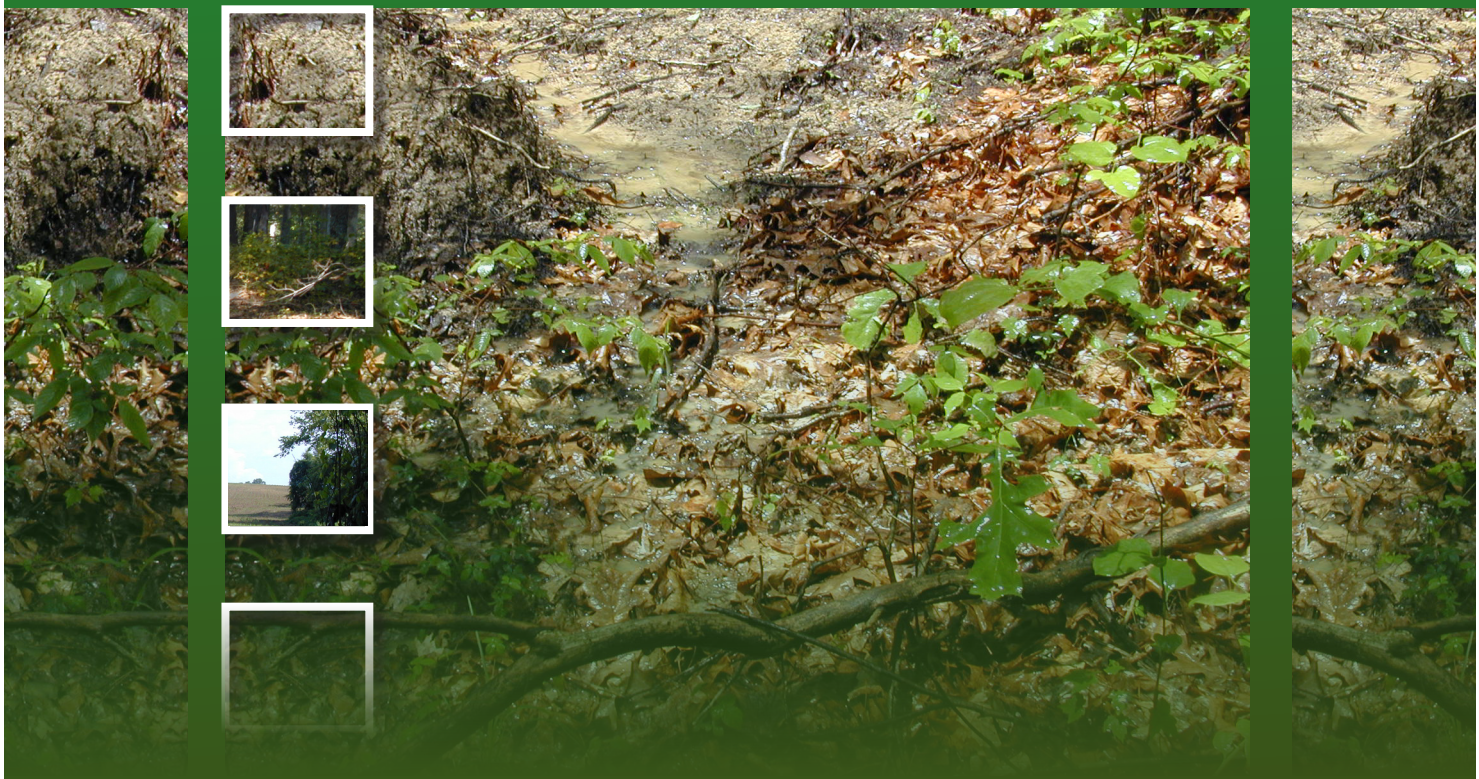
INDIANA DNR DIVISION OF FORESTRY

STATE FOREST PROPERTIES



1996 through 2008
Forestry Best Management Practices
Monitoring Results

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1996 through 2008 State Forest BMP Report

I. Executive Summary

Forestry BMP monitoring, as an internal audit by Division of Forestry (DoF) personnel of all timber harvests on State Forest properties, began Nov. 1, 2000. The timber harvests being monitored were sold starting July 1, 1999, when Forestry BMPs were first included on the timber sale contract and enforced. In reality, the BMPs had commonly been practiced before that date. The Statewide Forestry BMP program had previously conducted four rounds of monitoring. In those, state properties were monitored by teams that included DoF personnel, as well as private and industry people interested in forestry in the state. This report includes 234 timber harvests on State Forest properties that were monitored for forestry BMPs between Nov. 1, 1996, and Dec. 31, 2008, ranging in size from 1 to 248 acres.

The overall rates for forestry BMPs on State Forests since 1996 are 88.2% application and 94.2% effectiveness in protecting the soil and water quality of the sites monitored. This means that 88.2% of the practices were applied as directed in the BMP guidelines, and another 11.8% were minor departures, as defined in the monitoring sheet (Appendix B). There have been only 40 major departures, adding up to only 0.39% of all practices monitored. Of the 234 sites monitored on state properties, only one Application question scored a "Total Negligence." That aberration occurred at a site where eco-terrorists threw a 5-gallon can of gas into a wildlife pond and cut hydraulic lines on the large equipment near the same pond.

