

**Arkansas Voluntary
Forestry Best Management Practices**



Implementation Monitoring Report

**Arkansas Forestry Commission
Third BMP Implementation Monitoring Report
Survey Period: 2000 – 2001**

Survey Conducted By:

**Dennis M. Eagle, BMP Forester
and
Arnold Hameister, BMP Specialist**

Executive Summary

In October 2000, the Arkansas Forestry Commission (AFC) began a third statewide survey for monitoring implementation of forestry Best Management Practices (BMPs). Actual implementation monitoring occurred from October 2000 to May 2001. The AFC monitored 261 tracts comprising 19,975 acres, randomly selected through computer modeling.

The survey found an overall statewide BMP implementation rate of 83 percent. The implementation rate for the 1998-99 survey was 80 percent. Degree of implementation varied significantly by ownership category and, within the private non-industrial forest landowner category, by BMP awareness.

BMP implementation rates were higher for loggers that reported receiving BMP training than those without training (82 percent vs. 80 percent).

Implementation by physiographic region of the state was as follows: Ozark - 74 percent, down 3 percent from the 98-99 survey; Ouachita - 86 percent, up 9 percent from the 98-99 survey; Southwest - 84 percent, up 4 percent from the 98-99 survey; and Delta - 86 percent, up 1 percent from the 98-99 survey.

One hundred seventeen tracts out of 261 tracts (45 percent) surveyed scored 90 percent or higher.

Four categories of forestland ownership were recognized for study purposes: forest industry, private non-industrial forest landowners, federal, and state.

BMP implementation was lowest on sites owned by private non-industrial forest landowners (PNIFLOs) - 74 percent, down 1 percent from the 98-99 survey, and highest on U.S. Forest Service tracts (Federal) - 96 percent, no change from the 98-99 survey. Industrial site implementation rating averaged 88 percent, up 1 percent from the 98-99 survey. State implementation averaged 92 percent, up 10 percent from the 98-99 survey. All tracts monitored on federal and state lands were thinnings. Three tracts were monitored on the Poison Springs State Forest; average implementation was 88 percent. Seven tracts were monitored on Arkansas Game and Fish Commission Wildlife Management Areas; average implementation was 93 percent.

Six categories were evaluated for BMP implementation: 1) Forest Road Construction and Maintenance, 2) Harvesting, 3) Mechanical Site Preparation, 4) Chemical Site Preparation, 5) Streamside Management Zones, and 6) Harvest Planning.

This survey found Harvesting and Road Construction and Maintenance were the two areas needing the most attention. The previous two surveys also cited these two areas as needing the most attention.

A fourth BMP implementation monitoring cycle will start in October 2002.

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Introduction

As a result of the Federal Clean Water Pollution Control Act Amendments of 1972 (Public Law 92-500), the AFC was designated the lead state agency for monitoring and education in silvicultural nonpoint source water pollution in Arkansas.

Recognizing that BMPs can reduce non-point source pollution for silvicultural activities, the AFC adopted guidelines as an Implementation Plan and published them in 1982. These guidelines were updated and republished in various forms through 1996. In 1996 the AFC Board of Commissioners adopted a plan to survey the implementation of BMPs throughout the state on a biannual basis. The AFC completed the first survey in May 1998 and a second survey in July 1999. An education program designed to make loggers and landowners aware of the need to use these BMPs was also initiated during this period.

Until the implementation methodology was adopted in 1996, there had been no system to determine the degree of implementation of BMPs in Arkansas. The only data obtained-prior to the adoption of this implementation methodology-was obtained through checks in association with soil loss monitoring and landowner complaints.

The following data assessment and analysis report constitutes the third statewide survey of implementation of recommended forestry BMPs in Arkansas' non-point water source silvicultural program.

The AFC gratefully acknowledges the contributions of personnel and resources made by the U.S. Forest Service, U.S. Environmental Protection Agency, Arkansas Soil & Water Conservation Commission, School of Forest Resources at the University of Arkansas at Monticello, and, without exception, our field and staff personnel for their assistance. Also appreciated are those landowners that, through their permission and cooperation, helped make this study possible.

