

Voluntary Compliance with Forestry Best Management Practices in East Texas

Results from Round 3 of BMP Compliance Monitoring

by

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EXECUTIVE SUMMARY

A Best Management Practices (BMP) monitoring program, funded through an FY93 Environmental Protection Agency (EPA) 319(h) grant, evaluated the level of compliance with voluntary forestry BMPs between June, 1996 and July, 1997. A total of 150 sites on which silvicultural activities occurred were evaluated. These sites were a representative sample of the forestry activities that occurred in East Texas during that time.

Overall BMP compliance of the sites monitored was 87.3%. To be considered “in compliance,” a site must be rated Fair, Good, or Excellent. Compliance with BMPs varied by forest land ownership, type of operation, landowner and logging contractor knowledge of BMPs, level of forester involvement, and other site factors. Generally, compliance was highest on sites:

- owned by USDA Forest Service or forest industry

Compliance was generally lowest on sites:

- owned by non-industrial private forest (NIPF) landowners

Major deficiencies noted during the evaluations were:

- lack of SMZs where needed
- water quality impacts from stream crossings

In Round 1 of monitoring, conducted in 1990-1992, industry compliance was 89.6%. Compliance was at 95.1% during Round 2 of monitoring, conducted in 1993-1995. Compliance of 98.4% during Round 3 shows a continually improving trend. BMP compliance on USDA Forest Service lands has been at 100% in all three rounds of monitoring. Compliance on non-industrial private forest (NIPF) land was 86.3 % in Round 1 of compliance monitoring. During Round 2, NIPF compliance was 82.9%. Round 3 currently shows NIPF compliance at 76.3%.

Of the 95 inspections where the logging contractor was identified as being familiar with BMPs, 92 were in compliance (96.8%). Sites with landowners who were not familiar with BMPs had an overall compliance rating of 75.4%, while sites with landowners who were familiar with BMPs had a compliance rating of 95.5%. Ninety sites were identified as having a professional forester involved and had a compliance rating of 92.8%. Sites in which there was no or unknown forester involvement had a BMP compliance rating of 78.3%.

TABLE OF CONTENTS

BACKGROUND AND OBJECTIVES	3
DISTRIBUTION AND SELECTION OF COMPLIANCE SITES	3
QUALITY CONTROL	4
MONITORING CHECKLIST	4
INSPECTION CONTACTS	4
RESULTS	5
SITE CHARACTERISTICS	5
PERMANENT ROADS	5
SKID TRAILS & TEMPORARY ROADS	6
STREAMSIDE MANAGEMENT ZONES	7
SITE PREPARATION	7
LANDINGS	8
OVERALL COMPLIANCE WITH BMPs	8
COMPLIANCE BY SITE CHARACTERISTICS	8
Ownership	8
Type of Activity	9
Professional Forester Involvement	9
Landowner Familiarity with BMPs	9
Logging Contractor Familiarity with BMPs	9
Terrain	10
Erodability	10
Distance to Permanent Water	10
BMPs in Timber Sale Contract	10
DISCUSSION	10
OVERALL COMPLIANCE – Rounds 1, 2, and 3	10
APPENDIX A – Compliance Monitoring Checklist, Evaluation Criteria, And Tabulated Results by Checklist Question	11
APPENDIX B – Figures 1 – 7	20

BACKGROUND AND OBJECTIVES

The Clean Water Act of 1987 called for states to establish a program for development and implementation of Best Management Practices to reduce nonpoint source (NPS) water pollution. The Act also required states to develop methods for determining “BMP effectiveness,” including a measure of BMP compliance.

The Texas Silvicultural Nonpoint Source Pollution Project, funded by a FY93 CWA Section 319(h) grant from the EPA, requires that a monitoring program be conducted to document the level of voluntary implementation of BMPs and effectiveness of BMPs in reducing NPS pollution from silvicultural activities. Objectives of the monitoring program are to:

- 1) Measure the degree of compliance with BMP guidelines by forest landowners, silvicultural contractors, forest industry, and government agencies
- 2) Evaluate the effectiveness of BMPs as applied in the field and identify weaknesses in the BMP guidelines.

This report documents the findings of the BMP compliance monitoring for 150 sites monitored between June 5, 1996 and July 27, 1997. These data represent Round 3 of BMP compliance monitoring conducted by the Texas Forest Service. Please refer to the Texas Forest Service October, 1992 publication *Voluntary Compliance with Forestry Best Management Practices in East Texas* for Round 1 and the Texas Forest Service March, 1996 publication of the same title for Round 2 of compliance monitoring results.

DISTRIBUTION AND SELECTION OF COMPLIANCE MONITORING SITES

To get a valid estimate of overall compliance with Forestry Best Management Practices in East Texas, compliance monitoring sites were distributed regionally within East Texas and among forest land ownership categories. Sites were representative of the distribution of all silvicultural activities across East Texas. The distribution of monitoring sites was based on estimated annual timber harvest for each county based on data from the annual Texas Forest Service Publication, *Texas Forest Resource Harvest Trends*. See Table 1.

Table 1. Distribution of Compliance Monitoring Sites by County.

County	1994 Average Annual Harvest (cubic feet)	Completed # Sites
Anderson	13,314,933	2
Angelina	36,359,046	9
Bowie	6,414,455	2
Camp	1,965,354	1
Cass	34,532,931	7
Chambers	3,533,404	1
Cherokee	28,861,942	7
Grimes	4,741,389	1
Hardin	28,647,829	7
Harris	12,153,814	1
Harrison	24,237,804	5
Henderson	N/A	1
Houston	29,971,247	5

Jasper	45,673,001	7
Jefferson	1,569,606	1
Liberty	32,521,896	6
Marion	13,122,122	4
Montgomery	32,050,454	5
Nacogdoches	29,672,349	6
Newton	33,694,738	9
Orange	8,399,044	1
Panola	25,435,546	4
Polk	31,819,039	9
Rusk	22,226,573	5
Sabine	13,343,325	4
San Augustine	23,751,156	5
San Jacinto	14,113,196	4
Shelby	33,828,163	6
Smith	9,247,089	3
Titus	2,675,340	1
Trinity	19,833,956	6
Tyler	33,705,039	6
Upshur	11,784,183	3
Walker	30,667,414	5
Wood	4,714,851	1
Total	503,819,327	150

QUALITY CONTROL

To eliminate bias, compliance monitoring sites were selected in a random manner using several methods, including aerial detection and information from Texas Forest Service (TFS) personnel, to identify sites. All monitoring evaluations were conducted by one or a combination of the three trained foresters assigned full-time to the TFS BMP Project. Using only BMP Project employees as inspectors provided greater accuracy and quality control. At the beginning of the monitoring project, as well as throughout the project, all BMP Project foresters jointly evaluated tracts to maintain and improve consistency and fairness.

