SFI IMPLEMENTATION COMMITTEE
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Monitoring of Forestry BMPs in Michigan
Fall 2011

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For the Michigan SFI® Implementation Committee

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The Sustainable Forestry Initiative (SFI) program is a comprehensive system of principles, objectives and performance measures developed by professional foresters, conservationists and scientists, among others that combines the perpetual growing and harvesting of trees with the long-term protection of wildlife, plants, soil and water quality. The SFI program was developed in 1994 to ensure North America's valuable forests were sustainably managed and to document the commitment of forest products industry members to keep our forests healthy and to practice the highest level of sustainable forestry. Currently close to 200 million acres of forestland in North America and over five million acres of forestland in Michigan have been third-party audited to the SFI standard, making the SFI program among the world's largest sustainable forestry programs.

It is the mission of the Michigan SFI Implementation Committee (SIC) to promote and foster an understanding of the Sustainable Forestry Initiative (SFI) program, and to promote sustainable forestry practices on all forestlands, regardless of ownership. The SFI State Implementation Committee includes representation from non-industrial private landowners, timber harvesters, Michigan State University Extension, and the Michigan DNR, Michigan United Conservation Clubs, forestry consultants, and several major forest products industry companies. For more information on the SIC, go to: http://www.sfimi.org/

The Michigan Forest Products Council (MFPC) provides general management functions and services for operations of the Michigan SIC. The MFPC is a trade association representing the state's forest products industry including, landowners, foresters, sawmills and manufacturers of cabinets, furniture, flooring, pulp, paper, paperboard, lumber, panel board, plywood, oriented strand board, utility poles veneer and many other wood products. For more information regarding the MFPC, BMP audits, or Michigan forest products companies, go to: http://www.michiganforest.com/

Dr. Pedersen received his Ph.D. from Michigan State University in 1990 after which he began work for the Michigan Department of Natural Resources, Forest Management Division. In his capacity as Planning and Operations Supervisor, in 2009 he coordinated completion of Michigan's *Sustainable Soil and Water Quality Practices on Forest Land*. He retired from the Division in July, 2011. The SIC and Dr. Pedersen wish to thank the SIC BMP subcommittee; Howard Lindberg, Jessica Turino, Scott Robbins, Dennis Nezich, Jennifer Burnham, and George Madison. George Madison provided the photos used in this report.

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Executive Summary

Overall compliance with Michigan's Best Management Practices (BMPs) has improved during the past two decades. This observation is based on people's perceptions of public and private forestry operations, BMP monitoring by individual forest product firms, and joint statewide audits conducted in the fall of 2011 versus results from similar Michigan audits conducted across forest ownerships in 1996 and 1997.

The audit process was designed and coordinated by a BMP subcommittee of the Michigan SFI Implementation Committee (SIC). Candidate sites were nominated by MI SIC member participants. The 2011 audit evaluated twenty-nine recently harvested properties throughout northern Michigan. The audit teams consisted of public and private forestry experts and Michigan DNR fisheries biologists. Implementations of sixty-seven different BMPs were considered for each site along with seven supplemental questions and an overall water quality impact rating. The BMPs cover: equipment operation and maintenance, road systems, stream crossings, skidding, landings, riparian management zones, wetlands, and other dimensions or possible impacts of timber harvesting.

Overall, where BMPs were audited as needed, 93% were rated as "applied correctly" and another 6% were rated as having an "acceptable variation." These estimates contrast to the overall compliance results of 75% (1996 audit) and 82% (1997 audit) from fifteen years ago. Sustainable forestry certification standards and practices implemented in the past fifteen years are likely the most important factors behind this improvement. The high level of compliance provides evidence that Forestry BMPs and their statewide implementation in Michigan is successful and the goals of soil and water quality protection are being met. Continued investment in BMP education and auditing is necessary to maintain this success and strengthen these results.

Fall 2011 BMP Results by Category

	---------- BMP Needed ----------				
Category	applied correctly	acceptable variation	applied incorrectly	not applied	Total of BMP Needed
1 Equipment Operation and Maintenance	96.3%	1.9%	1.9%	0.0%	100.0%
2 Roads	90.8%	5.9%	2.7%	0.9%	100.0%
3 Stream Crossings (permanent & temporary)	85.5%	14.5%	0.0%	0.0%	100.0%
4 Skidding & Skid Trails	86.7%	12.0%	1.2%	0.0%	100.0%
5 Landings	99.3%	0.7%	0.0%	0.0%	100.0%
6 Riparian Management Zones	93.5%	6.0%	0.4%	0.0%	100.0%
7 Wetlands	91.1%	7.1%	1.8%	0.0%	100.0%
8 Other Considerations	100.0%	0.0%	0.0%	0.0%	100.0%
Overall	92.6%	6.1%	1.1%	0.2%	100.0%

Introduction

What are BMPs?

The term 'Best Management Practices', or BMPs, was coined years ago as a way to describe acceptable practices that could be implemented to protect water quality and promote soil conservation during forestry activities. BMPs are often combinations of practices that have been determined to be effective and practicable (with respect to technological, economic, and institutional considerations) in preventing or reducing the amount of nonpoint pollution to a level compatible with water quality goals. A BMP can be a structural "thing" that you actually install on-the-ground. Examples may include runoff diversions, silt fence, stream buffers and ground cover vegetation over bare soil areas. A BMP can also be part of the "process" that you use to plan, conduct and close-out your forestry operation. Examples include pre-harvest planning, laying out roads in advance of construction, marking stream buffers with paint or flagging, and locating streams on the site before you begin work.

Nonpoint source pollution is a term to describe undesirable runoff that flows across the ground surface. The U.S. Environmental Protection Agency defines the term this way (cited from National Management Measures to Control Nonpoint Source Pollution from Forestry, April 2005):

> Nonpoint source pollution usually results from precipitation, atmospheric deposition, land runoff, infiltration, drainage, seepage or hydrologic modification. As runoff from rainfall or snowmelt moves, it picks up and carries natural pollutants and pollutants resulting from human activity, ultimately dumping them into rivers, lakes, wetlands, coastal waters and groundwater. Technically, the term nonpoint source is defined to mean any source of water pollution that does not meet the legal definition of point source in section 502(14) of the Clean Water Act of 1987. Nonpoint sources include return flow from irrigated agriculture, or other agriculture runoff and infiltration; urban runoff from small or non-sewered urban areas; flow from abandoned mines; hydrologic modification; and runoff from forestry activities.

By effectively using BMPs, you have a very high likelihood of preventing and controlling polluted runoff, before it can reach a creek, pond, or wetland. And if you prevent or control nonpoint source pollution, you will most likely stay in compliance with the various water quality regulations for Michigan.

Michigan's Forestry BMPs

For forestry activities in Michigan, the term 'best management practice' is actually defined by the Michigan Department of Natural Resource's (MI DNR) publication "Sustainable Soil and Water Quality Practices on Forest land". This is also commonly referred to as the Soil and Water Quality Manual or Michigan's BMP Manual. This Manual describes a set of voluntary Forestry Best Management Practices (BMPs) which protect our soil and water resources while allowing appropriate use of our forest resources. The current 2009 version is the first substantial revision of the 1994 publication, Water Quality Practices on Forest Land, which was also known as Michigan's Forestry BMP Manual. BMPs described in previous editions are incorporated

into this manual and their specifications have not changed much, nor have the statutes governing them. However, the scope and use of the term "Best Management Practices" has expanded. The manual describes BMPs in the context of those practices that not only protect surface water quality, but soil quality too.
All Michigan forest landowners, managers and loggers are strongly encouraged to implement BMPs whenever forestry activities are conducted. The BMP manual may be found online through the MI DNR at:
http://www.mi.gov/documents/dnr/IC4011_SustainableSoilAndWaterQualityPracticesOnForestLand_268417_7.pdf

The full set of Michigan forestry BMPs are voluntary guidelines and most are not required by law, although some are such as ones applying to wetlands and fuel spills. (The applicable laws and legal dimensions of BMPs are clearly delineated within the BMP Manual.) However, the emergence of market-demand driven forest certification programs has elevated the awareness and implementation of forestry BMPs to an increased level of importance over the past decade. These certification programs require that participants meet or exceed the recommended BMPs for each state in which they own timberland, harvest timber or purchase timber for manufacturing operations. Part of this requirement is monitoring to assess the degree to which BMPs are used in Michigan. The Michigan SIC in conjunction with the Michigan DNR will periodically conduct statewide implementation surveys such as the Fall 2011 audit to achieve this goal.

Sustainable forest management certification has generated strong support for BMP auditing. For example, the third objective under the 2010-2014 Standard of the Sustainable Forestry Initiative (SFI) is protection and maintenance of water resources. Indicators of this objective include:

- Programs to implement state or provincial best management practices during all phases of management activities.
- Monitoring of overall best management practices implementation.

Most major Michigan wood products companies and large corporate landowners are certified under SFI and have been conducting ongoing or annual internal BMP audits. Several of these firms have been recognized for their water quality protective and enhancement practices during their third party SFI forest certification audits. As evidence of their intent to maintain and support a high standard of BMP practices, some companies have even stopped purchasing wood fiber from firms who have not lived up to BMP standards.

