Wisconsin's Forestry Best Management Practices (BMPs) for Water Quality

2013 BMP Monitoring Report

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Executive Summary

In the fall of 2013, state lands and county forests were monitored for the application and effectiveness of Wisconsin's Forestry Best Management Practices (BMPs) for Water Quality. State lands had 42 sites entered into the monitoring program, and county forests had 33 sites. These sites were chosen because of the water resources in or adjacent to the sale. Information on how the BMPs were implemented and how effective they were, was recorded along with site information such as: sale size, season of harvest, water resources, forest roads, and tree species of the harvest area.

County

There were a total of 33 timber sales monitored on county forests during the 2013 BMP monitoring cycle. The average size of the sale area was 97.8 acres, with a grand total of 3227 acres monitored. Most of the sites (11 each) were harvested either during the summer season or were cut during 'more than one' season. The most common water resource was wetlands (28 sites) followed closely by the presence of streams (23 sites). Every site that contained a water resource, for which the BMP manual recommended a Riparian Management Zone (RMZ), had used a RMZ. The most commonly used RMZ was one which met the recommended distance specified in the manual. The most abundant dominant tree species on the harvest sites was aspen (20 sites). Lastly, there were 30 sites that included forest roads – and 21 of those contained active roads. Eight of the sites that contained forest roads had roads which included the presence of drainage structures, like water bars.

The overall BMP application rate on county lands was good at 95%, and the amount of 'correctly applied' BMPs was only slightly less at 93%. BMPs were found to be 'not applied', in situations where they were warranted, 5% of the time. When breaking down the application rates into monitoring categories, 'fuels, waste, lubricants, and spills' were rated the highest (98.4%) and 'forest roads' were the lowest (84.4%).

The effectiveness of BMPs was very high, when their subsequent application rating was 'applied correctly'. The county effectively protected water quality 99.6% of the time (saw no negative impact to water quality), when they applied the BMPs correctly. However, when BMPs were 'not applied' where they were needed, water quality was only protected 36.1% of the time. This shows the importance of using and correctly applying the BMPs in order to protect water quality.

State

There were a total of 42 timber sales monitored on state lands during the 2013 BMP monitoring cycle. The average size of the sale area was 59.1 acres, with a grand total of 2484 acres monitored. The majority (19) of the sites were harvested during the winter season. The most common water resource present within the sites were wetlands (34 sites) followed by streams (30 sites). Along surface water resources, for which the BMP manual designated the use of an RMZ, the most commonly used RMZ distance was the one recommended by the BMP manual (20 sites). Pine and aspen were the most common tree species present within the harvested areas (20 sites each). There were a total of 34 sites that used forest roads to access the sale, and 14 contained active forest roads. Only two sites had the presence of drainage structures on their forest roads.

The overall BMP application rate on state lands was very high at 97.8%, and the amount of 'correctly applied' BMPs was only slightly less at 97.1%. BMPs were found to be 'not applied' in situations where they were warranted, 2.2% of the time. When breaking down the application rates into monitoring categories, 'fuels, waste, lubricants, and spills' were rated the highest (100%) and 'forest roads' were the lowest (94.9 %).

The effectiveness of BMPs was very high, when their subsequent application rating was 'applied correctly'. The state effectively protected water quality 100% of the time, (saw no negative impact to water quality) when they applied the BMPs correctly. However, when BMPs were 'not applied' where they were needed, water quality was only protected 76% of the time. This shows the importance of using and correctly applying the BMPs in order to protect water quality.

2013 BMP Monitoring Sites Map

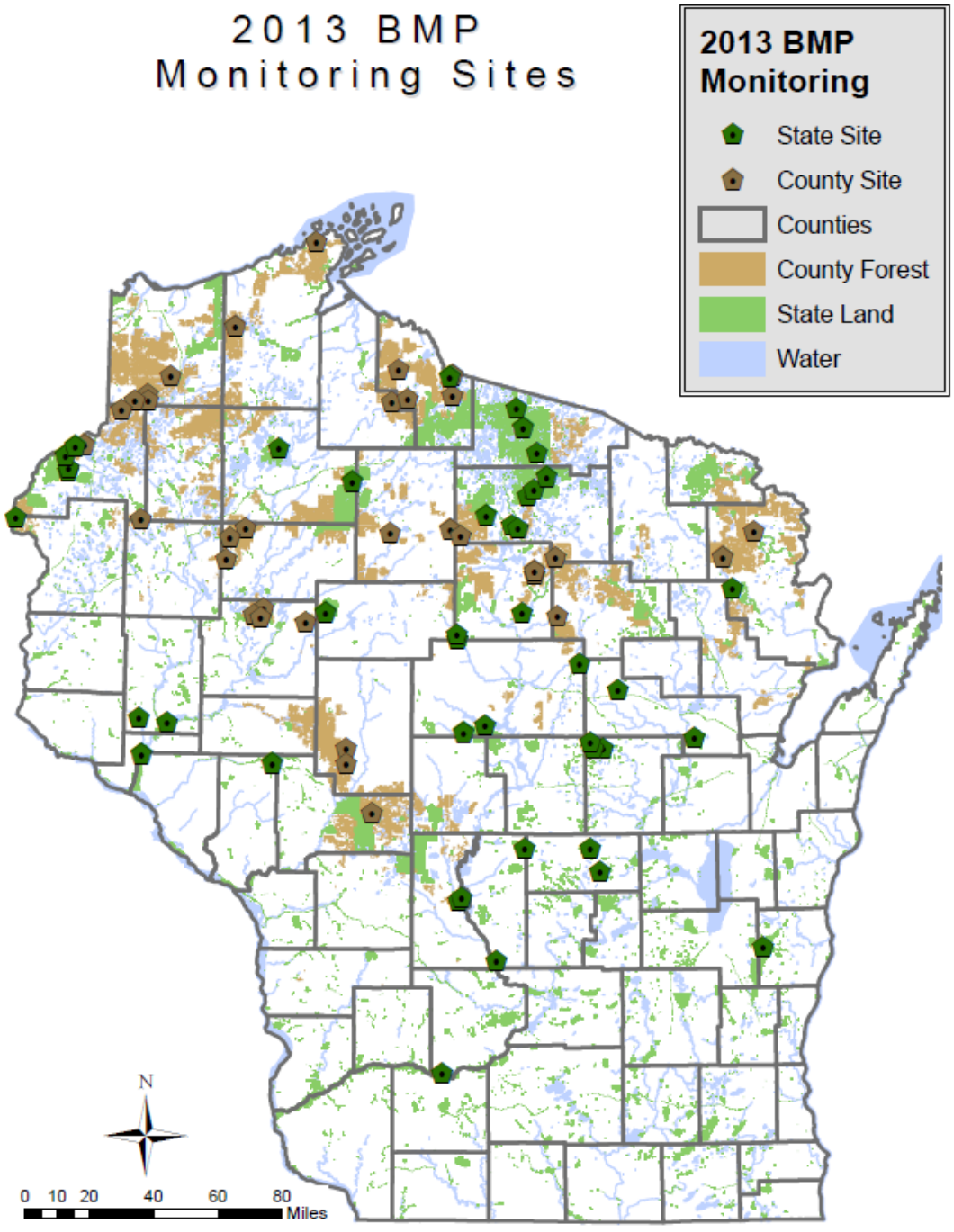


Figure 1. **The sites monitored by the 2013 BMP teams. Brown dots represent county sites and green dots represent state sites.** ***Note: Some dots are close together making the total number of sites difficult to determine on this map. Disclaimer:*The Department has made reasonable efforts to provide you with accurate information, but cannot exclude the possibility of errors or omissions in sources or of changes in actual conditions. The Department makes no warranties of any kind, either the express or implied. Changes may be periodically made to the information herein.****

Introduction

Since the Federal Clean Water Act was originally passed in 1972, several revisions have been made and now include the specific activities of silviculture and its' contributing factors to nonpoint source pollution (NPS). Each state is required to develop either guidelines or regulations to reduce the NPS from silviculture to the "maximum extent practical". In Wisconsin, this has led to the development of the Best Management Practices (BMPs), which are designed to protect water quality – from silvicultural activity – according to the Clean Water Act of 1972 and its following revisions.

Wisconsin adopted the BMP program in 1995, and through monitoring, statistical analysis, and written reports, Wisconsin is able to document its success in protecting its water quality through the BMP program. Initially, all silvicultural activities done within the state of Wisconsin were subject to being monitored every year. There are many different landowners that reside over the forests of Wisconsin including: Federal, Industrial (Large), County, State, Non-Industrial Private (NIP), and Tribal landowners. With this many landowners, monitoring a statistically valid sample size from each proved to be too demanding of a task and the BMP Advisory Committee (comprised of individuals who represent many different interests in Wisconsin's forests) decided to only monitor one or two landowners on any given year.

The two landowners being monitored during 2013 were county and state. There were a total of 467 timber sales cut on state lands and 1590 timber sales cut on county forests that were available to be monitored for the 2013 BMP monitoring cycle. In order to run statistical analysis on the results, 42 state sites and 33 county sites were chosen to be monitored to obtain a 95% confidence interval. The sites that are randomly selected are examined to see if they are eligible to be monitored using both computer satellite imagery and by taking trips to the potential sites. Sites that are chosen to be monitored have to pass a set of eligibility criteria including:

- Harvesting completed within 200 feet of a lake, river or steam
- At least one acre of wetland harvested
- A significant length of wetland crossed (≥50 ft.)
- A stream crossed

This ensures that the BMP program, through the monitoring teams, will be focusing their time at timber sales that can potentially have the most impact to water quality. Sites that lack any of these characteristics are unlikely to impact water quality in a direct (observable) manner.

The BMP monitoring teams are comprised of four to six individuals and have a wide background of expertise ranging from hydrology, soil science, ecology, conservation, silviculture and logging. In order to achieve consistent evaluations across all the different sites, there were trainings held for all the teams, put on by the DNR Forest Hydrologist. These trainings included both lecture/discussion in a classroom type setting and field portions where everyone went to sites to go through the monitoring worksheets together. Information about the site was collected as well as being evaluated for the application and effectiveness of BMPs.

Timber Harvest Information

Harvest Age

All the sales monitored during the 2013 BMP efforts were closed between January 1st 2012 and December 31st 2012. Although the sales were closed during this time, the actual time between when the sale was harvested and when it was monitored may vary. Sales are monitored the following year from when they are closed for several reasons:

- The sale will have went through at least one runoff season (spring)
- The sale will no longer be active (safety reason and not hindering logging operation)
- Evidence of logging activity will still be fresh and easy to see and evaluate

County

County sites had the majority (20 sites) cut 1-2 years prior to monitoring, and had roughly one-third (10 out of 33 sites) cut less than one year prior to monitoring (Table 1). Only three sites were cut more than two years before they were monitored and no sites had the harvest age listed as 'unknown'.

State

State sites had slightly less than half their sales (20 sites each) cut less than one year before monitoring and between 1-2 years before monitoring (Table 1). Only one site was listed as being harvested more than two years before monitoring and one site was listed as the harvest age 'unknown'.

Table 1. Harvest Age		
Age Class	County	State
<1 year old	10	20
1-2 years old	20	20
> 2 years old	3	1
Unknown	0	1

Table 1. The amount of time that has passed since the site was harvested/cut and when it was monitored.

Harvest Size

The harvest size for any particular sale includes the entire area within the boundary of the sale. This includes areas of non-harvest such as: roads, reserve areas, wetlands and streams. Sales are individual units of harvest that can occur in an isolated location or can border several other active or recently completed sales. A larger area of harvest can be broken down into sales based on a multitude of factors including: tree species composition, silvicultural prescriptions, property boundaries, natural boundaries, seasonal restrictions/ time of harvest, tree age, logging contractors, and product demand. The more differences between these factors in the area of harvest, the more likely they will be broken down into smaller sales.

County

County sales are rather large, with the average size at 97.8, and a grand total of 3227 acres monitored. However, the sales range in size from 16 acres all the way up to 234 acres. Almost half (15:33) of the sales fell into the largest harvest category of more than 100 acres. Very few (5) sales were in the smallest two harvest size categories of less than 51 acres, and only one of those was smaller than 26 acres. One possible reason for the large county sales is the blowdown event that took place in Northwest Wisconsin, and the subsequent salvage harvest operations that followed in the storms wake.

State

State sales were comprised of both small sales and larger sales, but small sales were more common. The average size was 59.1 acres, with a grand total of 2484 acres monitored. Eighteen (42.8%) of the sales fell into the two largest categories of over 76 acres while 23 (54.8%) of the sales fell into the two smallest categories of 50 acres or less. Only one sale was found to be between 51-75 acres.

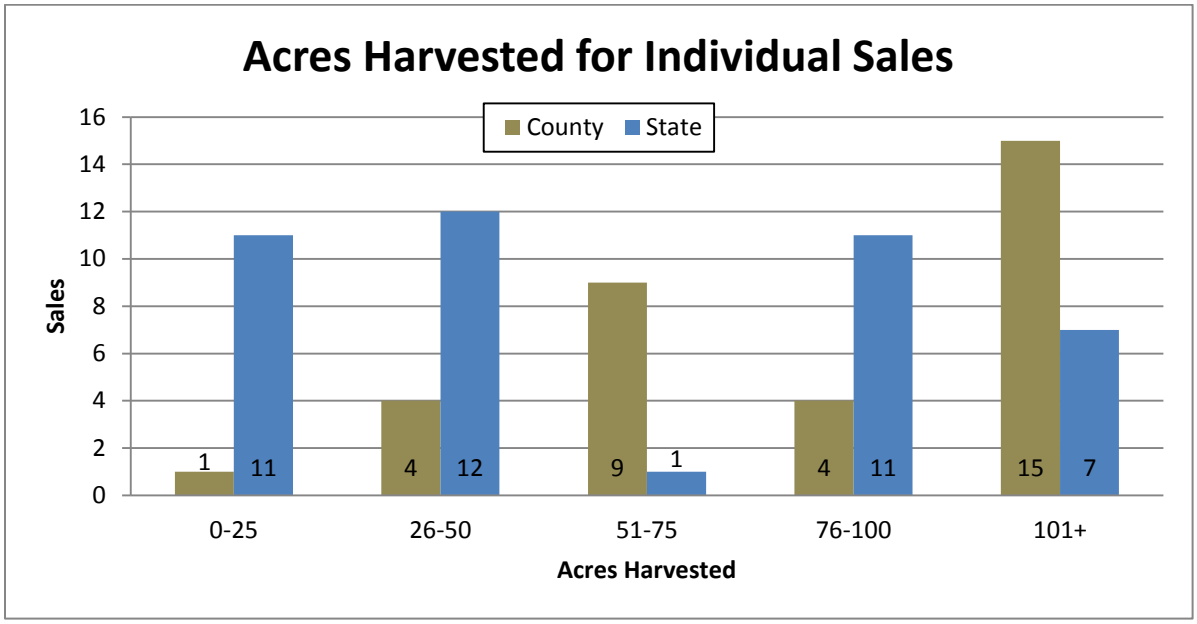


Figure 2. The number of acres that were harvested for each of the sales conducted on state lands and county forests.

Season of harvest

The season of harvest can play a vital role in the success of protecting water quality in silvicultural activities. The presence of water resources within a timber sale may lead to harvesting guidelines where it becomes best to operate harvesting equipment during dry (usually late summer/early fall) or frozen ground conditions (winter). Many recommendations within the BMP manual call for operations during these favorable ground conditions to avoid the potential problems of rutting and compacting hydric soils.

County

One-third (11/33) of the county sites were harvested during the course of more than one season, and another third (11/33) were harvested during the summer (Figure 3). The rest of the sites were distributed between winter (7 sites), fall (3 sites) and one site which the season of harvest was undetermined. No sites were harvested during the spring.

State

Winter was the most common season of harvest (19 sites), while spring was the least common season of harvest (1 site). Multi-Season was the second most common (12 sites) and the remaining sites were distributed evenly between summer, fall and unknown with three, four and three sites respectively (Figure 3).

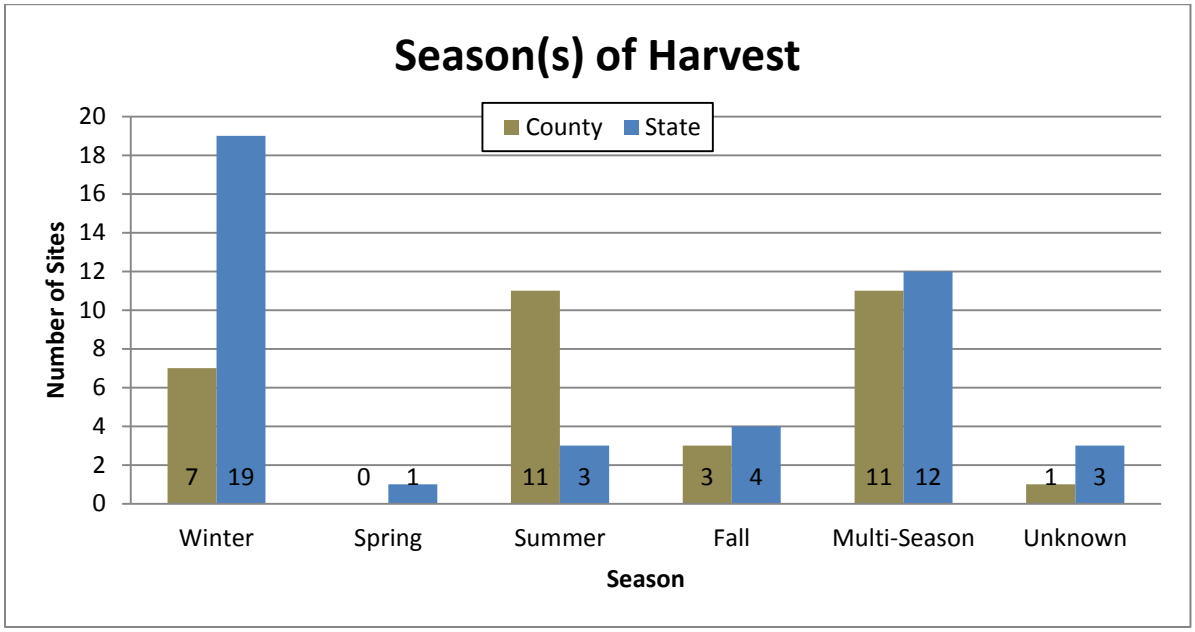


Figure 3. Time when the sale was harvested.

Water Resources

There were four types of water resources (lakes, streams, wetlands, and springs/seeps) found in the 2013 BMP monitoring sites. Streams are broken down even further by their width and designated trout stream classification (Figure 5). Width and the presence of trout are important because these two factors help determine the distance of the Riparian Management Zone (RMZ) on streams.

Figure 4. Stream crossing on Apple Creek (designated trout stream on Iron County Forest).

County

The most common water resource was wetlands (28 sites) with streams being the next most common (23 sites, Figure 5). Springs/seeps were the least common, with only two sites listing them as present, lakes were found on one-third (11:33) of the sites. The majority of the sites (17) that contained streams were found to have streams either greater than three feet or classified as a designated trout stream. Eight sites contained streams that were between the widths of 1-3 feet and only two sites had streams of less than one foot wide. The county crossed a total of six streams on forest roads, and all of which, used culverts as the crossing method (Table 2). The stream crossing must fall within the boundary of the sale or be on a road primarily used for the sale (paved town roads or a network of roads that serves a multitude of timber sales were not included for these numbers).

State

The most common water resource present was wetlands (34 sites) with streams being the second most common (30 sites, Figure 5). Springs/seeps and lakes were both fairly uncommon (6 sites and 8 sites respectively). The majority of the sites (28) that contained streams were found to have streams either greater than three feet wide and/or classified as a designated trout stream. Six sites (3 each) were found to have streams between the distances of 1-3 feet wide and less than one foot wide. Only one stream was crossed, and that method of crossing was a ford (Table 2).

