Data Management Needs for Regional Project Tracking to Support Implementation and Effectiveness Monitoring

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Executive Summary

Funders and sponsors of regional restoration projects have an increasing need to validate the effectiveness of their projects. The design and execution of efficient effectiveness monitoring requires several prerequisite tools – no matter who will perform the monitoring or at what scale. One prerequisite tool is specific information on the *what*, *where* and *when* of the restoration that has occurred or is planned for the near term – i.e. a comprehensive project tracking system.

To be useful, the relevant project information needs to be contained in an accessible, comprehensive data system. This proposal describes project-level information that is needed for both implementation and effectiveness monitoring; the vision, justification, design and performance requirements.

This data design, alone, does not constitute effectiveness monitoring – rather, it is a tool that is required to design and execute effectiveness monitoring efforts. ***The design is driven by the needs of Effectiveness RM&E (Research, Monitoring and Evaluation).***

This design is informed by an intensive survey of existing project tracking systems. Regionally there is a wide diversity of project tracking systems that were designed to track contracts and work elements rather than satisfy effectiveness monitoring needs. This document describes the steps needed to advance beyond project or contract tracking to provide the additional information needs for research, monitoring and evaluation. It has grown and been refined by experiences with the Pacific Coast Salmon Recovery Fund (PCSRF), the Pacific Northwest Habitat Restoration Project Tracking Database (PNSHPTD), and the National River Restoration Science Synthesis (NRRSS) and refines and adds to these efforts.

The information needs required for R M&E include all of what is currently part of PCSRF plus:

- Spatially explicit locations and project type designation for every project at the work site level (current project records may refer to multiple separate implementation sites or may contain insufficient spatial locations),
- References to all habitat restoration projects regardless of funding source, and
- Measures of treatment magnitude.

This document presents of a set of minimum metrics and metadata for RM&E data design. They represent a reasoned compromise between the technical need to collect numerous metrics and the practical limitations of what can be collected by regional partners.

The data system is designed to be flexible to respond to the unique needs of diverse regional partners. It is currently being incorporated into diverse regional monitoring projects, such as the Integrated Status and Effectiveness Monitoring Project and the Pacific Coast Salmon Recovery Fund project tracking systems to demonstrate its utility and performance.

Data Management Needs for Comprehensive Regional Project Tracking to Support Implementation and Effectiveness Monitoring

I Regional Habitat Restoration Project Tracking and its Relationship to R M&E

Habitat restoration is a cornerstone of regional recovery efforts for endangered salmon. Nearly $400 million dollars per annum are spent on salmon recovery in the Columbia River basin with a significant fraction addressing habitat management actions (GAO, 2002). There is a growing need to validate that these expenditures are producing desired consequences. The validation will require several complimentary tools. This paper is a description of only one of those tools – habitat project tracking -- and a description of how that tool complements the others.

Fundamental information needed to validate the efficacy of habitat restoration includes knowledge of what habitat improvements are being planned and implemented; knowledge provided by project tracking systems. Project tracking systems are about collecting and managing this information, rather than validating that information; it is not monitoring *per se*.

The Pacific Northwest Monitoring Partnership (PNAMP) focuses on monitoring, and PNAMP has defined two kinds of monitoring that rely on project tracking information: Implementation monitoring and Effectiveness monitoring. PNAMP defines Implementation monitoring as:

> *The **monitoring of management actions** to determine if they were implemented properly or comply with established standards. This is normally associated with a restoration project where an engineered solution has been constructed, or where a best management practice (BMP) has been implemented. Implementation monitoring documents the type of action, the location, and whether the action was implemented successfully. It does not require environmental data and is usually a low-cost monitoring activity.* [Emphasis added]

PNAMP has also defined two varieties of Effectiveness monitoring, Project Scale Effectiveness Monitoring and Validation Monitoring; both of which rely on project tracking:

> [Project Scale Effectiveness Monitoring] *Most salmon or watershed projects are implemented at a small scale, with defined sets of actions intended to protect or enhance specific habitat features or habitat-forming processes. Project scale effectiveness monitoring measures environmental parameters to ascertain whether **the actions implemented** were effective in creating a desired change in habitat conditions.*

> [Validation Monitoring or Action Effectiveness Research] *This type of monitoring (or research) attempts to establish "cause and effect" or inferential relationships between fish conditions, habitat conditions, and/or management actions. It pertains to* ***evaluation of projects and programs*** *meant to protect or enhance habitat conditions or fish production. These studies are complex and technically rigorous, and often require measuring many parameters under a very structured statistical design to detect the variable affecting change.* [Emphasis added]

In each case there clues provided about the tools required to perform the task. However, in each case the tools are going to have different specific features. For example, each type of monitoring contains an expectation that some direct observations will be made, but exactly where and when observations will be made will be different in the different varieties of monitoring. ***This paper is does not specify the features of those direct observations.***

For PNAMP monitoring there is a common prerequisite for information on what habitat management actions have occurred or are planned, where they are, how big they are and when they happened. Effectiveness monitoring can not be designed, or inferences extended to other locations without the knowledge of the distribution and intensity of restoration in the relevant locations.

That monitoring programs will depend on coordinated tools is often implicitly recognized, although precisely how the tools will work together is harder to express. For example the PNAMP guidance ***Establishing a Network of Intensively Monitored Watersheds in the Pacific Northwest*** (PNAMP, 2005) lists criteria for watersheds to be included in an IMW program.

> The IMW network:
>
> a. shall capitalize to the extent possible on the pre-existing availability of suitable scientific knowledge
> b. shall have long term commitments to juvenile, outmigrant, and adult fish monitoring
> c. shall support important management questions of PNAMP members
> d. shall be distributed across areas/ecoregions, species, and categories of project and/or management activities consistent with (a)
> e. shall have ***sufficient type and duration of management actions*** for reliable implementation of long term experimental designs [emphasis added]
> f. shall apply experimental designs with appropriate and viable controls
> g. shall have broad base of support in the locally affected area

Each of these criteria reflects, at least implicitly, a tool that is required to successfully deploy an IMW:

a. Information about what habitat data is available in the watershed (characterization of habitat)
b. Information about the current and historic levels of adult and smolt monitoring (current and historical monitoring)
c. Information about the complexity and diversity of the watershed in the context of providing treatment and control opportunities (experimental design opportunities)
d. Information about the level of local participation and administrative control over the watershed (integrity and maintenance of experimental design)
e. Information about what habitat projects and management are occurring in the watershed (project tracking)

These criteria are summarized in the figure 1:

So there are several tools, all working together that are required to perform successful effectiveness monitoring and research in IMW's. This paper is about the project tracking tool (the red box in figure 1). One may anticipate that parallel design guidance will be developed to support the other components of successful effectiveness monitoring—in IMW's and elsewhere and it can be shown that similar requirements exist for project level effectiveness monitoring and so these needs are generic (see below).

This document describes the design of the data system for project tracking – what data are in it, what its information needs are, and the justification of the data needs. It does not describe how such a system would be regionally adopted. Exactly who would participate and under what set of rules will require significant negotiation between funders, project sponsors, regulatory authorities and diverse data holders. Regional data holders have their own needs to maintain project tracking data and how they would participate in a coordinated data management system will vary widely. Regardless of individual roles, agreement on a standard for project tracking data, such as the system described in this paper, is a prerequisite for regionally coordinated project tracking, or beyond that, coordinated R M&E.

This design is informed by the lessons learned from development of the NWFSC Pacific Northwest Habitat Restoration Project Tracking Database (PNSHPTD). PNSHPTD surveyed regional holders of data for restoration actions occurring in the last 10 years and was designed to service the technical needs of M&E. The initial scope of PNSHPTD was the Federal Action Agency Research, Monitoring and Evaluation Plan for the Federal Columbia River Power System Biological Opinion, but it has grown to include project tracking across the states of OR, WA, ID & MT. Development of PNSHPTD highlighted several features of data system development that we considered in the design of the Project Tracking for M&E system. They are outlined below.

