

Voluntary Implementation of Forestry Best Management Practices in East Texas

*Results from Round 5 of BMP Implementation Monitoring
2000-2002*

by

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TEXAS FOREST SERVICE

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EXECUTIVE SUMMARY

A Best Management Practices (BMP) monitoring program evaluated the level of implementation with voluntary forestry BMPs. A total of 150 sites on which silvicultural activities occurred were evaluated. These sites were monitored between August 16, 2000 and April 23, 2002 and are believed to be a representative sample of the forestry activities that occur in East Texas.

Overall BMP implementation on the sites monitored was 91.5%. In general, implementation was highest on sites under public or industrial ownership. National and State Forest sites had an overall implementation of 98.4%, while industry sites had a 96.1% implementation rating. Nonindustrial private forest (NIPF) lands scored 86.4% overall.

Implementation with BMPs was statistically significantly higher when:

- the landowner was familiar with BMPs
- the logging contractor had attended formal BMP training
- a forester was involved in the sale or activity
- BMPs were included in the timber sale contract
- the landowner was a member of a forest organization
- the timber was delivered to a major SFISM mill

Implementation was generally lowest on sites when:

- owned by nonindustrial private forest (NIPF) landowners
- a forester was not involved in the sale or activity
- BMPs were not included in the timber sale contract

Major deficiencies noted during the evaluations were:

- improper stream crossings on temporary roads
- high amount of significant risks

Major improvements from previous rounds were:

- higher overall BMP implementation on stream crossings and roads
- increase in BMP implementation across all ownerships

In previous rounds (1, 2, and 3) of monitoring, tracts were graded for implementation using a "Pass or Fail" method. For Round 4, a new system was developed that uses percentages to denote implementation. This same system was used for Round 5.

TABLE OF CONTENTS

BACKGROUND AND OBJECTIVES	5
DISTRIBUTION AND SELECTION OF IMPLEMENTATION MONITORING SITES ...	5
QUALITY CONTROL.....	6
MONITORING CHECKLISTS – OLD vs. NEW	7
INSPECTION CONTACTS	7
RESULTS	8
SITE CHARACTERISTICS.....	8
PERMANENT ROADS.....	10
SKID TRAILS AND TEMPORARY ROADS	10
STREAM CROSSINGS	12
STREAMSIDE MANAGEMENT ZONES.....	15
SITE PREPARATION.....	17
LANDINGS	18
WETLANDS.....	21
OVERALL IMPLEMENTATION WITH BMPs.....	22
IMPLEMENTATION BY SITE CHARACTERISTICS	22
Ownership.....	22
Type of Activity.....	22
Region	25
Terrain.....	25
Erodability	25
Distance to Permanent Water.....	25
Proximity to 303 (d) Listed Stream Segments.....	25
STATISTICAL SIGNIFICANCE	26
Forester Involved in Sale or Activity.....	27
Landowner Familiarity with BMPs	27
Logging Contractor Familiarity with BMPs.....	27
BMPs in Timber Sale Contract.....	27
Landowner Member of Forest Organization	27
Timber Delivered to Major SFI SM Mill	27
DISCUSSION.....	30
OVERALL IMPLEMENTATION – Rounds 1, 2, 3, and 4	30
OVERALL IMPLEMENTATION – Round 5	31
CONCLUSION.....	32
APPENDIX.....	33

BACKGROUND AND OBJECTIVES

The Clean Water Act (CWA), as reauthorized in 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 implementation.

The Texas Silvicultural Nonpoint Source Pollution Project, funded by a FY99 CWA Section 319(h) grant from the Environmental Protection Agency (EPA) through the Texas State Soil and Water Conservation Board (TSSWCB), 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 implementation of BMP guidelines by forest landowners, silvicultural contractors, forest industry, and government agencies,

and

- 2) Evaluate the effectiveness of BMPs as applied in the field and identify any weaknesses in the BMP guidelines.

This report documents the findings of the BMP implementation monitoring for 150 sites monitored between August 16, 2000 and April 23, 2002. This data represents Round 5 of BMP implementation 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; the Texas Forest Service March, 1996 publication of the same title for Round 2 of implementation monitoring results; the Texas Forest Service April, 1998 publication, also same name, for Round 3; and the Texas Forest Service September, 2000 publication, also same name, for Round 4.

DISTRIBUTION AND SELECTION OF IMPLEMENTATION MONITORING SITES

To get a valid estimate of overall implementation with Forestry Best Management Practices in East Texas, monitoring sites were distributed regionally within East Texas and among forestland ownership categories. Sites were believed to be 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 Implementation Monitoring Sites by County.

County	1999 Average Annual Harvest (cubic feet)	Number of Sites Monitored
Anderson	11,462,930	2
Angelina	46,197,482	10
Bowie-Red River	23,223,116	5
Camp-Morris	4,926,419	1
Cass	35,715,294	8
Cherokee	21,950,935	5
Franklin-Titus	2,399,136	1
Gregg	5,490,289	1
Hardin	24,581,870	5
Harris	7,162,826	2
Harrison	23,544,358	5
Houston	10,035,937	2
Jasper	38,925,816	8
Jefferson	2,363,163	1
Liberty	33,340,924	7
Marion	20,289,409	4
Montgomery	35,257,919	8
Nacogdoches	31,147,080	7
Newton	37,334,271	8
Orange	6,487,753	1
Panola	25,052,453	5
Polk	39,674,199	9
Rusk	18,915,408	4
Sabine	21,704,335	5
San Augustine	20,805,993	5
San Jacinto	11,261,443	2
Shelby	26,707,571	6
Smith	16,213,489	4
Trinity	12,978,433	3
Tyler	38,276,738	8
Upshur	10,317,035	2
Walker	22,802,616	5
Wood	4,063,820	1
Total	690,612,459	150

QUALITY CONTROL

To eliminate bias, implementation monitoring sites were selected in a random manner using several methods, including aerial detection and information from Texas

Forest Service (TFS) personnel. All monitoring evaluations were conducted by one or a combination of the two trained foresters assigned 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 periodically throughout the project, both BMP Project foresters jointly evaluated tracts to maintain and improve consistency and fairness. The TFS BMP Project collected monitoring data in accordance with a Quality Assurance Project Plan, approved by TSSWCB and EPA.

MONITORING CHECKLISTS – OLD vs. NEW

After six years and three rounds of monitoring with a scoring system that applied a “Pass or Fail” assessment to each tract, a new form that is more objective in nature was implemented for Round 4 and continued in Round 5. This was done to follow the *Implementation Monitoring Protocol*, a guidance document approved by the Southern Group of State Foresters to allow the states to coordinate their BMP monitoring programs. Although there is a section for the evaluator to record a subjective score, this new form no longer grades a tract as No Effort, Poor, Fair, Good, or Excellent. Instead, each tract receives a number, or percent, which demonstrates voluntary implementation. In other words, instead of a tract receiving a “Good” it might receive an 89%. This removes the “Pass or Fail” system. It is important to note that this form has been extensively field tested for consistency and accuracy of representing true BMP implementation. Once the field data is collected, it is entered into an Access database for storage and retrieval. This data can easily be imported into ArcView GIS for further analysis and geographical representation. Copies of the new form are found in the Appendix.

Previously, “effort” at installing BMPs was acknowledged. The subjective nature of the old form allowed for a tract that had some improperly installed BMPs to receive credit in some cases. The new form objectively notes whether or not, for example, waterbars were installed properly. No credit was given where BMPs were not effectively installed.

A new category of “significant risk” appears on the new form. A significant risk is a situation or set of conditions that have resulted in or very likely will result in the measurable and significant degradation of water quality, and that can be remedied or otherwise mitigated. A determination was made for each BMP or lack of a BMP to see if a significant risk to water quality existed.

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, was answered “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 instructions on interpreting the form. Recommendations for remediation, if applicable, were made.

RESULTS

Between August 16, 2000 and April 23, 2002, TFS BMP foresters evaluated BMP implementation on 150 sites, totaling 14,983 acres, throughout East Texas. These 150 tracts are geographically represented by ownership category in Figure 1. Tabulated results by question on the BMP implementation monitoring checklist are located in the Appendix.

SITE CHARACTERISTICS

The 150 monitoring sites were distributed both geographically and by ownership, as shown in Figure 1. Seventy-four of the 150 sites (49%) were owned by nonindustrial private forest (NIPF) landowners. Sixty-six sites (44%) were owned by forest industry. Ten sites (7%) were on publicly owned lands (U.S. Forest Service and State lands).

The majority of sites (59%) were monitored after a regeneration harvest, including 78 clearcuts and 10 partial harvests (such as diameter cuts, seedtree cuts, or selection harvests). Forty thinning, 10 site preparation (only), and 12 planting operations were evaluated. In 44 cases, the site preparation evaluation was included in elements of the preceding timber harvest operation or succeeding planting operation.