Table 2. Streams Crossed on Sites

Stream Crossed	County	State
Culverts	6	0
Fords	0	1
Bridges	0	0

Table 2. The number of streams that were crossed using different types of stream crossing methods.

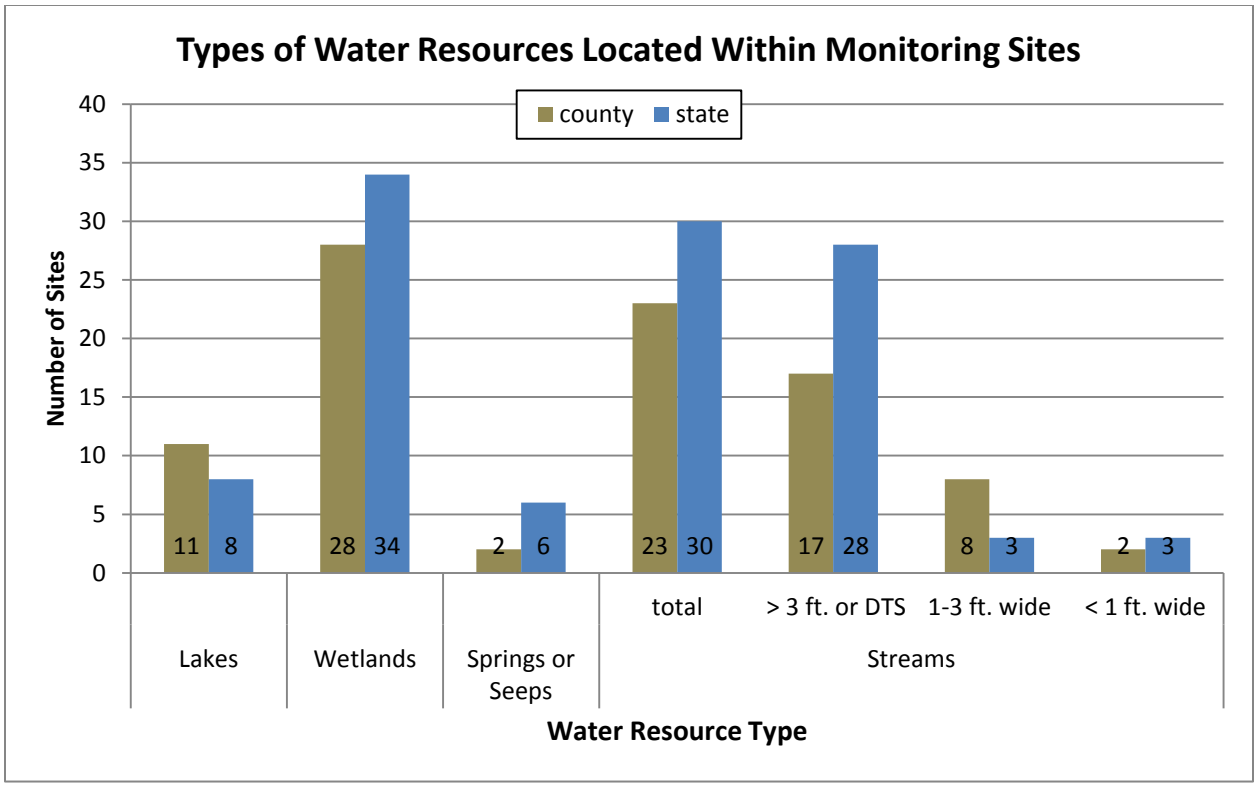


Figure 5. The number of sites that contain different types of water resources. Streams are broken down into three categories depending on width and/or if they are designated trout streams (DTS). *Note: Sites may have more than one type of water resource and more than one type of stream.*

Riparian Management Zones (RMZs)

Riparian Management Zones (RMZs) are areas of specific management criteria next to a stream or lake in order to provide shade and soil stabilization. Excess heat or erosion caused by exposed soil in a RMZ can possibly lead to impacts to water quality. The two different RMZ distances are 100 feet and 35 feet. A 100-foot wide RMZ is recommended for lakes, streams of a width three feet or greater, and all designated trout streams. A 35-foot wide RMZ is recommended for the two categories of streams less than three feet wide. All four water resources that recommend an RMZ, have different harvesting BMPs unique to each resource. RMZs can be modified, per the BMP manual, by foresters for several reasons including: timber species composition, presence of beavers, slope, soil, season of harvest, and storm or insect damage. The BMP Manual's recommended RMZ distance from Ordinary High Water Mark (OHWM) to the timber harvesting edge can fall into one of four categories:

- The site RMZ can be increased in distance
- The site RMZ can meet the recommended distance
- The site RMZ can be decreased in distance
- The site may not have used an RMZ

County

Most sites (21) used a RMZ that met the recommended distance listed in the BMP manual, and these were found on all four different types of water resources that recommended a RMZ (Figure 6). The next most common (13 sites) increased the recommended RMZ distance, while only four sites had decreased the recommended RMZ distance. No sites were observed to have not used a RMZ on a water resource where a RMZ was recommended.

State

Most (20) used a RMZ that met the recommended distance listing in the BMP manual. Fifteen sites had a RMZ distance that was increased from the recommended distance. RMZ distances that were decreased were uncommon (2 sites) and three sites were found to have not used an RMZ for which the BMP manual had a RMZ distance recommended.

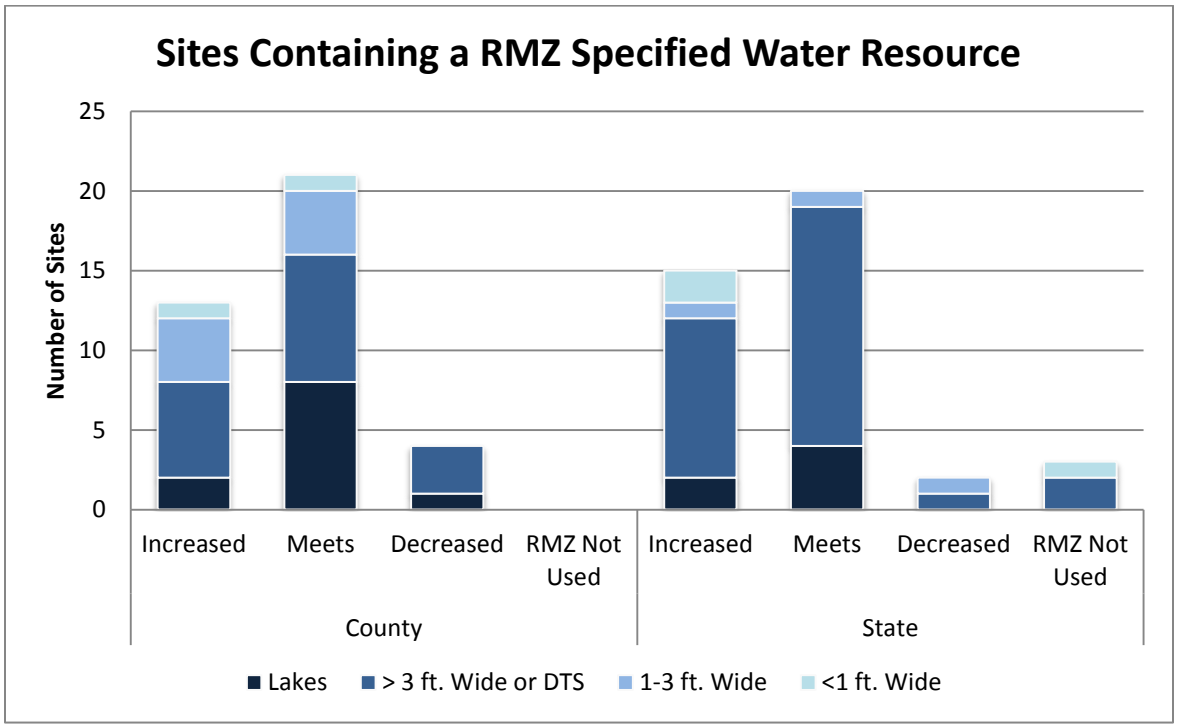


Figure 6. The number of sites that have RMZ specified water resource within or on the boundary of the sale. The RMZ can be increased or decreased in width, follow the recommended distance, or not be used at all. The bars are broken down to show the four different types of water resources.

Species Composition of Harvest Sites

Seven different tree stand compositions were listed in the 2013 monitoring report. Anytime they were present to a significant degree, they were recorded as being a dominant cover type for the harvest. This leads to many sites having more than one dominant cover type.

County

The most common tree stand composition was aspen (20 sites), with maple/basswood and oak/hickory tied (14 sites) as being the second most common (Figure 7). Bottomland hardwoods and swamp conifers were tied for being the least common tree stand composition with only one site each.

State

The most common tree stand composition was aspen and pine, each of which were found to be a dominant cover type in 20 sites (Figure 7). Oak/hickory and maple/basswood were the next most common with 15 sites and 9 sites having the species listed as a dominant cover type respectively. The least common cover type was swamp conifers (1 site).

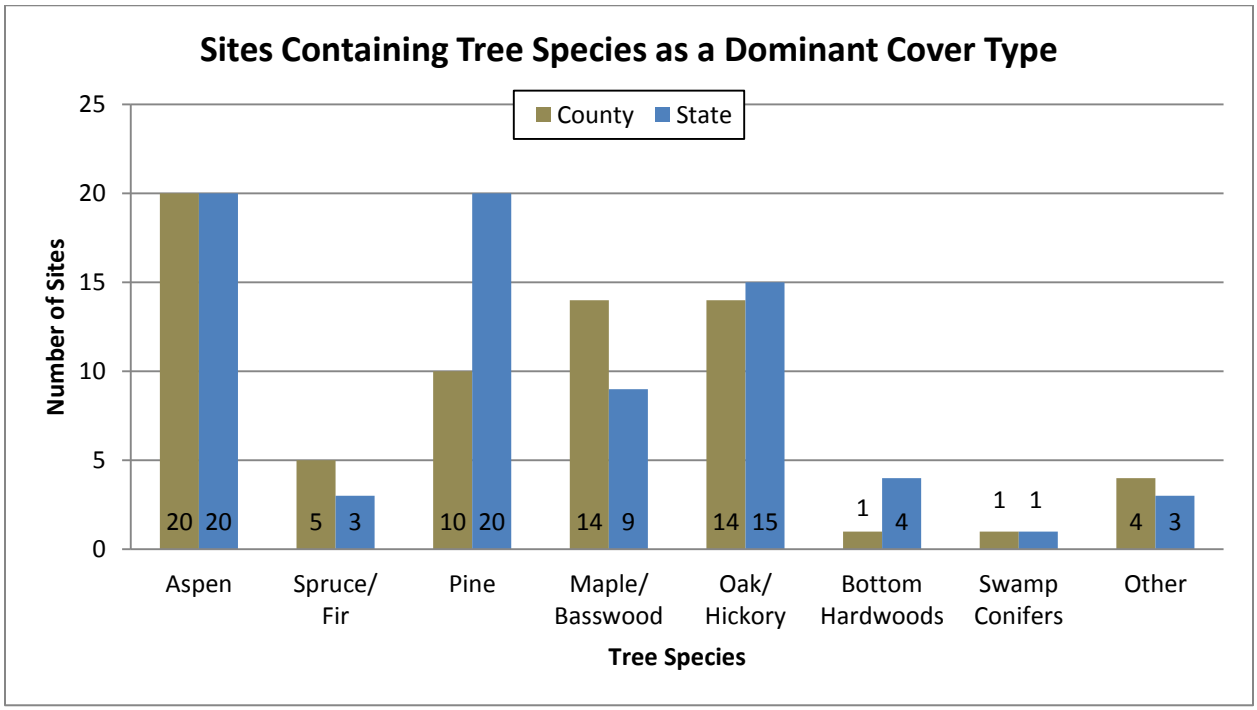


Figure 7. Dominant tree species present on a site. ***Note: a site may have multiple dominant tree species listed as present.***

Silviculture Prescriptions

Silviculture prescriptions determine several aspects of a timber harvest: it can determine which trees get harvested, how many trees get harvested, what the remaining tree density should be, and may determine which tree species are established post-harvest.

County

The most common silvicultural prescription was 'more than one'. Given the average size of sales, almost 100 acres, it is not surprising that 'more than one' type of silvicultural prescription was utilized throughout the sale area. 'Clearcut', 'shelterwood', and 'seedtree' silvicultural prescriptions were completely absent from all sales conducted on county land (Figure 8). Although there were no sales that

documented the solo use of the 'clearcut' silvicultural prescription, many sales included components of 'clearcut' that fell into the different categories of 'other', 'clearcut with reserves', and 'more than one'.

State

The most common silvicultural prescription was 'more than one' (15 sales), with selection harvest being a close second (14 sales). 'Clearcut with reserves' and 'clearcut' saw some utilization on state lands (9 and 4 sites respectively). 'Shelterwood', 'seedtree', and 'other' were not utilized on any of the 42 sales conducted on state lands.

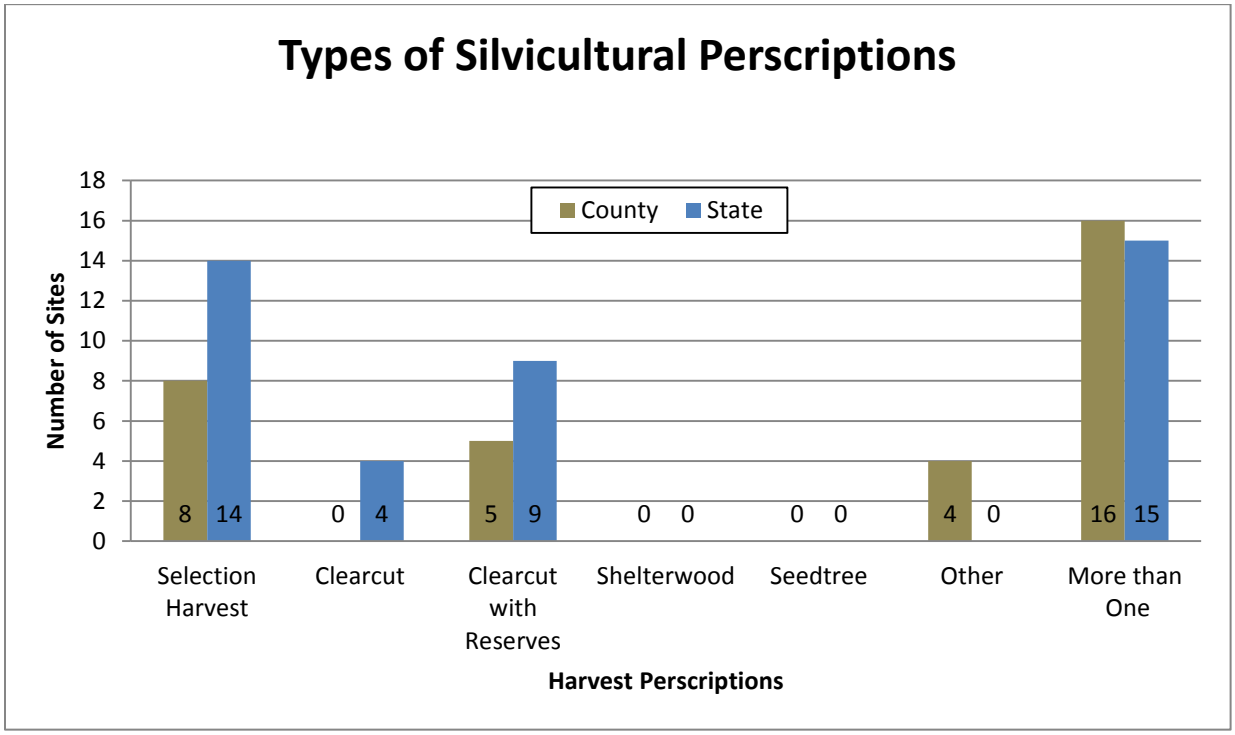


Figure 8. Types of silvicultural prescriptions used on sites.

Timber Stand Improvements

Timber stand improvements (TSI) are defined as improving the quality of a forest or tree stand by removing undesirable trees or tree species to obtain the desired forest composition or forest timber productivity. This may include methods that yield no current merchantable timber including girdling, spraying herbicide, and burning.

County and State

Given the definition of TSI and the fact that it does not directly produce income, it is not surprising to see that both state and county did not use many TSI (Table 3). Both state and county had one sale that utilized 'crop tree release', and county had five sites that used 'other' method of TSI.

Table 3. Timber Stand Improvements		
Timber Stand Improvements	County	State
None	27	41
Crop Tree Release	1	1
Pre-Commercial Thinning	0	0
Other	5	0

Table 3. Different types of timber stand improvements used on state and county lands.

Harvest System

County

The most common harvesting system used on county sites was 'shortwood' (25 sites), while 'other' was not utilized on any site (Table 4). 'Tree-length' and 'more than 1 type' were each used on three sites and 'whole tree' was found on only two sites.

State

The most common harvesting system used on state sites was 'shortwood' (37 sites), while 'other' was not utilized on any site. 'Whole tree' and 'more than 1 type' were each used on two sites and 'tree-length' was found only on one site.

Table 4. Harvesting System		
Harvesting System	County	State
Shortwood	25	37
Tree-length	3	1
whole tree	2	2
other	0	0
more than 1 type	3	2

Table 4. Types of harvesting systems

Equipment

The BMP monitoring teams determined the equipment used for the harvest operation using several methods. If a site specific forester was present, they simply inquired him/her for that information. Otherwise, looking for signs of either wheel or track marks on the ground as a result of the harvest operation also helped determine the type of equipment. If the ground was dry, frozen, or had lots of snow, the equipment marks would be difficult to see if present.

County

Most of the sites (22) used both wheeled and tracked logging equipment during the harvesting process (Table 5). Wheeled equipment was solely used in nine sites, while one site used solely tracked equipment. On one site, the BMP monitoring team was unable to determine what type of logging equipment was used.

State

A combination of using both wheeled and tracked equipment during the harvesting process was the most common (23 sites) equipment type (Table 5). Wheeled equipment was the next most common equipment type and it was used on 17 sites. The sole use of tracked equipment along with the equipment being 'unknown' was only present for one site each.

Table 5. Equipment Type		
Logging Equipment	County	State
Wheeled	9	17
Tracked	1	1
Both	22	23
Unknown	1	1

Table 5. Types of logging equipment used during the harvest.

Road Systems

Forest roads serve several purposes: access to the sale by trucks and other equipment, moving wood from the sale to the landing, and in some cases provide area for decking. How roads are designed, constructed, and maintained plays a large role in how successful a harvesting operation will be at protecting water quality. Roads that go through, or adjacent to wetland, or roads that go against the contours will most likely require some type of drainage structure to ensure that the road stays in usable condition and that water quality is not negatively impacted. For forest roads that go through wetlands, equalization culverts help to maintain hydrologic flows beneath the roads, which will stop water buildup that may potentially wash out the road. For roads that go up and down contours: water bars, broad-based dips, out-sloping, or ditches can help reduce the flow on the road surface – which will extend the life of the road. The amount of drainage structures on roads that go across the contours will greatly depend on several features, but primarily the length and gradient of the road.

County

Most of the county sites (30) had forest roads present (Table 6). Thirteen of those sites had improved the road to some degree, either prior, during, or post-harvest. Out of the 30 sites that had roads, 21 of those sites contained active roads – roads that receive use for the majority of the year. Drainage structures were also found on eight sites – four existing and four new drainage structures.

Figure 9. This culvert was found on the forest road system owned by the county. The culvert is buried deep enough to handle the weight of logging traffic along with a stable bank, due to the rock armoring.

State

Many of the state sites (34) had forest roads present, while eight sites did not have roads present. Only eight of the 34 sites with roads were improved either before, during or post-harvest. There were more sites containing inactive roads (22) than sites with active roads (14). State sites had very few drainage structures of any kind, with only two being new installation and none having pre-existing (Table 6).

