Forestry Best Management Practice – 2009

Results

Prepared May 2010

by

Michael D. Kaller

School of Renewable Natural Resources
Louisiana Agricultural Experiment Station
Louisiana State University
Baton Rouge, LA

Summary

A survey of the compliance with voluntary forestry Best Management Practices (BMPs) was conducted by the Louisiana Department of Agriculture and Forestry (LDAF) July through October 2009. The 2009 survey found 73.5% of 151 surveyed forestry operations fully implement Louisiana BMPs, which was lower than the reported 96% in the 2002 survey and calculated 96% in the 2000 survey. In 2003, BMP compliance (96%) was derived from a question that was not included in 2009, therefore, comparisons between 2003 and 2009 are not directly available. However, the 2000 survey did calculate BMP implementation similarly, which suggests that BMP implementation appears to have declined from 96% to 73.5% between 2000 and 2009.

A new question was added to the survey in 2009 questioning whether a site had significant water quality risk. Only 2.6% (4 of 150 surveyed sites) were deemed by LDAF foresters to have significant water quality risk. Whereas this is a new question, comparison to previous years' surveys is impossible.

Statistically significantly lower BMP implementation occurred in mixed pine/hardwoods (60.8% implementation) compared to natural pine, pine plantations, and bottomland hardwoods. BMP implementation also was statistically significantly lower if road construction occurred in streamside management zones (50% implementation). Lastly, BMP guideline implementation D5 – seeding and/or mulching performed when necessary (67.7% implementation) and E3 - skid trails, temporary road crossings, or landings conditioned to minimize erosion by seeding and/or installing waterbars (86.0% implementation) were statistically significantly lower than other guidelines in their respective categories. BMP implementation did not statistically significantly differ among Northwest, North/Delta, Southeast, or Southeast regions, silvicultural treatments, site acreage, ownership, source of technical assistance, terrain type, site slope, or type of adjacent water body. Non-statistically significant trends were noted with lower BMP implementation on private, non-industrial forest lands (70.7%), sites with no technical assistance (70%), sites under 90 acres in size (between 66.7-73.2% implementation), wetland sites (50%), and sites undergoing SMZ clearing (57.1%) or SMZ regeneration cuts (50%). Further, although the correlation was not evaluated statistically, mixed forest sites with BMP implementation issues were almost exclusively owned by private, non-industrial landowners receiving no or unknown technical assistance, and these sites were where most SMZ and timber harvesting guidelines were needed but not applied. Therefore, lower BMP implementation in the 2009 survey is probably driven by this type of site. Possibly,

the issues uncovered in this survey reflect private landowners conducting post-hurricane (Gustav, Katrina, Ike, or Rita) salvaging, recession-related profit maximizing (e.g., not hiring technical assistance or extending harvesting in SMZs), or a lack of education regarding harvesting in wetlands or sites with or adjacent to waterbodies.

Background and Brief Methods

In 1988, a manual was written to offer forest landowners, logging contractors, and the forest industry guidance in terms of voluntary guidelines to protect water quality during forestry operations In 2000, the Louisiana Department of Agriculture and Forestry (LDAF), the Louisiana Forestry Association (LFA), and the Louisiana Department of Environmental Quality (LDEQ) revised the manual of Louisiana Recommended Forestry Best Management Practices (BMPs) to include more detailed voluntary guidelines and technical procedures to be followed for each operation and described the federally mandated Best Management Practices for forestry operations in wetlands. Subsequently, LDAF's Office of Forestry has been conducting inspections on silvicultural sites since 1991. During the fall of 2009, a total of 151 forestry operation sites were selected and a survey on implementation of various forestry BMP guidelines at each of the sites was conducted. The survey included a field inspection and the completion of a series of survey forms.

The data analysis was performed by a modification of the methods used on the 1994, 1997, 2000 and 2003 survey data. Quantitative site-level BMP implementation was calculated from specific answers to BMP guidelines. The answers "Exceeds," "Full," and "Minor departure," indicated BMP implementation. The answer "Needed but not applied" indicated the BMP was not implemented. Site-level BMP implementation was assigned "Full" if all individual BMP guidelines that were need (i.e., not answered "No action required"). If any single BMP guideline was marked, "Needed not but applied" the site was assigned "Not Fully Implemented."

For comparisons between site-level and individual guideline BMP implementation and the factors that may influence BMP implementation, including region, ownership, silvicultural treatments, site acreage, ownership, source of technical assistance, terrain type, site slope, or type of adjacent water body, logistic regression (PROC GENMOD, SAS vers. 9.2, SAS Institute, Cary, N.C.) was implemented as an extension of the log-linear model, which itself is the extension of the chi-square test for questions with many levels. Logistic regression allowed the probability of BMP implementation to be evaluated in light

of predictive factors (i.e., logistic regression estimated the probability of fully implementing BMPs from 0-100% given a predictor, such as region). Logistic regression has a number of substantial advantages for these applications; specifically because logistic regression uses maximum likelihood estimation rather than least-squares estimation, it is more robust to smaller sample sizes and high levels of complexity than the weighted least-squares analyses employed in 2002 and 2005. For example, logistic regression allowed the inclusion of additional categories in questions A5, A6, and A7 that would not have been possible with chi-square tests or weighted least-squares analysis of variance. It is important to note that statistical significance is tied to sample size and variability within categories. Thus, statistical significance may not always be obvious from the histogram bars for each category, and statistical significance may differ from conclusions based on examination of the histograms alone.

Although site size (question A4) was recorded as a continuous variable (i.e., size could range from 0-any number), it was evident that some exact sizes were known and some answers were estimates. Therefore, site sites were categorized following the categories in previous reports: < 30 acres, 30-40 acres, 40-50 acres, 50-90 acres, and > 200 acres. Analyses were performed on these categories rather than the answers directly.

For some questions, the number of responses in different categories varied considerably. Therefore, the least frequent answers were excluded to prevent complications to data analyses. For question A5 – Ownership, public lands were excluded from analyses (n=1). For question A6 – Dominant Site Type, upland sites were excluded (n=2). For question A7 – Technical Forestry Assistance, the categories “Other –Landowner (n=1),” and “Other-Unknown (n=2)” were excluded. No soil type (question B2) was reported in more than 11% of sites. Consequently, statistical relationships between soil type and BMP implementation were impossible to resolve. For question B3 – Terrain within 150ft of watercourse, steep slopes were excluded (n=3).

Lastly, in many cases, a specific guideline may not have been needed. In these instances, the guideline was excluded from analyses. Therefore, the analyses of these guidelines only includes the answers “Exceeds,” “Full,” “Minor departure,” and “Needed but not applied.”

Detailed Results

Summary of Survey Demographics

Region

Region	%	Number
North/Delta	17.1	26
Southeast	36.2	55
Southwest	13.8	21
Northwest	32.9	49

Silviculture Treatment (A3)
(more than one may have occurred)

Treatment	%	Number
Clearing	76.3	116
Site Preparation	36.1	55
Regeneration Cut	0	0
Thinning	19.7	30

Site Size (A4)

Size	%	Number
< 30 acres	19.7	30
30-40 acres	15.8	24
40-50 acres	5.9	9
50-90 acres	27.0	41
90-200 acres	30.0	45
> 200 acres	2.0	3

Site Ownership (A5)

Ownership	%	Number
Corporate	14.4	22
Industry	34.9	53
Private	49.3	75
Public	0.7	1

Site Type (A6)

Type	%	Number
Bottomland	3.3	5
Mixed Pine/Hardwood	33.6	51
Natural Pine	4.0	6
Pine Plantation	57.2	87
Upland	1.3	2

Source of Technical Assistance (A7)

Source	%	Number
Consultant	30.5	46
Industrial Forester	39.7	60
Landowner	0.7	1
LDAF	7.3	11
None	6.6	10
Unknown	15.2	23

Terrain Type (B1)

Type	%	Number
Bottomland	7.3	11
Flatwoods	19.2	29
Upland	73.5	111

Terrain within 150 feet of water (B3)

Terrain	%	Number
Flat	51.7	78
Moderate	44.3	67
Steep	2.0	3
N/A	4.0	6

Type of Water body/streams (B4)

Type	%	Number
Perennial stream	23.2	35
Intermittent stream	63.8	97
River	1.3	2
Bayou	3.9	6
Lake	3.3	5
Wetland	3.3	5
None	12.5	19

Designated Scenic River (B5)

Answer	%	Number
No	97.4	147
Yes, not named	0.7	1
Yes, Calcasieu River	0.7	1
Yes, Pretty Creek	0.7	1

Type of silviculture activity occurring in the streamside management zone (SMZ; B6)

Type	%	Number
Clearing	18.4	28
Thinning	40.8	62
Site Preparation	7.2	11
Regeneration Cut	1.3	2
Road Construction	10.5	16
Fire Line Construction	5.9	9
Reforestation	2.6	4
None	36.4	55

Overall BMP Implementation

Whereas the 2009 survey lacked the qualitative surveyor assessment of overall site-level BMP implementation, site-level BMP implementation was calculated based on responses to the individual BMP guidelines as described in the Methods. Overall, at the site-level, 73.5% (111 of 151 surveys) had full BMP implementation. At 40 sites, at least one BMP guideline was marked “Needed but not applied.” The number of guidelines marked “Needed but not applied” ranged from 1 (14 sites) to 20 (1 site) with an average of 3.8 (± 1.4 95% confidence interval) guidelines marked “Needed but not applied.”

BMP Implementation by Region (A2)

Based on calculated site-level BMP implementation, region did not statistically significantly influence ($p>0.05$) BMP implementation (Figure 1). BMP implementation was highest in the Northwest region (81.8%) followed by the Southwest region (78%), North/Delta region (72.7%), and Southeast region (57.1%). Fewer sites were surveyed in the Southeast region (21) with more sites surveys in the North/Delta (26), Southwest (50), and Northwest (55). Lower levels of BMP implementation in the Southeast could be overly influenced by a few non-compliant sites unduly influencing the region because of relatively lower numbers of sites surveyed. However, although these results were not statistically significant, the notably lower level of BMP implementation in the Southeast may warrant additional educational efforts in the region.