Fall 2011 BMP Audit Process

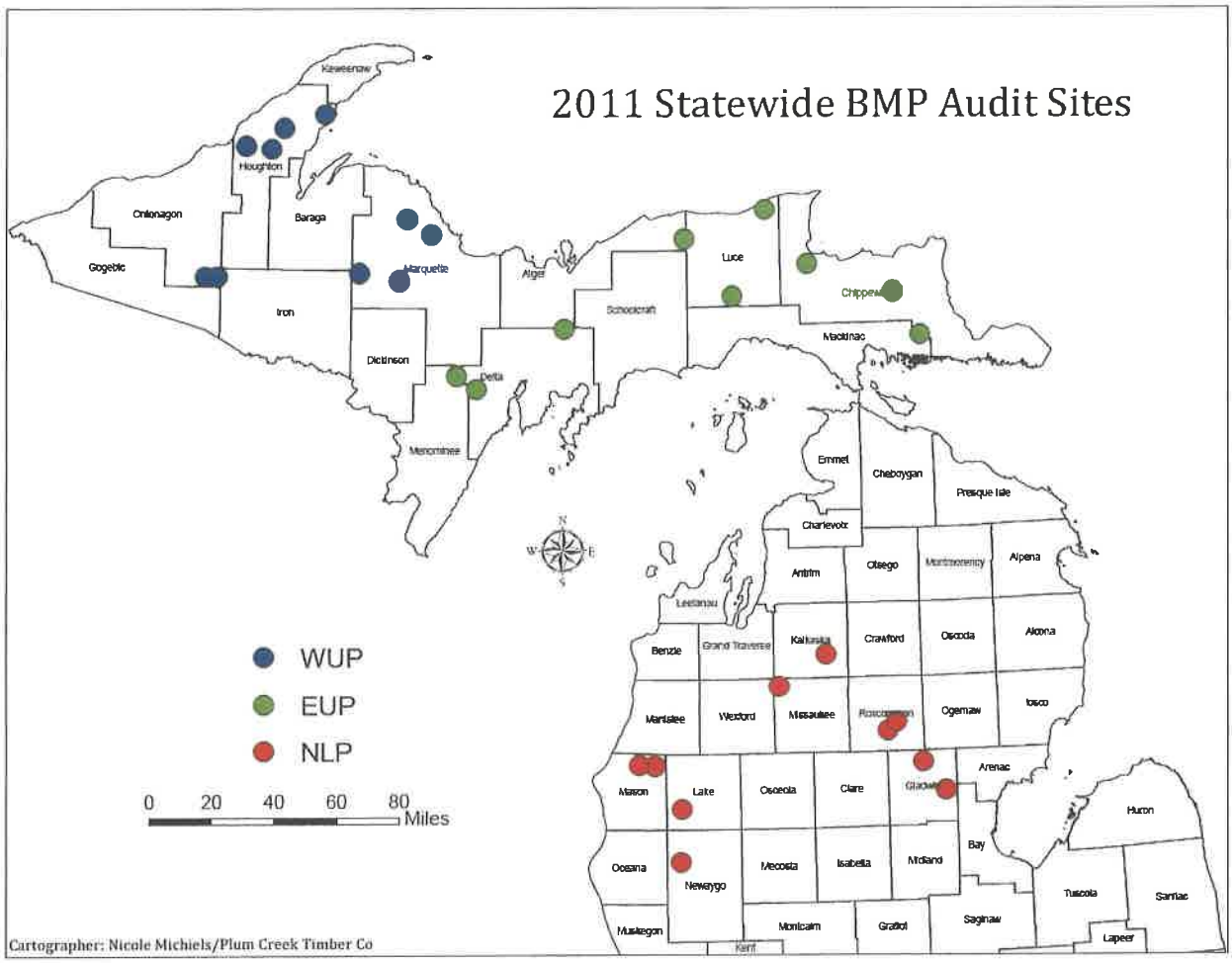
Over the summer of 2011, a subcommittee of the Michigan Sustainable Forestry Initiative Implementation Committee (SIC) developed a plan and procedures for conducting BMP audits (see Appendix A). The plan included the development of a Forest and Soil Water Quality Review Field Worksheet (see Appendix B). This worksheet was based on and tied to recommended practices from the new Michigan BMP Manual guidelines.

Candidate audit sites were solicited by the BMP sub-committee from SIC participant companies and the DNR. Close to 150 sites in total were submitted. Criteria used for site selection included:

1. Timber sales harvested (and completed or nearly complete) between May, 2010 and May, 2011
2. A body of water is located in or very near the sale
3. Minimum sale size of 5 acres
4. Site located no more than one mile from a road or trail accessible with a two wheel drive vehicle.
5. Sale with unlevel or steep terrain, wetlands, riparian zones, road construction, and other types of buffer zones are preferred (see BMP audit site selection worksheet for more detail).
6. Location related to other sites

The state was divided into 3 regions for teams to select candidate timber sales audit sites. Lead auditors were selected for the Western Upper Peninsula (WUP), Eastern Upper Peninsula (EUP), and the Northern Lower Peninsula (NLP). Audit team members were selected from forest industry and the MI DNR forestry and fisheries divisions (see Appendix E). Lead auditors collectively evaluated the submitted candidate sites and selected 10 for each region based on site characteristics and logistics. The sites with the greatest potential impact to water quality were selected.

Plans were developed to conduct the audits in 3-day time periods. A two-hour training session was held for audit team members to review forms and discuss audit protocols. Participants on the audit teams individually appraised the audit sites and the audit team developed a consensus audit report for each site. The audits were conducted in September and early October of 2011. Time and access constraints prohibited auditing one site in the eastern upper peninsula, resulting in 29 BMP audits being conducted.



Sites were rated on 8 areas of focus (categories) based upon the BMP Manual, including:

- Equipment Operations and Maintenance
- Roads
- Stream Crossings
- Skidding and Skid Trails
- Landings
- Riparian Management Zones
- Wetlands
- Other Considerations such as threatened and endangered (T&E) species, archeological sites, and regeneration.

BMP practices associated with each of these areas of focus were coded according to the following rating system:

- BMP needed, applied correctly
- BMP needed, acceptable variation
- BMP needed, applied incorrectly
- BMP needed, not applied
- BMP not applicable
- Insufficient information to rate

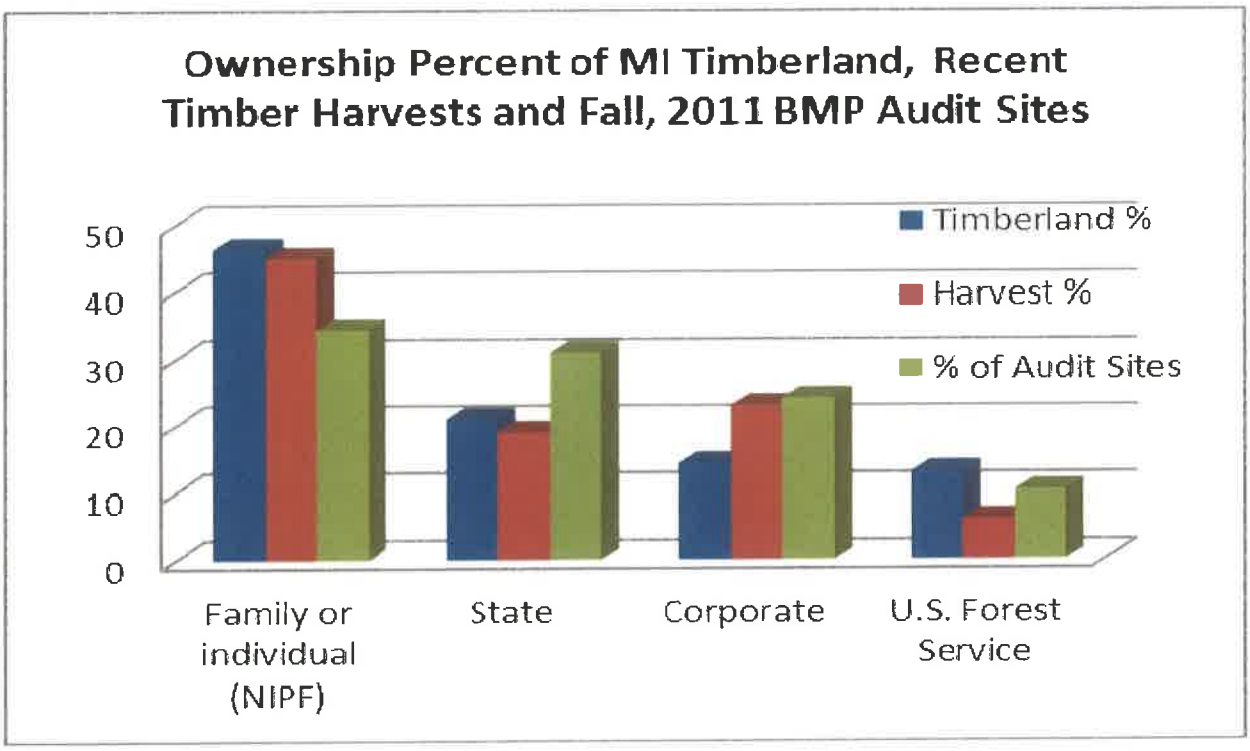
The audit team discussing RMZ management and stream classification along an intermittent stream.

The meanings of most of these codings are straightforward. "Acceptable variation" is where a practice is different than what is presented in the BMP Manual, but the outcome was acceptable and in the spirit of the guidelines.

Four types of ownerships were included in the audit: federal, state, family or individual owners (often referred to as "non-industrial private forests" or "NIPF"), and corporate ownerships. All federal sites were on National Forests while all state sites were on State Forests.

Consideration was given to approximately matching the number of audit sites on each ownership to the proportion of total Michigan timber harvest operations which occurs on that ownership. The primary source of forestry data across ownerships is the USDA Forest Service's Forest Inventory and Analysis (FIA) data. Because using multiple data sets helps to corroborate results and FIA harvest data is not as reliable or precise as timberland data, both rounded 2010 timberland and 2004-2010 timber harvest data were contrasted here. (Part of the reliability issue is that timberland data is a "condition" variable whereas timber harvest data is a "change" variable, measuring differences over two time periods.) For NIPF and State ownerships, the share of timber harvest operations is quite close to their percent of Michigan timberland. Corporate ownership has a higher percent of harvest operations than timberland and the US Forest Service has a lower harvest percent than timberland. Figure 1 displays each ownership's percent of total timberland, harvests, and audit sites.

Figure 1. Ownership Percent of Michigan Timberland, Recent Timber Harvests, and Fall 2011 BMP Audit Sites



Overall, the number of sites audited by ownership was in line with the order and magnitudes of timber harvests by ownership. Although it had the most audit sites, the number of sites for the NIPF ownership was below its proportional share of both timberland and timber harvests while the number of State sites audited was proportionally higher. Past Michigan BMP audits and audits in other states indicate NIPF audit participation is typically more difficult to achieve than the other three ownerships. Several reasons for this exist and have been cited, including the dispersed nature of the NIPF ownership, communications between the other three ownerships, especially with regards to preparation for a BMP audit, relatively new heightened sustainable forest management concerns by the other three ownerships, and NIPF regulatory or enforcement concerns.