Table 6. Road Characteristics			
Road Characteristics		County	State
Sites w/Roads Present		30	34
Sites w/Roads Absent		3	8
Improved Roads		13	8
Drainage Structures	New	4	2
	Existing	4	0
Road Use	Active	21	14
	Inactive	11	22

Table 6. The amount of sites with roads, whether they were active, if they were improved, and how many had drainage structures present. *Note: sites may have inactive and active roads on the same site.*

Table 7. Road Types and Water Removal Efficiency					
Water Removal Efficiency	Traffic Volume Capacity	Road Category	Road Type	County	State
Low	Temporary/ Seasonal	Design	Flat	20	28
		Construction	Below Grade	2	2
		Construction	At Grade with No Ditch	17	27
Moderate	Seasonal	Design	In-Slope/flat	0	2
		Design	Out-Slope/flat	2	1
		Design	Crowned/Flat	5	2
		Design	Many Typed	1	0
		Construction	Combinations	7	4
High	Permanent	Design	Crowned	5	1
		Construction	Ditch < 1 ft. Deep	4	0
		Construction	Ditch > 1 ft. Deep	0	0

Table 7. The construction and design of roads are shown on state lands and county forests, with their respective water removal capabilities along with their associated recommended traffic volume capacity.

Results

Overview

During the 2013 Wisconsin Forestry Best Management Practices for Water Quality, 75 sites were visited by the monitoring teams and included 42 sites for state lands and 33 sites for county forests. For each of these sites, 119 BMPs were assessed for application and effectiveness (See Appendix E). These BMPs were divided into five categories:

- *Fuels, Lubricants, Waste and Spills*: There are two BMPs on the monitoring form and relate to location of fueling, and cleaning up waste and spills.
- *Riparian Management Zones (RMZs)*: There are 18 BMPs on the monitoring form and are divided into sections according to different RMZ practices that occur on subsequent water bodies.
- *Forest Roads*: There are 47 BMPs on the monitoring form and they are divided into several sections which cover a variety of aspects including location, drainage structures, and stream crossing on forest roads.
- *Timber Harvesting*: There are 36 BMPs on the monitoring form and they are divided into a multitude of sections which include: skid trails and all aspects regarding them, log landings, and dry washes.
- *Wetlands*: There are 15 BMPs on the monitoring form and they cover wetland harvesting, filter strips, and rutting in wetlands.

When teams go through the process of monitoring a site, they decide which BMPs apply to the site and how well the site protected water quality by using (or not using) BMPs – which is termed evaluating for application and effectiveness. There are several different application categories that describe how the landowner either used, or did not use a BMP, as applicable. In turn, BMP effectiveness is rated for individual BMPs and is also divided into the different categories of application.

BMP Application

The first element that a monitoring team must decide when answering a BMP from the monitoring report is to determine if the individual BMP question is applicable to the site. The five options of BMP applicability are:

- BMP not applicable to the site
- BMP applied correctly where it was needed
- BMP applied but incorrectly
- BMP not applied where it was needed
- Insufficient information to rate how the BMP was applied

County

Application rates for county forests were good, at 95%. This means for every BMP that was applicable to the site, 95% of the time, the BMP was applied (either correctly or incorrectly) and only five percent of the time a BMP was not applied (Figure 10). The correct application rate was also good at 93%, which implies that only two percent of the BMPs that were applicable to the site were applied incorrectly.

State

Application rates for state lands were excellent, at 97.8%. Only 2.2% of the time, when a BMP was applicable to the site, was one 'not applied' (Figure 10). The correct application rate for BMPs was also very high, at 97.1%. This leads to a low rate of BMPs that were applied incorrectly (0.8%).

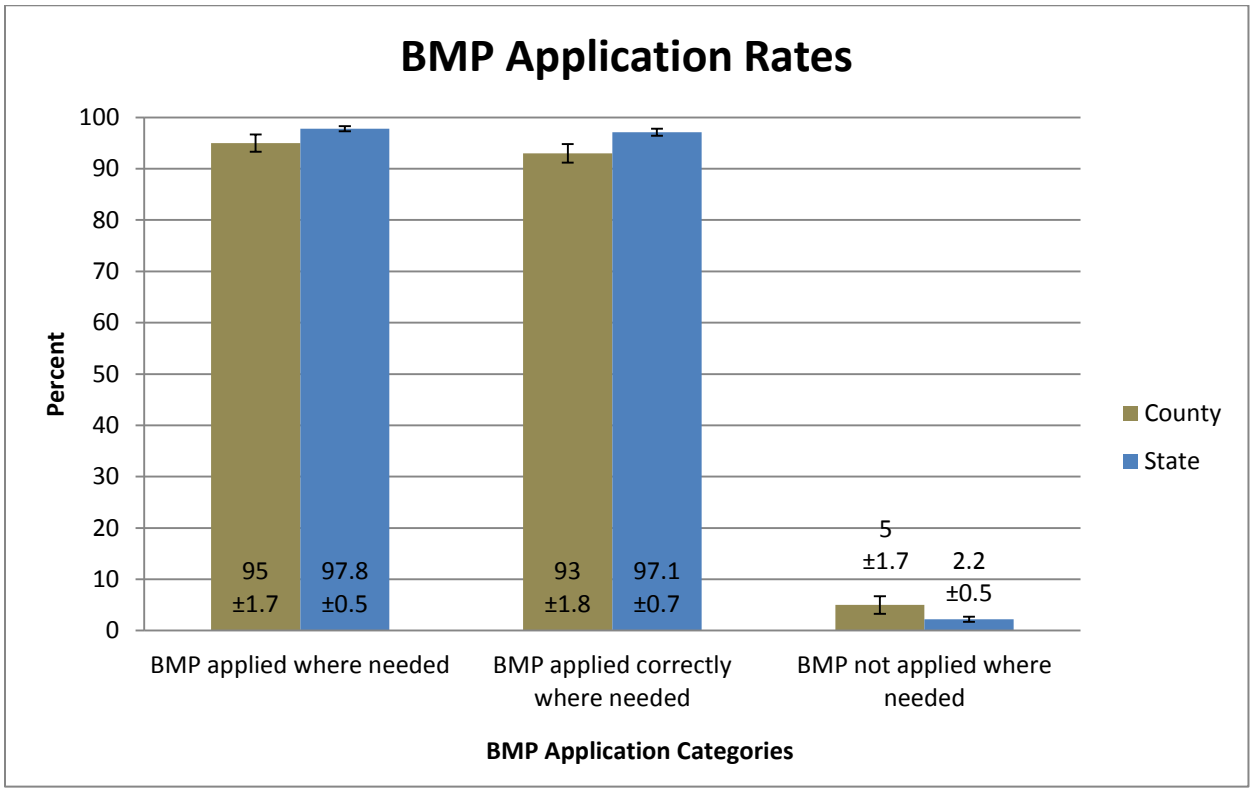


Figure 10. BMP application rates for state lands and county forests.

BMP Application by Monitoring Category

BMP application rates were broken down into respective monitoring categories to provide greater detail of where BMPs were undergoing high or low compliance. Variances in application rates, between the monitoring categories, are both common and expected. This is due to the intrinsic properties between the monitoring categories and how easy or difficult it is for landowners to correctly apply BMPs. For example, 'forest roads' is a BMP monitoring category where it is usually more difficult to achieve a higher BMP correct application rating than the monitoring category of 'fuel, waste, and spills'. Here are just a few reasons the BMPs for 'forest roads' are more difficult to achieve compliance:

- 'Forest roads' BMPs are subject to criteria like location and design
- 'Forest roads' have both short and long term maintenance, which may include road closure
- 'Forest roads' may receive un-intended or post closure use

This is compared with BMPs for the monitoring category 'fuels, waste, and spills' where, to achieve a high application rate, is to clean up any trash or spills that may have occurred during the harvest operation – if they occurred at all.

County

The monitoring category that received the highest rating was 'fuels, waste, and spills' (98.4%) followed closely by 'RMZs' (98.3%). The monitoring category that had the lowest correct application rating was forest roads (84.4%) by a considerable amount – 8.8% behind the next lowest monitoring category of wetlands (93.2%, Figure 12).

Figure 11. This culvert on county forest does not extent far enough beyond the road, which does not allow for armoring on the road side slope. This can lead to erosion around it – like pictured here.

State

All the monitoring categories had a relatively high correct application rate – which is to be expected due to the very high overall application rate – but there is a small variance of 5.1% between the highest and lowest rated monitoring categories. The highest, at 100%, is the monitoring category of 'fuels, waste, and spills', and the lowest is 'forest roads' (94.9%). The remaining three monitoring categories were approximately 97% (Figure 12).

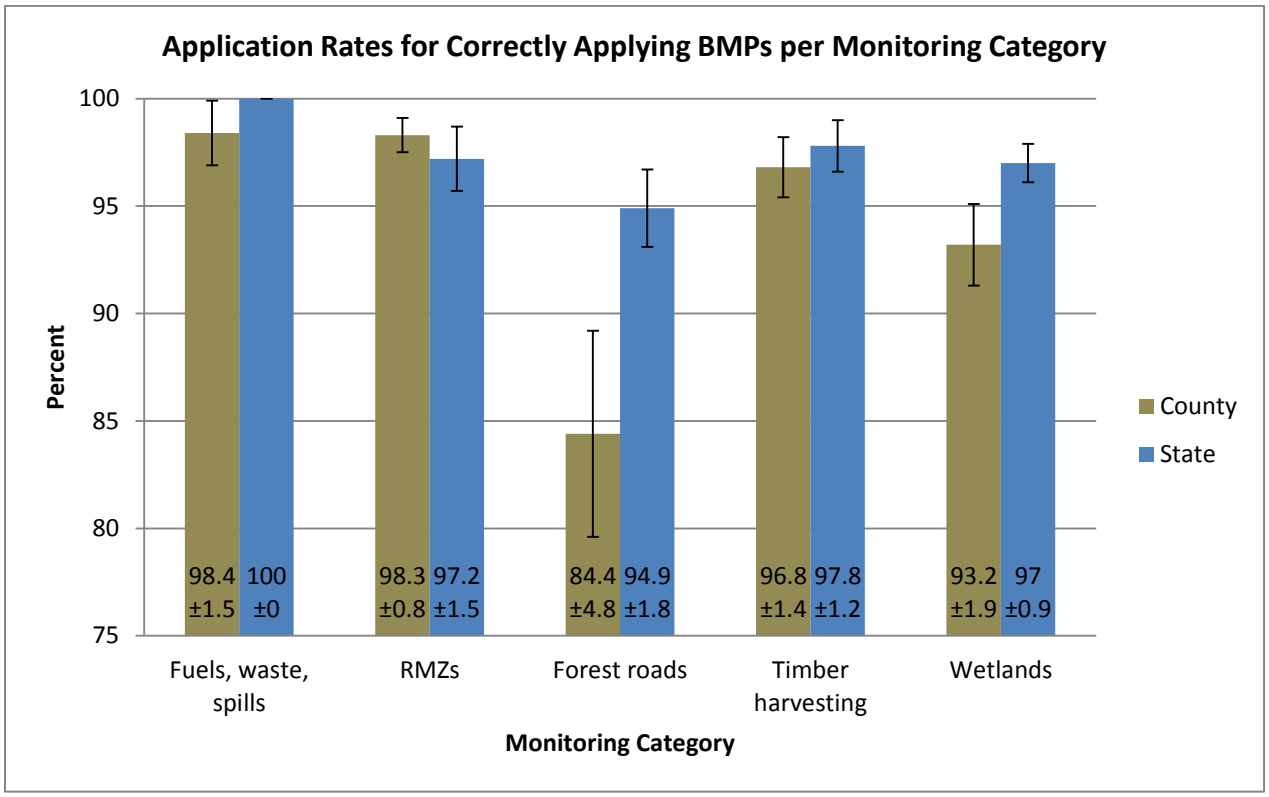


Figure 12. BMP correct application rates for the different monitoring categories for both state lands and county forests.

2013 BMP Application Rates Compared to Prior Years

The comparison of current results to past findings is an extremely important function of the BMP monitoring program. It allows the question to become answerable "is Wisconsin's BMP program protecting water quality?" By comparing the application rates from different years – silvicultural activities can be shown to ensure continued – and hopefully, ever improving protection of water quality in Wisconsin. This self-evaluation, also allows for changes to the BMP program to be made, so it can adopt the new ways to measure and protect water quality. Changes to both the BMP manual and the monitoring worksheets have occurred, since its start in 1995, to incorporate better ways to monitor and protect water quality.

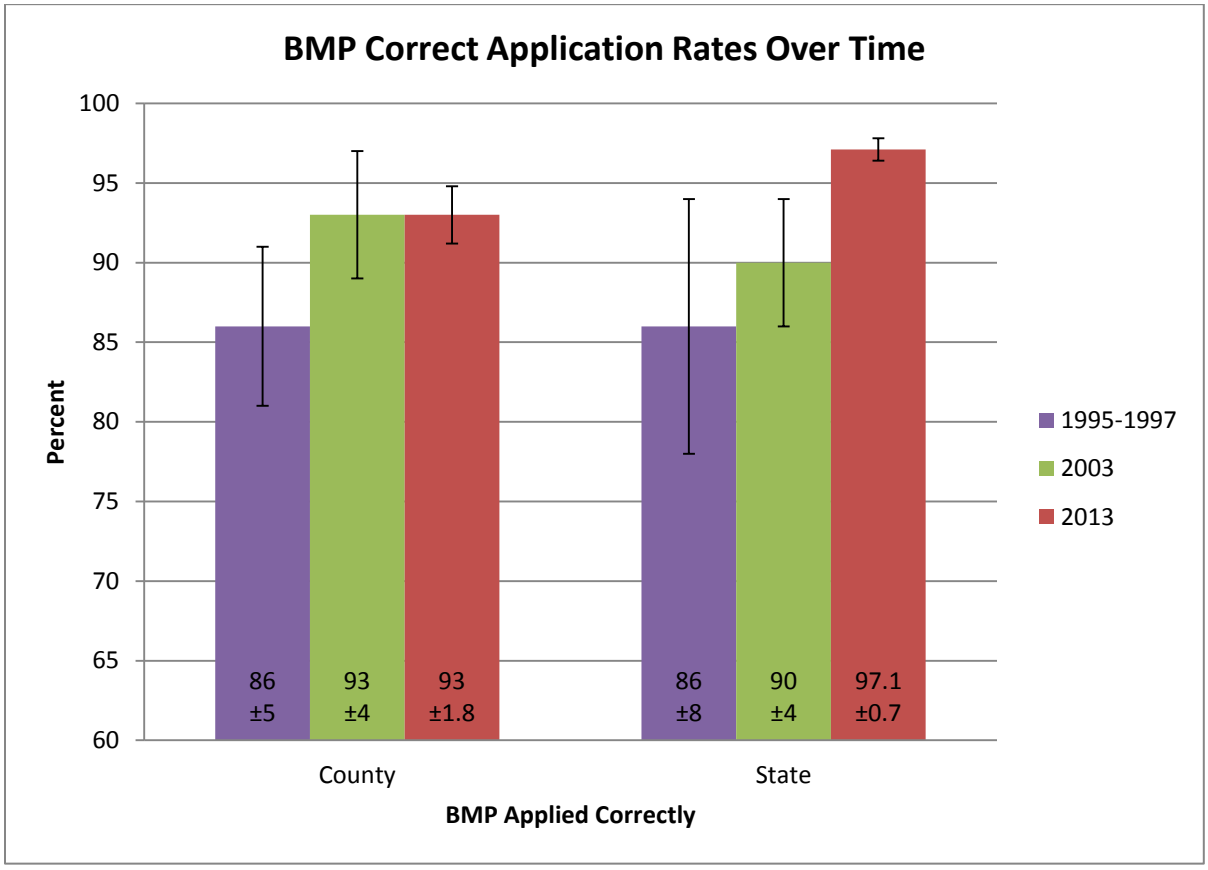


Figure 13. The correct application rate of BMPs from the 2013 results compared to past results in 2003 and the combined years of 1995-1997 on both state and county lands.

County

The 2013 correct application rate has improved from the base results in 1995-1997, and has remained the same since 2003 (Figure 13). The confidence interval has also increased (decreased error) compared to past years, due to a larger number of county sites evaluated compared to the past years, allowing a more accurate representation of BMP 'correct application'. When the results are broken down into monitoring categories, the 2013 application rates were found to be higher when compared to prior years, with one notable exception – forest roads (Figure 14). There was a substantial drop in correct application in 'forest roads' from 2003 to 2013 (96% to 84.4%); however, it was still an increase from the baseline data in 1995-1997. The only other decrease was in 'wetlands' from the 2003 to the 2013 data. All the other categories over the years were either increased or maintained the current 'correct application' rate.

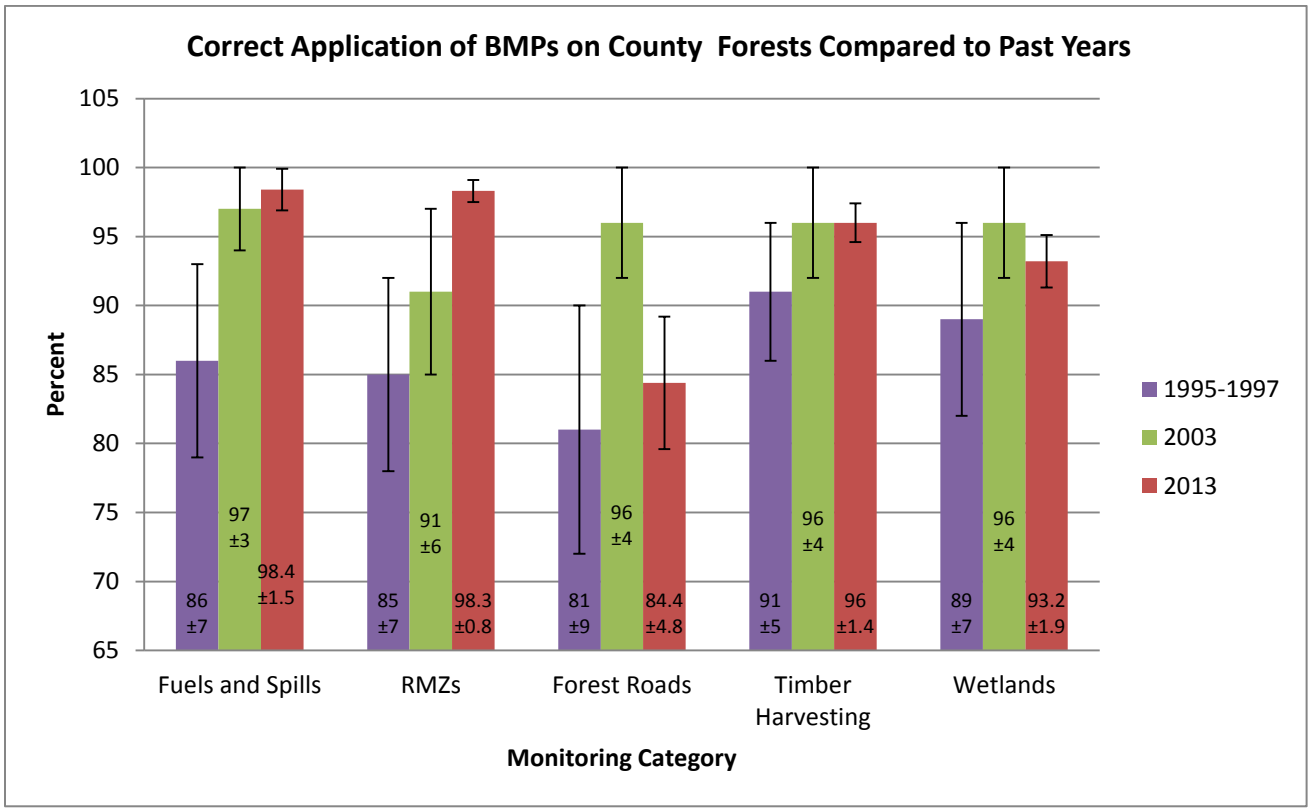


Figure 14. Correct Application rates of BMPs on county lands, with different monitoring categories, of the 2013 BMP results to the past results in 2003 and 1995-1997.

