Monitoring of Forestry BMPs in Michigan

Fall 2011

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What Are BMPs?

Best Management Practices = acceptable practices to protect water quality and promote soil conservation during forestry activities.

- effective and practicable with respect to technological, economic, and institutional considerations in preventing the amount of nonpoint pollution (undesirable runoff that flows across the ground surface).

They can be:

- a structural "thing" that you install on-the-ground: runoff diversions, silt fences, stream buffers or vegetation over bare soil areas.
- part of the "process" that you use to plan, conduct and close-out your forestry operation: pre-harvest planning, laying out roads in advance of construction, and marking stream buffers with paint or flagging.

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, BMPs are defined by the joint MI DNR & MI DEQ publication:

"Sustainable Soil and Water Quality Practices on Forest land"

Commonly known as the "Michigan BMP Manual."

- The current 2009 Manual expanded BMPs to practices that protect soil quality too.
- The BMP manual may be found online through the MI DNR.
- 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.
- Forest certification programs have elevated the awareness and implementation of forestry BMPs over the past decade. The certification programs require that participants meet or exceed the recommended BMPs and that BMP monitoring takes place (e.g. SFI 2010-2014 3rd objective). Hence, the Fall 2011 BMP audit…

The Fall, 2011 BMP Audit Process

Developed by a team of Michigan Sustainable Forestry Initiative®– Implementation Committee (SIC) members.

Candidate audit sites were solicited from SIC member companies and the DNR. Close to 150 sites in total were submitted.

Criteria used for site selection included:

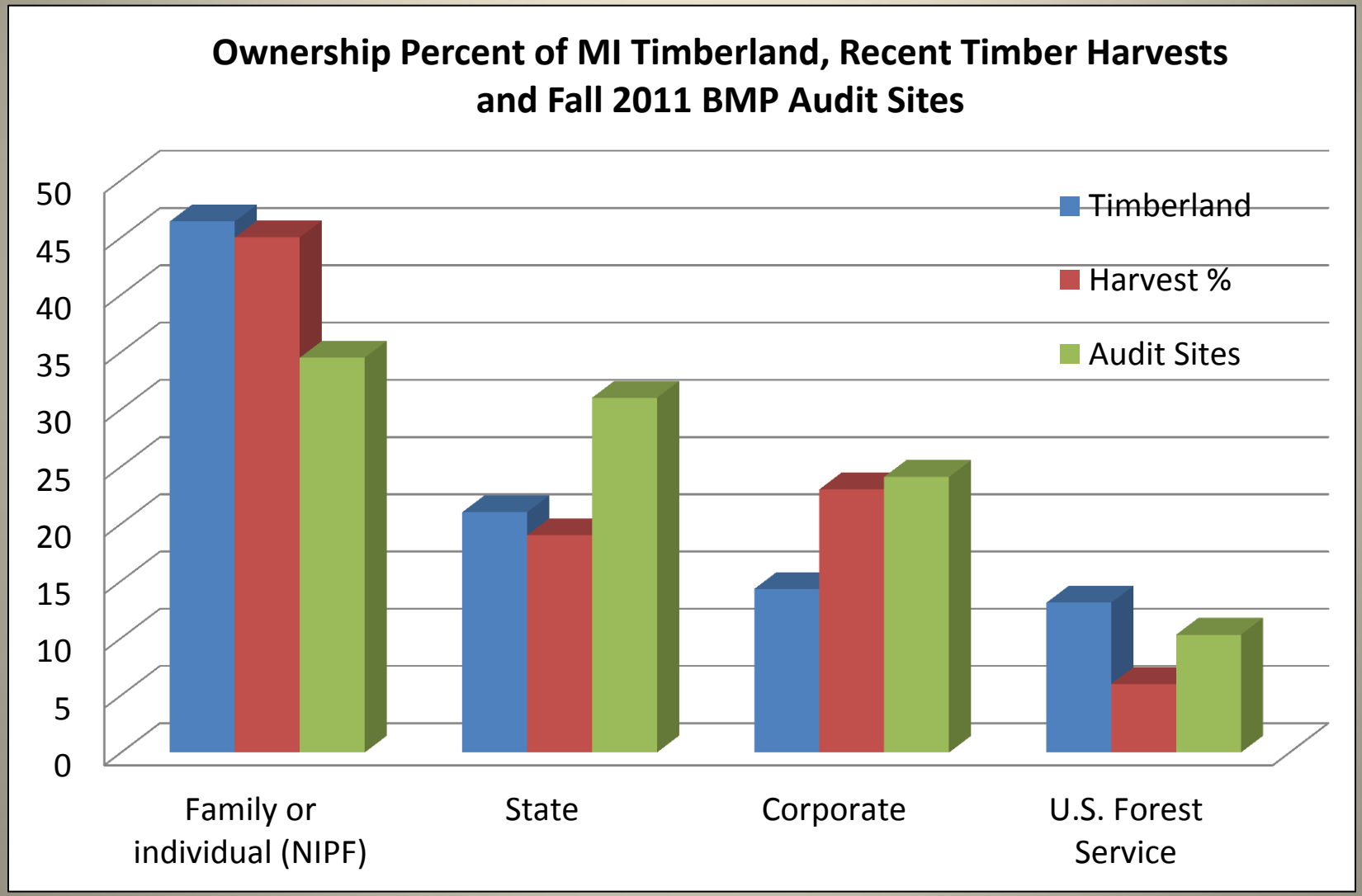
- Timber sales harvested between May, 2010 and May, 2011
- A body of water located in or very near the sale
- Minimum sale size of 5 acres
- Site located ≤ 1 mile from road or trail accessible with a 2-wheel drive vehicle
- Sale with unlevel or steep terrain, wetlands, riparian zones, road construction, and other types of buffer zones were preferred
- Location related to other sites