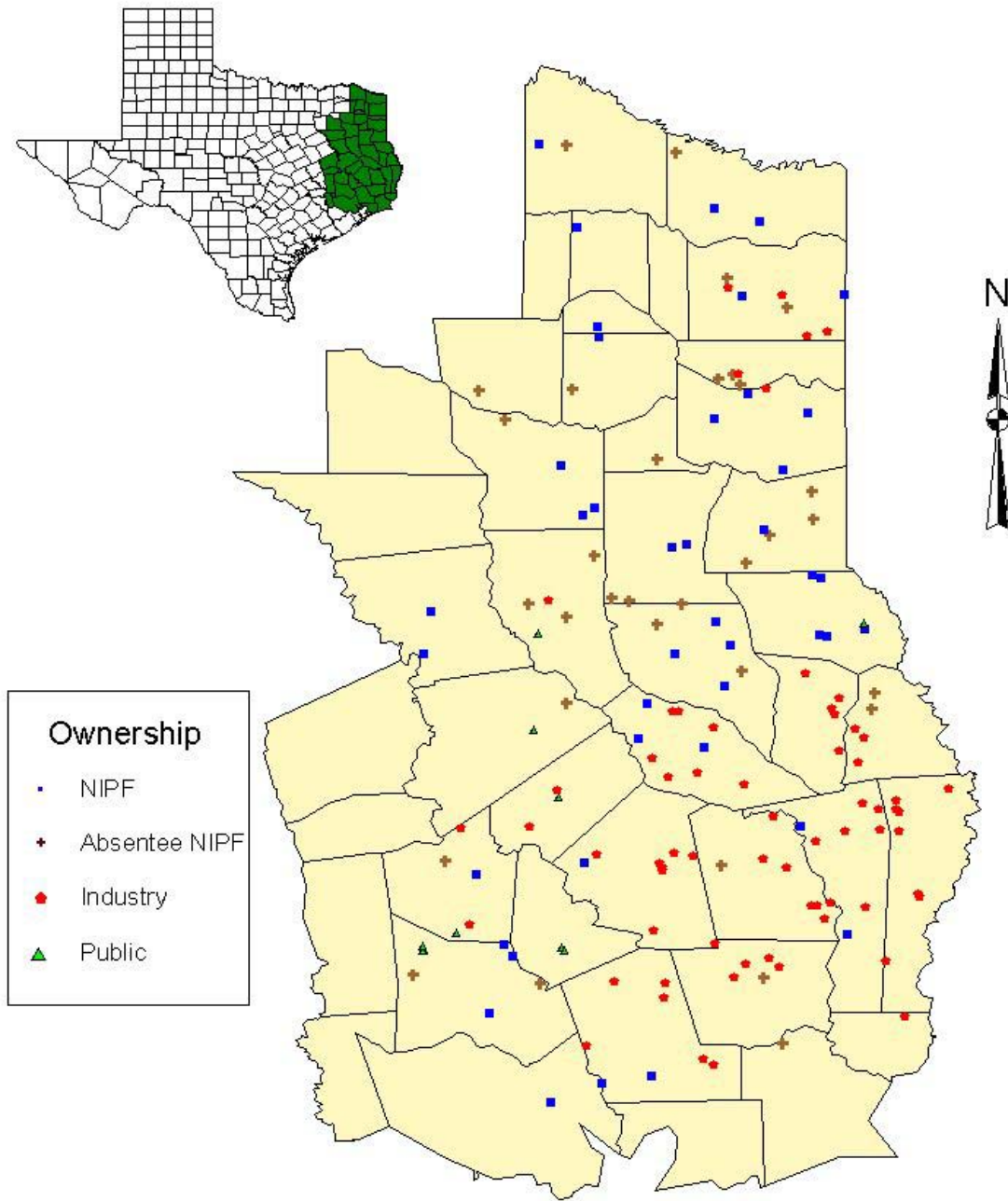
Professional foresters were involved in planning and/or implementing the silvicultural operation on 123 (82%) of the sites. On 66 sites, the forester was employed by forest industry. Private consultants were involved on 47 of the sites, while U.S. Forest Service and Texas Forest Service foresters were involved on 10 sites.

Terrain classification and soil erodability were recorded from the Natural Resources Conservation Service (NRCS) soil survey, if applicable, or estimated by the forester in the field. Forty-eight sites (32%) were on flat terrain. Ninety-nine sites (66%) were on hilly terrain and three (2%) were on steep terrain. Forty-seven sites (31%) were on soils with low erodability, 66 sites (44%) on medium erodability soils, and 37 (25%) were on high erodability soils.

Of the 150 sites, 119 had either a perennial (54) or intermittent (94) stream or both perennial and intermittent (29). A permanent water body was found within 1,600 feet of 68 sites (45%).

Figure 1. Site locations by ownership category.

Fifth Round of Monitoring (2000-2002)



PERMANENT ROADS

Permanent roads were evaluated for implementation of 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 applicable on 129 of the 150 sites. The percent implementation for permanent roads was 94% and two significant risks were noted. The lowest implementation score was for not having roads well drained with appropriate structures (78%). The area with the highest level of implementation was for roads respecting sensitive areas and meeting grade specifications (99% for both categories). See Table 2. Figure 2 breaks down these numbers of sites into ownership type.

Table 2. Implementation of Specific BMPs Relating to Permanent Roads.

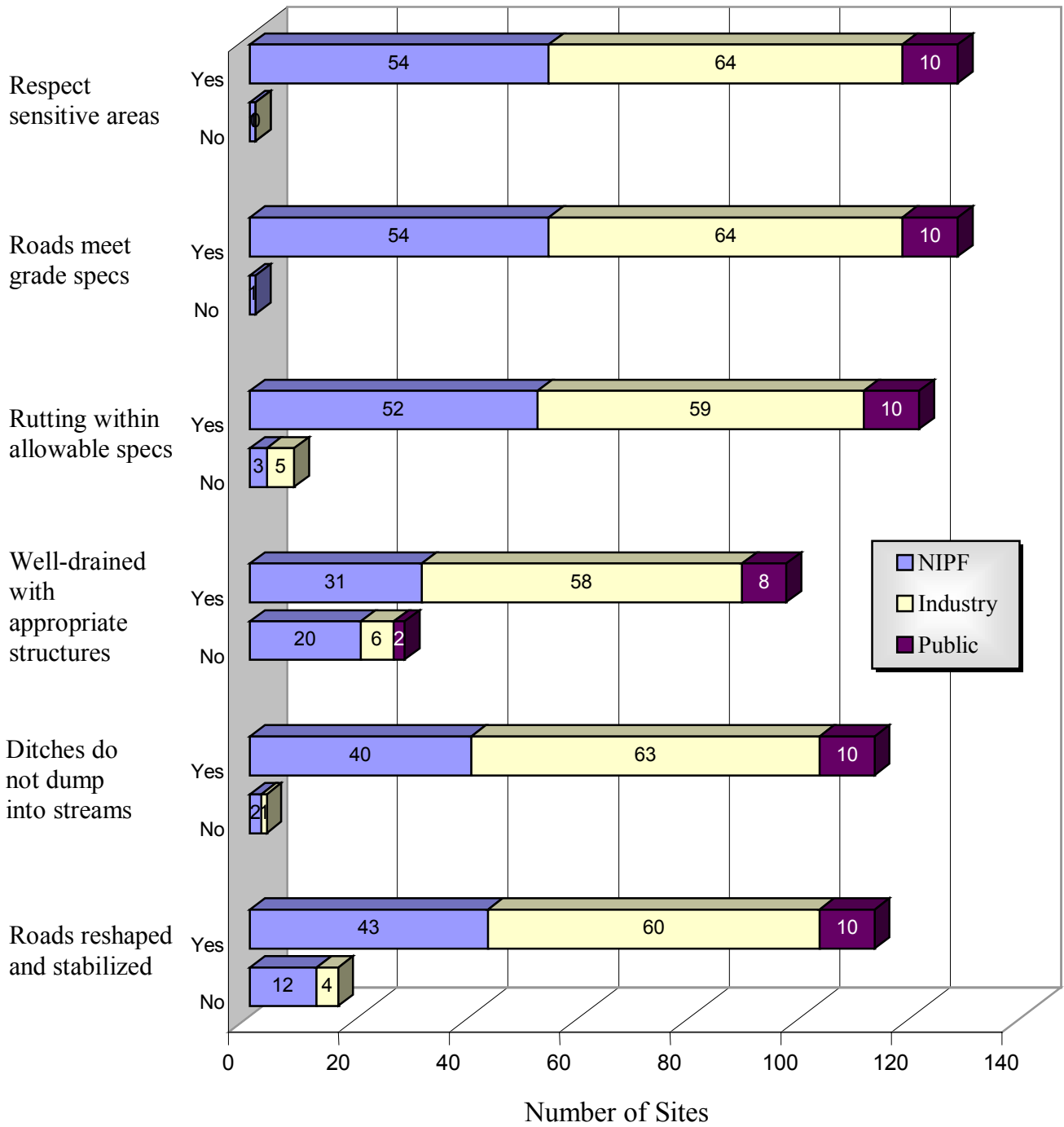
BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Respect sensitive areas	128	1	21	99	0
Roads meet grade specifications	128	1	21	99	0
Rutting within allowable specs	121	8	21	94	0
Well-drained with appropriate structures	97	28	25	78	2
Ditches do not dump into streams	113	3	34	97	0
Roads reshaped and stabilized	113	16	21	88	0

It is important to note that non-use of a specific BMP does not necessarily imply lack of implementation 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 AND TEMPORARY ROADS

Skid trails and temporary roads were evaluated on 94 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 traffic long-term and are usually retired, closed, or reforested after the harvest activity. The percent implementation for temporary roads was 86% and a total of three significant risks were noted. The lowest implementation category was for

Figure 2. BMP implementation on permanent roads by ownership type.



roads that were not well drained with appropriate water control structures to effectively reduce erosion (73%). The area with the highest implementation (98%) was for slopes less than 15%. See Table 3 and Figure 3.

Table 3. Implementation of Specific BMPs Relating to Skid Trails and Temporary Roads.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Slopes less than 15%	92	2	56	98	1
Respect sensitive areas	85	9	56	90	0
Roads well-drained with appropriate structures	63	23	64	73	2
Roads stabilized	75	19	56	80	0
Rutting within allowable specifications	83	11	56	88	0

STREAM CROSSINGS

Stream crossings were evaluated on 72 sites. Thirty sites had crossings on permanent roads only, 30 had them on temporary roads only, and 12 were on both permanent and temporary roads. The percent implementation for stream crossings was 84.9% and a total of twelve significant risks were noted. Stream crossings on permanent roads received the lowest implementation for not being stabilized (83%). The highest implementation, 97%, was for ditches not dumping into streams. Crossings on temporary roads scored the lowest for not being restored and stabilized (71%). However, 95% of the crossings were minimized on permanent roads and 93% were installed at right angles on temporary roads. See Table 4 and Figure 4.

Figure 3. BMP implementation on skid trails/temporary roads by ownership type.