State

The 2013 correct application rate is the highest out of all three years monitored. Each time it has been monitored, it has shown improvements, from 1995 to 2013 (Figure 13). This improving 'correct application' shows that the BMP program has been very successful for state lands. The confidence interval has also increased due to an increase in state sales that were monitored. When breaking down the 'correct application' into the different monitoring categories and comparing them to past years, it becomes apparent that most of the overall 'correct application' improvement came from one monitoring category – forest roads (Figure 15). 'Forest roads' increased its 'correct application' rate by 23.9% from 2003 and 15.9% from 1995-1997. 'Fuels, waste, and spills', 'RMZs', and 'Wetlands' saw improvements from the two prior monitoring results, whereas, 'timber harvesting' has remained fairly consistent – yet very high – 'correct application' rate.

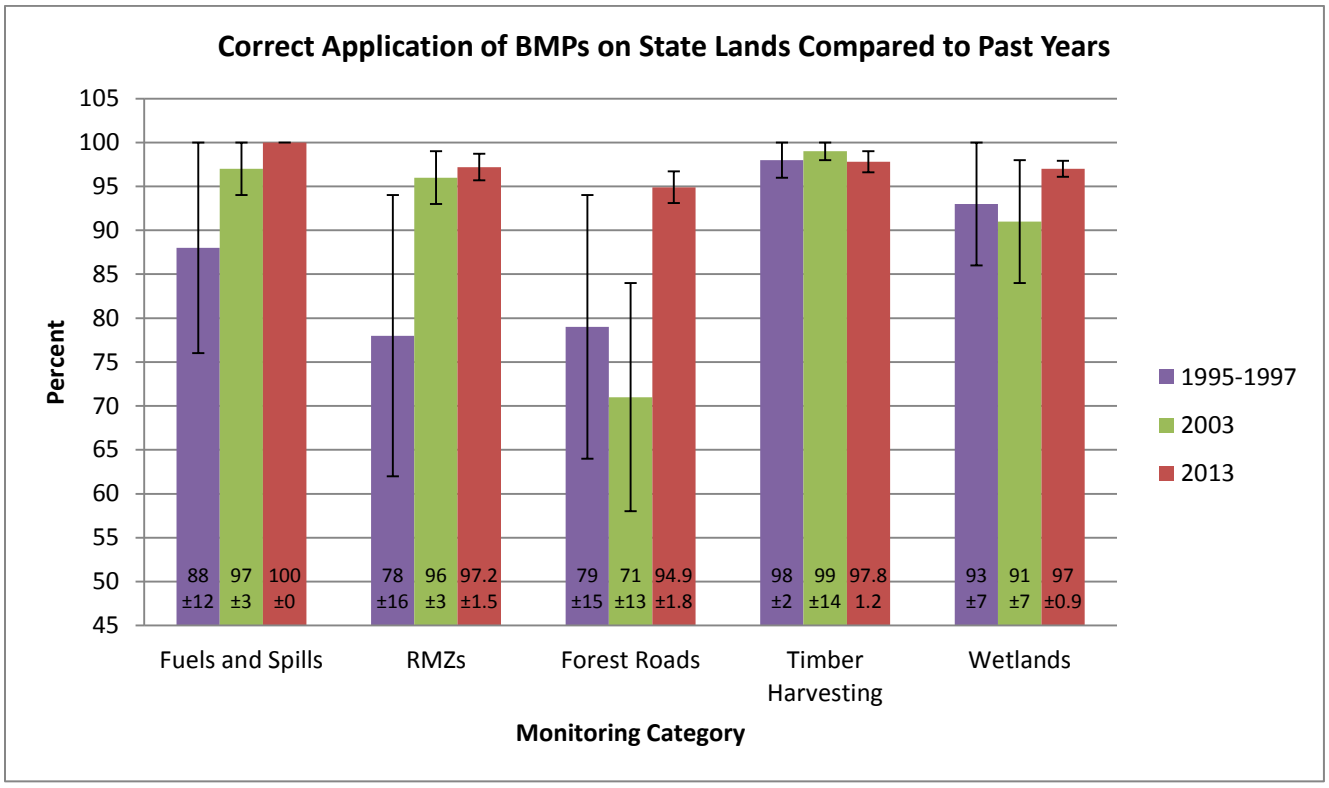


Figure 15. Correct Application rates of BMPs on state lands, with different monitoring categories, of the 2013 BMP results to the past results in 2003 and 1995-1997.

BMP Effectiveness

After a BMP monitoring team decides whether or not a BMP is applicable to the site, they must decide how effective the respective BMP application is in protecting water quality. There are five different categorical effectiveness ratings that can be given to any BMP question that is found to be applicable:

- No adverse impact to water quality
- Minor short-term impact to water quality
- Minor long-term impact to water quality
- Major short-term impact to water quality
- Major long-term impact to water quality

The types of impacts, which describe the effectiveness of the BMPs, are conducted as qualitative measures. These evaluations reflect only the point in time for which the monitoring team is present. The monitoring teams are asked to use their best professional judgment as to what the type of impact the effectiveness of the BMP will have on water quality.

- Short term may refer to an impact that lasts less than one year or recurring for a short period of time for multiple years.
- Long term may refer to an impact that lasts more than one year or persist for a significant length of time for multiple years.
- Minor refers to an slight adverse impact on water quality
- Major refers to a significant adverse impact on water quality

By describing these impacts as a point in time reflectiveness, it means that the best professional expertise is used to rate how an impact is occurring on a specific site at that current time. This could lead to impacts being more or less serious depending on what happens to the site in the future. For example, a huge rain event could wash out a culvert that appeared to be working well which would cause greater adverse impact, or foresters could be planning to fix a road problem after spring break-up, causing less adverse impact.

Figure 16. Slash was used to effectively cross an area in order to protect the soils from rutting.

BMP Effectiveness for 'Correctly Applied' BMPs

County

As to be expected, BMPs that were 'correctly applied' received very high effectiveness rates: 99.6% of the time, no adverse impact to water quality was observed. Only two monitoring categories, 'forest roads' and 'wetlands' received slightly lower rates, at 99%. All other monitoring categories received 100% effectiveness ratings.

State

When BMPs were 'correctly applied' on state lands, they were effective 100% of the time. This means for every time a BMP was applicable and applied correctly, there were no negative impacts to water quality observed on state lands.

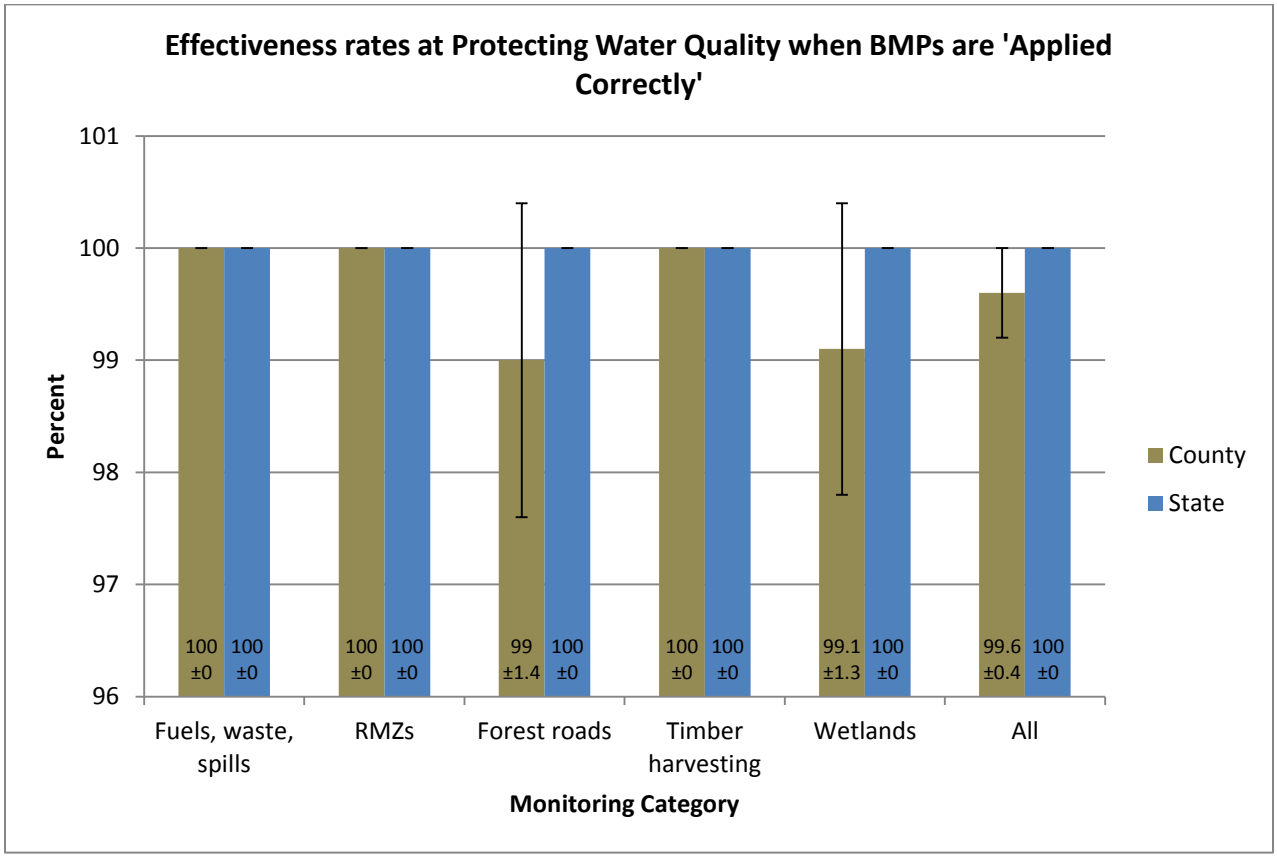


Figure 17. The effectiveness rates for BMPs that are 'applied correctly'. They are additionally broken down by monitoring categories and divided between state lands and county forests.

BMP Effectiveness for 'Not Applied' BMPs

County

When BMPs were 'not applied' on county forests, impacts to water quality were much more common (Figure 18). Only 36.1% of the time, when a BMP was 'not applied' there was no negative impact on water quality observed by the monitoring teams. This means almost 65% of the time, there were negative impacts to water quality observed when a BMP was 'not applied'. The most common impact observed was 'minor, short-term impacts', which occurred 50.8% of the time when a BMP was 'not applied'.

State

Only minor impacts were found on state lands when BMPs were 'not applied' and the most common result was still 'no adverse impact' at 76% (Figure 18). Negative impacts to water quality were found 24% of the time when BMPs were 'not applied'. Both minor 'short-term' and 'minor long-term' impacts were found, but only 12% of the time for each impact type. There were no 'major impacts' of any kind found on state lands.

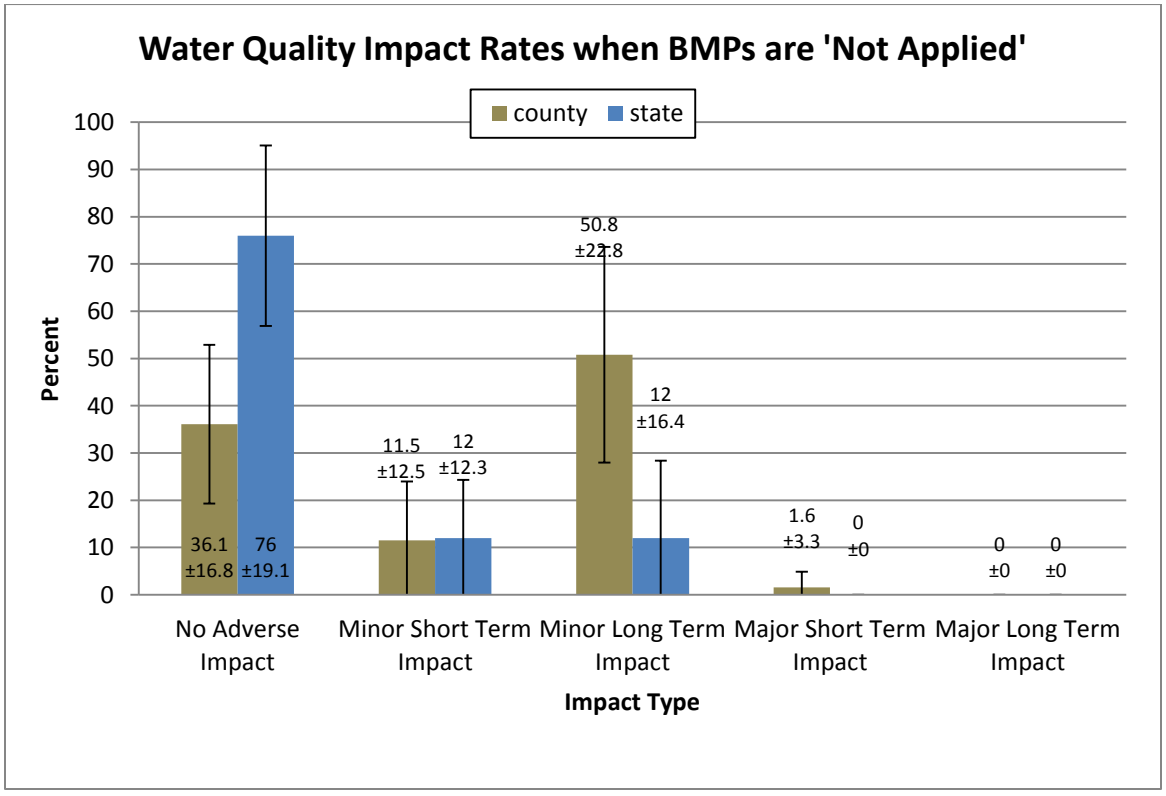


Figure 18. Water quality impact rates when the BMPs were 'not applied'. They are divided between the different types of impact rates and between landowners – state and county.

Conclusion and Recommendations

The results from the 2013 monitoring cycle reveal that the BMP program has seen continued and growing success. High rates of 'correctly applying' BMPs (93.0% county, 97.1% state) led to an even higher rate of protecting water quality (99.6% county, 100% state). Even within this overall high application rate however, individual BMP monitoring categories experience different amounts of compliance. Forest roads, which are historically low, improved on state sites but failed to improve on county sites. It still remains the BMP monitoring category that has the largest room for improvement. Comparing BMPs that were 'correctly applied' to when BMPs are 'failed to be applied' – only 5.0% county and 2.2% state – water quality is protected far less often (36.1% county, 76% state). However, even these are usually rated to be 'minor impacts' to water quality. The most direct way to protect Wisconsin's water quality even further is by continuing to improve the rate on which BMPs are correctly applied – especially on forest roads.

This reinforces the continued use of BMP program and all its derivatives, which includes:

- the education of BMPs to loggers, foresters, and landowners
- training monitoring teams to review harvest sites for BMP application and effectiveness
- producing reports to assess effectiveness and compliance with the BMP program
- Continue improving the BMP Field Manual and Monitoring Worksheet in order to incorporate new scientific findings on water quality and to ensure clear understanding of all BMP rules, guidelines, and goals.

With the sustained use of the BMP program we hope to see even greater correct application rates, and therefore water quality protection, in the future for Wisconsin's waters.

Appendix A: Methods

Selection of Timber Harvests

There were a total of 467 sales cut on state lands and 1590 sales cut on county forests that were able to be monitored for the 2013 BMP monitoring cycle. It was determined that 42 state sites and 33 county sites were needed to ensure a sample size that held statistical validity. A single stage cluster sampling method (which used each sale as a cluster) was used for analysis. By assuring that 42 state and 33 county sites were monitored, this report could confidently (95% confidence interval) assess the accuracy in that the monitoring results were a true representation of the total number of sites cut on state and county lands during the year 2012.

Bias and Limitations

Bias, with regard to BMP monitoring, is where one site is more likely to be selected than another regardless of eligibility criteria. This type of bias can result in a skewed depiction of the total sales, and was limited to the best possible extent.

One area that could have possibly led to a bias in the selection of timber harvests was the blowdown event that took place (mostly) in Burnett and Douglas County, summer 2011. Both the state and county owned, and was still working on, much of that blowdown area. This may have led to the size of harvest becoming larger than it normally would have been (due to the large salvage harvests associated with blowdown events). Also, this would have prompted the harvest of areas concentrated to the blowdown event that would not naturally occur. The cluster of sales, associated with this event can be seen by looking at the 'Team Aquamarine' map in Appendix D.

All sales that were thought to be cut in 2012 on state and county lands were entered into a database by DNR personal and then passed to the DNR Forest Hydrologist and DNR BMP Forester to review. A bias introduced intentionally by our eligibility criteria include sites that have water resources and are close enough to a road system for a monitoring team to walk to them in a timely manner. These intentional biases are brought in so that monitoring teams can focus on sites that have the most possible BMPs applicable and that they can monitor those sites in a time effective manner.

To prevent unwanted bias, all sites were entered into a spreadsheet where they were selected using a random number generator. All sites that were randomly selected were determined to be eligible for monitoring based on the set eligibility criteria found through the combination of: a trip to the site, and satellite review through DNR Surface Water Data Viewer and Google Earth.

Appendix B: Eligibility Criteria –Field Form

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

Eligibility Criteria - Field Form
2013 Forestry BMP Monitoring

ID:_____ Date: _____

Landowner:_____ Landowner Phone:_____

County:_____ Township:_____

Legal Description: T _____ N, R _____ E / W, Section _____, _____ 1/4, _____ 1/4

GPS Lat/Long: _____

Eligibility Criteria:

1.	Was harvesting completed within 200 feet of lake, river or stream?	❑ Yes	❑ No
2.	Was at least one acre of wetland harvested?	❑ Yes	❑ No
3.	Was a significant length of wetland crossed?	❑ Yes	❑ No
4.	Was a stream crossed?	❑ Yes	❑ No
5.	Is it less than a ½ mile walk to the timber sale? (required "yes")	❑ Yes	❑ No

Background Information:
If the timber sale has at least one "yes" in the eligibility criteria, please provide the following information, if known.

