Indiana DNR Division of Forestry

Classified Forest & Wildlands

1997 through 2011

Forestry Best Management Practices Monitoring Results

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1996 through 2011
Classified Forest & Wildlands BMP Report

I. Executive Summary

The purpose of this report is to quantify the application and effectiveness of forestry BMPs on Classified Forest and Wildland (CFW) sites, based upon guidelines laid out in the Indiana Forestry BMP Field Guide. This report includes 157 CFW timber harvests monitored for Forestry Best Management Practices (BMPs) between November 1996 and December 2011 ranging in size from 2.4 to 785 acres.

85.90% of the Forestry BMPs were applied as directed in the BMP guidelines, 12.52% were minor as defined in the monitoring sheet (Appendix). There have been 93 major departures and they add up to 1.54% of all practices monitored. Of the total 157 sites monitored on CFW, 2 practices have scored "Total Negligence" for 0.03%.

Effectiveness rates are used to evaluate the success of the forestry BMPs applied to a site. The CFW effectiveness rate for the 157 sites monitored is 91.92%. Indirect and temporary impacts to water quality were found 2.14% of the time, indirect and prolonged impacts were found to occur 0.94% of the time, 2.88% of the time direct and temporary impacts occurred and there were 2.12% direct and prolonged impacts to water quality.