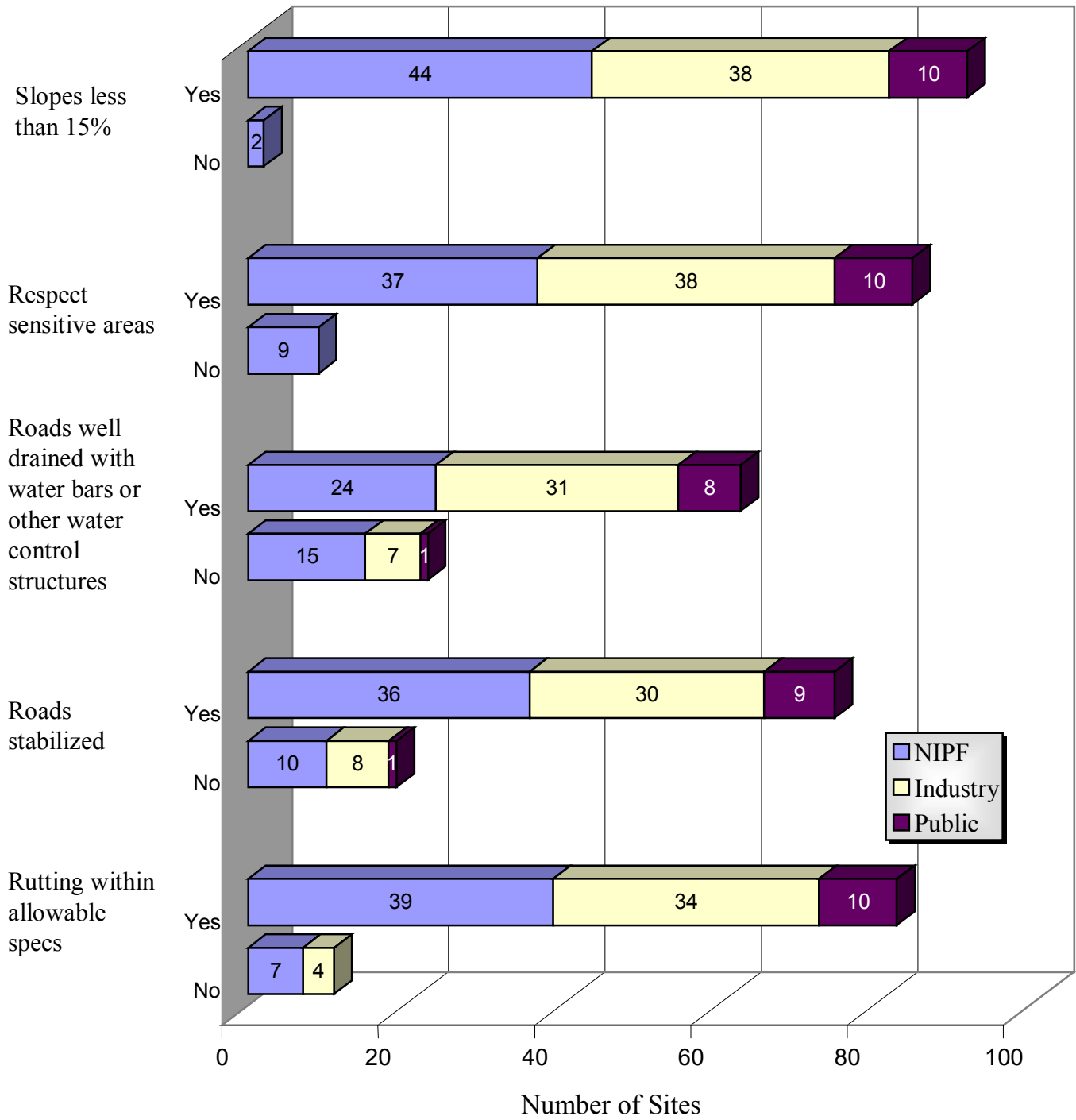


Figure 4. BMP implementation on stream crossings by ownership type.

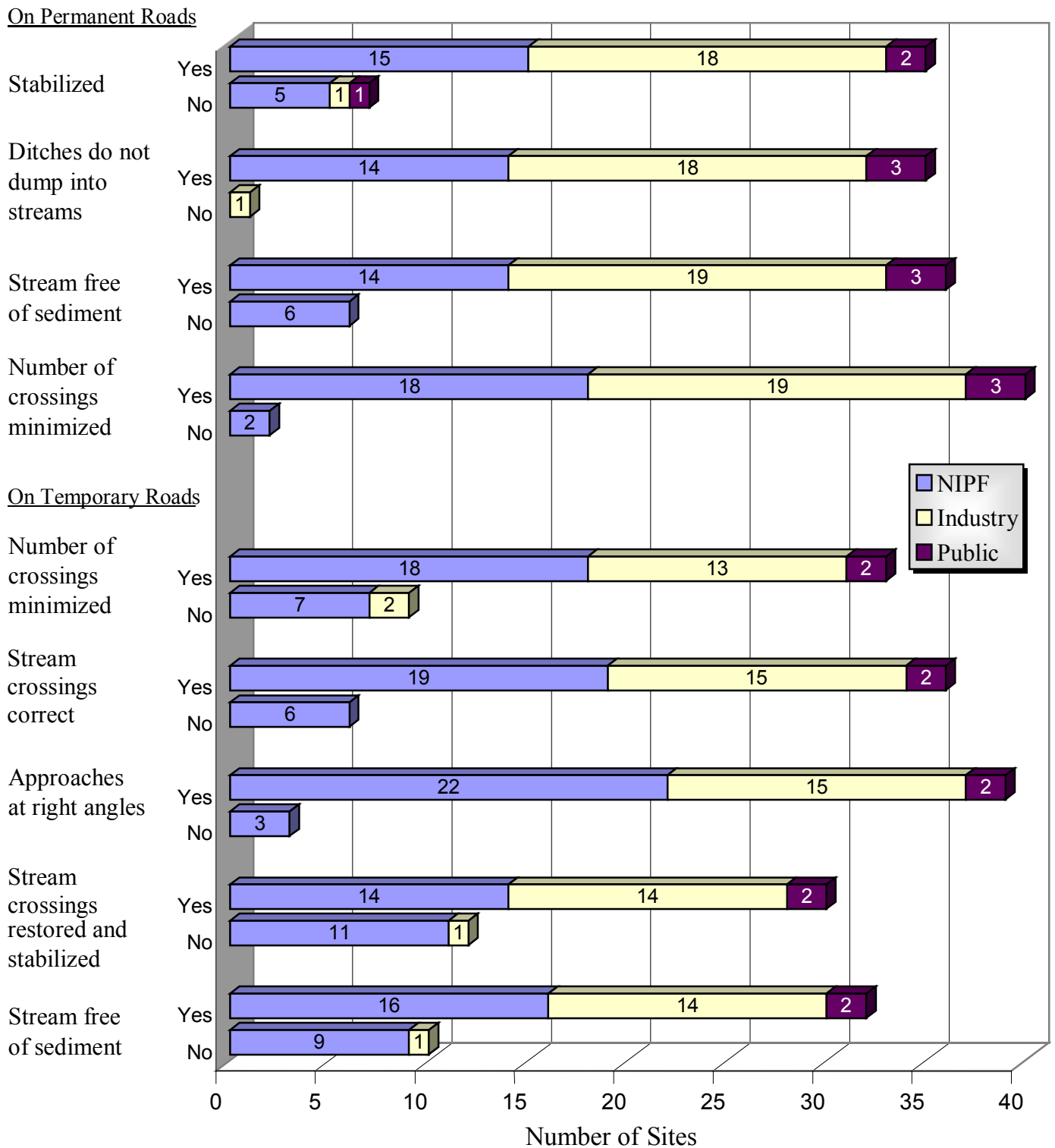


Table 4. Implementation of Specific BMPs Relating to Stream Crossings.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Permanent Roads					
Stabilized	35	7	108	83	3
Ditches do not dump into streams	35	1	114	97	0
Stream free of sediment	36	6	108	86	1
Number of crossings minimized	40	2	108	95	0
Temporary Roads					
Number of crossings minimized	33	9	108	79	2
Stream crossings correct	36	6	108	86	0
Approaches at right angles	39	3	108	93	0
Stream crossings restored and stabilized	30	12	108	71	4
Stream free of sediment	32	10	108	76	2

STREAMSIDE MANAGEMENT ZONES

Streamside management zones (SMZs) are recommended on all perennial and intermittent streams, lakes, ponds, and reservoirs. All sites with either perennial or intermittent streams were evaluated for the presence and adequacy of SMZs. Streams were present on 119 of the 150 sites. Of these 119 sites, 25 had perennial streams only, 65 had intermittent streams only, and 29 had both perennial and intermittent streams. Overall implementation of SMZs was 88% and eleven significant risks were noted. It is important to note the BMP implementation of having a SMZ on a permanent stream was 96%. The lowest implementation was for SMZs not being adequately wide (70%). See Table 5 and Figure 5.

Figure 5. BMP implementation on streamside management zones by ownership type.