The Fall, 2011 BMP Audit Process *(cont.'d)*

- State divided into 3 regions (WUP, EUP, NLP)
- 10 sites selected for each region.
- Regional audit team members selected from forest industry and MI DNR forestry and fisheries divisions.
- A Forest and Soil Water Quality Review Field Worksheet was developed using 8 BMP categories and 67 specifications and 7 supplemental questions.
- Audits conducted in 3-day time periods in Sep.- Oct., 2011.
- Time and access constraints prohibited auditing one site in the eastern upper peninsula, resulting in 29 BMP audits being conducted.

The Fall, 2011 BMP Audit Process *(cont.'d)*

Overall, the number of sites audited by ownership was in line with the magnitudes of timberland and timber harvests by ownership.



Truckin’ right along…

Results

- Statewide Results
- Differences by Michigan Region
- Differences by Ownership
- Comparisons with Past Michigan Audits
- Comparisons with Other States' BMP Audits

Statewide Results

- Overall Summary
- Results by broad BMP category
- Ratings for Individual BMP Specifications
- Assessments from Supplemental questions

Statewide Results: Overall Summary

Audit Coding Applied	# 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%
BMP applications needed (sum of above)	902	100%
BMP applications not needed	979	
Insufficient information	62	
Total BMP Applications Assessed	1943	

- 835 of the 902 BMPs (92.6%) assessed as needed were applied correctly.
- An additional 55 audited BMP circumstances were coded acceptable variations.
- Only 12 cases (just over 1%) were applied incorrectly or not applied when needed.
- Of these 12 cases, only 2 (.2%) were not applied out of the total 902 cases where a BMP was deemed needed.

Statewide Results: by Category

- Audit ratings for all eight BMP categories at the statewide level exceeded 85% for those situations needing BMPs applied.
- Only two categories, Stream Crossings and Skidding & Skid Trails had 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.
- There were an adequate number of observations of BMPs to support the results at the statewide category level. 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. (For 29 sites, the small number of observations becomes a major issue only at a substate level for these categories and individual specifications within them.)

Statewide Results: by Category *(cont.'d)*

BMP Category	---------- BMP Needed ----------				
	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 Mgmnt 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%

Statewide Results: by Specification

The Audit Report presents ratings for the 67 individual specifications in a number of ways. One of the more important considerations is where there could be BMP implementation improvement. There were only two cases, both on the same site, where the BMP was needed but not applied at all:

BMP Specification (with Manual reference in parentheses)	# of sites not applied
Broad base dips installed properly. (pg 45-47)	1
Water bars properly spaced and installed where slope of road requires & where temporary cross drainage culverts were removed. (pg 40-44)	1

The nine specifications which had “applied incorrectly” codings are on the next slide. (*There were 10 “applied incorrectly” codings; one specification was applied incorrectly on two different sites.)*