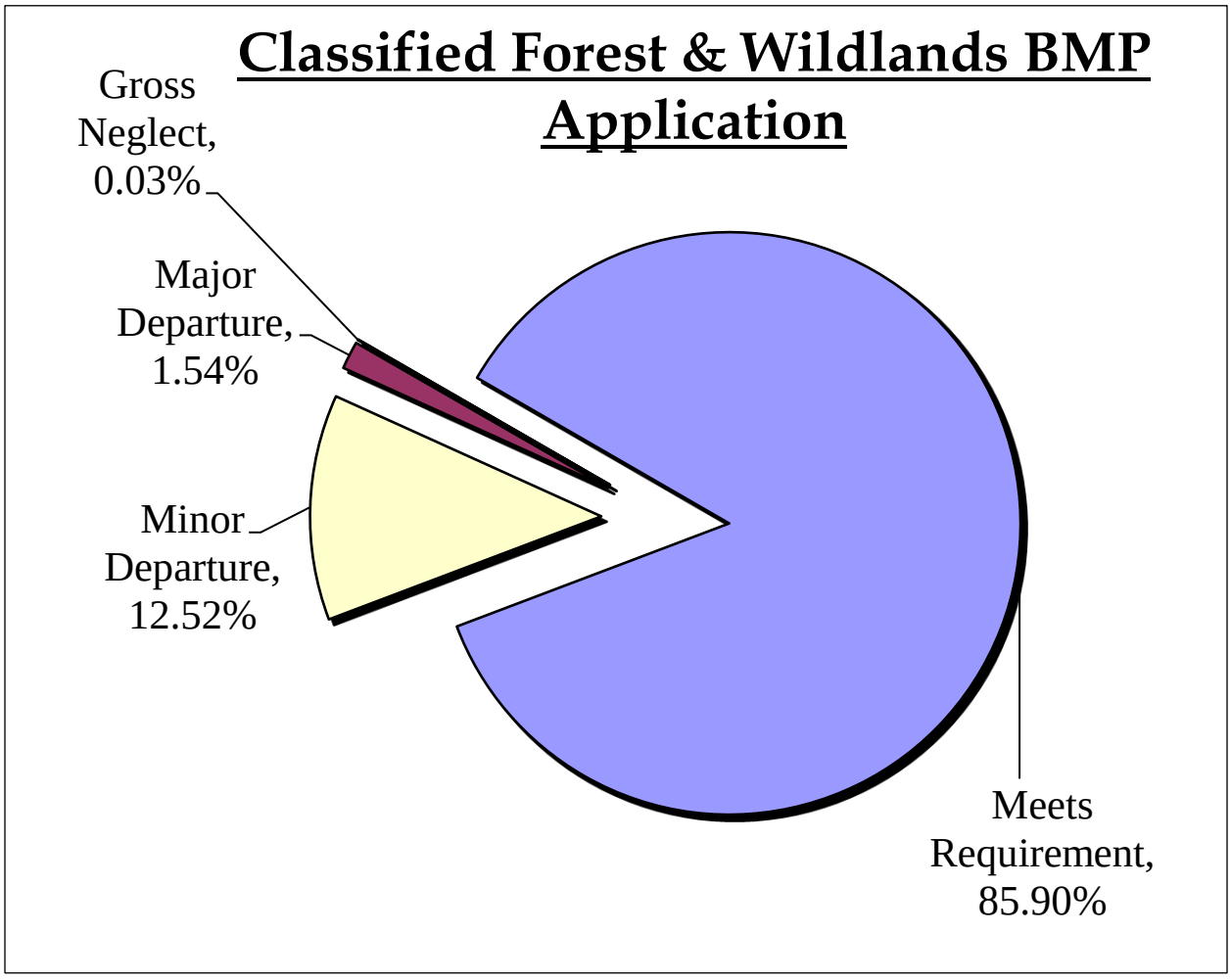

Figure 1: Overall CFW BMP application percentages.