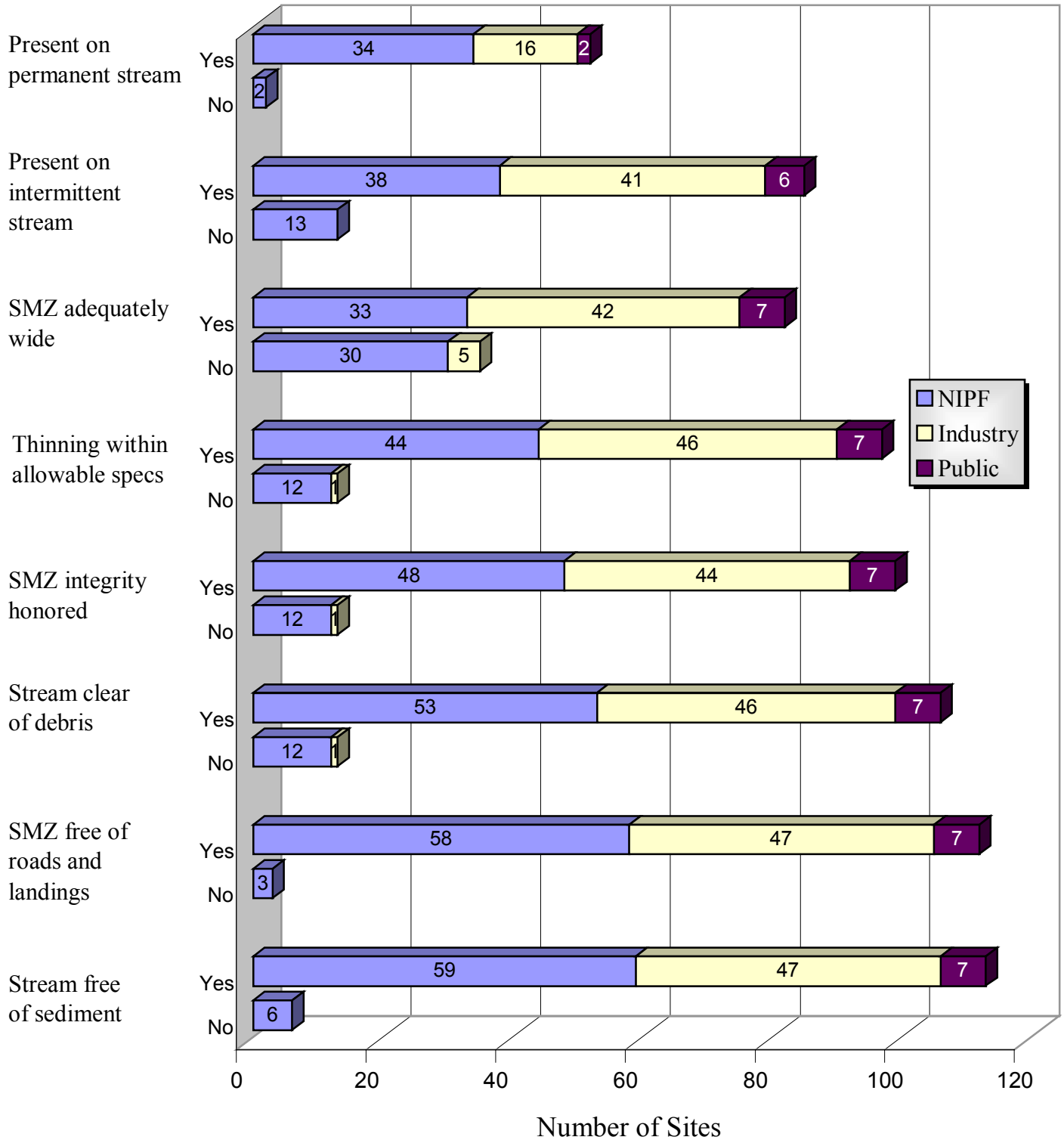


Table 5. Implementation of Specific BMPs Relating to SMZs.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Present on perennial stream	52	2	96	96	1
Present on intermittent stream	85	13	52	87	6
Adequately wide	82	35	33	70	0
Thinning within allowable specs	97	13	40	88	0
Integrity honored	99	13	38	88	0
Stream clear of debris	106	13	31	89	4
Free of roads and landings	112	3	35	97	0
Stream free of sediment	113	6	31	95	0

SITE PREPARATION

Fifty-four sites were evaluated for implementation with site preparation BMPs. A variety of site preparation techniques were evaluated, including 40 with some combination of shearing, piling, subsoiling, bedding, and/or burning. Eleven sites involved application of herbicide only. The implementation for site preparation was 90% and no significant risks were noted. Four of the nine sites that were machine planted were not done on the contour, resulting in an implementation of 69%. See Table 6 and Figure 6.

Table 6. Implementation of Specific BMPs Relating to Site Preparation.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Respect sensitive areas	50	4	96	93	0
No soil movement on site	53	1	96	98	0
Firebreak erosion controlled	29	4	117	88	0
SMZ integrity honored	46	2	102	96	0

Windrows on contour/free of soil	18	4	128	82	0
No chemicals off site	38	2	110	95	0
Machine planting on contour	9	4	137	69	0
Stream free of sediment	50	0	100	100	0

LANDINGS

Landings, sometimes called sets, are areas where logs are gathered, delimbed, bucked, and loaded onto log trucks. Landings were evaluated on 102 sites with an overall implementation of 98%. Several areas were found to have fully implemented BMPs (100%), including respecting sensitive areas, being located outside of the SMZ, and minimizing their number and size. There were no significant risks noted on landings. See Table 7 and Figure 7.

Table 7. Implementation of Specific BMPs Relating to Landings.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Location free of oil/trash	95	8	47	92	0
Located outside of SMZ	97	0	53	100	0
Well-drained location	101	1	48	99	0
Number and size minimized	102	0	48	100	0
Respect sensitive areas	102	0	48	100	0
Restored/stabilized	97	5	48	95	0

Figure 6. BMP implementation on site preparation by ownership type.

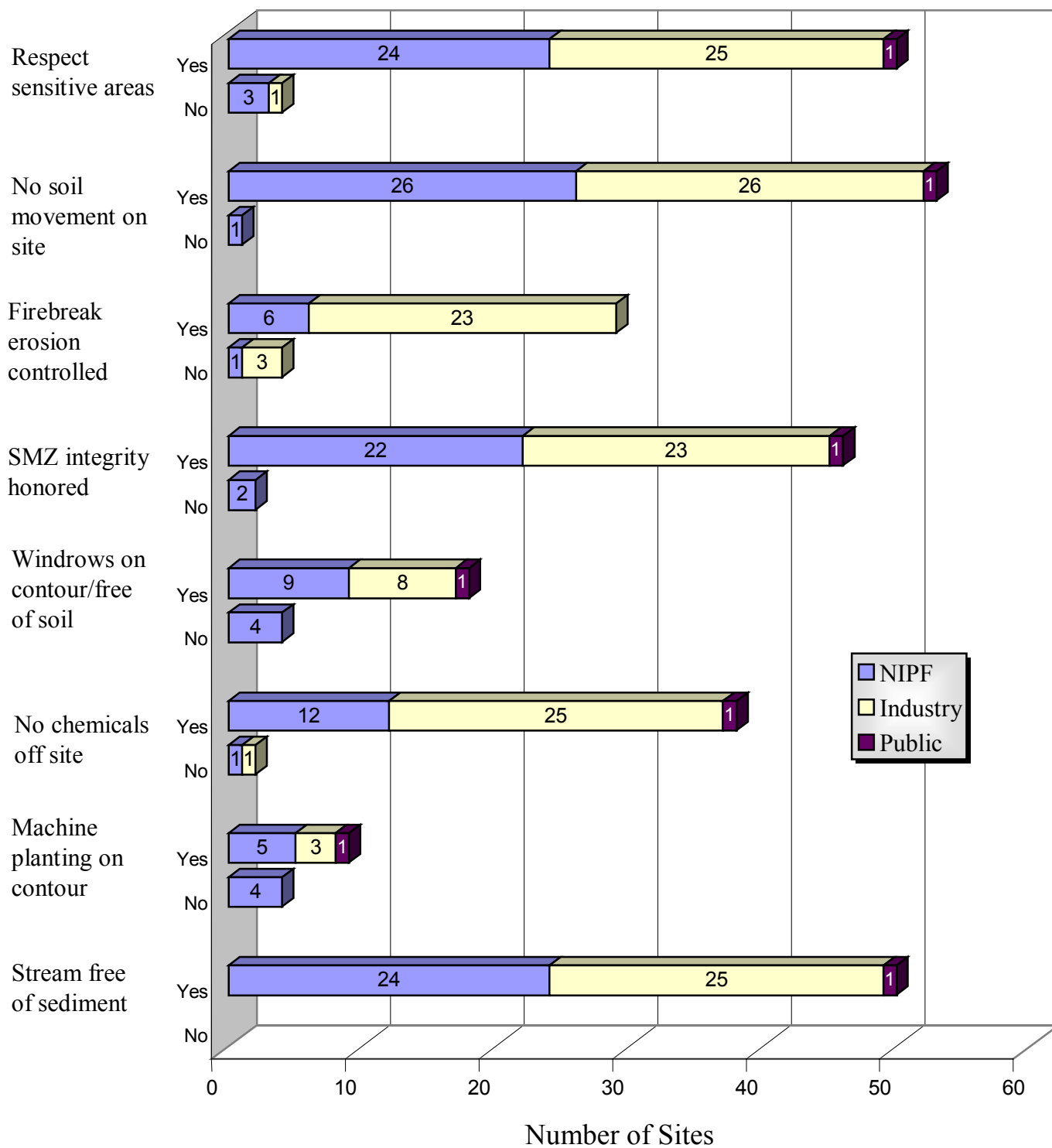
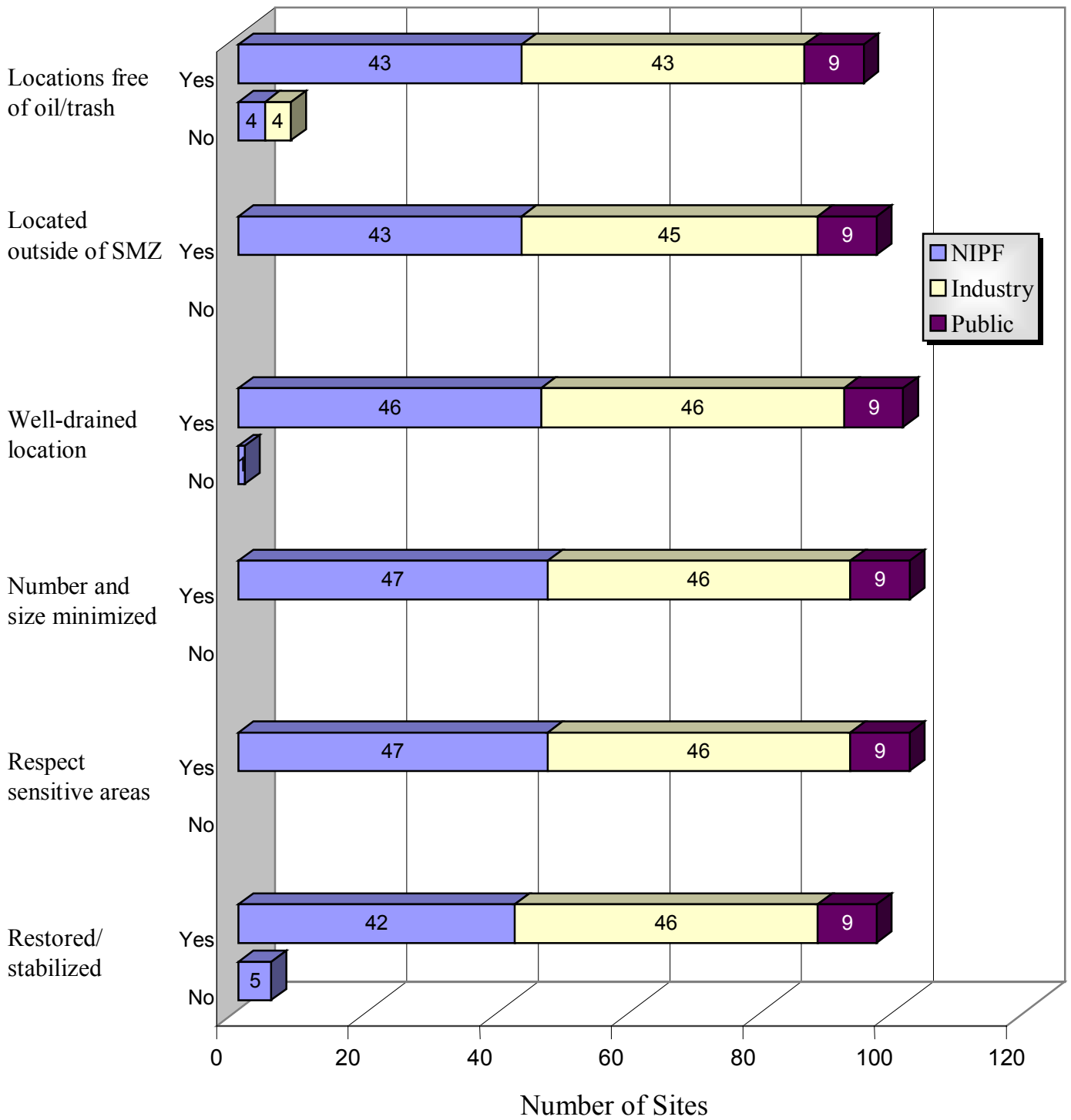


Figure 7. BMP implementation on landings by ownership type.