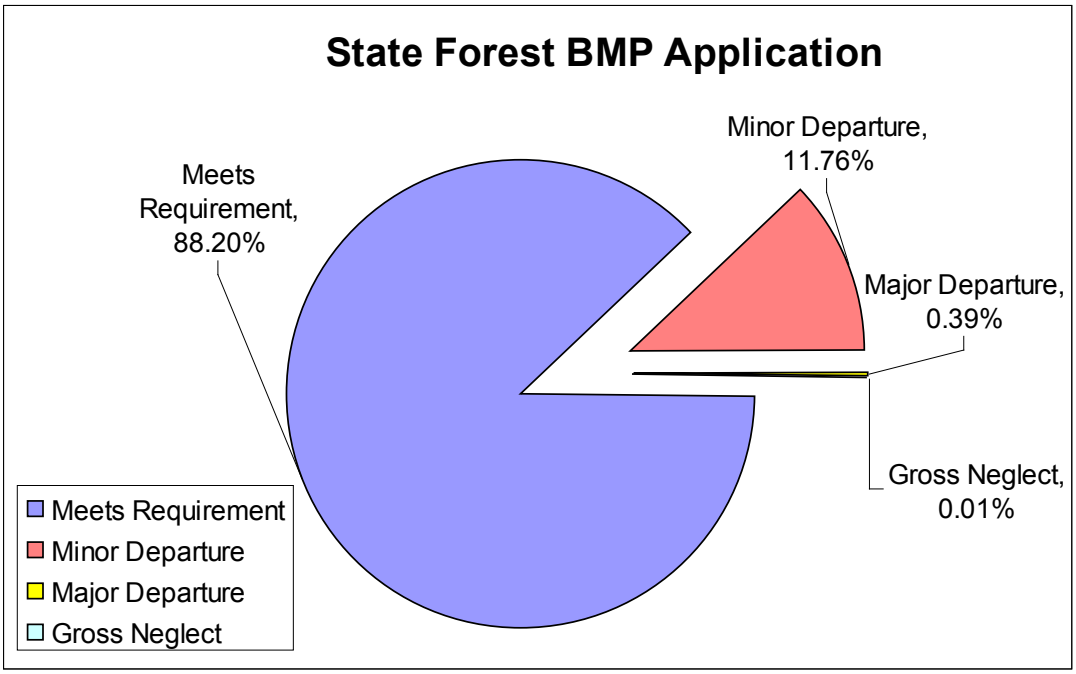

Figure 1: Overall State Forest BMP Application Percentages

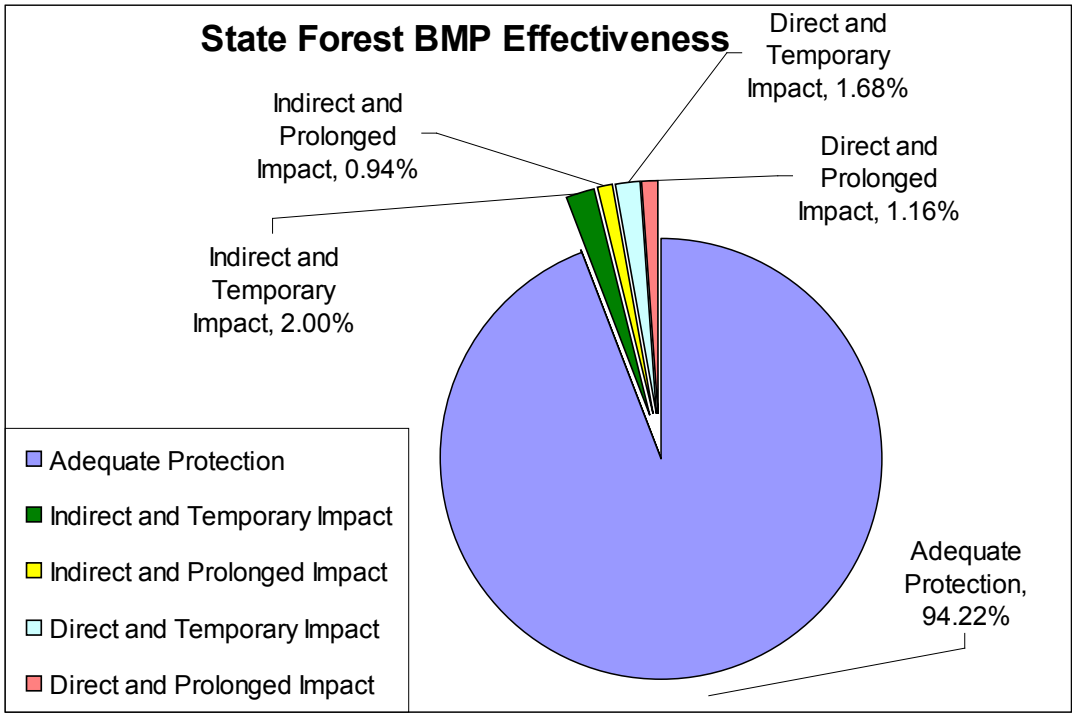

Figure 2: Overall State Forest BMP effectiveness percentages.

II. Introduction

Indiana contains 4.8 million acres of forestland that benefits all of Indiana's people and wildlife. The State Forest system owns only 3.2% or 153,878 acres of Indiana's forestland; however, this land is important to many Hoosiers who frequently use State Forest properties for various forms of recreation, including hiking, biking, hunting, fishing and wildlife watching. Since State Forest lands are important to the public, any harvesting there must be done in a way that minimizes environmental impact as much as possible. Although forests are known to be the best agent for reducing non-point source pollution (NPS) to waterways, they also can be a source of pollutants. When forest soils are bared, NPS pollution can occur. Forestry best management practices (BMPs) reduce or eliminate impacts that harvesting can have upon forest soils and water quality.

Forestry BMPs are a foundation for water-quality protection and are guidelines for safeguarding water quality during forestry operations. BMPs minimize the impact of forest activities that may affect soil and water quality. This report summarizes the application and effectiveness of BMPs for timber harvests conducted on State Forests properties since July 1998, when BMPs were officially placed in the contracts of all timber sales on state properties. This document reports on data that cover all the BMP monitoring on State Forest properties, examining time trends and making comparisons.

From July 1999 to winter 2003, BMP monitoring on State Forests was conducted with the Watershed Conservation (WC) Forester and/or the License Timber Buyer (LTB) Forester from the Special Programs Section of the Division of Forestry, the Administering Forester of the timber harvest being monitored, an Administering Forester from another property, and the Property Specialist who administered the timber harvest program. The Property Specialist stopped coordinating the monitoring as well as participating in the monitoring of sites late in 2003. In October 2004, the DoF started to change the monitoring system to

a sampling method, but was transitioning the system when a change in leadership halted the monitoring until new management was put in place, at which time 100% monitoring resumed. Currently, 100% of the timber harvests are monitored after they are completed, but the monitoring team consists of the LTB and the Administering Forester of the harvest being monitored.

BMP Monitoring is a site evaluation based on the Indiana Logging and Forestry Best Management Practices: BMP Field Guide (BMP Field Guide) and Indiana's Forestry BMP Monitoring Worksheet. Fifty-eight BMP specifications are evaluated under the five forestry operation categories: 1) forest access roads, 2) log landings, 3) skid trails, 4) stream crossings, and 5) riparian management zones. Each BMP specification is rated for application of the BMP and the effectiveness in protecting the water quality. Seven general questions are posed on the evaluation dealing with the root of the noted failures, successes and records of other land uses on the site that could affect water quality.

III. Methods

BMP Monitoring Objectives

The objectives of BMP monitoring are to: 1) assess the effectiveness of the BMP guidelines in minimizing soil erosion and stream sedimentation, 2) provide information on the extent of BMP implementation, past and current, 3) identify areas on which to focus future program training and educational efforts to improve BMP implementation and effectiveness, 4) identify BMP specifications that may need technical modification, and 5) identify improvements needed in future monitoring efforts.

B. Monitoring Team Selection

For State Forest properties, DoF tries to have the WC and LTB foresters come to every BMP monitoring; however, at many sites one or the other was absent for either personal or professional reasons, but the monitoring continued. This approach allowed for consistent monitoring and results without falling behind.

The other participants were the Administering Forester and an Administering Forester from another property, which balanced the team for input in the site evaluation of the monitoring and provided training and discussion opportunities.

From July 1999 until 2003, the coordination of monitoring dates and people was carried out by the Property Specialist, who also would attend the monitoring of every timber harvest. This practice was discontinued when administrative duties increased for that position and the coordination of monitoring was passed to the WC forester.