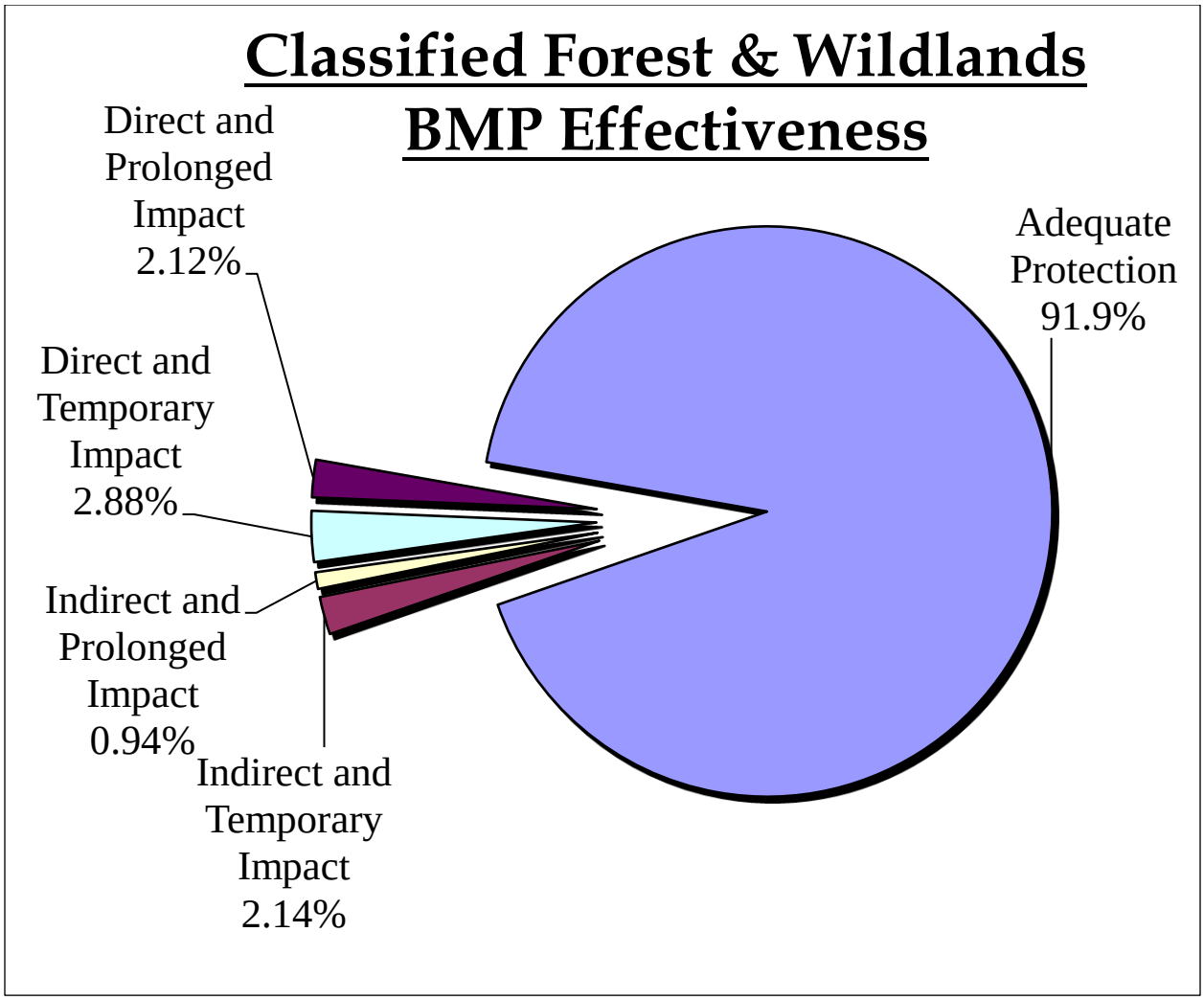

Figure 2: Overall CFW BMP effectiveness percentages.

II. Introduction

Indiana contains 4.7 million acres of forestland that provides many benefits to Indiana's people and wildlife. 87% of the forestland in the state is privately owned. In 2011, CFW program has 692,999 acres and makes up 12.9% of the total forestland in the state. CFW are generally high quality woodlands that are important for timber production, wildlife habitat, watershed protection as well as other non-tangible benefits. This profits not only the forest owner, but all residents. Forests are known to be the best way to reduce nonpoint source pollution (NPS) to waterways. However, when forest soils are exposed there is opportunity for NPS pollution to occur.

Forestry BMPs are the foundation for water quality protection during forest operations. This report is a summary of the application and effectiveness of BMPs for timber harvests conducted on 157 CFW sites from 1996-2011. In the 1996 and 1997 BMP Monitoring reports, there were more sites that were understood to be CFW sites, but this cannot be confirmed by the records that have survived, so we have included only those sites we know to be CFW at the time they were harvested and 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 (Appendix). 58 BMP

specifications are evaluated under the 5 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 its effectiveness in protecting the water quality. Seven general questions are posed on the evaluation dealing with the cause of the noted failures and successes, and records other land uses on the site that could affect water quality.

III. Methods

A. BMP Monitoring Objectives

The objectives of BMP monitoring are: 1) to assess the effectiveness of the BMP guidelines in protecting water and soil quality, 2) provide information on the extent of BMP implementation, past and current, 3) identify areas to focus future program training and educational efforts to improve BMP implementation and effectiveness, 4) identify BMP specifications which may need technical modification, 5) identify improvements needed in future monitoring efforts and 6) to achieve certification of CFW through the Forest Stewardship Council (FSC).

B. Monitoring Team Selection

In the monitoring rounds from 1996 through 2004, an assortment of technical backgrounds was the basis for monitoring team selection. Each team was lead by an IDNR forester to provide technical and logistic support. Team members also included individuals from the forest industry, the environmental community, landowners, planning and development staff, wildlife biology, hydrology, loggers, and soil conservation. Team size was 4-5 individuals, often with team members possessing multiple areas of expertise.

In the 2009-2011 monitoring of CFW sites, the District Forester and one or more of the BMP monitoring staff monitored each site. If the landowner or harvesting professional came as well, they were included.

C. Site Selection

From 1996 through 2004 monitoring, sites were selected by their geographic position. The 1996 and 1997 rounds were in the Lake Monroe Watershed; the 1999 round was in 5 randomly selected counties throughout the state (Ohio, Jefferson, Clay, Martin and Stueben); and 2000 round looked at sites in 7 of the 13 counties that have watersheds flowing into the Great Lakes (Adams, Allen, Elkhart, Lagrange, LaPorte, Noble, Steuben). One site in 1996, 6 sites in 1997, and 5 sites in 1999 were recorded as being CFW. All others were recorded as being in another type of ownership or their ownership type was unknown.

The 2009 round of monitoring focused on CFW. In 2008 there were approximately 374 harvests from the tracts in the CFW Program from which the Division of Forestry had to monitor at least 10%. From the total 374 sites harvested in 2008, the Division monitored 40 randomly selected sites, 10.69% of the total sites harvested.