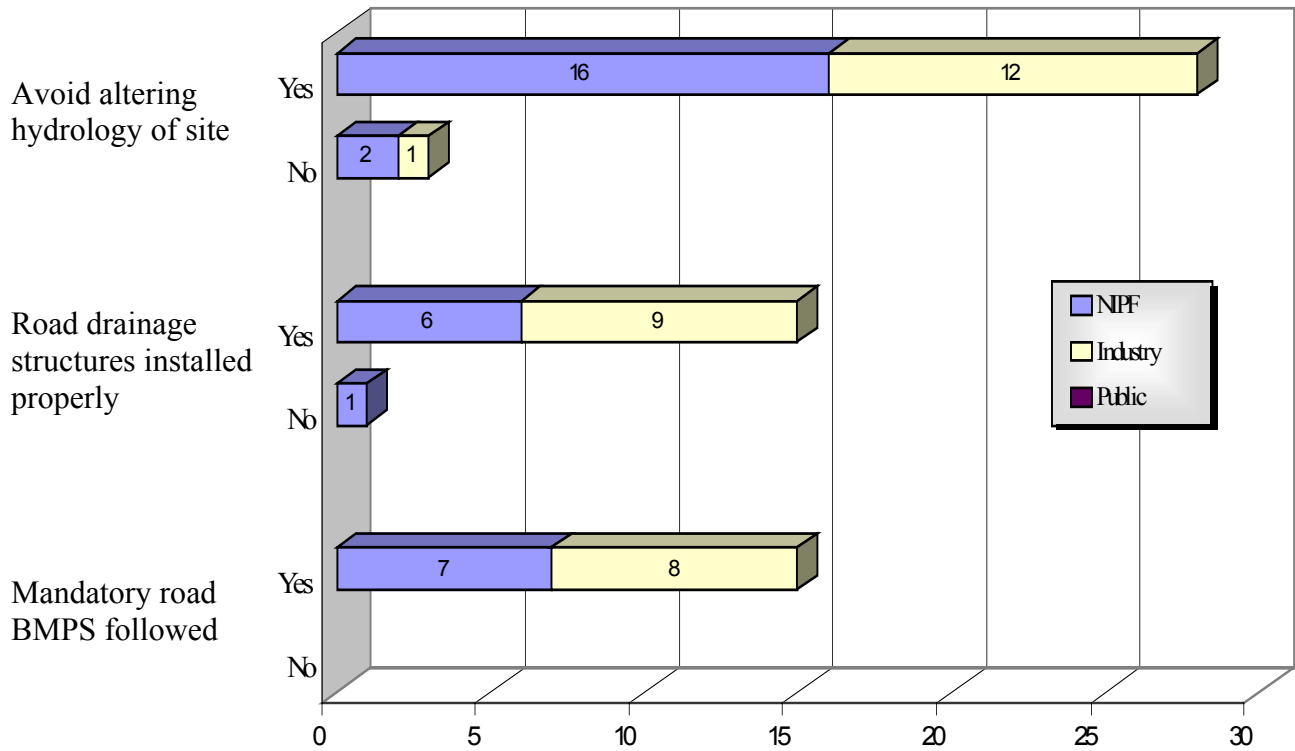
WETLANDS

Fifteen sites had wetland or “wetland like” areas – not necessarily jurisdictional wetlands. These sites had an overall implementation of 94%. No significant risks were noted and all mandatory road BMPs for wetlands were followed. See Table 8 and Figure 8.

Table 8. Implementation of Specific BMPs Relating to Wetlands.

BMP	Yes	No	N/A	% Implementation	Number of Significant Risks
Avoid altering hydrology of site	28	3	119	90	0
Road drainage structures installed properly	15	1	134	94	0
Mandatory road BMPs followed	15	0	135	100	0

Figure 8. BMP Implementation on wetlands by ownership type.



OVERALL BMP IMPLEMENTATION

To illustrate the spread of the implementation scores, Figures 9 and 10 separate the results into six categories: 0-49%, 50-59%, 60-69%, 70-79%, 80-89%, and 90-100%. Figure 9 geographically illustrates implementation across all ownership types. Figure 10 provides the number of tracts across all ownership types receiving the respective level of implementation.

IMPLEMENTATION BY SITE CHARACTERISTICS

Ownership

BMP implementation varied by ownership type. The public ownership category (U.S. Forest Service and State forestlands) fared best, with 98.4% for the ten tracts with no significant risks noted.

The 66 sites owned by forest industry had an overall BMP implementation of 96.1% and had only four significant risks.

Nonindustrial private forest (NIPF) landowners had an implementation rating of 86.4%, the lowest level of the three ownership types, and had twenty-four significant risks.

Type of Activity

Five types of silvicultural activities were monitored: regeneration harvests, partial regeneration cuts, thinning, site preparation, and planting. Ten sites were evaluated for site preparation only, although site preparation was evaluated along with a regeneration harvest or planting 44 times. See Table 9.

Table 9. Overall BMP Implementation by Type of Operation.

Type of Operation	BMP Implementation
Regeneration harvest (clearcut)	88%
Regeneration harvest (partial cut)	82%
Thinning	97%
Site preparation (only)	95%
Planting	96%

Figure 9: Overall implementation scores across all ownerships and monitoring criteria.

Fifth Round of Monitoring (2000-2002)

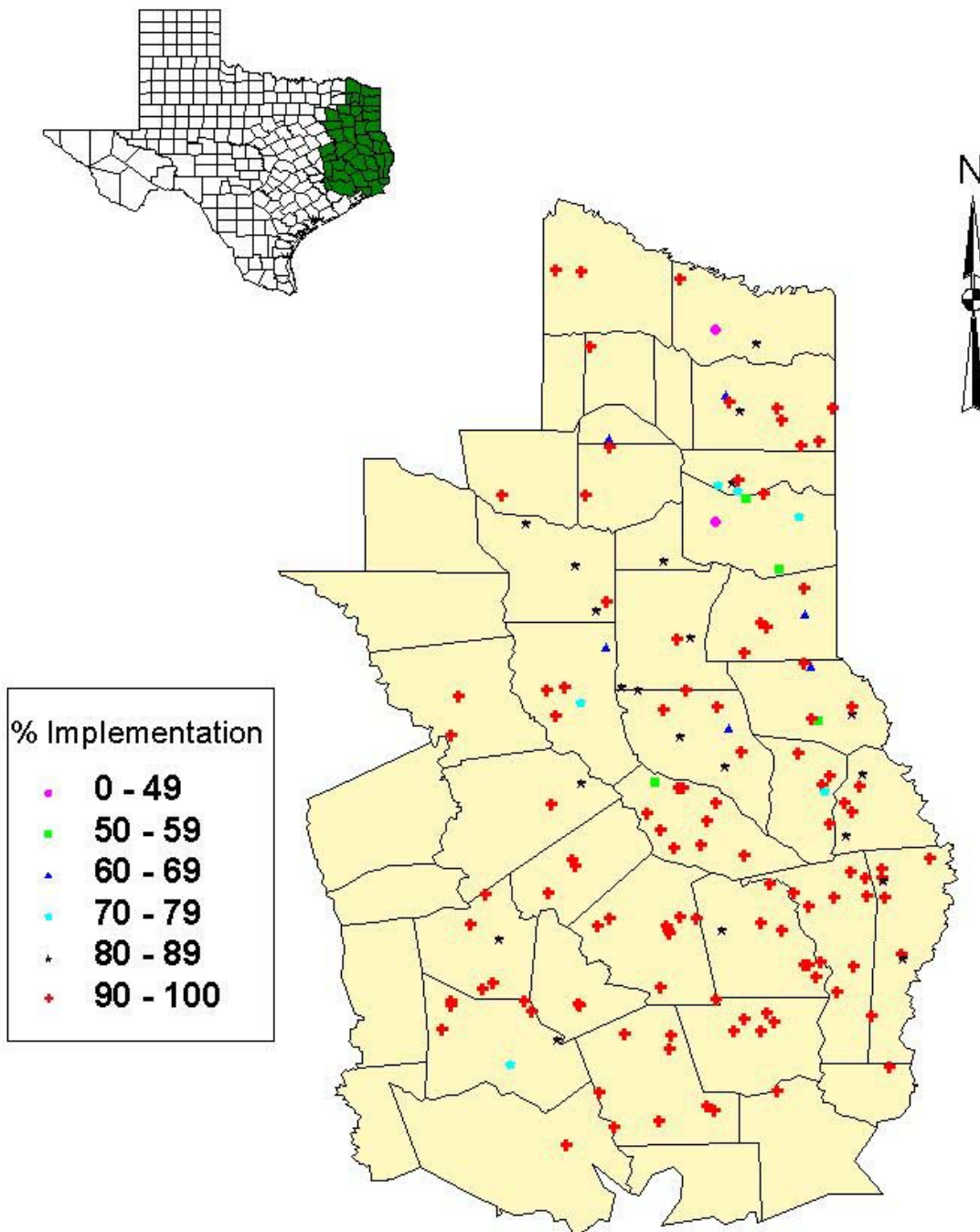
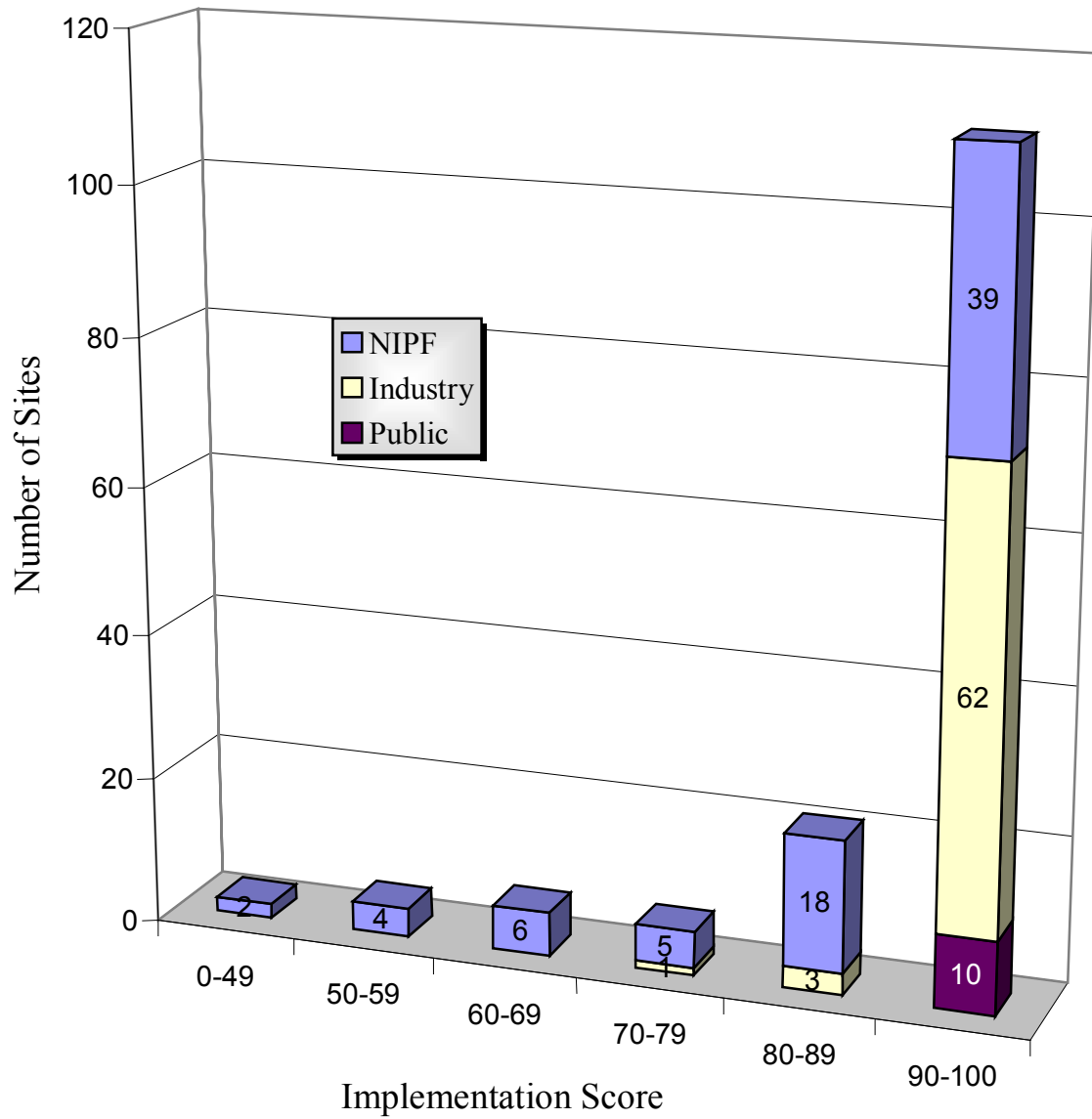