Site Conditions
Dominant Cover type:

❑ Spruce-Fir ❑ Aspen ❑ Pine Plantation ❑ Pine (not plantation)
❑ Maple-Basswood ❑ Oak-Hickory ❑ Bottomland Hardwoods

Dominant Topography:

❑ Flat (0-3%) ❑ Gently Rolling (4-9%) ❑ Rolling Hills (10-19%)
❑ Steep (20-45%) ❑ Very Steep (>45%)

Water Resources

Lake: ❑ Yes ❑ No

Name:_____ Size:_____

Stream: ❑ Yes ❑ No

Name:_____ ❑ Perennial ❑ Intermittent

Navigable: ❑ Yes ❑ No Trout Stream: ❑ Yes ❑ No

Wetlands: ❑ Yes ❑ No

Area Harvested:_____ Length Crossed:_____

Springs: ❑ Yes ❑ No Seeps: ❑ Yes ❑ No

Approximate Number:_____ Approximate Number:_____

Notes about water resources:_____

_____

_____

_____

Access to Site

Gated entrance: ❑ Yes ❑ No

Contact Information for Access:_____

Recommended Driving Directions to site/parking location:_____

_____

Is 4-wheel drive or a high clearance vehicle needed to access site? ❑ Yes ❑ No

Sale Information

Forester/Timber Sale Administrator:_____

Contact Information:_____

Logger:_____ Master Logger: ❑ Yes ❑ No

Contact Information:_____

Date Harvested:_____

Logging Equipment Used:_____

Was any equipment tracked? ❑ Yes ❑ No

Harvest System Used: ❑ Clear-cut ❑ Shelterwood ❑ Salvage ❑ Thinning/Selection

❑ Other:_____

Approximate Acres Harvested:_____

Appendix C: 2013 BMP Monitoring Teams

Team 1: Duran Bjorklund, Chris Martin, Sue Reinke, Paul Hanson

Team 2: Scott Mueller, Roberta Kunzman, Nick Crane, Laura Giese

Team 3: Dave Kafura, Charlie Zinsmaster, Will Erickson, Robert Hurray

Team 4: Kent Mikkelson, Quita Sheehan, Steven Kaufman, Manny Oradei

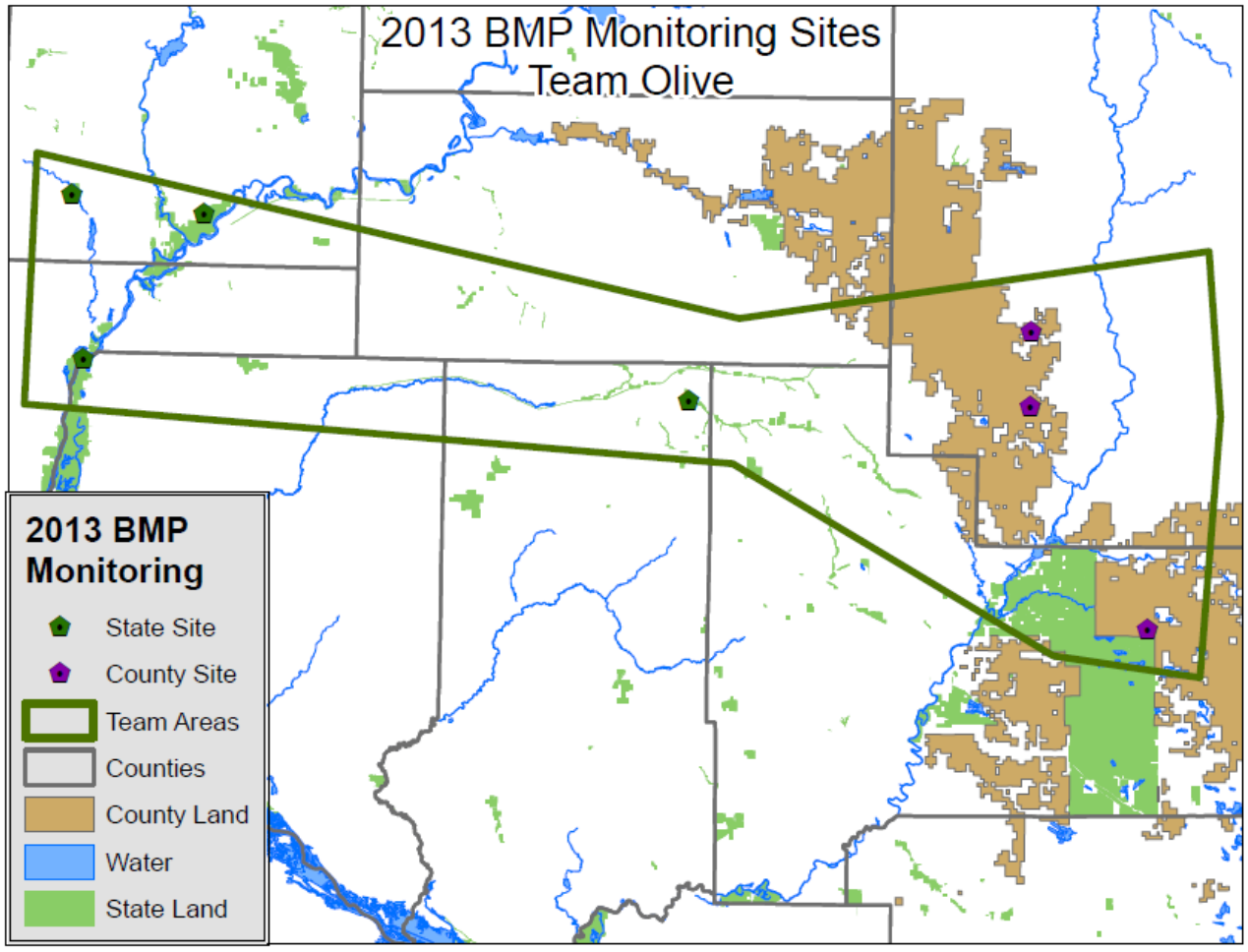
Team 5: Peter Kinsman, Scott leonhardt, Ben Parsons, Brad Hutnick

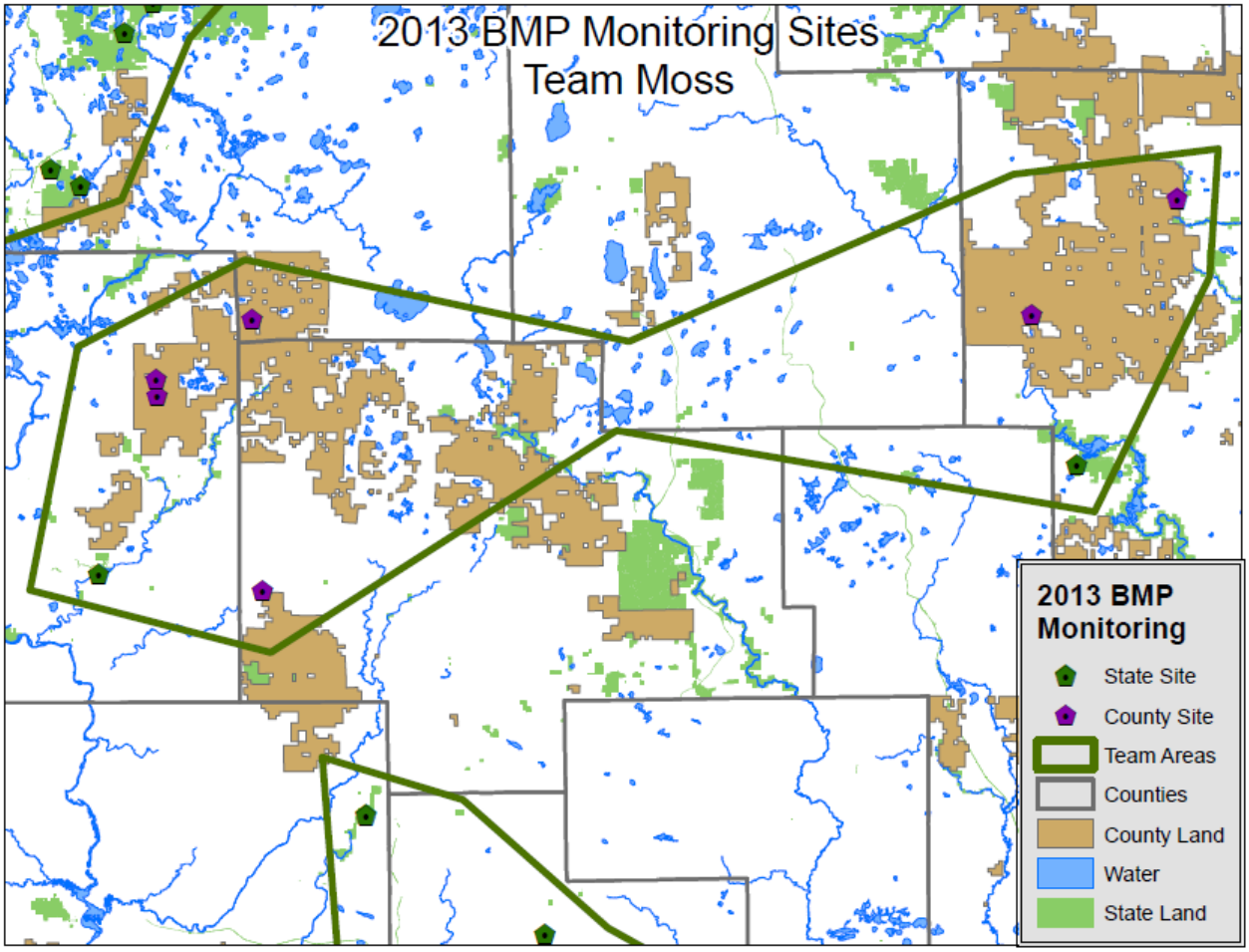
Team 6: Sara Sommer, Lowell Petersen, Joseph Mattke, Tim Allen

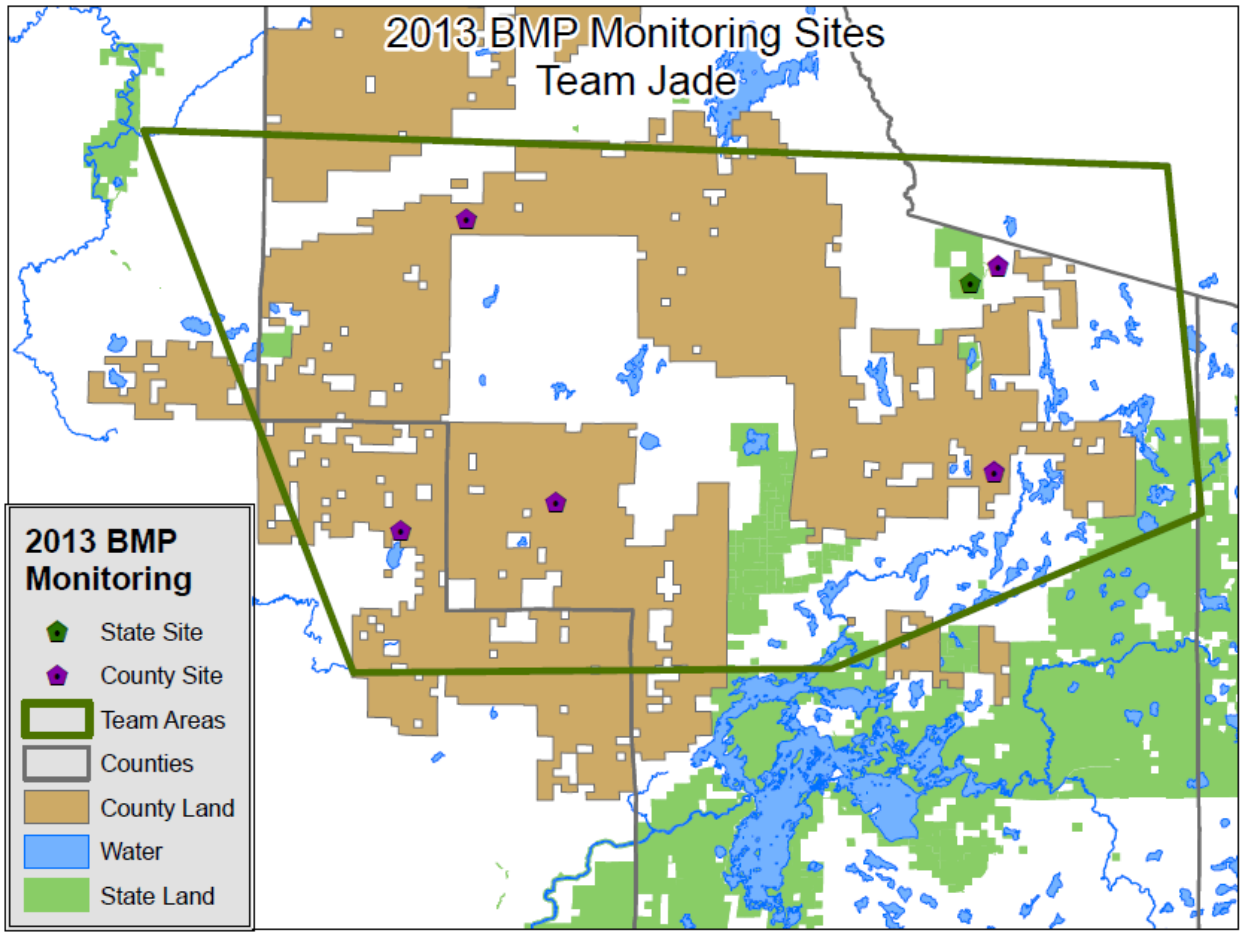
Team 7: Steve Williamson, Randall Mell, Rachel McDonald, Matthew Hansen

Team 8: Steve Kariainen, Joesph Kies, Craig Dalton, Greg Rebman

Appendix D: Team Maps




2013 BMP Monitoring Sites
Team Moss
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land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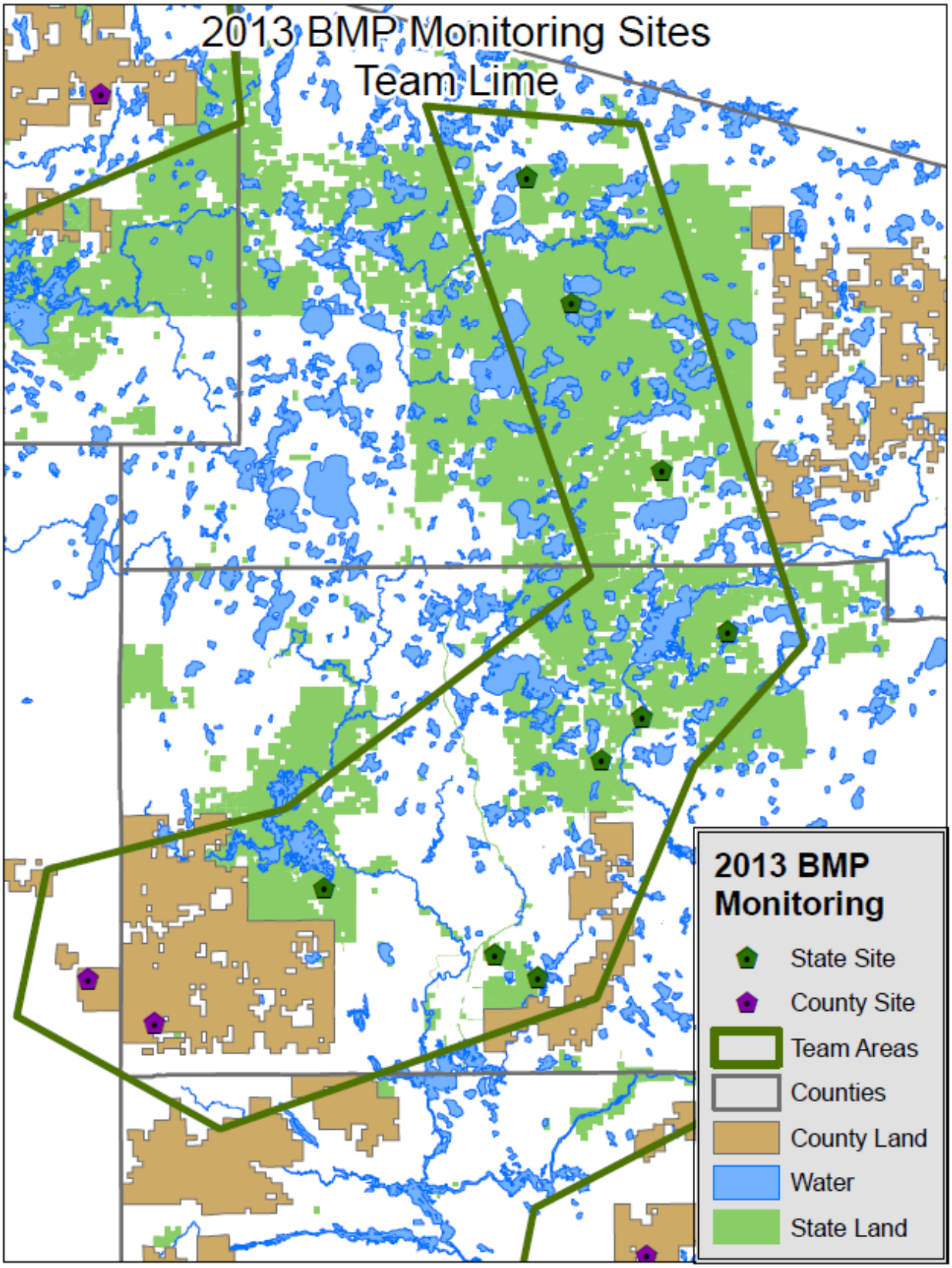
Team Jade
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land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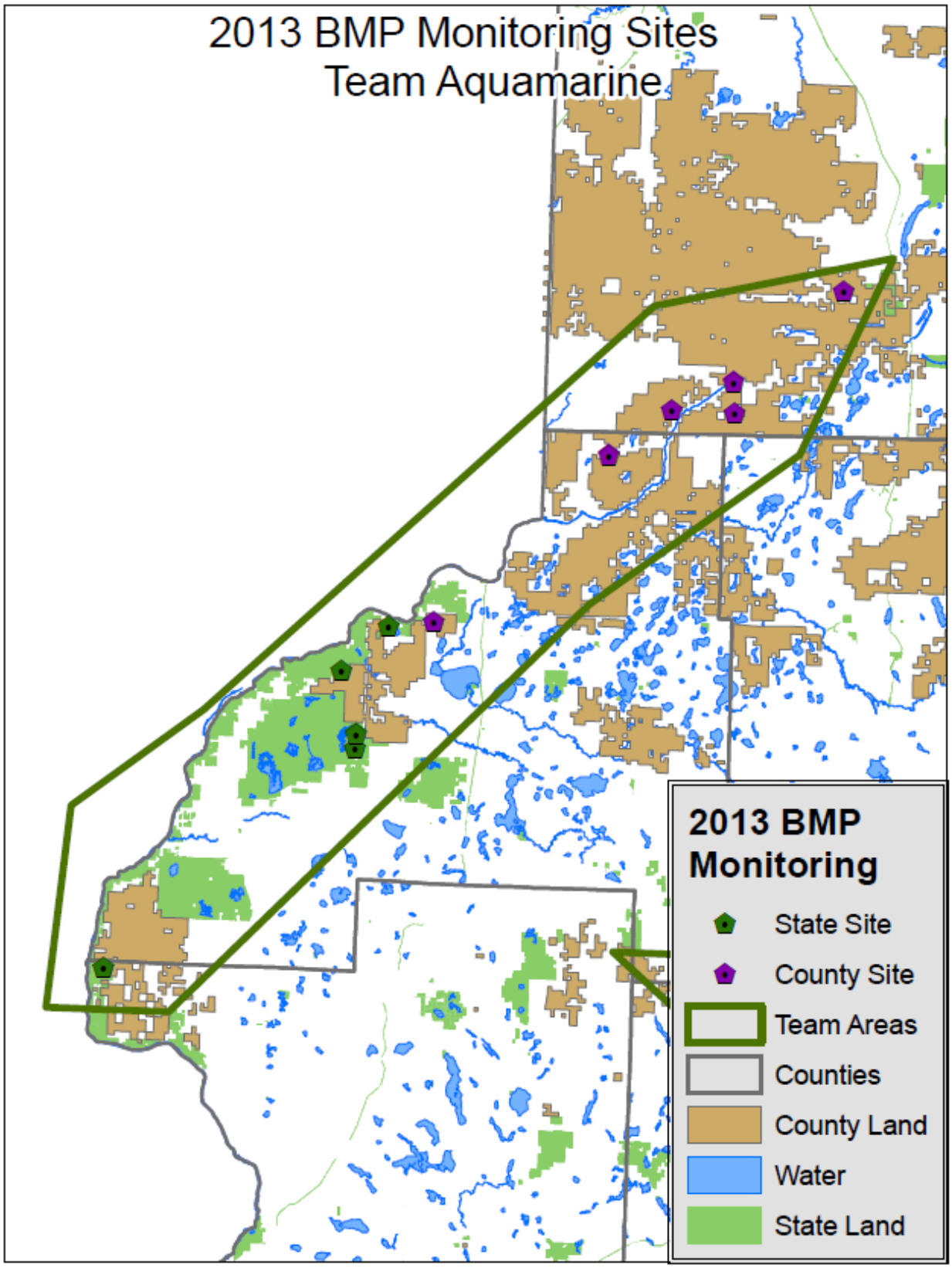
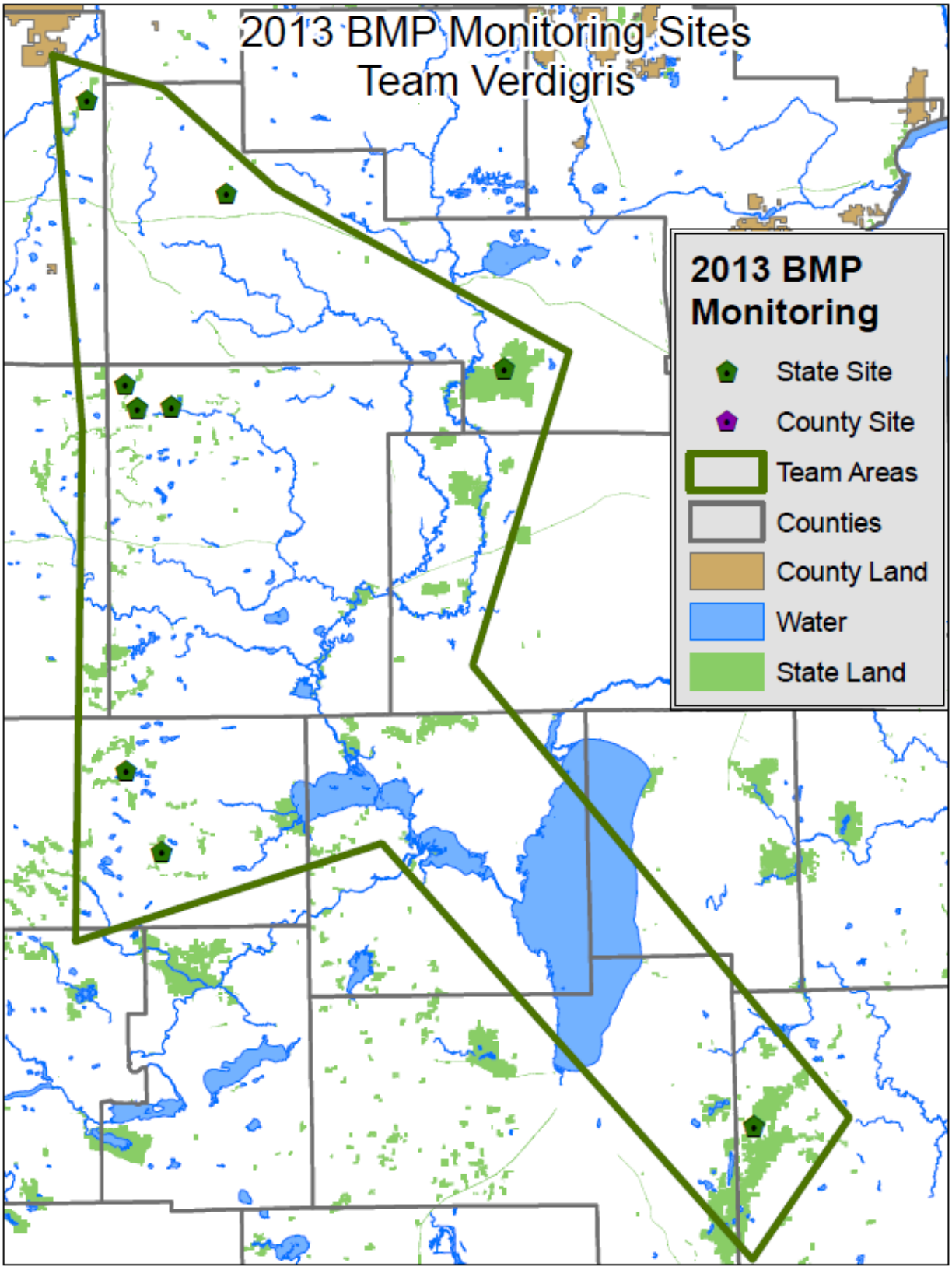
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land