MONITORING CHECKLIST

The Texas BMP Monitoring Checklist used was the same checklist used in previous monitoring (Round 1, done between July 1, 1991 and August 31, 1992, and Round 2, done between September 1, 1992 and November 30, 1995). The checklist is comprised of 73 questions, and it is included along with an explanation of each question in the Appendix.

For simplification each question was worded so that a positive answer was recorded with a “Yes” while a negative answer, indicating a departure from BMP recommendations or a negative water quality impact, was a “No.” This allowed readers to quickly determine any problem areas identified during an inspection.

INSPECTION CONTACTS

Landowners were contacted prior to the inspection of the site so that permission for entry onto the property could be obtained. During this initial contact, the forester explained the program and invited the landowner or his/her representative to join the BMP forester on site during the evaluation. Sites were not

inspected if the landowner denied access. In nearly all cases on forest industry property, an industry forester accompanied the BMP forester.

Landowners, logging contractors, and timber buyers (where applicable and identifiable) were provided with a copy of the completed checklist, along with a cover letter explaining the BMP Project and interpreting the form. Recommendations for remediation, if applicable, were made.

RESULTS

Between June 5, 1996 and July 27, 1997, TFS BMP foresters evaluated BMP compliance on 150 sites, totaling 20,150 acres, throughout East Texas. Tabulated results by question on the checklist for all sites monitored are found in the Appendix.

SITE CHARACTERISTICS

The 150 monitoring sites were distributed both geographically and by ownership, as shown in Figure 1. Sixty-three (42%) of the 150 sites were owned by forest industry. Seventy-six sites (51%) were owned by non-industrial private forest (NIPF) landowners. Eleven sites (7%) were on U.S. Forest Service lands.

The majority of sites (79.3%) were monitored after a regeneration harvest, including 98 clearcuts and 21 partial harvests (such as diameter cuts, seedtree cuts, or selection harvests). Thirty thinning and one site preparation (only) operations were evaluated. In 32 cases, the site preparation evaluation was included in elements of the preceding timber harvest operation.

Professional foresters were involved in planning and/or implementing the silvicultural operation on 90 (60%) of the sites. On 70 sites, the forester was employed by forest industry. Private consultants were involved in 11 of the sites, while U.S. Forest Service foresters were involved in 9 sites.

Terrain classification and soil erodability were recorded from the Natural Resources Conservation Service (NRCS – formerly the Soil Conservation Service) soil survey, if applicable, or estimated by the forester in the field. Thirty-four sites (23%) were on flat terrain. Eighty sites (53%) were on hilly terrain and 36 (24%) were on steep terrain. Forty-four (29%) sites were on soils with low erodability, 58 sites (38%) on medium erodability soils, and 48 (32%) were on high erodability soils.

Of the 150 sites, 95 had either a perennial (26) or intermittent (48) stream or both perennial and intermittent (21). A permanent water body was found within 800 feet of 77 sites (51%), while 73 sites (49%) did not have permanent water within 800 feet.

PERMANENT ROADS

Permanent roads were evaluated for compliance with BMPs when they were used in the forestry operation. Permanent roads in the forestry context are generally graded dirt roads that are used for year-round access. County roads were not included in the monitoring, as they are not under the management control of the landowner. Permanent roads were inspected on 73 of the 150 sites. See Table 2.

Table 2. Compliance with Specific BMPs Relating to Permanent Roads.

BMP	Yes	No	N/A	% Compliance
Avoid sensitive areas	73	0	77	100.0
Meet grade specifications	68	5	77	93.2
Stream crossing stabilized	23	4	123	85.2
Rutting within allowable specs	70	3	77	95.9
Ditches do not dump into streams	29	12	109	70.7
Specific BMPs used	69	1	80	98.6
BMPs effective	61	8	81	88.4
Stream free of sediment	26	11	113	70.3

It is important to note that non-use of a specific BMP does not necessarily imply lack of compliance with BMPs. Often, there are many alternative methods that could be applied in a given instance. The value of the evaluation of whether specific BMPs were used is its indication of whether efforts were made to use at least one of the more commonly recommended BMPs.

SKID TRAILS & TEMPORARY ROADS

Skid trails and temporary roads were evaluated on 125 of the 150 monitoring sites. Skid trails are routes through the logging area by which logs are skidded or dragged to a permanent road or central loading point called a “set” or “landing.” Temporary roads are not designed to carry long-term traffic and are usually retired or closed after the silvicultural activity is completed. See Table 3.

Table 3. Compliance with Specific BMPs Relating to Skid Trails and Temporary Roads.

BMP	Yes	No	N/A	% Compliance
Slopes less than 15%	111	14	25	88.8
Rutting within allowable specs	109	14	25	88.6
Water bars evident	51	37	61	58.0
Water bars working	37	18	94	67.3
Stream crossings minimized	71	9	70	88.8
Stream crossings correct	23	22	105	51.1
Stream crossings restored & stabilized	17	24	109	41.5
Specific BMPs used	80	31	38	72.1
Stream free of sediment	53	28	68	65.4

STREAMSIDE MANAGEMENT ZONES

Streamside management zones (SMZs) are recommended on all perennial and intermittent streams. All sites with either perennial or intermittent streams were evaluated for the presence and adequacy of SMZs. Streams were present on 95 of the 150 sites. Of these 95 sites, 26 had perennial streams only, 48 had intermittent streams only, and 21 had both perennial and intermittent streams. See Table 4.

Table 4. Compliance with Specific BMPs Relating to SMZs.

BMP	Yes	No	N/A	% Compliance
Present on perennial stream	41	4	105	91.1
Present on intermittent stream	61	10	79	85.9
Adequately wide	73	19	58	79.3
Thinning within allowable specs	39	18	93	68.4
Integrity honored	74	20	56	78.7
Stream clear of debris	76	18	56	80.8
Free of roads and landings	89	4	57	95.7
Stream free of sediment	84	10	56	89.4

SITE PREPARATION

Twenty-nine sites were evaluated for compliance with site preparation BMPs. A variety of site preparation techniques were evaluated, including 24 with some combination of shearing, piling, and/or burning. Three sites involved application of herbicide only. See Table 5.

Table 5. Compliance with Specific BMPs relating to Site Preparation.

