Best Management Practices (BMP) Implementation Monitoring Keys to Success and Pitfalls to Avoid

Julianne Thompson
Tongass National Forest, Petersburg, Alaska

Jenny Fryxell
T.E.A.M.S. (a Forest Service Enterprise Unit), Driggs, Idaho

Implementation Monitoring determines whether Best Management Practices (BMP), mitigation measures, and standards and guidelines were applied to a project as planned. The Clean Water Act, Forest Plans, the National Environmental Policy Act (NEPA), and the Forest Service Soil and Water Conservation Handbook provide the legal framework and guidance for Implementation Monitoring. Since the early 1990s, BMPs have been an integral part of the NEPA process. NEPA decisions rely heavily on stated and implied assumptions of BMP implementation and their effectiveness in achieving the goals of state water quality standards. Implementation Monitoring tracks whether or not a given practice was successfully applied from project planning through completion, and when or where in the process implementation may have failed. Conclusions are carried directly into accountable actions, creating a feedback loop to improve procedures if necessary. An interdisciplinary monitoring approach fosters trust, respect and communication between specialists and project administrators. The feedback loop works best when an interdisciplinary team evaluates a project that they planned, and when local line officers convey tangible support for the process. At a minimum, participants should include watershed specialists and project administrators. It is not an accusatory process and must focus on maintaining meaningful feedback. Excessive focus on numeric ratings may sabotage the feedback loop. A database with querying capabilities aids efficient reporting of results. The implications of effectiveness monitoring results depend on whether the BMP was implemented successfully. Tracking BMP implementation, and subsequently effectiveness, is fundamental to our credibility as land and water stewards.

Keywords: *Best Management Practices, BMPs, water quality, watershed management, monitoring programs, interdisciplinary, hydrology/water*

Introduction

The authors have spent a combined total of 18 years on the Tongass National Forest, Alaska, meeting the challenges of conducting reliable and repeatable Best Management Practices (BMP) Implementation Monitoring surveys. Our objective in giving an oral presentation at the San Diego meeting of 18-21 October 2004 was to share with others the keys to success that worked well for us, as well as defining pitfalls to avoid when developing or conducting a BMP Implementation Monitoring program.

M Furniss, C Clifton, and K Ronnenberg, eds., 2007. *Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA, 18-22 October 2004*, PNW-GTR-689, Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Discussion

A Best Management Practice, or BMP, is defined by 40 CFR 130 as a practice, or combination of practices, that have been determined to be most effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals. The Forest Service Handbook (FSH) 2509.22 defines BMP Implementation Monitoring as determining whether necessary BMPs were actually applied to an activity as planned. Put more simply and plainly, we can ask the question "Did we do what we said we would do?" Watershed specialists may be challenged, as we have been, to explain why BMP Implementation Monitoring is needed. Current direction and support for BMP Implementation Monitoring occurs at the national, regional, state, forest, and project levels, and includes:

- the Clean Water Act [As amended through P.L. 107-303, 27 November 2002]

- the National Forest Management Act [1976]
- National Environmental Policy Act [1970]
- the EPA Water Quality Standards Handbook [(EPA-823-B-94-005) August 1994]
- the USFS Soil and Water Conservation Handbook [FSH 2509.22, See *http://fsweb.r10.fs.fed.us/directives/fsh/2509.22/*]
- state Non-point Source Pollution Control Strategies or Programs, as developed by individual states
- Memoranda of Understanding (MOUs) between the USFS and states
- Forest Plans, Environmental Analysis (EAs), Environmental Impact Statements (EISs), and Cumulative Effects (CE) documents

How do we do we conduct BMP Implementation Monitoring in such a manner that we expedite getting the job done; document that we did it; and create and maintain the documentation that we implemented the BMP as we said we would? Based on our experiences in developing the Implementation Monitoring process on the Tongass National Forest, we suggest eight important steps:

1. Ensure that Line and Staff support is in place.
2. Incorporate interdisciplinary input into the monitoring process.
3. Field test data collection form(s) and review for database management and analysis requirements.
4. Present the process to Line and Staff Officers.
5. Revise process and forms if needed after management review.
6. Select database managers; design and develop database considering intended uses of data.
7. Randomly select project(s) for monitoring; do the pre-work (project documents); conduct monitoring in an interdisciplinary group setting.
8. Enter data queries as needed to generate monitoring report(s).

Staff and Line support is critical to ensuring that the Implementation Monitoring process is initiated and maintained. Their support may encourage reluctant participants to be involved more constructively. The design of land management activities should never occur without interdisciplinary input, and conducting BMP Implementation Monitoring is no different. Without interdisciplinary input, the "feedback loop," which allows all of us to change how we do business, would be compromised from the start of the monitoring process. Field-testing of data forms and databases helps users to figure out what formats will be most efficient, effective, and accurate for recording information, data entry, and querying.