2013 BMP Monitoring Sites
Team Aquamarine
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land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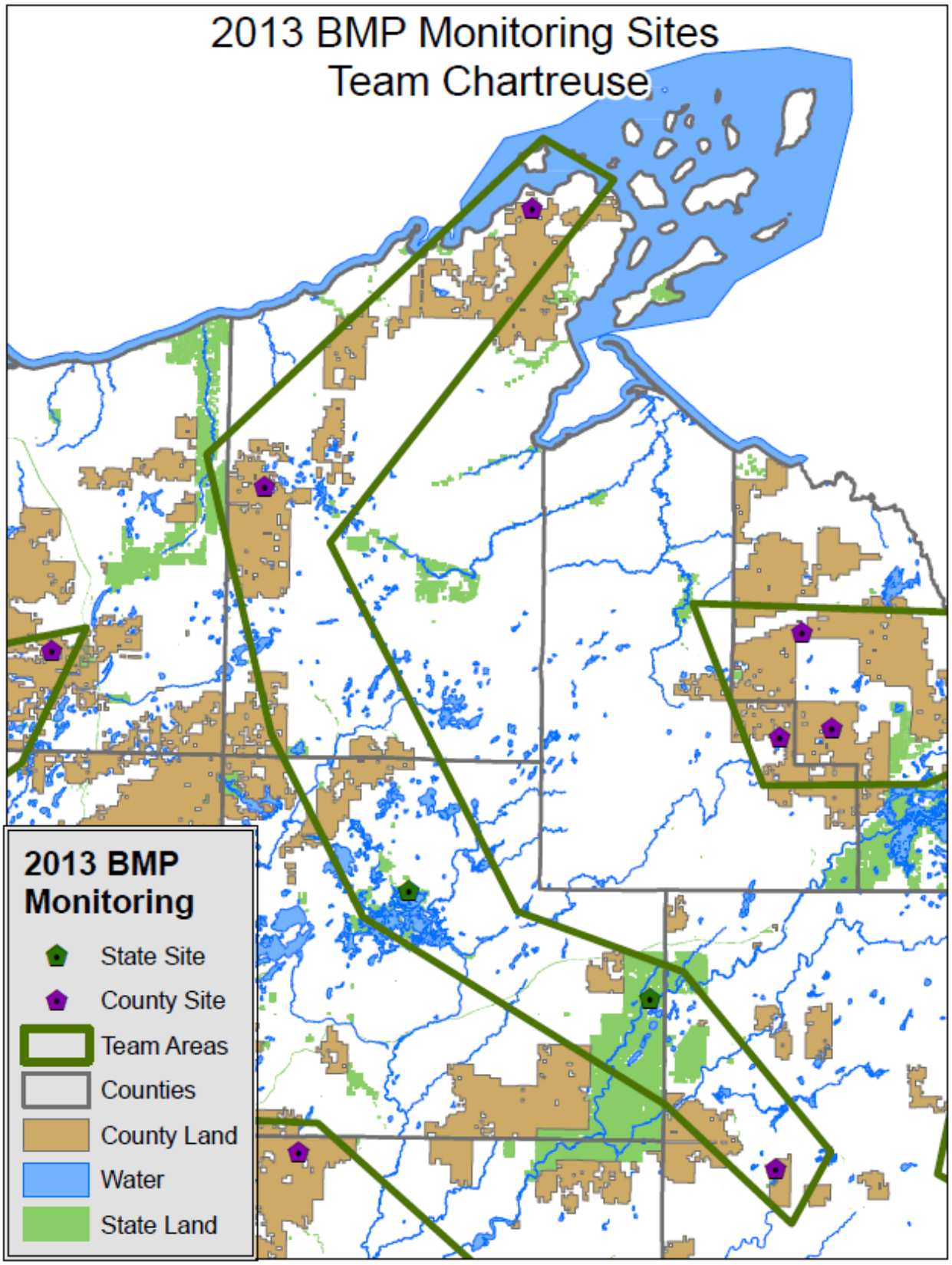
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land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2013 BMP Monitoring
State Site
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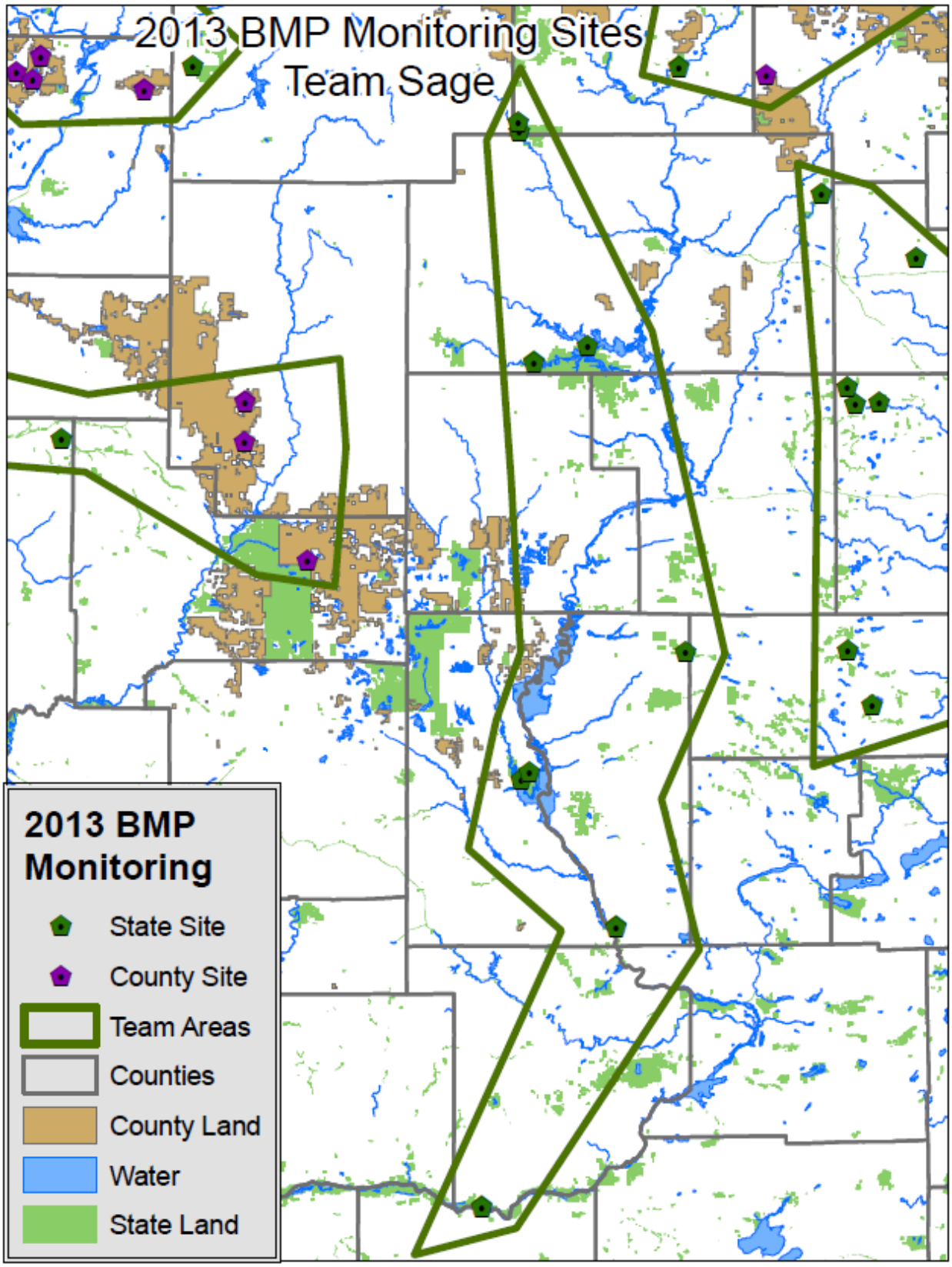
Team Areas
Counties
County Land
Water
State Land


2013 BMP Monitoring Sites
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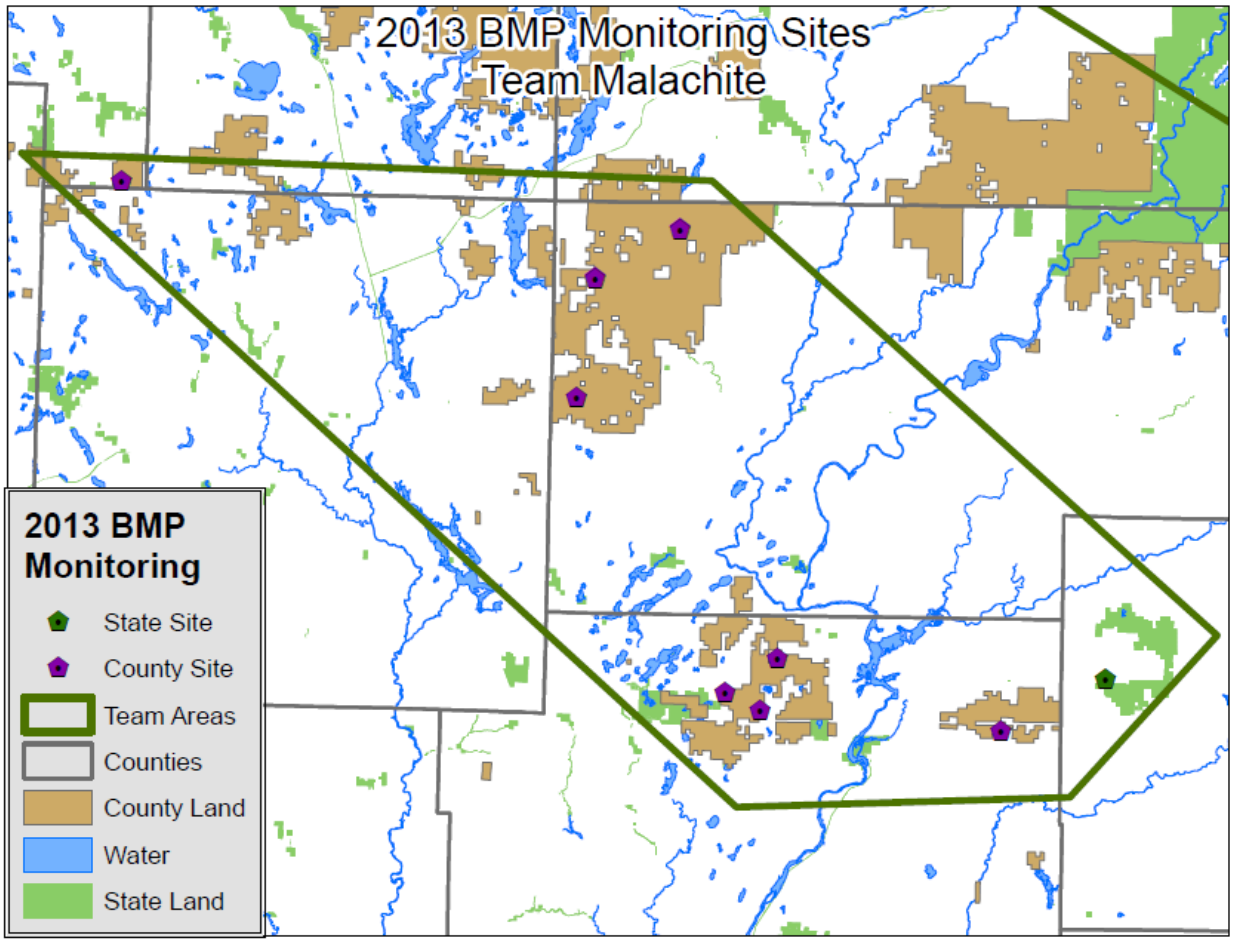
2013 BMP Monitoring Sites
Team Malachite
2013 BMP Monitoring
State Site
County Site
Team Areas
Counties
County Land
Water
State Land

Appendix E: Monitoring Worksheet

2013 BMP Monitoring Worksheet

for Wisconsin's Forestry Best Management Practices for Water Quality

Objectives of BMP Monitoring

1) Determine the extent to which BMPs were applied on the selected sites.
2) Determine the effectiveness of properly applied BMPs in protecting water quality on the selected sites.
3) Determine the effects of not applying BMPs where needed on the selected sites.
4) Obtain descriptive information about RMZs and buffer strips (where present) with respect to size, vegetative composition, and past use.

The results of these objectives from BMP Monitoring will be used to:

* Identify trends
* Identify where modifications may be needed in the BMP field manual
* Identify research and information needs
* Educate landowner, loggers and foresters involved in the sites that are monitored
* Compare and contrast with other landowner categories

Timber Sale ID: _____

Landowner Name: _____

Date: _____

Team:

Aquamarine	Lime	Olive
Chartreuse	Malachite	Sage
Jade	Moss	Verdigris

Non-Team Members: _____

Age of Harvest: ❑ Less than 1 y.o. ❑ 1 to 2 y.o. ❑ More than 2 y.o. ❑ Unknown

Acres Harvested: _____

Weather Conditions: ❑ Sunny ❑ Partly Sunny ❑ Cloudy/Overcast ❑ Rain ❑ Snow ❑ Drought

Any Extreme or Rare Weather Events? ❑ Yes ❑ No
Please explain:

APPLICATION Was the BMP applied at the sale? 1 -- BMP applied correctly 2 -- BMP applied but incorrectly 3 -- BMP not applied 4 -- Insufficient information to rate X -- BMP not applicable to the site (site or harvest conditions not found on site)	**EFFECTIVENESS** What effect did applying (or not applying) the BMP have? 1 -- No adverse impact 2 -- Minor short-term impact 3 -- Minor long-term impact 4 -- Major short-term impact 5 -- Major long-term impact

BEST MANAGEMENT PRACTICES	**APPLICATION**	**EFFECTIVENESS**	**COMMENTS/IMPACT**
A. Fuels, Lubricants, Waste and Spills			
Fuels, Lubricants, and Waste (p. 115)			
1. Designate specific areas for equipment maintenance and fueling. Locate these areas on level terrain, a minimum of 100 feet from all streams and lakes.			
2. Collect all waste lubricants, containers, and trash (i.e. grease cartridges).			
B. Riparian Management Zones			
BMPs Common to All Three RMZ Categories (p. 90)			
B-a. Is there a lake or stream present in the area monitored for the timber sale? (Check all that apply.)	❑ Yes – lake(s). ❑ Yes – stream(s). Go to next question.		❑ No. Go to Section C – Forest Roads.
3. Locate roads outside the RMZ, unless necessary for stream crossings.			
4. Locate landings outside the RMZ.			
5. Do not dispose of or pile slash within the RMZ.			
6. Minimize soil exposure and compaction to protect ground vegetation and the duff layer.			
B-b. Did harvesting occur within the RMZ?	❑ Yes.		❑ No.
B-c. If harvesting occurred within the RMZ, what type of equipment was used?			
BMPs for Lakes, Designated Trout Streams, & Streams 3' Wide & Wider (100' RMZ) (p. 91)			
B-d. Is there a lake, designated trout stream, or stream 3' wide or wider in or adjacent to the harvest area of the timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question B-i.
7. Do not operate wheeled or tracked equipment within 15 feet of the ordinary high water mark (OHWM) except on roads or at stream crossings.			
8. Operate wheeled or tracked equipment within 15 to 50 feet of the OHWM when the ground is frozen or dry.			
9. Do not harvest fine woody material within 50 feet of the OHWM.			
10. Use selection harvests and promote long-lived tree species appropriate to the site.			
11. Harvesting intervals should be a minimum of every 10 years			