Figure 10. Overall implementation scores by number of sites and ownership.



Region

East Texas was divided into two regions, North and South, for easy comparison of BMP implementation rates. The line was drawn along the northern boundary of Leon, Houston, Angelina, San Augustine, and Sabine Counties. Eighty-nine sites were monitored in the southern region and had an implementation rating of 95.2% while 61 sites were monitored in the northern region with an implementation rating of 85.9%. The higher BMP implementation in Southeast Texas is to be expected due the high concentration of public and industrial ownership, flatter topography, and less erodible soils.

Terrain

Monitoring sites were classified by BMP foresters as Flat, Hilly, or Steep. BMP implementation on the 48 flat sites was 96.1% with no significant risks; on the 99 hilly sites, 89.0% with 28 significant risks; and on the three steep sites, 97.4% with no significant risks.

Erodability

Monitoring sites were identified as Low, Medium, or High soil erodability. BMP implementation on a total of 47 low erodability sites was 95.2% with one significant risk; on 66 medium erodability sites, 89.5% with sixteen significant risks; and on 37 high erodability sites, 90.2% with eleven significant risks.

Distance to Permanent Water

Distance to nearest permanent water was determined for each monitoring site. BMP implementation on 59 sites with permanent water less than 300 feet away was 90.8% with eleven significant risks. On two sites with permanent water 300 to 800 feet away, implementation was 100.0% with no significant risks. Seven sites were 800 to 1,600 feet from permanent water. BMP implementation on these sites was 93.0% with no significant risks. Of the 82 sites in which permanent water was greater than 1,600 feet away, BMP implementation was 91.6% with seventeen significant risks.

Proximity to 303 (d) Listed Stream Segments

The proximity of BMP monitoring sites to 303 (d) listed stream segments was analyzed using Geographic Information Systems. Thirty-three sites were identified to be within 1.5 miles of a listed stream segment or lake and had an implementation rating of 92.5%. It is important to note that BMP implementation is higher near these impaired waters than the overall BMP implementation for all monitored sites.

STATISTICAL SIGNIFICANCE

Two different statistical analyses were performed on the following categories:

- Forester Involved in sale or activity
- Logger Attended BMP Training
- Landowner Familiar with BMPs
- BMPs in Contract
- Landowner Member of Forest Organization
- Timber Delivered to Major SFISM Mill

The first statistical analysis was a parametric test (one sample t – test), which was included because of the relatively large sample size. However, due to the nature of the percentage data, a non parametric test (Wilcoxon) was also performed. Percentages are not normally distributed, which invalidates the assumptions of the parametric test. To determine statistical significance, the resulting *P* value was compared to the level of significance. The *P* value is the probability of observing a value of the test statistic as contradictory (or more) to the null hypothesis as the computed value of the test statistic. In these tests, a 0.05 (5%) level of significance was used. For the two implementation ratings to be significantly different, the *P* value must be lower than the level of significance. The implementation ratings for the “yes” answers and the “no” answers were calculated to be significantly different in all of these categories. See Table 10.

Table 10. Results of Statistical Tests Determining Statistically Significant Differences.

	%		Parametric <i>P</i> value	Non Parametric <i>P</i> value	Level of Significance	Statistically Different?
	Implementation Yes	No				
Forester Involved	94	81	< .0001	< .0001	0.05	Yes
Logger Attended BMP Training	94	84	.0152	.0378	0.05	Yes
Landowner Familiar with BMPs	94	81	<.0001	.0001	0.05	Yes
BMPs in Contract	95	79	<.0001	< .0001	0.05	Yes
Landowner Member of Forest Organization	93	82	<.0001	.0006	0.05	Yes
Timber Delivered to Major SFI SM Mill	95	86	<.0001	<.0001	0.05	Yes

Forester Involved in the Sale or Activity

BMP implementation was higher when a professional forester was involved in the sale or activity. One hundred twenty-three sites were identified as having a professional forester involved and had an implementation rating of 93.8%. Sites in which there was no forester involvement had a BMP implementation rating of 80.6%. See Figure 11.

Landowner Familiarity with BMPs

Landowner familiarity with BMPs influences BMP implementation. Sites with landowners who were not familiar with BMPs had an overall implementation rating of 81.4%, while sites with landowners who were familiar with BMPs had an implementation rating of 93.8%. One hundred seventeen of 150 sites had landowners who were familiar with BMPs, while 30 were not. Landowner familiarity was unknown on three sites. See Figure 11.

Logging Contractor Attended BMP Workshop

Logging contractor familiarity with BMPs also influences implementation. Texas Forest Service BMP Project staff offers a BMP workshop in which contractors become more aware of BMPs and water quality. One hundred twenty-two inspections identified the logging contractor as having attended the formal BMP training, with an implementation of 93.7%. Sites in which there was no attendance by the logger at the formal BMP training had an implementation rating of 84.3%. See Figure 11.

BMPs in Timber Sale Contract

BMPs were included in the timber sale contract, if applicable, on 118 sites. Implementation on sites with BMPs included in the contract was 94.8%, while implementation on tracts without BMPs in the contract was 78.6%. See Figure 12.

Landowner Member of Forest Organization

Membership in forest organizations (Texas Forestry Association, county landowner associations, trade associations, etc.) can have an impact on implementation. Landowners who are members of these organizations are generally more involved in the forestry practices that are conducted on their property. Landowners were identified as being members of forest organizations on 102 sites and had an implementation rating of 93.1%, while implementation for nonmembers was 82.4%. See Figure 12.

Timber Delivered to Major SFISM Mill

BMP implementation was higher on sites in which the receiving mill was a major Sustainable Forestry Initiative participant. This occurrence was documented on 80 sites with an implementation rating of 94.9%, compared to an 85.7% implementation rating on 60 sites in which the timber went to other mills. The receiving mill was unknown on 10 sites. See Figure 12.

Figure 11. Overall implementation by various involvement.