BMP	Yes	No	N/A	% Compliance
No soil movement on site	27	5	118	78.1
Firebreak erosion controlled	13	2	135	86.7
SMZ integrity honored	17	3	130	85.0
Windrows on contour/free of soil	6	0	144	100.0
No chemicals off site	4	0	146	100.0
BMPs used	16	9	125	64.0
Stream free of sediment	15	5	130	75.0

LANDINGS

Landings, sometimes called sets, are areas where logs are gathered, delimbed, bucked, and loaded onto log trucks. Landings are areas of concentrated activity and can become a water quality issue if drainage is not properly controlled. Landings were evaluated on 131 sites. One hundred twenty-six sites (96.2%) were free of oil and trash. One hundred-one of 103 sites (98.0%) with SMZs had landings located outside the SMZ. On 127 sites (97.0%) landings were located in a well-drained location.

OVERALL COMPLIANCE WITH BMPs

BMP foresters used a 5-level grading scale to determine overall compliance with BMPs as an indication of the impact of the silvicultural activity on water quality. The five grades are as follows:

1. **NO EFFORT** – Substantial erosion and water quality degradation as a result of operations. Sedimentation evident in streams. Non-compliance with several BMPs that were needed with a resulting adverse impact on water quality. Poor attitude evident about the job.
2. **POOR** – Some effort made at installing BMPs. Generally poor quality construction or no substantial effort at certain locations which now suffer from erosion and stream sedimentation. Substantial lack of BMPs in a particular emphasis such as roads, skid trails, or SMZs, with significant problems as a result.
3. **FAIR** – (1) Generally, a pretty good effort at BMPs. Poor application procedures perhaps. Lack of BMPs in a particular emphasis area, but with moderate consequences. (2) No BMPs on a site which requires few BMPs but has some resultant minor problems.
4. **GOOD** – (1) BMPs generally installed correctly. Guidelines followed. Allows for some failure of devices or failure to observe guidelines, but with light consequences. (2) Good quality operation which requires no BMPs and has few problems.
5. **EXCELLENT** – (1) BMPs installed correctly. Guidelines followed. (2) Some BMPs implemented even though they might not have been “required.” Few if any problems exist.

These ratings, though subjective in nature, provide a “feel” for the level of BMP compliance versus the need for BMPs on the particular tract, as well as the visible impact of the forestry activity on water quality.

Overall BMP compliance, as determined by number of sites receiving a “Passing” grade of Fair, Good, or Excellent, was 87.3%. Of the 150 sites evaluated, 18 (12%) received an Excellent rating; 87 (58%) received a Good rating; 26 (17%) received a Fair rating; 14 (9%) received a Poor rating; and 5 (3%) received a No Effort rating. See Figure 2.

COMPLIANCE BY SITE CHARACTERISTICS

Ownership

BMP compliance varied by ownership category. The public ownership category (U.S. Forest Service) fared best, with 100% of the 11 tracts evaluated in compliance (receiving a Fair, Good, or Excellent rating). Significantly, all U.S. Forest Service sites received a Good or Excellent rating. See Figure 3 for geographical distribution of sites by compliance rating. Figure 4 shows compliance ratings by ownership.

The sixty-three sites owned by forest industry had an overall BMP compliance of 98%, with 55 of the 63 (87%) receiving a rating of Good or Excellent.

Non-industrial private forest (NIPF) landowners had a compliance rating of 76%, the lowest level of the three ownership types.

Type of Activity

Four types of silvicultural activities were monitored: regeneration harvests, partial regeneration cuts, thinning, and site preparation. Only one site was evaluated for site preparation only, although site preparation was evaluated along with a regeneration harvest 29 times. See Table 6.

Table 6. Overall Compliance with BMPs by Type of Operation.

Type of Operation	BMP Compliance
Regeneration harvest (clearcut)	83.7%
Regeneration harvest (partial cut)	95.2%
Thinning	96.7%
Site preparation (only)	0%

Professional Forester Involvement

BMP compliance was higher when a professional forester was involved in the activity. Ninety sites were identified as having a professional forester involved and had a compliance rating of 92.8%. Sites in which there was no or unknown forester involvement had a BMP compliance rating of 78.3%. Figure 5 shows compliance ratings by forester involvement.

Landowner Familiarity with BMPs

Landowner familiarity with BMPs influences BMP compliance. Sites with landowners who were not familiar with BMPs had an overall compliance rating of 75.4%, while sites with landowners who were familiar with BMPs had a compliance rating of 95.5%. Eighty-nine of 150 sites had landowners who were familiar with BMPs, while 44 were not. Landowner familiarity was unknown on 27 sites. Only 18 of 76 NIPF landowners (23.7%) were identified as being familiar with BMPs.

Logging Contractor Familiarity with BMPs

Logging contractor familiarity with BMPs also influences compliance. Contractor familiarity was identified on 107 of 150 tracts. Of the 95 inspections where the logging contractor was identified as being familiar with BMPs, 92 were in compliance (96.8%). On the other hand, on the tracts where the contractor was identified as not being familiar with BMPs, compliance was at 50%. Figure 6 shows BMP compliance by logging contractor knowledge of BMPs.

Terrain

Monitoring sites were classified by BMP foresters as Flat, Hilly, or Steep. BMP compliance on flat sites was 100%; on hilly sites, 83.8%; and on steep sites, 83.3%. This trend of increased compliance with flatter terrain is to be expected since less erosion and less adverse effect on water quality is likely.

Erodability

Monitoring sites were identified as Low, Medium, or High soil erodability. BMP compliance on low erodability sites was 97.7%; on medium erodability sites, 86.0%; and on high erodability sites, 79.2%.

Distance to Permanent Water

Distance to nearest permanent water was determined for each monitoring site. BMP compliance on 64 sites with permanent water less than 300 feet away was 85.9%. On 13 sites with permanent water 300 to 800 feet away, compliance was 92.3%. Twenty-five sites were 800 to 1600 feet from permanent water. BMP compliance on these sites was 88%. Of the 48 sites in which permanent water was greater than 1600 feet away, BMP compliance was 87.5%.

BMPs in Timber Sale Contract

BMP foresters determined whether BMPs were included in the timber sale contract, if applicable, on 123 sites. Compliance on sites with BMPs included in the contract was 96.7%, while compliance on tracts without BMPs in the contract was 68.8%.

DISCUSSION

The compliance rating system, though subjective in nature, provides an understanding of the level of BMP use versus the need for BMPs and the overall visible impact on water quality. It should be noted that a Fair or even Good rating does not necessarily reflect implementation of specific BMPs on a particular site. These ratings may have been applied to a site where few or no specific BMPs were installed if the site was such that few BMPs were called for and the resulting impact on water quality was judged to be minor. Likewise, a Poor rating does not necessarily mean that no specific BMPs were implemented on a site. Sites may have received a Poor rating even if some effort was made at installing BMPs, but the BMPs were generally of poor quality or absent in certain locations.

