provides a timeline and due dates for critical tasks within the study. This should include all aspects of the study, including:

* Planning
* Documentation
* Sample collection
* Sample analysis
* Data validation
* Reporting

Given the scope of this section, a table is the suggested format for communicating this information clearly to the reader.

**Table X: Study Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Task** | **Projected Start Date** | **Projected Completion Date** | **Product** | **Responsible Party** |
|  |  |  |  |  |
|  |  |  |  |  |
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**3.3 Coordination and Review Strategy**

This section discusses the overall project coordination strategy and should include an outline of the potential interested agency and stakeholder groups, as well as how the project will provide public outreach and transparency.

It should also identify CDFW technical staff within the department that will provide review and approval of the study plan and associated technical elements. Suggested individuals to include are staff from the CDFW Region, CDFW Water Branch, CDFW Engineering Branch, and CDFW Fisheries Branch.

* The following items should also be discussed:
* Coordination – If other agencies are participating in the project (e.g., sample collection or data analysis), discuss how work will be coordinated between the agencies. If there is a coordination plan in place, please include the document as an Appendix.
* Collaborators (e.g., agencies, non-governmental organizations, academia, etc.) - List agencies and discuss their involvement with the project, and if possible include contact names and information.
* Study Site Access – Discuss specific requirements for study site access (both public and private property) and if arrangements have been made.
* Stakeholder Outreach – Identify the type of outreach to be implemented, the tasks involved, and the schedule for each task.

**3.4 Compliance Considerations**

* This section clearly states if any permits or Biological Opinion requirements need to be obtained or followed. Questions to consider for this section are:Will the project result in the need for permitting?
* Will the permit requirements be covered by an existing BO (such as a take permit)? If not, how will compliance be achieved?

**4. Project Design and Methodology**

**4.1 Study Design**

This section describes and justifies the study design, including temporal and spatial scales. An effective design ensures that the type and quantity of data collected are sufficient to achieve study goals. Specifically, this section addresses:

* The study design, including temporal and spatial scales
* The rationale behind specific aspects of the study design
* The location and quantity of measurements to be taken to support statistical analyses or modeling
* The use of historical or pre-existing data

**4.2 Identification of Study Reaches and Sampling Sites**

This section identifies and describes how the study determined its:

* Study reaches and sampling sites: Describe the process to be used for delineation of stream reaches, site identification, and locating transects. Include statistical and scientific rational for site selection. Include maps and pictures.
* Sample site parameters (i.e., what parameters will be measured at each site, how often, and why). Refer to blank field sheets in the Appendix.

**4.3 Biology**

**4.3.1 Target Species and Life Stages**

Identify target species and life stage(s) to be studied and describe the selection procedure. Important components to include are:

* + - Fish resources (e.g., target species occurrence, life stage characteristics,

periodicity)

* + - Other species (game/nongame) of note or interest
    - Procedural evaluation (if necessary)

**4.3.2 Habitat Suitability and Biological Criteria**

Briefly introduce and describe the importance of the habitat criteria. Identify and summarize the process for collecting site-specific criteria and/or identifying criteria from literature, as well as evaluating the transferability of criteria from other streams. Place this section before the modeling and empirical methods section (flow vs. habitat relationship) since it duplicates the information. Important components include:

* Microhabitat elements including, but not limited to water depth, mean column velocity, substrate, and cover type
* Procedural evaluation (e.g., curve smoothing/fitting techniques, sample size considerations, category type of criteria)

**4.4 Hydrology**

This section briefly introduces hydrology and the importance of knowing its characteristics and influences on a system. It should describe how the information is integrated into development of management recommendations. Important components include:

* Unimpaired hydrographs
* Impaired hydrographs
* Exceedance flows
* Reach gains and losses

**4.4.1 Unimpaired Hydrology**

Describe unimpaired hydrology, which is the natural flow of a watershed or waterbody that would have occurred prior to anthropogenic or human influences on the watershed, and therefore provides fixed frames of reference for flow rates.

**4.4.2 Target Flows for Sampling**

Describe target flows for sampling of habitat vs. flow models and empirical methods, and identify target flows for site-specific habitat criteria development.

**4.5 Connectivity**

This section briefly introduces the importance of aquatic connectivity for species and life stages, and identifies components to be included in the study. Examples include:

* Groundwater/surface water interaction
* Sandbar breaching
* Critical riffle passage
* Culvert/road crossing passage
* Barriers

**4.6 Geomorphology**

This section briefly introduces the importance of flow and geomorphology relationships for stream health and address components to be included in the study. Examples include:

* Channel-forming flows
* Sediment transport
* Spawning gravel assessment
* Riparian habitat
* Floodplain habitat

**4.7 Water Quality**

This section addresses components to be included in the study. Examples include:

* General water characteristics
* Elements and compounds in the river
* Thermal refugia
* Water temperature monitoring and/or models
* Point and/or nonpoint discharges

**5. Procedures and Protocols**

**5.1 Stream Survey and Habitat Mapping Procedures and Protocols**

This section identifies and summarizes the procedures to be used for stream surveys and habitat mapping. In addition to a written summary of procedures, method information can be summarized in a table for quick reference.