Following the audits, each audit participant was mailed a copy of their individual site results along with a thank you letter.

RESULTS

Introduction

Several different estimates can be generated from the audit results. Because of the limited size of the audits, the primary focus here is on statewide results. These will be reviewed in terms of statewide summary statistics, performance by broad BMP category, highest and lowest performance items, and information from supplemental questions. Strengths and opportunities will also be examined.

Additional observations and comparisons of the results will be made across Michigan regions and ownerships, to past Michigan audits, and to audit results from other states.

Statewide Results

Table 1 presents the summary statewide results from the twenty-nine sites audited. Overall, 835 of the 902 BMPs (92.6%) assessed as needed were rated as being applied correctly. An additional 55 audited BMP circumstances were deemed to be acceptable variations. Combining these 55 acceptable variations with the 835 BMPs applied correctly leaves only 12 BMPs or just over 1% applied incorrectly or not applied when needed. Only 2 cases of "needed and not applied" were coded out of 902 cases (.2%) where it was assessed that a BMP was needed (see Table 1).

Table 1. Fall 2011 BMP Summary Results (all ownerships)

	# of obser-vations	% of BMPs Needed
BMPs applied correctly	835	92.6%
BMP acceptable variations	55	6.1%
BMPs applied incorrectly	10	1.1%
BMPs needed & not applied	2	0.2%
Sum of BMP applications needed	902	100%
BMP applications not needed	979	
Insufficient information	62	
Total BMP Applications Assessed	1943	

A common coding used in the BMP audits was "BMP applications not needed." As Table 1 indicates, a slight majority of possible BMP applications were assessed to be not needed (979 of 1943, where 1943 equals the maximum coded values for 29 sites and 67 BMP specifications). A majority of BMP specifications typically do not apply to individual audit sites as standards are developed to apply to the full range of possibilities which may be encountered in the field but often are not. As an illustration of this, a recent Wisconsin audit report (Shy and Wagner, 2007) states the condition

"BMP not applicable to the site" applied more than 70% of the time to the sites audited in 2006. The percent of "not applicable" BMPs was of a similar magnitude in previous Michigan audits. In this regard, the large percent of "not applicable" BMPs is not an issue as long as the sample size is adequate. And even where the sample size is somewhat limited, as with the Fall, 2011 audits, a pervasive lack of applicability may indicate that it is not a statewide problem. This issue will be returned to below with respect to sample size issues and with more specific 2011 audit result examples.

"Insufficient information" was a coding used in those circumstances where a definitive rating otherwise could not be given by the audit team. The 62 times it was used represents 3.2% of the total and does not appreciably affect the overall results.

A high level of BMP performance was also reflected in the auditors' qualitative findings for the supplemental questions. Four questions addressing the BMP performance on the audit sites required simple 1-word responses (see the "Supplemental Questions" at the end of Appendix B). Two sites were assessed to have slight water quality impacts, but all 29 sites were deemed to meet or exceed expectations with regards to a site overall rating considering application of BMPs with impact to water quality. With one site exception, there were affirmative assessments to the questions: "Did they implement all appropriate BMPs to control erosion (a system of BMPs)?" and "Did the system of BMPs control erosion and sedimentation?"

Besides foresters, fishery and environmental quality professionals also see and appreciate that forestry BMP performance in Michigan has improved over the past ten or twenty years and that poor practices are not common:

"*I have seen that forest management practices are generally sound in this state dating back the full 10 years of my observations. Especially true is the fact that they have nearly always been very conscientious of aquatic surroundings.*" – Tim Cwalinski, DNR Fisheries Division

"*My take is that ... foresters have embraced the BMP manual and new techniques as standard operating procedures in the field. Requiring SFI training of loggers and good management practices by the buyers of lumber (Home Depot, Lowes) have really helped on the ground (my personal opinion). I have not run into a really bad cut on state land in a number of years.*" – William Taft, DEQ Water Resources Division

Four supplemental questions called for more elaborate auditor responses. They were:

1. What things went right on this site?
2. What things went wrong on this site?
3. Have other activities occurred on this site that potentially impact water quality? (ie ATV use, hunting traffic, grazing, etc.)
4. Are there mitigating activities that should take place on this site or is there corrective action already being taken?

Responses to the above questions are included in Appendix G. There was a wide variety of very positive observations, outnumbering the negative concerns raised. There was no single, pervasive concern reported. The most frequent concerns cited related to rutting and culverts; these applied to a handful of sites. Seeding and/or successful regeneration was also cited in a few instances along with water diversion, water bars, and soil stabilization.

Audit ratings for all eight BMP categories at the statewide level exceeded 85% for those situations needing BMPs applied. (For a detailed listing of the BMP specifications for each of these categories, see Appendix B: Field Worksheet.) Only two categories, Stream Crossings and Skidding and Skid Trails, had overall compliance averages below 90% (Roads was close at 90.8%). These two categories also had the highest shares of "acceptable variation," (14.5% and 12% respectively), but few or no "applied incorrectly" nor needed but "not applied" ratings. Three categories had over 95% compliance: Equipment Operation and Maintenance, Landings, and Other considerations. Only the Roads category had more than 2% of its total ratings in "applied incorrectly" and "not applied" codes combined (see Table 2).

Table 2. Fall 2011 BMP Results by Category

	---------- BMP Needed ----------				
Category	applied correctly	acceptable variation	applied incorrectly	not applied	Total of BMP Needed
1 Equipment Operation and Maintenance	96.3%	1.9%	1.9%	0.0%	100.0%
2 Roads	90.8%	5.9%	2.7%	0.9%	100.0%
3 Stream Crossings (permanent & temporary)	85.5%	14.5%	0.0%	0.0%	100.0%
4 Skidding & Skid Trails	86.7%	12.0%	1.2%	0.0%	100.0%
5 Landings	99.3%	0.7%	0.0%	0.0%	100.0%
6 Riparian Management Zones	93.5%	6.0%	0.4%	0.0%	100.0%
7 Wetlands	91.1%	7.1%	1.8%	0.0%	100.0%
8 Other Considerations	100.0%	0.0%	0.0%	0.0%	100.0%
Overall	92.6%	6.1%	1.1%	0.2%	100.0%

Table 3 indicates that, at the statewide category level, there were an adequate number of observations of BMPs to support the results presented in Table 2. The percent averages in Table 3 are based upon different numbers of BMP specifications and observations for each category. The "Other Consideration" category has the fewest associated BMP specifications and observations of times when a BMP was needed, but there were over thirty "BMP Needed" observations for it at the statewide level. (In contrast, for only 29 sites, the small number of observations becomes a problem statistically for these categories at the regional or ownership level (as well as for individual BMP specifications within the categories).)

Table 3. Count of 2011 BMP Needed Observations and Total Possible Ratings by Category

Category	# of Times BMP Needed	Total Possible Ratings	% BMP Needed of Total
1 Equipment Operation and Maintenance	54	87	62.1%
2 Roads	219	551	39.7%
3 Stream Crossings (permanent & temporary)	76	261	29.1%
4 Skidding & Skid Trails	83	232	35.8%
5 Landings	135	174	77.6%
6 Riparian Management Zones	248	406	61.1%
7 Wetlands	56	145	38.6%
8 Other Considerations	31	87	35.6%
Overall	902	1943	46.4%

Auditors discuss perched culvert placed over bedrock.

Ratings for the 67 individual specifications can be evaluated in a number of ways. Future educational and monitoring efforts may be helped by noting which of the 67 BMPs had the highest and lowest percent compliance. The number of times which the individual 67 specifications were coded as "BMP needed" provides context as well. Table 4 shows the BMP specifications having the highest number of sites with the BMP rated as being applied correctly or with an acceptable variation.

Table 4. BMP Specifications with more than 22 "Applied Correctly and/or "Acceptable Variation" Codings

BMP Specification (Field worksheet category and question, page number in parentheses links spec. to BMP Manual)	Category # & Specification	Applied Correctly	Acceptable variation
RMZs: Buffer strip clearly established. (pg 20)	6a	20	3
Skidding and Trails: Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)	4f	22	5
Landings: Erosion control features functional, no movement of soil from the landing area. (pg 64)	5e	23	0
RMZs: Located roads, landings &skid trails outside strip where possible. (pg 21)	6g	23	0
RMZs: Leave late successional trees in RMZ	6n	23	0
RMZs: No logging slash/debris disposed from outside of strip into strip. (pg 21)	6d	24	0
Landings: Located outside RMZ. (pg 65)	5a	24	1
Landings: Provide for adequate drainage. (pg 65)	5b	25	0
Equipment Operation and Maintenance: Provided for adequate storage and disposal of fuel, debris, lubricants, fluids and rinsate from equipment cleanup. (pg 14)	1b	26	0
Roads: Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)	2l	26	0
Landings: Re-vegetated/stabilized/leveled as needed	5f	28	0

Table 5 shows 10 BMP Specifications where there were only three or fewer sites applied correctly or having acceptable variations. The problem with the audit results for the specifications in Table 5 is not that they were applied wrong or incorrectly, it is that there are so few sites from which to draw conclusions. The number of sites where the BMP was deemed not applicable or there was insufficient information is also shown in the table. Only the last two specifications (2d and 2o) had one site where the BMP was applied incorrectly (and only three specifications -- 4g, 4b, and6j -- had single sites with insufficient information codings). Specifications with the greatest number of "BMP not applicable" or "Insufficient information" codings should be evaluated before the next audit to determine if the specification's wording may be modified for it to be relevant or needed.