As the BMP monitoring process and forms evolve, review the progress in BMP implementation that is being made with management. Ensure that management's data information needs are being met. If input is received from management, or from other resource representatives, it is important to be flexible and willing to revise the forms and process as needed. This will help ensure that the process is useful, functional, and applicable to a variety of information needs. Once the data forms have been finalized, it is important to take the time to make sure that the design of the database is well thought out. Database entry screens should be the same as the data entry forms, to maximize efficiency of data entry.

The random selection of monitoring sites ensures equal treatment of projects. A quick and easy way to do this is to consecutively number all units, then use a random numbers table for selections.

Random review of data entry printouts should be conducted once data is entered. We suggest printing out 10-20% of the data to review for input errors by comparing to the original data entry forms.

The BMP Implementation Monitoring process starts with tracing the incorporation of BMPs in various project planning documents, long before they are implemented on the ground. As resource concerns are identified, they should be incorporated into field notes, planning documents, and contracts, all of which are completed prior to project implementation. During Implementation Monitoring, these documents form the basis for tracking the development of BMP recommendations from planning to on-the-ground project implementation. Before evaluating how well a BMP has been implemented on the ground, tracking its incorporation into planning documents and contract records should be completed.

The following example shows how BMP language may occur in NEPA documents:

> "Best Management Practices (BMPs) - Section 313 of the Clean Water Act and Executive Order 12088 require that Best Management Practices (BMPs) that are consistent with State Forest Practices and other applicable State Water Quality Regulations be used to mitigate the impacts of land disturbing activities. Site-specific application of these BMPs are designed with consideration of geology, land type, hydrology, soil type, erosion hazard, climate, cumulative effects, and other factors in order to protect and maintain soil, water, and water related beneficial uses. All appropriate Best Management Practices will be followed in the layout and harvesting of the selected units (USDA Forest Service 2004)."

Another example shows a more specific incorporation of a BMP into this EIS:

"Road 46631 - Site Specific Design Criteria, Erosion Control: An erosion control plan for construction and maintenance will be developed by the contractor and approved by the Contracting Officer (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 12.17, 14.8 [Alaska Region FSH 2509.22, see *http://fsweb.r10.fs.fed.us/directives/fsh/2509.22*, accessed May 2006])."

After BMP recommendations are made in the EIS, the next step is to incorporate them into the appropriate contract. The following example shows how the BMP is referenced as part of a road construction contract. Without this step, some BMPs cannot be tracked from planning to the project on the ground.

"Road construction shall be performed in accordance with all contract provisions and specifications as established in clause B 5.211. All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 14.8 E1). During road construction, minimize sediment input into streams. Excess and/or unsuitable material excavated during bridge/culvert construction shall not be placed on the slopes adjacent to the stream or in the stream channel (BMP 14.17)." (excerpt from Road Construction Contract 12-11-010-1545-12, Road 6420-5, Tongass National Forest)

At a minimum, watershed specialists and project administrators should be involved in the BMP monitoring process. They should confirm what is being successfully implemented as well as identify areas of concern. This includes developing action items that define what needs to be clarified, improved or developed, and identifying personnel who will be involved in resolving each action item. All of this should be accomplished while out in the field, including all relevant documentation, to ensure accurate communication of issues and to avoid surprises. Ensure that a cooperative feedback loop using the results of monitoring has been developed. This will help ensure that the information collected, and recommendations made, are actually used to improve future projects.

Collecting all the information that has been discussed above on a single-page form is a challenge. What is a good format to use? We suggest a form that documents the item(s) monitored, whether or not the BMP is applicable in that setting, to what degree implementation occurred, corrective actions needed as a result of a failure to implement a BMP correctly, and where in the process implementation failed (see Figure 1 for an example). A variety of forms are currently in use across the nation, and a standard format may be developed through the Washington Office.

A simple but effective visual demonstration of the importance of properly implemented BMPs can be seen by comparing the results of two culvert replacement projects shown in Figures 2a and 2b.

Figure 1: Example of BMP Implementation Monitoring Form.

Item Monitored	Applies	BMP Rating[1]	Corrective Action Needed?	Departure Occurred[2]	Comments
BMP 12.7/14.5/14.8 Measures to minimize surface erosion - Erosion Control Plan - Measures to limit sediment transport; ditch dams, sediment basins, silt fences - Seeding	yes	Not implemented	Clean ditches, culverts, and seed cut-slopes	Contract, Project Administration	

[1] BMP rating (rate after unit closure): Y (3, 4, or 5) = BMP fully implemented; D (2 or 1) = Departure from full BMP implementation; n (0) = BMP not implemented. Note: higher number designates a higher degree of implementation).

