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VERIFYING MANAGEMENT PRACTICE EFFECTIVENESS--MONITORING

A monitoring program is a critical component of the WQMP. The monitoring program assesses the success of the USFS in protecting and improving water quality, identifies program elements that can be made more effective through adaptive management (Chapter X), and evaluates trends in water-quality conditions resulting from natural and anthropogenic factors.

Objectives

The objectives of the monitoring program are:

1. Early detection of actual or potential water-quality problems associated with current management activities.
2. Documentation and correction of known deficiencies in BMP implementation.
3. Assessment of long-term (3 to 5 year) effectiveness of water-quality protection measures.
4. Evaluation of linkages between resource management activities, including BMP implementation and watershed restoration programs, and cumulative watershed effects.
5. Calibration of thresholds of concern for cumulative watershed effects analyses.
6. Evaluation of water-quality trends affecting beneficial uses in receiving waters downstream of forest management activities, including waters listed as impaired under section 303(d).
7. Assessments of water quality in relatively pristine reference streams for comparison with listed and potentially listed impaired waters.

Program Management

1. The monitoring program will be a regional program coordinated by the Regional Office and conducted by the national forest staffs.
2. Annual targets for all monitoring activities will be set by the Regional Office and communicated to the State and Regional Boards. Targets will be changed as necessary to reflect changes in priorities, funding, and staffing.
3. Funding to support monitoring will be allocated based on assigned targets.
4. Watershed staff will be used to conduct monitoring to the extent possible, but monitoring may also be conducted by other trained USFS personnel.
5. The USFS Regional Office will prepare a Quality Assurance Project Plan (QAPP) for the monitoring program within one year of adoption of this Water Quality Management Plan.
6. Relevant data provided by other agencies and organizations that meets QAPP criteria will be used as part of the monitoring program.

Monitoring Protocols

This plan will rely on existing well-documented monitoring methods. Hillslope monitoring for current management activities will use the Best Management Practice Evaluation Program

(BMPEP, U.S. Forest Service, Pacific Southwest Region, 2002) protocols. In-channel monitoring will follow Stream Condition Inventory (SCI, U.S. Forest Service, Pacific Southwest Region, 2005) protocols.

Incentive-Based Approach

The monitoring program will follow the incentive-based approach adopted by the North Coast Regional Board waiver approved on June 10, 2010. Under this incentive-based approach, each national forest will establish a network of baseline in-channel and hillslope monitoring sites at the watershed (5th field hydrologic unit) scale (described below). This network fulfills most monitoring requirements and eliminates the need for project-level monitoring within the monitored watersheds, with the exception of the BMP checklists described below. Projects in watersheds that do not have baseline monitoring sites will be required to conduct project-level monitoring (described below).

Baseline Hillslope and In-Channel Monitoring

A. Hillslope monitoring of current management activities and corrective actions

1. All projects will have BMP implementation monitoring using a “checklist” approach. BMP implementation checklists will document whether, and when, the site-specific BMPs specified in NEPA analyses were implemented. These checklists will be the primary systematic means for early detection of potential water-quality problems, and will be completed early enough to allow corrective actions to be taken, if needed, prior to any significant rainfall or snowmelt throughout the duration of the project. Checklists will need to be completed several times during the life of most projects, including prior to ground-disturbing activities, prior to winter periods, and at the completion of the project. Checklists will be developed by USFS watershed staff based on BMPs identified in NEPA documents. Checklists will be completed by USFS project staff (timber, range, recreation, engineering, etc.) and will be coordinated and reviewed by the Forest Hydrologists.
2. The BMPEP, with random site selection, will continue to be the primary means of assessing the effectiveness of water-quality protection for current projects on NFS lands at the hillslope scale. Random effectiveness monitoring for BMPEP protocols that have consistently scored 95% or higher for 5 consecutive years at the Regional level will be reduced to allow staff resources to be used for non-random BMP evaluations and in-channel monitoring.
3. National forests will conduct road patrols to the extent allowed by weather, safety, and road conditions during and after major storms to detect and correct road drainage problems that could affect water quality.

B. Retrospective hillslope monitoring of past management activities

1. Follow-up BMPEP monitoring for sites that were evaluated and rated as “not implemented” or “not effective” the previous year will be conducted to determine if corrective actions have been taken.

2. Sample pools will be developed annually for BMPs evaluated in the previous 3 to 5 years that were rated as effective, and sites will be selected randomly from this pool for retrospective BMPEP effectiveness evaluations.
3. Retrospective BMPEP evaluations will follow the standard BMPEP protocols. If protocols change between the time of the original evaluation and the retrospective evaluation, the current protocol will be used.
4. Results of retrospective monitoring will be compared to original BMPEP effectiveness scores to determine if BMPs remained effective over a period of 3 to 5 years.
5. The recurrence interval for the highest peak flow during the period between the original and retrospective evaluations will be estimated for the stream nearest the site of the evaluation. Recurrence interval estimates will be compared to long-term effectiveness in national forest and regional BMPEP reports.