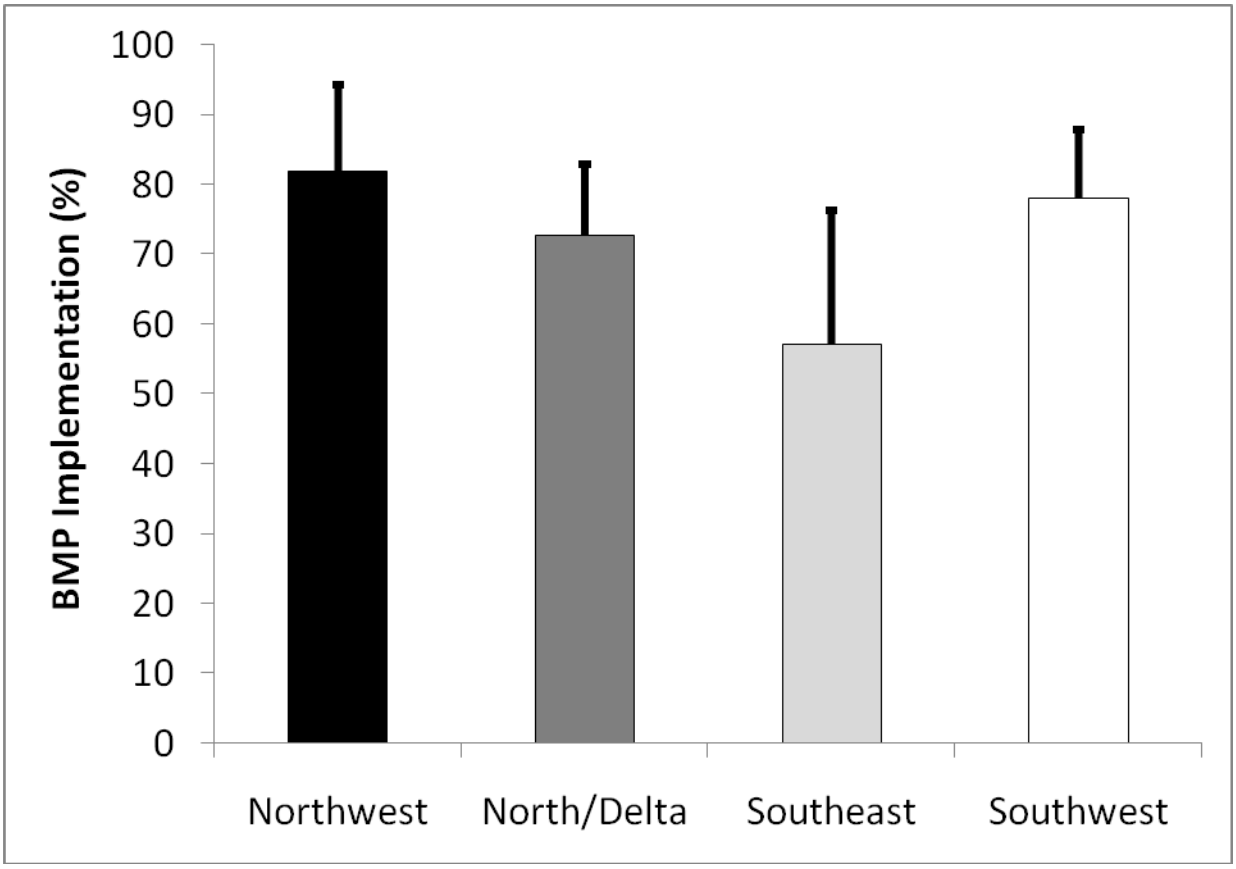

Figure 1. BMP implementation by region in 2009. Error bars are 95% confidence intervals.

Silviculture Treatment (A3)

In the 2009 survey, site-level BMP implementation did not differ by silviculture treatment ($p>0.05$; Figure 2). Regeneration cuts were not being performed at any site. Among the other treatments, BMP implementation was highest at sites where thinning was being performed (83.3%; 25 of 30 sites) followed by clearcutting (74.1%; 86 or 116 sites) and site preparation (70.9%; 39 of 55 sites). Although not statistically significantly different, the 2009 survey data suggest that additional improvement in BMP implementation could occur at sites with clearcuts and site preparation activities.

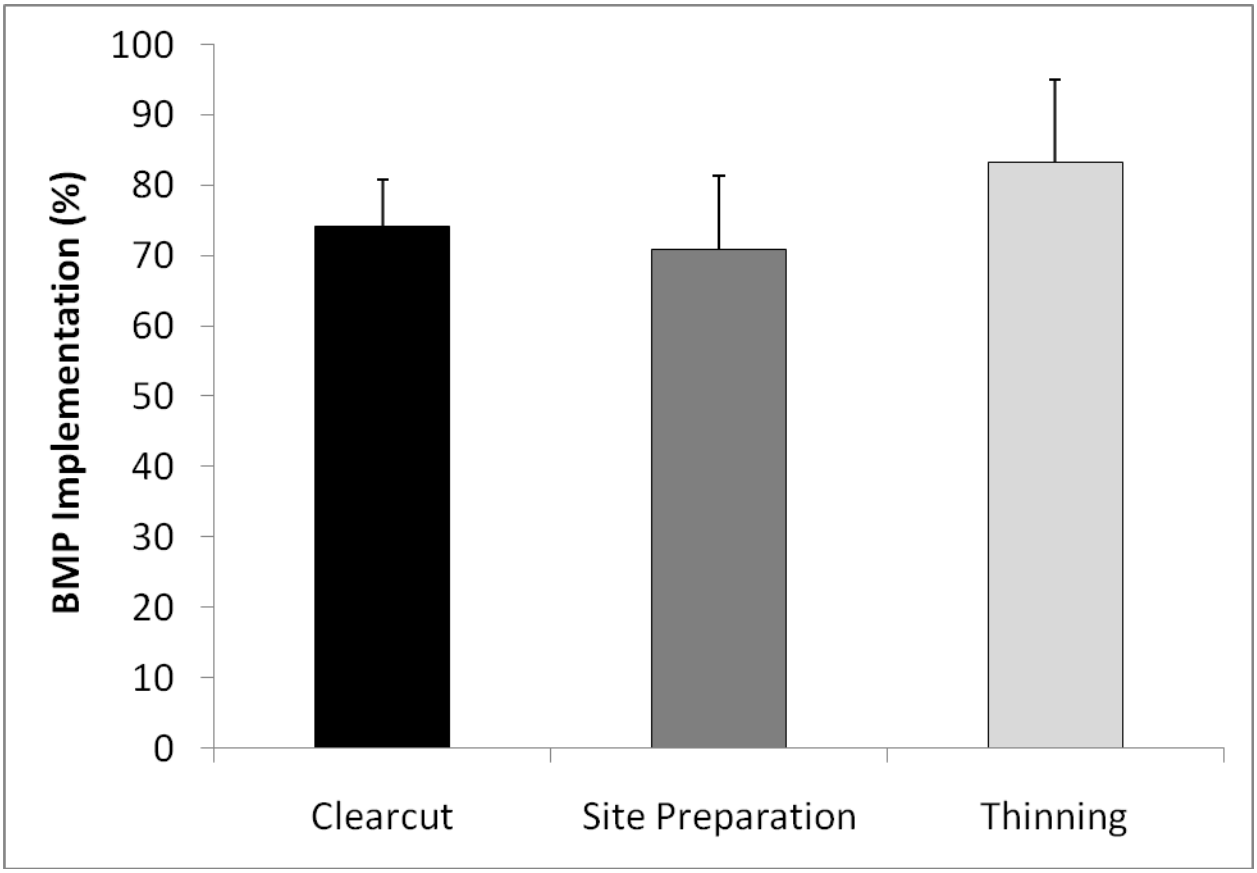

Figure 2. BMP implementation by silviculture treatment. Regeneration cuts are not shown because no regeneration cuts were reported. Error bars are 95% confidence intervals.

Size of Operation (A4)

BMP implementation did not statistically significantly differ among size categories ($p>0.05$; Figure 3). The size of operations ranged from 10 to 400 acres with an average of 86.9 acres (± 11.1 acres 95% confidence interval) undergoing silviculture treatment. BMP implementation was highest at sites greater than 200 acres (100%; 3 sites) followed by sites between 90-200 acres (80%; 36 of 45 sites), 50-90 acres (73.2%; 30 of 41 sites), 30-40 acres (70.8%; 17 of 24 sites), 40-50 acres (66.7%; 6 of 9 sites), and less than 30 acres (66.7%; 20 of 30 sites). Although not statistically significant, smaller parcels appear to be more likely to have non-application of BMP guidelines.

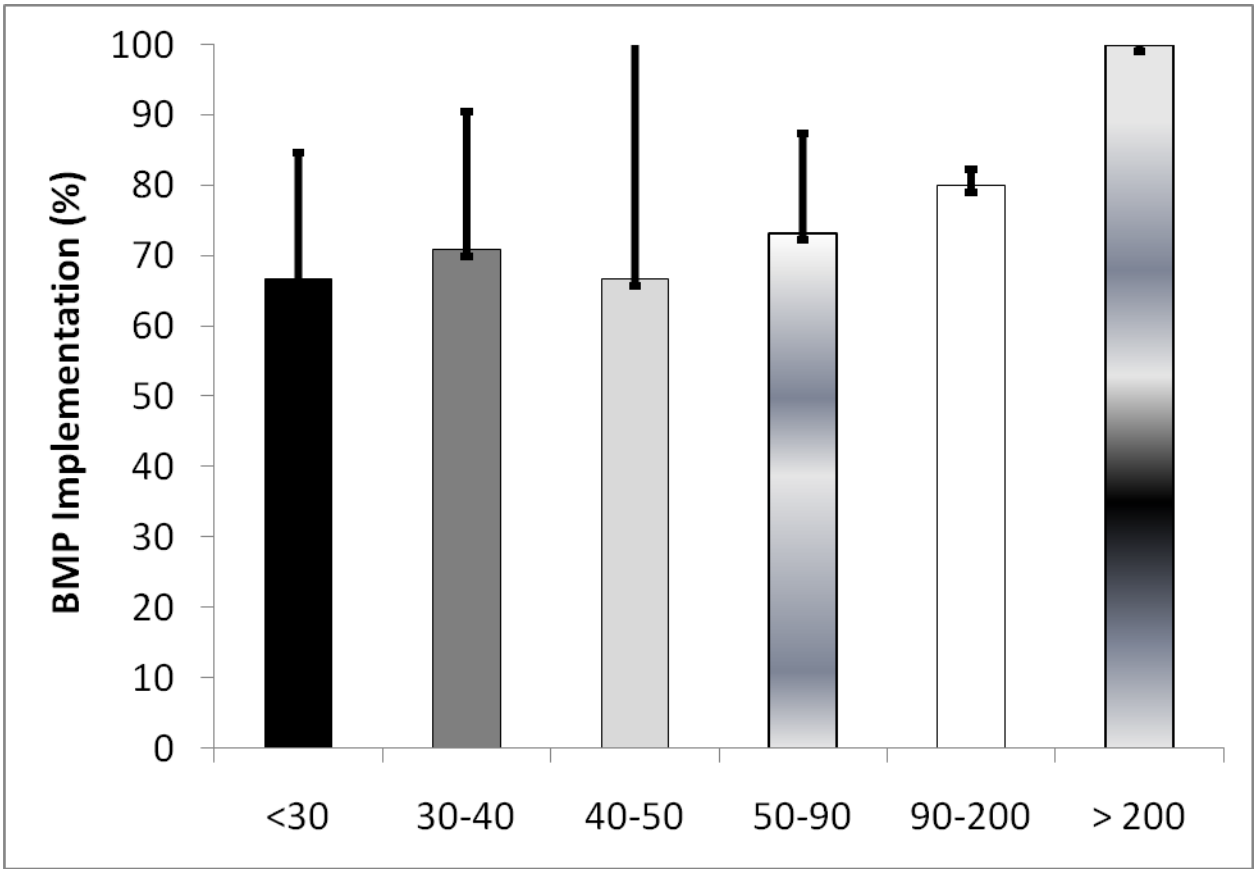

Figure 3. BMP implementation by size of operation. Error bars are 95% confidence intervals.