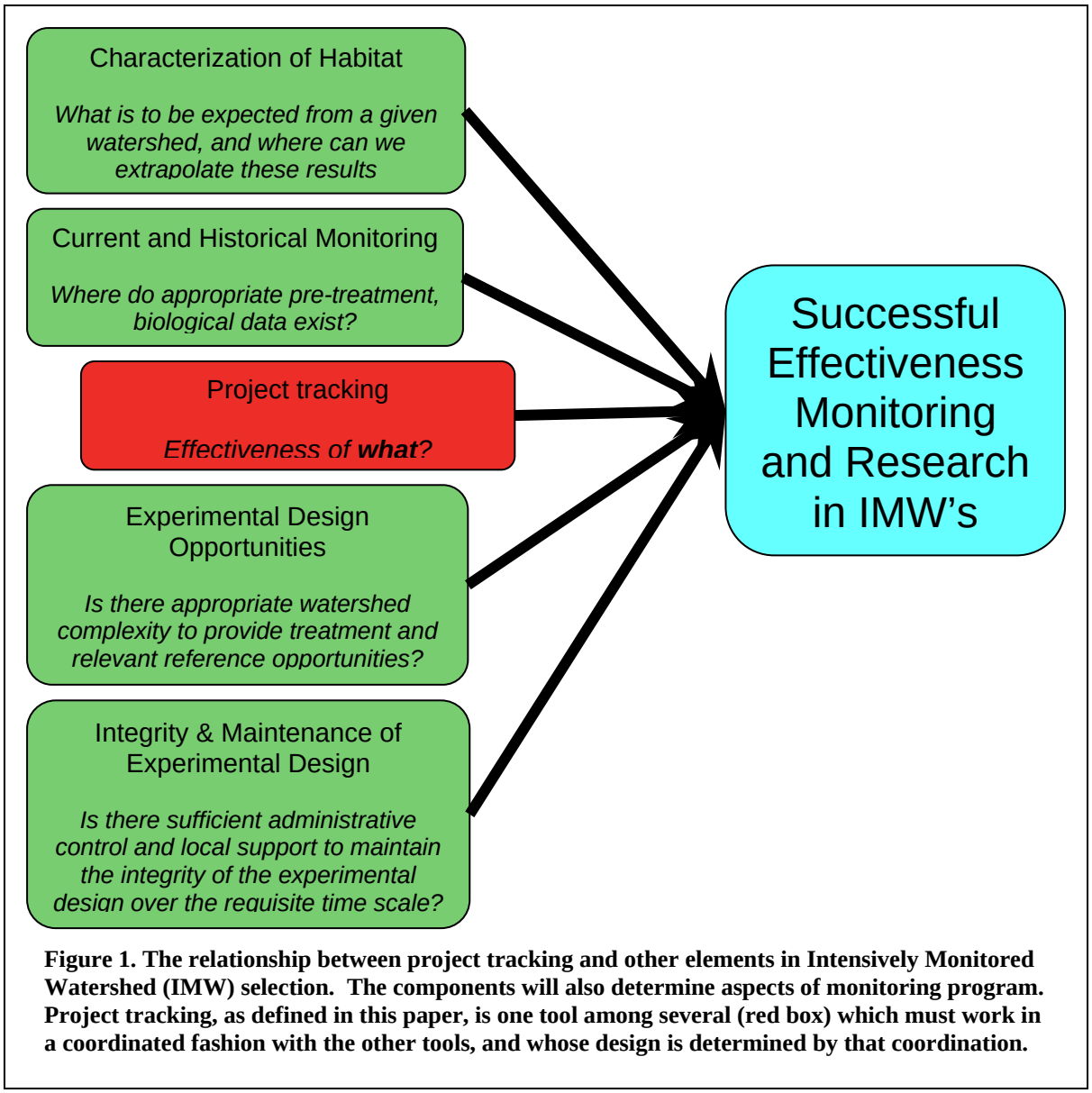


Figure 1. The relationship between project tracking and other elements in Intensively Monitored Watershed (IMW) selection. The components will also determine aspects of monitoring program. Project tracking, as defined in this paper, is one tool among several (red box) which must work in a coordinated fashion with the other tools, and whose design is determined by that coordination.

In addition, the PNSHPTD identified the need for a common set of standards for project tracking data. PNSHPTD obtained data from 30 sources directly, and many of these were holding data from numerous other independent contributors. The total sources of data were in excess of ninety. Since there is no regional standard for data formats, this results in a tremendous diversity of data types, that in many cases, are incompatible. For example, in the data collected by PNSHPTD there are 24 ways of expressing project location with resolutions from meters to tens of kilometers. If spatial data is collected with high resolution, the lower resolution data can usually be "back-filled" with automated protocols – as is done for example in Washington's PRISM data system where latitude and longitude are used to inform county and HUC. Thus, one objective if this proposed design is to collect data with high spatial resolution to service the greatest number of needs.

In the absence of standardized data formats and automated back-fill protocols only 20% of the project resources were used to obtain the data, with the remaining 80% applied to data stewardship, including the cross-walking of diverse data types. In addition to being more costly, the process of data migration and quality assurance added significant delays to the availability of data useful in the context of M&E (Katz *et al.,* Rest. Ecol., In press).

A common data design for project tracking data will reduce these delays and improve the utility of existing data collection programs. To demonstrating this increased utility the design is being used in the ongoing work of the Integrated Status and Effectiveness Monitoring Project (ISEMP) in the Wenatchee and John Day pilot M&E projects. It is also being deployed by NOAA's Pacific Coast Salmon Recovery Fund (PCSRF) as part of its maturing program of tracking management actions for recovery of threatened and endangered salmonids. These demonstrations will be used to inform other efforts to develop or improve data systems for regional monitoring and evaluation.

II What does M&E need from a project tracking system?

Current project tracking systems, such as the current PCSRF, track information to answer questions about resource distribution. This kind of accountability places specific design requirements on the data system. For example, one needs to know how much money is being allocated per project, and where the recipients of the funds are located. Other examples of needed information include, who is doing the work, when the work happened, where the work occurred and some measure of what kind of restoration work is happening. The information collected can answer general questions like how much activity is located within a particular jurisdiction, County or State. It is important to note that the PCSRF project tracking system was designed to answer questions about projects, not the effectiveness of the projects

Effectiveness monitoring is a very different enterprise than tracking project resource distribution. Effectiveness monitoring must assess the success or progress of habitat restoration projects in addressing some identified ecological need or pathology. ***Therefore, while not by themselves effectiveness monitoring, project tracking systems that service effectiveness monitoring must look to the relevant effectiveness monitoring questions to determine what the information needs are—the design of project tracking is driven by the needs of Effectiveness RM&E.*** In some cases the information needs of M&E are similar to resource distribution but in more detail, and in other cases they are whole new data elements. This design for project tracking is built on the data elements that already exist in PCSRF, supplemented or modified as necessary. PCSRF has had wide regional exposure and review, has a large geographic footprint and funds a significant fraction of the restoration in the region. Therefore, the current PCSRF system was a good starting place to design the next generation or project tracking system.

What information needs do we glean from Effectiveness Monitoring and Research to design project tracking?

Like all other types of monitoring, the data needs are specified by the questions being asked. The questions addressed in a specific monitoring design will usually be one-off custom questions with little generic or "template" character. However, there are three overarching classes of questions that have been identified:

1. Is a single restoration action effective?
2. Is a diverse set of restoration actions implemented within some spatial domain, such as a watershed or subbasin effective?
3. Is a given class of similar restoration projects effective?

In each case, the word *effective* is contextual and must be defined in a manner relevant to the project and the study. In one case it might refer to how a physical process is altering habitat character, while in another it could refer to responses seen in a population of salmon that are impacted by a change in some habitat character. The questions determine the information needed to answer them, and the information needs in turn define the data collection design. For example, to address question 2 above, we would need to know about all restoration projects in a particular basin and would also need to collect data on the net productivity of fish in that basin. We may also need to know the distribution of restoration projects and productivity in adjacent basins to provide contrast and thereby separate the impact of those restoration actions from some other large-scale driver of the system. This is the variety of question addressed in the IMW program and which determined the criteria described above.

Figure 2a illustrates this approach in the John Day Basin in Oregon. The John Day basin consists of 5 large sub-basins each with a diverse set of restoration projects based on data from PNSHPTD. We could define effectiveness in this case as the relative change in fish productivity by sub-basin as a consequence of different levels of habitat treatment. To describe the performance of these restoration actions we might place a series of smolt traps and adult counting weirs at each outflow point of the sub-basins. We could then compare the amount of treatment (restoration actions) and the population productivity for a rough measure of effectiveness.

On the other hand, if we were going to address question 3, or what PNAMP refers to as "project-scale" effectiveness monitoring, we might develop some criteria for identifying similar projects that could serve as replicates in an experimental design. For example, we could develop criteria for a study of riparian function improvement projects such as:

- Find all projects that are of a single type (e,g, riparian improvement)
- Find all projects that are on wade-able streams.
- Find all projects that are the only treatment in their stream.
- Find all projects that have adjacent streams with projects that could as reference sites.

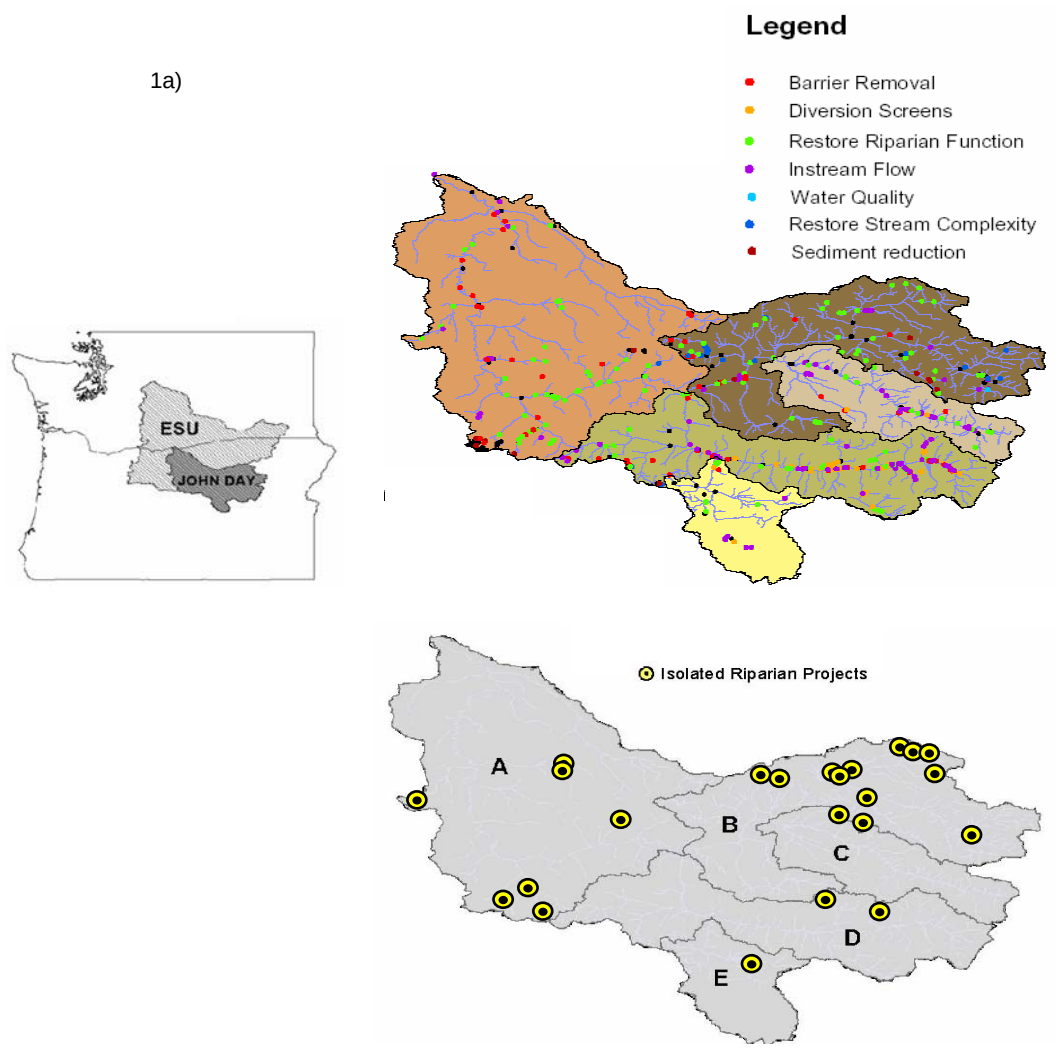


Figure 2: Conceptual design for project effectiveness monitoring Designs applied to the John Day Basin in Oregon, USA. Fig. 1a: Design for assessing the effectiveness of diverse actions in changing population responses within a reasonable demographic domain. Inventory of projects within five sub-basins are correlated with fish productivity measures for those sub-basins assessed at traps and weirs located at the outflow points of the sub-basins. Fig. 1b: Design for assessing the effectiveness of a single class of restoration action – in this case riparian improvement projects. Total project inventory was filtered to leave a subset of projects that are candidates for replicates based on location, project type, distribution of other projects in the same location and the presence of a reference area close by.