Table 5. BMP Specifications with 3 or less "Applied Correctly or "Acceptable Variation" Codings

BMP Specification (Field worksheet category and question, BMP Manual link to spec. in parentheses)	Category # & Specification	Applied Correctly	Acceptable variation	Not Applicable or Insufficient Information
Skidding and Trails: Stream crossing permit obtained if skidding across stream. (pg 67)	4g	0	0	29
Skidding and Trails: Zigzag pattern – break grade to avoid long slopes. (pg 67)	4e	1	0	28
Skidding and Trails: Water bars properly installed as needed. (pg 40)	4b	2	1	27
Roads: Soil erosion & Sedimentation permit obtained for earth changes outside the sale area when 1 acre or more in size or if within 500 feet of stream. (pg 93)	2m	2	0	27
Stream Crossings: Temporary water crossings satisfactorily removed at termination of harvest activity. (pg 52 & 54)	3i	2	1	26
Wetlands Permit obtained for culverts, bridges, or construction in floodplains > 2 sq miles. (pg 10)	7b	2	0	27
Other Considerations: Site preparation and reforestation practices minimize soil disturbance, follow land contours, recognize RMZs, and avoid soil erosion. (pg 78-82)	8c	2	0	27
RMZs: State Natural River Plan or Wild and Scenic River Plan followed and permit obtained. (pgs 26-28)	6j	3	0	26
Roads: Broad base dips installed properly. (pg 45-47)	2d	3	0	25
Roads: Water bars properly spaced and installed where slope of road requires and where temporary cross drainage culverts were removed. (pg 40-44)	2o	3	0	25

Table 6 shows the four specifications that had more than one site with an "Insufficient information" coding. The four specifications were in the categories "Other Considerations" (8a and 8b) or "Equipment and Operations" (1b and 1c). Under the current audit process, these specifications are not easily auditable in many cases. Other states have required proof of checking available state databases for protecting archeological resources and rare, threatened and endangered species. This provides auditable information for these specifications. Insufficient information on spills may be related to both the specification wording and ambiguity in the BMP Manual about a cleanup and a DEQ reporting threshold.

Table 6. BMP Specifications with 3 or more "Insufficient information" Codings

BMP Specification (Field worksheet category and question, BMP Manual link to spec. in parentheses)	Category # & Specification	# of Sites Coded "Insufficient information"
Other Considerations: Archeological sites are protected if known to be present. (pg 11)	**8a**	14
Other Considerations: Rare, threatened, and endangered species are protected if present. (pg 12)	**8b**	13
Equipment Operation and Maintenance: Spills are cleaned up. If DEQ reporting threshold is met, then spill was reported. (pg 14 &15)	**1c**	9
Equipment Operation and Maintenance: Provided for adequate storage and disposal of fuel, debris, lubricants, fluids and rinsate from equipment cleanup. (pg 14)	**1b**	3

Table 7 shows those specifications where the "acceptable variation" coding was applied three or more times. This is a code which is not commonly used by other states nor was it used previously in Michigan. In review of the data, there were also indications that it may have been applied inconsistently between regions and site comments did not appear to be in line with the coding in a few cases. The issue of "acceptable variation" codings will be returned to later under the heading "Primary Issues for Future Audits," but here it is noted that particular attention should be paid to two specifications relating to rutting and RMZ width where the coding was applied to more than three sites.

Table 7. BMP Specifications with 3 or more "Acceptable Variation" Codings

BMP Specification (Field worksheet category and question, BMP Manual link to spec. in parentheses)	Category # & Specification	Applied Correctly	Acceptable variation
Stream Crossings: Sediment not being discharged into stream. (pg 63)	3h	9	3
Roads: Erodible soils stabilized by seeding, natural vegetation or brush. (pg 40)	2q	12	3
Wetlands: Excessive rutting avoided: > 6 inches deep and 25 feet long. (pg 64)	7d	18	3
Skidding and Trails: Gullies, seeps and other permanently wet areas avoided where feasible. (pg 68)	4d	19	3
RMZs: Buffer strip clearly established. (pg 20)	6a	20	3
Skidding and Trails: Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)	4f	22	5
RMZs: Minimum width >=100 ft. (pgs 20, 22-23) Is there a designated trout stream less than 50 feet in width and appropriate widening of the RMZ? (pg 24 & 25)	6b	15	8

The audit team discussing use of timber mats to cross a seasonally wet area.

Few instances of noncompliance were found. Ratings of "Applied Incorrectly" or "Not Applied" were found for only 11 specifications out of the 67 and only one of these ("Drain surface water into filter strip or vegetative draw") had two instances of such ratings (see Table 8).

Table 8. BMP Specifications Receiving "Applied Incorrectly" or "Not Applied" Codings

BMP Specification (Field worksheet category and question, BMP Manual link to spec. in parentheses)	Category # & Specification	# of sites applied incorrectly	# of sites not applied
Roads: Broad base dips installed properly. (pg 45-47)	**2d**	0	1
Roads: Water bars properly spaced and installed where slope of road requires & where temporary cross drainage culverts were removed. (pg 40-44)	**2o**	0	1
Equipment Operation and Maintenance: Located equipment adequate storage and maintenance sites outside buffer areas.	**1a**	1	0
Roads: Roads follow contour with grades between 2% and 10%. Grades exceeding 10% do not exceed 300' in distance. (pg 32)	**2b**	1	0
Roads: Water diversion ditches installed properly. (pg 40-48)	**2e**	1	0
Roads: Drain surface water into filter strip or vegetative draw. (pg 47-49)	**2g**	2	0
Roads: Obstacles: avoid gullies, seeps, springs, wetlands, and poor drainage areas where possible. (pg 31)	**2i**	1	0
Roads: Roads out sloped where gradient permits. Where in-sloped (gradients >15%), adequate cross drainage is provided to protect water quality. (figure 4, pg 36)	**2j**	1	0
Skidding and Trails: Rehabilitate skid trails as needed. (pg 68)	**4h**	1	0
RMZs: Buffer strip clearly established. (pg 20)	**6a**	1	0
Wetlands: Wetland crossings include placement of culverts and other structures to ensure adequate water flow and drainage. (pg 70-74)	**7e**	1	0
Total		10	2

Other Observations & Comparisons

Differences by Michigan Region

There are significant vegetative, topographic, social and economic differences across the three northern Michigan regions (northern lower peninsula (NLP), eastern peninsula (EUP), and western peninsula (WUP)). For example, relatively speaking, the WUP has more topographical issues, the EUP has more lowland forests, and the NLP has more people and non-timber forest activities (e.g. second homes, recreation and oil and gas development). There were also differences in the regional BMP audit teams, although some auditors did work on multiple audits and multiple disciplines were represented on all audit teams. Given these regional differences, one might expect that there would be differences between regional audit results.

However, overall, the audit results were similar across the regions. Combining the percent of "acceptable variation" coding with the percent coded "applied correctly" results in very close values across regions. Two differences do stand out; certain estimates in Table 9 are highlighted to draw attention to these differences. One difference is that the coding "acceptable variation" was applied more in the WUP than the other two regions. It is also the case that the WUP had more BMPs needed proportionally than the other two regions; the corollary to this is that it also had a much lower percent of "not applicable" BMPs. The EUP's 64.5% BMP "not applicable" is in sharp contrast to the WUP's 39%. This might explain more "acceptable variation" coding in the WUP; more BMPs required may contribute to more variation in implementation. Perhaps there is more opportunity for BMP runoff issues from WUP slopes than rutting in EUP lowland forests because of the WUP's greater topographical issues and relatively fewer harvests in EUP lowlands. Future audits will lend clarity to this issue, but clearly there is more BMP implementation required in the WUP.

Table 9. BMP Coding Regional Averages

	NLP	EUP	WUP	Statewide
% of BMP Needed Sum:				
applied correctly	95.9%	95.2%	89.5%	93.0%
acceptable variation	4.4%	2.7%	9.2%	6.1%
applied incorrectly	0.0%	2.7%	1.3%	1.1%
not applied	0.0%	0.0%	0.5%	0.2%
% of Total Coding Sum:				
applied correctly	45.8%	29.4%	52.4%	43.0%
acceptable variation	2.1%	0.8%	5.4%	2.8%
applied incorrectly	0.0%	0.8%	0.7%	0.5%
not applied	0.0%	0.0%	0.3%	0.1%
Not Applicable	49.1%	64.5%	39.0%	50.4%
Insufficient Info	3.0%	4.5%	2.2%	3.2%
Needed Sum	47.8%	30.8%	58.5%	46.2%
Total Sum	100.0%	100.0%	100.0%	100%

Differences by Ownership Category

Four major ownerships participated in the BMP audit, but one of these, the US Forest Service only had three audit sites. One of the three USFS sites had the poorest audit results and was a clear outlier from the other twenty-eight sites audited. However, although its percent of the audit sites exceeds the percent of Michigan timber harvests from Forest Service lands, extrapolations from just three sites would not be appropriate so USFS audit results are not further summarized here.

BMP performance for audit sites of the other three ownerships is shown in Table 10. The differences in the results across these ownerships are negligible and the results may be viewed as equivalent. The issue of how random and representative the sites are will be returned to later in this report as an issue for future audits. If the sites were drawn as a perfectly random sample, the overall rates of compliance shown in Table 10 would not be significantly different in a statistical sense due to their similarity in size and the small number of sites audited. It should be noted that the Corporate ownership is weighted towards sites in the WUP which, as the previous section indicated, had the highest percentage of sites needing BMPs. In fact, the Corporate ownership has a higher percentage of cases where BMPs were deemed needed (over 54% compared to the State's 45% and the NIPF 46% rate). If more BMPs needed were associated with more BMPs applied incorrectly or not applied, one would expect slightly lower corporate compliance, but that was not found in the Fall 2011 audit.