**Table X: Stream Survey and Habitat Mapping Procedures and Protocols**

|  |  |  |
| --- | --- | --- |
| **Method** | **Version#/Date** | **Author/Organization** |
|  |  |  |
|  |  |  |
|  |  |  |

**5.2 Field Data Collection Procedures and Protocols**

This section identifies and summarizes procedures to be used for field data collection for hydraulic habitat models and/or empirical methods. It should include coverage of associated equipment, preservation, holding times, and corrective actions. In addition to a written summary of procedures, method information can be summarized in a table for quick reference.

**Table X: Field Data Collection Procedures and Protocols**

|  |  |  |
| --- | --- | --- |
| **Method** | **Version#/Date** | **Author/Organization** |
|  |  |  |
|  |  |  |
|  |  |  |

**5.3 Modeling and Empirical Flow vs. Habitat Procedures and Protocols**

This section identifies and summarizes:

* Hydraulic model(s) and empirical methods proposed for the study (may be presented in a table format)
* The appropriateness of the model(s) and methods to address study goal
* Calibration methods and procedures (i.e., bed roughness and transmissivity calibration procedures; model performance; identification of data outliers in calibrated models; selection of model simulation flows; bed surface development; mesh development; rating curve development; hydraulic calibration; simulation results).
* Limitations of models and procedures
* Verification/validation procedures for model outputs

**6. Quality Assurance/Quality Control**

**6.1 Quality Objectives and Criteria**

This section defines the qualitative criteria upon which study decisions will be made. It should discuss the quality objectives for the study and the performance criteria required to achieve those objectives. Study criteria are best presented in tables, but narrative criteria may also be included if applicable.

**6.2 Quality Control**

This section identifies any quality control (QC) activities needed for the study and the frequency at which they should occur. It should include a discussion of control limits for each activity and a discussion of corrective action procedures to be taken if control limits are not met. Much of the requested information may be available in methods, standard operating procedures (SOPs) and other documentation, in which these documents may be referenced or excerpted.

**6.3 Corrective Action**

This section summarizes actions to be taken should any issues occur during the study. It should include coverage of the procedure to be followed, documentation of corrective actions, and names of responsible parties. Corrective action procedures may be included in other documents such as SOPs, in which these documents may be referenced or excerpted.

**6.4 Assessments**

This section describes any assessments performed by or on behalf of the study, such as field audits. Assessments ensure that:

* the study is being implemented correctly;
* data generated meets the study’s objectives;
* corrective actions are implemented in a timely manner; and
* the efficacy of corrective actions is confirmed.

Section content should include:

* Assessments to be performed
* Assessment logistics
* Response actions

**7. Data Management and Reporting**

**7.1 Data Review**

This section describes or references the procedures to be followed for data review and the criteria used to accept, reject, or qualify study data in an objective and consistent manner.

The data review process consists of two primary components: data verification and data validation:

* Data *verification* is the process for evaluating the completeness, correctness, and compliance of a specific data set against method, procedural, or contractual specifications. The process of data verification effectively ensures all the information required for decision making has been generated and is readily available to the decision maker.
* Data *validation* is the process of examining a product or result to determine conformance to method requirements. The validation process effectively confirms the degree to which QC acceptance criteria or specific performance criteria have been met. The result is a qualification (i.e., “flagging”) of data in terms of its perceived usability. Data qualifiers should be defined by the program.

This section should reference or summarize the procedures followed for data review, including:

* Evaluation of variability inherent in sample design
* Departures from survey, mapping, or sample collection procedures
* QC samples
* Calibration and calibration checks
* Data reduction and calculations
* Data reporting format and supporting metadata
* Corrective actions

This section should also describe how the study confirms that its data has been recorded, transmitted, and processed correctly. Errors commonly occur during:

* Data entry
* Transcription
* Calculation
* Reduction
* Transformation

If data review processes are already described in existing documents (e.g., methods, SOPs), they may be referenced here in lieu of a summary.

**7.1.1 Verification and Validation Procedures**

Describe the procedures to be followed for the verification and validation of study data. Discussion should list the responsible party for each step and include any checklists used as part of the process. An SOP may be referenced and included as an appendix.

**7.2 Data Management Procedures**

This section discusses the process for data handling and management throughout the project. Discussion should include formats for data submittal and storage, how long data is to be stored, back-up procedures, and document control.

**7.3 Reporting**

This section describes how results will be conveyed to data users. The discussion should include what documents and information will be included with the report, the format of the report, and how corrective actions and limitations on data use will be communicated. This section should detail any reporting requirements and identify the information and records to be included in reports. As applicable, content should include:

* QC reporting requirements for groups submitting data (e.g., results summary only, raw data)
* Metadata to be reported by field personnel or other groups submitting data (e.g., coordinates)
* An outline or list of required information for the QA section of reports (e.g., assessment results, detection studies)
* A list of records that must be included in reports (e.g. field logs, chains of custody, raw data)
* A list of any required forms (e.g., field data sheets)
* The required reporting format (e.g., electronic, hard copy)

**8. References**

**Appendices**

**Appendix A**