

CHAPTER 10

MONITORING THE PRACTICES

This section addresses the need to evaluate the success of the manual's practices in protecting water quality, fish, and stream habitat. A practical approach is proposed to fit the realities of time, funds, and capabilities of County staff. Self-monitoring by the County is the most economical and effective in order to identify and rectify problems. The County Road Erosion Inventory of 2001-02 is one method being used of developing baseline information on existing and potential water



quality problem sources. Documentation of problems also needs to be shared with agencies responsible for protecting water quality and fish habitat. Manual review and updating procedures are also recommended in this chapter. Adaptive management is the term used to describe this process of learning from experience, or using the feedback from monitoring to change or add BMPs if needed.

The goal for this chapter is to document whether the BMPs in this manual:

- Prevent or minimize delivery of sediment and chemicals to streams
- Prevent or minimize the interruption of normal runoff into streams
- Protect aquatic and riparian habitat
- Restore access for fish movement at stream crossings

10-A **Documentation & Reporting**

10-B **Monitoring**

- 10-B-1 BMP Implementation Monitoring
- 10-B-2 BMP Effectiveness Monitoring
- 10-B-3 Photopoint Monitoring
- 10-B-4 Project Monitoring

10-C **Manual Review & Updating**

10-A DOCUMENTATION & REPORTING

Description: This section is about the documentation of water quality or stream habitat problems and any identified problems which are related, or possibly related, to county road maintenance practices or accidents. Results from selective self-monitoring of the implementation and effectiveness of BMPs (see: 10-B) can be summarized in a simple format.

1. Annual Report: Develop an annual report by January of each year to summarize the County's self-evaluation of the effectiveness of its road maintenance BMPs and this manual in protecting water quality and stream habitat. The intent is to provide a fairly simple process for documentation that can be used internally by the county and can be shared with the other counties and agencies (see (e) below) in the region. Suggested contents include the following items:

- a) Investigations of possible water quality and ESA-related problems from maintenance activities identified by County Road staff, other agencies, or members of the public. (See #2 below.)
- b) Modifications of, or improvements to, any Best Management Practices in this manual, including summaries of challenges or successes in applications.
- c) Compliance reviews, performance assessments, and the results of selective monitoring activities of maintenance actions.
- d) Investigations of illicit discharges to County rights of way or drainages.
- e) Overall summary of contacts and coordination with California Dept. of Fish and Game, National Marine Fisheries Service, and North Coast RWQCB on specific issues.
- f) Outline of future work & monitoring activities planned for the next year, in tables or spreadsheets.

2. Problem Review Documentation:

- a) Document any problems identified by County Road staff, agencies, or members of the public on impacts to water quality or stream habitat possibly caused by maintenance activities as a standard operating procedure. The documentation will include the basis of the perceived problem, results of the investigation, and resolution of issue, or recommendations.
 - Problems to be reviewed can represent a very wide spectrum of issues, ranging all the way from complaints with no factual basis to problems that result in significant changes in department operations.
- b) Develop an Environmental Problem Report Form (1 page) for Maintenance Practices. Maintain all reports in a file at the relevant District and Headquarters offices.

Description: Monitoring is a formal process for evaluating the effectiveness of the BMPs in this Maintenance Manual in protecting, maintaining, and enhancing water quality and stream habitat, particularly for listed salmon and steelhead. The intent of the process is to make adjustments to road maintenance practices as needed. However, it is not practical for the county to monitor every practice or every site.

Types and Purposes of Monitoring

Implementation Monitoring: This type of monitoring assesses whether the BMP activities recommended in this manual were carried out as planned. Typically this is carried out as an administrative review and does not involve any water quality or habitat measurements. The intent is to provide immediate feedback to the managers on whether the BMP process is being carried out as intended. However, the results cannot be linked back to water quality or aquatic habitat as none of these measurements are being made.

Effectiveness Monitoring: Effectiveness monitoring is used to evaluate whether the specified activities had the desired effect, specifically a particular BMP. Evaluating individual BMPs may require detailed and specialized measurements best made at the site of, or immediately adjacent to, the management practice. Effectiveness monitoring often occurs outside of the stream channel and riparian area, even though the objective of a particular practice is intended to protect the quality of the aquatic habitat. In contrast, monitoring the overall effectiveness of BMPs is usually done in the stream channel and it may be difficult to relate these measurements to the effectiveness of individual BMPs.