[2] Departure occured during Site Evaluation (SE), Environmental Analysis (EA), Contract (CT), Layout (LO), or Administration (AD).

Figure 2. (a) Successful implementation through timely seeding – Road 2645 on Mitkof Island. (b) No BMP implementation – the effects show, on Road 6549, Etolin Island. Both projects are on Tongass National Forest lands in southeast Alaska.

The following quote illustrates the need for BMP clarification and lack of compatibility with existing road specifications, as defined by an interdisciplinary Implementation Monitoring team.

"Contract enforcement of erosion control is inadequate due to the disparity between BMPs and road construction specifications. The road construction contract did not incorporate enforceable time erosion control requirements for seeding…road segments are routinely accepted as final without seed and seed may not be applied until the following year (BMP Implementation Monitoring Report, Tongass NF [USDA Forest Service 1992])."

After defining an accountable action item, and those who need to be involved to define a solution, the next step is for those people to work together. In the Tongass NF example, the interdisciplinary monitoring team worked together to resolve a discrepancy between the erosion control BMP and road specifications. They developed the corrective on-site actions for seeding, evaluated and documented what went wrong in getting the seed applied, and revised the seeding specification to ensure that the BMP was enforceable.

Accountable action items and the "feedback loop" go hand in hand. A review of BMP implementation can find things that were done well, along with areas needing improvement. Accountable actions recognize both situations. Documenting where in the process implementation failed will help direct what type of outcome from the feedback loop is most needed to alleviate future problems. Outcomes could include commendations, BMP or contract revisions, training needs, increased communication, and specialist presence in the field.

In relation to the Tongass program, three elements were essential to developing and maintaining the process, which is still being used on the forest.

1. Engage managers.
2. Keep the process local and include project administrators.
3. Encourage and reward interdisciplinary co-operation, interaction, and innovation.

Involve district personnel in monitoring their own projects; they can tell the story of the project on the ground best as they often have helped develop and implement projects selected for monitoring. By involving both the specialists and the project managers, immediate feedback regarding BMP recommendations, design, and implementation is facilitated. Encouragement and reward go a long way toward fostering cooperation, improving trust and interaction, breaking down the perception of others being "territorial" about their disciplines, and fostering innovative ways to deal with resource concerns on the ground.

We identified four common pitfalls to avoid in implementation monitoring:

1. "Gotcha!" attitudes and surprises. Don't undertake monitoring with a mean-spirited, punitive, or fault-finding attitude.
2. Focusing on numeric ratings at the expense of meaningful feedback.
3. An excess of self-congratulation.
4. Waiting until you are back in the office to agree on major findings and needed actions – decide while you are still in the field.

The monitoring process is subjective; resist the temptation to "fight" for a particular rating or result (the Tongass NF uses a 1-5 scale). Strive for concise rating definitions. Make every effort to achieve objective evaluations of how well practices are implemented. Balancing the acknowledgement of good work versus identification of where improvement is needed can be tricky. Excessive praise could mean that there is something to hide.

Agree early and explicitly in the process that discussions will be respectful and focus on building credibility and trust. Talk about the problems, concerns, and the successes, while on the ground.

First and foremost, an established Implementation Monitoring program allows us to demonstrate our track record and verify our assertions that we are credible stewards of the land. With a feedback loop created as an integral part of the monitoring process, we ensure that issues are documented and accountable actions (solutions) are defined. This is essential not only to improving BMP implementation, but also to improving how BMPs are designed and written. A well-designed database provides the ability to query data efficiently and share information with other forest staff and the public. Interdisciplinary participation results in improved communication and trust, and therefore fewer "dropped balls" and crises to handle.

Another benefit of an established Implementation Monitoring process is that the stage is set for effectiveness monitoring. Effectiveness monitoring tells us how well the BMP worked, but its implications may differ depending on whether or not the BMP was fully implemented.

Summary

There is substantial direction in place in federal and state regulations requiring BMP Implementation Monitoring. A well-established and repeatable implementation monitoring program sets the stage for effectiveness monitoring, and fosters interdisciplinary cooperation. Perhaps most importantly, BMP Implementation Monitoring is fundamental to our credibility as land and water stewards.

References

USDA Forest Service. 1992. 1992 BMP implementation monitoring report. Unpublished report. Petersburg, AK: USDA Forest Service, Tongass National Forest, Supervisor's Office.

USDA Forest Service. 2004. Three Mile timber harvest final Environmental Impact Statement. R10-MB-446b, Ketchikan, AK: Tongass National Forest.