Ownership (A5)

Site-level BMP implementation did not statistically significantly differ among landownership categories ($p>0.05$; Figure 4). The lone public forest had 100% BMP implementation. Among other ownership categories, rates were highest among corporate-owned forests (77.3%; 17 of 22 sites) followed by industrial forests (75.5%; 40 of 53 sites), private, non-industrial forests (70.7%; 53 of 75 sites). In one site, the ownership was not listed. Although not statistically significant, the data suggest that educational efforts should be targeted at private, non-industrial forest landowners.

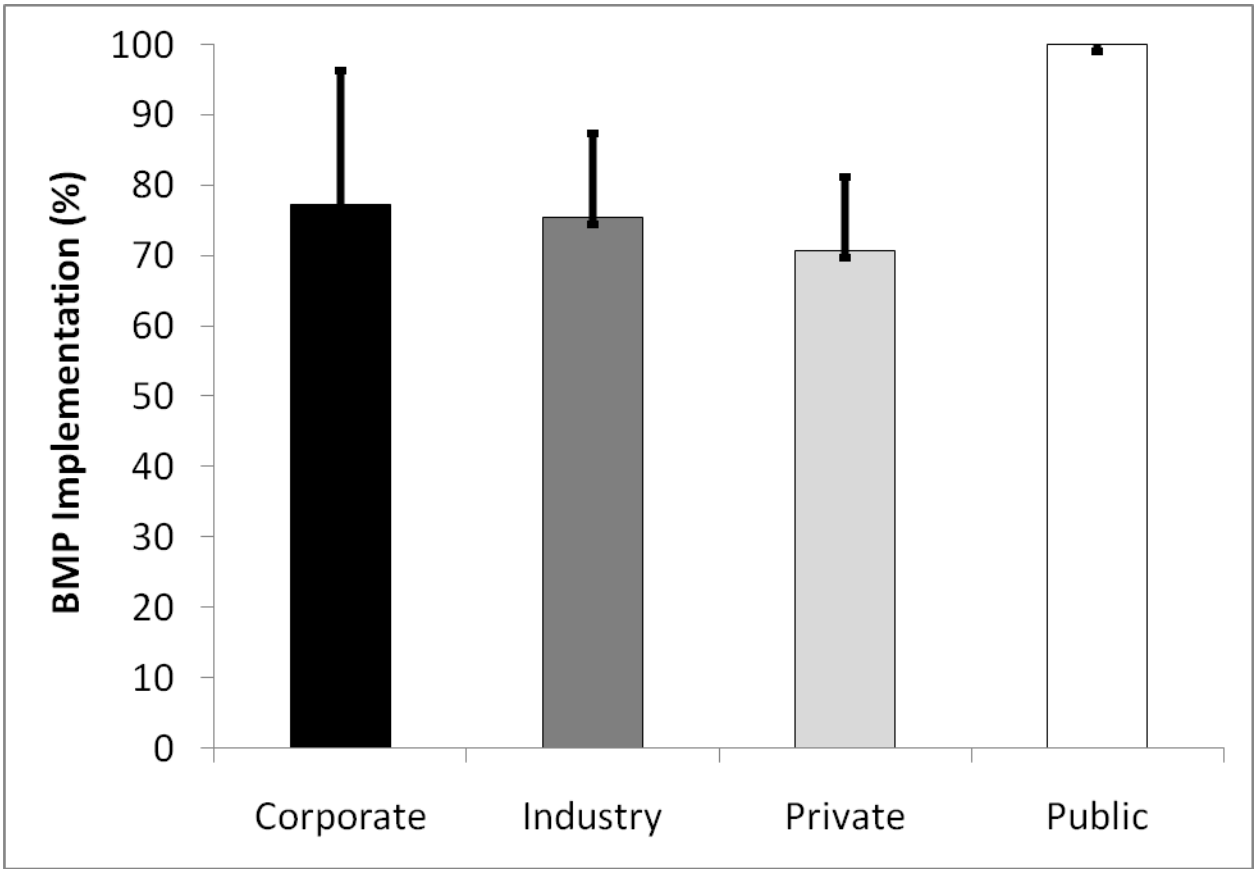

Figure 4. BMP implementation by ownership category. Error bars are 95% confidence intervals.

Dominant Forest Type (A6)

BMP implementation was statistically significantly lower (60.8%; 31 of 51 sites) in mixed pine-hardwood than other stand types ($\chi^2_{3\ d.f.} = 8.31$, P =0.04), which were statistically similar. BMP implementation was highest in bottomlands (100%; 5 of 5 sites) and uplands (100%; 2 of 2 sites). BMP implementation was lower, although statistically similar to bottomlands and uplands, in natural pine (83.3%; 5 of 6 sites) and pine plantations (78.2%; 68 of 87 sites). The lower level of BMP implementation in mixed pine/hardwood sites may be related to SMZ activities at these sites (Figure 10). Almost all SMZ activity occurred in mixed pine/hardwood sites. Further, most mixed/pine hardwood sites were in private ownership (84.3%), which exhibited somewhat lower BMP implementation than other ownership types (Figure 4). Therefore, the statistically significantly lower BMP implementation in mixed pine/hardwoods is very likely related to SMZ activities on privately owned sites.

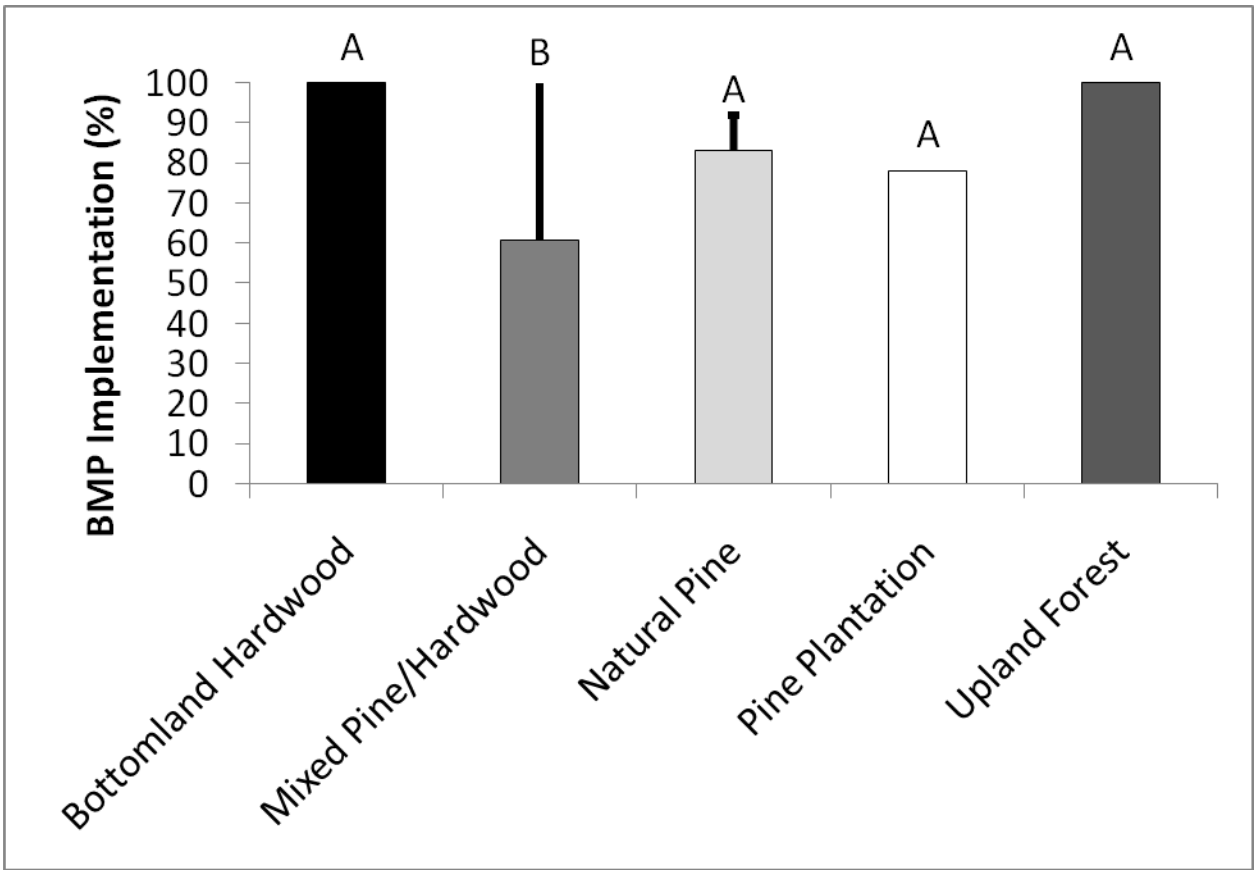

Figure 5. BMP implementation by forest type. Error bars are 95% confidence intervals. Different letters indicate statistical differences.

Technical Assistance (A7)

BMP implementation did not statistically significantly differ among sources of technical assistance. Sites with assistance from industrial foresters had the highest BMP implementation (83.3%; 60 sites) followed by consulting forester (70.2%; 47 sites), no reported technical assistance ("None"; 70%; 10 sites), LDAF forester (63.6%l 11 sites), and unknown source (62.5%; 24 sites). The landowner was reported as the source of assistance at 1 site that had full BMP implementation. The number of sites with no technical assistance or unknown sources were higher in 2009 than 2000 or 2002. As with lower BMP implementation in mixed forests (Figure 5) and in sites with SMZ activities (Figure 10), lower BMP implementation in sites with LDAF forester, consulting forester, and no technical assistance were almost all on private lands. Therefore, private ownership may be a more important factor in these lower BMP implementation levels than source of technical assistance.