C. Representative in-channel monitoring

The purpose of in-channel monitoring is to determine whether USFS BMPs and restoration activities collectively are effective in protecting and improving water quality at the watershed scale. Effectiveness will be assessed by monitoring trends in channel characteristics that affect beneficial uses and by comparing measures of central tendency for channel characteristics of streams downstream of actively managed areas with those in pristine or nearly pristine reference watersheds. Reference watersheds will be defined using the State Board Surface Water Ambient Monitoring Program (SWAMP) criteria (Ode, 2009). Actively managed watersheds are those that do not meet criteria for reference watersheds.

Representative in-channel monitoring sites will be selected for 5th field hydrologic units (watersheds), which are generally between 20 and 200 square miles in area. Each watershed in the baseline monitoring network will have one site representative of reference conditions and one site representative of actively managed conditions. Relating downstream channel changes to upstream activities is problematic in large watersheds (MacDonald and Coe, 2006), so monitoring sites will be located on relatively small headwaters streams (6th and 7th field hydrologic units). Monitoring sites will be selected to have similar valley segment and stream reach characteristics (Bisson and others, 2006).

1. Fixed long-term locations for SCI surveys will be selected by national forest aquatic specialists and Regional Office in cooperation with the State and Regional Board staffs. These locations will remain in the monitoring pool unless removed by consensus of the national forest, Regional Office, and Regional and State Boards.
2. SCI surveys will be conducted annually, with the goal of monitoring each 5th field watershed at least once every 5 years and as soon as possible following major (RI>10 year) floods. Roughly 20% of the watersheds will be surveyed each year, on average. Survey locations will be rotated among all 5th field watersheds within each 4th field sub-basin. For repeat surveys, the recurrence interval of the highest peak flow between consecutive surveys will be estimated and reported.
3. For watersheds 303(d) listed for water temperature, SCI water-temperature monitoring will be conducted for at least one full snow-free season. In addition, effective shade will be monitored using Solar Pathfinders.

Project-Level Monitoring for Projects in Watersheds without Baseline Monitoring

A. Hillslope monitoring of current management activities and corrective actions

1. All projects will have administrative BMP implementation monitoring using a “checklist” approach, as described above for baseline monitoring.
2. Projects in watersheds without baseline monitoring will be included in sample pools for random annual BMPEP monitoring as described for baseline monitoring above.
3. Projects will have non-random BMPEP effectiveness monitoring for all high-risk activities. High-risk activities include road construction or reconstruction, stream crossings, grazing, and all activities within designated riparian buffers, including riparian reserves, riparian conservation areas, riparian habitat conservation areas, and streamside management zones.
4. Follow-up BMPEP monitoring for sites that were evaluated and rated as “not implemented” or “not effective” the previous year will be conducted to determine if corrective actions have been taken.

B. Project-level in-channel monitoring

1. SCI surveys will be made at the nearest suitable reach downstream of the project area before any ground-disturbing activities and after project completion.
2. For repeat surveys, the recurrence interval of the highest peak flow between consecutive surveys will be estimated and reported.
3. SCI survey results will be compared to BMPEP results to evaluate relations between BMP effectiveness and stream-channel responses.
4. For watersheds 303(d) listed for water temperature, SCI water-temperature monitoring will be conducted for at least one full snow-free season. In addition, effective shade will be monitored using Solar Pathfinders.

Reporting

All monitoring results will be reported annually by each national forest to the appropriate Regional Board(s). A summary of results for all national forests in the Pacific Southwest Region will be provided to the State Board annually. Detailed reports summarizing results, including hydrologic conditions, will be prepared and provided to the State Board at intervals of 3 to 5 years.

References

Bisson, P.A., Buffington, J.M., and Montgomery, D.R., 2006, Valley segments, stream reaches, and channel units: Chapter 2 in Methods in Stream Ecology, Elsevier Publishing, p. 23-49.

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MacDonald, L.H., and Coe, D., 2006, Influence of headwater streams on downstream reaches in forested areas: *Forest Science* 53(2):148-168.

Ode, P. 2009. Recommendations for the development and maintenance of a reference condition management program (RCMP) to support biological assessment of California's wadeable streams. Report to the State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP), SWAMP Aquatic Bioassessment Laboratory/ Water Pollution Control Laboratory California Department of Fish and Game

USDA Forest Service, 2002, Investigating water quality in the Pacific Southwest Region, Best Management Practices Evaluation Program: A User's Guide: USDA Forest Service, Pacific Southwest Region, Vallejo, California.