2000-2001 BMP Implementation Survey

In 1996, in cooperation with the U.S. Forest Service, the AFC developed guidelines for the statewide biannual survey of implementation of silvicultural BMPs. This third survey involved 261 individual tracts of land. Field monitoring was completed May 2001.

On each tract six categories were evaluated for BMP implementation: 1) Forest Road Construction and Maintenance, 2) Harvesting, 3) Mechanical Site Preparation, 4) Chemical Site Preparation, 5) Streamside Management Zones, and 6) Harvest Planning. A survey form with 45 questions was completed on each tract monitored.

Tracts in 54 of Arkansas' 75 counties were monitored. All four of the state's physiographic regions were sampled (see Table 1). Tracts were sampled regardless of proximity to water.

In 1996, prior to any surveys, it was estimated the overall implementation rate for the state would be 80 percent. The 1997-1998 survey rate was 85 percent. The 1998-1999 survey rate was 80 percent. The 2000-2001 survey rate is 83 percent.

Monitoring Design and Implementation

AFC County Foresters and Rangers initially selected more than 500 timber harvest sites based on instructions from the BMP Forester. Two hundred sixty-one timber harvest sites were evaluated across Arkansas for BMP implementation. The number of sites, randomly selected, was based on a sample percentage estimated for a projected statistical accuracy of plus or minus five percent.

The sites surveyed were harvested from one month to twenty-four months prior to actual survey. Distribution of surveyed sites was based on 1998 timber severance tax records (see Table 1). Minimum and maximum tract sizes were instructed to be 5 and 500 acres respectively.

The sampling was not stratified by ownership category. Final harvest cuts were preferred for implementation monitoring. Thinnings were monitored where final harvest cuts were not available.

Table 1: Wood Harvest and Distribution of Implementation Monitoring Sites.

Delta Region	1998 Annual Harvest (Tons)	Number of Sites
Arkansas	256,002	4
Chicot	139,745	1
Clay	18,206	1
Craighead	8,696	0
Crittenden	22,042	0
Cross	19,332	0
Desha	211,153	2
Greene	12,868	0
Jackson	13,988	0
Jefferson	519,363	6
Lawrence	29,724	1
Lee	59,613	0
Lincoln	417,423	4
Lonoke	28,285	1
Mississippi	4,956	0
Monroe	40,655	0
Phillips	123,063	1
Poinsett	12,082	0
Prairie	18,677	0
St. Francis	36,913	0
Woodruff	12,059	0
Total Delta	2,004,845/8%	21/8%

Ouachita Region	1998 Annual Harvest (Tons)	Number of Sites
Garland	427,559	5
Logan	185,620	2
Montgomery	215,043	2
Perry	267,221	3
Polk	557,213	6
Pulaski	155,971	3
Saline	391,172	4
Scott	540,221	6
Yell	563,614	6
Total Ouachita	3,303,634/14%	37/14%

Ozark Region	1998 Annual Harvest (Tons)	Number Of Sites
Baxter	36,417	0
Benton	40,233	0
Boone	38,726	0
Carroll	38,723	0
Cleburne	289,068	3
Conway	217,827	2
Crawford	44,620	0
Faulkner	64,280	2

Franklin	61,713	1
Fulton	10,028	0
Independence	222,701	2
Izard	93,671	1
Johnson	237,982	3
Madison	129,998	1
Marion	76,218	1
Newton	123,895	2
Pope	238,745	4
Randolph	34,243	0
Searcy	168,803	2
Sebastian	25,629	0
Sharp	44,194	0
Stone	218,203	2
Van Buren	327,324	5
Washington	118,115	1
White	149,420	2
Total Ozark	3,050,776/13%	34/13%

Southwest Region	1998 Annual Harvest (Tons)	Number Of Sites
Ashley	1,049,482	11
Bradley	972,604	10
Calhoun	683,043	7
Clark	1,031,414	9
Cleveland	794,537	8
Columbia	915,892	10
Dallas	1,103,211	12
Drew	1,106,291	12
Grant	930,162	10
Hempstead	570,213	6
Hot Spring	447,388	5
Howard	495,659	5
Lafayette	580,409	6
Little River	490,374	6
Miller	314,829	3
Nevada	670,139	8
Ouachita	970,444	11
Pike	646,268	7
Sevier	537,341	6
Union	1,600,646	17
Total Southwest	15,910,346/65%	169/65%
Grand Total State-1998	24,269,601/100%	261/100%

BMP Monitoring Inspection

AFC personnel contacted all landowners whose sites were randomly selected for implementation monitoring. Four categories of land ownership were recognized for the purpose of this study: (1) Private Non-industrial, (2) Industrial, (3) Federal, and (4) State.