In Figure 2b this set of criteria has been applied to the data in the John Day basin from PNSHPTD. Approximately 30 riparian improvement projects have been identified that, if monitored over the right time period, could serve as replicates to estimate the characteristic performance of these types of projects. It is likely that some other aspect of

these 30 would prevent all of them from serving as replicates, but these 30 would serve as a short list of candidates.

It is critically important to understand that regardless of which class of question one addresses, this design exercise defines the information needed for effectiveness monitoring. These information needs include ***everything in the current PCSRF Project Tracking system*** plus:

- ***Spatially explicit data on project location (i.e. the work-site), not the location of the project contract***. To identify the relevant habitat data to analyze these projects such as location of relevant reference sites based on stream gradient, vegetation cover type and so on, one needs to know exactly where the restoration project is in some kind of consistent coordinate system—like latitude and longitude in decimal degrees. The current system of documenting project location in PCSRF, as well as some other data holders in the region, does not specifically locate the implementation site in the stream. The Project tracking for M&E design proposes latitude and longitude as the standard referent for location because from this reported data, the entire spectrum of location referents (LLID, county, HUC, etc) can be generated automatically. These recommendations are parallel to the Best Practices for Reporting Location and Time Related data developed by the Northwest Environmental Data-network.

- ***Project level data on all implementations—not just PCSRF funded ones***
  Characterizing the net impact of diverse restoration actions (figure 2a) and clearly identifying replicates that are unimpacted by adjacent restoration actions (figure 2b), both require knowledge of all other restoration actions in the watershed. In the former case one needs to accurately characterize the net magnitude of the treatments, while in the latter, one needs to identify the presence of potentially confounding treatments. Therefore, both the design and analysis of effectiveness M&E require information about PCSRF projects as well as all the projects regardless of funding source.

- ***A measure of the magnitude of the action.***
  For each action tracked some measure of magnitude or "treatment" is necessary. Measures of the treatment magnitude are useful in three contexts.

  1) <u>To identify potential replicates for an effectiveness M&E study, the level of treatment is critical.</u> One would not compare the effect of a fencing project that excluded cattle from 1 km of stream length with a project that excluded cattle from 500 km of stream length.

  2) <u>Assessment of project performance</u> – Some M&E assessments will be comparisons of levels of treatment with levels of response. Although the actual statistical comparison may be more sophisticated, on a conceptual level the comparison is simple. It is illustrated in figure 3. If projects are to be deemed effective, one expects to see more recovery (eg # of fish) with more treatment (eg # of culverts). Therefore, some

measure of treatment extent needs to be incorporated into a project tracking system as a prerequisite to service M&E.

3) <u>Prioritizing project placement</u> – Planning and prioritizing restoration has often occurred at local levels. If M&E efforts are to inform the prioritization of new action implementation at any scale, then some measure of implemented treatments must be available to planners. More and larger-scale coordination on the placement of restoration actions is needed (where large-scale refers to the scale of the Columbia River Basin or salmon recovery domains.) It is unreasonable to expect coordinated results at spatial scales over which there is little coordination of planning or implementation.

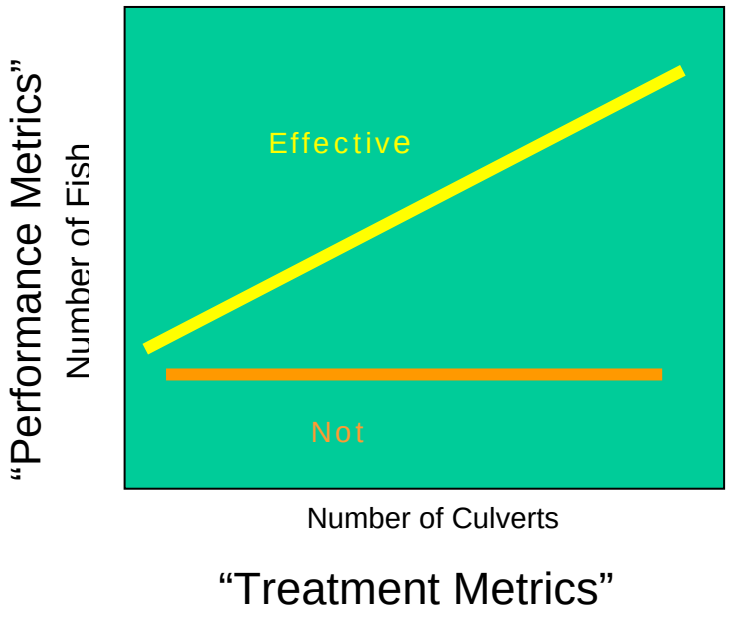


Figure 3: Conceptual application of project inventory to assessment of project effectiveness. Ultimately, assessments will amount to treatment to amount of response. Lack of significant response in the face of treatment will constitute "not-effective". Given the lack of simple systems with single restoration project types, the actual statistical analysis will require more sophistication. Conceptually, however, the discrimination between "effective" and "not-effective" will amount to a similar

III Project Tracking Needs for M&E Design

In addition to PCSRF the additional information needs required for M&E are, spatial referents for implementation, referents for all implementations, and measures of treatment magnitude. We can now turn to a description of what Project Tracking for M&E would look like.

Project Tracking for M&E will utilize the three following tools:

1) ***A project taxonomy that maps the diverse sets of restoration actions onto factors that limit the recovery of listed fish***. This is accomplished through a two-level taxonomy. The higher level, termed project type, is a synthesis of the current PCSRF project tracking system which was based on a combination of project location and type of action, and PNSHPTD which was defined based on type of action. These two systems have been combined and the functional components of each have been preserved in a single list that is proposed for adoption. Each of these project types can be associated with a habitat limiting factor. This allows

the direct comparison of what has been done in watersheds to limiting factors that will require treatment.

Below the project type level are more detailed, sub-type designations. For example, fish passage is a major limiting factor in the Pacific Northwest, and there is a project type that addresses all fish passage types. Fish ladders, log weirs, dam breaches and culvert repair are all sub-types of the fish passage type, and, clearly, are not all equivalent. Clearly there is a wide diversity of restoration actions that address passage that would not make equivalent replicates for an effectiveness monitoring study.

The other project types contain similar diversity of project sub-type. The proposed project tracking taxonomy contains 84 project subtypes. The taxonomy is presented in total in Appendix A.

2) ***A data dictionary that describes the metrics, units of measure, needed data resolution and associated metadata.*** The data dictionary is the foundation reference document for the design of any data system. The data dictionary provides the definitions of each of the data elements: data element name, data element description, data element unit of measure, and data organization or taxonomy. Many different databases track projects with similar nomenclature, but among the lessons of PNSHPTD are that the same words mean very different things in different systems.

   The data dictionary is the tool that allows anyone to assess whether data from different sources can be combined, to, for example, increase the analytical capability of the aggregate data. In addition to defining all the terms, the data dictionary specifies the units of measure, the resolution and other metadata that is required to validate data compatibility. As will be mentioned below, there are reasons why many regional data holders may wish to continue with their own nomenclature, but if regional project tracking is to be useful for regional effectiveness monitoring activities, then one single foundation reference document must be available for all potential users. The proposed data dictionary is provided in Appendix B.

3) ***The conceptual design for the data base structure.*** The power of a relational database system is not simply containing the data; a flat-file spreadsheet could do that. Rather it is in the relationships that are built between the data elements. The relationships allow searchers to extract information from the data in a systematic and documentable fashion. The conceptual design maintains the relationship between project information, metrics, and the specific worksite(s) locations where the restoration actions occurred. A diagrammatic representation of the relationships between data elements is provided in Appendix C.

These three elements contain significant overlap in content. Their different conceptual content will serve different users. That there is overlap expresses the consistency in our proposed design.

IV Needs: Adoption of Consistent Metrics

Success in cooperative monitoring projects will depend on several key components, among them the use of standard data formats. In this case the ability to track restoration projects from multiple data holders will depend on the adoption of common project-level metrics, examples of which are provided in the Appendices.

Are these metrics reasonable, necessary and sufficient?

Appendix C provides a list of metrics collected for each project. Readers will appreciate that providing this information will result in increased effort or resources. Therefore, it is important to explain that the needed data is, essential, is reasonable and will be useful.

It must be emphasized again that we are describing the design of a system for project tracking that services implementation and effectiveness monitoring, ***but is not implementation or effectiveness monitoring itself.*** If we were defining metrics for effectiveness monitoring the needed level of data detail and diversity would be much higher and there would be no single generic list for all monitoring designs. The more detailed list of data needs for the actual monitoring is termed "Response Metrics" in figure 4 below.