Statewide Results: by Specification *(cont.'d)*

BMP Specification (with Manual reference in parentheses)	# of sites applied incorrectly
Located equipment, adequate storage and maintenance sites outside buffer areas. (pg 21)	1
Roads follow contour with grades between 2% and 10%. Grades exceeding 10% do not exceed 300' in distance. (pg 32)	1
Water diversion ditches installed properly. (pg 40-48)	1
Drain surface water into filter strip or vegetative draw. (pg 47-49)	2
Obstacles: avoid gullies, seeps, springs, wetlands, and poor drainage areas where possible. (pg 31)	1
Roads out sloped where gradient permits. Where in-sloped (gradients >15%), adequate cross drainage is provided to protect water quality. (figure 4, pg 36)	1
Rehabilitate skid trails as needed. (pg 68)	1
Buffer strip clearly established. (pg 20)	1
Wetland crossings include placement of culverts & other structures to ensure adequate water flow & drainage. (pg 70-74)	1
Total	10

Statewide Results: Supplemental Questions

A high level of BMP performance was also reflected in the auditors' qualitative findings for the supplemental questions.

- A wide variety of very positive observations outnumbered negative concerns raised. There was no single, pervasive concern reported. In a handful of cases, rutting and culverts were cited. Seeding and/or successful regeneration was also cited in a few instances along with water diversion, water bars, and soil stabilization.

- 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 for application of BMPs to minimize water quality impacts.

- 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?"

Audit Results

Differences by Michigan Region

The three northern Michigan regions (NLP, EUP, and WUP) have significant vegetative, topographic, social, and economic differences. 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 wells). In addition, there were some differences in the regional BMP audit teams.

Despite these differences, results were similar across the regions with the percent of audit codings in all three regions for “applied correctly” and “acceptable variation” summing close to or slightly above 98%.

Two minor differences stand out:

- The WUP had more “BMPs needed” proportionally than the other two regions. A corollary to this is that it had a much lower percent of “not applicable” BMPs. One may think of this as more opportunity for BMP runoff issues on WUP slopes than rutting in EUP lowland forests; the EUP’s 64.5% BMP “not applicable” rate contrasts to the WUP’s 39%.
- This might partially explain more “acceptable variation” coding in the WUP; more BMPs required may contribute to more variation in implementation. Future audits will lend clarity to this issue.

Differences by Michigan Region *(cont.'d)*

	NLP	EUP	WUP	Statewide
% of BMP Needed Sum:				
applied correctly	95.6%	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

Four major ownerships participated in the BMP audit: corporate, state, NIPF, and national forests. However, there were only three audit sites for the national forests and as extrapolations from just three sites would not be appropriate, the USFS audit results are not incorporated here.

The differences in the results across the remaining three ownerships are negligible and the results may be viewed as equivalent.

The Corporate ownership is weighted towards sites in the WUP which had the highest percentage of sites needing BMPs. Correspondingly, the Corporate sites overall had a higher percentage of cases where BMPs were deemed needed (over 54% compared to the State's 45% and the NIPF 46% rates), but the Corporate compliance rate was virtually the same as the other two ownerships.

Differences by Ownership *(cont.'d)*

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%
Needed Sum	54.2%	45.3%	46.4%
Total Sum	100.0%	100.0%	100.0%