Project Monitoring: The impact of a particular activity or project, such as a culvert replacement, is assessed through this type of monitoring. Data are usually taken upstream and downstream of, or before and after, the particular project. Since such comparisons may partly evaluate the overall effectiveness of BMPs used to mitigate any environmental impacts associated with the project, project monitoring could be considered a type of effectiveness monitoring. Often project monitoring is required as a condition of grant funding for projects by state and federal agencies.

Policies:

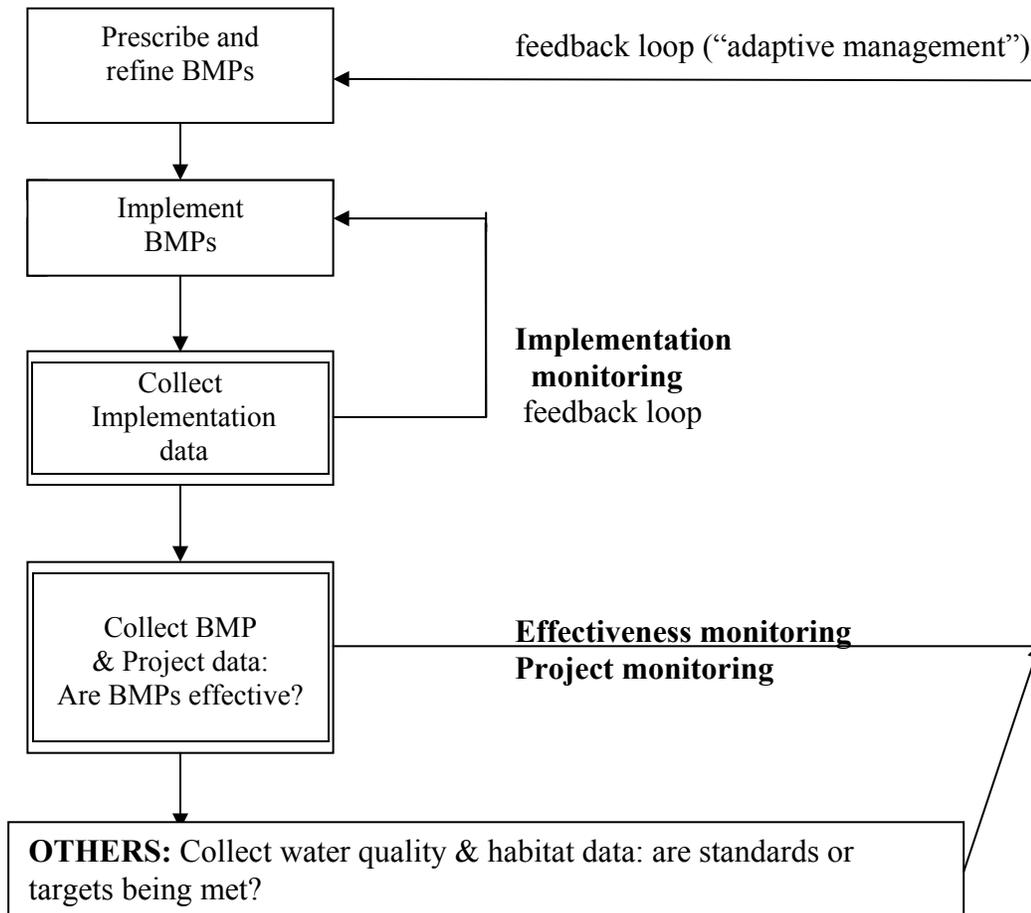
1. Monitor the Implementation and Effectiveness of the manual's Best Management Practices (BMPs) as needed in the course of developing necessary documentation, as well as responding to specific issues.
2. Commit to doing selective monitoring of county road maintenance activities related to this manual, depending upon available resources. An internal audit of road department activities by another county department is also an option.
3. Participate in inter-agency or partnership research programs, as appropriate, that monitor the effectiveness or impacts of the agency's maintenance activities on stream habitat or water quality. Share research results with others in the region.

10-B

MONITORING

- Continue to network with other counties, agencies, and municipalities about effective monitoring of non-point source pollution from roads that are similar to county roads.