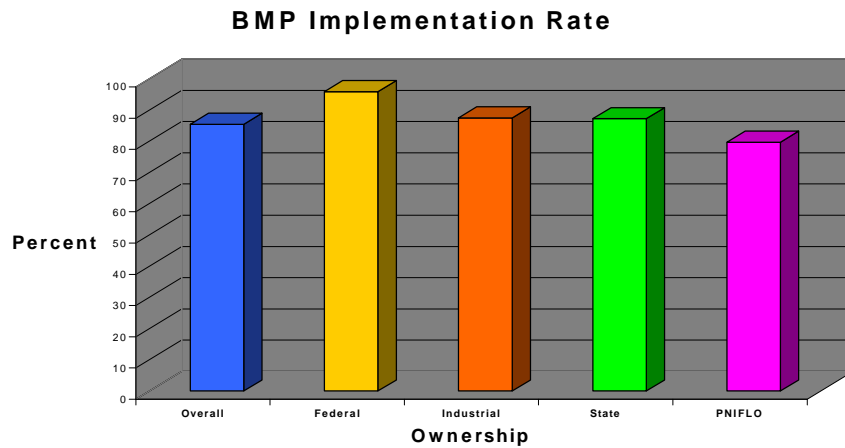
Before tracts were monitored, PNIFLOs were questioned concerning their familiarity with BMPs, their use of professional assistance, their use of a written timber agreement, and whether or not they required compliance with BMPs in the timber sale agreement. If landowners refused permission, the next tract in the random list was selected.

Tracts were monitored between October 2000 and May 2001. Each tract was evaluated on six categories of BMPs. Each major category contained a set of questions and was given a score depending on responses to the yes/no/na questions. The overall implementation rating, though subjective, was based on implementation of specific BMPs as noted throughout the inspection form.

BMP Monitoring Results

Two hundred sixty-one tracts were monitored for BMP implementation. The number of tracts monitored, by ownership category, was:

Ownership	Sites	Acres	Implementation Rate
Private Nonindustrial	113	6,786	74%
Industrial	128	11,060	88%
Federal	10	583	96%
State	10	1546	92%



Of 113 PNIFLO tracts surveyed, 85 reported seeking professional assistance, 27 did not seek assistance, and one was recorded as not responding. Average implementation rates for PNIFLOs who sought assistance was 77 percent, two percent higher than PNIFLOs who did not seek professional assistance.

	1998-1999	2000-2001	Variation
PNIFLOs Surveyed	137	113	-17.5%
PNIFLOs Assisted	97	85	-4.0%
AFC Forester Assistance	36	11	-24.0%
Industrial Forester Assistance	16	19	+6.0%
Consultant Forester Assistance	46	55	+16.0%

Forestry operations monitored represented the four major physiographic regions of the state.

Region	Number of Tracts	Acres Monitored	Implementation Rating %
Ozark	34	2,453	74
Ouachita	37	2,374	86
Southwest	169	12,259	84
Delta	21	2,889	86
	261	19,975	

Landowner Questionnaire

Three questions asked of PNIFLOs yielded the following information:

1. Was the landowner familiar with BMP guidelines?

83Yes Average Implementation Rate..... 78 percent
 29No Average Implementation Rate..... 72 percent

2. Did the landowner require a written sales contract for the timber harvest?

91Yes Average Implementation Rate..... 77 percent
 20No Average Implementation Rate..... 73 percent

3. Did the landowner require implementation of BMPs during harvest?

78Yes Average Implementation Rate..... 79 percent
 33No Average Implementation Rate..... 71 percent

Logger Training

BMP Logger Training, conducted by the Arkansas Timber Producers Association, has been ongoing since 1993. Currently more than 7000 individuals are on record as having received BMP training.