OVERALL COMPLIANCE – Rounds 1, 2, and 3

Round 1 of BMP compliance monitoring, conducted between July 1, 1991 and August 31, 1992, yielded an overall compliance of 88.2%. (See Texas Forest Service publication *Voluntary Compliance with Forestry Best Management Practices in East Texas*, October, 1992.) Round 2 of compliance monitoring, conducted between July 8, 1993 and November 15, 1995, showed an overall compliance of 87.4%. (See Texas Forest Service publication *Voluntary Compliance with Forestry Best Management Practices in East Texas*, March, 1996.) Round 3 of monitoring shows overall compliance with voluntary BMPs at 87.3%.

BMP compliance on industry land has steadily increased from 89.6% in Round 1 to 95.1% in Round 2 to 98.4 % currently. This substantial increase documents the diligence of forest industry in using voluntary BMPs.

Publicly-owned land BMP compliance has increased from 93.3% in Round 1 to 100% in Round 2, and has maintained its 100% compliance in Round 3. In Round 3, the USDA Forest Service owned all 11 public

sites that were monitored. Specifically, compliance on tracts owned and managed by the USDA Forest Service is currently and has always been at 100%.

BMP compliance on non-industrial private forest (NIPF) land continues to lag behind other ownerships. In Round 1 of monitoring, compliance on NIPF land was 86.3%. During Round 2 NIPF compliance was 82.9%. Round 3 currently shows NIPF compliance to be at 76.3%. NIPF landowners are generally less intensely involved in forest management, only infrequently sell timber, may be absentee, and may lack technical knowledge necessary to implement BMPs. However, a positive correlation exists between landowner familiarity with BMPs and BMP compliance.

The significant increases in timber prices undoubtedly influence certain landowners to sell timber who wouldn't otherwise have sold in times of lower expected revenue. Therefore, individuals who may now be selling timber may not be as knowledgeable since they are new to the realm of forest management. In fact, as Figure 7 shows, BMP compliance appears to be inversely related to timber prices. This demonstrates the necessity for continued landowner awareness programs such as the TFS FY96 Silvicultural Nonpoint Source Project currently operating.

Positive correlations between forester and logging contractor familiarity with BMPs and BMP compliance demonstrates the need for NIPF landowners to involve a forester and a knowledgeable logging contractor to ensure BMP compliance. Concentrating educational efforts on NIPF landowners appears to be the best method for minimizing water quality impacts from silvicultural operations.

APPENDIX A

Compliance Monitoring Checklist
Evaluation Criteria
Tabulated Results by Checklist Question

Evaluation Criteria for BMP Monitoring Checklist Texas Forest Service BMP Project

I. General Landowner and Tract Information

County: TFS County code.

TFS Block and Grid: Enter only entry point if multiple blocks or grids.

Latitude and Longitude:

Forester Type: Professional, i.e. consultant, industry, etc.

Forester Name: First and last name.

Timber Buyer: First and last name or Corporation name.

Logging Contractor: First and last name or business name.

Activity: Type activity occurring, e.g. harvesting, site preparation, etc.

Acres Affected: Acres affected by activity.

Estimated Date of Activity: Quarter and year activity appears to have occurred. Use first entry if multiple entries.

Date of inspection: mmddyy.

Inspector: Name of TFS forester doing BMP inspection.

Accompanied by: Name of landowner, industry or consulting forester, logger, etc. who is present during the inspection.

Owner Type: Nonindustrial (N), Absentee nonindustrial (A), Industry (I), Public (P).

Name, Address, City, Zip, and Phone: Contacts for the landowner.

II. Site Characteristics

Terrain: Check only one; Flat, Hilly, or Steep.

Erodibility hazard: Check only one; Low, Medium, or High.

Type stream present: Perennial or Intermittent.

Distance to nearest permanent water body: Distance to nearest blue line stream or lake.

Predominant soil series: Series number from Soil Survey data (if available).

Predominant soil texture: Check only one; Clay, Clay Loam, Loam, Sandy Loam, or Sand.

III. Permanent Roads

1. Respect sensitive areas: Do roads avoid wet areas, SMZs, steep slopes if an alternative exist, erosion prone areas if an alternative exists, etc.?
2. Roads meet grade specs: Pertains to new roads or roads which are substantially reworked. Are roads within 2-10 percent grade except for short distances? Are roads on contour? Are ridge tops avoided?
3. Rutting within allowable specs: Is the road free of ruts in excess of 6 inches deep for more than 50 feet?
4. Well drained with appropriate structures: Are roads constructed so that water will quickly drain from them to minimize soil movement?

5. Ditches do not dump into streams: Are water turn outs and water bars venting far enough from the stream to prevent sediment from entering the stream channel?
6. Roads reshaped and stabilized: If needed, are roads reworked to minimize soil movement?

BMPs present: Which types of BMPs were used? Rolling dips (RD), Wing ditches (WD), Water bars (WB), Revegetate (RE), On contour (OC), Proper placement (PL), Reshaping (RS), Culverts (CU), Bridge (BR), Low water crossing (LW).

IV. Skid Trails/Temporary Roads

1. Slopes less than 15 %: Are skid trails run on or near contour as per guideline recommendations, rather than up and down steep slopes?
2. Respect sensitive areas: Do skid trails and temporary roads avoid wet areas, SMZs, steep slopes if an alternative exist, erosion prone areas if an alternative exists, etc.?
3. Roads well drained with water bars or other water control structures: Were BMPs installed effectively to reduce erosion from the road?
4. Roads stabilized: If needed, are skid trails and temporary roads worked to minimize soil movement?
5. Rutting within allowable specs: Are skid trails and temporary roads free of ruts in excess of 6 inches deep for more than 50 feet?

BMPs present: see section III above.

V. Stream Crossings

On Permanent Roads:

1. Stabilized: Are stream banks and fill stabilized? Are culverts properly sized? Are bridges used where necessary?
Are washouts evident? Are crossings at right angles?
2. Ditches do not dump into streams: Are water turn outs and water bars venting far enough from the stream to prevent sediment from entering the stream channel?
3. Stream free of sediment: Has sedimentation from the road into the stream channel been minimized?
4. Number of crossings minimized: Was an effort made to use as few crossings as possible?

On Temporary Roads

5. Number of crossings minimized: Was an effort made to use as few crossings as possible?
6. Stream crossings correct: Is the crossing located so as to minimize the potential erosion in the stream channel? Is the crossing at a right angle to the stream channel?