C. Site Selection

Every timber harvest conducted on State Forest property is monitored if the timber was sold after July 1999, unless the harvest occurred in order to change the land use. For example, Ferdinand State Forest had a site where the timber was harvested before the area was cleared for a pipeline right of way. That kind of land-use change makes it impossible to monitor forestry BMPs.

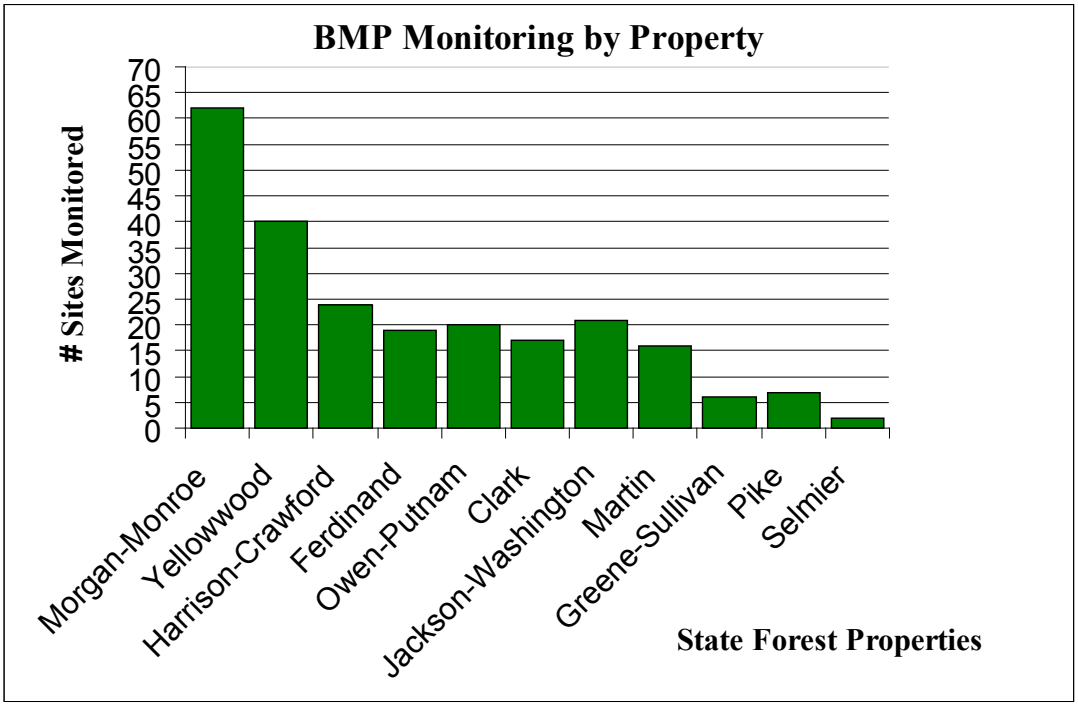

Figure 3: The number of harvests monitored at each property, with a total of 234 sites.

D. Monitoring Process

BMP monitoring is based on the evaluation of each specific practice for application and effectiveness. Application is the installation of a practice and the condition of the practice at the time of monitoring. Effectiveness is the level of success a practice has in preventing pollutants from entering a water body or the level of impact the pollutant has on the water body at the time of monitoring. It is possible to apply all BMPs properly and get a good score in application but still have soil entering a stream. That situation would call for a lower score in effectiveness. The opposite is possible as well.

The monitoring on State Forest properties follows the same format as all other forestry BMP monitoring in Indiana, except that the team of monitors is made up of people from similar backgrounds. On any monitoring day, the team meets at the forest office and then goes to the field to conduct the BMP monitoring on a harvest that is already completed and closed. The team walks each part of the harvest area covering all of the access roads, inspecting the log landings, skid trails, riparian management zones, and stream crossings, as suggested in the Indiana BMP Monitoring Protocol, and comments on successes and departures from the BMP guidelines. Also, the WC or the LTB forester walks all of the intermittent or larger streams in or adjacent to the timber harvest area.

Once on the site, the State Forest monitoring team walks the area and its adjacent and interior intermittent or larger streams while carrying maps of the site, the BMP monitoring form and the BMP Field Guide.

During this time, each team member does a separate evaluation of the BMPs for each. Once they have walked most of the area, the team members reunite at the vehicle or another gathering place and discuss each question on the BMP monitoring form until they reach consensus on each score.

On State Forest properties, the definition of intermittent streams focuses on streams that are 4 feet wide at the bed of the stream or marked as mapped intermittent streams on USGS quadrangle maps. This is done to more easily determine which streams need to be monitored for stream crossings and which need to have large woody debris, caused by the harvest, removed. For a better history and definition for streams that qualified as being 4 feet, see Appendix A.

IV. Results

A. Overall Application and Effectiveness

Of the 234 sites monitored there was an 88.2% application rate with a 94.2% effectiveness rate. This means the BMPs that were needed were correctly implemented 88.2% of the time and were effective at protecting water quality from NPS 94.2% of the time.

When looking at application, 88.2% of the questions were answered with a "1," which means that the practice met the BMP guidelines when needed. A "0" in application means that the practice was not needed on the site and was therefore not included in counting the percentage of application. A score of "2" or higher means there were departures from the BMP guidelines to some degree, and they would include the other 11.8% of all the application scores that were tallied.

When looking at effectiveness, 94.2% of the questions were answered with a "1," which means that there was adequate protection of the water resource by the BMP guidelines. An answer of "0" in application, means that the practice was not needed to protect water quality on the site and therefore was not included in counting the percentage of effectiveness. A score of "2" or higher means there was a visible impact to water quality to some degree, and that would be the other 5.8% of all the effectiveness scores that were tallied.

For more detailed definitions, see the FORESTRY BMP MONITORING WORKSHEET (Appendix B).

B. BMPs by Category

1. Access Roads

Access road BMPs were correctly applied 96.4% of the time. All of the access road BMP specifications employed had a 98.8% effectiveness rate.

Table 1: Application and Effectiveness of BMP Specifications for Access Roads

Access Roads	**% Application**	**% Effective**
A1. Uses existing routes where appropriate	100.0	100.0
A2. Adequate buffer strip next to water courses and sensitive areas	95.1	98.0
A3. Avoids unstable gullies, seeps, very poorly drained areas	94.9	100.0
A4. Road grades are within standards	97.7	100.0
A5. Amount of roads minimized	100.0	100.0
A6. Stream crossings minimized	100.0	100.0
A7. Road excavation minimized	98.6	100.0
A8. Excavated and fill materials placed properly	98.6	99.1
A9. Roads constructed to drain well	87.5	98.6
A10. Appropriate road stabilization, drainage and diversions installed	81.3	96.2
A11. Water diversions functioning properly	89.5	96.7
A12. Runoff diverted onto stable forest floor areas	90.0	93.8
A13. Public road drainage system maintained	99.5	100.0
A14. Public road's drainage maintained	100.0	100.0
A15. Traffic barriers installed	98.1	100.0
Overall Access Road	96.4	98.8

The only specification needing greater attention in the application phase is installation of drainage diversions and road stabilization. Although that area had only an 81.3% application rate, there was a 96.2% effectiveness rate indicating virtually no visible impact to water quality due to those departures. Many of the access roads are permanent fire trails or other roads that are used and maintained to varying degrees, thus some are more structurally stable while others have had the diversions worn down by use over long periods.