This project tracking design does not specify the field protocols or sampling design that would be a part of a complete monitoring design. The specific features of these other tools will require parallel development.

For project tracking we need some measure of the magnitude of treatment, which may be as simple as the number of miles fenced in a riparian fencing project. These are termed "Implementation Metrics" in Figure 4. In many cases the Implementation Metrics will be a subset of, and so look like the Response Metrics. For example, if we are examining a restoration action that specifically altered stream flow by a specified amount, then the Implementation and Response Metrics would both include a measure of stream flow.

The list of implementation metrics that characterize treatment extent in Appendix B & C are at most, one to three in number for each project implementation. Not all metrics will be reported for every project.

The two questions that arise are: Are these project tracking metrics appropriate and are they sufficient?

To guarantee completeness in project tracking one would collect data on a very wide list of project attributes. If resources were unlimited, having this level of information for all restoration projects would provide the highest expectation for successful monitoring programs. Unfortunately, this is likely to be expensive. Even if one did monitor a long list of project attributes, it is not clear that one would use all of those metrics in the design of monitoring or the analysis of project implementation. Therefore a reasoned

solution is necessary – one that balances the resources it would take to collect more detailed data against the minimum amount of information that is necessary for implementation monitoring – to track and to adequately design effectiveness monitoring. The list in Appendix C has been evaluated and reviewed by restoration professionals (NRRSS) and represents such a compromise.

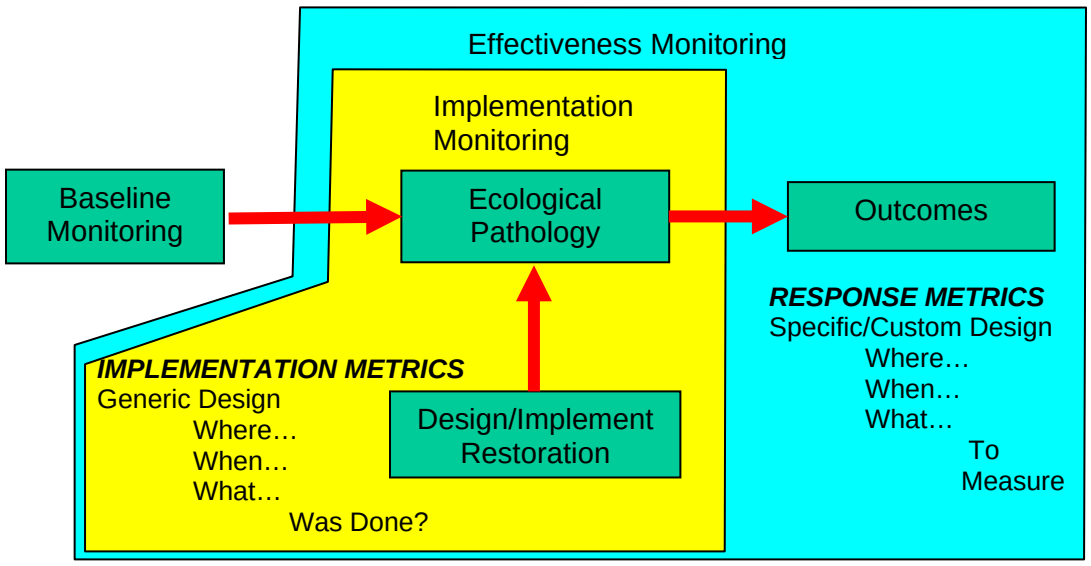


Figure 4. Rational Design Scheme for implementation of restoration. In a rational world, baseline monitoring would be ongoing and in specific cases would identify environmental or ecological pathologies. In response to these pathologies the design and implementation of restoration would be triggered. These implementations would be monitored with some form of project tracking, implementation monitoring, which would measure a thin set of "Implementation Metrics" at each and every restoration action. Environmental outcomes would be documented with a more in depth effectiveness monitoring program that would include "Response Metrics". For many reasons, the more detailed analytical design and longer list of metrics in effectiveness monitoring would likely be performed at only a subset of all restoration actions. The choice of which ones and when would be critically dependant on a complete set of Implementation Metrics.

There is no pre-existing consensus on a list of needed implementation metrics across the region. However, the list in Appendix C is informed by what metrics are currently being collected, from the PNSHPTD project survey. PNSHPTD also cataloged what diverse data holders are recording as metrics in a wide array of monitoring programs. Appendix C is also informed by the current PCSRF system. PCSRF included numerous workshops and meetings among the PCSRF partners to develop a minimum set of project tracking metrics. Although some of the objectives of PCSRF differ from this project tracking design, the utility of the metrics remains. In many cases ongoing use of exiting metrics or new metrics are logical measures of treatment magnitude and the utility is apparent on inspection. Examples include: Number of miles fenced for fencing projects, Number of acres planted for planting projects, Miles of roads decommissioned on road decommissioning projects, and so on.

The scope of needed data collection is substantial To estimate feasibility, there are no similar models linking project tracking to effectiveness monitoring to which this design can be compared. Heretofore, effectiveness monitoring has only occurred on the reach or single implementation scale, rather than entire sub-basins or large-scale applications of specific project types. Therefore, an important component of the development of this project tracking design is an explicit, functional link to an effectiveness monitoring component. The Northwest Fisheries Science Center is developing a model mechanism to evaluate the utility and completeness of all aspects of the project tracking design, including metrics, along with some mechanism for adjusting the program as we incorporate new knowledge and testing.

Among the activities in progress to provide this test of functionality are coordination of this data system design with PNAMP and US Bureau of Reclamation Protocol Manager application, the Integrated Status and Effectiveness Monitoring Project (ISEMP), integration into the adaptive management plan used by NOAA-Fisheries as part of its de-listing process and framework, and the Northwest Environmental Data Network (NED).

V Needs: Contributions of Data

By identifying the generic needs of effectiveness monitoring in relation to existing data this data system design can be of most use to interested parties across the region. A consequence of addressing these generic needs is the realization that populating the system with data from all sources is critical. In return, the data system may serve as an efficient regional resource for planning, tracking and assessing habitat improvements, and demonstrating the importance of collaborative efforts

The demands for data and/or service that Project Tracking for M&E places on the state and tribal partners will vary based on what the partners are already doing. For the PCSRF partners, there will be no additional requirement beyond those currently being planned for PCSRF Phase II. In some cases state, federal and tribal partners would need to populate the project tracking data system with new data, or in some cases the same data but in a more standardized format. In this event partners will continue to host their own data and service their diverse project tracking needs with their own data intact. On the other hand, other contributors of data may seek some degree of hosting from a central project tracking data system.

Whatever the users' needs, the purpose of a regional project tracking system is to create a comprehensive set of data about restoration actions, where the data are collected and maintained in a single database, in a single format, with integrity and with verifiable data quality.

Overall, the expectation is that these new requirements represent a reasoned balance between what is the minimum requirement of a project tracking system to service effectiveness monitoring, what is optimal for that purpose, and what is a reasonable burden on data contributors.

One of the additional lessons of PNSHPTD was that while some individual data holders are up to date, the region as a whole experiences approximately an 18-24 month lag between project implementation and project tracking data being available in any format. Reconciling diverse project-level data to a single format adds an additional 18-24 months before the data can be provided back to the region. If the definitions provided here can provide a useful regional standard and some degree of hosting for project tracking data, it will reduce these two significant impediments to timely project tracking.

All of these points are given additional urgency with the recognition that the region is at a critical crossroads with respect to salmonid recovery. At the very time that the next phase of PCSRF is being designed, regional salmon recovery plans are also being developed and a new Biop is being prepared by NOAA Fisheries. Many management and recovery plans are also being written by diverse local, municipal, tribal and other sub-basin planning groups. These groups are working hard to complete their plans within a short time horizon, but with little explicit guidance on M&E – particularly the monitoring of restoration actions.

This guidance for project tracking will service this important regional need and help to support the need to move to effectiveness monitoring. Failure to capitalize on the common implementation monitoring needs of PCSRF partners and other regional recovery planners when a useful model is in hand would be a regrettable missed opportunity.

Appendix A

Type	Subtype
Fish Screening	Fish Screen Fish Screen Replaced
Fish Passage	Fish Ladder Improved Fish Ladder Installed Fishways (ladders, chutes, or pools) Barriers (dam sor log jams) Diversion Dam/ push up dam removal Road Crossings (bridges or culverts) Culvert Improvements/ upgrades Culvert Installation Culvert Replacement Culvert Removal Weirs (log or rock)
Instream Flow	Water leased or purchased Irrigation practice improvement Water flow returned to stream
Instream	Streambank Stabilization Channel Connectivity Channel reconfiguration (includes channel roughening) Deflectors/ barbs Log (control) weirs Off channel habitat Plant removal/ control Rock (control) weir Signage Site Maintenance Spawning Gravel Placement Large Woody Debris Stream Channels Boulders Rootwads Structure/ Log Jam Beaver Introduction
Instream- Wetland	Wetland Creation Wetland Improvement/ Enhancement Wetland Restoration Wetland Vegetation Planting Wetland Invasive Species Removal
Riparian	Livestock Water Development Water Gap Development Fencing Forestry Practices/ Stand Management Planting Livestock Exclusion Conservation Grazing Management Weed Control
Sediment Reduction	Road Reconstruction Road Relocation Road Stream Crossing Improvements (=Rocked Ford) Road Drainage System Improvements Road Obilteration Erosion Control Structures Sediment Traps Upland Erosion Control (sediment conrol basins, windbreaks, planting, conservation land management)