7. Approaches at right angles: Are approaches at right angles to the stream channel to minimize bank disturbance?
8. Stream crossings restored and stabilized: Have the temporary crossings been removed, excess fill removed from the stream channel and the banks been stabilized against erosion? Has the SMZ been stabilized in the area of the crossing?
9. Stream free of sediment: Has sedimentation from the road into the stream channel been minimized?

BMPs present: Which types of BMPs were used? Culverts (CU), Bridge (BR), Low water crossing (LW).

VI. Streamside Management Zones

1. Present on permanent stream: Is there an SMZ present on any permanent stream?
2. Present on intermittent stream: Is there an SMZ present on any intermittent stream?
3. SMZ adequately wide: Is the stream being protected from erosion and deposition of sediments? Does the width meet the guidelines recommendations?
4. Thinning within allowable specs: If thinning was done, is the basal area remaining at least 50 square feet? Is there minimal soil disturbance from felling and skidding?
5. SMZ integrity honored: Was an effort made to stay out of the SMZ with skidders, landings, roads, etc. (except for designated stream crossings)? Is the SMZ free of firebreaks?
6. Stream clear of debris: Are tops and limbs removed from permanent and intermittent stream channels? Has any brush or debris pushed into the stream channel been removed?
7. SMZ free of roads and landings: Were guidelines followed in locating roads and landings outside of the SMZ?
8. Stream free of sediment: Has sedimentation reaching the stream channel through the SMZ been minimized?

VII. Site Preparation

Site preparation method: Shear/pile/burn, Sheer only, Drum chop, Hot fire, Chemical, Disk/bed, Sub-soil, Disk/burn, Disking only.

Regeneration method: Mechanical, Hand, Natural, None.

1. Respect sensitive areas. Effort to prevent site prep intrusion into sensitive areas? Effort to prevent heavy equipment intrusion into sensitive areas? Effort to prevent fire intrusion into sensitive areas?
2. No soil movement on site: Is there no soil movement on site? Are rills or gullies prevented? Is there no problem with broad scale sheet erosion?
3. Firebreak erosion controlled: If present, has potential erosion from firebreaks been minimized as per guideline recommendations?

4. SMZ integrity honored: Effort to prevent site prep intrusion into the SMZ? Effort to prevent heavy equipment intrusion into the SMZ? Effort to prevent fire intrusion into the SMZ? Are perennial or intermittent streams free of debris?
5. Windrows on contour / free of soil: Are windrows on contour on hilly lands rather than up and down slopes? Was soil disturbance minimized? Was soil in windrows minimized?
6. No chemicals off site: Does it appear that chemicals were used according to label directions? Have they remained on site and out of water bodies?
7. Machine planting on contour: Are rows on contour on hilly lands rather than up and down slopes?
8. Stream free of sediment: Has sedimentation reaching the stream channel because of site prep activities been minimized?

VIII. Landings

1. Locations free of oil / trash: Any sign of deliberate oil spills on soil? Is trash picked up and properly disposed of?
2. Located outside of SMZ: Was the landing located outside SMZ so as to minimize traffic and erosion in the SMZ?
3. Well drained location: Were the landings located so as to minimize puddling, soil degradation and soil movement?
4. Number and size minimized: Were the number and size of landings kept to a minimum?
5. Respect sensitive areas: Were landings kept out of wet areas, SMZs, steep slopes if an alternative exist, erosion prone areas if an alternative exists, etc.?
6. Restored / stabilized: Has the landing been back bladed or otherwise restored as per guideline recommendations? Has erosion been minimized through spreading bark, etc., seeding, water bars, or other recommended BMP practices?

IX. Wetlands (may or may not be jurisdictional)

1. Avoid altering hydrology of site: Were ruts and soil compaction kept to a minimum?
2. Road drainage structures installed properly: Were BMPs installed to effectively to maintain the flow of water and keep erosion to a minimum in the wetland?
3. Mandatory road BMPs followed: Were the 15 federal mandatory BMPs followed?

X. Overall Compliance

Section compliance percentages are determined by dividing the number of questions receiving a yes answer by the total applicable questions in each section. $Y/(Y+N)$

Overall compliance is determined in a similar manner using the totals from all sections combined. $Y/(Y+N)$

Significant Risk. A significant risk to water quality exists if during a normal rainfall sediment is likely to be delivered to a permanent water body.

Subjective Score.

No Effort: Substantial erosion as a result of operations. Sedimentation in streams. Temporary stream crossings not removed. No SMZ when needed, etc. Poor attitude evident about the job.

Poor: Some effort at installing BMPs. Generally poor quality construction or no effort in certain locations, which suffer from erosion, stream sedimentation, etc. Substantial lack of BMPs in a particular emphasis such as roads, skid trails or SMZ.

Fair: (1) Generally a pretty good effort at BMPs. Poor application procedures perhaps. Lack of BMPs in a particular emphasis but with moderate consequences. (2) No BMPs on a site, which requires few BMPs but has some resultant minor problems.

Good: (1) BMPs generally installed correctly. Guidelines generally followed. Allows for some failures of BMP devices or failure to observe guidelines but with light consequences. (2) Good quality job which required no BMPs and has few problems.

Excellent: (1) BMPs installed correctly. Guidelines followed. (2) Some BMPs implemented even when they might not have been required. Few if any problems exist.

Summary of responses to BMP compliance monitoring checklist items, all sites.