2. Log Landings

Log landing BMPs were correctly applied 91.1% of the time. All of the log landing BMP specifications employed were 99.1% effective at protecting the water resources of the site.

Table 2: Application and Effectiveness of the BMP Specifications for Log Landings

Log Landings	**% Application**	**% Effective**
Y1. Suitable number and size of landings	95.3	100.0
Y2. Landings located outside RMZ	95.6	99.6
Y3. Landings located on stable areas	96.1	100.0
Y4. Excavation of site minimized	94.8	100.0
Y5. Landings avoid concentrating or collecting runoff	78.9	97.8
Y6. Landing's runoff enters stable area	82.8	96.6
Y7. Proper water diversions in working order	86.6	98.2
Y8. Landing smoothed and soil stabilized	89.7	99.6
Y9. Landings free of fuel and lubricant spills and litter	91.8	99.1
Y10. Landing location suitable for equipment fueling and maintenance	98.7	100.0
Overall Log Landings	91.1	99.1

Correct drainage of landings was the main problem area in this category, with only a 78.9% application rate; however, the effectiveness rate for this specification was 97.8%. Therefore, even though some of the landings concentrated or collected runoff, this had little negative impact upon the water resources of these sites due to these application departures. There also are some departures, 82.8%, in runoff entering stable area; however, this seems to have minimal impact upon the water resources of the site with an effectiveness rate of 96.6%. An example of such a departure would be runoff from the landing going down a skid trail, an "unstable area," but the water being diverted onto stable areas by the water diversions on the skid trail.

3. Skid Trails

Skid trail BMPs were correctly applied 78.2% of the time. All of the skid trail BMP specifications employed were 89.9% effective at protecting the water resources of the sites.

Table 3: Application and Effectiveness of BMP Specifications for Skid Trails.

Skid Trails	% Application	% Effective
S1. Uses of existing routes were appropriate	98.7	99.6
S2. Adequate buffer strip next to water courses and sensitive areas	76.2	86.8
S3. Avoids steep and long straight grades (>20% for >200')	74.9	94.8
S4. Avoids unstable gullies, seeps, poorly drained areas	84.8	92.6
S5. Amount of skid trails minimized	81.4	94.4
S6. Trail excavation minimized	89.2	97.8
S7. Appropriate drainage and diversions installed	43.9	80.4
S8. Water diversions in working order	80.3	89.5
S9. Runoff diverted onto stable forest floor areas	63.2	72.4
S10. Streams not used as skid trails (except for crossings)	90.4	91.7
Overall Skid Trail	78.2	89.9

Skid trails often are in rough areas with limited options for diversion installation and often there is debate as to whether diversions are necessary, thus the 43.9% application rate, but there is still an 80.4% effectiveness rate. Runoff diverted onto the stable forest floor areas has 63.2% application and a 72.4% effectiveness rate, with 41 out of 63 (65%) departures indirect and temporary, 15 (24%) indirect and prolonged, and 7 (11%) direct and temporary—165 out of a total of 228 sites (72%) had diversions on skid trails but they had no negative effect on water quality.

4. Stream Crossings

Stream-crossing BMPs were correctly applied 82.5% of the time. All of the stream crossing BMP specifications employed were 84.5% effective at protecting the water resources of the sites.

Table 4: Application and Effectiveness of BMP Specifications for Stream Crossings

Stream Crossing	% Application	% Effective
X1. Number of crossings minimized	90.8	92.1
X2. Crossings minimize disturbance to the natural bed and banks	81.8	84.4
X3. Stream bank approaches properly designed and stabilized	67.5	75.3

X4. Water runoff diverted from road prior to crossing	60.5	61.8
X5. Crossing as close to 90 degrees as practicable	92.2	94.8
X6. Crossing does not unduly restrict water flow	85.7	88.3
X7. Soil has not been used as fill in the stream (except culverts)	87.0	87.0
X8. Ford constructed of non-erosive materials	96.9	95.4
X9. Fords have stable banks and stream beds	67.2	67.7
X10. Culverts are properly sized and installed	83.3	91.7
X11. Culverts clear of significant flow obstructions	91.7	100.0
X12. Temporary structures properly anchored	100.0	100.0
X13. Temporary structures and resulting obstructions removed	87.5	87.5
Overall Stream Crossing	82.5	84.5

Stream crossings are always dealing directly with water bodies; therefore, it is likely that if there is a departure, or if there are no departures, there can be some impact to the water quality, and it will always be a direct impact. The likely impacts of stream crossings often cause managers to avoid using them if possible. A result of this is shown by having only 76 sites (32.5%) that had at least one stream crossing, out of 234 sites monitored. A total of 37 sites (49%) with crossings had only one crossing, 13 sites (17%) had two crossings, nine sites (12%) had three crossings, one site (1%) had four crossings, two sites (3%) had five crossings, three sites (4%) had six crossings, one site (1%) had seven crossings, and one site had 13 crossings, for a total of 142 crossings on state properties over a 12-year period. There were eight sites for which the number of crossings and corresponding widths were not recorded.

Since stream crossings deal directly with intermittent streams, they are defined, on state properties, as streams that are 4 feet wide or wider. State properties often have stream crossings that, on other properties in the past, would have been classified as ephemeral crossings. A total of 41% of the stream crossings were on unmapped intermittent streams, which means they were classified as intermittent streams on the ground according to the 4-foot rule, but the USGS quadrangle maps did not map them as intermittent streams. There were 82 crossings (58%) on intermittent streams identified on the USGS maps. Two crossings (1%) were on perennial streams.

5. Riparian Management Zones

Riparian-management-zone (RMZ) BMPs were correctly applied 85.1 % of the time. All of the RMZ BMP specifications employed were 89.5% effective at protecting the water resources of the sites.

Table 5: Application and Effectiveness of BMP Specifications for Riparian Management Zones.