In response to the following question loggers indicated:

1. Had the Logger received prior BMP training?

230...Yes	Average Implementation Rate.....83 percent
8...No	Average Implementation Rate.....81 percent

Best Management Applications

Forest Road Construction and Maintenance

This category had the second lowest implementation rating of the six major categories. Forest road construction and maintenance requires the largest outlay of expense and is the most difficult for landowners, especially PNIFLOs, to construct and maintain.

As in the 1998-1999 survey, the 2000-2001 monitoring indicated most implementation of forest road erosion control measures and revegetation was observed on federally owned tracts. The least implementation of recommended erosion control measures was found on PNIFLOs.

Of the 261 tracts monitored, 218 were rated for the presence of roads. The implementation survey asks ten specific questions about roads. The two activities receiving the highest number of positive responses were questions (1) "Roads located on contour?" and (3) "Design and layout appropriate for site, anticipated traffic, etc.?". The two questions which generated the highest number of negative responses, and which resulted in an implementation rate of 20 percent and 58 percent respectively, were (5) "Seeding and mulching utilized where necessary" and (8) "Roads maintained, where necessary, to prevent erosion". Excessive erosion can be a judgment call, and should be verified by a second inspection at a later date. Many roads were constructed as inexpensively as possible, with few waterbars, seeding, or "engineering controls" evident. Results of the survey for Road Construction and Maintenance are presented in Table 2.

Table 2: Survey results for Road Construction and Maintenance. Two hundred eighteen out of 261 tracts were rated for this practice.

A. Road Construction & Maintenance - 79%	Meets BMP Guidelines		
	Yes	No	N/A
1. Roads located on contours?	211	3	47
2. Minimized number of stream crossings?	117	2	142
3. Design and layout appropriate for site, anticipated traffic, etc.?	210	2	49
4. Balanced cut/fill ratio?	15	0	246
5. Seeding and mulching utilized where necessary to mitigate potential for excessive erosion?	18	77	166
6. Ditches, culverts, cross drains and wing ditches installed correctly and where needed?	105	69	87
7. Stream crossings properly installed?	43	22	196
8. Roads maintained, where necessary, to prevent erosion?	117	85	59
9. Roads cross streams at right angles to the main channel?	102	0	159
10. Roads located sufficient distances from SMZs?	99	8	154
Total Responses For Roads	1037	268	1305

?? **Greatest threat to Roads: (5) “Seeding and Mulching utilized where necessary to mitigate potential for excessive erosion?” and (8). “Roads maintained, where necessary, to prevent erosion?”**

Harvesting

All 261 tracts monitored had completed harvesting operations. Of the 261 tracts, 215 were final harvest cuts (206 clearcuts and 9 seed-tree cuts) and 46 were thinnings.

This category had the lowest implementation rating of the six categories. Ten questions were asked in the harvest category. The highest number of positive responses was received for the questions (1) “Landings located to minimize the impact of skidding?” and (11) “Logging litter properly disposed of?” These activities were implemented at a rate 95 percent and 97 percent respectively.

The two questions generating the greatest number of negative responses were (4) “Harvested mature timber from the SMZ in such a way that shading and filtering effects were not destroyed?” and (10) “Logging debris removed from streams?” These activities resulted in implementation ratings of 50 percent and 45 percent respectively.

Table 3: Survey results for Harvesting. All 261 sites were rated for this activity.