Site Characteristics (150 Sites Evaluated 20,150 Total Acres)									
Owner Type	Forester	Terrain	Erodability	Highest Order	Distance to Nearest		Type of Activity Monitored		
					Stream Present	Permanent Water Body	#	Acres	
					<u>64</u>	< 300'	<u>98</u>	<u>10,681</u> Regen Hrv-Clearcut	
<u>62</u> Small NIPF	<u>70</u> Industry	<u>34</u> Flat	<u>44</u> Low	<u>47</u> Perennial	<u>13</u>	300-800'	<u>21</u>	<u>2,449</u> Regen Hrv-Partial	
<u>14</u> Large NIPF	<u>11</u> Consultant	<u>80</u> Hilly	<u>58</u> Medium	<u>48</u> Intermittent	<u>25</u>	800-1600'	<u>30</u>	<u>6,984</u> Thinning	
<u>63</u> Industry	<u>9</u> USFSI	<u>36</u> Steep	<u>48</u> High	<u>55</u> None	<u>48</u>	1600'+	<u>1</u>	<u>36</u> Site Prep	
<u>11</u> USFS	<u>60</u> None/Unknown								
Permanent Roads:		<u>73</u> Applicable	<u>77</u> Not Applicable	Skid Trails/Temporary Roads:		<u>125</u> Applicable	<u>25</u> Not Applicable		
		Yes	No	N/A			Yes	No	
								N/A	
24. Avoid sensitive areas		73	0	77	32. Slopes less than 15%		111	14	25
25. Roads meet grade specifications		68	5	77	33. Rutting within allowable specs		109	14	25
26. Stream crossings stabilized		23	4	123	34. Water bars evident		51	37	61
27. Rutting within allowable specs.		70	3	77	35. Water bars working		37	18	94
28. Ditches do not dump into stream		29	12	109	36. Stream crossings minimized		71	9	70
29. Were BMP's used		69	1	80	37. Stream crossings correct		23	22	105
30. BMP's effective		61	8	81	38. Stream crossings restored & stabilized		17	24	109
31. Stream free of sediment		26	11	113	39. Were BMP's used		80	31	38
					40. Stream free of sediment		53	28	68
Streamside Management Zones:		<u>94</u> Applicable	<u>56</u> Not Applicable						
		Yes	No	N/A			Yes	No	N/A
41. SMZ present on permanent stream		41	4	105	45. SMZ integrity honored		74	20	56
42. SMZ present on intermittent stream		61	10	79	46. Stream clear of debris		76	18	56
43. SMZ adequately wide		73	19	58	47. SMZ free of roads and landings		89	4	57
44. Thinning within allowable specs		39	18	93	48. Stream free of sediment		84	10	56
Site Preparation:		<u>32</u> Applicable	<u>118</u> Not Applicable						
49. Site prep method:									
<u>6</u> Shear/Pile/Burn	<u>1</u> Shear/Pile	<u>4</u> Shear Only	<u>1</u> Drum Chop	<u>3</u> Burn Only	<u>3</u> Chemical	<u>1</u> Disk/Bed	<u>0</u> Disk Only	<u>5</u> Shear/Subsoil	
<u>1</u> Chop/Burn	<u>4</u> Shear/Disk/Bed	<u>3</u> Other							
50. Regeneration Method:		<u>4</u> Mechanical	<u>5</u> Hand-plant						
		Yes	No	N/A			Yes	No	N/A
51. No soil movement on site		27	5	118	54. Windrows on contour/free of soil		6	0	144
52. Firebreak erosion controlled		13	2	135	55. No chemical off site		4	0	146
53. SMZ integrity honored		17	3	130	56. Were BMP's used		16	9	125
					57. Stream free of sediment		15	5	130
Landings:		<u>131</u> Applicable	<u>56</u> Not Applicable						
		Yes	No	N/A			Yes	No	N/A
58. Locations free of oil/trash		126	5	19	60. Well drained location		127	4	19
59. Located outside SMZ		101	2	47	61. Restored, stabilized		25	8	117
62. Overall Compliance with Best Management Practices									
	Needs Improvement			Pass					
	<u>No Effort</u>	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Excellent</u>				
	5	14	26	87	18				
	3.3%	9.3%	17.3%	58.0%	12.0%				

APPENDIX B

Figures 1 – 7

Figure 1. Site locations by ownership category.