Table 10. BMP Codings by Ownership

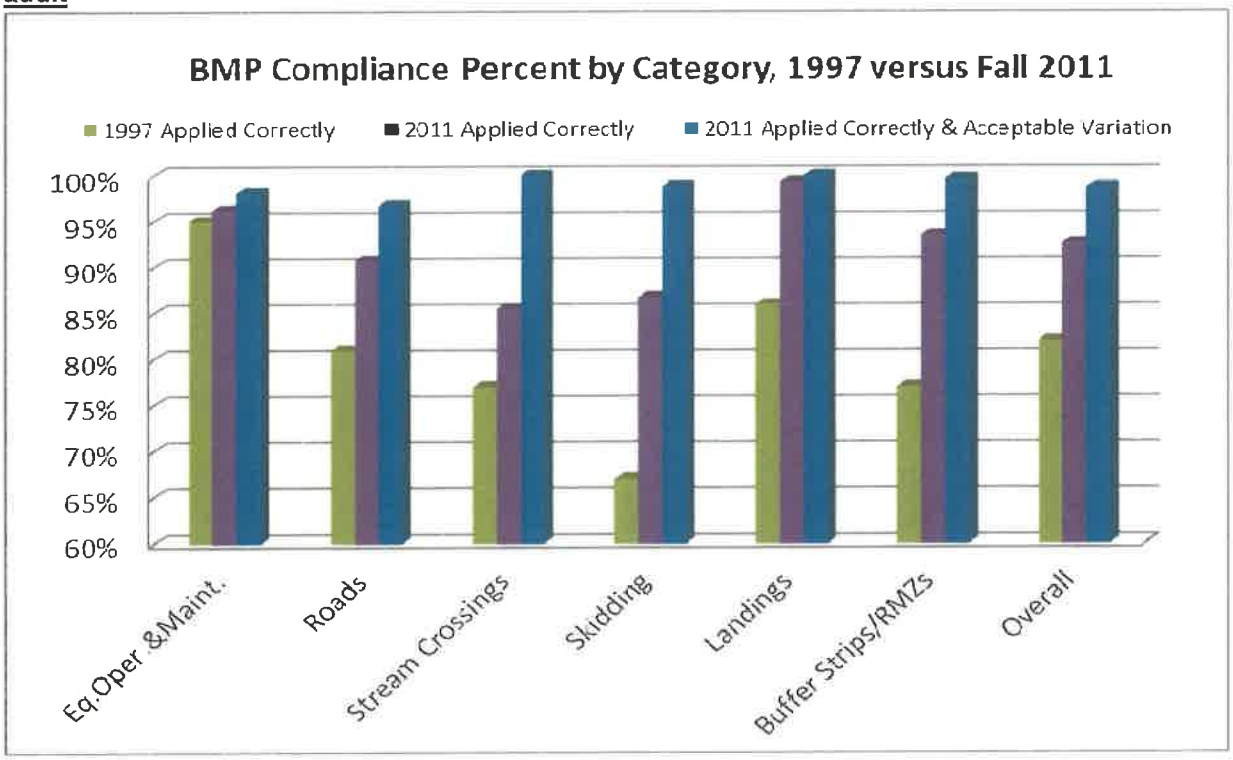
Ownership:	Corporate	State	NIPF
# of Audit Sites:	7	9	10
% of Needed Sum:			
applied correctly	92.9%	94.1%	92.9%
acceptable variation	5.5%	5.5%	6.8%
applied incorrectly	1.6%	0.4%	0.3%
not applied	0.0%	0.0%	0.0%
% of Total Sum:			
applied correctly	50.3%	42.6%	43.1%
acceptable variation	3.0%	2.5%	3.1%
applied incorrectly	0.9%	0.2%	0.1%
not applied	0.0%	0.0%	0.0%
Not Applicable	42.4%	52.6%	50.9%
Insufficient Info	3.4%	2.2%	2.7%
blank/unusable	0.0%	0.0%	0.0%
Needed Sum	54.2%	45.3%	46.4%
Total Sum	100.0%	100.0%	100.0%

Comparison with past Michigan audits

Comparisons across forestry BMP audits may be questionable because of possible differences between audits, even within the same state. These differences may include weather conditions, number and types of sites visited, auditing participants, auditing codes, and BMP applications audited. Many of these differences apply to a comparison of Michigan's Fall 2011 audit results to those from 1996 and 1997.[1] However, the Fall 2011 audit process - including the forms, questions and BMP specifications - was largely based upon and quite similar to the earlier Michigan audits.

The 1996 report indicates there was an overall compliance rate of 75% for the 60 sites included in the 1996 audit. The 1997 report indicates the average compliance was 82% for the 54 sites audited that year. In descending order, they found the Equipment Operation and Maintenance category had the highest rate of compliance at 95%, Landings and Roads categories both were 81%, Water Crossings and Buffer Strips both were 77%, and Skidding had the lowest rating at 67%. Figure 2 shows a comparison between the 1997 BMP Category results to Fall 2011 category results. Fall 2011 results are shown both with "applied correctly" results only and these combined with the "acceptable variation" results. Although some different specifications and categories are used in 2011, there appears to have been improvement across the board, with the exception that Equipment Operations and Maintenance was similar because it was rated quite high in 1997.

Figure 2. BMP Compliance Percent by Category, 1997 audit versus Fall 2011 audit



[1] In addition to the 1996 and 1997 audits, the DNR carried out an audit on its own lands in 2000 and many individual large wood product companies in Michigan for several years have maintained their own audits on logging operations which supply their mills.

An important dimension of the 1996 and 1997 audits was the emphasis that the audit results could not be extrapolated to all timber harvest activities in the state nor to different ownerships. The Executive Summary of the 1997 report noted in this regard:

- "The methods and sources used to create the site pool from which the audited sites were selected have serious limitations in terms of accurately representing what was occurring in Michigan with regards to forest landowners and water quality."
- "The information and data presented in this report are **not statistically significant** and **cannot be interpreted** as a valid representation of what is actually happening on the ground." *(bolding in original text)*

Despite these caveats, the report concluded that the data could be used for general and relative comparisons. However, the primary strength of the audit process was said to be that it provided a positive and productive approach which generated good information for future educational efforts and an excellent opportunity for positive interaction between professionals with varying backgrounds.

Comparison with Other States' BMP Audits

Wisconsin and Minnesota have similar forests to Michigan. Combined, the three states are often referred to as the "Lake States." While the three states take some significantly different approaches to BMPs, it would be expected that they also share some similarities because often the same companies operate across state lines, they share similar climate, topography, and vegetation. Another important factor is that forest management across the three states has been engaged in forest certification efforts for about the past 15 years.

Overall, BMP compliance was estimated at 83% in Wisconsin for the 1995 through 2003 period (see Shy, 2007). The most recently published annual BMP Monitoring report (Shy and Wagner, 2007) shows improvement. The report covered just federal and industrial sites for 2006. It stated for federal timber sales, "BMPs were applied correctly where needed 95% of the time" and industrial timber sales had a very similar estimate of 94%. This appears similar to improved 2011 audit results found in Michigan.

The most recent Minnesota report (Dahlman, 2010) does not provide an overall compliance rate, but states "Overall implementation of the guidelines was similar to previous reports." Minnesota's audits also are broader than Michigan's, monitoring more forest management practices. For example, Michigan audits a category of "other considerations," including cultural resources and Threatened and Endangered (T&E) species, but in addition to these, Minnesota monitors coarse woody debris and visual quality.

Other highlights from Wisconsin and Minnesota BMP reports include the following:

- •Both Wisconsin and Minnesota have been engaged in annual or semi-annual BMP audits for over a decade with significant annual budgets.
- •The sample size of the Wisconsin and Minnesota annual audits have tended to be double or triple the 29 sites in the Michigan 2011 audit.
- •Both have overcome the issue of randomness or representativeness of the audit sites, but through different means. Minnesota employs an impressive, but relatively expensive remote sensing and aerial photo assessment of where disturbances occur while Wisconsin relies upon timber harvest databases developed for other programs.

See the references for more detail on the BMP programs in Minnesota and Wisconsin.

Primary Issues for Future Audits

The following strengths and weaknesses of the Fall 2011 audits were captured in the October 21, 2011 minutes of the BMP Subcommittee (see Appendix F):

Strengths:

- •protecting anonymity of auditees for summary reporting;
- •balance and experience of audit teams;
- •DNR Fisheries participation;
- •forester representative to guide to site and answer questions.

Opportunities:

- DEQ participation on future audit teams;
- site maps in advance of audit (aid in site selection);
- additional categories on site selection spreadsheet (soil type, designated trout stream, other);
- GPS coordinates;
- additional NIPF sites (gatewood/open market-Master Logger and Timber Producers as possible source?);
- USFS participation;
- further review and improvements to the field worksheet and rating guide (add road inspection program to worksheet).

The following items may be added to these:

- Consider documentation of checking for protecting archeological resources and rare, threatened and endangered species. This provides auditable information.

- Pursue having a landowner forestry representative available during all site visits.

- The lack of a random sample of sites was a major concern for earlier Michigan audits and this concern continues to apply to the 2011 audit. For extrapolations to harvest operations beyond those audited, the sites must be from a random, representative sample. Close to 150 sites were submitted for consideration. This pool of sites that the audit team leaders selected from were not randomly selected, therefore it is uncertain as to whether sites are truly representative. It is noteworthy that the site selection criteria included a preference for timber sales "with unlevel or steep terrain, wetlands, riparian zones, road construction, and other types of buffer zones." The intent was to select sites where application of BMPs was needed more than average; in essence, to bias the audit towards more difficult-to-achieve BMP compliance sites than typical timber harvest operations.

- The sample size (number of audit sites) and frequency of audits must be assessed in order to ensure Michigan maintains a credible BMP program. While there are many general statistical guides available, two BMP-related references for this issue are "The Statistical Guide for BMP Implementation Monitoring" (Southern Group of State Foresters' Water Resource Committee, 2008) and Minnesota's "Site-Level Monitoring Program Review" (Turner, 2008).

  To ensure reasonable margins of error for statistical extrapolations and evaluations of trends, a minimum number of sites should be sought for items or groupings within categories of interest (i.e. each major ownership class, region, or BMP specification). Having 30 sites as a minimum for each item or grouping would achieve this and result in the total number of audit sites likely being in a range of 75 to 100 or more. But further review of this issue and what is possible and a priority is necessary. Achieving a sound sample size which permits generating statistics for more than just statewide estimates is likely to be more important than having frequent audits. Ownership and regional differences are of interest to people and enable better targeting of educational and training efforts.

- Wisconsin has adopted annual audits but with rotating ownerships each year. Minnesota reviewed its choices with respect to establishing and maintaining a regular schedule for monitoring and reporting (Turner, 2008). Three alternative scenarios were considered: 1) Go to every two years (annual audits are not necessary if the audits have adequate samples), 2) Go to either a subset of guidelines or a substate region annually (a subset of guidelines may not save as

much as concentrating audits in a substate region – ed.), and 3) Do field monitoring for two years then report generation in a third year. As of early 2012, Minnesota is planning on audits every other year, but future budgets could impact those plans. As indicated previously, Wisconsin has adopted a variant of Minnesota's alternative scenario #2, rotating ownerships by year.