Riparian Management Zones	**% Application**	**% Effective**
Z2. Perennial and large intermittent streams clear of obstructing debris	63.5	66.5
Z3. Tree tops and cutoffs placed back from water course to prevent movement into streams during floods	90.1	95.5
Z4. RMZ free of excavated material and debris (other than above)	95.8	98.1
Z5. Less than 10% bare mineral soil exposed within RMZ (not including crossings)	98.1	99.1
Z6. Adequate tree stocking in primary RMZ next to perennial streams	97.8	97.8
Z7. RMZ free of roads and landings (except crossing)	72.8	92.1

Z8. Water diverted from roads before entering RMZ	88.6	93.4
Z9. Water diverted onto stable areas of the forest floor	89.2	92.2
Z10. Road and trail surfaces stabilized as needed within RMZ	94.0	94.6
Z11. Ephemeral channels free of excavated material	73.7	74.1
Overall Riparian Management Zones	85.1	89.5

Out of 234 sites, 213 had a water body of some type that had an RMZ. Of the 72 sites that had a departure in "streams clear of obstructing debris," one was indirect and temporary, six were direct and temporary, and 59 were direct and prolonged. The nature of the debris was prolonged unless it could be removed or mitigated in some way. Roads and landings in the RMZ scored lower in application with a 72.8%, but had 92.1% effectiveness. This suggests that although there were some roads and or landings located within the RMZ, they were well-planned and implemented and therefore had little impact on the water quality of the site. In "ephemeral channels free of excavated material" there were 59 departures in application, 44 of which were minor departures and four of which were major departures. There were 58 departures in effectiveness for this specification. A total of 31 departures had an indirect and temporary impact on soil and water quality, 26 indirect and temporary, and one direct and prolonged.

C. Yearly Monitoring Trends

All monitoring rounds on State Forest properties from 1996 to present were broken down to determine the overall application and effectiveness rates. Arranging the data in this manner can be helpful in determining the presence of any possible trends. In Figure 4 it is apparent that application and effectiveness rates are lower for all years after 1999. These lower numbers can be attributed to the change in the 4-foot rule that occurred at the beginning of the 2000 monitoring year, and that internal BMP monitoring of State Forest harvests was started that year. All monitoring before 2000 was completed by monitoring teams formed of people within and outside the DoF, who volunteered for BMP monitoring on different types of land ownerships. These rounds of monitoring are better explained in the reports Indiana Forestry Best Management Practices Report of Findings; 1996, 1997, 1999, 2000, 1996-2003, 1999-2004, 1999-2005 1999-2006, 1999-2007.

Table 6: Overall Application and Effectiveness of All BMP Monitoring Rounds.

Year	% Application rate	% Effectiveness rate	# sites (n)
1996	93.0	96.2	12
1997	93.5	95.8	7
1999	96.2	99.2	3
2000	87.1	94.6	15
2001	87.9	89.2	19
2002	89.6	94.6	25
2003	83.6	91.7	15
2004	83.5	92.2	20
2005	89.8	95.6	20
2006	92.6	96.0	25
2007	89.3	95.7	26
2008	84.0	92.9	47
Overall	88.2	94.2	234

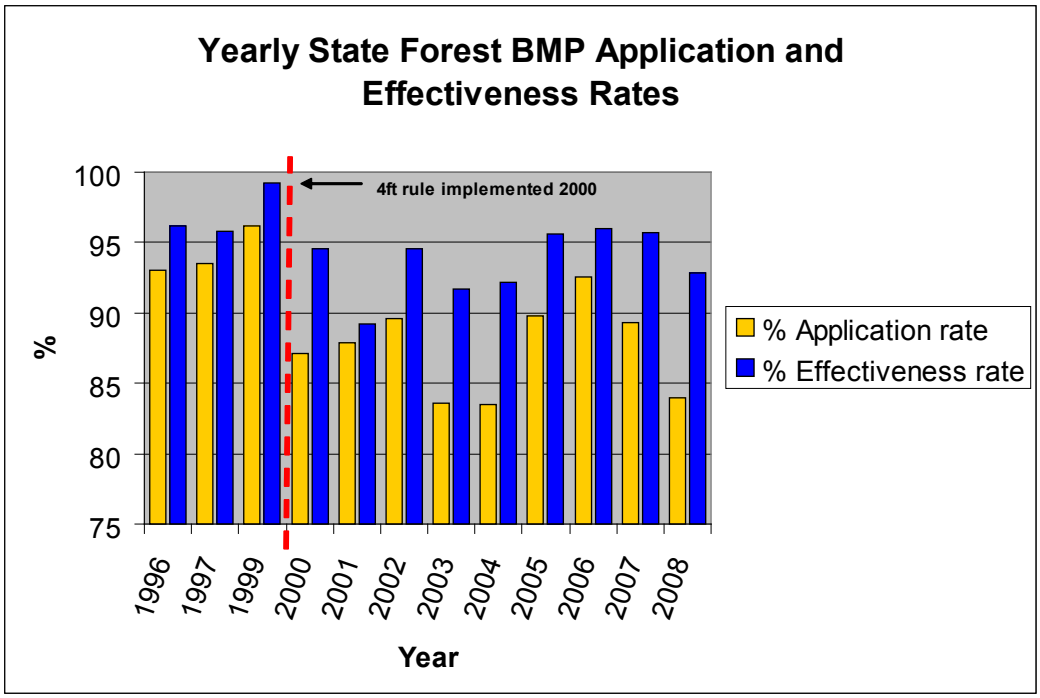

Figure 4: Overall Application and Effectiveness Rates for Each Year of BMP Monitoring Application and effectiveness rates were affected by implementing the 4-foot rule. (Appendix A).

V. Discussion

The overall BMP application rate was 88.2% at the time of this report. BMPs on State Forest properties also were found to be 94.2% effective at protecting water quality. As the time trends show, as BMP monitoring became internal to the DoF, the application rate dropped, not because application of BMPs on state properties dropped, but because the standard of BMPs on State Forest properties was being raised. The effectiveness scores have remained consistent over the years, which is evidence that BMPs were always practiced. Also, the implementation of the 4-foot rule tightened the restriction of tops in the stream on state properties, which is always a 4 or 5 in effectiveness, but is often mitigated by being cleaned out soon after the monitoring, unless there is another reason the Administrating Forester has for keeping the top in the stream. A typical reason for doing so might be for stream restoration or wildlife habitat. In an informal accounting, at least 92 sites have been mitigated; therefore, if a top was in the stream, most likely the top had since been removed.

In looking at the application rate, the 1s were at 88.2%; the 2s (minor departure) accounted for 11.8%; the 3s (major departures) accounted for 0.38%; and there was only one application score out of 10,293 with a score of 4 (total negligence). In that case, environmental activists cut hydraulic lines and threw a 5-gallon can of gas into a wildlife pond on Martin State Forest. In effectiveness, 94.2 % were in 1s, 2.0% in 2s (indirect and temporary impacts), 0.94% in 3s (indirect and prolonged), 1.7% in 4s (direct and temporary), and 1.2% in 5s (direct and prolonged). The high application and effectiveness scores show that many sound practices take place on State Forest timber harvest sites, and they result in few negative impacts to the soil and water resources. When problems occur in either application or effectiveness, they are mostly minor and short term.

