PROJECT EFFECTIVENESS MONITORING

In ecological studies, monitoring typically refers to repeated sampling in an effort to detect changes in biological, chemical and/or physical parameters. When it comes to habitat restoration and enhancement projects, a variety of different types of monitoring are conducted based on the questions to be answered.

Implementation Monitoring, sometimes referred to as Compliance Monitoring is typically completed to evaluate management actions to determine whether they were implemented as proposed or comply with established standards. This type of monitoring often collects information suitable for compliance with grant or permit reporting requirements.

Effectiveness Monitoring (sometimes referred to as Project Effectiveness Monitoring) is typically defined as monitoring to determine if restoration actions had the desired effects on physical processes or habitat conditions (e.g., did Project *X* result in an increase in pool area?). Validation Monitoring is the term often used to define monitoring to evaluate cause and effect (inferential) relationships between restoration actions and physical or biological responses (e.g., did the change in pool area associated with Project *X* lead to desired changes in fish abundance?). The same concepts also can be applied at broader scales to assess the success of integrated restoration actions designed to affect entire streams, watersheds or basins.

At TEP we conduct two different types of project monitoring: Implementation Monitoring and Effectiveness Monitoring. The goal of TEP's Project Monitoring Program is to comply with requirements of our funding and permits and to determine if our restoration/enhancement projects have the desired effects on physical processes and/or habitat conditions and, when possible, to evaluate cause and effect relationships between our restoration actions and physical or biological responses.

Our Implementation Monitoring efforts determine whether our projects are completed as planned and collect information needed to address the reporting requirements of our funders and project permits. The data we collect includes repeat photographs (pre-construction and multi-year post-construction) and information needed to verify that our project implemented what was planned (e.g., number of wood structures placed, linear feet of riparian vegetation planted, etc.)

For our purposes, we define Effectiveness Monitoring to include both Effectiveness and Validation monitoring as defined above. In other words, our Effectiveness Monitoring is used to assess how our restoration projects affect physical processes and habitat conditions and, to the extent possible, we evaluate the cause and effect relationships between the restoration actions and physical and biological response. We recognize that observed physical and biological responses often can be confounded by influences outside of those associated with restoration actions or may be only indirectly affected by some restoration actions. In addition, studies to gather this type of information are complex, technically rigorous and typically require very structured statistical designs. As a result, our first priority is collection and analysis of data that can answer questions relative to project-related effects on physical processes and habitat conditions. To the extent possible, we account for the aforementioned outside influences in our study designs, analyses, and reporting to facilitate evaluation of physical and biological responses. We collect data on water quantity (e.g., water levels) and quality (e.g., temperature,

salinity, dissolved oxygen concentration), vegetation composition and structure, soils, fish and wildlife, restoration planting survival, and other attributes.

Our Project Effectiveness Monitoring effort strives to:

- Use standardized and widely accepted methods to collect and analyze data on a variety of physical and biological attributes.

- Use a systematic approach in which restoration actions and associated monitoring efforts are integrated in an iterative process.

- Integrate Effectiveness Monitoring with Implementation/Compliance Monitoring. We concur with authors who have pointed out that it is not possible to fully evaluate the effectiveness of a project without knowing how it was implemented.

- Include monitoring line items in restoration project budgets to the extent possible. Because monitoring is an integral part of our restoration projects, it is critical that we consider its costs and how it will be funded.

- Use the most robust study designs that logistical and financial constraints allow.

- Use existing data and incorporate ongoing data collection programs whenever practicable. Many agencies and organizations have long-term data sets and ongoing data collection efforts for a variety of applicable parameters including fish counts, water quality, precipitation, tides, in-stream habitats, and others.

- Use the results of this monitoring effort in an adaptive management process to inform future projects and refine our restoration and monitoring techniques as needed.

- Make our data and results widely available. Results of our efforts will be provided to our funders and partners. In addition, we post reports on our website and seek to present our findings in print and electronic media, journals and professional conferences.

- Keep abreast of the current "state of the art" for restoration and monitoring by networking with professionals and organizations conducting similar work and attending workshops, symposiums and other training forums.

- Although most of our projects are conducted primarily to affect salmonids and their habitats, to the extent possible, our monitoring efforts collect information on a wide variety of ecological parameters to help us understand how our projects affect other wildlife and plant species.