- Continue pursuing means to leverage the investment and information individual SIC members have in their own firm's internal BMP monitoring. This could involve working with logging interests to reduce redundancies. Although such monitoring may vary by firm and be a part of company policy established outside of the State of Michigan, the possibility of efficiencies and strengthening of monitoring results makes this worth ongoing consideration.

- To help the auditing be consistently and objectively achieved, auditor training should be expanded to assure uniform assessment of BMPs and the individual specifications should be reviewed to make as many of the BMP specifications clearly auditable and operational. At the same time, consideration should be given to maintaining continuity so that data can be compared across years.

- It was unclear whether the "acceptable variation" coding was consistently applied. There were cases where auditor comments seemed to indicate that practices may not have been in full conformance with the BMP manual, yet they received an "acceptable variation." Reasons to use this qualified coding include that there is a tremendous amount of variation in field conditions and all possibilities cannot be captured in a brief BMP Manual. However, the coding is not used by other BMP audits and its use should be revisited to ensure it is consistently applied.

Summary and Conclusions

The Fall 2011 Michigan BMP Audits recorded very high performance across all BMP specifications, regions, and ownerships. The impressive results reflect over a decade of effective education, training, and ongoing field attention to maintain or improve soil and water quality practices in Michigan's timber harvesting activities.

The results were anticipated to show where future educational efforts should be targeted, but it is difficult to differentiate where existing efforts or practices need shoring up due to the very high compliance ratings. Training and educational efforts could be aimed at the BMP category which had the highest number of non-conformances with the BMP Manual. However, all eight BMP categories had their overall implementation rated as applied correctly or acceptable variation above ninety-six percent. The Roads category had the largest number of specifications (seven) with non-conformance ratings, but the Roads category also has the largest number of BMP audit specifications and thereby simply mathematically more potential for specifications with a stray instance of non-conformance.

One other further step that could be undertaken is to check original field worksheet comments for each audit site to see if there are commonalities that could, in turn, be the focus of future educational efforts. Otherwise, the lesson may be not so much that particular practices need to be focused upon, but rather that the educational, training, and certification standards which are in place are working and need to be continued.

The audit results do indicate two areas of the BMP audit program could benefit from receiving some attention. These have to do with where "acceptable variation" and "insufficient information" codings were more frequently assessed. Stream Crossings and Skiddings and Skid Trail categories had distinctively higher percentages of "acceptable variation" codings. These need to be reviewed to assure consistency and transparency on what is acceptable versus not reflective of the BMP standards. Similarly, the primary concern with "insufficient information" is to review the audit language for means to minimize situations where it is applied.

A major, ongoing concern to address is how to achieve a truly representative, random sample. This is linked to the issue of how frequent and what the size of future audits should be. It needs to be understood that if there is not an assurance that the sample is representative of broader harvest activities, statistics cannot be used to extrapolate information about harvest activities from the sites being audited. Size and frequency of audits remain important for determining maintenance of BMP concerns and high levels of implementation success, but they are not the primary factors in estimating the overall actual levels of BMP performance. If no reasonable means of assuring a random sample can be found, then the applicability of the audit

results to all Michigan timber harvests may be suspect, but the audits themselves would still provide good opportunities for collaboration and valuable information on trends over time.

A great deal of resources and coordination went into planning and implementing the Fall 2011 audit. It was a grass roots effort, initiated to evaluate implementation of Best Management Practices and identify more effective and consistent auditing methodology. This effort has been successful and its results point to a high level of BMP performance among SFI participants. The effort has also provided a sound basis for future audits and the ongoing maintenance of Michigan forestry soil and water quality practices.

References

Dahlman, R. and Rossman, D. 2010. *Timber Harvesting and Forest Management Guidelines on Public and Private Forest Land in Minnesota: Monitoring for Implementation 2009.* Prepared by the Minnesota Department of Natural Resources and submitted to the Minnesota Forest Resources Council. 57pgs.

Hausler, R. 1997. *Michigan Forestry Best Management Practices: Site Audit Program for Water Quality, 1996 Forestry BMP Site Audits Final Report.* Michigan Department of Natural, Forest Management Division. 38 pgs.

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Michigan Department of Natural Resources and Michigan Department of Environmental Quality. 2009. Sustainable Soil and Water Quality Practices on Forest Land. IC4011. 82 pgs.

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Southern Group of State Foresters' Water Resource Committee. 2008. *Implementation of Forestry Best Management Practices, A Southern Region Report.* Southern Group of State Foresters. 41 pgs.

Turner, C. 2008. Site-level Monitoring Program Review: A report to the Minnesota Forest Resources Council, June 2008. Minnesota Department of Natural Resources. Document MP-0608. 21 pgs.

Appendices

A. SIC BMP Audit Proposal
B. Field Worksheet (includes list of BMP audit items and rating guide)
C. Site Selection Spreadsheet
D. List of Michigan SIC Member Companies/Organizations, March, 2012
E. Committee and/or Audit Team Members
F. Committee Observations on Lessons Learned: October 21, 2011 BMP Statewide Audit Subcommittee Conference Call
G. Responses to Audit Field Worksheet Supplemental Questions

Appendix A: SIC BMP Audit Proposal

2011 FOREST SOIL AND WATER QUALITY Audit Proposal (9-16-11)

Overview:

The Michigan SFI SIC will be conducting BMP audits on 30 member sites that will be located in the Northern Lower, Western Upper, and Eastern Upper Peninsulas in the summer of 2011.

Primary Objective:

1. Use BMP monitoring data as a means to target future education efforts and technical assistance.
2. Educate participating landowners about the importance and use of BMPs when conducting timber harvesting activities.
3. Promote voluntary conformance with BMP guidance within the state.
4. Evaluate best management practices of SFI participating members.

Scope of Project:

- 10 sites per region, 30 sites total
  - Each SFI member company will be asked to submit 10 locations, per region, that fit the BMP site selection criteria
- Three audit teams consisting of 3 or 4 persons per teams
  - Two SIC representative on each team
  - One DNR FMD representative on each team
  - One DEQ or DNR Fisheries staff on each team (if approved by DNR/DEQ Management)
  - Invite attendance by:
    - Landowner will be invited to accompany auditors observe audit
    - Other conservation partners will be invited to observe audit
    - Logger will be notified and invited to observe audit
  - Audit Team leaders will be selected by the SIC BMP Subcommittee
- Land ownership types represented:
  1. State forest land
  2. National forest land (dependent on USFS participation)
  3. Non-industrial private lands and
  4. Corporate lands

- Audit Results will be compiled by the SIC BMP Subcommittee and results will be published on the SIC website, Grow Michigan Magazine (published by MFPC), and DNR website.

Timeline:

- March 25 – target date for developing final draft project proposal
- ~~National forest land: Jessica and Howard to follow up and obtain USFS response by April 7~~.
- April 15 - hold SIC conference call to discuss project proposal and obtain endorsement for project.
- May 20- Present final proposal, site selection process and training plan to SIC for approval
- August 15- SIC member companies deadline to submit sites
- August 15- Three groups of BMP auditors identified, training to commence
- Midsummer- Early fall- conduct BMP audits

Site selection:

- The following criteria will be used to select site:
  1. Timber sales harvested (and completed or nearly complete) between May, 2010 and May, 2011
  2. A body of water is located in or very near the sale
  3. Minimum sale size of 5 acres
  4. Site located no more than one mile from a road or trail accessible with a two wheel drive vehicle.
  5. Sale with unlevel or steep terrain, wetlands, riparian zones, road construction, and other types of buffer zones are preferred (see BMP audit site selection worksheet for more detail).
  6. Location related to other sites will be considered
- SFI Participants will be asked to fill out a BMP Audit Site Selection worksheet for each proposed site. Each SFI Participant will provide 10 sites per region of operation, selected per the above selection criteria.
- The SFI SIC BMP workgroup will review submitted Audit Site Selection Spreadsheets and select locations based upon meeting the above criteria, ownership class, and location.
- 10 sites will be chosen in each region, the Western UP, Eastern UP and the Northern Lower Peninsula (30 sites total). Landowner permission must be obtained prior to auditing.

Auditing

- Audits will be conducted in midsummer to early fall 2011
- Three audit teams composed of at least 3 people will evaluate each site using the 2011 Forest Soil and Water Quality Field Worksheet (see audit team composition outlined on page 29).
- Sites will be rated on the severity of non-conformance based on 8 areas of focus derived from the DNR/DEQ Sustainable Soil and Water Quality Practices on Forest Land manual:
  1. Equipment Operations and Maintenance

2. Roads
3. Stream Crossings
4. Skidding and Skid Trails
5. Landings
6. Riparian Management Zones
7. Wetlands
8. Other Considerations such as T&E species, archeological sites, artificial regeneration.

- Each recommended best management practice will be ranked as: A -- BMP NEEDED, APPLIED CORRECTLY, V – BMP NEEDED, ACCEPTABLE VARIATION, 1 – BMP NEEDED, APPLIED INCORRECTLY, 2 – BMP NEEDED, NOT APPLIED, NA – BMP NOT APPLICABLE, 0 - INSUFFICIENT INFORMATION TO RATE.
- The audit report will indicate where strengths and weaknesses exist and where BMP training is needed.
- The SFI program participant is responsible for obtaining appropriate permission to visit selected BMP audit sites. Landowner and possibly logger permission is required.
- Confidentiality:
  - Landowner will be advised of observations
  - Law Violations may be referred to the DEQ or the proper enforcement authority
  - Law violations will be reported to the SFI participating company.
  - Auditor protocol on confidentiality (derived from section 9 of the SFI Program Requirements):
    - All information and documents, including working drafts and reports, shall be considered confidential. SIC members and auditors shall not release any information or documents without the prior permission of the SIC. Auditors shall conduct themselves in a professional and ethical manner.
    - Prior to engaging in an audit, audit team members shall disclose to the SIC and audit team members their relationship to the property to be audited.
- Site selection process – audit teams will select sites with assistance and input from the SIC BMP Subcommittee.