B. Harvesting –78%	Meets BMP Guidelines		
	Yes	No	N/A
1. Landings located to minimize adverse impact of skidding on the natural water drainage pattern?	221	12	28
2. Landings located on firm ground outside the SMZs?	178	5	78
3. Landings-that require treatment-treated after use?	22	38	201
4. Harvested mature timber from the SMZ in such a way that shading and filtering effects were not destroyed?	74	73	114
5. Felled trees in such a way as to minimize debris entering the stream?	104	53	104
6. Skid trails located to take advantage of topography to minimize disruption of natural drainage?	162	50	49
7. Skid trails kept out of stream channels?	153	17	91
8. Temporary crossing removed upon completion of use?	29	12	220
9. Skid trails water barred and seeded upon completion of use?	45	56	164
10. Logging debris removed from streams?	66	54	141
11. Logging litter properly disposed of?	246	8	7
Total Responses For Harvesting	1300	374	1197

?? **Greatest threat to Harvesting: (4) “Harvested mature timber from the SMZ in such a way that shading and filtering effects were not destroyed?” and (10) “Logging debris removed form streams?”**

Mechanical Site Preparation

Mechanical Site Preparation activities were observed on 59 sites. Mechanical Site Preparation on 8 tracts was rated as “light” and 51 tracts were rated as “intensive”. Overall implementation rating for mechanical site preparation was 84 percent, ranking it “fourth” from the top of the six BMP categories checked.

Table 4: Survey results for Mechanical Site Preparation. Fifty-nine sites out of 261 were rated for Mechanical Site Preparation

C. Mechanical Site Preparation - 84%	Meets BMP Guidelines		
	Yes	No	N/A
1. Minimized activity in SMZs?	34	4	223
2. Windrows located on contours?	9	3	249
3. Soil in windrows kept to a minimum?	11	0	250
4. Ripping followed the approximate contour?	35	7	219
5. Dry when site soil prepped to prevent rutting?	43	0	218
6. Site clear of debris, filters, buckets, trash, etc.?	49	1	211
7. Breaks in windrows to allow drainage?	5	3	253
8. Drain areas clear of debris and slash?	36	10	215
9. Where burned, fire kept out of SMZ?	20	4	237
10. Firelines, where necessary, water-barred and erosion controlled?	11	17	233
Total Responses For Mechanical Site Preparation	253	49	2308

?? **Greatest risk to Mechanical Site Preparation: (8) “Drain areas clear of debris and slash?” and (10) “Firelines, where necessary, water-barred and erosion controlled?”**

Chemical Site Preparation

Chemical site preparation was recorded as occurring on 52 of the surveyed tracts.

Some “combined” treatments may have had herbicide application that was not evident due to “bedding” activities (that eliminated evidence of herbicide treatment) and failure to have landowner tract history available.

This category rated 99 percent in the 1997-1998 BMP survey, but dropped to 80 percent for the 1998-99 survey when additional questions were added to the rating questionnaire. Results for this 2000-2001 survey was 89 percent.

Table 5: Survey results of Chemical Site Preparation. Fifty-two of 261 tracts were rated for this practice.

D. Chemical Site Preparation - 89%	Meets BMP Guidelines		
	Yes	No	N/A
1. No evidence of leaks, spills, or misapplications?	52	0	209
2. No evidence of application to SMZ zones?	33	1	227
3. Firelines, where necessary, water barred and erosion controlled?	15	10	236
4. Where burned, fire kept out of SMZs?	15	3	243
Total Responses For Chemical Site Preparation	115	14	915

?? **Greatest risk to Chemical Site Preparation: (3) “Firelines, where necessary, water barred and erosion controlled.”**

Streamside Management Zones

One hundred and ninety-two of 261 tracts monitored contained intermittent and/or perennial streams. This category ranked second of six categories in implementation compliance with an implementation rating of 86 percent.

Table 6: Survey results of Streamside Management Zones.

E. Streamside Management Zones - 86%	Meets BMP Guidelines		
	Yes	No	N/A
1. SMZ’s left consistent with stream characteristics and wide enough to protect water quality?	118	73	70
2. Roads, skid trails and logging sets located outside the SMZ’s	155	33	73
3. Stream free of sediment?	189	0	72
4. No Water quality impairment present?	190	0	71
Total Responses For Streamside Management Zones	652	106	286

?? **Greatest Risk to SMZs: (1) “SMZs left consistent with stream characteristics and wide enough to protect water quality?”**

Harvest Planning

Virtually all tracts had received some degree of prior planning. Questions (4) “Settings located to balance skidding distance against road densities for an efficient operation?” and (1) “Appears obvious prior planning was done?” received almost all-positive responses. However, there were 34 negative responses versus 142 positive responses for question (3) “Skidding planned away from stream channels?”