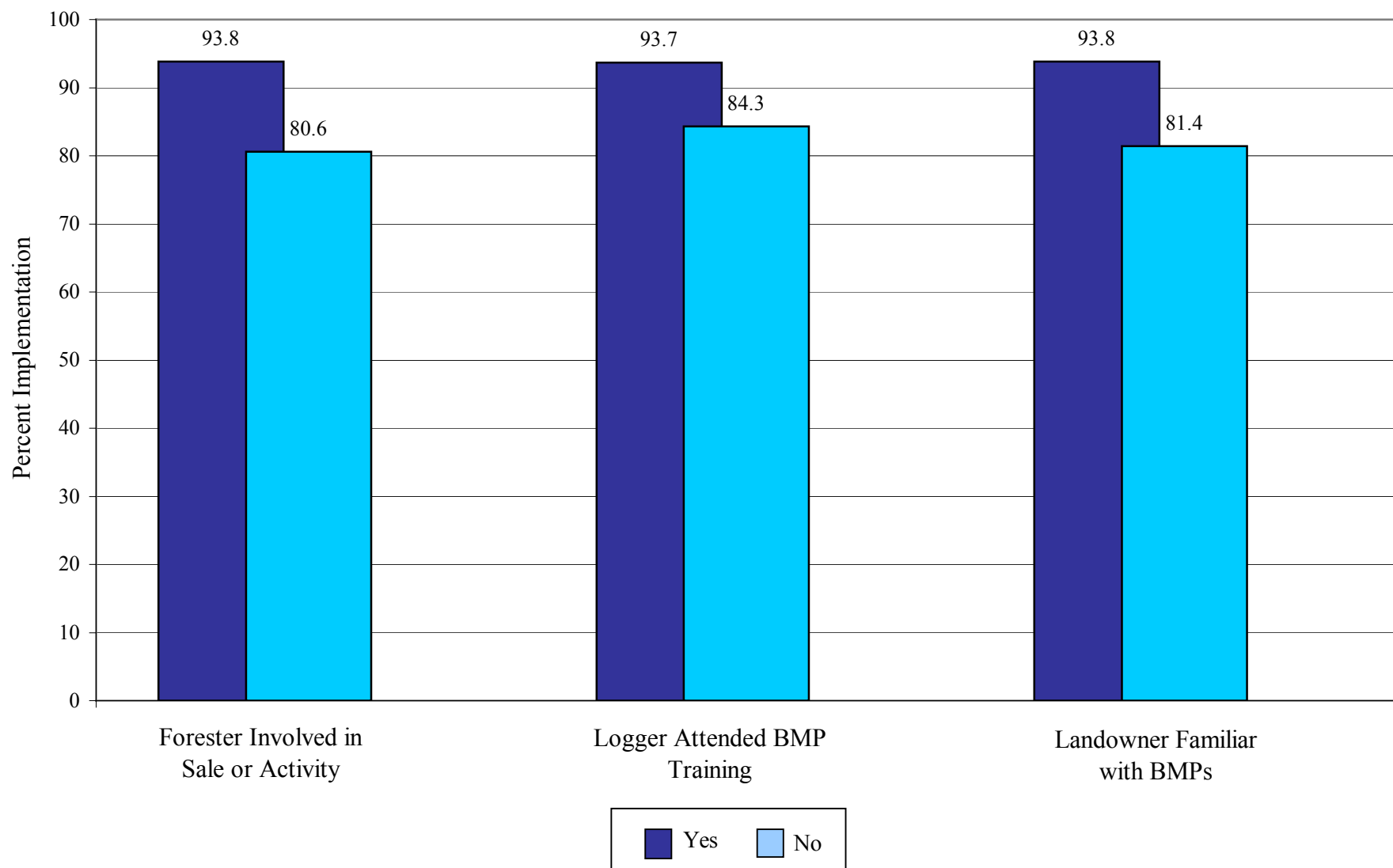
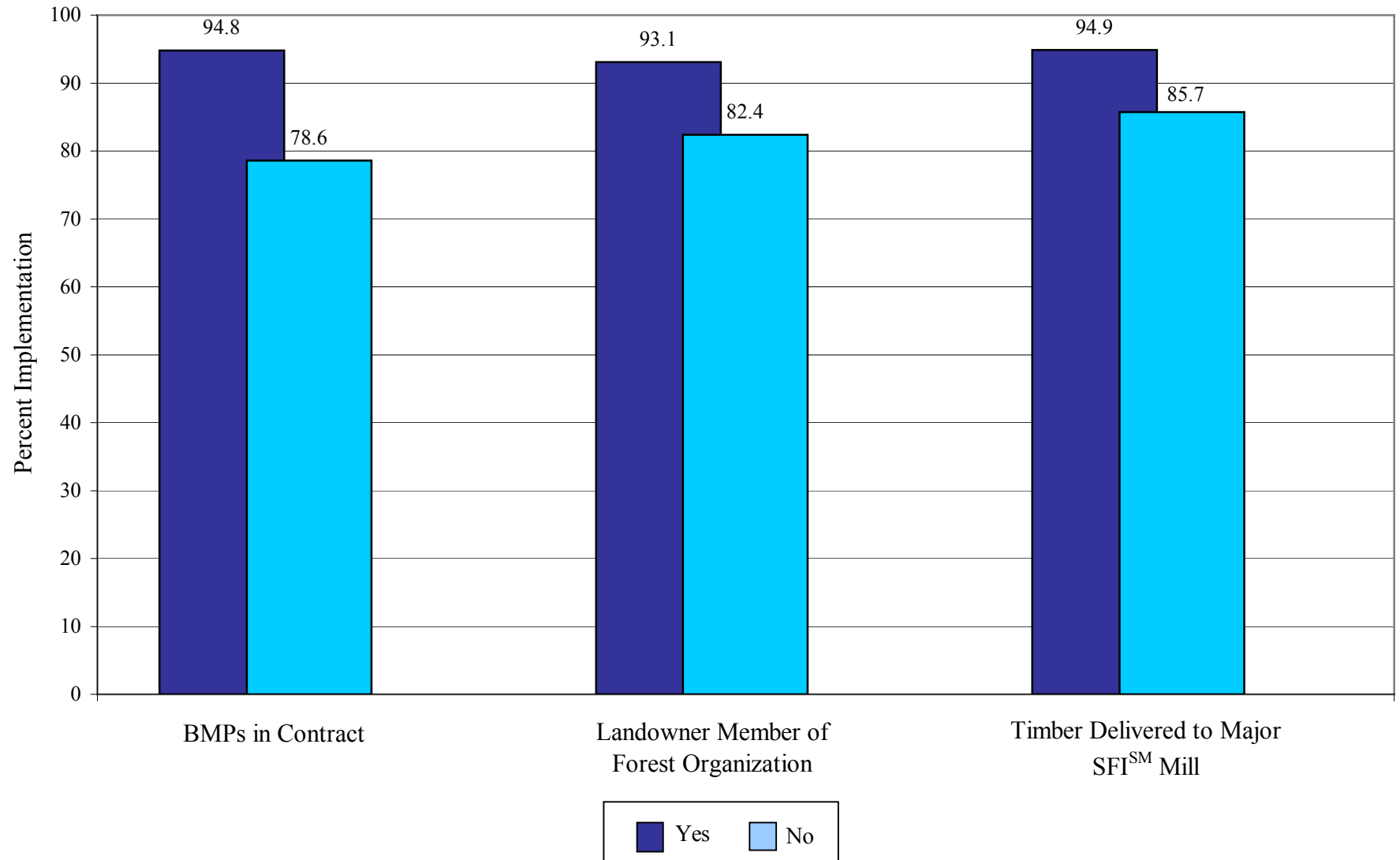


Figure 12. Overall implementation by various categories



DISCUSSION

As mentioned in the monitoring checklist section of this report, a new approach to reporting the percent implementation has been implemented. This new method was field tested extensively. Tracts were also scored the old way at the time of monitoring to see how the new method paralleled the old. The results provided confidence in using the new reporting method.

Because of the change in the reporting method, the results from this new method *cannot* be directly compared to the previous (Rounds 1-3) data. Consider the following example. BMP implementation on USFS-owned land is currently at 98.4%. It was 100% for the first three rounds. Did it actually decrease? Previously a tract *passed*, or was considered to have followed the BMP guidelines, if it received a Fair, Good, or Excellent score. Not all USFS tracts received an Excellent; however, they all passed and were all in compliance. The average score on USFS tracts was 100% on previous rounds since all individual tracts were in compliance with the recommended guidelines.

The new method of computing overall implementation considers the percent of BMP implementation on a single tract. For example, consider that on a particular tract, under the new method, the score is 85%. Using the old method, it is likely that the tract would have received at least a Fair. Previously that tract would have been added with all other Fair, Good, and Excellent scores, and then divided by the total number of tracts to determine overall implementation rates. It is now factored in individually as an 85%. Every single tract would have had to receive a 100% under the new system to monitor at that previous level of implementation.

A brief discussion of the three previous rounds of monitoring is provided to give a historical perspective on BMP monitoring in Texas.

OVERALL IMPLEMENTATION – Rounds 1, 2, 3, and 4

Round 1 of BMP implementation monitoring, conducted between July 1, 1991 and August 31, 1992, yielded an overall implementation rate of 88.2%. Round 2 of implementation monitoring, conducted between July 8, 1993 and November 15, 1995, showed an overall implementation rate of 87.4%. Round 3 of monitoring showed overall implementation with voluntary BMPs at 87.3%. Round 4 of BMP implementation monitoring conducted between June 3, 1998 and August 31, 1999 introduced a new method of monitoring BMP implementation. Under the old method, the overall implementation rate was 90%. Using the new method, the overall BMP implementation rate was 88.6%.

BMP implementation on industry land had steadily increased from 89.6% in Round 1 to 95.1% in Round 2 to 98.4% in Round 3 to 98.6% (old method) and 94.2% (new method) in Round 4. This substantial increase documents the diligence of forest industry in using voluntary BMPs.

BMP implementation on publicly-owned land has increased from 93.3% in Round 1 to 100% in Round 2, and maintained its 100% implementation through Round 4 using the old method and 97.9% using the new method. In Round 4, the USDA Forest Service owned all 9 public sites that were monitored.

In Round 1 of monitoring, implementation on NIPF land was 86.3%. During Round 2, NIPF implementation was 82.9%. Round 3 showed NIPF implementation to be at 76.3%. NIPF implementation made an upward shift in Round 4 with an implementation of 79.1% (old) and 81.2% (new).

OVERALL IMPLEMENTATION – Round 5

Using the new method, BMP implementation on USFS land is currently 98.4% with no significant risks to water quality identified. Implementation on industry land is currently 96.1% with four significant risks, while implementation on NIPF land is 86.4% with twenty-four significant risks to water quality. This results in an overall BMP implementation of 91.5% with a total of 28 significant risks over all ownership categories.

BMP implementation on NIPF land lags behind other ownerships and accounted for 24 of the 28 significant risks. 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. It is important to note that the average size of the harvested NIPF tract was smaller than the industrial tracts. This lower level of implementation is occurring on smaller tracts while the higher level of BMP implementation is occurring on larger tracts of land.

Scores for this fifth round of monitoring were also calculated using the old method. Table 11 shows these results and compares all five rounds using the old method. This shows an across-the-board increase in implementation in each ownership category and overall from Round 3 to Round 5. NIPF landowners have improved from the last monitoring period; industry scores remain high, even improving slightly; and USFS lands are again at the 100% level.

Table 11. Percent Implementation by Ownership Type, All Five Rounds.

	Round 1	Round 2	Round 3	Round 4		Round 5	
				Old	New	Old	New
NIPF	86.3	82.9	76.3	79.1	81.2	81.1	86.4
Industry	89.6	95.1	98.4	98.6	94.2	100.0	96.1
Public	93.3	100.0	100.0	100.0	97.9	100.0	98.4
Overall	88.2	87.4	87.3	90.0	88.6	90.7	91.5

The majority of the USFS and industry tracts that were monitored installed BMPs that met or exceeded the recommended guidelines. Even though the implementation rates for these two groups is less than 100% (98.4% for USFS and 96.1% for industry), no industry or public tracts received less than a passing score using the old system.