For the 2010 round of CFW monitoring, sites harvested in 2009 were randomly selected. In 2009 there were approximately 366 harvests from the tracts in the CFW Program from which the Division of Forestry had to monitor at least 10%. From the total 366 sites harvested in 2009, the Division monitored 45 for a 12.3% of the total sites harvested.

The 2011 round of CFW monitoring consisted of 60 sites that were randomly selected from the 519 sites that were reported to have harvests in 2010. The 60 sites that were reviewed made up 11.6% of the CFW sites monitored in 2010.

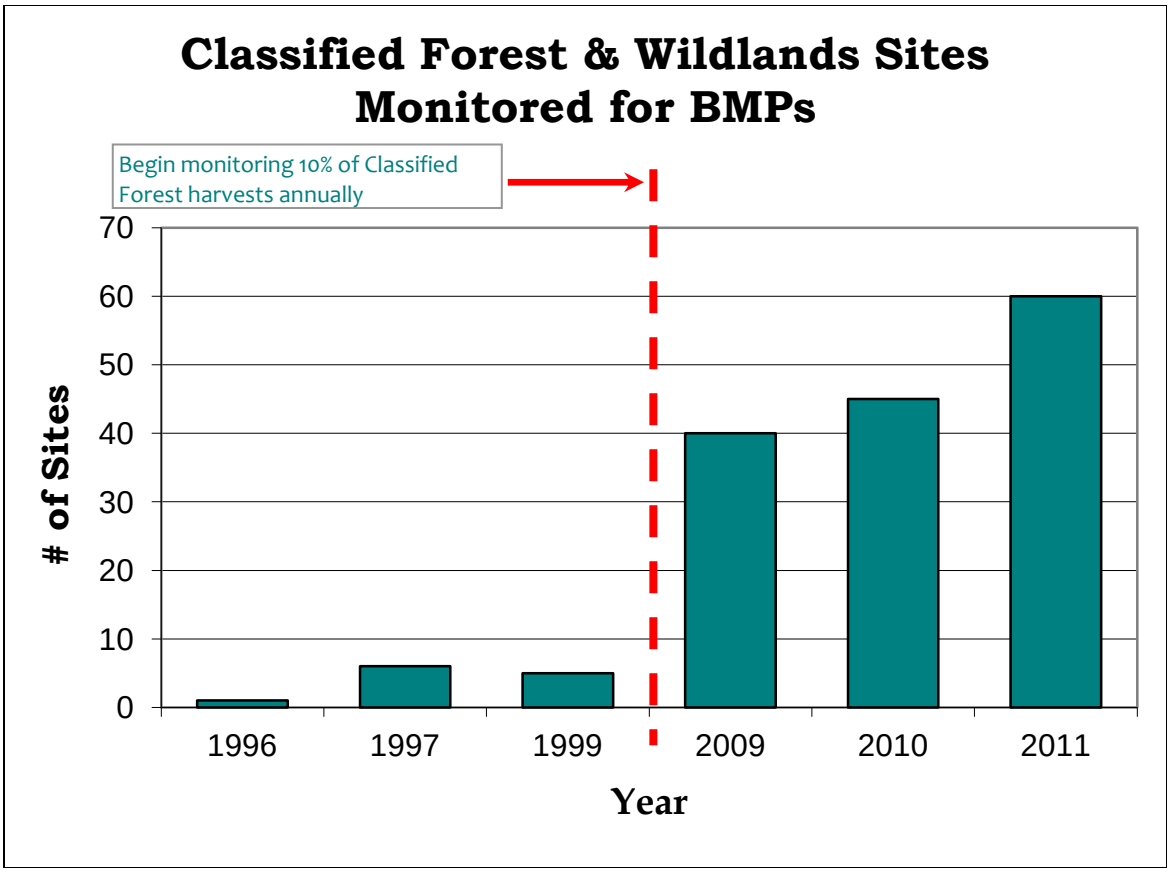

Figure 3: 1 CFW site was monitored in 1996, 6 in 1997, 5 in 1999, 40 in 2009, 45 in 2010 and 60 in 2011.