12. Harvesting plans should leave at least 60 ft^2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.			
13. Develop trees 12 inches DBH and larger.			
B-e. The RMZ width….	❑ Meets the minimum standard of 100 feet. ❑ Exceeds the minimum standard of 100 feet. ❑ Is less than the minimum standard of 100 feet. ❑ An RMZ was not used.		
B-f. If the RMZ width was modified, it was…	❑ Increased _____ feet. ❑ Decreased _____ feet.		
B-g. The basal area retained within the RMZ was…	❑ 0 – 20 sq. ft./acre ❑ 20 – 40 sq. ft./acre ❑ 40 – 60 sq. ft./acre ❑ 60 – 80 sq. ft./acre ❑ More than 80 sq. ft./acre		
B-h. The **pre-harvest** condition of the RMZ was…	❑ Forested the entire width ❑ Forested greater than 50% of the width ❑ Forested less than 50% of the width ❑ Not forested (tag alders or sedge meadow)		
BMPs for Stream Less Than 3' Wide (35' RMZ) (p. 92)			
B-i. Is there a stream less than 3 feet wide in or adjacent to the harvest area of the timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question B-n.
14. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high water mark (OHWM), only when the ground is frozen or dry.			
15. Do not harvest fine woody material within 15 feet of the OHWM.			
16. Use selection harvests and promote long-lived tree species appropriate to the site.			
17. Harvesting intervals should be a minimum of every 10 years.			
18. Harvesting plans should leave at least 60 ft^2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.			
B-j. The RMZ width….	❑ Meets the minimum standard of 35 feet. ❑ Exceeds the minimum standard of 35 feet. ❑ Is less than the minimum standard of 35 feet. ❑ An RMZ was not used.		
B-k. If the RMZ width was modified, it was…	❑ Increased _____ feet. ❑ Decreased _____ feet.		
B-l. The basal area retained within the RMZ was…	❑ 0 – 20 sq. ft./acre ❑ 20 – 40 sq. ft./acre ❑ 40 – 60 sq. ft./acre ❑ 60 – 80 sq. ft./acre ❑ More than 80 sq. ft./acre		
B-m. The **pre-harvest** condition of the RMZ was…	❑ Forested the entire width ❑ Forested greater than 50% of the width ❑ Forested less than 50% of the width ❑ Not forested (tag alders or sedge meadow)		

BMPs for Streams Less Than 1' Wide (35' RMZ) (p. 93)			
B-n. Is there a stream less than 1 foot wide in or adjacent to the harvest area of the timber sale?	❑ Yes. Go to next question.		❑ No. Go to Section C – Forest Roads.
19. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high-water mark (OHWM) only when the ground is frozen or dry.			
20. Do not harvest fine woody material within 15 feet of the OHWM.			
B-o. The RMZ width….	❑ Meets the minimum standard of 35 feet. ❑ Exceeds the minimum standard of 35 feet. ❑ Is less than the minimum standard of 35 feet. ❑ An RMZ was not used.		
B-p. If the RMZ width was modified, it was…	❑ Increased _____ feet. ❑ Decreased _____ feet.		
B-q. The basal area retained within the RMZ was…	❑ 0 – 20 sq. ft./acre ❑ 20 – 40 sq. ft./acre ❑ 40 – 60 sq. ft./acre ❑ 60 – 80 sq. ft./acre ❑ More than 80 sq. ft./acre		
B-r. The **pre-harvest** condition of the RMZ was…	❑ Forested the entire width ❑ Forested greater than 50% of the width ❑ Forested less than 50% of the width ❑ Not forested (tag alders or sedge meadow)		
C. Forest Roads			
Location and Design of Forest Roads (p. 37 & 44)			
C-a. Was there a forest road system for this timber sale?	❑ Yes. Go to next question.		❑ No. Go to Section D – Timber Harvesting.
C-b. What best describes the forest road design? (Check all that apply.)	❑ Crowned ❑ Out-sloped		❑ In-sloped ❑ Flat
C-c. What best describes the predominant construction of forest roads?	❑ Roads are below the grade of adjoining land. ❑ Roads are at grade with no ditch constructed. ❑ Roads have an excavated ditch less than 1 foot deep. ❑ Roads have an excavated ditch greater than 1 foot deep. ❑ Roads were created by cut and fill on side slopes. ❑ Roads were constructed of fill material with no excavation. ❑ Roads are a combination of these types.		
C-d. Was there an existing forest road system for this timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question C-e.
21. Use existing roads when they provide the best long- term access.			
C-e. Were forest roads constructed or improved for this timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question C-d
22. Select road locations that allow for drainage away from the road.			
23. Where possible, locate roads on well-drained soils.			
24. Minimize the number of stream, dry wash, and wetland crossings.			

25. Locate roads outside of riparian management zones and wetland filter strips, except at crossings			
26. Road grades should not exceed 10%. If road grades greater than 10% are necessary, limit grade length or break the grade using drainage structures.			
27. Construct roads to follow natural contours and minimize cut and fills.			
28. Construct roads to remove water from road surfaces.			
29. Construct stable cut and fill slopes that will re-vegetate easily, either naturally or artificially.			
30. Do not bury debris in the road base.			
Drainage Structures on Forest Roads (p. 53)			
C-f. Were forest roads constructed or improved for this timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question 35.
31. Install drainage structures to remove water from road surface and ditches.			
32. Install a berm at the inlets of drainage structures, if needed, to direct water into the structures.			
33. Provide erosion protection at the outlets of drainage structures to minimize erosion and disperse the water.			
34. Install drainage structures at grades of at least 2% more than the ditch grade and at a 30 to 45 degree angle to the road.			
35. Check drainage structures to ensure that they are not filling with sediment or other debris. Clean if needed.			
C-g. What types of drainage structure were used on the road system? (check all that apply)	❑ New cross drain culvert(s). Go to Question 36. ❑ Existing cross drain culvert(s) ❑ New open-top culvert(s) ❑ Existing open-top culvert(s) ❑ New broad-based dip(s). Go to Question 37. ❑ Existing broad-based dip(s) ❑ New water bar(s) ❑ Existing water bar(s) ❑ New diversion ditch(es) ❑ Existing diversion ditch(es) ❑ No drainage structures were used		
Cross Drain Culverts for Drainage on Forest Roads (pp. 54)			
36. Install cross drain culverts long enough to extend beyond the road fill.			
Broad-based Dips for Drainage on Forest Roads (p. 54)			
37. Construct broad-based dips deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely.			
Soil Stabilization on Forest Roads (p. 56)			
38. Use seed, mulch and/or erosion control netting where necessary to minimize soil erosion into lakes, streams and wetlands. See Tables 4-3 and 4-4.			
39. Install sediment control structures where necessary to slow the flow of runoff and trap sediment until vegetation is established at the sediment source. See Tables 4-3 and 4-4.			
40. Maintain, clean and/or replace sediment control structures until areas of exposed soil are stabilized.			

Forest Road Maintenance – Active Forest Roads (p. 61)			
C-h. Does the forest road system include active roads? Roads are considered active if they continue to be used by the landowner and/or public for multiple uses, such as forest management, hunting and recreation.	❑ Yes. Go to next question.		❑ No. Go to Question C-i.
41. Inspect the road system at regular intervals. Clear debris from drainage structures to prevent clogging that can lead to washouts.			
42. Keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs.			
43. Shape road surfaces periodically to maintain proper surface drainage. Fill in ruts and holes with gravel or compacted fill as soon as possible to reduce erosion potential.			
44. Remove berms along the edge of the road if they will trap water on the road.			
45. When dust control agents are used, apply them in a manner that will keep these compounds from entering lakes, stream and groundwater.			
Forest Roads Maintenance – Inactive Forest Roads (p. 62)			
C-i. Does the forest road system include inactive roads? Inactive roads are not used for extended periods of time and may be closed by gates, berms, boulders, pits or other measures that make vehicle passage unlikely in order to protect the road surface and water protection measures. In some instances, the length of time and/or reason for closure may be posted and acceptable uses may be invited to assure compliance with the road closure.	❑ Yes. Go to next question.		❑ No. Go to Question C-j.
46. Remove all temporary drainage and crossing structures.			
47. Shape all road system surfaces to maintain proper surface drainage, if necessary.			
48. Inspect and maintain road surfaces, drainage structures, and crossings to minimize erosion.			
General BMPs for Stream Crossings on Forest Roads (p. 67-68)			
C-j. Was a stream crossed in forest road system?	❑ Yes. Go to next question.		❑ No. Go to Section D – Timber Harvesting.
C-k. Which of the following best describe the stream crossing?	❑ New crossing used. Go to next question. ❑ Existing stream crossing used. Go to Question 55. ❑ Both new and existing stream crossings used. Go to next question.		

49. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.			
50. Install stream crossing structures at right angles to the stream channel.			
51. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.			
52. Minimize channel changes and the amount of excavation or fill needed at the crossing.			
53. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.			
54. Use soil stabilization practices on exposed soil at stream crossings.			
55. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life.			
56. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.			
57. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.			
C-l. What type of stream crossings were used in the forest road system?	❑ Bridges ❑ Culverts ❑ Fords ❑ Pole fords (PVC or logs) ❑ Timber mats ❑ Frozen snow/ice crossing ❑ Other: _____ ❑ Stream crossed without any structure		
Stream Crossing BMPs for Culverts on Forest Roads (p.69)			
C-m. Were culverts used as stream crossing structures on the forest roads?	❑ Yes. Go to next question.	❑ No. Go to Question C-o.	
C-n. Which of the following best describe the stream crossing structure(s)?	❑ New culvert(s) were installed. Go to next question. ❑ Existing culvert(s) were used. Go to Question 63. ❑ Both new and existing culvert(s) were used. Go to next question.		
58. Install culverts that extend at least 1 foot beyond the road fill.			
59. Install culverts that are large enough to pass flood flows.			
60. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.			
61. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.			
62. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.			

63. Keep culverts clear and free of debris so that water can pass unimpeded at all times.			
Stream Crossing BMPs for Fords on Forest Roads (p. 70)			
C-o. Were fords installed as stream crossing structures on the forest roads?	❑ Yes. Go to next question.		❑ No. Go to Question C-p.
64. Locate fords where stream banks are low.			
65. Locate where the stream bed has a firm rock or gravel streambed.			
Temporary Stream Crossing BMPs on Forest Roads (p. 71)			
C-p. Were temporary stream crossing structures installed on the forest roads?	❑ Yes. Go to next question.		❑ No. Go to Section D – Timber Harvesting.
66. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.			
67. Anchor temporary structures on one end with a cable or other device so they do not float away during high water.			
D. Timber Harvesting			
Landings BMPs (p. 74)			
D-a. Were there any existing landings available for this timber sale?	❑ Yes. Go to next question.		❑ No. Go to Question 69.
68. Use existing landings if possible.			
69. Locate landings on frozen ground or on firm well-drained soils with a slight slope or that have been shaped to promote efficient drainage.			
70. Locate residue piles (sawdust, chipping residue, and other material) away from areas where runoff may wash residue into streams, lakes or wetlands.			
Skid Trail BMPs (p. 39)			
71. Where possible, keep skid trail grades less than 15%. Where steep grades are unavoidable, break the grade and install drainage structures at recommended intervals. Grades greater than 15% should not exceed 300 feet in length.			
72. Use existing skid trails if they provide the best long-term access.			
General Timber Harvesting BMPs (p. 76)			
73. Limit the length and number of skid trails, landing, and stream crossing to the minimum necessary for conducting the harvest operation and to meet the landowner's objectives.			
74. Whenever possible, winch logs up steep slopes if conventional skidding could cause erosion that affects water quality.			
75. Avoid operating equipment where excessive soil compaction, rutting, or channelized runoff may cause erosion that affects water quality.			

76. Fill in ruts, apply seed and mulch, and install sediment control structures and drainage structures on skid trails and landings where needed to prevent erosion and sedimentation into surface waters.			
77. Inspect soil stabilization practices periodically during and after harvest operations to insure that they are successful and remain functional.			
78. Do not dispose of or pile slash in areas where runoff may wash slash into lakes, streams, or wetlands.			
79. For winter harvesting, mark stream channels, dry washes, and existing culvert locations before snowfall.			
Dry Wash BMPs (p.78)			
D-b. Are there any dry washes associated with the timber harvest?	❑ Yes. Go to next question.		❑ No. Go to Question D-c.
80. Use selection harvests or patch clear-cuts within 35 feet of the dry wash to promote tree species appropriate to the site.			
81. Avoid locating roads and landings within 35 feet of the dry wash unless necessary for crossings.			
82. Operate wheeled or tracked equipment within 15 feet of the dry wash only when the ground is frozen or dry.			
83. Do not harvest fine woody material within 15 feet of the dry wash.			
84. Minimize soil exposure and compaction to protect ground vegetation and the duff layer.			
85. Avoid cabling logs across the dry wash, where feasible, to prevent damage to the banks of the dry wash.			
General BMPs for Stream Crossings on Skid Trails (p. 67-68)			
D-c. Are there any stream crossings associated with the skid trails?	❑ Yes. Go to next question.		❑ No. Go to Section E – Wetlands.
D-d. Which of the following best describe the stream crossing?	❑ New crossing used. Go to next question. ❑ Existing stream crossing used. Go to Question 92. ❑ Both new and existing stream crossings used. Go to next question.		
86. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.			
87. Install stream crossing structures at right angles to the stream channel.			
88. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.			
89. Minimize channel changes and the amount of excavation or fill needed at the crossing.			
90. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.			
91. Use soil stabilization practices on exposed soil at stream crossings.			
92. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life.			
93. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.			

94. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.			
D-e. What type of stream crossings were used on the skid trails?	❑ Bridges ❑ Culverts ❑ Fords ❑ Pole fords (PVC or logs) ❑ Timber mats ❑ Frozen snow/ice crossing ❑ Other: _____ ❑ Stream crossed without any structure		
Stream Crossing BMPs for Culverts on Skid Trails (p. 69)			
D-f. Were pipe culverts used for crossing streams on skid trails?	❑ Yes. Go to next question.	❑ No. Go to Question D-h.	
D-g. Which of the following best describe the stream crossing structure(s)?	❑ New culvert(s) were installed. Go to next question. ❑ Existing culvert(s) were used. Go to Question 100. ❑ Both new and existing culvert(s) were used. Go to next question.		
95. Install culverts that extend at least 1 foot beyond the road fill.			
96. Install culverts that are large enough to pass flood flows.			
97. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.			
98. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.			
99. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.			
100. Keep culverts clear and free of debris so that water can pass unimpeded at all times.			
Fords for Stream Crossings on Skid Trails (p. 27 & 40)			
D-h. Were fords used for crossing streams on skid trails?	❑ Yes. Go to next question.	❑ No. Go to Question D-j.	
D-i. Which of the following best describe the stream crossing structure(s)?	❑ New ford(s) were installed. Go to next question. ❑ Existing ford(s) were used. Go to Question D-h. ❑ Both new and existing ford(s) were used. Go to next question.		
101. Locate fords where stream banks are low.			
102. Locate where the stream bed has a firm rock or gravel streambed.			

Temporary Stream Crossing BMPs on Skid Trails (p. 71)			
D-j. Were temporary stream crossing structures installed on skid trails?	❑ Yes. Go to next question.		❑ No. Go to Section E – Wetlands.
103. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.			
104. Anchor temporary structures on one end with a cable or other device so they do not float away during high water.			
E. Wetlands			
General Wetland BMPs (p.100)			
E-a. Is there a wetland present?	❑ Yes. Go to next question.		❑ No. Go to Section F – Supplemental Questions.
105. Whenever practical, avoid locating roads and landings in wetlands; otherwise use extreme caution.			
106. Whenever possible, forest management activities in wetlands should occur on frozen ground to minimize rutting.			
107. Do not dispose of or move upland slash into a wetland. Slash from trees harvested within the wetland may remain in the wetland.			
E-b. What best describes the source of slash deposition in the wetland?	❑ Slash was moved into the wetland from the uplands. ❑ Slash was from trees harvested in the wetlands. ❑ No slash was left in the wetland.		
108. Keep slash out of open water.			
109. Whenever practical, avoid equipment maintenance and fueling in wetlands.			
Wetland Filter Strip BMPs (p.101)			
110. Whenever practical, avoid locating roads and landings in the wetland filter strip; otherwise use extreme caution.			
111. Minimize soil exposure and compaction to protect the ground vegetation and the duff layer in the wetland filter strip.			
112. Operate equipment in the wetland filter strip only when the ground is firm or frozen.			
Wetland Roads, Skid Trails, and Landings (pp. 105-108)			
E-c. Were any wetlands crossed to access or to harvest the timber sale or were any wetlands used as landings?	❑ Yes. Go to next question.		❑ No. Go to Section F – Supplemental Questions.
113. Construct upland approaches to the wetland so the surface runoff is diverted away from the road approach prior to reaching the wetland.			
114. If landings are necessary in a wetland, build them to the minimum size required for the operation and to achieve the landowner's objective.			

115. Avoid operating equipment in areas of open water, springs, or seeps.			
116. Provide for adequate cross-road drainage in roads to minimize changes to natural surface and subsurface flow in the wetland.			
117. Use low ground pressure equipment, such as wide tire or tracked equipment, if necessary to minimize rutting.			
118. Minimize rutting in wetlands by conducting forestry activities on firm or frozen ground that can support the equipment.			
119. Cease equipment operations when rutting becomes excessive.			