Monitoring for Feedback by County Road Departments



Possible Sources of Instream Monitoring Data Collected by Others:

- Local Resource Conservation Districts (RCDs)
- Local watershed councils
- Local water districts and agencies
- California Dept. of Fish and Game (DFG)
- California Dept. of Water Resources (DWR)
- North Coast Regional Water Quality Control Board
- U.S. Forest Service / Bureau of Land Management (BLM)
- U.S. Fish & Wildlife Service

10-B-1 IMPLEMENTATION MONITORING

Description: This type of monitoring assesses whether the BMP activities recommended in this manual were carried out as planned. Typically it is carried out as an administrative review and does not involve any water quality or habitat measurements. Since it is not practical to measure every practice, practices are reviewed selectively.

Method:

Selective monitoring can be done in many ways, such as by selecting: 1) all practices on several dates; 2) all practices within a certain category (such as 5-A Spoil Disposal) over a period of time; 3) randomly selected practices within randomly selected categories on randomly selected dates; or 4) some other combination.

Potential data to be collected at an on-site review of selected BMPs include answers to the following:

A) Were each of the practices implemented as recommended in the manual? _____

Ratings to be used:

1 = Exceeds BMP recommendation

2 = Meets BMP recommendation

3 = Minor departure from BMP

4 = Major departure from BMP

NA = criteria not applicable at this site

B) List the possible reasons why the implementation departed from the BMP, and describe:

- Emergency conditions
- Safety concern
- Lack of adequate equipment or materials
- Lack of adequate personnel
- Lack of training
- Unaware of BMP
- BMP was not practical (list why _____)
- Off-site problem
- Other _____

C) Can any of the BMP procedures being implemented be improved? Please describe new or improved BMP procedures. (Attach additional comments or drawings as necessary)

10-B-2 EFFECTIVENESS MONITORING

Description: Effectiveness monitoring is used to evaluate whether the specified activities or a particular BMP had the desired effect, such as provide fish passage, or prevent erosion and sedimentation. Evaluating individual BMPs may require detailed and specialized measurements best made at the site of, or immediately adjacent to, the management practice. Some of this monitoring can be done by county staff, while some aspects may best be done by others specializing in field monitoring. It is assumed that routine instream monitoring will not usually be done by County road staff for the purposes of this manual, unless special funding and appropriate expertise are provided. The focus of BMP effectiveness will be on direct evaluation of upslope conditions and potential for water quality and habitat impairment. Instream data routinely collected by others will be sought and used as an indirect indicator of BMP effectiveness.

Baseline conditions for county roads in the region were evaluated for erosion and fish passage problems in 2000-02. These sites can be re-evaluated after projects are completed or other BMPs have taken place, as the baseline data are readily available.

Method:

Effectiveness monitoring can be done in many ways, such as by selecting: 1) all practices on several dates, such as before and during storms; 2) all practices within a certain category (such as 5-A Spoil Disposal) over a period of time; 3) randomly selected practices within randomly selected categories on randomly selected dates; or 4) some other combination. The Five Counties need to be able to compare the results of their separate BMP monitoring efforts. The two options described below are intended to help primarily answer the question, *“Is the potential reduced for sediment or chemical delivery to the streams due to road maintenance by the use of this BMP?”*

Option A:

- 1) Use County erosion (DIRT) inventory process, plus any sites previously missed, to systematically reevaluate selected high and medium priority sediment delivery sites after remedial work is done or BMP is implemented. Purpose would be to estimate the effectiveness of areas where BMPs have attempted to correct the identified problem. Comparisons would be made of estimated pre- and post-treatment sediment delivery rates. Include blank Data Inventory Sheet in Appendix. Road Managers should maintain a data inventory sheet for each site identified as a sediment delivery site in order to track current condition, replacement history, and effectiveness of implemented BMP at each site.
- 2) Use Culvert Inventory process by fishery biologist to systematically re-evaluate fish passage effectiveness following culvert replacement or improvement BMPs. “Did this culvert replacement or improvement BMP help provide adequate fish passage?”

Option B: Visual evaluations of the following problem indicators, if relevant to the BMP and the evaluation site, can be completed with minimal time and training. Use Photopoint Monitoring (10-B-3) to depict each of these estimates, where relevant.