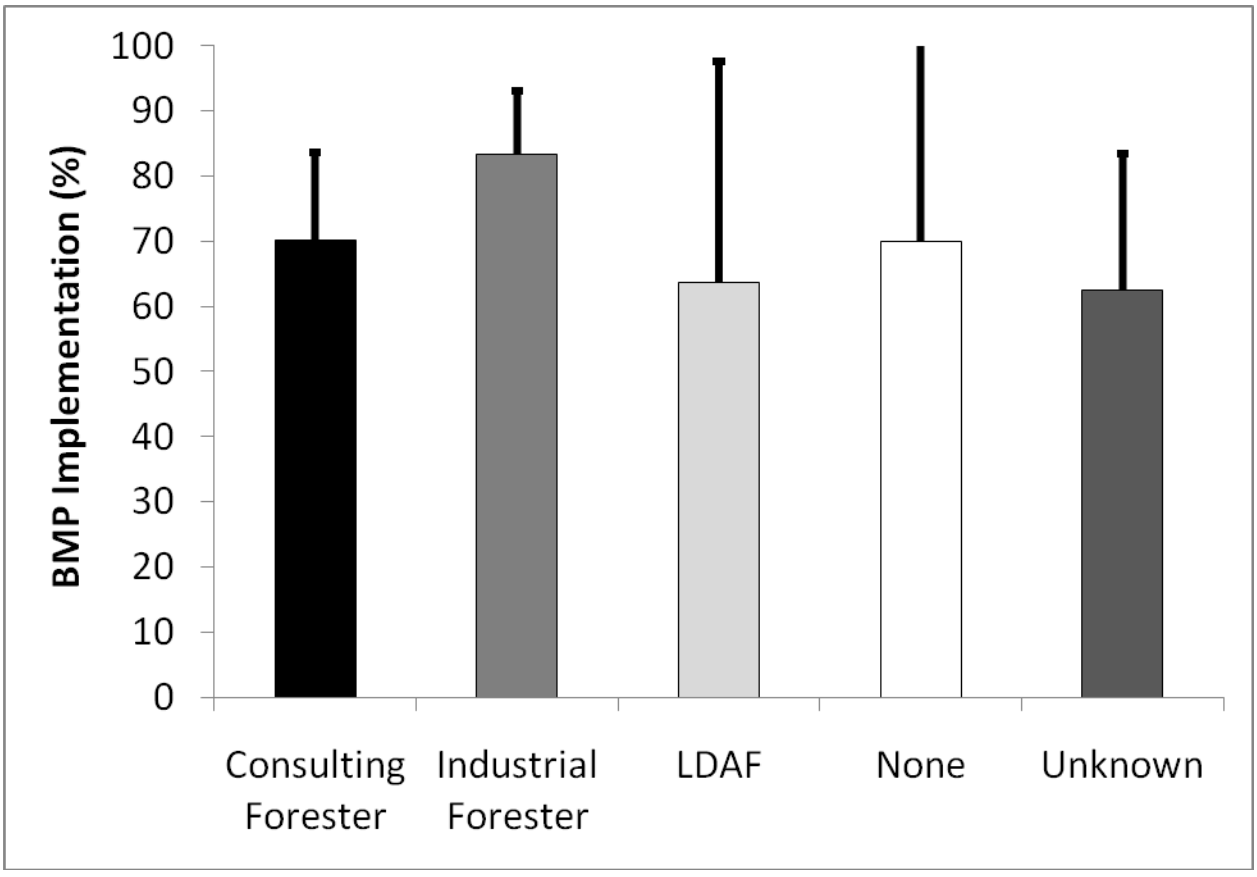

Figure 6. BMP implementation by source of technical assistance. Error bars are 95% confidence intervals.

Terrain Type (B1)

Terrain type had no statistically significant influence on BMP implementation. BMP implementation was highest in upland forests (75.7%; 84 of 111 sites) followed by bottomland forests (72.7%; 8 of 11 sites) and flat woods (66.7%; 20 of 30 sites). BMP implementation across terrain types was similar to statewide implementation rates.

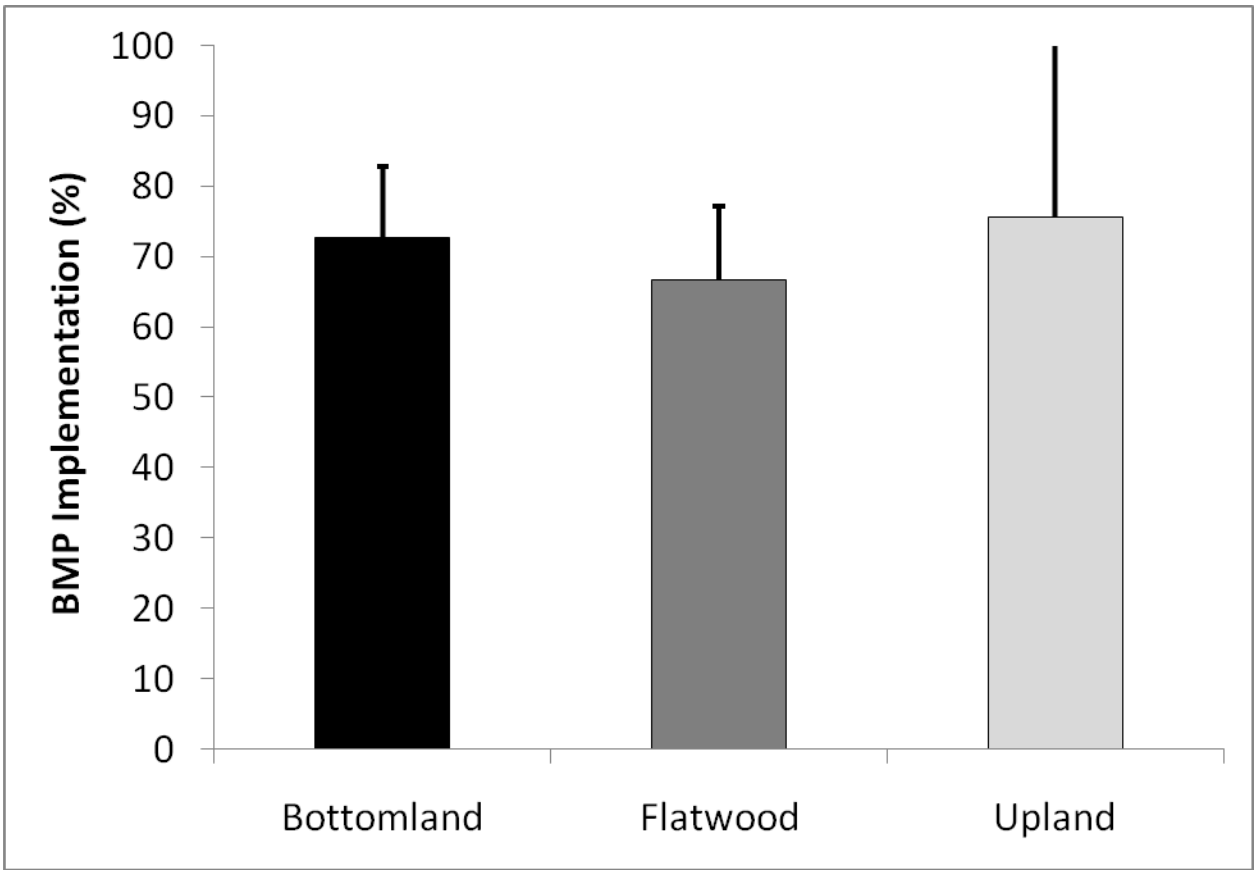

Figure 7. BMP implementation by terrain type. Error bars are 95% confidence intervals.

Terrain Type Near Watercourse (B3)

Terrain type adjacent to a watercourse did not statistically significantly influence BMP implementation. BMP implementation was highest at sites with moderate slopes (76.1%; 51 of 67 sites) followed by flat sites (70.9%; 56 of 79 sites) and steep sites (66.7%; 2 of 3 sites). BMP implementation across terrain types near watercourses was similar to statewide implementation rates.

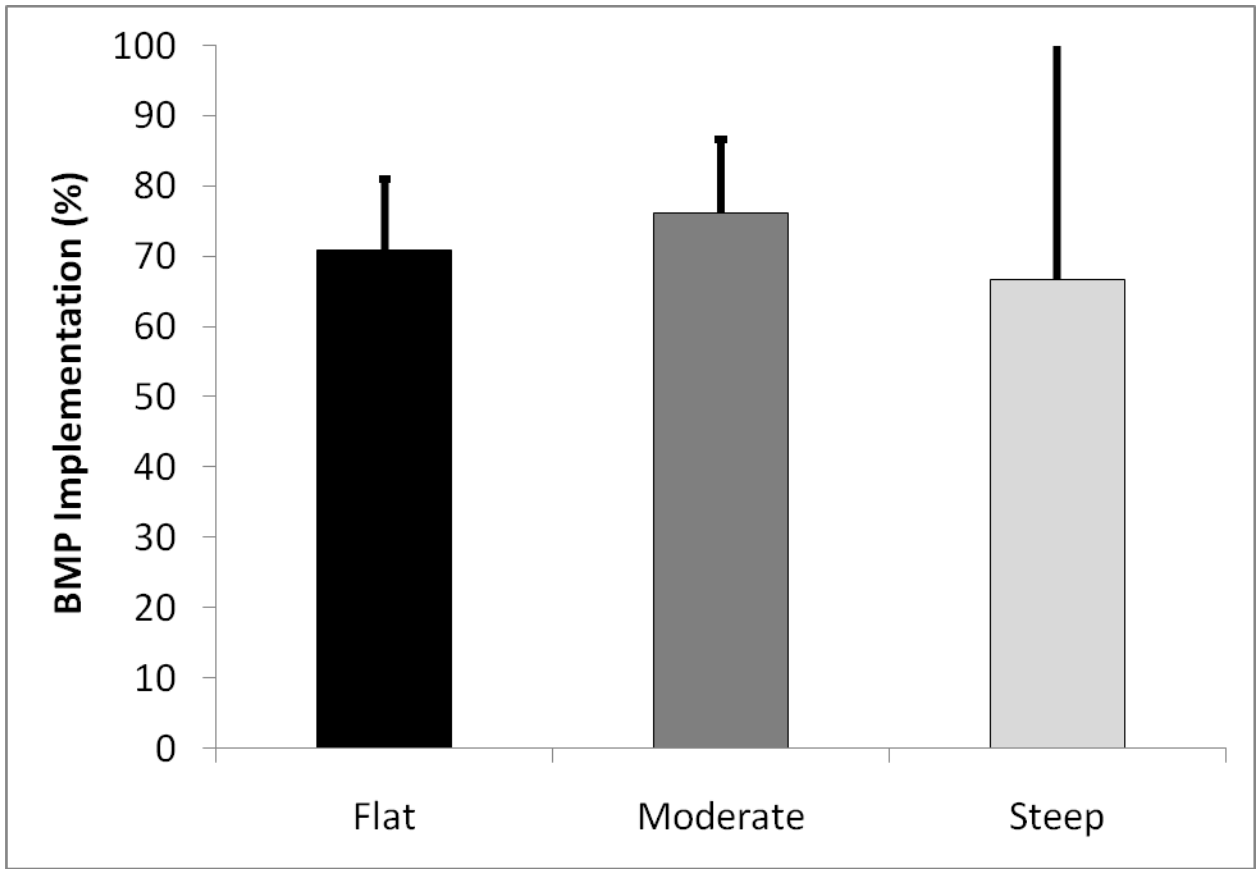

Figure 8. BMP implementation by terrain type. Error bars are 95% confidence intervals.

Water Body Type Within or Adjacent to Site (B4)

BMP implementation did not statistically significantly differ among sites with different water body types within or adjacent to the site. Sites without water bodies within or adjacent to the site had the highest BMP implementation (75%; 20 sites) followed by sites with or adjacent to intermittent streams (73.4%; 98 sites), sites with or adjacent to perennial streams (73.0%; 37 sites), sites with or adjacent to bayous (71.4%; 7 sites), sites with or adjacent to lakes (66.7%; 6 sites), sites with or adjacent to rivers (66.7%; 3 sites), and sites with or adjacent to wetlands (50%; 6 sites). The relatively low number of sites with lakes, rivers, or wetlands within or adjacent to sites complicates statistical analyses, however, these sites do exhibit a trend of lower levels of BMP implementation.