CONCLUSION

Positive statistical correlations between landowner familiarity with BMPs, forester involvement, logging contractor training in BMPs, and BMP implementation were shown. This demonstrates the importance for NIPF landowners to involve a forester or some sort of professional assistance and a knowledgeable logging contractor to ensure BMP implementation.

Forest industry has also played a significant role in increasing BMP implementation. This has occurred primarily through its support of the Texas Forest Service BMP Program and participation in the Sustainable Forestry InitiativeSM. Water quality protection is a top priority, as evident from requiring all contractors to attend BMP training workshops.

Special programs and incentives, advocated by the Texas Forest Service, are also beginning to have an effect on BMP implementation. The Texas Reforestation and Conservation Act of 1999 encouraged landowners to leave SMZ when harvesting timber by giving them special property tax incentives. The water quality management plan program recognizes landowners for protecting water quality through BMPs.

Using this method of site evaluation, across-the-board increases in implementation are shown from all landowner types from the last round to this round of monitoring. Most notably is the NIPF landowner, who increased BMP implementation by 6.4%. This demonstrates that the already-implemented education and training strategies geared towards loggers, landowners, and foresters were the driving force behind the increases in implementation.

Although BMP implementation has increased, there is still room for improvement. This past round of monitoring noted a high amount of significant risks to water quality. Continuing effective educational programs on NIPF landowners and BMP training for loggers can minimize the potential water quality impacts from silvicultural operations.

Appendix

Implementation Monitoring Checklist

Evaluation Criteria

Summary of Results

TEXAS FOREST SERVICE



The Texas A&M University System

TEXAS BMP MONITORING CHECKLIST

Site ID

I. General Landowner and Tract Information

County TFS Block and Grid

Latitude Longitude

Forester Type Name

Timber Buyer Logging Contractor

Activity Acres Affected

Estimated Date of Activity Date of Inspection

Inspector Accompanied by

Owner Type:

N A I P

Landowner:

Name

Address

City State

Zip

Phone

II. Site Characteristics

Terrain: Flat Hilly Steep

Erodibility hazard: Low Medium High

Type stream present: Perennial Intermittent

Distance to nearest permanent water body:

< 300' 300 - 800' 800 - 1600' 1600' +

Predominant soil series/texture:

Clay Clay Loam Loam Sandy Loam Sand

III. Permanent Roads

1. Respect sensitive areas
2. Roads meet grade specs
3. Rutting within allowable specs
4. Well drained with appropriate structures
5. Ditches do not dump into streams
6. Roads reshaped and/or stabilized

BMPs present RD WD WB RE OC
 PL RS CU BR LW

YES NO NA/NN Sig. Risk

YES	NO	NA/NN	Sig. Risk
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Section Total
Percent Compliance

IV. Skid Trails/Temporary (secondary) Roads

1. Slopes less than 15%
2. Respect sensitive areas
3. Roads well drained with water bars or other water control structures
4. Roads stabilized
5. Rutting within allowable specs

BMPs present RD WD WB RE OC
 PL RS CU BR LW

YES NO NA/NN Sig. Risk

YES	NO	NA/NN	Sig. Risk
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Section Total
Percent Compliance

V. Stream Crossings

On Permanent Roads

1. Stabilized
2. Ditches do not dump into streams
3. Stream free of sediment
4. Number of crossings minimized

On Temporary Roads

5. Number of crossings minimized
6. Stream crossings correct
7. Approaches at right angles
8. Stream crossings restored and stabilized
9. Stream free of sediment

BMPs present CU BR LW

YES NO NA/NN Sig. Risk

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section Total

Percent Compliance

VI. Streamside Management Zones

1. Present on permanent stream
2. Present on intermittent stream
3. SMZ adequately wide
4. Thinning within allowable specs
5. SMZ integrity honored
6. Stream clear of debris
7. SMZ free of roads and landings
8. Stream free of sediment

YES NO NA/NN Sig. Risk

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section Total

Percent Compliance

VII. Site Preparation

Site preparation method

Regeneration method

1. Respect sensitive areas
2. No soil movement on site
3. Firebreak erosion controlled
4. SMZ integrity honored
5. Windrows on contour / free of soil
6. No chemicals off site
7. Machine planting on contour
8. Stream free of sediment

YES NO NA/NN Sig. Risk

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section Total

Percent Compliance

VIII. Landings

1. Locations free of oil / trash
2. Located outside of SMZ
3. Well drained location
4. Number and size minimized
5. Respect sensitive areas
6. Restored / stabilized

YES NO NA/NN Sig. Risk

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section Total

Percent Compliance

IX. Wetlands (may or may not be jurisdictional)

- 1. Avoid altering hydrology of site
- 2. Road drainage structures installed properly
- 3. Mandatory road BMPs followed

YES	NO	N/NN	Sig. Risk
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section Total			<input type="text" value="0"/>
Percent Compliance			<input type="text" value="N/A"/>

X. Overall Compliance

- III. Permanent Roads
- IV. Skid trails/Temporary Roads
- V. Stream Crossings
- VI. Streamside Management Zones
- VII. Site Preparation
- VIII. Landings
- IX. Wetlands

YES	NO	NA/NN	Sig. Risk
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input type="text" value="0"/>
Overall Total			<input type="text" value="0"/>
Total Significant Risk			<input type="text" value="0"/>
Percent Compliance			<input type="text" value=""/>

Subjective Score

<u>Needs Improvement</u>		<u>Pass</u>		
<input type="checkbox"/> No Effort	<input type="checkbox"/> Poor	<input type="checkbox"/> Fair	<input type="checkbox"/> Good	<input type="checkbox"/> Excellent

Follow Up Questions

- Was activity supervised by landowner or representative?
Who?
- Was landowner familiar with BMPs?
- Was logger familiar with BMPs?
- Has logger attended BMP Workshop?
- Were BMPs included in the contract?
- Is landowner a member of TFA? Landowner Association? Other?
Organization
- Is remediation planned by landowner (if needed)?

YES	NO	N/NN
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Date <input type="text"/>

Comments (Explain discrepancies observed in the field check. Make recommendations for better compliance.)

Map/Sketch Area (on back if needed)

**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, Round 5

I. General Landowner and Tract Information

<u>Owner type</u>		<u>Forester type</u>		<u>Activity</u>	
NIPF	42	Industry	66	Regeneration Harvest	
NIPF-Absentee	32	Private Consultant	47	Clearcut	78
Industry	66	Public	10	Partial	10
USFS (Public)	10			Thinning	40
				Site Prep only	10
				Planting	12

II. Site Characteristics

<u>Terrain</u>		<u>Erodibility hazard</u>		<u>Type stream present</u>	
Flat	48	Low	47	Perennial	54
Hilly	99	Medium	66	Intermittent	94
Steep	3	High	37	Both	29
				None	31

Distance to nearest permanent water body

< 300'	59
300 - 800'	2
800 - 1600'	7
1600' +	82

Predominant soil series/texture

Clay	6	Sandy loam	95
Clay loam	13	Sand	19
Loam	17		

III. Permanent Roads

129 applicable

	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Respect sensitive areas	128	1	21	0
2. Roads meet grade specs	128	1	21	0
3. Rutting within allowable specs	121	8	21	0
4. Well drained with appropriate structures	97	28	25	2
5. Ditches do not dump into streams	113	3	34	0
6. Roads reshaped and stabilized	113	16	21	0

IV. Skid Trails/Temporary (secondary) Roads

94 applicable

	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Slopes less than 15%	92	2	56	1
2. Respect sensitive areas	85	9	56	0
3. Roads well drained with water bars or other water control structures	63	23	64	2
4. Roads stabilized	75	19	56	0
5. Rutting within allowable specs	83	11	56	0

V. Stream Crossings

On Permanent Roads 36 applicable

	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Stabilized	35	7	108	3
2. Ditches do not dump into streams	35	1	114	0
3. Stream free of sediment	36	6	108	1
4. Number of crossings minimized	40	2	108	0

On Temporary Roads 36 applicable

5. Number of crossings minimized	33	9	108	2
6. Stream crossings correct	36	6	108	0
7. Approaches at right angles	39	3	108	0
8. Stream crossings restored and stabilized	30	12	108	4
9. Stream free of sediment	32	10	108	2

VI. Streamside Management Zones		119 applicable		
	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Present on permanent stream	52	2	96	1
2. Present on intermittent stream	85	13	52	6
3. SMZ adequately wide	82	35	33	0
4. Thinning within allowable specs	97	13	40	0
5. SMZ integrity honored	99	13	38	0
6. Stream clear of debris	106	13	31	4
7. SMZ free of roads and landings	112	3	35	0
8. Stream free of sediment	113	6	31	0

VII. Site Preparation		54 applicable		
	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Respect sensitive areas	50	4	96	0
2. No soil movement on site	53	1	96	0
3. Firebreak erosion controlled	29	4	117	0
4. SMZ integrity honored	46	2	102	0
5. Windrows on contour/free of soil	18	4	128	0
6. No chemicals off site	38	2	110	0
7. Machine planting on contour	9	4	137	0
8. Stream free of sediment	50	0	100	0

VIII. Landings		103 applicable		
	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Locations free of oil/trash	95	8	47	0
2. Located outside of SMZ	97	0	53	0
3. Well-drained location	101	1	48	0
4. Number and size minimized	102	0	48	0
5. Respect sensitive areas	102	0	48	0
6. Restored/stabilized	97	5	48	0

IX. Wetlands		31 applicable		
	<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
1. Avoid altering hydrology of site	28	3	119	0
2. Road drainage structures installed properly	15	1	134	0
3. Mandatory road BMPs followed	15	0	135	0

X. Overall Compliance		<u>Yes</u>	<u>No</u>	<u>NA/NN</u>	<u>Sig. Risk</u>
III. Permanent Roads - 92%	700	57	142	2	
IV. Skid Trails/Temporary Roads - 86%	398	64	288	3	
V. Stream Crossings - 85%	316	56	978	12	
VI. Streamside Management Zones - 88%	746	98	356	11	
VII. Site Preparation - 90%	293	21	886	0	
VIII. Landings - 98%	594	14	292	0	
IX. Wetlands - 94%	58	4	388	0	

Follow-up Questions		<u>Yes</u>	<u>No</u>	<u>NA/NN</u>
Was activity supervised by a professional forester?	123	25	2	
Was landowner familiar with BMPs?	117	30	3	
Has logger attended BMP workshop?	122	8	20	
Were BMPs included in the contract?	118	21	11	
Is landowner a member of TFA, LO Assoc., etc.?	102	26	22	