BMPs in access roads and log landings had little to no effect upon water quality. Often the roads and landings are established where the concentration and amount of repeated traffic is assumed to be highest. Often, managers work hard to put such structures on the most stable areas outside RMZs (95.1% and 95.6% application, respectively). Sometimes site landform and characteristics force the roads to cross streams or be in a RMZ or force landings to be within a RMZ, in which case managers are more thoughtful and careful about how the harvest and closeout are carried out (98% and 99.6% effectiveness, respectively). The results of the monitoring show the above inferences to be true, with all of effectiveness scores in both categories above 95%.

A total of 78.2% of the application scores for skid trails were 1, but effectiveness scores of 1 accounted for 89.9%, showing a difficulty in implementing some practices within the guidelines, while affecting water quality, to some degree, only 10.1% of the time. Skid trails can have a spectrum of disturbance levels depending on the amount of times the equipment drives over a particular point on the ground. For instance, the main trail just off the landing has a higher disturbance level because all of the harvested logs have to be moved to the landing; an area that is traveled over only twice—once to get to access logs and the other pulling the logs out—has a much lower level of disturbance. Also, skid trails go to areas that other equipment cannot access, so they may cross drainages, travel down or across hill slopes, or go into areas that are wet most of the time; therefore, most of the application and effectiveness issues of a site come from skid trails. Also, most of the closeout practices are put in place with limited space, as landforms and adjacent vegetation often limit the equipment's ability to place structures where they would be most effective, which causes minor departures in application (21.7% of application scores are 2s) with little to no effect on water quality.

Stream crossings are difficult to use without affecting water quality. Stream crossings, by definition, cross some body of water, so any impact causes a 4 or 5 as an effectiveness score, if anything goes wrong. Because of this, the DoF avoids crossing streams, while retaining access to the site. Out of 234 sites, only 32.5% (76 sites) had stream crossings. On those 76 sites with crossings, there were a total of 142 crossings—82 on mapped intermittent streams, 58 on unmapped (4-foot rule) streams, and two on perennial streams. In the application of stream crossings, 82.5% of the practices fell within the guidelines, and scored 1 in effectiveness 84.5% of the time. As mentioned, stream crossings may directly affect impact, according to the definitions in the effectiveness scoring. For that reason, there are no scores of 2 or 3 in effectiveness, but only 10% of the effectiveness scores had a 4 (direct and temporary impacts) and only 5.5% had a 5 (direct and prolonged impacts). There was an average of 1.9 crossings for the 76 sites that had a crossing.

RMZs are much like stream crossings in that they are close to water bodies. If there is a problem, it often leads to direct impacts to water quality, so managers often try to avoid placing high-impact infrastructure like access roads or landings in RMZs, unless they already exist. The evidence is that 168 sites had at least one RMZ, and 117 of those sites had no roads or landings in them. Nine of these sites had no information on roads or landings within the RMZ. Of the 213 sites with at least 1 RMZ, there were no skid trails within the RMZ on 118 sites (74.1%). There were 55 sites that had skid trails within the RMZ. Of those 55 sites with skid trails within the RMZ, 39 (71%) had no impact to water quality, two sites (4%) had an indirect and temporary effect on water quality, one site (2%) had an indirect and prolonged effect, and 12 sites (22%) had a direct but temporary effect upon water quality. One site (2%) had a direct and prolonged effect on water quality.

VI. Recommendations

Concentrate on areas where problems are more common, such as skid trails, RMZs, and stream crossings. Continue to emphasize the importance of diverting water before it concentrates on roads, landings, skid trails and enters streams and RMZs. Continue providing BMP educational information and programs for loggers and resource professionals who work on state properties. If there is an area of concern on state properties, focus training on that area.

VII. Conclusions

The Indiana Forestry BMP Guidelines are scrutinized and enforced on State Forest properties more than on any other general landowner category in the state. When the internal inspections began, the application scores actually dropped because of the standards on the State Forest properties being raised by factors like the 4-foot rule. The trends in application over time indicate that they fluctuate in accordance with changes in the system or personnel; however, effectiveness in protecting water quality, the main goal of Indiana's forestry BMPs, has always been high and continues as such at the time of this report.

The State Forest system has a diverse usage. The DoF strives to ensure that all forest users have a minimal impact upon the other resources of the forests. Forestry BMPs minimize soil erosion from harvesting areas. Minimal soil erosion allows for quick recovery of the site because the topsoil is still in place to allow for natural succession. Limiting the amount of sedimentation to the water resources of the forest protects or restores water quality.

Appendix A

BMP Definition Clarification – 4-Foot Rule

Background

The BMP Field Guide states: "Remove felled tops and logging debris from the channels of perennial and large intermittent streams." On the BMP Monitor Sheet (expanded) the definition of the streams is further defined as "…wider than 6'…" The purpose is to identify a specified width **for monitoring purposes**, rather than using a vague descriptive term (e.g.,"large intermittent"). Note that BMPs are guidelines, not rules. In some instances, even a 6-foot width may not be "large." In other situations more narrow streams may be "large" from a hydrological standpoint. Foresters are expected to interpret local hydrology and make determinations on site when applying BMPs.

At the start of BMP monitoring on State Forests, the DoF decided to try to adhere to a tighter standard for streams on State Forests, hence the 4-foot standard for large intermittent streams. The goal was twofold—to demonstrate commitment to water quality and to both demonstrate and test a tighter standard.

Variable stream width was a problem early in this process, requiring clarification of the "stream width" term. Some streams would widen to more than 4 feet, then narrow to less than 4 feet. This made it difficult to find the last point upstream at which a stream was 4 feet wide. To meet the 4-foot rule, a stream had to be *consistently* 4 feet wide or wider. This adjustment solved some but not all concerns. Some stakeholders are concerned both about what debris needs to be removed and where a stream is considered to be 4-feet wide or wider.

The latest attempt to clarify the 4-foot rule follows. This clarification covers both the definition of the stream and of what debris is to be removed from that stream.

Removing Logging Debris from Streams—4-Foot Rule

To meet the BMP Field Guide guidelines for riparian zones that states "Remove felled tops and logging debris from the channels of perennial and large intermittent streams," the BMP Monitor Sheet has Item Z2, "Perennial & large intermittent streams clear of obstructing debris." On State Forests, all streams that are to meet this standard have a clearly defined bed with a width that equals or exceeds 4 feet.

The bed is the portion of the stream that is the lowest level where water commonly flows at typical levels (i.e., not storm levels). This location generally will be at the base of the banks and usually consists of aggregate or exposed alluvium. The bed is generally free of significant vegetation because of the regular scouring and water flows. An area with a strong, well-rooted vegetative component with a relatively stable soil surface is not considered stream bed. In streams where the channel is strewn with large rocks, the bed is the area of smaller gravel at the base of the large rocks.