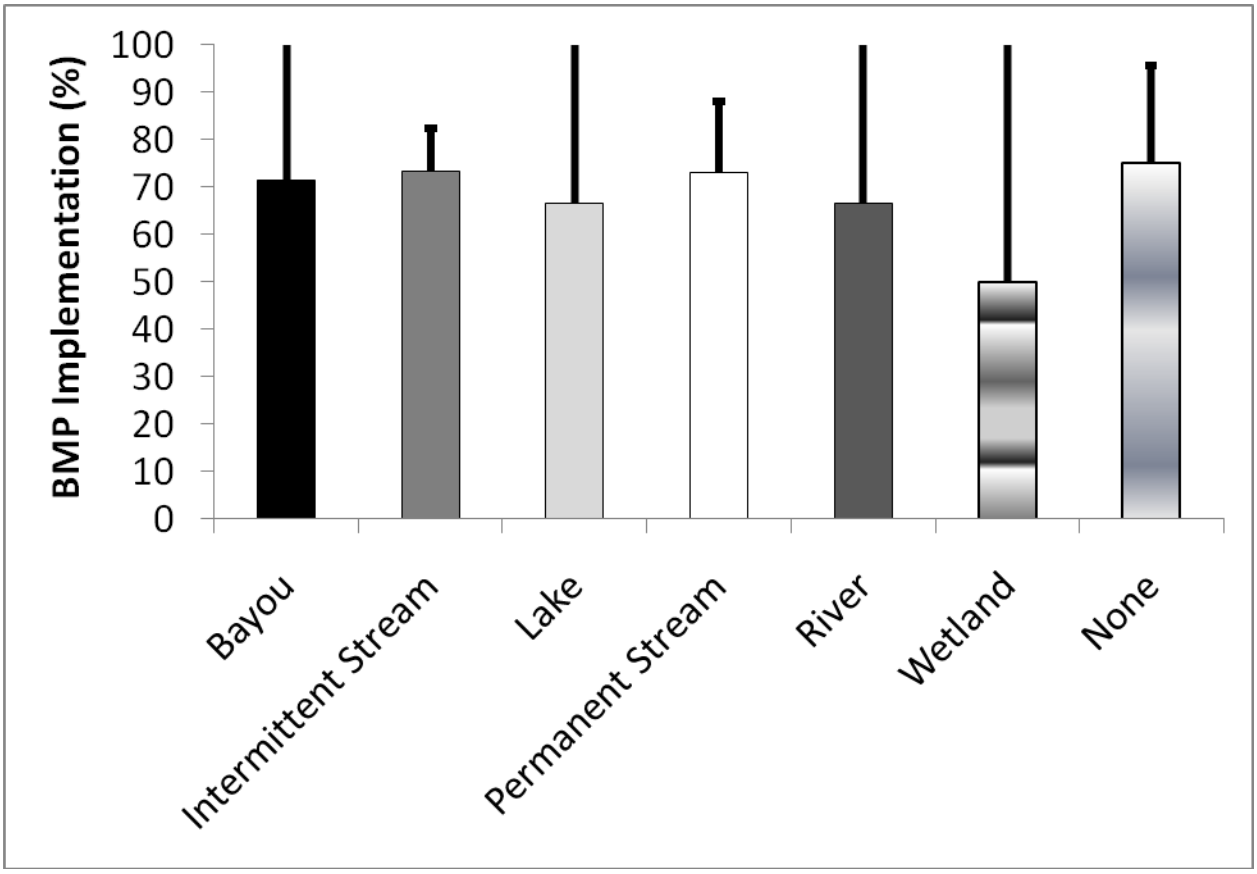

Figure 9. BMP implementation by adjacent water body type. Error bars are 95% confidence intervals.

Activities within Streamside Management Zones (SMZs)

BMP implementation statistically significantly differed among activities within streamside management zones (SMZs; $\chi^2_{7\ d.f} = 16.68$, P = 0.02). Sites with road construction had statistically significantly lower BMP implementation (50%; 16 sites) than any other SMZ activity. Sites with thinning had the highest level of BMP implementation (83.9%) followed by sites with no SMZ activity (78.6%), sites with fire line construction (77.8%), sites with reforestation activities (75%), sites with preparation activities (72.7%), sites with clearing (57.1%), and sites with regeneration cuts (50%). The lower level of BMP implementation in sites with road construction in the SMZs may be related to failures to implement permanent access road guideline 5 (D5; Figure 13) and timber harvesting guideline 3 (E3; Figure 14), which both deal with erosion prevention measures by seeding or mulching.

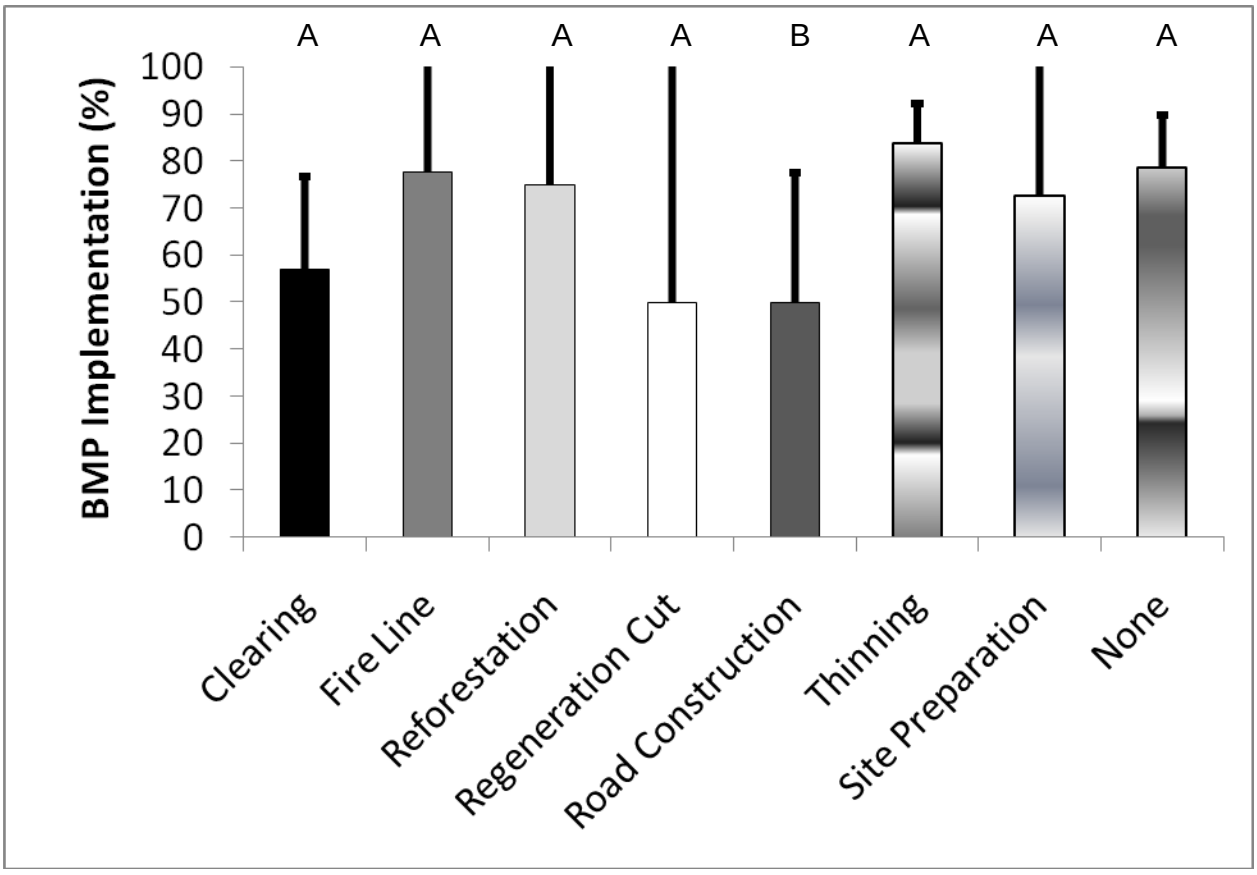

Figure 10. BMP implementation by activity within Streamside Management Zones (SMZs). Error bars are 95% confidence intervals. Different letters indicate statistical differences.

Within Guidelines

BMP implementation at sites was statistically significantly similar within guideline categories (i.e., no single category influenced overall site BMP implementation than any other category). Further, when average BMP implementation across guidelines was compared across categories, no category had a statistically significantly higher level of implementation than any other category. Guideline BMP implementation was highest among guidelines in fire line construction (category G; 96.6%) followed by timber harvesting guidelines (category E; 96.4%), site preparation guidelines (category F; 95.8%), streamside management zone (SMZ) guidelines (category C; 95.5%), permanent access road guidelines (category D; 95.1%).

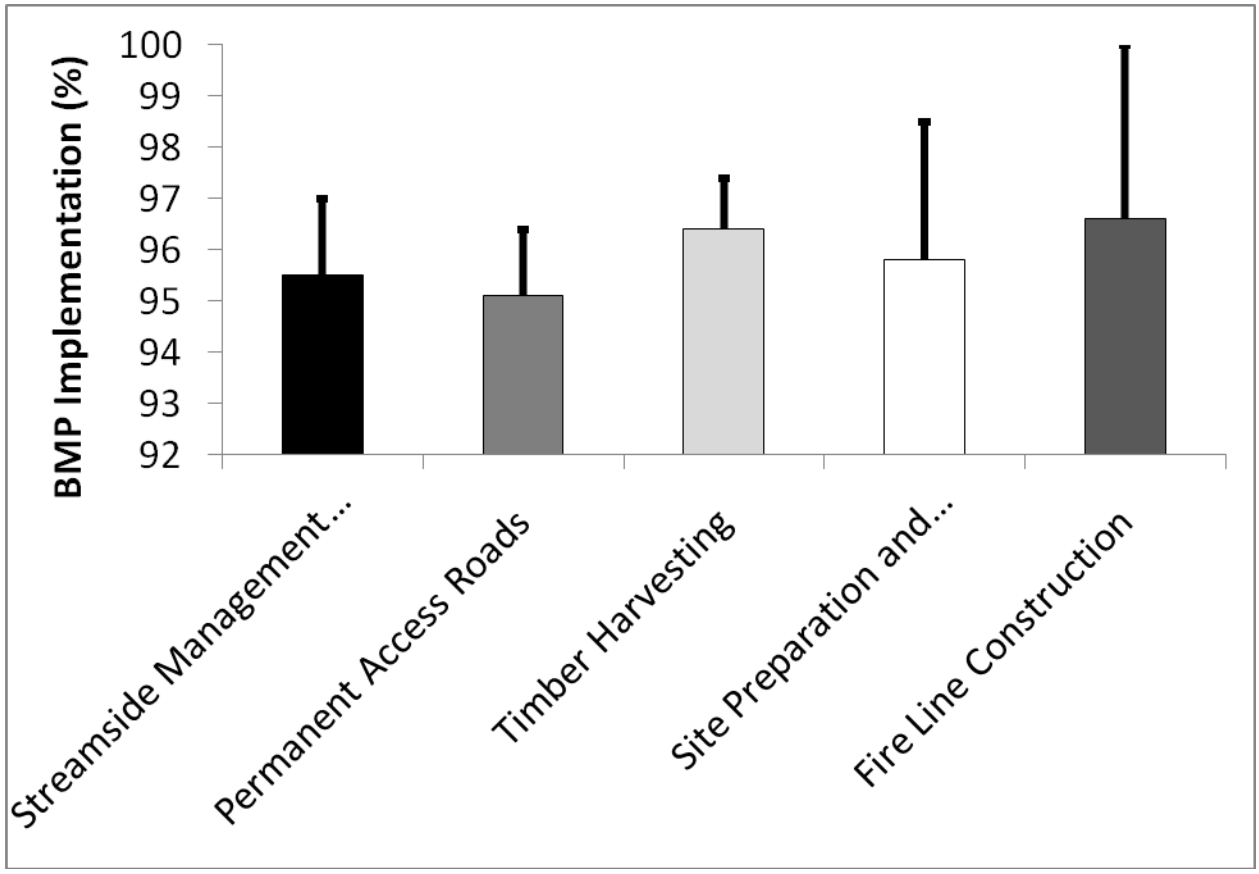

Figure 11. BMP implementation among BMP guideline categories. Error bars are 95% confidence intervals.