Figure 2
Overall Compliance Ratings – All Categories, All
Ownerships

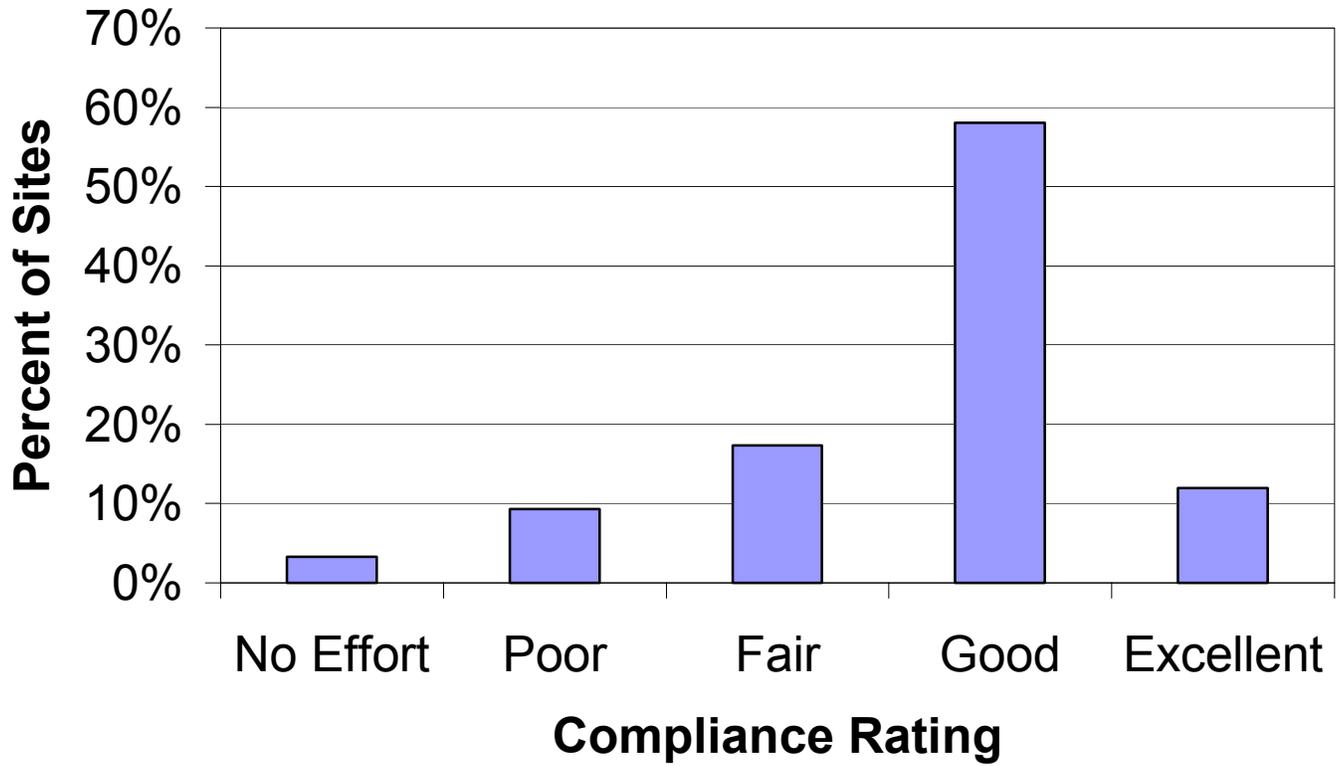


Figure 3. Site locations by overall compliance ratings

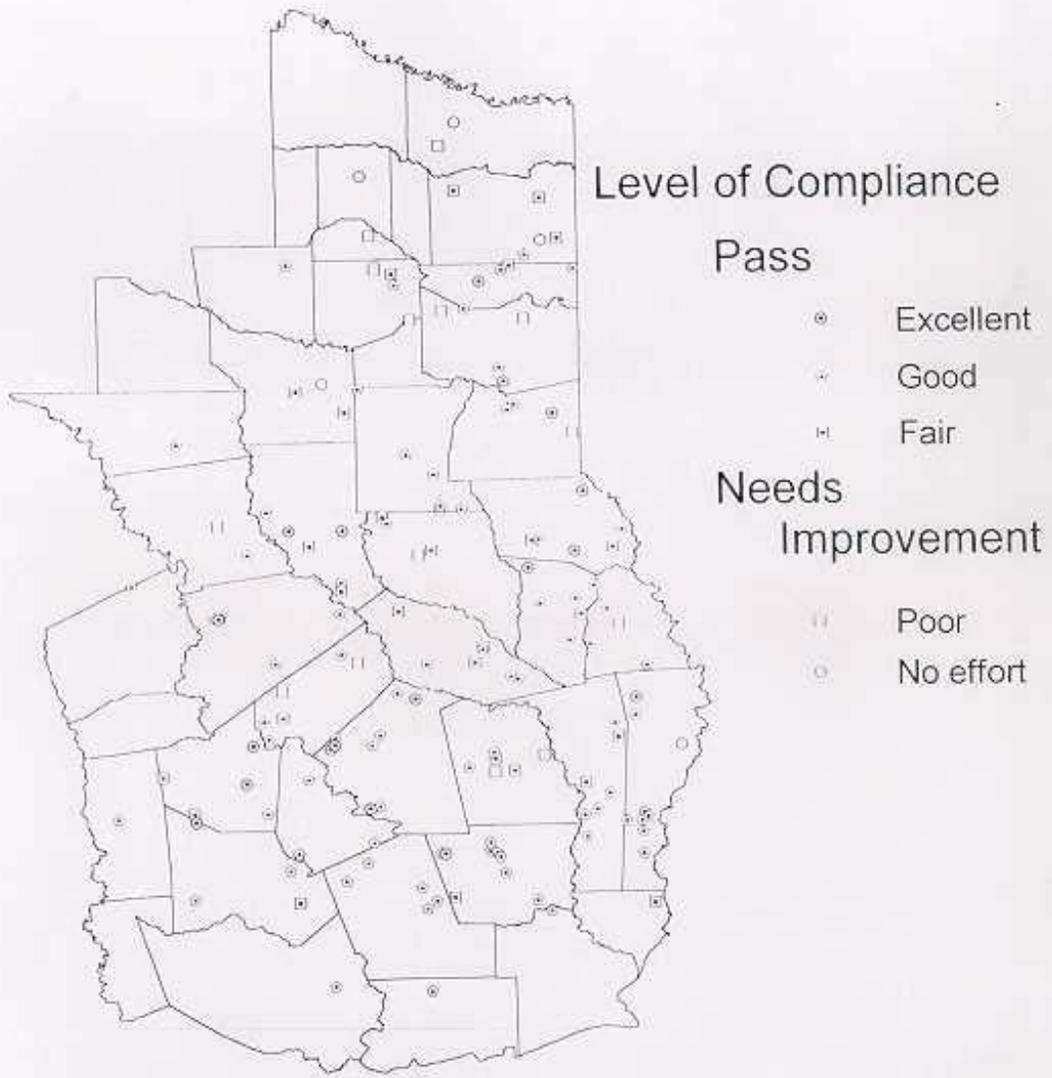


Figure 4
Compliance Ratings by Ownership Category

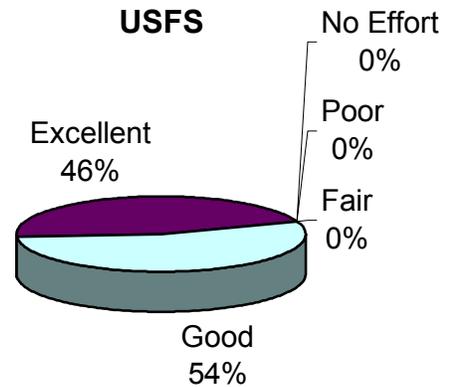
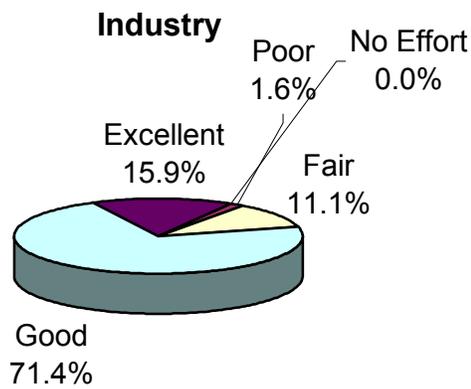
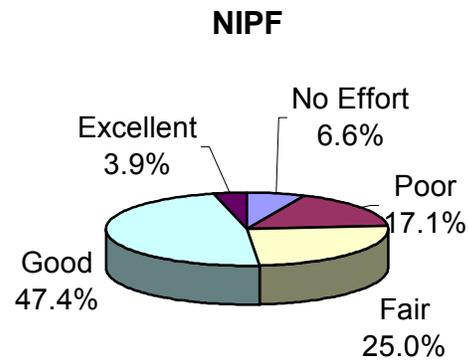
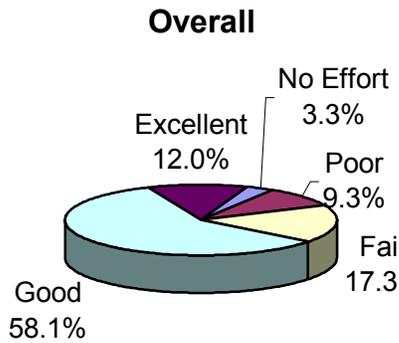