Upland-Agriculture	Livestock Management Agriculture Management (BMPs) Fencing Water Development
Upland- Vegetation	Planting Invasive Plant Control Vegetation/ Stand Management Slope Stabilization
Upland- Wetland	Wetland Creation Wetland Improvement/ Enhancement Wetland Restoration Wetland Vegetation Planting Wetland Invasive Species Removal
Water Quality Improvement	Return Flow Cooling Refuse Removal Toxic Clean-up
Outmigrant Survival Improvement (Estuary)	Invasive Species Treated Creation of new estuarine area Removal of existing fill material Channel Modification Increased Freshwater Flow Dike Breaching/ Removal Tidegate Alteration/ Removal Dike Reconfiguration
Land Protected, Acquired, or Leased	Streambank Protected Wetland or Estuarine are Protected
Nutrient Enrichment	Fertilizer Carcass Analog Carcass Placement

Appendix B

Part I. General information fields for all projects

Basic Project Information

Column Name	Definition	Format/ Mandatory?
Project Grantee	This the official PCSRF Grantee (State or Tribal group)	Lookup Value, Y
PCSRF Objective	The PCSRF Objective under which the project is conducted: Watershed and Sub-basin Planning and Assessment; Salmon Habitat Protection and Restoration; Salmon Enhancement; Salmon Research, Monitoring, and Evaluation; or Public Outreach and Education.	Lookup Value, Y
Project Reference	This is the identification number given to the project by the Grantee	Varchar Text (20 Char), Y
Project Name	The name of the project given by the Grantee	Varchar Text (100 Char), Y
Primary Subgrantee	The Tribe or State Agency that will assign the project work to be completed (i.e. NWIFC member tribe, CRITFC member tribe, KRITFWC member tribe, OR state agencies, WA state agencies)	Lookup Value
Selection Date	Date funding was committed to the subgrantee through state/tribal decision-making process.	Date (mm/dd/yyyy)
Start Date	The date that the project lead/subgrantee proposes to start the project.	Date (mm/dd/yyyy)
Deliverable Date	The date that the project worksite deliverables are completed. The project deliverable date can be entered when deliverables are due beyond the project end date (in A7 above).	Date (mm/dd/yyyy)
Scheduled End Date and Actual E	The date that the project's lead/subgrantee contract is scheduled and is actually completed	Date (mm/dd/yyyy)
Fund Year	The Federal fiscal year in which the PCSRF funding was awarded to the state/tribe.	Year (yyyy), Y
PCSRF Funds (Proposed and Actual)	The amount of PCSRF Federal funds being expended on this project in dollars.	Number (13 Char.), Y
State Funds (Proposed and Actual)	Amount of State funds being expended on this project in dollars.	Number (13 Char.)
Project Description	Short description of the project. The fish stock(s) and or ESUs targeted by the project should be identified as a part of this description.	Varchar Text (4000 Char.)
Project Benefits	Short description of the expected benefits to fish, for example to improve the range, the breeding or the spawning of a Salmonid population.	Varchar Text (4000 Char.)

Geographic Area Name	On land the Geographic Area Name is defined as the name of the 5th field Hydrologic Unit (HUC).	Varchar Text (200 Char.)
Project Status	Grantees may use the project status as they see fit. For the Reports on the web site and the Report to Congress, projects are classified as Complete if the Actual End Date (or the Scheduled End Date if there is no Actual) is in the past.	Lookup Value
Progress Reports	Grantees and Primary Subgrantees can submit multiple progress reports covering any time period.	Varchar Text (4000 Char.)
Project Lead(s)/Subgrantee(s)	The name of the entity receiving funds to do the actual project work.	Lookup List
Project Contact(s)	Contact person/people for the project.	Lookup List

Worksite Information

Column Name	Definition	Format/ Mandatory?
Work Start Date	The date that work was started at the current worksite.	Date (mm/dd/yyyy)
Work End Date	The date that work ended at the current worksite.	Date (mm/dd/yyyy)
State	State that worksite is located in.	Lookup Value
County	County that worksite is located in.	Lookup Value
Latitude	The Latitude coordinate value for the worksite. Value should be reported as a positive number from 0 to 90 degrees with up to 8 decimal places.	Number (0-180 Degrees and up to 8 Decimal Places)
Longitude	The Longitude coordinate value for the worksite. Value should be reported as a negative number from 0 to -180 degrees with up to 8 decimal places.	Number (0-180 Degrees and up to 8 Decimal Places)
Streamname	The name of the stream where the worksite is located. This name should be taken from the stream data layer provided by StreamNet, so that this name is consistent.	Varchar Text (60 Char.)
LLID	The LLID of the stream where the worksite is located. An LLID is a stream number method used only in the Northwest region that is based on Latitude/Longitude coordinates of the stream confluences.	Number (25 Char.)
Begin Ft.	This marks where on a stream network a worksite begins. Begin Ft is a distance measure on a stream network from the confluence.	Number
End Ft.	This marks where on a stream network a worksite ends. End Ft is a distance measure on a stream network from the confluence.	Number
Township	A public land surveying unit of 36 sections or 36 square miles. This displays the Township where the worksite is located.	Varchar Text (20 Char.)

Range	A north-south strip of townships, each six miles square, numbered east and west from a specified meridian in a U.S. public land survey. This displays the Range within a Township that the worksite is located in.	Varchar Text (20 Char.)
Section	A land unit equal to one square mile (2.59 square kilometers), 640 acres, or 1/36 of a Township. This displays the Section that the worksite is located in.	Varchar Text (20 Char.)
3rd Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units).	Lookup Value
4th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units).	Number (25 Char.)
5th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units).	Number (25 Char.)
Targeted ESU (Evolutionary Significant Unit)		Lookup Value, Y

Appendix B

Part I. General information fields for all projects

Description	Definition	format (units) for proposed actions and field length	format (units) for completed actions
Project identification number	This is the number given to the project by the State or Tribe	text field	not applicable
Project Grantee	This the official PCSRF Grantee (State or Tribal group)	Lookup Value	
Primary Subgrantee	The Tribe or State Agency that will assign the project work to be completed (i.e. NWIFC member tribe, CRITFC member tribe, KRITFWC member tribe, OR state agencies, WA state agencies)	Lookup Value	
Project name	This is the name given to the project by the State or Tribe	text field	not applicable
Geographic area name	On land the Geographic Area Name is defined as the name of the 5th field Hydrologic Unit (HUC). For ocean/estuarine areas not covered by 5th field HUC's the Geographic Area is the name of the water body as shown on NOAA charts or the name of the statistical area. The NWFSC will provide web access to a set of NOAA nautical charts.	text field	not applicable
Geospatial reference/location	This is locational data for each treatment site where the project work is done. Report as a point, line or polygon for all treatment locations. Latitude and longitude from GPS is preferred.	Point, line or polygon. Latitude/ longitude from GPS is preferred. Beginning and end points of stream segment can also be provided if available.	Point, line or polygon. Latitude/ longitude from GPS is preferred. Beginning and end points of stream segment can also be provided if available.
Project Lead/Subgrantee name	The name of the entity receiving funds to do the actual project work.	text field	not applicable
Project start date	The date that the project lead/subgrantee proposes to start the project.	mm/dd/yyyy	not applicable
Project end date	The date that the project's lead/subgrantee contract is completed	mm/dd/yyyy	mm/dd/yyyy
Project deliverable date	The date that the project worksite deliverables are completed. The project deliverable date can be entered when deliverables are due beyond the project end date (in A7 above).	not applicable	mm/dd/yyyy
PCSRF Objective	The PCSRF Objective under which the project is conducted: Watershed and Sub-basin Planning and Assessment; Salmon Habitat Protection and Restoration; Salmon Enhancement; Salmon Research, Monitoring, and Evaluation; or Public Outreach and Education. Choose one objective for each project.	pull down list	not applicable
PCSRF Federal funds	The amount of PCSRF Federal funds being expended on this project in dollars.	# ($)	not applicable
State funding	Amount of State funds being expended on this project in dollars.	# ($)	not applicable
Federal Fiscal Year	The Federal fiscal year in which the PCSRF funding was awarded to the state/tribe.	yyyy	not applicable
Date of project selection	Date funding was committed to the subgrantee through state/tribal decision-making process.	mm/dd/yyyy	not applicable
Project description	Short description of the project. The fish stock(s) and or ESUs targeted by the project should be identified as a part of this description.	narrative, limited to 1000 char. Additional documentation can be attached (e.g. project plans).	narrative, limited to 1000 char. Additional documentation can be attached (e.g. project plans).

Expected benefits of the project	Short description of the expected benefits to fish, for example to improve the range, the breeding or the spawning of a Salmonid population.	narrative, limited to 1000 char.	not applicable
Project Status	Grantees may use the project status as they see fit. For the Reports on the web site and the Report to Congress, projects are classified as Complete if the Actual End Date (or the Scheduled End Date if there is no Actual) is in the past. All other project	Lookup Value	
Progress Reports	Grantees and Primary Subgrantees can submit multiple progress reports covering any time period.	Varchar Text (4000 Char.)	
Project Contact(s)	Contact person/people for the project.	Lookup List	
Habitat Restoration & Protection $	Dollars Spent on Habitat Restoration & Protection.	Number (13 Char.)	
Instream Funds $	Dollars Spent on Instream Activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Fish Screening $	Dollars Spent on Fish Screening Activities for an Instream project.	Number (13 Char.)	
Fish Passage Improvement $	Dollars Spent on Fish Passage Improvement for an Instream project.	Number (13 Char.)	
Instream Flow $	Dollars Spent on Instream Flow activities for an Instream project.	Number (13 Char.)	
Instream Habitat $	Dollars Spent on Instream Habitat activities for an Instream project.	Number (13 Char.)	
Upland Habitat $	Dollars Spent on Upland Habitat activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Water Quality $	Dollars Spent on Water Quality activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Riparian Habitat $	Dollars Spent on Riparian Habitat activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Estuarine $	Dollars Spent on Estuarine activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Land Acquisition $	Dollars Spent on Land Acquisition activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Wetland $	Dollars Spent on Wetland activities for a Habitat Restoration & Protection project.	Number (13 Char.)	
Subbasin Planning $	Dollars Spent on Watershed Subbasin Planning & Assessment.	Number (13 Char.)	
Research Monitoring $	Dollars Spent on Research Monitoring & Evaluation.	Number (13 Char.)	
Work Start Date	The date that work was started at the current worksite.	Date (mm/dd/yyyy)	
Work End Date	The date that work ended at the current worksite.	Date (mm/dd/yyyy)	