Streamside Management Zone (SMZ) Guidelines (category C)

Guideline BMP implementation was statistically significantly higher ($\chi^2_{6\ d.f.}$ = 18.5, P < 0.01) for guideline C7 – roads and log decks outside SMZs. The other guidelines were similar in implementation with BMP implementation highest in guideline C3 – frequent stream crossings avoided (97.5%) followed by C4 – Stream crossings at right angles (96.1%), C1 – SMZ(s) adequate to protect streambed and streambank stability (94.7%), C2 – Trees or tops removed from streams or watercourses (94.3%), C6 – temporary crossing material removed from water bodies (91.7%), and C5 – culverts, bridges, or fords when crossing from water bodies (91.0%). Although C7 was statistically significantly higher than the other guideline categories, all of the guideline categories exhibited BMP implementation exceeding 90%. Consequently, BMP guidelines for SMZs appear to be widely implemented at high levels.

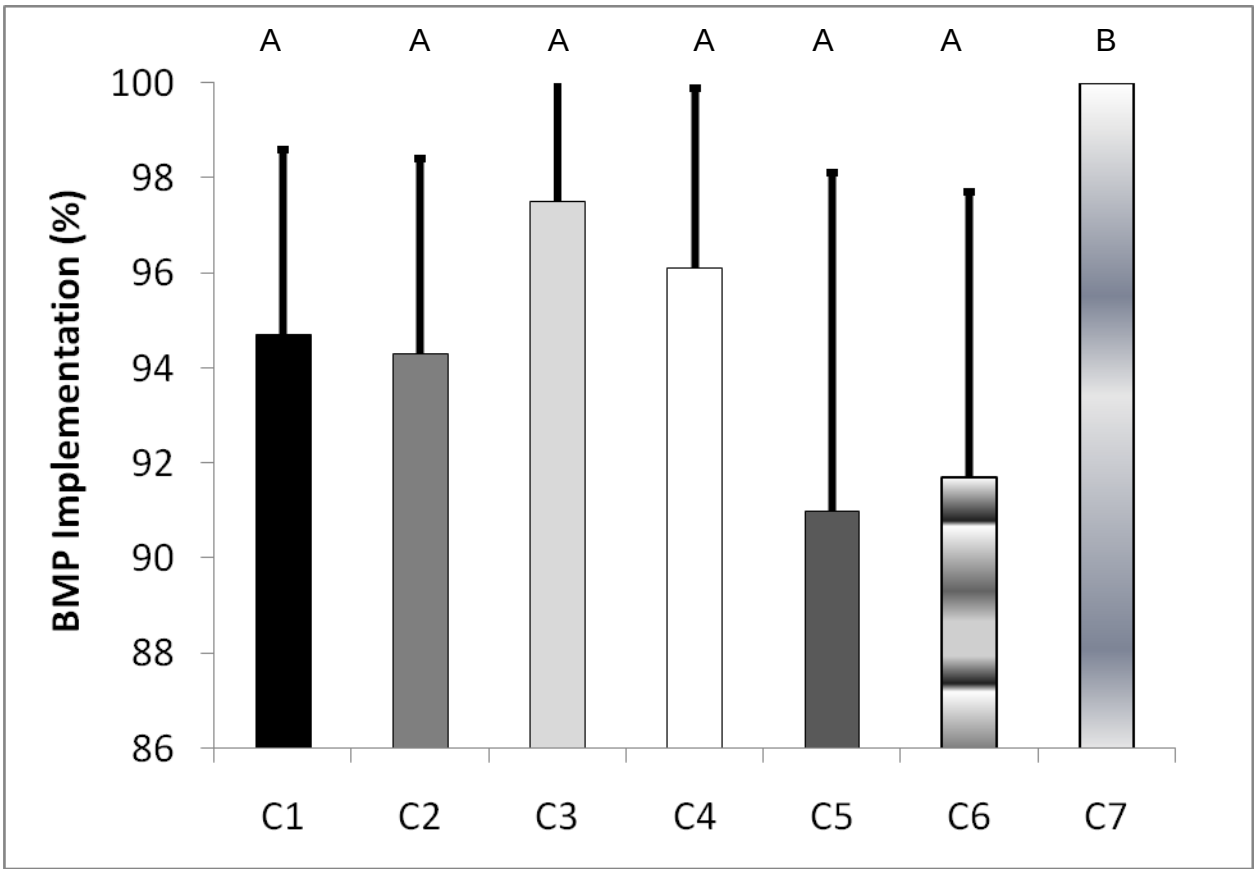

Figure 12. BMP implementation within Streamside Management Zones (SMZ) guidelines. Error bars are 95% confidence intervals. Different letters indicate statistical differences.

Permanent Access Road Guidelines (category D)

Guideline BMP implementation was statistically significantly (χ^2, $_{7\ d.f.}$ = 74.3, P < 0.01) lower in guideline category D5 – seeding and/or mulching performed when necessary (67.7%) than the other guidelines. BMP implementation was highest in guideline D1 – road construction avoided in narrow canyons, marshes, wet meadows, natural drainage channels or SMZ(s)(99.2%) followed by D3 – roads located along crest of ridges or on the contour, and at a distance sufficient to minimize impact to water bodies (98.5%), D4 – timber on road rights-of-way removed or decked outside borrow ditches (98.5%), D2 – number of stream crossings minimized and at right angles to the main channel, where practical (97.8%), D7 – water flow not constricted by bridges, culverts, or debris generated by road construction (95.0%), and D6 – wing ditches, culverts, and cross drains installed at such frequency to minimize erosion (91.8%). Opportunities exist for improvement in site-level BMP implementation by increasing implementation of guideline D5.

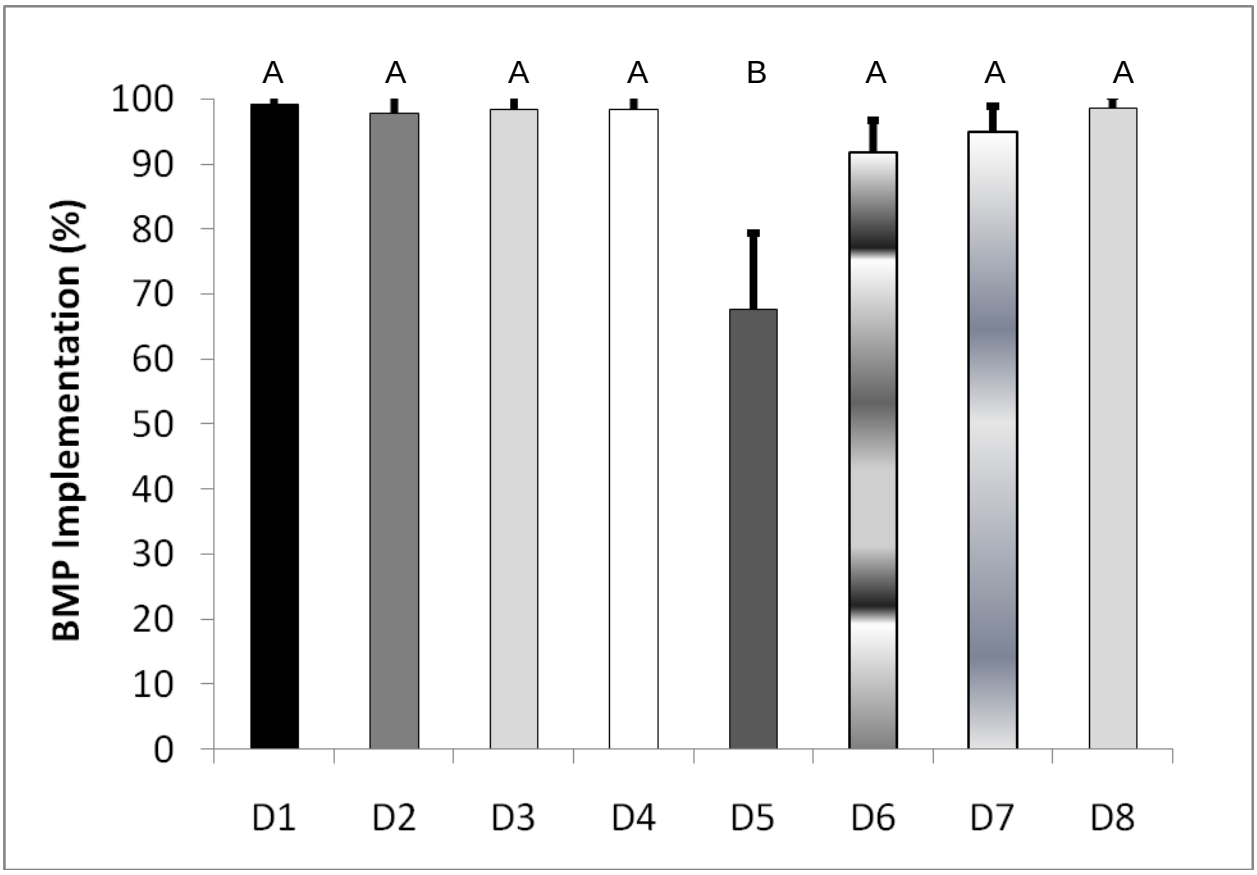

Figure 13. BMP implementation within permanent access road guidelines. Error bars are 95% confidence intervals. Different letters indicate statistical differences.

Timber Harvesting Guidelines (category E)

Guideline BMP implementation was statistically significantly lower ($\chi^2_{8\ d.f.}$ = 47.36, P < 0.01) in guideline E3 – skid trails, temporary road crossings, or landings conditioned to minimize erosion by seeding and/or installing waterbars (86.0%) than any other guideline. BMP implementation was highest in guideline E7 – skid trails and traffic minimized on steep slopes (100%) and E8 – equipment serviced away from streams and petroleum products disposed properly (100%) followed by E9 – trash generated during the harvesting operation properly disposed (99.3%), E5 – skidding across streams minimized (97.5%), E6 – stream crossings at right angles and take advantage of natural fords, stable banks, and gentle slopes (97.1%), E4 – avoid skidding or forwarding in watercourses or streambeds (96.3%), E2 – location of skid trails and landings avoid natural drainage patters (95.9%), and E1- trees felled away from waterbodies and debris removed from watercourses. Similar to permanent road access guidelines (D5; Figure 13), lower BMP implementation among timber harvesting guidelines appears to be related to erosion control measures.