Comparisons with Past Michigan Audits

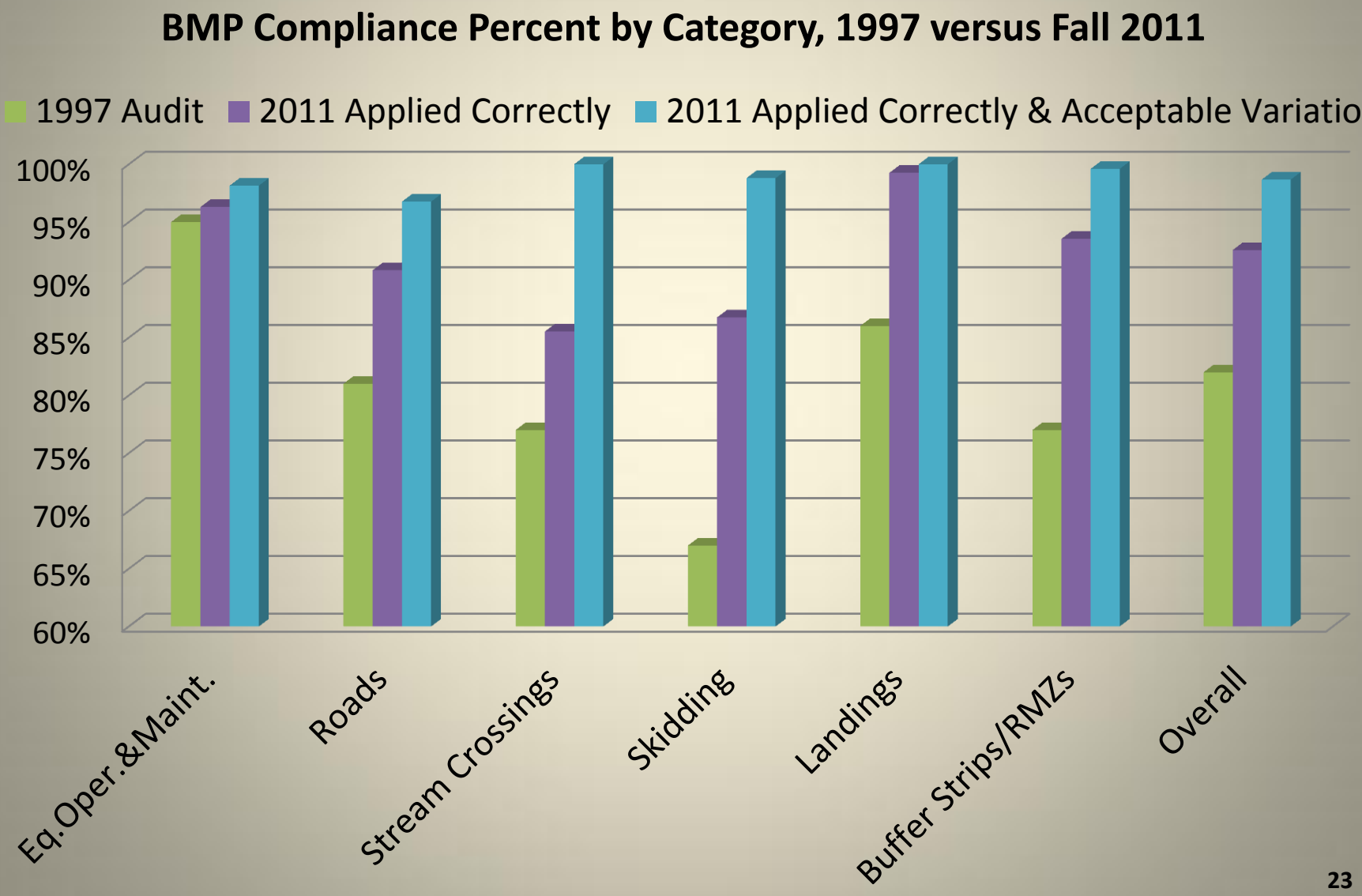
BMP audits were conducted across Michigan forestry ownerships in 1996 and 1997. In addition to these, there was a State Forest BMP audit in 2000 and many individual wood product firms have been maintaining their own audits.

Comparisons across forestry BMP audits are compounded by differences in weather conditions, number and types of sites visited, auditing participants, audit codes, and BMP applications audited. While the 2011 audit process and forms were based upon earlier Michigan audits, the audits used significantly different substate regions and audit site locations.

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.

The next slide compares the 1997 performance with the 2011 performance by BMP category. 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.

Comparisons with Past Michigan Audits *(cont.'d)*



Comparisons with Other States

Wisconsin and Minnesota have similar forests to Michigan. Combined, the three states are often referred to as the "Lake States." They share similar climate, topography, and vegetation. Another important factor is that forest management and industry across the three states have been engaged in forest certification efforts for about the past decade.

- 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, finding BMPs were applied correctly for the two ownerships audited (where needed 95% of the time for federal timber sales and 94% for industrial timber sales). This is similar to improvement found here 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 are broader and more stringent than Michigan's. For example, Michigan's audits of "other considerations" items resulted in many "Insufficient information" codings for cultural resources and T&E species, whereas Minnesota requires proof of database checking for these.

Comparisons with Other States *(cont.'d)*

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.
- The number of sites in their audits have tended to be double or triple the 29 sites in the Michigan 2011 audit.
- Both have overcome the issue of achieving 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).

Issues & Direction for Future Audits

Strengths and weaknesses of the Fall 2011 audits were captured in the October 21, 2011 minutes of the SIC BMP Subcommittee.

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.

Issues & Direction for Future Audits *(cont'.d)*

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).

Issues & Direction for Future Audits *(cont'.d)*

Additional Items

- Need to achieve a representative, random sample of sites in order to make extrapolations to harvest operations beyond those audited.
- The sample size (number of sites) and frequency of audits must be addressed to maintain a credible, ongoing BMP program. This is also tied to distinguishing ownership and regional differences and better targeting of educational and training efforts.
- Auditor training should be done to assure uniform, consistent assessment of BMPs. Individual specifications should be reviewed to make them clearly auditable and operational.
- The "acceptable variation" coding is a subject that was debated. There is a large 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 states or past BMP audits. At a minimum, the specifications it was used with in 2011 should be reviewed and the circumstances under which it can be used should be clearly spelled out.