Additional information included with proposal: 2011 Forest Soil and Water Quality Review Field Worksheet and BMP Audit Site Selection Worksheet

Appendix B: Field worksheet (includes list of BMP audit items and rating guide)

2011 FOREST SOIL AND WATER QUALITY REVIEW

FIELD WORKSHEET (FINAL 9-16-11)

DATE SITE REVIEWED: _____

CODE NUMBER: _____

SALE NAME: _____

AUDIT REGION: _____

AUDIT TEAM: _____

_____

OWNERSHIP CLASS:

FEDERAL ☐

STATE ☐

CORPORATE ☐

NIPF ☐

CERTIFIED LANDOWNER:

_____

YES ☐ NO ☐

_____

If yes, what certification system

_____

RATING GUIDE

APPLICATION

A -- BMP NEEDED, APPLIED CORRECTLY
V – BMP NEEDED, ACCEPTABLE VARIATION
1 – BMP NEEDED, APPLIED INCORRECTLY
2 – BMP NEEDED, NOT APPLIED
NA – BMP NOT APPLICABLE
0 - INSUFFICIENT INFORMATION TO RATE

General Direction for Completion and Interpretation of Rating Form:

1. Each auditor should rate each item on the below list. The team will then collaborate to develop a composite score.
2. There is no weighting of factors at this time.
3. Following completion of the composite form, the supplemental questions on the final page should be answered.
4. The proposed rating system reflects the severity of non-conformance.
5. Comparisons between audit sites and between ownerships are difficult because of variability of time, site conditions, the many audited items, audit team membership, and other factors.
6. What the audit report will indicate is where weaknesses exist and where training is needed.

	RECOMMEND BEST MANAGEMENT PRACTICES	APPLIC-ATION RATING	COMMENTS
1	**Equipment Operation and Maintenance**		
1a	Located equipment adequate storage and maintenance sites outside buffer areas.		
1b	Provided for adequate storage and disposal of fuel, debris, lubricants, fluids and rinsate from equipment cleanup. (p 14)		
1c	Spills are cleaned up. If DEQ reporting threshold is met, then spill was reported. (p 14 &15)		
2	**Roads**		
2a	Avoid placing roads in RMZ. (p 31 & 34)		
2b	Roads follow contour with grades between 2% and 10%. Grades exceeding 10% do not exceed 300' in distance.(p 32)		
2c	Crown road on sections crossing level ground or low areas. (p 34)		
2d	Broad base dips installed properly. (p 45-47)		
2e	Water diversion ditches installed properly. (p 40-48)		
2f	Cross drainage culverts properly sized (min 12") and installed. (p 49 & 50)		
2g	Drain surface water into filter strip or vegetative draw. (p 47-49)		
2h	Energy dissipators at cross drainage and/or stream culvert outlets where necessary. (p 35)		
2i	Obstacles: avoid gullies, seeps, springs, wetlands, and poor drainage areas where possible. (p 31)		
2j	Roads out sloped where gradient permits. Where in-sloped (gradients .15%), adequate cross drainage is provided to protect water quality. (figure 4, p 36)		
2k	Road cuts sloped and stabilized to minimize water quality impacts. (p 35)		
2l	Excessive rutting avoided:6 inches deep &25 foot long in RMZ, 12 inches deep&50 feet long in other areas. (p 64-64)		
2m	Soil erosion & Sedimentation permit obtained for earth changes outside the sale area when 1 acre or more in size or if within 500 feet of stream. (p 93)		

	Road Closure and Retirement:		
2n	Temporary cross drainage culverts and stream crossings removed. (p 38)		
2o	Water bars properly spaced and installed where slope of road requires and where temporary cross drainage culverts were removed. (p 40-44)		
2p	Erosion control features functional. (p 40)		
2q	Erodible soils stabilized by seeding , natural vegetation or brush. (pg 40)		
2r	Plantings utilize native seed species where possible, see Appendix E. (p 98-108)		
2s	Properly close and/or sign abandoned or infrequently used roads. (p 39)		
3	**Stream Crossings (permanent & temporary)**		
3a	Stream crossing permit obtained and followed. (p 8)		
3b	Cross streams at right angles. (p 21 & 67)		
3c	Natural stream channel disturbance minimized. (p 54-55)		
3d	Stream bank approaches properly designed. (p 54-55)		
3e	Crossings do not impede fish migration. (p 54 & 59)		
3f	Culverts properly sized and installed. (p 57-58)		
3g	Culverts properly armored if needed. (p 56)		
3h	Sediment not being discharged into stream. (p 63)		
3i	Temporary water crossings satisfactorily removed at termination of harvest activity. (p 52 & 54)		
4	**Skidding & Skid Trails pg 65-68**		
4a	Gradients no steeper than 40%, average slopes no more than 15%. (p 67)		
4b	Water bars properly installed as needed. (p 40)		
4c	Drain surface water into buffer strip or vegetative draw with energy dissipaters as needed. (p 67)		
4d	Gullies, seeps and other permanently wet areas avoided where feasible. (pg 68)		
4e	Zigzag pattern – break grade to avoid long slopes. (p 67)		

4f	Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)		
4g	Stream crossing permit obtained if skidding across stream. (pg 67)		
4h	Rehabilitate skid trails as needed. (p 68)		
5	**Landings**		
5a	Located outside RMZ. (p 65)		
5b	Provide for adequate drainage. (pg 65)		
5c	Proper water diversion devices in working order. (pg 65)		
5d	Drain surface water into buffer strip or vegetation and logging residue does not enter water bodies. (pg 65)		
5e	Erosion control features functional, no movement of soil from the landing area. (pg 64)		
5f	Re-vegetated/stabilized/leveled as needed		
6	**Riparian Management Zones pgs 18-30**		
6a	Buffer strip clearly established. (p 20)		
6b	Minimum width >=100 ft. (pgs 20, 22-23) Is there a designated trout stream less than 50 feet in width and appropriate widening of the RMZ (pg 24 & 25)		
6c	Leave 60-80 BA and less than 10% of soil exposed within strip. (pg 20)		
6d	No logging slash/debris disposed from outside of strip into strip. (p 21)		
6e	Streams, lakes, open-water wetlands free of slash. (p 20 - 21)		
6f	Retained sufficient cover to maintain shading of the stream to avoid increase in stream temp. (p 20)		
6g	Located roads, landings and skid trails outside strip where possible. (p 21)		
6h	Cuts, fills, roads stabilized if present. (pg 21)		
6i	Limbs and tops within RMZ left on ground. (pg 21)		
6j	State Natural River Plan or Wild and Scenic River Plan followed and permit obtained. (pgs 26-28)		
6k	Vernal ponds protected from rutting and buffered. (pg 29)		

6l	Soil compaction and scarification avoided. (pg 21)		
6m	Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)		
6n	Leave late successional trees in RMZ		

7	**Wetlands pgs 69-75**		
7a	Non-forestry construction does not occur with out a Part 303 permit from DEQ. (pg 69)		
7b	Permit obtained for culverts, bridges, or construction in floodplains > 2 sq miles. (pg 10)		
7c	Harvesting is timed for appropriate conditions and operations minimize rutting and compaction damage. (pg 70)		
7d	Excessive rutting avoided: > 6 inches deep and 25 feet long. (pg 64)		
7e	Wetland crossings include placement of culverts and other structures to ensure adequate water flow and drainage. (pg 70-74)		
8	**Other Considerations:**		
8a	Archeological sites are protected if known to be present. (pg 11)		
8b	Rare, threatened, and endangered species are protected if present. (pg 12)		
8c	Site preparation and reforestation practices minimize soil disturbance, follow land contours, recognize RMZs, and avoid soil erosion. (pg 78-82)		

SUPPLEMENTAL QUESTIONS

1. Did they implement all appropriate BMPs to control erosion (a system of BMPs)? Yes/No

2. Did the system of BMPs control erosion & sedimentation? Yes/No

3. What things went right on this site? (Summarize highlights)

4. What things went wrong in this site? (Summarize problems)

5. Have other activities occurred on this site that potentially impact water quality? (ie ATV use, hunting traffic, grazing, etc.) If so, please explain.

6. Are there mitigating activities that should take place on this site or is there corrective action already being taken?

7. Give this site an overall rating considering application of BMPs with impact to water quality (Meets expectations, Exceeds expectations, or Does not meet expectations)

Rate this site from for its overall impact to water quality
severe, moderate, slight, negligible, or no impact _____

Appendix C: Site Selection spreadsheet: *(Close to 150 sites were submitted for consideration.)*

	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
2	**Forest Soil and Water Quality Audit Site Selection Spreadsheet (FINAL DRAFT 5-2-11)**																	
4	Ownership	Certified Landowner Yes or No (If yes, what system)	Legal Description	County	Harvest Completion Date	Harvest Acreage	Written Mgmt. Plan	Drivable Summer Access	Water Body*	Stream Crossing**	RMZ	Wet lands	Terrain	Road Construction	T&E Species	Archeological Sites	Site Prep./ Reforestation	Forest of Exceptional Cons. Value
5	State						(y/n/?)	(y/n/?)	(y/n/?)	(y/n/?)	(y/n/?)	(y/n/?)	steep rolling slight ?	(y/n/?)	(y/n/?)	(y/n/?)	(y/n/?)	(y/n/?)
6	Federal																	
7	NIPF																	
8	Corporate																	
9	Tree Farm																	
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22	* Water body within sale area or adjacent to sale (RMZ present)																	
23	** Stream crossing either within the sale area or on road accessing the sale																	
24																		
25	The following criteria are being used to select site:																	
26	1. Timber sales harvested (and completed or nearly complete) between May, 2010 and May, 2011																	
27	2. A body of water is located in or very near the sale																	
28	3. Minimum sale size of 5 acres																	
29	4. Site located no more than one mile from a road or trail accessible with a two wheel drive vehicle.																	
30	5. Sale with unlevel or steep terrain, wetlands, riparian zones, road construction, and other types of buffer zones are preferred *																	
31	6. Location related to other sites will be considered * (see BMP audit site selection worksheet for more detail).																	