As in the 1998-1999 survey, the most negative response concerned question (6) “SMZ boundaries delineated prior to harvest?” This activity was received 59 negative responses versus 138 positive responses.

Harvest Planning had the highest implementation percent of the six BMP factors rated.

Table 7: Survey results for Harvest Planning. All 261 tracts were rated for this activity.

F. Harvest Planning - 91%	Meets BMP Guidelines		
	Yes	No	N/A
1. Appears obvious that prior planning was done?	258	3	0
2. Design and layout of entire operation appropriate for Site?	249	12	0
3. Skidding planned away from stream channels?	142	34	85
4. Settings located to balance skid distance against road densities for an efficient operation?	231	4	26
5. Logging sets, roads, and skid trails delineated prior to harvest?	220	13	13
6. SMZ boundaries delineated prior to harvest?	138	59	64
Total Responses For Harvest Planning	1240	125	188

?? Greatest risk to Harvest Planning: (6) “SMZ boundaries delineated prior to Harvest?”

Overall BMP Implementation Summary

Six BMP categories were monitored on 261 harvested tracts. On each tract 45 questions were asked to determine if BMPs were used. Since a BMP may not be applicable on a particular tract each question could be answered Yes, No, or N/A (not applicable). Based on the applicable responses, Harvest Planning and Chemical Site Preparation were the highest-ranking categories. Both scored in the high eighty to low ninety-percentile range. Harvesting and Roads and Road Maintenance scored lowest. Both categories scored in the high seventy-percentile range.

Table 8: Survey results for the six BMP categories monitored.

Overall BMP Implementation Summary	Meets BMP Guidelines			
BMP Practices Applicable To Site	Yes	No	Total	% Yes
A. Road Construction and Maintenance	1037	268	1305	79
B. Harvesting	1300	374	1674	77
C. Mechanical Site Preparation	253	49	302	84
D. Chemical Site Preparation	115	14	129	89
E. Streamside Management Zones	652	106	758	86
F. Harvest Planning	1238	124	1362	91
Totals:	4592	931	5531	
Overall Implementation	83 Percent			

?? **Greatest threats: Harvesting and Road Construction and Maintenance**

Conclusion and Discussion

The purpose of this BMP implementation survey was to 1) survey current status of implementation of BMPs in the silvicultural activities of Arkansas' forests, and 2) determine the direction and intensity of future monitoring and educational needs.

Six BMP categories were checked for compliance: Road Construction and Maintenance, Harvesting, Mechanical Site Preparation, Chemical Site Preparation, Streamside Management Zones, and Harvest Planning. Overall implementation of BMPs rated 83 percent. Harvesting had the lowest implementation rating, 77 percent. The highest implementation rating was found in Harvest Planning, 91 percent.

Seventy-six percent of private landowners received technical assistance in the harvest activities, while twenty-four percent responded as not having any help. Those receiving help showed significantly higher BMP compliance than those reported as not receiving help.

Of the tracts monitored for this 2000-2001 survey, 82 percent were final harvest cuts. Eight-five percent of the tracts monitored in the 1998-1999 survey were final harvest cuts and 59 percent of the tracts monitored in the 1997-1998 survey were final harvest cuts.

Recommendations

“Site Prepared” and “Harvested” tracts should be surveyed separately. Each of these operations can expose mineral soil to washing, and each operation has certain BMP procedures that should be followed to reduce erosion possibilities. Harvesting BMP implementation at skid trails, sets, roads, stream crossings, etc. may be “eliminated” by some Site Preparation procedures, i.e., ripping and bedding activities. Site preparation activities also present a different set of concerns to be evaluated and treated.

Develop a system to address the BMP needs of ongoing silvicultural operations, similar to the one developed and used in South Carolina. Silvicultural operations are surveyed by air, and when BMP needs are identified, landowner contact is made immediately. This not only accomplishes training and education it effects a positive correction rather than a “missed” opportunity.