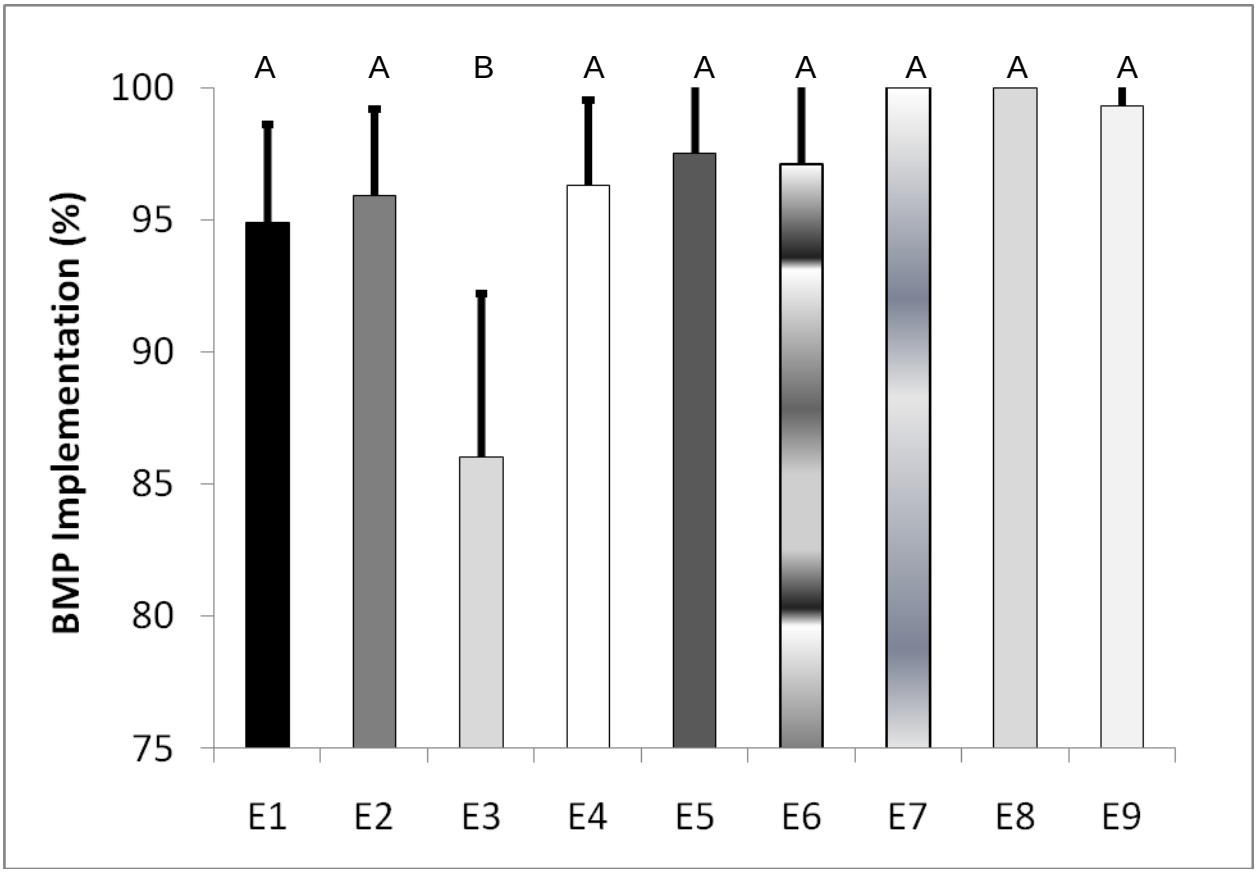

Figure 14. BMP implementation within timber harvesting guidelines. Error bars are 95% confidence intervals. Different letters indicate statistical differences.

Site Preparation and Reforestation Guidelines (category F)

Guideline BMP implementation was not statistically significantly different among guidelines. BMP implementation was highest in guideline category F4 – minimum stream crossings by equipment (98.2%) followed by F1 – bedding, ripping, windrowing, etc. follow contours (97.6%), F5 – machine planting follows contours (95.8%), F3 – SMZ(s) protected (94.1%), and F2 – water outlets provided on bedding areas (92.6%). All site preparation and reforestation guidelines were quite high.

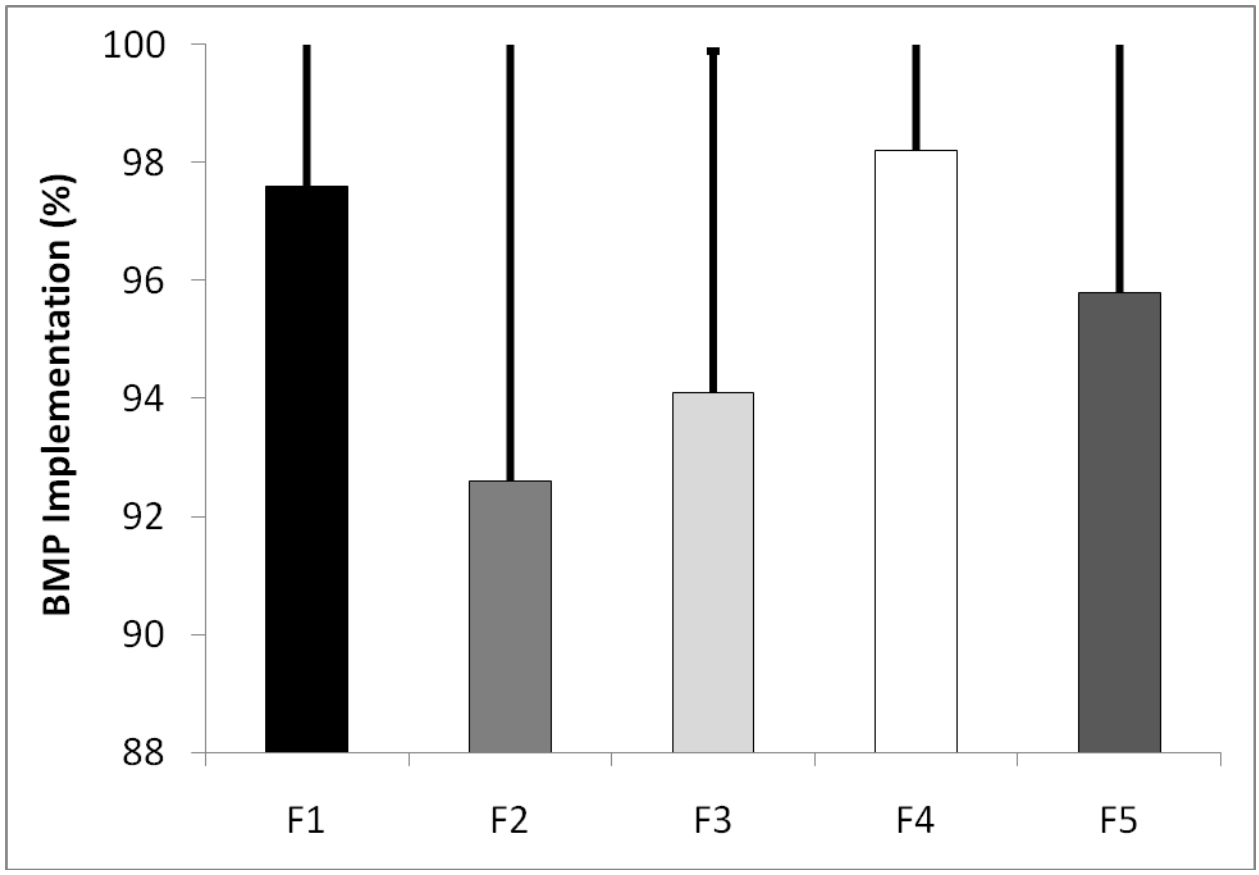

Figure 15. BMP implementation within site preparation and reforestation guidelines. Error bars are 95% confidence intervals.

Fire Line Construction Guidelines (category G)

Guideline BMP implementation did not statistically significantly differ between guideline categories. BMP implementation was higher in guideline G1 – pre-suppression firebreaks located on contour as often as possible (98.4%) than G2 – waterbars or diversions installed on firebreaks or plowed fire lines constructed on erodible steep grades (94.7%). Overall BMP implementation was high among fire line construction guidelines.

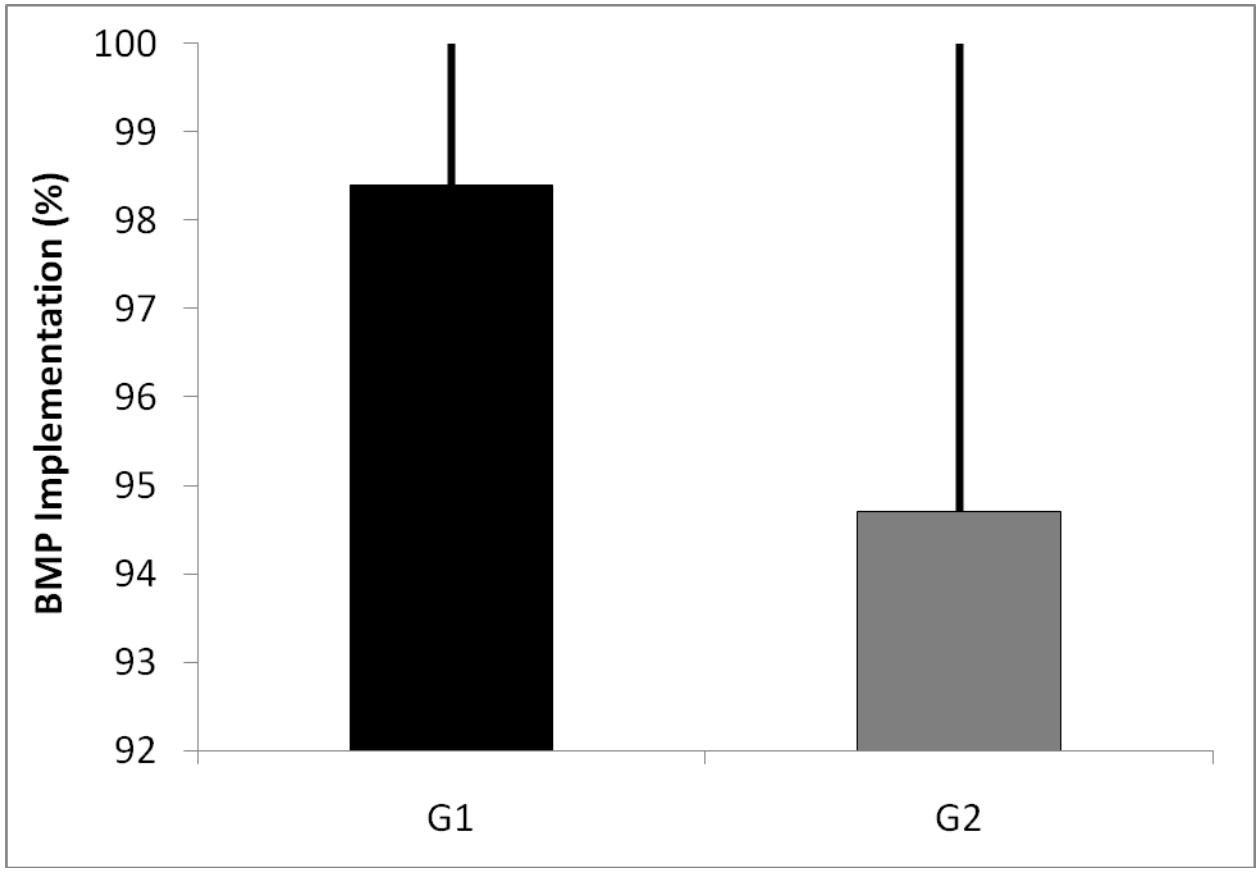

Figure 16. BMP implementation within fire line construction guidelines. Error bars are 95% confidence intervals.