Appendix D: List of Michigan SIC member companies/organizations, April 2012

SIC Program Participants

American Forest Management, Inc.
Atlantic Mine, Michigan 49905

Michigan Department of Natural Resources and Environment
South Marquette, MI 49855

NewPage Corporation
WI Rapids, WI 54495

Packaging Corporation of America
Filer City, MI 49634

Plum Creek Timberlands
L'Anse, MI 49946

SAPPI Fine Paper North America
Bessemer, MI 49911

Timber Products of Michigan
Munising, MI 49862

Verso Paper
Norway, MI 49870

Weyerhaeuser N.R. Company
Grayling, MI 49738

Louisiana-Pacific
Sagola, MI. 49881

Molpus Timberlands Management, LLC.
Houghton, MI 49931

Northwest Hardwoods
Lewiston, MI 49756

SIC Affiliate Members

Forestry Associations

Grossman Forestry Company (Tree Farm Group Administrator)
Newberry, MI 49868

MI Forest Products Council
Lansing MI 48912

Loggers

Suchovsky Logging
Stephenson, MI 49887

Nickels Logging
Norway, MI 49870

Conservation Groups

MUCC
Lansing, MI 48912-3785

The Nature Conservancy
Lansing, MI 48906-4374

Appendix E: Audit Team Members

West U.P.
Howard Lindberg (team leader), Plum Creek Timberlands
Scott Robbins (1 day), Michigan Forest Products Council
Jennifer Burnham, MI DNR, Forest Management Division
George Madison, MI DNR, Fisheries Division
Eric Stier (2 days), American Forest Management, Inc.
DEQ Observers: Lindsey Rinquette and Mitch Koetie (2 sites on 1 day)

East U.P.
Scott Robbins (team co-leader), Michigan Forest Products Council
Dennis Nezich (team co-leader), MI DNR, Forest Management Division
Jennifer Burnham, MI DNR, Forest Management Division
Steve Scott & Cory Kovacs (2 days) or Darren Kramer & Nick Leglar (1 day) MI DNR, Fisheries Division

North L.P.
Jessica Turino (team leader), Weyerhaeuser N.R. Company
Scott Robbins, Michigan Forest Products Council
Pat Potter, MI DNR, Forest Management Division
Neil Godby (2 days) or Tim Cwalinski (1 day), MI DNR, Fisheries Division

Note: team leaders collectively selected audit sites from the pool of sites submitted.

In addition to the above, the DEQ was invited to participate more fully in the audits, but was not able to.

Appendix F: Committee Observations on Lessons Learned: October 21, 2011

BMP Statewide Audit Subcommittee Conference Call

Participants: Lindberg, Turino, Robbins, Nezich, Burnham, Madison, Stier

The intent of the post-audit call was to identify what worked well and where opportunities for improvement exist, as well as to establish a timeline for reporting individual results as well as summary publication.

Strengths: Protecting anonymity of auditees for summary reporting; balance and experience of audit teams; DNR Fisheries participation; forester representative to guide to site and answer questions.

Opportunities: DEQ on future audit teams; site maps in advance of audit (aid in site selection); additional categories on site selection spreadsheet (soil type, designated trout stream, other); GPS coordinates; additional NIPF sites (gatewood/open market-Master Logger and Timber Producers as possible source?); USFS participation; review field worksheet and rating guide (add road inspection program to worksheet).

Nezich staff to type individual audit results; Turino to craft cover letter to accompany individual results; distribute to SIC participants at November 3rd. meeting.

Summary draft report to be completed by 12/31//11; final report to be completed by 4/30/12. Subcommittee will benchmark how other states report findings in November; consider comparing 2011 finding with previous MI results; summary report to be posted on DNR and SIC websites, MFPC periodical.

Audit frequency: 2-3 years as per Objective 10.2

Burnham and Madison have joined the sub-committee.

Next call: week of December 5th

Appendix G: Responses to Audit Field Worksheet Supplemental Questions

3. What things went right on this site? (Summarize highlights)

They had wet soil issues and worked them out to complete the harvest.

YES-flat land, light soils. Moderate slope to wetlands area.

Good RMZ highly visible. Water diversion by bridge; closed bridge gaps to avoid sedimentation.

Eagle's nest protected and still active. Roads vegetated with white clover.

Access road is good with good diversions, left cedar for wildlife, buffer distance meets objectives.

The fact they harvested timber in a ski recreation area is a very positive, didn't cut slope facing marsh.

Roads in good shape. Not much in the way of streams or wetland. Two known vernal pools.

Left an adequate buffer, good road system, access controlled. Low skidding impacts, good silviculture.

Avoided rutting wetlands. Corduroyed access road. Picked the correct time of year. Good measures to block road.

Able to meet landowner goals on a very challenging site, seeded landings.

Excellent use of water bars on roads approaching temporary stream crossing. Identified the RMZ well. Good attempt to block stream crossings to keep ATVs out.

No erosion, no rutting, good time to harvest – did nice job protecting stream corridors.

RMZ's done well, native seed for vegetation, rocked broad base dips, clean rock for armoring 4 ft culvert. Culvert adequately sized. Post logging visits and maintenance, landowner participation on audit.

GPS use by the loggers to locate RMZ and skid roads. Flagging used for RMZ location. Could have crossed intermittent drainage but chose not to.

Excellent job considering terrain. A lot of water barriers. Made a new road to divert bike race traffic and others away from the Bismark. Recognized an archeological site.

Escanaba River and Rocky Creek are well protected.

Large RMZ buffer.

Don and Jason's (sale Admin) knowledge of trout designated streams in the area. Followed permitted crossing. No harvesting within the RMZ.

Timber mats used on ephemeral skid trail. Protection of vernal pools. Good road closure with stumps and natural vegetation.

Good culvert sizing in culvert replacement. Used existing road system. Minimized loadings.

Protect a pristine trout stream and river while accomplishing their management goals and salvage cut.

Timing of cutting was good. Sand Creek was protected while obtaining management goals.

Great bridge replacement project. Protected a vernal pool.

Chose best area to access the cutting units; learned the need to utilize mats on next entry. Met BA goals of RMZ management.

Good crossing on skid trail. Good culvert but not long enough. Met management goal and satisfied a private landowner for access.

Great job of stabilizing roads and landings. Water bars and diversions are outstanding. Buffer was adequate for the intermittent drainage. It would be a good site to do field training and BMP education.

Used a short wood system and good timing to harvest and avoid rutting. Used existing roads.

Excellent, well marked buffer on a blue ribbon trout stream. Using old roads adequate. Left oak regeneration; good.

Met their management goals in the spring. Regen. and all trails look good. Trails seeded.

YES-avoided rutting and left an adequate RMZ.

4.What things went wrong in this site? (Summarize problems)

There was some rutting in wetland areas outside of the RMZ.

The only problem is a skid cut in one short stretch, 70 degrees, need stabilization.

They could have used a longer culvert on the access road on the previous sale.

Some rutting was border line. Dirt at temporary bridge could have been stabilized better.

They should have cut more dead dying and diseased.

One long slope needed water bars to slow down velocity.

ATV trail in lakeshore. Berms crossed by ATVs; No damage currently.

Didn't see anything.

Excessive rutting on skid trails. Removing water bars. We recommend working with landowner to stabilize steep skid trails.

Used pit run, not washed. One water bar could have been placed better. Better contact with equipment operator.

First permitted crossing a bit high but will not create problems for fish.

Perched culvert – did not recess and follow permit – inadequate water diversion at 4ft culvert.

Slight washing on main road – but not impacting water quality – was graded after sale closed.

Some concern about fall operational run off near culvert installation. Culverts placed in July. Some rutting but uncharacteristic.

Nothing.

Nothing.

Auditors all felt something more should have been done to stabilize the area where the culvert was removed and bare soil remains.

Cross drainage culvert incorrectly installed at non-forested wetland. More cross drainage needed on main road. Roads ditched; not adequate diversions.

More fill could have been put onto middle crossing.

None.

Could have been a little more fill on culvert placement to crown it a little more.

Nothing.

Some rutting in the swail. Will be corrected.

Stabilization issues on the road. Buffer strip not sufficient for a few hundred feet.

Deer are digging up the dirt looking for acorns. Deer eating regeneration.

None.

Could have put seeding or more woody material on Unit Z road.

One area rutted. Seed did not take in all areas. No erosion occurring.

5. Have other activities occurred on this site that potentially impact water quality? (ie ATV use, hunting traffic, grazing, etc.) If so, please explain.

None at this time (a variant of "none" or "no" was applied to 16 audit sites).

Used short wood harvest (Ponsee-tracked) they did a good job of painting in the buffer. There is lot of cedar and scattered large white pine for wildlife.

May have ATV damage in the future because of deer hunting activity present.

ATV trail in lakeshore. Berms crossed by ATVs; No damage currently.

Yes; ATV deer hunter is gaining access; problem is being addressed.

Yes; landowner ATV to access hunting blinds.

Some ATVs and hunting traffic.

Not at this time – there are gates at each end – one is usually closed.

Tractor and truck use of roads will necessitate maintenance of cross drainages.

Heavy hunter use – may do something to water in future.

Moved road to accommodate bike race.

Not at this time – but potential from ATV use.

Not happening yet.

Harmigties australiatis will impact water quality. Needs to be treated by commercial herbicide applicator.

6. Are there mitigating activities that should take place on this site or is there corrective action already being taken?

Nothing so far (a variant of "none" or "no" was applied to 16 audit sites).

This is a deer area and regeneration may be depleted and it may have to be planted. If it is planted, furrows should be run with care to not cause erosion and allow easier water flow.

The only problem is a skid cut in one short stretch; 70 degrees; needs stabilization.

None apparent other than skid trail – see #4.

Improve water bars on road slope.

ATV trail in lakeshore. Berms crossed by ATVs. No damage currently.

DNR staff will be contacting Law Enforcement.

Excessive rutting on skid trails. Removing water bars. We recommend working with landowner to stabilize steep skid trails and culverts should be lengthened.

It will be up to the landowner to maintain the road.

Forester is going to check to see if road should be closed in future.

Correct non-forested wetland crossing with seeding.

Use mats next time they reenter this winter.

Yes - seed it/silt fence it.