A stream is considered 4 feet or wider when the bed, moving upstream, reaches the first point at which the stream-bed width drops below 4 feet for a lineal distance of 10 feet or more. Any portion of the drainage system upstream of this point is not subject to the debris-removal guidelines for large intermittent streams, and debris left in these portions of the drainage is not considered a departure during monitoring.

Downstream of the identified 4-foot-wide point, all logging debris, except as noted below, that will come in contact with the water when the stream is "bank full" and impede or divert stream flow, must be removed from the stream channel. Unattached, individual pieces of debris, less than 2 inches in diameter or less than 4 feet long, will not ordinarily impede flow and do not need to be removed. Debris that bridges the stream channel from top of bank to top of bank, does not impede flow, and is unlikely to fall into the stream channel within one year is not required to be removed. Debris less than 2 inches in diameter obstructing less than 20% of the stream channel does not need to be removed.

Debris should be removed in a manner that minimizes disturbance to stream banks. The recommended method of removal is pulling the material free of the channel using a cable skidder or other equipment that is kept back from the stream edges. Another option is cutting debris into smaller pieces that can either be removed from the channel or are altered so as to no longer impede flow. Equipment should not be used in the stream channel to push the material out of the channel. Careful marking of the trees to be harvested, use of directional felling, and clearly explaining the BMP requirements during the pre-harvest conference minimizes the amount of debris that must be removed from stream channels.

The point where the stream channel reaches the 4-foot width threshold should be clearly delineated in harvest areas. While upstream of this point is not considered subject to debris removal from streams, care should be taken to avoid excessive, intentional deposition of debris in all naturally occurring drainage features, regardless of size. Excessive piling (beyond felling) of debris in any drainage that severely impedes flow may be considered a departure.

Appendix B
FORESTRY BMP MONITORING WORKSHEET
(2000)

DATE INSPECTED:_____
TEAM:_____
OWNER:_____ PHONE:_____
_____
_____

COUNTY:_____Site #:_____ ACRES HARVEST-
ED:_____
CIVIL TWP:_____ USGS QUAD:_____
_____
SEC:_____TWP:_____ RANGE:_____
MAJOR WATERSHED:_____
DATE OF ACTIVITY:_____
HARVEST EQUIPMENT USED: Dozer:__ Skidder:__ Horses:__ Other:__
TYPE OF HARVEST: Diameter limit:__ Single Tree:__ Group Selection:__ Clear Cut:__ Other:__

SITE CONDITIONS

TERRAIN: BOTTOMLAND_____% RIDGES_____% SIDE SLOPES_____%
SLOPE STEEPNESS: (2-6%)_____ (6-12%)_____ (12-20%)_____ (20+%)_____
LAKES PRESENT: name:_____shore length:_____
PERENNIAL STREAMS PRESENT: name:_____width:_____length:_____
SINKHOLES PRESENT: Yes_____ No_____ FLOWING SPRINGS PRESENT: Yes_____
No_____
OPEN WATER WETLANDS PRESENT: Yes_____ No_____ .

FOR OFFICE USE – DO NOT COMPLETE

OPERATOR/FORESTER: (leave blank)_____

TYPE OF OWNERSHIP: nipf:__ clf:__ industry:__ state:__ fed:__ county:__ other:__

APPLICATION
0--The Practice Not Needed or Applied on Site
1--Operation Meets Requirement of BMP
2--Minor Departure from BMP
3--Major Departure from BMP
4--Gross Neglect of BMP

EFFECTIVENESS
1--Adequate Protection of Water Resources
2--Indirect and Temporary Impacts on Water Resources
3--Indirect and Prolonged Impacts on Water Resources
4--Direct and Temporary Impacts on Water Resources
5--Direct and Prolonged Impacts on Water Resources

APPLICATION DEFINITIONS (BY EXAMPLE)
MINOR DEPARTURE: Practice not clearly needed; attempted practice but poorly applied; small potential for soil to reach streams.
MAJOR DEPARTURE: Practice clearly needed; common departures from practice; large potential for soil to reach streams.
GROSS NEGLECT: No attempt at application; total disregard for water quality; large and direct impacts.

EFFECTIVENESS DEFINITIONS (BY EXAMPLE)
ADEQUATE: Small amount of material eroded; material does not reach drainages, streams, lakes or sinkhole openings.
INDIRECT IMPACT: Erosion and delivery of material to drainages (including ephemerals) but not to intermittent or perennial streams, lakes or sinkhole openings.
DIRECT IMPACT: Erosion and subsequent delivery of sediment to intermittent or perennial streams, lakes or sinkhole openings.
TEMPORARY IMPACT: Impacts lasting one year or less; no more than one runoff season; small amount of material involved.
PROLONGED IMPACT: Impacts lasting more than one year; large amount of material involved.

*It is possible to have a departure from BMPs and still have adequate protection.

ACCESS ROADS							APPLICATION (0-4)		
								EFFECTIVENESS (1-5)	
									COMMENTS
There is no access road present _____ (If true, do not answer questions below)									
A1. Uses existing routes where appropriate									
A2. Adequate buffer strip next to water courses and sensitive areas									
A3. Avoids unstable gullies, seeps, very poorly drained areas									
A4. Road grades are within standards									
A5. Amount of roads minimized									
A6. Stream crossings minimized									
A7. Road excavation minimized									
A8. Excavated and fill materials placed appropriately									
A9. Roads constructed to drain well									
A10. Appropriate road stabilization, drainage & diversions installed									
X=applied	**water bars_____ dips/rolls_____ outslopes_____ berms cut_____ culverts____ geotextile____ rock____ seed____ mulch____**								
A11. Water diversions are in working order (_____% working) **Failure due to: installation, damage, location, timing, weather, other**									
A12. Runoff diverted onto stable forest floor areas									
A13. Mud kept off public roadways									
A14. Public road drainage system maintained									
A15. Appropriate traffic barriers installed									

APPLICATION
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LOG LANDINGS									
							APPLICATION (0-4)		
								EFFECTIVENESS (1-5)	
									COMMENTS
Y1. Suitable number and size of landings									
Y2. Landings located outside RMZ									
Y3. Landings located on stable areas									
Y4. Excavation of site minimized									
Y5. Landings avoid concentrating or collecting runoff									
Y6. Landing's runoff enters stable area									
Y7. Proper water diversions in working order									
Y8. Landing smoothed and soil stabilized									
Y9. Landings free of fuel and lubricant spills and litter									
Y10. Landing location suitable for equipment fueling and maintenance									
Number of log landings _____ Size: (acres) _____									

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SKID TRAILS								
						APPLICATION (0-4)		
							EFFECTIVENESS (1-5)	
								COMMENTS
S1. Uses existing routes where appropriate								
S2. Adequate buffer strip next to water courses & sensitive areas								
S3. Avoids steep and long straight grades (>20% for >200')								
S4. Avoids unstable gullies, seeps, poorly drained areas								
S5. Amount of skid trails minimized								
S6. Trail excavation minimized								
S7. Appropriate drainage and diversions installed								
X= applied	water bars____ outslopes____ dips/rolls____ berms cut____ culverts____ seed____ mulch____ rock____ other____							
S8. Water diversions in working order (_____% working) Failure due to: installation, damage, location, timing, weather, other								
S9. Runoff diverted onto stable forest floor areas								
S10. Streams not used as skid trails (except crossings)								
Types of streams involved and length of disturbance: perennial_____ , mapped intermittent_____. Unmapped intermittent_____ , ephemeral_____.								