State	State that worksite is located in.	Lookup Value	
County	County that worksite is located in.	Lookup Value	
Latitude	The Latitude coordinate value for the worksite. Value should be reported as a positive number from 0 to 90 degrees with up to 8 decimal places.	Number (0-180 Degrees and up to 8 Decimal Places)	
Longitude	The Longitude coordinate value for the worksite. Value should be reported as a negative number from 0 to -180 degrees with up to 8 decimal places.	Number (0-180 Degrees and up to 8 Decimal Places)	
Streamname	The name of the stream where the worksite is located. This name should be taken from the stream data layer provided by StreamNet, so that this name is consistent.	Varchar Text (60 Char.)	
LLID	The LLID of the stream where the worksite is located. An LLID is a stream number method used only in the Northwest region that is based on Latitude/Longitude coordinates of the stream confluences. This number should be taken from the standardized data l	Number (25 Char.)	
Begin Ft.	This marks where on a stream network a worksite begins. Begin Ft is a distance measure on a stream network from the confluence.	Number	
End Ft.	This marks where on a stream network a worksite ends. End Ft is a distance measure on a stream network from the confluence.	Number	
Township	A public land surveying unit of 36 sections or 36 square miles. This displays the Township where the worksite is located.	Varchar Text (20 Char.)	
Range	A north-south strip of townships, each six miles square, numbered east and west from a specified meridian in a U.S. public land survey. This displays the Range within a Township that the worksite is located in.	Varchar Text (20 Char.)	
Section	A land unit equal to one square mile (2.59 square kilometers), 640 acres, or 1/36 of a Township. This displays the Section that the worksite is located in.	Varchar Text (20 Char.)	
3rd Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or reg	Lookup Value	
4th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or reg	Number (25 Char.)	
5th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or reg	Number (25 Char.)	
Targeted ESU (Evolutionary Significant Unit)		Lookup Value	

Reporting for projects that assess current or baseline habitat condition/s and or prioritize factors limiting native salmonid production such as amount of freshwater flow and address measures needed to eliminate limiting factors. Types of reports include recovery plans, water shed plans, subbasin plans and habitat inventory reports, and Tribal Resource Management Plans. Projects can include recovery planning and participation in NMFS Technical Recovery Teams, watershed assessments, including mapping/inventory for plans, subbasin planning, development of habitat inventory reports, support for watershed councils and organizational infrastructure and staffing for local conservation groups and tribal entities.			
Support local watershed group?	Does the project fund operations of watershed councils, or provide technical assistance to watershed councils?	Y/N	not applicable
Support tribal or agency infrastructure?	Does the project provide staff support and/or infrastructure costs directly related to assessments or recovery planning?	Y/N	not applicable
Plan/assessment in development?	Does this project support development of a plan or assessment? If so, record the name of the plan/assessment	Y/N or name of plan/assessment	not applicable
Plan/assessment completed?	Has the plan or assessment funded with PCSRF been completed? This will show how many plans were completed each year.	not applicable	Y/N or Citation: Author, date, name, source, source address. Endnote citation format.
Identify/prioritize factors limiting production?	Does the plan/assessment identify/prioritize specific factors limiting the production of populations and ESUs or conservation opportunities at the watershed scale?	Y/N	Y/N
Biological goals?	Does the plan/assessment incorporate biological goals consistent with State or Tribal conservation plans or Technical Recovery Team recommendations?	Y/N	Y/N
Identify necessary actions?	Does the plan/assessment identify actions needed to meet goals?	Y/N	Y/N

Part II. Project specific information fields

Type	Type Definition	Subtype	Subtype Definition	Metric	Metric Definition
Fish Screening	Projects that result in the installation or improvement of screening systems that prevent Salmonids from passing into areas that do not support salmonid survival, for example into irrigatio diversion channels.	Fish Screen Installed	Adding screen to an unscreened diversion to keep juveniles fro being diverted.	#, cfs	A total count of screens proposed for installation and actually installed, recognizing that a project may install more than one screen, The flow rate at the screened diversion(s) from the water right. (CFS to nearest 0.01 CFS)
		Fish Screen Replaced	Replacement, repair or improvement of an existing fish screen	#, cfs	A total count of screens proposed for installation and actually installed, recognizing that a project may install more than one screen, The flow rate at the screened diversion(s) from the water right. (CFS to nearest 0.01 CFS)
Fish Passage	Projects that affect or provide fish migration up and down stream including road crossings (bridges or culverts), barriers (dams or log jams), fishways (ladders, chutes or pools), and weirs (log or rock). Barriers may be complete or partial.	Fish Ladder Improved	Improvement or upgrade of an existing fish ladder	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Fish Ladder Installed	Installation of a fish ladder where there was not one previously	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Fishways (chutes or pools) Installed	Placement of an engineered way around a barrier (usually a side channel/ or pool) or any by-pass that isn't specified as a fis ladder that is used by salmon migrating upstream; or a chute, used to ease salmon migrating downstream over a dam.	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Barriers (dams or log jams)	Removal of a dam other than a push-up or diversion dam; or removal of a naturally formed log or debris jam that created a passage barrier	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Diversion Dam/ push up dam removal	Removal of a push-up dam (earthen dam), or removal of a diversion dam (permanent structure)	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Road Crossings in stream beds (other than culverts)	Establishment of engineered passage associated with road placement that may include placement of a bridge.	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Culvert Improvements or Upgrades	Improve, upgrade or replace an existing culvert	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Culvert Installation	Add a passable culvert where none previously existed.	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Culvert Removal	Removal of culvert (often replaced by a non-blocking structure, bridge etc. or removed because the structure it was associated with was removed, a road etc.)	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Weirs (Incomplete dams)	Placement, modification or removal of a incomplete dam that is a passage barrier to fish	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.

Instream Flow	Projects that maintain and/or increase the flow of water to provide needed habitat conditions. These can include releases of water from dams or impoundments or water conservation projects to reduce stream diversions or extractions.	Water leased or purchased	Purchase of water rights. These water allocations are not withdrawn from the stream.	cfs	Water volume proposed for lease or purchase and actually leased o purchased should be reported in CFS to nearest 0.01 CFS.
		Irrigation practice improvement	Installation of a headgate with water gauge that controls water flow into irrigation canals and ditches. Regulates flow on previously unregulated diversions. Also the addition of other water sources (wells etc.) so that water from diversion is less needed or improvement in irrigation systems eg. replacing open canals with pipes to reduce water loss to evaporation.	cfs	The flow of water returned to the stream (not including water that is maintained in the stream). (CFS to nearest 0.01 CFS)
Instream	Projects that increase or improve the physical conditions within the stream environment (below the ordinary high water mark of the stream) to support an increased salmonid population.	Streambank Stabilization	The use of rock barbs, log barbs, revetments, gabions etc. to stabilize stream banks	length treated in miles	The number of miles of of treatment. Add length treated on both sides when both sides are stabilized. Add one side when one side treated. (miles to .01 miles)
		Channel Connectivity	Increasing channel connectivity between stream channels, wetlands, and/ or off-channel habitat and floodplain channels. May include increase of historic or new connectivity.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Channel reconfiguration	Changes in channel morphology, e.g. pools added/ created, meanders added, former channel bed restored, channel roughening etc.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Deflectors/ barbs	Placement of triangular structures of rock or logs that extend int the stream to narrow and deepen the channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Log weirs	Placement of logs to collect and retain gravel for spawning habitat, to deepen existing resting/jumping pools, to create new pools above and/or below the structure, to trap sediment, aerate the water, or promote deposition of organic debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Off channel habitat	Creation of off-channel habitat consisting of side-channels, backwater areas, alcoves or side-pools, off-channel pools, off-channel ponds, and oxbows.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Plant Removal/ Control	The removal or control of aquatic non-native plants and noxious weeds growing in the stream channel.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Rock Weirs	The placement of rocks to collect and retain gravel for spawning habitat, to deepen existing resting/jumping pools;and/or to creat new pools, to trap sediment, aerate the water, and to promote deposition of organic debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Spawning Gravel Placement	Addition of spawning gravel to the channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Large Woody Debris	Placement of individual logs in the stream that are not part of engineered structures or log jams or other large woody debris not specified as rootwads	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Boulders	Addition of large rocks or boulders to a stream channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Rootwads	Placement of a stump with roots attached extending into the stream. Rootwads are a type of large woody debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Wood Structure/ Log Jam	Placement of Wood Structure/Log Jam with multiple logs fastened together to form increasing instream habitat	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Beaver Introduction	The introduction or management of beavers to add natural stream complexity (beaver dams, ponds, etc).	# of beavers introduced	# of beavers introduced to increase instream structure/ complexity