Significant Risk to Water Quality

Overwhelmingly, sites were not deemed to have significant risks to water quality (94.7% 144 sites). Only 4 sites were judged to have significant risks to water quality. The answers to this question were statistically significantly different than the calculated quantitative site-level BMP implementation ($\chi^2_{, 2\ d.f} = 19.9$, $P < 0.01$). Thirty-three sites that were deemed to not pose significant risks to water quality did not have full site-level BMP implementation. Most of these sites lacked BMP implementation in guidelines not directly associated with water quality.

Interpretation and Recommendations

The 2009 survey data suggest most problems with BMP implementation occurred on private, non-industrial mixed pine/hardwood forests with regard to erosion control and SMZs, specifically BMP guidelines D5 and E3. Other types of BMP guidelines were consistently highly implemented across sites. Guidelines D5 (67.7%) and E3 (86%) are related to erosion control through seeding, mulching, installing waterbars and otherwise conditioning to reduce erosion. These guidelines also were problematic in the 2000 survey with implementation at 61% for D5 and 69% for E3. In the 2002 survey, implementation of BMP guidelines D5 and E3 were 89% and 94.8%, respectively, which was higher than 2000 or 2009. Potentially, several factors could be influencing these data. First, economic downturns in 2000 and 2009 could have led to cost cutting and profit maximizing measures. For example, both D5 and E3 discuss the use of seeding and mulching, which could be viewed as additional, and possibly unnecessary, expenses. Further, although the data were not provided in the 2002 report of the 2000 survey, the 2009 survey reported a much higher proportion of sites with no specified or unknown sources of technical assistance, which again could have been viewed as a cost saving measure. Second, the higher proportion of BMP implementation in the 2002 survey for BMP guidelines E3 and D5 could have been the result of educational efforts following the 2000 survey. Third, the 2009 survey could have been strongly influenced by salvage logging following the 2005 and 2008 hurricanes. The author of this reported noted extensive salvage logging in SMZs in southeastern and southwestern Louisiana following Hurricanes Katrina and Rita (see Kelso, W. E., A. R. Harlan, and M. D. Kaller. 2008. A survey of fishes Inhabiting the Pearl, Tchefuncte, and Tangipahoa river systems in Louisiana, report to the Louisiana Department of Wildlife and Fisheries and Kelso, W.E., D.A. Rutherford, and M.D. Kaller. 2008. Relationships between nutrients, dissolved oxygen conditions, habitat, and fish assemblage composition in Louisiana streams, report to the Louisiana Department of Environmental Quality).

During each stream study, landowners were observed salvaging trees along streams to prevent wildfire and increase site safety. It is possible that these unusual circumstances and urgency of action may have led to incomplete BMP implementation in the interest of addressing the hurricane damage. These factors are not mutually exclusive and suggest that educational efforts be focused on the importance of seeding, mulching, and erosion control in all circumstances.

The 2009 survey contained data on several improvements. In 2000, BMP guideline G2 was implemented at 75% of sites. By 2002, implementation of guideline G2 increased to 100%, and in 2009, G2 implementation was again high at 94.7%. Further, between 2002 and 2009, guidelines C7, E7, and G1 improved to 100% implementation across all sites. These data suggest that during silviculture, attention is being paid to implementing BMPs regarding water movement and use of natural contours and slopes.

In summary, the 2009 survey suggests focusing on educational programs for private, non-industrial forest landowners aimed at erosion control and cost management. If the low implementation of BMP guidelines D5 and E3 and the low use of technical assistance were indeed viewed as cost-cutting measures, educational programs should focus on the consequences of these decisions and alternative cost-reducing methods. Further, even if the low implementation of D5 and E3 were related to once in a lifetime salvage logging, the educational efforts will reinforce the benefits of BMP implementation in all circumstances.

Appendix

DEPARTMENT OF AGRICULTURE AND FORESTRY
OFFICE OF FORESTRY
BEST MANAGEMENT PRACTICES
IMPLEMENTATION SURVEY

A. GENERAL INFORMATION

1. Survey date

2. Parish _____, Section
   Township _____, Range

3. Type of silvicultural treatment (check one or more):
   ____ Clearcut
   ____ Thinning
   ____ Regeneration cut (seed tree or shelterwood)
   ____ Site preparation (mechanical or chemical for natural or artificial regeneration)

4. Acres receiving silvicultural treatment

5. Ownership: ____ Public, ____ Industry, ____ Corporate,
   ____ Private (nonindustrial)

6. Dominant site type (before silvicultural treatment):

   ____ natural pine, ____ pine plantation, ____ mixed pine-hardwood,
   _____bottomland hardwood,____ upland hardwood, ____ field or pasture

7. Technical forestry assistance provided by (if known):

   ____ LOF Forester, ____ Consultant, ____ Industrial Forester,
   ____ Other (specify: _____), ____ None

B. SITE CHARACTERISTICS

1. Terrain: ____ Bottomland,____ Flatwoods, ____ Upland

2. Principal soil type and texture (from soil survey, if available)
3. Terrain within 150 feet along watercourse (check one): ____ Steep slopes (>25%),
   ____ Moderate slopes (25% - 5%), ____ Flat (<5%)

4. Type of water body/bodies occurring adjacent to or within treatment area (check one or more):
   ____ Perennial stream, ____ Intermittent stream, ____ River, ____ Bayou,
   ____ Lake or Pond, ____ Swamp or Wetland, ____ None

5. Is there a designated scenic stream or river within the treatment area?
   ____ Yes ____ No (If yes, name of scenic watercourse.)

6. Type of silvicultural practice(s) occurring within SMZ (check one or more):
   ____ Clearcut, ____ Thinning, ____ Site preparation, ____ Regeneration cut,
   ____ Logging road construction, ____ Fire line construction, ____ Reforestation,
   ____ No activity

C. STREAMSIDE MANAGEMENT ZONES (SMZs)

BMP GUIDELINES	EXCEEDS[1] GUIDELINES	FULL IMPLEMENTATION	MINOR[2] DEPARTURE	NEEDED BUT NOT APPLIED	NO ACTION REQUIRED	COMMENTS/ RECOMMENDATIONS
1. SMZ(s) adequate to protect streambed and streambank integrity.						
2. Trees or tops removed from streams or watercourses.						
3. Frequent stream crossings avoided.						
4. Stream crossings at right angles.						
5. Culverts, bridges, or fords used when crossing water bodies.						
6. Temporary crossing material removed from water bodies.						
7. Roads and log decks outside (SMZs).						

[1]Provides greater than recommended protection. [2]Applied but not complete implementation.

D. PERMANENT ACCESS ROADS

BMP GUIDELINES	EXCEEDS[1] GUIDELINES	FULL IMPLEMENTATION	MINOR[2] DEPARTURE	NEEDED BUT NOT APPLIED	NO ACTION REQUIRED	COMMENTS/ RECOMMENDATIONS
1. Road construction avoided in narrow canyons, marshes, wet meadows, natural drainage channels, or SMZ(s).						
2. Number of stream crossings minimized and at right angles to the main channel, where practical.						
3. Roads located along crest of ridges or on the contour, and at a distance sufficient to minimize the impact to water bodies.						
4. Timber on road rights-of-way removed or decked outside borrow ditches.						
5. Seeding and/or mulching performed where necessary.						
6. Wing ditches, culverts, and cross drains installed at such frequency to minimize erosion.						
7. Water flow not constricted by bridges, culverts, or debris generated by road construction.						
8. Logging traffic restricted during periods of excessive ground moisture.						

[1]Provides greater than recommended protection. [2]Applied but not complete implementation.

E. TIMBER HARVESTING

BMP GUIDELINES	EXCEEDS[1] GUIDELINES	FULL IMPLEMENTATION	MINOR[2] DEPARTURE	NEEDED BUT NOT APPLIED	NO ACTION REQUIRED	COMMENTS/ RECOMMENDATIONS
1. Trees felled away from waterbodies and debris removed from watercourses.						
2. Location of skid trails and landings avoid natural drainage patterns.						
3. Skid trails, temporary roads, or landings conditioned to minimize erosion by seeding and/or installing waterbars.						
4. Avoid skidding or forwarding in watercourses or streambeds.						
5. Skidding across streams minimized.						
6. Stream crossings at right angles and take advantage of natural fords, stable banks, and gentle slopes.						
7. Skid trails and traffic minimized on steep slopes.						
8. Equipment serviced away from streams and petroleum products properly disposed.						
9. Trash generated during the harvesting operation properly disposed.						

[1]Provides greater than recommended protection. [2]Applied but not complete implementation.

F. SITE PREPARATION AND REFORESTATION

BMP GUIDELINES	EXCEEDS[1] GUIDELINES	FULL IMPLEMENTATION	MINOR[2] DEPARTURE	NEEDED BUT NOT APPLIED	NO ACTION REQUIRED	COMMENTS/ RECOMMENDATIONS
1. Bedding, ripping, windrowing etc. follow contours. Drum chopping is up and down slope.						
2. Water outlets provided on bedded areas.						
3. SMZ(s) protected.						
4. Minimum stream crossings by equipment.						
5. Machine planting follows contours.						

[1]Provides greater than recommended protection. [2]Applied but not complete implementation.

G. FIRE LINE CONSTRUCTION

BMP GUIDELINES	EXCEEDS[1] GUIDELINES	FULL IMPLEMENTATION	MINOR[2] DEPARTURE	NEEDED BUT NOT APPLIED	NO ACTION REQUIRED	COMMENTS/ RECOMMENDATIONS
1. Pre-suppression firebreaks located on contour as often as possible.						
2. Waterbars or diversions installed on firebreaks or plowed fire lines constructed on erodible steep grades.						

[1]Provides greater than recommended protection. [2]Applied but not complete implementation.

H. SIGNIFICANT RISK

Significant Water Quality Risk – An existing on-the-ground condition resulting from failure to correctly implement BMPs, that if left unmitigated will likely result in an adverse change in the chemical, physical or biological condition of a waterbody. Such change may or may not violate water quality standards.

On-Site Indicators of Significant Risk to Water Quality

The conditions listed below are often associated with significant water quality risks. They should be viewed as "red flag" warnings that the chemical, physical and/or biological quality of adjacent waterbodies will likely be threatened if not mitigated.

- Temporary stream crossings remain in channel following operation
- Stream crossings and approaches not stabilized
- Logging debris in waterbody affecting or obstructing flow
- Evidence of excessive sediment entering waterbody from adjacent treated area
- Canopy completely or almost completely removed from SM Z on perennial waterbody
- Evidence of heavy equipment operation in stream channel
- Waterbody banks compromised by equipment or skidding activities
- Water diversion devices absent or severely compromised on roads or skid trails where runoff is likely to enter waterbody
- Ruts or other excessive physical damage to soils and cover within the SMZ
- Fill material in stream crossing without ad equate means for conveyance of flow
- Un-stabilized fireline tied directly into waterbody
- Oil, chemicals, batteries or other hazardous materials leaking or remaining on sit e following operation
- Road or skid trail too steep or so poorly located that stabilization is improbable

Do the conditions present constitute a significant risk(s) to water quality due to inadequate BMP implementation on this site?

____ Yes ____ No

If yes, briefly state primary reason(s) for the significant risk:

_____

LOF FORESTER DATE