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 the prevention of pollutants entering a water body or the level of impact the pollutant is having on the water body at the time of monitoring. It is possible to apply all of the BMPs properly and get a good score in application, but still have soil entering a stream, which would call for a lower score in effectiveness, and the opposite may be possible as well.

The team meets at the site to conduct the BMP monitoring on a harvest that is completed and closed. The team walks each part of the harvest area inspects all of the access roads, log landings, skid trails, riparian management zones, and stream crossings as directed in the Indiana BMP Monitoring Protocol. They also comment on successes and departures from the BMP guidelines.

The monitoring team also inspects adjacent and interior intermittent or larger streams. This time allows each team member to evaluate the BMPs on the site for themselves. Once all members have inspected the harvest area, the team comes together at the vehicle or other gathering place and discusses each question on the BMP monitoring form until consensus is reached.

IV. Results

A. Overall application and effectiveness

Of the1597 sites monitored, there was an 85.9% application rate with a 91.9% effectiveness rate. This means the BMPs that were needed were correctly implemented 85.99% of the time and were effective at protecting water quality from NPS 91.9% of the time.

More detailed definitions can be found on the FORESTRY BMP MONITORING WORKSHEET (Appendix).

B. BMP Application & Effectiveness by Section

1. Access roads

Access road BMPs were correctly applied 93.7% of the time. All of the access road BMP specifications employed had a 98.7% effectiveness rate.

Table 1: Application and effectiveness of BMP specifications for access roads.

Access Roads	% Application	% Effective
A1. Uses existing routes where appropriate	98.4	100.0
A2. Adequate buffer strip next to watercourses and sensitive areas	93.2	99.1
A3. Avoids unstable gullies, seeps, very poorly drained areas	93.4	98.3
A4. Road grades are within standards	99.2	100.0
A5. Amount of roads minimized	100.0	100.0
A6. Stream crossings minimized	99.1	99.1
A7. Road excavation minimized	99.2	100.0
A8. Excavated and fill materials placed properly	99.1	99.1
A9. Roads constructed to drain well	88.5	98.4
A10. Appropriate road stabilization, drainage and diversions installed	82.9	93.7
A11. Water diversions functioning properly	96.7	96.7
A12. Runoff diverted onto stable forest floor areas	93.9	98.0
A13. Public road drainage system maintained	100.0	99.1
A14. Public road's drainage maintained	99.1	99.1
A15. Traffic barriers installed	61.1	99.1
Overall Access Road	93.7	98.7

The following areas of access road application needing greater attention: appropriate road stabilization, drainage and diversions installed, 82.9% and traffic barriers installed, 61.1%. The reason for the low incidence of traffic barriers was that many of these roads are frequently used by the landowner to access other parts of their property or their or other's homes. Even with relatively low application rates in the above areas, the effectiveness rates are still very high, 93.7% or higher. Therefore these departures in application appear to have a minimal impact upon the soil and water resources of these sites.

2. Log Landings

Log landing BMPs were correctly applied 92.7% of the time. All log landing BMP specifications employed were 97.4% 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	97.9	100.0
Y2. Landings located outside RMZ	86.7	98.5
Y3. Landings located on stable areas	94.4	97.2
Y4. Excavation of site minimized	95.7	99.3
Y5. Landings avoid concentrating or collecting runoff	83.7	95.7
Y6. Landing's runoff enters stable area	87.0	93.5
Y7. Proper water diversions in working order	92.6	94.4
Y8. Landing smoothed and soil stabilized	91.2	96.4
Y9. Landings free of fuel and lubricant spills and litter	99.3	99.3
Y10. Landing location suitable for equipment fueling and maintenance	97.9	99.3
Overall Log Landings	92.7	97.4

Only one area of log landings had application issues. The avoidance of concentrating or collecting runoff and runoff entering a stable area had application scores of 83.7%. However, the effectiveness of this specification is 95.7%, showing very little impact on the resources of the site.

