

## CHAPTER 9. MONITORING

### Key Points

- There are several different types of monitoring, including implementation monitoring, upslope-near stream effectiveness monitoring, instream effectiveness monitoring, and compliance and trend monitoring.
- Monitoring may be required in conjunction with existing and/or proposed human activities that will likely result in elevated water temperatures, or discharges of biostimulatory substances, nutrients, or other material that detrimentally lowers dissolved oxygen concentrations.
- Regional Water Board staff shall coordinate development of a compliance and trend monitoring plan within two years of the date the Shasta River TMDL Action Plan takes effect.
- Monitoring requirements are specifically incorporated into the proposed Memoranda of Understanding with the U.S. Forest Service and U.S. Bureau of Land Management.

The purpose of this chapter is to describe the types of monitoring applicable to the Shasta River watershed and describe the monitoring requirements of the TMDL Action Plan.

### 9.1 Types of Monitoring

Monitoring can take several different forms, have different objectives, and yet be called, ubiquitously, monitoring. Consistent nomenclature is necessary for clarity. It is the intention of this section to describe the different types of monitoring.

#### 9.1.1 Implementation Monitoring

Implementation monitoring assesses whether activities and control practices were carried out as planned. This type of monitoring can be as simple as photographic documentation, provided that the photographs are adequate to represent and substantiate the implementation of control practices. Implementation monitoring is a cost-effective type of monitoring because its purpose is to demonstrate that pollutant source control practices were properly installed and operated. On its own, however, implementation monitoring cannot directly link management activities to water quality, as no water quality measurements are made.

#### 9.1.2 Instream and Upslope-Near Stream Effectiveness Monitoring

Upslope-near stream effectiveness monitoring is intended to determine if control practices are effective at keeping the pollutant from being discharged to a water body. In other words, it is "...used to evaluate whether the specified activities had the desired effect (Solomon 1989, as cited by MacDonald et al. 1991, p. 7)."

Instream effectiveness monitoring may be conducted upstream and downstream of the area of concern or before, during, and after the implementation of control practices. Development of an instream effectiveness monitoring program is site-specific and may include, where appropriate, partnerships between landowners and state and federal agencies. Both instream and upslope effectiveness monitoring can be as simple as photographic documentation. Photo-documentation would be especially useful to detect changes in riparian vegetation cover, instream aquatic plant abundance, etc., as it may affect light transmittance, hence, indirectly water temperature, provided that the photographs are adequate to represent and substantiate that the control practices are effective.

### ***9.1.3 Compliance and Trend Monitoring***

Compliance and trend monitoring is intended to determine, on a watershed scale, if water quality objectives are being met, if TMDLs are being met, and if beneficial uses are being protected from the adverse effects of one or more pollutants.

Different sources refer to this type of monitoring as either compliance monitoring or trend monitoring. For example, MacDonald et al. (1991, p.7) state that compliance monitoring is "...the monitoring used to determine whether specified water quality criteria are being met." The California Department of Forestry (CDF) and the Regional Water Boards across the State have developed general water quality monitoring conditions that use trend monitoring for monitoring typically applied at a watershed scale, focusing on the combined effects of all watershed management activities for multiple years. Examples of Trend Monitoring objectives include "... [determining] whether Basin Plan water quality standards are achieved and maintained over time (Fitzgerald 2004)." In reality, monitoring for compliance with water quality objectives, TMDLs, and beneficial uses will produce data that is useful for analyzing trends in water quality. Therefore, Regional Water Board staff calls this monitoring requirement "Compliance & Trend Monitoring."

The comprehensiveness of compliance monitoring will vary depending on the site, local conditions, land ownership patterns, and the extent of land management activities in an area. Regarding nutrients and oxygen-consuming constituents, for example, compliance monitoring may involve the use of seasonal grab sample monitoring, and dissolved oxygen measurements at hourly or sub-hourly intervals at select instream locations. Temperature monitoring, as mentioned above, may consist of relevant photo-documentation depicting changes, beneficial or otherwise, to riparian and/or instream vegetation components, grab sampling, periodic time-step recording using remote temperature data loggers, or other appropriate methods and approaches selected by the stakeholder and approved by the Regional Water Board's Executive Officer.

## **9.2 Monitoring Requirements**

Each of the above types of monitoring is important for determining the overall success of the TMDL Action Plan in achieving dissolved oxygen and temperature water quality standards. Therefore, monitoring shall be conducted upon the request of the Regional Water Board's Executive Officer in conjunction with existing and/or proposed human activities that will likely result in nutrient and oxygen-consuming constituent waste discharges and/or elevated water temperatures within the Shasta River watershed. Monitoring may involve implementation,

upslope-near stream effectiveness, instream effectiveness, and/or compliance and trend monitoring. The authority for such requirements is contained in Section 13267 of the California Water Code, which states that the Regional Water Board may require any discharger, suspected discharger, or future discharger to furnish monitoring program reports.