Instream- Wetland	Projects designed to protect, create or improve connected wetland areas (that meet the standard for federal delineation) that are known to support salmonid production. For example salmonid populations, especially juveniles, can benefit from access to connected wetland areas where conditions provide food supply, protection from high flows and protection from predators.	Wetland Creation	Creation of wetland area where it did not previously exist	area treated (acres)	Acres of artificial wetland proposed to be created and actually created from an area not formerly a wetland. (Acres to nearest whole acre)
		Wetland Improvement/ Enhancement	Improvements or enhancements to an existing wetland	area treated (acres)	Acres of wetland proposed for treatment and actually treated. (Acres to nearest whole acre)
		Wetland Restoration	Restoration of existing or historic wetland	area treated (acres)	Acres of wetland proposed for treatment and actually treated. (Acres to nearest whole acre)
		Wetland Vegetation Planting	Planting of native wetland species in wetland areas.	area treated (acres)	Acres of wetland proposed for treatment and actually treated. (Acres to nearest whole acre)
		Wetland Invasive/Noxious Weed Species Removal	Remove or control Non-native species and/or noxious weeds in wetland area	area treated (acres)	The acreage of invasive species proposed for treatment and actuall treated in the wetland project. The proposed project area may only be a portion of an existing wetland such as removing an area of purple loosestrife. (Acres)
Riparian	Projects that change areas (above the ordinary high water mark of the stream and within the flood plain of streams) in order to improve the environmental conditions necessary to sustain Salmonids throughout their life cycle.	Livestock Water Development	Provision of water supply for livestock that is out of the riparian zone. Also called livestock water development or livestock wate supply.	# of installations	# of installations, may be more than 1 per project
		Water Gap Development	Provision of a fenced livestock stream crossing	# of installations	# of installations, may be more than 1 per project
		Fencing	Creation of livestock exclusion or other riparian fencing	length of fencing	This refers to meander miles of stream bank proposed for treatment and treated. Report the actual length of proposed treatment, adding lengths of treatment on both sides if treatment was on both sides. (miles to .01 miles)
		Forestry Practices/ Stand Management	Prescribed burnings, stand thinnings, stand conversions, silviculture, vegetation management	area treated (acres)	Total acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence.
		Planting	Riparian planting, native plant establishment	Species; area treated (acres)	Species Planted (Latin name);Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence
		Livestock Exclusion	Remove livestock from riparian areas	area treated (acres)	Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protectio of riparian zone with a fence.
		Conservation Grazing Management	Alteration of agricultural land use practices to reducing grazing pressure for conservation. E.g. Rotate livestock grazing to minimize impact on riparian areas	area treated (acres)	Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protectio of riparian zone with a fence.
		Weed Control	Removal and/or control of non-native species and noxious weed	Species; area treated (acres)	Invasive species (latin name); the total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence
Sediment Reduction	Projects the diminish sediment transport into streams	Road Reconstruction	Reconstruction and restoration of road in place (not a road relocation) and for a restoration purpose (eg. road is crumbling into stream and needs to be reinforced). Road reconstruction does not include drainage improvement projects.	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Relocation	Abandonment of existing road in riparian or streambed area wit or without rehabilitation and with a new road constructed in a les sensitive area.	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Stream Crossing Improvements (same as Rocked Ford)	Creation or improvement of a reinforced rock roadbed that crosses the stream without restricting the stream flow. Does not include stream crossing improvements that have a fish passage goal.	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Drainage System Improvements	Placement of structures to contain/ control run-off from roads. Includes surface drainage, peak flow drainage improvements and roadside vegetation	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Obilteration	Road closed with or without rehabilitation. Not a road relocation.	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Erosion Control Structures	Hillside stabilization, grassed waterways wind breaks, planting, conservation land management, and waterbars.	# of erosion structures	# of sediment control installations
		Sediment Control	sediment basins, sediment ponds and sediment traps.	# of erosion structures	# of sediment control installations

Upland-Agriculture	Upland restoration activities relating to agricultural use	Livestock Management	Any upland livestock management including livestock watering schedules and grazing management plans	acres	Total acres proposed for each treatment to nearest whole acre.
		Agriculture Management Best Managemetn Practices	Implementaton of best management practices eg low/ no till agriculture	acres	Total acres proposed for each treatment to nearest whole acre.
		Fencing	Placement of exclusion and non-exclusion fencing	miles	Total miles of fencing to nearest 0.01 mile
		Water Development	Irrigation and livestock water development including ditches, wells, ponds, springs etc.	type and #	Type of water development project (ditch, well, pond, etc.) and number of treatments.
Upland- Vegetation	Upland restoration activities relating to vegetation, includes forestry	Planting	Upland plant installation, seeding, and revegetation	area treated (acres)	Total acres for each treatment to nearest whole acre.
		Invasive Plant Control	Removal and control of non-native plants and noxious weeds	area treated (acres)	Total acres for each treatment to nearest whole acre.
		Vegetation/ Stand Management	Prescribed burns, stand thinning, stand conversion, silviculture vegetation management, selective thinning, hazard reduction	area treated (acres)	Total acres for each treatment to nearest whole acre.
		Slope Stabilization	Implementation of slope stabilization methods including landslid reparation and terracing.	area treated (acres)	Total acres for each treatment to nearest whole acre.
Upland- Wetland	Projects designed to protect, create or improve connected wetland areas (that meet the standard for federal delineation)	Wetland Creation	Wetland area created where it did not previously exist	area treated (acres)	Acres of artificial wetland created from an area not formerly a wetland. (Acres to nearest whole acre)
		Wetland Improvement/ Enhancement	Changes to an existing wetland	area treated (acres)	Acres of wetland actually treated. (Acres to nearest whole acre)
		Wetland Restoration	Restoration of existing or historic wetland	area treated (acres)	Acres of wetland actually treated. (Acres to nearest whole acre)
		Wetland Vegetation Planting	The planting of native wetland species in wetland areas.	area treated (acres)	Acres of wetland actually treated. (Acres to nearest whole acre)
		Wetland Invasive Species Removal	Removal and/or control of non-native species and/or noxious weeds in a wetland area.	area treated (acres)	The acreage of invasive species actually treated in the wetland project. The proposed project area may only be a portion of an existing wetland such as removing an area of purple loosestrife. (Acres to nearest whole acre)
Water Quality Improvement	Projects that result in an improvement of water quality conditions for example through improved water quality treatment, capture toxic highway runoff, reduction in the use of herbicides, pesticides and fertilizers, and other point sources.	Return Flow Cooling	All projects with a goal of directly reducing or directly limiting increase in water temperature. Most are return flow cooling projects which generally consist of replacing old open return ditches with underground PVC pipe. The primary benefits are to eliminate nutrient and thermal loading, by filtering flows underground where they cool before returning to the river.	water temp measured	Water temp before and after project completion (if at a point source then avg water temp before at after of point source emission) in degrees Celsius to nearest whole degree.
		Refuse Removal	Removal of garbage in the waterway	lbs of trash collected	Pounds of trash collected from stream and wetland areas to nearest 100 pounds.
		Sewage Clean-up	Clean up of sewage outfall, etc.		
		Toxic Clean-up	Clean up/prevention of mine tailings, hebicide, pesticide, toxic sediments, etc.	Toxin, area treated (acres)	Name of Toxic species, element or material Total acres, wet and/or dry for each cleaned up to nearest whole acre.
Outmigrant Survival Improvement (Estuary)	Projects that result in improvement of or increase in the availability of estuarine habitat such as tidal channel restoration, floodplain connectivity, floodgate fish passage or diked land conversion. This habitat is important for salmonid out migration where juvenile Salmonids begin the transition from fresh to salt water environments and where predatory pressures are known to be high. Estuarine habitat is distinct from other wetland habitat in being tidally influenced.	Invasive Species Treated	Control or removal of invasive or exotic estuarine species e.g. Spartina alterniflora	Invasive species, area treated (acres)	Invasive species (latin name); Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Creation of new estuarine habitat	Creation of an estuarine area where one did not exist previously.	area created (acres)	Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Restoration/Rehabilitation of estuarine habitat	Restoration of existing or historic estuarine habitat	area created (acres)	Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Removal of existing fill materia	Removal of fill that isn't associated with a dike e.g. removal of tideflat fill.	area treated (acres)	Acres of estuary proposed for treatment and actually created to nearest whole acre.
		Channel Modification	Deepening or widening existing tidal channel	Type of modification, length treated in miles	Type of channel modification and Length of channel modified in miles to nearest 0.01 miles)
		Dike Breaching/ Removal	Removal or breaching of a barrier constructed to contain tidal flooding. Breaching/ removal allows for natural flow/flood regime and potential for off-channel habitat usage.	#; length of treatment (miles)	Number of Dikes breached or removed, total aggregate length of dike reconfigured in miles to .01 miles.
		Tidegate Alteration/ Removal	Removal or changes to tidegate that allows water to flow freely when the tide goes out, but which prevents the water from flowing in the other direction. Changes are generally made to allow fish passage at low and high tide.	#	Number of tide gaits removed or altered
		Dike Reconfiguration	Modification of location or design of an embankment to confine or control water flow.	#, length of treatment (miles)	Number of reconfigurings, total aggregate length of dike reconfigured in miles to .01 miles.

Land Protected, Acquired, or Leased	Projects that involve the acquisition or lease of land or riparian areas.	Streambank Protection	Protection of section of streambank from further degradation or development through purchase, lease, negotiated agreement, statute or other mechanism.	meander miles	This refers to meander miles (to nearest 0.01 mile) of stream bank proposed for protection and actually protected by acquisition, easement or lease. Count miles on both sides of stream if both sides are acquired. Count on one side if only one side is acquired.
		Wetland or Estuarine Area Protection	Protection of wetland or estuarine area from further degradation or development through purchase, lease, negotiated agreement statute or other mechanism.	acres	The acreage reported should be the total acreage proposed for protection and actually protected regardless of whether all of the habitat is applicable to the desired goals for acquisition. (Acres to nearest whole acre)
Nutrient Enrichment	Projects to add marine derived nutrients back into the system	Fertilizer	Nutrients placed in stream to increase nutrient availability	Weight of fertilizer, area treated (acres)	Total of fertilizer delivered (pounds to nearest 100 pounds); Total acres of each treatment to nearest whole acre.
		Carcass Analog	Fish meal bricks placed in the stream to increase nutrient availability	Weight of fertilizer, area treated (acres)	Total of fertilizer delivered (poundsto nearest 100 pounds); Total acres of each treatment to nearest whole acre.
		Carcass Placement	Dead salmon added to stream	area treated (acres), weight of carcasses	Total acres of each treatment to nearest whole acre, total weight of salmon carcasses placed in the stream
Project Maintenance	Projects that maintain the functionality of Salmonid Restoration Projects	Site Maintenance	Maintenance of the restoration project site eg.replanting trees that failed to survive	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.