3. Skid Trails

Skid trail BMPs were correctly applied 80.8% of the time. Skid trail BMP specifications employed were 89.6% 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 existing routes were appropriate	95.4	97.4
S2. Adequate buffer strip next to water courses and sensitive areas	64.8	87.2
S3. Avoids steep and long straight grades (>20% for >200')	88.2	96.1
S4. Avoids unstable gullies, seeps, poorly drained areas	78.8	93.6
S5. Amount of skid trails minimized	89.8	96.2
S6. Trail excavation minimized	87.9	92.9
S7. Appropriate drainage and diversions installed	37.2	62.8
S8. Water diversions in working order	88.1	91.5
S9. Runoff diverted onto stable forest floor areas	81.4	86.0
S10. Streams not used as skid trails (except for crossings)	89.2	89.2
Overall Skid Trail	80.8	89.6

Skid trails often are in rough areas with limited options for diversion installation and often there is debate as to whether or not diversions are necessary, thus the 37.2% application rate and a 62.8% effectiveness rate, with 21 out of 48 departures having indirect and temporary impacts, 12 departures were indirect and prolonged, 7 departures direct and temporary impacts, and 8 departures direct and prolonged impacts were found. Application scores showed that RMZs, unstable gullies, and other sensitive areas were not adequately buffered or avoided (S2 and S4). However, both of these specifications showed high levels of effectiveness with an 87.2 and 93.6%.

4. Stream Crossings

Stream crossing BMPs were correctly applied 71.9% the time. All stream crossing BMP specifications employed were 74.7% 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	89.2	90.1
X2. Crossings minimize disturbance to the natural bed and banks	57.1	60.7
X3. Streambank approaches properly designed and stabilized	51.8	55.4
X4. Water runoff diverted from road prior to crossing	42.6	57.4
X5. Crossing as close to 90 degrees as practicable	89.3	92.9
X6. Crossing does not unduly restrict water flow	83.9	83.9
X7. Soil has not been used as fill in the stream (except culverts)	72.7	72.7
X8. Ford constructed of non erosive materials	75.0	75.0
X9. Fords have stable banks and streambeds	55.3	58.3
X10. Culverts are properly sized and installed	90.9	90.9
X11. Culverts clear of significant flow obstructions	90.0	90.0
X12. Temporary structures properly anchored	100.0	100.0
X13. Temporary structures and resulting obstructions removed	87.5	87.5
Stream Crossing	71.9	74.7

Areas in the stream-crossing category that had the lower application scores in Classified Forests are, minimization of disturbance to natural bed and banks, proper design and stabilization of stream bank approaches, diversion of water from road prior to crossing, construction of fords with non erosive materials and stable banks and streambeds of fords.

Stream crossings are always dealing directly with water bodies. Therefore, even if there are no departures, there may be some impact to the water quality, and it will almost always be a direct impact. The avoidance of stream crossings by sale administrators and loggers is reflected in the statistic for stream crossings, as there were 56 sites (36%) that had at least 1 stream crossing, out of 157 sites monitored. There were 20 sites that had only 1 crossing, 14 sites with 2 crossings, 9 sites with 3 crossings, 5 sites with 4 crossings, 2 sites with 5 crossings, and 2 sites with 6 crossings, 1 site with 9 crossings, 1 site with 11 crossings, and 1 site with 14 crossings to make a total of 151 crossings on CFW sites monitored over this 14-year period.

Forty stream crossings occurred on unmapped intermittent streams. This means they were classified as intermittent streams on the ground, but the USGS quadrangle maps did not map them as intermittent streams. There were 90 crossings on intermittent streams identified on the USGS maps. There were 21 crossings on perennial streams.