Summary & Conclusions

- A few minor concerns which warrant further attention remain. For example, where “acceptable variation” and “insufficient information” codings were more frequently assessed could be evaluated. 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. Similarly, the primary concern with “insufficient information” is to review the audit language for means to minimize situations where it needs to be applied.
- The Fall 2011 Michigan BMP Audits recorded very high performance across all BMP categories and 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.

Summary & Conclusions *(cont.'d)*

- A major, ongoing concern to address is how to achieve a truly representative, random audit sample of harvesting sites. This is linked to how frequent and what the size of future audits should be.
- If no reasonable means of assuring a random sample can be found, then the applicability of the audits to all Michigan timber harvests may be questioned. But future audits would still provide good opportunities for collaboration, indications of BMP performance and trends over time, and address certification requirements as the Fall 2011 audit has done.

Discussion/Questions

(Supplemental Slides)

Fall 2011 BMP Categories & Specifications

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)

Fall 2011 BMP Categories & Specifications *(cont.'d)*

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)

Fall 2011 BMP Categories & Specifications *(cont.'d)*

2	**Roads** *(cont.'d)*
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. (p 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)

Fall 2011 BMP Categories & Specifications *(cont.'d)*

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)

Fall 2011 BMP Categories & Specifications *(cont.'d)*

4	**Skidding & Skid Trails**
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)

Fall 2011 BMP Categories & Specifications *(cont.'d)*

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

Fall 2011 BMP Categories & Specifications *(cont.'d)*

6	**Riparian Management Zones**
6a	Buffer strip clearly established. (p 20)
6b	Minimum width >=100 ft. (p 20, 22-23) Is there a designated trout stream less than 50 feet in width and appropriate widening of the RMZ? (p 24 & 25)
6c	Leave 60-80 BA and less than 10% of soil exposed within strip. (p 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. (p 21)
6i	Limbs and tops within RMZ left on ground. (p 21)
6j	State Nat. River Plan or Wild & Scenic River Plan followed & permit obtained. (p 26-28)
6k	Vernal ponds protected from rutting and buffered. (p 29)
6l	Soil compaction and scarification avoided. (p 21)
6m	Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (p 64)
6n	Leave late successional trees in RMZ

Fall 2011 BMP Categories & Specifications *(cont.'d)*

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

Audit Coding

BMP practices 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.

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%

BMP Specifications with more than 22 "Applied Correctly" or "Acceptable Variation" Codings

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

Supplemental Slides

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

BMP Specification (BMP Manual link to spec. in parentheses)	Applied Correct-ly	Accept-able variation	Not Applicable or Insufficient Information
Stream crossing permit obtained if skidding across stream. (pg 67)	0	0	29
Zigzag pattern – break grade to avoid long slopes. (pg 67)	1	0	28
Water bars properly installed as needed. (pg 40)	2	1	27
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)	2	0	27
Temporary water crossings satisfactorily removed at termination of harvest activity. (pg 52 & 54)	2	1	26
Permit obtained for culverts, bridges, or construction in floodplains > 2 sq miles. (pg 10)	2	0	27
Site preparation and reforestation practices minimize soil disturbance, follow land contours, recognize RMZs, and avoid soil erosion. (pg 78-82)	2	0	27
State Natural River Plan or Wild and Scenic River Plan followed and permit obtained. (pgs 26-28)	3	0	26
Broad base dips installed properly. (pg 45-47)	3	0	25
Water bars properly spaced & installed where road slope requires & where temporary cross drainage culverts were removed. (pg 40-44)	3	0	25

BMP Specifications with 3 or more "Insufficient information" Codings

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

BMP Specifications with 3 or more "Acceptable Variation" Codings

BMP Specification (BMP Manual link to spec. in parentheses)	Applied Correctly	Acceptable variation
Sediment not being discharged into stream. (pg 63)	9	3
Erodible soils stabilized by seeding, natural vegetation or brush. (pg 40)	12	3
Excessive rutting avoided: > 6 inches deep and 25 feet long. (pg 64)	18	3
Gullies, seeps and other permanently wet areas avoided where feasible. (pg 68)	19	3
Buffer strip clearly established. (pg 20)	20	3
Excessive rutting avoided: 6 inches deep and 25 foot long in RMZ, 12 inches deep and 50 feet long in other areas. (pg 64)	22	5
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)	15	8