Figure 5
Compliance Ratings by Forester Involvement

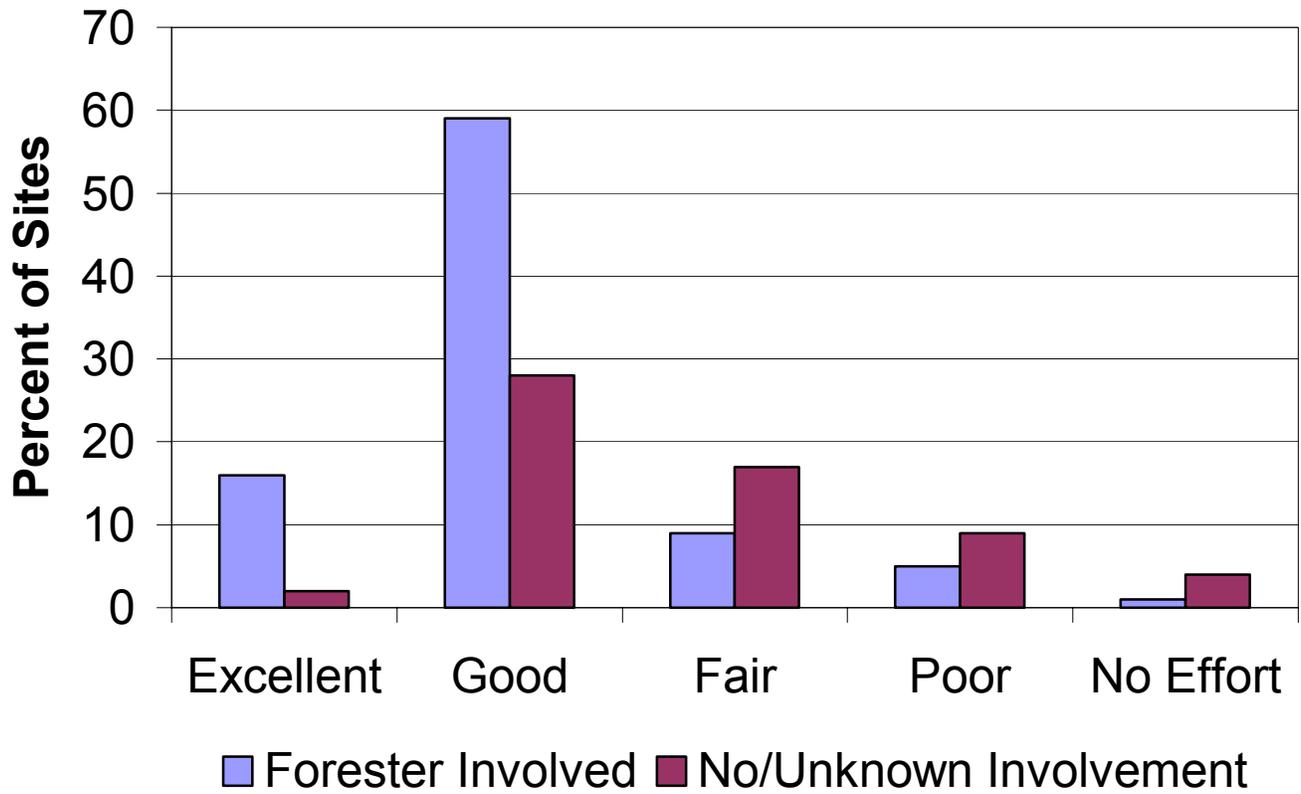


Figure 6
Compliance by Logger Familiarity with BMPs

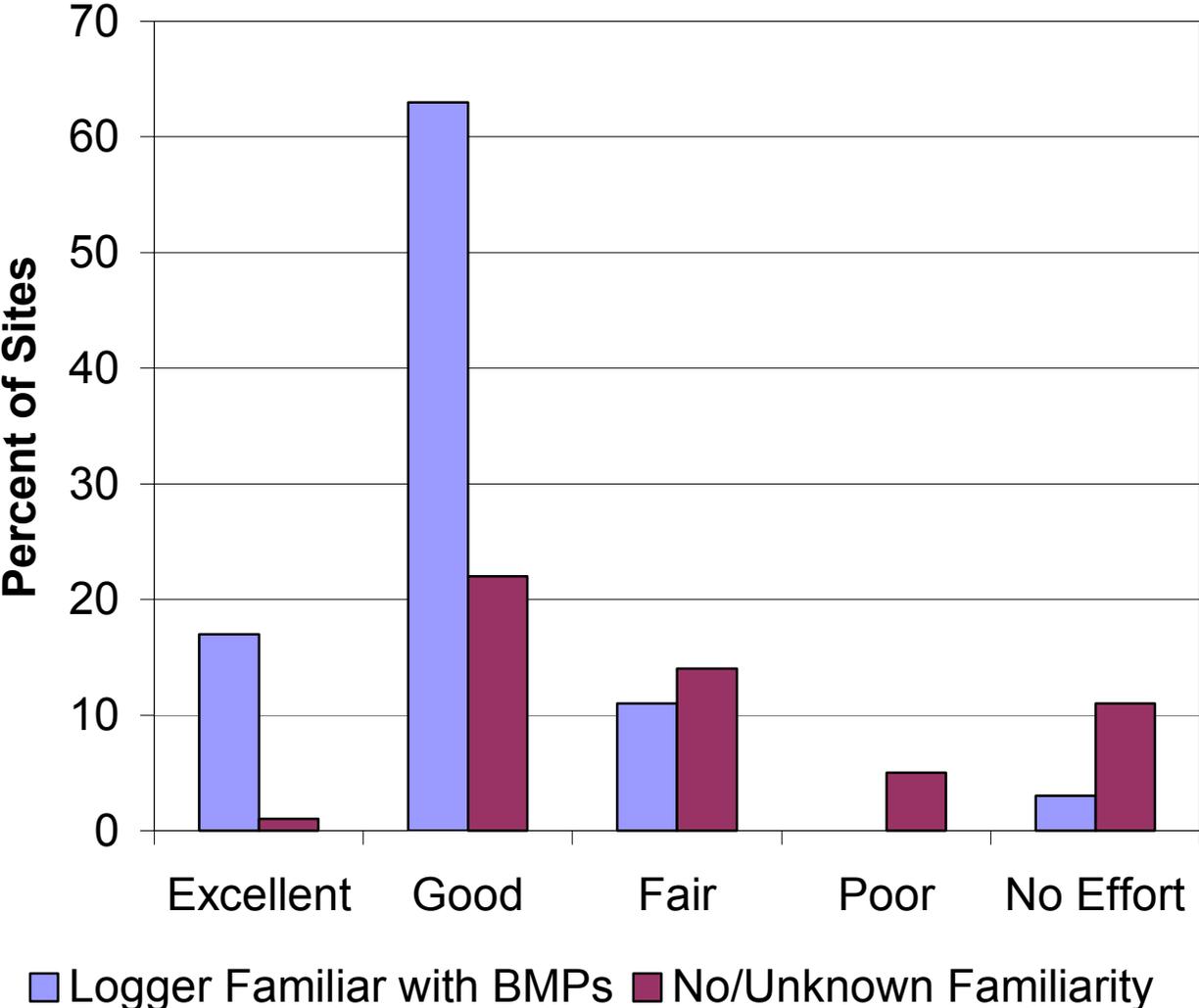


Figure 7. BMP compliance versus timber prices.