5. Riparian Management Zones

Riparian management zone (RMZ) BMPs were correctly applied 78.4% of the time. All of the RMZ BMP specifications employed were 85.7% 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 & large intermittent streams clear of obstructing debris	66.7	71.7
Z3. Tree tops and cutoffs placed back from water course to prevent movement into streams during floods	86.4	94.5
Z4. RMZ free of excavated material & debris (other than above)	95.0	97.5
Z5. Less than 10% bare mineral soil exposed within RMZ (not including crossings)	97.5	98.4
Z6. Adequate tree stocking in primary RMZ next to perennial streams	95.0	97.5

Z7. RMZ free of roads and landings (except crossing)	56.3	81.5
Z8. Water diverted from roads before entering RMZ	64.0	79.8
Z9. Water diverted onto stable areas of the forest floor	78.8	84.7
Z10. Road and trail surfaces stabilized as needed within RMZ	76.3	83.9
Z11. Ephemeral channels free of excavated material	73.1	72.3
Riparian Management Zones	78.4	85.7

Out of 157 sites, 122 had a water body of some type that had a RMZ. In specification Z2, "streams clear of obstructing debris," the application rate was 66.7% and the effectiveness rate was 71.7%. Of the 28 sites that had departures in effectiveness for obstructing debris, 1 was indirect and temporary, 5 had direct and temporary impact and 22 had a direct and prolonged impact to the water quality of the site. The nature of the debris would be prolonged unless it could be removed or mitigated in some way; mitigation by removing the debris is the standard recommendation. Roads and landings in the RMZ scored lower in application with a 56.3% but had 81.5% effectiveness. Three of the sites with departures in Z7 had indirect and temporary impact to water quality, one had indirect and prolonged impact, and 15 sites had direct and temporary impacts, while 3 sites had direct and prolonged impacts due to roads and or landings in the RMZ. More attention is needed in the diversion of water from roads before entering the RMZ (Z8). This is supported by the 64% application rate for this specification, and the effectiveness rate for Z8 was 79.8%. Road and trail surfaces needed greater stabilization within the RMZ with a 76.3% application rate and 83.9% effectiveness rate. Keeping sediment out of ephemeral channels (Z11) also needs more attention with an application rate of 73.1% and effectiveness rate of 72.3%.

C. Overall Site Ratings

On the final page of the monitoring form there is an opportunity for each monitor to rank his or her overall subjective impression of the site's BMP application & effectiveness (Appendix). Sites can be rated from 1 to 4 or any number in between. The ratings are decided by the following scale for application: 1=above average, 2=average, 3=poor, 4=total negligence. The rating scale for effectiveness is as follows: 1= no visible impact, 2=slight, 3=moderate, 4=severe. Table 6 shows the average ratings for all the sites monitored on the CFW. The overall site rating is an average of the application and effectiveness ratings for all sites.

Table 7. The average site ratings for application, effectiveness and the overall site rating.

Overall Application	Overall Effectiveness	Overall Site Rating
1.50	1.49	1.49

Monitors found overall application to be between above average and average. They found overall effectiveness to be between no visible impact and slight impact.

V. Discussion

The BMP application rate on CFW sites monitored was 85.9%. Minor departures in application accounted for 12.52%, major departures accounted for 1.5%, 2 practices were considered "total negligence" 0.03%. Forestry BMPs on CFW sites were 91.9% effective at protecting water quality, 2.1% of practices had indirect and temporary impacts, 0.94% had indirect and prolonged impacts, 2.9% had direct and temporary impacts, and 2.1% had direct and prolonged impacts to water quality. The application and effectiveness scores show that there are many sound

practices taking place on CFW timber harvest sites resulting in few negative impacts to the soil and water resources. When there are problems in either application or effectiveness, they are minor and short term.

BMPs in access roads and log landings had little to no effect upon the water quality. Roads and landings are established with the knowledge that these are areas where the concentration and amount of repeated traffic will be highest. During site planning and layout, managers will put roads and landings on the most stable areas outside RMZs (93.2 and 86.7% 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 (99.1% and 98.5% effectiveness, respectively). The results of the monitoring show the above inferences to be true by having all of effectiveness scores in both categories above 98%.

Skid trail application rate was 80.8%, but effectiveness score is 89.6% showing a difficulty in implementing some practices within the guidelines. 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. The main trail just off the landing would have a higher disturbance level because all 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. 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 are from skid trails. Also, most of the closeout practices are put in place within limited space as landforms and adjacent vegetation will often limit the equipment's ability to place structures where they would be most effective. This causes minor departures in application (16.8% of skid trail application scores are minor departures) with little to no effect on water quality. However, the 37.2% application rate on "Appropriate drainage and diversions installed" is concerning and should be addressed with landowners and loggers through training and publications.