The Executive Officer will base the decision to require monitoring on site-specific conditions, the size and location of the discharger's ownership, and/or the type and intensity of land uses being conducted or proposed by the discharger. The decision will also be based on the control practices selected by the discharger. For example, if a discharger selects proven, established control practices, then instream effectiveness monitoring is less likely to be required. Conversely, if a discharger selects control practices that are not proven and are not known to provide protection against discharges, then there is a higher likelihood that instream effectiveness monitoring will be required. If monitoring is required, the Executive Officer may direct the stakeholder to develop a monitoring plan and may describe specific monitoring requirements to include in the plan. Such requirements may include:

- parameter(s) to monitor (e.g., nutrients such as ortho-phosphate, total phosphorus, ammonia, nitrite plus nitrate, total Kjeldahl nitrogen, as well as measures of oxygen-consuming constituents such as biochemical oxygen demand, chemical oxygen demand, and/or total organic carbon, water temperature, percent shade, etc.);
- procedure (e.g., visual observations, photo-documentation, grab samples, near-constant sampling, etc.);
- technique (e.g., sample upstream and downstream of areas of concern, sample before, during, and after the implementation of a control practice, etc.);
- location(s) (e.g., TMDL compliance monitoring points or tailwater return flow locations);
- frequency (i.e., how often will a sample be collected);
- duration (i.e., how long will the sampling occur);
- quality control and quality assurance protocols, and/or;
- reporting requirements.

### ***9.2.1 Monitoring Requirements Specific to Ranch Management Plans***

Implementation monitoring and upslope effectiveness monitoring will also likely be required of those landowners/stakeholders who are required to develop and implement a Ranch Management Plan as described in Chapter 8 Implementation, and upslope and/or near-stream effectiveness monitoring in such instances will generally involve photographic documentation over time (i.e., photo-point monitoring). Some examples where photo-point monitoring would be valuable include structural controls and management practices that exclude cattle and cattle wastes from watercourses, tailwater discharge sites, riparian vegetation conditions, bank stabilization projects, and stormwater control practices and facilities.

### ***9.2.2 Compliance and Trend Monitoring Requirements***

Compliance and trend monitoring is a valuable and necessary element of any strategy to restore and attain water quality standards. The data gathered from compliance and trend monitoring provides dischargers and the Regional Water Board with the information needed to determine if the requirements of the TMDL Action Plan are improving the quality and quantity of instream

salmonid habitat and, thus, if the TMDL Action Plan as a whole is effective at achieving water quality objectives, achieving the TMDLs, and protecting the beneficial uses.

In order to gather adequate instream monitoring data and draw valid conclusions, it is necessary for instream monitoring to be well planned for and thought out. Therefore, Regional Water Board staff shall develop a compliance and trend monitoring plan designed to provide feedback on the effectiveness of the TMDL Action Plan. The plan will likely include a detailed description of monitoring objectives, the parameters to be monitored, monitoring procedures and techniques, the locations of trend monitoring stations, monitoring frequency and duration, quality control and quality assurance protocols, benchmark conditions where available, measurable milestones, and specific due dates for monitoring and data analysis. Regional Water Board staff shall complete the monitoring plan within one year from the date that the U.S. EPA approves the TMDL Action Plan.

Due to the complexity and expense of compliance and trend monitoring, Regional Water Board staff shall attempt to work cooperatively with other agencies and organizations to develop the plan and conduct monitoring. In particular, Regional Water Board staff shall attempt to coordinate efforts with the Shasta Valley Resource Conservation District (SVRCD) and the Shasta River Coordinated Resources Management and Planning Committee (Shasta CRMP). The Shasta CRMP, as described in the Shasta Watershed Restoration Plan (Shasta CRMP 1997), is engaged in a pro-active monitoring effort designed to establish baseline information in the Shasta River watershed by describing current conditions both quantitatively and qualitatively so that restoration needs can be identified and projects prioritized.

<p><b>Schedule:</b> Within two year from the date that the US EPA approves the TMDL Action Plan, Regional Water Board staff shall complete a compliance and trend monitoring plan.</p>
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### ***9.2.3 Monitoring Requirements Specific to the U.S. Forest Service and U.S. Bureau of Land Management***

Monitoring requirements are specifically addressed and incorporated into the proposed Memorandum of Understanding for the U.S. Forest Service (Section 8.9.3) and U.S. Bureau of Land Management (Section 8.10). For both of these agencies, the requirements are primarily for implementation and upslope-near stream effectiveness monitoring.