1. Road surface

a. Rilling

- Little or no evidence

10-B-2 EFFECTIVENESS MONITORING

- Some present, but occur on < 10% of road length, or where present do not leave road surface
- >10% of surface length has rills 2" deep and 20' in length that continue off road surface

2. Road cuts or fills

a. Rilling

- No evidence
- Rills present but do not extend > slope length below toe
- Rills present and extend > slope length below toe

3. Sediment to channels

- No evidence of transport to watercourse or storm water drainage system
- Sediment deposited near but not in channel
- Sediment deposited in channel (estimate amount below)
 - <10 cu.yds.
 - 10-500 cu.yds.
 - 500-1,000 cu.yds.
 - 1,000-5,000 cu.yds.
 - >5,000 cu.yds.

4. Slope failures: A) Cut slope B) Fill slope C) Hillside

- Less than 10 cu.yd. of material moved
- More than or equal to 10 cu.yd. of material moved but not into channel
- More than or equal to 10 cu.yd. of material moved into channel

5. Debris

- No debris from project in channel or near watercourse
- Debris near watercourse but not in it
- Debris in watercourse or storm water drainage system

6. Road drainage – cross drains (not stream crossings)

a) Plugging

- No evidence of sediment or debris restricting flow
- Sediment and/or debris is accumulating, but <30% of inlet or outlet blocked
- Sediment and/or debris is blocking >30% of inlet or outlet

b) Scour at outlet

- No evidence of scour
- Scour evident, but does not extend >20' below outlet
- Scour evident > 20' below outlet

7. Stream crossing – Culvert

Stream is ___perennial ___intermittent ___ephemeral

a) Diversion potential

- Crossing is configured to pass flows without diversion if culvert fails
- If culvert fails, flow will be diverted out of channel and down roadway

10-B-2 EFFECTIVENESS MONITORING

b) **Plugging**

- No evidence of sediment or debris restricting flow
- Sediment and/or debris is accumulating, but <30% of inlet or outlet blocked
- Sediment and/or debris is blocking >30% of inlet or outlet

c) **Scour at outlet**

- No evidence of scour
- Scour evident, but extends less than 2 channel widths below outlet; and no undercutting of crossing fill
- Scour evident that extends more than 2 channel widths below outlet, or scour is undercutting crossing fill

8. **Evidence (or risk) of chemical/ hazardous discharge**

- No evidence of discharge outside bermed containment areas
- Evidence of discharge outside containment area has > 50' slope length to nearest channel, or to ditch that drains to a stream channel
- Evidence of discharge outside containment area and within 50' of a channel, or to a ditch that drains to a stream channel.

9. **Complaints by staff, other agencies, or public of practice**

- No verbal or written complaints
- Verbal or written complaints received

10. **Sediment removed from channel system [Name watershed: _____] due to County Maintenance operations:**

- a. Culvert cleaning
- b. Ditch cleaning
- c. Landslide clearing
- d. Other
 - < 10 cu. yds
 - 10-500 cu. yds.
 - 501-1,000 cu yds
 - 1,001-5,000 cu yds
 - > 5,000 cu yds

11. **[Other]**

If poor effectiveness is evident, comment on:

- 1) possible causes (e.g., site sensitivity, inadequate BMP, major storm event);
- 2) the degree and duration of effects on water quality or habitat

10-B-3 PHOTOPPOINT MONITORING

Description: Photopoint monitoring means taking a series of photographs from the same point. This method is especially recommended for monitoring sediment delivery because it captures a complete inventory or baseline through a quick and repeatable process. By documenting through successive photos, the implementation and effectiveness of sediment control measures can also be monitored. In addition, photopoints can be used to evaluate the effect of practices on riparian conditions and fish passage in culverts and under bridges.

Methods:

1. **Camera:** Either a 35 mm color or digital color camera is recommended. A digital camera is preferred for the ease of sharing and storing photos electronically. Use the same camera to the extent possible for each photo throughout the duration of the monitoring.
2. Permanently mark designated photopoint sites with a fence post, ground marker, or some other suitable object. The marker should be made of durable material that can withstand climatic conditions over a long period of time. Once markers are established, their locations and the dates of the photographs should be recorded on the form following. A Geographic Positioning System (GPS) unit may be helpful to identify location if the resolution of the equipment is within about 10 feet.
3. **Monitoring site location and map.** Include any general information about marker location on or near the road or facility on the description. Direction in which to photograph should be given by a compass heading from the photopoint. Any obvious landmarks should also be recorded, particularly “witness points” (a point from which a photopoint can be seen). Record the same type of information for the second and third photopoints if needed for the site. Space is provided on the form for notes about these locations. [SEE: “Sediment Delivery Photopoint Monitoring Record” form]
 - a) For stream sediment load or erosion monitoring, take pictures of these views:
 - i) Long views from bridge or other elevated position;
 - ii) Medium views of stream with a person for scale;
 - iii) Close views of streambed with ruler or other common object for scale;
 - iv) Time series: Views above and below BMP site during high runoff
4. **Photograph documentation.** Record detailed information on each photograph taken: date/time, photographer, photopoint number, camera/lens/film speed, film roll# /frame#, and other observations of details specific to that particular year or condition, such as changes in weather conditions and management practices. Storm events are opportune times to capture evidence of any erosion and sediment delivery problems. Effective photopoint monitoring requires consistency in taking photographs from year to year. Such consistency can be maintained by following these suggestions:
 - a) Use a date-back camera that records at least the date on the photograph. Be familiar with where the date is positioned so the date can be put in a darker area of the photograph.
 - b) When taking the photographs, carefully follow the information provided for each photopoint. This includes using a similar camera, lens, and film.
 - c) Take the photographs during the same season every year and at the same time of day.

10-B-3 PHOTOPPOINT MONITORING

- d) Use a staff gage to provide scale in the photograph. The gage should be at least 6 feet long and have 1-foot increments visibly marked. It can be made from PVC, wood, or other materials on hand.
5. **Document Storage.** Store the photographic record and photographs with other important records. Each successive year's photographs can be documented and filed with the appropriate record. Make sure digital photos are stored on both back-up disks and on hard copy.

For more information:

California Association of Resource Conservation Districts. 2001. Guidelines for Citizen Monitors. Wild on Watersheds Program. Sacramento. [Free @ (916)447-7237]

Lewis, D., Tate, K. and J. Harper. 2000. Sediment delivery inventory and monitoring: A method for water quality monitoring in rangeland watersheds. UC Cooperative Extension Publication 8014. California Rangelands Research and Information Center, U.C. Davis. [Free @ (530) 752-1720]

10-B-4 PROJECT MONITORING

Description: The impact of a particular activity or project, such as a culvert replacement, is assessed through this type of monitoring. Data are usually taken upstream and downstream of, or before and after, the particular project. Since such comparisons may partly evaluate the overall effectiveness of BMPs used to mitigate any environmental impacts associated with the project, project monitoring could be considered a type of effectiveness monitoring. Often project monitoring is required as a condition of state and federal grant funding for projects

Methods:

- 1) If a proposed project requires financing through outside grant funding, first check on the monitoring requirements of the granting agency to get a realistic estimate of what types of monitoring will be expected as a result of this grant.
- 2) Incorporate the cost of project monitoring into the total project budget estimate.
- 3) Before signing the project contract, be sure that the required monitoring tasks can be accomplished within the known budget and with the available expertise.
- 4) Implement the project monitoring requirements of the funding agency or agencies.
- 5) Document the before, during and after phases of the project through Photopoint Monitoring (see 10-B-3).
- 6) If a project includes a BMP or multiple BMPs in this manual, use the final monitoring report as one evaluation of the BMP's effectiveness. Share the results with the Five Counties' effort.

References:

California Dept. of Fish and Game. 2002. "Project Evaluation and Monitoring" In: California Salmonid Stream Habitat Restoration Manual. 4th Edition. Sacramento.
[\[//www.dfg.ca.gov/nafwb \]](http://www.dfg.ca.gov/nafwb)

10-C MANUAL REVIEW & UPDATING

Description: This County Road Maintenance Manual for Water Quality and Habitat Protection is a work-in-progress. As such, it will require periodic review and updating in order to keep it relevant, effective and practical for the users.

Methods:

1. Use the Maintenance Manager team meetings and the annual field visits to identify and announce any modifications to the Best Management Practices identified in this document. Present new technologies and design standards at the team meetings.
2. Evaluate at least every five (5) years the need to rewrite this manual. Base changes on the number of substantive changes needed and new technologies to be incorporated.
3. Continue the periodic Regional Meetings and the annual ‘Road, Salmon & Water Quality Workshop’ of the five northwestern counties to be forums for discussing and evaluating the progress and effectiveness of the practices within this manual.
4. Provide proposed changes to the permit-issuing agencies prior to incorporation.

Manual Evaluation Feedback Process