Yellow = in PCSRF Phase II, Not in PCSRF Phase I

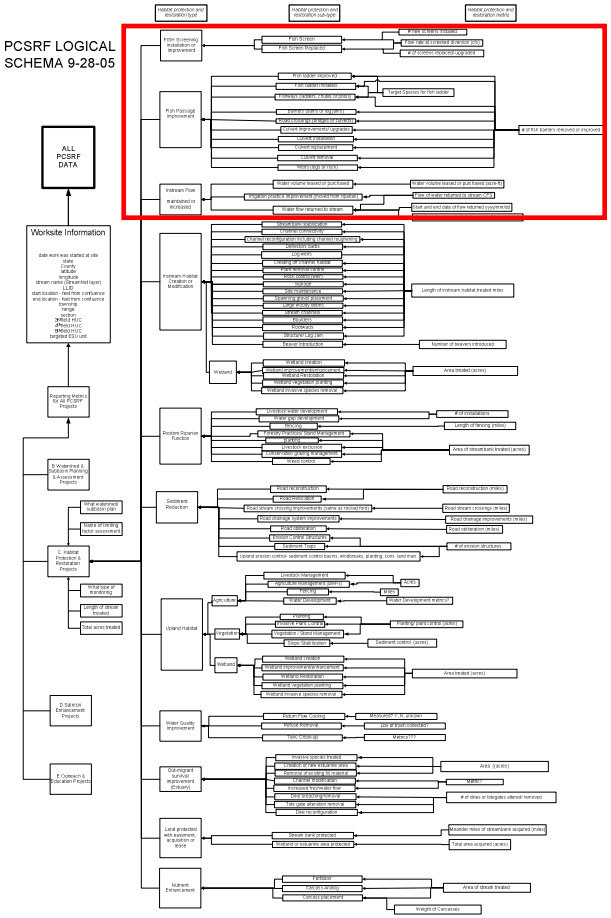
Orange = In PCSRF Phase I, but different (including new metric)

Appendix C

Legend

In PCSRF phase II not in phase I

In PCSRF phase 1 but different (including new metric)

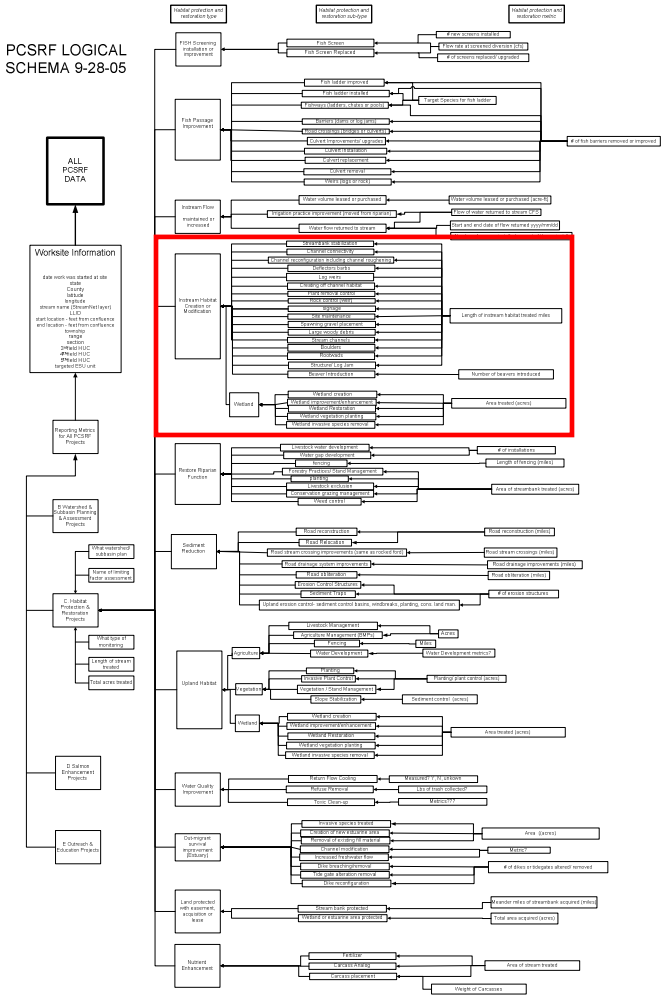


Habitat protection and restoration type	*Habitat protection and restoration sub-type*	*Habitat protection and restoration metric*
Fish Screening	Fish Screen	# new screens installed
		Flow rate at screened diversion (cfs)
	Fish Screen Replaced	# of screens replaced/ upgraded
Fish Passage Improvement	Fish ladder improved	Target Species for fish ladder
	Fish ladder installed	
	Fishways (ladders, chutes or pools)	
	Barriers (dams or log jams)	# of fish barriers removed or improved
	Road crossings (bridges or culverts)	
	Culvert Improvements/ upgrades	
	Culvert Installation	
	Culvert replacement	
	Culvert removal	
	Weirs (logs or rock)	
Instream Flow	Water volume leased or purchased	Flow of water returned to stream CFS
	Irrigation practice improvement	Start and end date of flow returned yyyy/ mm/dd
	Water flow returned to stream	Number of gauges installed as part of the project #

Legend

In PCSRF phase II not in phase I

In PCSRF phase 1 but different (including new metric)



Habitat protection and restoration type

Habitat protection and restoration sub-type

Habitat protection and restoration metric

Instream Habitat Creation or Modification

- Streambank stabilization
- Channel connectivity
- Channel reconfiguration including channel roughening
- Deflectors barbs
- Log weirs
- Creating off channel habitat
- Plant removal control
- Rock control (weir)
- signage
- Site maintenance
- Spawning gravel placement
- Large woody debris
- Stream channels
- Boulders
- Rootwads
- Structure/ Log Jam
- Beaver Introduction

→ Length of instream habitat treated miles

→ Number of beavers introduced

Wetland

- Wetland creation
- Wetland improvement/enhancement
- Wetland Restoration
- Wetland vegetation planting
- Wetland invasive species removal

→ Area treated (acres)

Legend

In PCSRF phase II not in phase I

In PCSRF phase 1 but different (including new metric)

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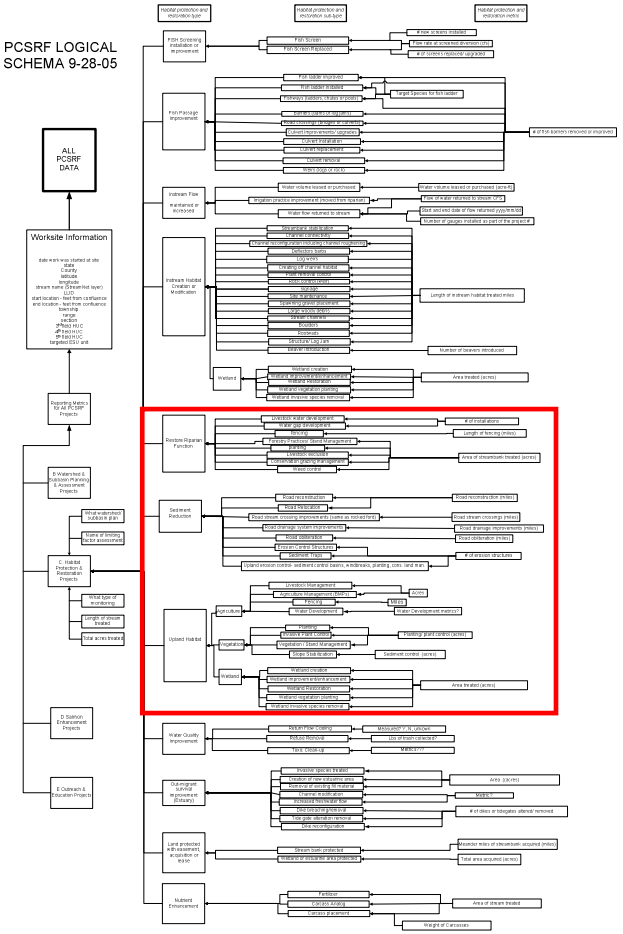

Habitat protection and restoration type	*Habitat protection and restoration sub-type*	*Habitat protection and restoration metric*
Restore Riparian Function	Livestock water development	# of installations
	Water gap development	
	Fencing	Length of fencing (miles)
	Forestry Practices/ Stand Management	Area of streambank treated (acres)
	Livestock exclusion	
	Conservation grazing management	
	Weed control	
	Planting	Species
Sediment Reduction	Road reconstruction	Road reconstruction (miles)
	Road Relocation	
	Road stream crossing improvements (same as rocked ford)	Road stream crossings (miles)
	Road drainage system improvements	Road drainage improvements (miles)
	Road obliteration	Road obliteration (miles)
	Erosion Control Structures	# of erosion structures
	Sediment Traps	
	Upland erosion control- sediment control basins, windbreaks, planting, cons. land man.	
Upland Habitat	Agriculture: Livestock Management	Acres
	Agriculture: Agriculture Management (BMPs)	
	Agriculture: Fencing	Miles
	Agriculture: Water Development	Type and #
	Vegetation: Planting	Planting/ plant control (acres)
	Vegetation: Invasive Plant Control	
	Vegetation: Vegetation / Stand Management	
	Slope Stabilization	Sediment control (acres)
	Wetland: Wetland creation	Area treated (acres)
	Wetland: Wetland improvement/enhancement	
	Wetland: Wetland Restoration	
	Wetland: Wetland vegetation planting	
	Wetland: Wetland invasive species removal	

Legend

In PCSRF phase II not in phase I

In PCSRF phase 1 but different (including new metric)

PCSRF LOGICAL SCHEMA 9-28-05