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STREAM CROSSINGS					
			APPLICATION (0-4)		
				EFFECTIVENESS (1-5)	
					COMMENTS
X1. Number of crossings minimized					
X2. Crossings minimize disturbance to the natural bed & banks					
X3. Stream bank approaches properly designed and stabilized					
X4. Water runoff diverted from road prior to crossing					
X5. Crossing as close to 90 degree angle as practicable					
X6. Crossing does not unduly restrict water flow					
X7. Soil has not been used as fill in the stream (except culverts)					
X8. Ford constructed of non erosive materials that will not degrade water quality					
X9. Fords have stable banks and streambed					
X10. Culverts are properly sized and installed					
X11. Culverts clear of significant flow obstructions					
X12. Temporary structures properly anchored					
X13. Temporary structures and resulting obstructions removed					
Number of perennial crossings_____ widths_____. **Number of intermittent crossings_____ widths_____ Number of unmapped intermittents_____ widths_____.**					

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RIPARIAN MANAGEMENT ZONES			
	APPLICATION (0-4)		
		EFFECTIVENESS (1-5)	
			COMMENTS
Z1. RMZ present on this site include: _____ lakes, _____ rivers, _____ perennial streams, _____ intermittent streams, _____ sinkhole openings (specify), _____ open water wetlands, _____ unmapped intermittent streams			
Z2. Perennial & large intermittent streams clear of obstructing logging debris			
Z3. Logging debris placed back from water course to prevent movement into streams during floods			
Z4. RMZ free of piled slash, debris and fill			
Z5. Less than 10% bare mineral soil scattered within RMZ - not including crossing			
Z6. Adequate tree stocking in primary RMZ next to perennial streams			
Z7. RMZ free of roads and landings (except crossings) Were roads pre-existing? _____			
Z8. Water diverted from roads before entering RMZ			
Z9. Water diverted onto stable areas of the forest floor			
Z10. Road and trail surfaces stabilized as needed within RMZ			
Z11. Ephemeral channels free of excavated material			

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SUPPLEMENTAL QUESTIONS AND SUMMARY

1) What went right on this site? (Summarize highlights.)

2) What went wrong on this site? (Summarize problems.)

3) Have other activities occurred on this site that potentially impact water quality? (e.g,. ATV use, other vehicle traffic, grazing, etc.) If so, please explain.

4) Were traffic barriers in place to prevent trespass damage? _____.
What kind of trespass damage was observed?

5) Are there mitigating activities that should take place on this site or is corrective action already being taken?

6) -Has the sale administrator received BMP training? Yes_____ No_____Unknown_____
- Has the operator (logger) received BMP training? Yes_____ No_____Unknown_____
- Was the sale administered by a forester? Yes_____ No_____Unknown_____
- Is the landowner aware of BMPs? Yes_____ No_____Unknown_____

7) Give this site an overall rating of 1-8 combining application of BMPs with impact to water quality.

Rate this site from 1-4 for the overall application of BMPs _____
1=above average 2=average 3=poor 4=total negligence

Rate this site from 1-4 for its overall impact to water quality _____
1= no visible impact 2=slight 3=moderate 4=severe

SITE RATING _____/2=_____

Note: These numbers do no necessarily need to directly reflect the worksheet ratings for application or effectiveness.

Field Guide Cross Reference

On this page is each question in the monitoring sheet and the corresponding pages on the subject in the BMP Field Guide.

ACCESS Roads == Section II, pages 8-16

A1 == pages 4, 8, 10
A2 == pages 8, 9, 12, Section V page 32, 33, Table 4 page 34, 35
A3 == page 8
A4 == page 8
A5 == page 10
A6 == page 8 and Section IV page 24 – 30
A7 == pages 8, 10
A8 == pages 10, 12, 24, 29
A9 == pages 8, 10, Table 1 page 11, 12
A10 = pages 8, 10 Table 1 page 11, 12, 14, 15, Table 2 page 21, 22
X=Applied == (waterbars, pages 21-22), (dips/rolls, pages 21-22), (outslopes, Glossary), (berms cut, Glossary),(culverts, pages 27-28), (geotextile, Glossary), (rock, page 10), (seed, Appendix A), (mulch, Appendix A).
A11 = pages 14, 15, Table 1 page 11, 18, Table 2 page 21
A12 = page 10
A13 = pages 13, 14
A14 = page 14

LOG LANDINGS == Section IV, pages 36-40

Y1 == pages 36, 39
Y2 == Table 4 page 34, 36
Y3 == page 36
Y4 == page 38
Y5 == pages 36, 38-40
Y6 == pages 38-40
Y7 == pages 38-40
Y8 == pages 38-40
Y9 == pages 39, 40
Y10 = page 39

SKID TRAILS == Section III, pages 18-22

S1 == pages 4, 18
S2 == pages 18, 20, Section V pages 32-35
S3 == page 18
S4 == page 18
S5 == page 18
S6 == page 18
S7 == Table 1 page 11, pages 18-20, Table 2 page 21, 22, 27, 28

X=Applied == (waterbars, pages 21-22), (dips/rolls, pages 21-22), (outslopes, Glossary), (berms cut, Glossary),(culverts, pages 27-28), (geotextile, Glossary), (rock, page 10), (seed, Appendix A), (mulch, Appendix A).

S8 == Table 1 page 11, pages 14, 15, 20 Table 2 page 21
S9 == page 20
S10 = pages 18-20, Section IV pages 24-30
Types of Streams == page 24, Glossary, and Section V pages 32-35

STREAM CROSSINGS == Section IV, pages 24-30

X1 == page 24
X2 == page 24
X3 == pages 24, 25
X4 == pages 24, 25
X5 == page 24
X6 == pages 24-26, 28
X7 == pages 24, 29
X8 == pages 24, 29
X9 == pages 24, 25, 29
X10 = pages 25, 27, Table 3 page 28
X11 = pages 24, 27, 28
X12 = pages 25, 26
X13 = pages 25-29

RIPARIAN MANAGEMENT ZONES == Section V, pages 32-35

Z1 == pages 32, 34, Glossary
Z2 == page 33
Z3 == pages 32-34
Z4 == pages 32-34
Z5 == pages 32-34
Z6 == pages 32-34
Z7 == pages 32, 34
Z8 == pages 33, 34
Z9 == pages 32-34
Z10 = pages 33, 34
Z11 = page 35