Stream crossings are difficult to make or utilize without impacting water quality. Any impact is either direct and temporary or direct and prolonged. Because of this fact, the BMP guidelines emphasize the avoidance stream crossings if possible. Out of 157 sites, only 36% (56 sites) had stream crossings. Of those 56 sites with crossings there were a total of 151 crossings, 90 on mapped intermittent streams, 40 on unmapped intermittent streams, and 21 on perennial streams. In the application of stream crossings, 71.9% of the practices were implemented within the guidelines, and 74.7% of the time had a no impact to water quality. As earlier mentioned, if there is an impact from stream crossings, they can have a direct effect according to the definitions in the effectiveness scoring, 13.3% of the effectiveness scores had a 4 (direct and temporary impacts) and 10.4% had a score of 5 (direct and prolonged impacts).

RMZs, like stream crossings, they are in close proximity to water bodies. Problems often lead to direct impacts to water quality. Avoid placing high impact infrastructure like access roads or landings in RMZs. RMZ BMP application was 78.4% and RMZ BMP effectiveness was 85.7%. There were 122 sites with at least one RMZ and 52 of those sites had roads or landings in them. Out of the 52 sites with roads or landings in the RMZ, 30 had no impact upon water quality. Three sites with roads and or landings in the RMZ had an indirect and temporary impact, one site had an indirect and prolonged impact, 15 sites had a direct and temporary impact, and 3 sites had direct and prolonged impacts to water quality.

VI. Recommendations

- Focus on areas where problems are more common, such as skid trails, RMZs, and stream crossings.
- Training for landowners and loggers needs to emphasize the utilization of water diversions.

- Continue to emphasize 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 that work on private properties.

VII. Conclusions

CFWs are privately owned and have a diverse usage. Private lands provide a great service to the citizens of this state by producing clean water and air, and increasing biodiversity. Forestry BMPs are the means by which soil erosion from harvesting areas is minimized and thus soil and water quality are maintained. Minimal soil erosion allows for quick recovery of the site because the topsoil is still in place to allow for natural succession to take place. Limited sedimentation to the water resources of the forest protects water quality. BMPs allow the forest to remain a "working" timberland while still providing the environmental benefits that are necessary to our state.

While there are BMP applications that need improvement, the negative environmental impact is short term for most sites. By allowing these forests to provide an income for the landowner through timber management, there is an incentive for the landowner to keep that land in forest rather than converting to grazing, row cropping, or development; all of which have a larger and more sustained impact on the environment. Indiana Forestry BMPs are in place to minimize sedimentation in the waters of Indiana. The negative impacts of a timber harvest on water quality are short term as the trees grow in that forest and the leaves continue to fall on that site, keeping the impacts to a short time period, whereas land use conversion impacts a site for the long term.

Appendix

FORESTRY BMP MONITORING WORKSHEET

(2000)

DATE INSPECTED:_____TEAM:_____
OWNER:_____ PHONE:_____.
_____
_____

COUNTY:_____Site #:_____ ACRES HARVESTED:_____
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	EFFECTIVENESS
0--The Practice Not Needed or Applied on Site	**1--Adequate Protection of Water Resources.**
1--Operation Meets Requirement of Bmp	**2--Indirect and Temporary Impacts on Water Resources.**
2--Minor Departure from Bmp	**3--Indirect and Prolonged Impacts on Water Resources.**
3--Major Departure from Bmp	**4--Direct and Temporary Impacts on Water Resources.**
4--Gross Neglect of Bmp	**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 watercourses 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

0--The Practice Not Applicable
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.**

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) _____.								

APPLICATION

0--The Practice Not Applicable
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
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EFFECTIVENESS DEFINITIONS (BY EXAMPLE)

ADEQUATE: Small amount of material eroded; material does not reach drainages, streams, lakes or sinkhole openings.
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TEMPORARY IMPACT: Impacts lasting one year or less; no more than one runoff season; small amount of material involved.
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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 watercourses & 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_____.				

APPLICATION

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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. Streambank 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 watercourse 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, 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 ANY 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**