F. Supplemental Questions		
Water Resources		
F-a. Are there any springs or seeps present?	❑ Yes. Go to next question.	❑ No. Go to Question F-d.
F-b. Was there a skid trail or forest road in a spring or seep?	❑ Yes. Go to next question.	❑ No. Go to Question F-d.
F-c. What was the impact on the spring or seep?	❑ No adverse impact to water quality. ❑ Minor short-term impacts to water quality ❑ Minor long-term impacts to water quality. ❑ Major short-term impacts to water quality. ❑ Major long-term impacts to water quality.	
Timber Harvesting		
F-d. What is the dominant cover type(s) of the harvested area? (check all that apply)	❑ Aspen ❑ Spruce/Fir ❑ Pine ❑ Maple/Basswood ❑ Oak/Hickory ❑ Bottomland Hardwoods ❑ Swamp Conifers ❑ Other:	
F-e. If the dominant tree species that were harvested are different than the dominant cover type, what types of tree species were harvested?	❑ Aspen ❑ Spruce/Fir ❑ Pine ❑ Maple/Basswood ❑ Oak/Hickory ❑ Bottomland Hardwoods ❑ Swamp Conifers ❑ Other:	
F-f. What best describes the silvicultural prescription(s) used?	❑ Clearcut ❑ Clearcut with reserves ❑ Shelterwood ❑ Seedtree ❑ Selection harvest ❑ Other:	
F-g. What best describes the timber stand improvements that were used, if any.	❑ Pre-commercial thinning ❑ Crop tree release ❑ Other: ❑ None	
F-h. What best describes the type of harvesting system(s) used?	❑ Shortwood (cut-to-length) ❑ Tree-length (pole skidding)	

(check all that apply)	❑ Whole tree (chipping operation) ❑ Other:	
F-i. What best describes the logging equipment used?	❑ Wheeled ❑ Tracked ❑ Both ❑ Other:	
F-j. Was this a salvage operation?	❑ Yes	❑ No.
F-k. What season(s) did harvesting occur?	❑ Spring (March – May)	
	❑ Summer (June – August)	
	❑ Fall (September – November)	
	❑ Winter (December – February)	
	❑ Unknown	
Overall Evaluation		
F-l. What were some of the positive aspects of this timber sale?		
F-m. With respect to water quality, what could have been done better?		
F-n. How would you rate this site for the overall application of BMPs for water quality?	❑ 1 = Total negligence ❑ 2 = Poor ❑ 3 = Average ❑ 4 = Good ❑ 5 = Excellent	
F-o. How would you rate this site for its overall impact on water quality?	❑ 1 = Severe impacts to water quality ❑ 2 = Moderate impacts to water quality ❑ 3 = Slight impacts to water quality ❑ 4 = Negligible impacts to water quality ❑ 5 = No visible impacts to water quality	

GPS and Photo Waypoint Log

(Important for documenting waypoint data)

Lat/Long/Waypoint Name	Description of Waypoint and Photo	Date and Time

Appendix F-1: State Results

Timber Sales	**Application Rating**	**Effectiveness Rating**					
	BMP Application	Total	No Adverse Impact	Minor Short-Term Impact	Minor Long-Term Impact	Major Short-Term Impact	Major Long-Term Impact
Summary of ALL BMPs	Not Applicable	3785					
	Insufficient Information	32					
	Applied Correctly	1147	1147	0	0	0	0
	Applied Incorrectly	8	2	6	0	0	0
	Not Applied	26	21	3	2	0	0
Fuels, Lubricants, Waste, and Spills							
1. Designate soecific areas for equipment maintenance and fueling. Locate these areas on level terrain, a minimum of 100 feet from all lakes and streams.	Not Applicable	0					
	Insufficient Information	0					
	Applied Correctly	42	42	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
2. Collect all waste lubricants, containers and trash (i.e. grease cartridges).	Not Applicable	0					
	Insufficient Information	0					
	Applied Correctly	42	42	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Riparian Management Zones							
3. Locate roads outside the RMZ, unless necessary for stream crossings.	Not Applicable	14					
	Insufficient Information	0					
	Applied Correctly	27	27	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
4. Locate landings outside the RMZ.	Not Applicable	8					
	Insufficient Information	0					
	Applied Correctly	34	34	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
5. Do not dispose of or pile slash within the RMZ.	Not Applicable	9					
	Insufficient Information	1					
	Applied Correctly	31	31	0	0	0	0
	Applied Incorrectly	1	1	0	0	0	0
	Not Applied	0	0	0	0	0	0
6. Minimize soil exposure and compaction to protect ground vegetation and the duff layer.	Not Applicable	12					
	Insufficient Information	1					
	Applied Correctly	29	29	0	0	0	0

	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
7. Do not operate wheeled or tracked equipment within 15 feet of the ordinary high water mark (OHWM) except on roads or at stream crossings.	Not Applicable	15					
	Insufficient Information	1					
	Applied Correctly	26	26	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
8. Operate wheeled or tracked equipment within 15 to 50 feet of the OHWM when the ground is frozen or dry.	Not Applicable	19					
	Insufficient Information	1					
	Applied Correctly	22	22	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
9. Do not harvest fine woody material within 50 feet of the OHWM.	Not Applicable	30					
	Insufficient Information	1					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
10. Use selection harvests and promote long-lived tree species appropriate to the site.	Not Applicable	22					
	Insufficient Information	1					
	Applied Correctly	17	17	0	0	0	0
	Applied Incorrectly	1	1	0	0	0	0
	Not Applied	1	1	0	0	0	0
11. Harvesting intervals should be a minimum of every 10 years.	Not Applicable	18					
	Insufficient Information	0					
	Applied Correctly	24	24	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
12. Harvesting plans should leave at least 60 ft2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.	Not Applicable	21					
	Insufficient Information	0					
	Applied Correctly	19	19	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	1	1	0	0	0
13. Develop trees 12 inches DBH and larger.	Not Applicable	23					
	Insufficient Information	0					
	Applied Correctly	19	19	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
14. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high water mark (OHWM), only when the ground is frozen or dry.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0

	Not Applied	0	0	0	0	0	0
15. Do not harvest fine woody material within 15 feet of the OHWM.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
16. Use selection harvests and promote long-lived tree species appropriate to the site.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
17. Harvesting intervals should be a minimum of every 10 years.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
18. Harvesting plans should leave at least 60 ft2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
19. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high-water mark (OHWM) only when the ground is frozen or dry.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
20. Do not harvest fine woody material within 15 feet of the OHWM.	Not Applicable	41					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Forest Roads							
21. Use existing roads when they provide the best long- term access.	Not Applicable	12					
	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
22. Select road locations that allow for drainage away from the road.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0

	Not Applied	0	0	0	0	0	0
23. Where possible, locate roads on well-drained soils.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
24. Minimize the number of stream, dry wash, and wetland crossings.	Not Applicable	34					
	Insufficient Information	0					
	Applied Correctly	8	8	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
25. Locate roads outside of riparian management zones and wetland filter strips, except at crossings	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
26. Road grades should not exceed 10%. If road grades greater than 10% are necessary, limit grade length or break the grade using drainage structures.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	8	8	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
27. Construct roads to follow natural contours and minimize cut and fills.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
28. Construct roads to remove water from road surfaces.	Not Applicable	32					
	Insufficient Information	1					
	Applied Correctly	9	9	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
29. Construct stable cut and fill slopes that will re-vegetate easily, either naturally or artificially.	Not Applicable	37					
	Insufficient Information	1					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
30. Do not bury debris in the road base.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0

31. Install drainage structures to remove water from road surface and ditches.	Not Applicable	37					
	Insufficient Information	1					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
32. Install a berm at the inlets of drainage structures, if needed, to direct water into the structures.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
33. Provide erosion protection at the outlets of drainage structures to minimize erosion and disperse the water.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
34. Install drainage structures at grades of at least 2% more than the ditch grade and at a 30 to 45 degree angle to the road.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
35. Check drainage structures to ensure that they are not filling with sediment or other debris. Clean if needed.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
36. Install cross drain culverts long enough to extend beyond the road fill.	Not Applicable	41					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
37. Construct broad-based dips deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
38. Use seed, mulch and/or erosion control netting where necessary to minimize soil erosion into lakes, streams and wetlands.	Not Applicable	31					
	Insufficient Information	1					
	Applied Correctly	9	9	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
39. Install sediment control	Not Applicable	41					

structures where necessary to slow the flow of runoff and trap sediment until vegetation is established at the sediment source.	Insufficient Information	1					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
40. Maintain, clean and/or replace sediment control structures until areas of exposed soil are stabilized.	Not Applicable	41					
	Insufficient Information	1					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
41. Inspect the road system at regular intervals. Clear debris from drainage structures to prevent clogging that can lead to washouts.	Not Applicable	31					
	Insufficient Information	2					
	Applied Correctly	9	9	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
42. Keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs.	Not Applicable	29					
	Insufficient Information	2					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	1	1	0	0	0	0
	Not Applied	0	0	0	0	0	0
43. Shape road surfaces periodically to maintain proper surface drainage. Fill in ruts and holes with gravel or compacted fill as soon as possible to reduce erosion potential.	Not Applicable	33					
	Insufficient Information	2					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	2	0	0	0	0
44. Remove berms along the edge of the road if they will trap water on the road.	Not Applicable	37					
	Insufficient Information	2					
	Applied Correctly	3	1	0	2	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
45. When dust control agents are used, apply them in a manner that will keep these compounds from entering lakes, stream and groundwater.	Not Applicable	40					
	Insufficient Information	2					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
46. Remove all temporary drainage and crossing structures.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
47. Shape all road system surfaces to maintain proper surface	Not Applicable	27					
	Insufficient	0					

drainage, if necessary.	Information						
	Applied Correctly	15	15	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
48. Inspect and maintain road surfaces, drainage structures, and crossings to minimize erosion.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	15	15	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
49. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
50. Install stream crossing structures at right angles to the stream channel.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
51. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
52. Minimize channel changes and the amount of excavation or fill needed at the crossing.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
53. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
54. Use soil stabilization practices on exposed soil at stream crossings.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
55. Design, construct and maintain stream crossings to avoid disrupting the	Not Applicable	41					
	Insufficient Information	0					

migration/movement of fish and other aquatic life.	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
56. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
57. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.	Not Applicable	41					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
58. Install culverts that extend at least 1 foot beyond the road fill.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
59. Install culverts that are large enough to pass flood flows.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
60. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
61. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
62. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
63. Keep culverts clear and free of debris so that water can pass unimpeded at all times.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0

	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
64. Locate fords where stream banks are low.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
65. Locate where the stream bed has a firm rock or gravel streambed.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
66. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
67. Anchor temporary structures on one end with a cable or other device so they do not float away during high water.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Timber Harvesting							
68. Use existing landings if possible.	Not Applicable	23					
	Insufficient Information	0					
	Applied Correctly	19	19	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
69. Locate landings on frozen ground or on firm well-drained soils with a slight slope or that have been shaped to promote efficient drainage.	Not Applicable	0					
	Insufficient Information	0					
	Applied Correctly	42	42	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
70. Locate residue piles (sawdust, chipping residue, and other material) away from areas where runoff may wash residue into streams, lakes or wetlands.	Not Applicable	12					
	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
71. Where possible, keep skid trail grades less than 15%. Where steep grades are unavoidable, break the grade and install drainage	Not Applicable	15					
	Insufficient Information	1					
	Applied Correctly	26	26	0	0	0	0

structures at recommended intervals. Grades greater than 15% should not exceed 300 feet in length.	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
72. Use existing skid trails if they provide the best long-term access.	Not Applicable	24					
	Insufficient Information	0					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
73. Limit the length and number of skid trails, landing, and stream crossing to the minimum necessary for conducting the harvest operation and to meet the landowner's objectives.	Not Applicable	1					
	Insufficient Information	1					
	Applied Correctly	40	40	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
74. Whenever possible, winch logs up steep slopes if conventional skidding could cause erosion that affects water quality.	Not Applicable	40					
	Insufficient Information	1					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
75. Avoid operating equipment where excessive soil compaction, rutting, or channelized runoff may cause erosion that affects water quality.	Not Applicable	2					
	Insufficient Information	1					
	Applied Correctly	39	39	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
76. Fill in ruts, apply seed and mulch, and install sediment control structures and drainage structures on skid trails and landings where needed to prevent erosion and sedimentation into surface waters.	Not Applicable	34					
	Insufficient Information	1					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
77. Inspect soil stabilization practices periodically during and after harvest operations to insure that they are successful and remain functional.	Not Applicable	31					
	Insufficient Information	1					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
78. Do not dispose of or pile slash in areas where runoff may wash slash into lakes, streams, or wetlands.	Not Applicable	3					
	Insufficient Information	1					
	Applied Correctly	37	37	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
79. For winter harvesting, mark stream channels, dry washes, and existing culvert locations before snowfall.	Not Applicable	33					
	Insufficient Information	1					
	Applied Correctly	7	7	0	0	0	0

	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
80. Use selection harvests or patch clear-cuts within 35 feet of the dry wash to promote tree species appropriate to the site.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
81. Avoid locating roads and landings within 35 feet of the dry wash unless necessary for crossings.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
82. Operate wheeled or tracked equipment within 15 feet of the dry wash only when the ground is frozen or dry.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
83. Do not harvest fine woody material within 15 feet of the dry wash.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
84. Minimize soil exposure and compaction to protect ground vegetation and the duff layer.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
85. Avoid cabling logs across the dry wash, where feasible, to prevent damage to the banks of the dry wash.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
86. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.	Not Applicable	37					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
87. Install stream crossing structures at right angles to the stream channel.	Not Applicable	38					
	Insufficient Information	0					
	Applied Correctly	4	4	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0

	Not Applied	0	0	0	0	0	0
88. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.	Not Applicable	38					
	Insufficient Information	0					
	Applied Correctly	4	4	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
89. Minimize channel changes and the amount of excavation or fill needed at the crossing.	Not Applicable	37					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
90. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.	Not Applicable	37					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
91. Use soil stabilization practices on exposed soil at stream crossings.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
92. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life.	Not Applicable	37					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
93. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
94. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
95. Install culverts that extend at least 1 foot beyond the road fill.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0

96. Install culverts that are large enough to pass flood flows.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
97. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
98. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
99. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
100. Keep culverts clear and free of debris so that water can pass unimpeded at all times.	Not Applicable	42					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
101. Locate fords where stream banks are low.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
102. Locate where the stream bed has a firm rock or gravel streambed.	Not Applicable	40					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
103. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.	Not Applicable	37					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
104. Anchor temporary structures	Not Applicable	38					

on one end with a cable or other device so they do not float away during high water.	Insufficient Information	1					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	3	0	0	0	0
Wetlands							
105. Whenever practical, avoid locating roads and landings in wetlands; otherwise use extreme caution.	Not Applicable	8					
	Insufficient Information	0					
	Applied Correctly	34	34	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
106. Whenever possible, forest management activities in wetlands should occur on frozen ground to minimize rutting.	Not Applicable	20					
	Insufficient Information	1					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	2	1	0	0	0
107. Do not dispose of or move upland slash into a wetland. Slash from trees harvested within the wetland may remain in the wetland.	Not Applicable	8					
	Insufficient Information	0					
	Applied Correctly	32	32	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	2	0	0	0	0
108. Keep slash out of open water.	Not Applicable	19					
	Insufficient Information	0					
	Applied Correctly	22	22	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	1	0	0	0
109. Whenever practical, avoid equipment maintenance and fueling in wetlands.	Not Applicable	9					
	Insufficient Information	0					
	Applied Correctly	33	33	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
110. Whenever practical, avoid locating roads and landings in the wetland filter strip; otherwise use extreme caution.	Not Applicable	9					
	Insufficient Information	0					
	Applied Correctly	33	33	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
111. Minimize soil exposure and compaction to protect the ground vegetation and the duff layer in the wetland filter strip.	Not Applicable	8					
	Insufficient Information	0					
	Applied Correctly	34	34	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
112. Operate equipment in the	Not Applicable	12					

wetland filter strip only when the ground is firm or frozen.	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
113. Construct upland approaches to the wetland so the surface runoff is diverted away from the road approach prior to reaching the wetland.	Not Applicable	35					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	2	0	0	0	0
114. If landings are necessary in a wetland, build them to the minimum size required for the operation and to achieve the landowner's objective.	Not Applicable	41					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
115. Avoid operating equipment in areas of open water, springs, or seeps.	Not Applicable	35					
	Insufficient Information	0					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
116. Provide for adequate cross-road drainage in roads to minimize changes to natural surface and subsurface flow in the wetland.	Not Applicable	39					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
117. Use low ground pressure equipment, such as wide tire or tracked equipment, if necessary to minimize rutting.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
118. Minimize rutting in wetlands by conducting forestry activities on firm or frozen ground that can support the equipment.	Not Applicable	29					
	Insufficient Information	0					
	Applied Correctly	13	13	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
119. Cease equipment operations when rutting becomes excessive.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	9	9	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0

Appendix F-2: County Sales

Timber Sales	**Application Rating**	**Effectiveness Rating**					
BMP	BMP Application	Total	No Adverse Impact	Minor Short-Term Impact	Minor Long-Term Impact	Major Short-Term Impact	Major Long-Term Impact
Summary of ALL BMPs	Not Applicable	2686					
	Insufficient Information	6					
	Applied Correctly	1152	1143	8	1	0	0
	Applied Incorrectly	21	2	9	10	0	0
	Not Applied	62	23	10	28	1	0
Fuels, Lubricants, Waste, and Spills							
1. Designate soecific areas for equipment maintenance and fueling. Locate these areas on level terrain, a minimum of 100 feet from all lakes and streams.	Not Applicable	0					
	Insufficient Information	2					
	Applied Correctly	31	31	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
2. Collect all waste lubricants, containers and trash (i.e. grease cartridges).	Not Applicable	0					
	Insufficient Information	0					
	Applied Correctly	32	32	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
Riparian Management Zones							
3. Locate roads outside the RMZ, unless necessary for stream crossings.	Not Applicable	4					
	Insufficient Information	0					
	Applied Correctly	29	29	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
4. Locate landings outside the RMZ.	Not Applicable	3					
	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
5. Do not dispose of or pile slash within the RMZ.	Not Applicable	4					
	Insufficient Information	0					
	Applied Correctly	28	28	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
6. Minimize soil exposure and compaction to protect ground	Not Applicable	4					
	Insufficient	0					

vegetation and the duff layer.	Information						
	Applied Correctly	29	28	1	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
7. Do not operate wheeled or tracked equipment within 15 feet of the ordinary high water mark (OHWM) except on roads or at stream crossings.	Not Applicable	10					
	Insufficient Information	0					
	Applied Correctly	23	23	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
8. Operate wheeled or tracked equipment within 15 to 50 feet of the OHWM when the ground is frozen or dry.	Not Applicable	12					
	Insufficient Information	0					
	Applied Correctly	21	20	1	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
9. Do not harvest fine woody material within 50 feet of the OHWM.	Not Applicable	15					
	Insufficient Information	0					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
10. Use selection harvests and promote long-lived tree species appropriate to the site.	Not Applicable	16					
	Insufficient Information	0					
	Applied Correctly	17	17	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
11. Harvesting intervals should be a minimum of every 10 years.	Not Applicable	11					
	Insufficient Information	0					
	Applied Correctly	22	22	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
12. Harvesting plans should leave at least 60 ft2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.	Not Applicable	13					
	Insufficient Information	0					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	2	0	0	0	0
13. Develop trees 12 inches DBH and larger.	Not Applicable	15					
	Insufficient Information	0					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
14. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high water	Not Applicable	26					
	Insufficient Information	0					

mark (OHWM), only when the ground is frozen or dry.	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
15. Do not harvest fine woody material within 15 feet of the OHWM.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
16. Use selection harvests and promote long-lived tree species appropriate to the site.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
17. Harvesting intervals should be a minimum of every 10 years.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
18. Harvesting plans should leave at least 60 ft2 of basal area per acre in trees 5 inches DBH and larger, evenly distributed.	Not Applicable	27					
	Insufficient Information	0					
	Applied Correctly	6	6	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
19. Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high-water mark (OHWM) only when the ground is frozen or dry.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
20. Do not harvest fine woody material within 15 feet of the OHWM.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Forest Roads							
21. Use existing roads when they provide the best long- term access.	Not Applicable	3					
	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
22. Select road locations that allow for drainage away from the road.	Not Applicable	19					
	Insufficient Information	0					

	Applied Correctly	13	12	1	0	0	0
	Applied Incorrectly	1	1	0	0	0	0
	Not Applied	0	0	0	0	0	0
23. Where possible, locate roads on well-drained soils.	Not Applicable	18					
	Insufficient Information	0					
	Applied Correctly	15	15	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
24. Minimize the number of stream, dry wash, and wetland crossings.	Not Applicable	19					
	Insufficient Information	0					
	Applied Correctly	14	14	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
25. Locate roads outside of riparian management zones and wetland filter strips, except at crossings	Not Applicable	18					
	Insufficient Information	0					
	Applied Correctly	15	15	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
26. Road grades should not exceed 10%. If road grades greater than 10% are necessary, limit grade length or break the grade using drainage structures.	Not Applicable	21					
	Insufficient Information	0					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	0	1	0
27. Construct roads to follow natural contours and minimize cut and fills.	Not Applicable	18					
	Insufficient Information	0					
	Applied Correctly	15	15	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
28. Construct roads to remove water from road surfaces.	Not Applicable	18					
	Insufficient Information	0					
	Applied Correctly	12	12	0	0	0	0
	Applied Incorrectly	3	1	1	1	0	0
	Not Applied	0	0	0	0	0	0
29. Construct stable cut and fill slopes that will re-vegetate easily, either naturally or artificially.	Not Applicable	25					
	Insufficient Information	0					
	Applied Correctly	7	7	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	1	0	0	0
30. Do not bury debris in the road base.	Not Applicable	19					
	Insufficient Information	0					
	Applied Correctly	14	14	0	0	0	0

	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
31. Install drainage structures to remove water from road surface and ditches.	Not Applicable	24					
	Insufficient Information	0					
	Applied Correctly	6	6	0	0	0	0
	Applied Incorrectly	2	0	1	1	0	0
	Not Applied	1	0	0	1	0	0
32. Install a berm at the inlets of drainage structures, if needed, to direct water into the structures.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	1	0	0	1	0	0
33. Provide erosion protection at the outlets of drainage structures to minimize erosion and disperse the water.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	5	5	0	0	0	0
	Applied Incorrectly	2	0	1	1	0	0
	Not Applied	0	0	0	0	0	0
34. Install drainage structures at grades of at least 2% more than the ditch grade and at a 30 to 45 degree angle to the road.	Not Applicable	29					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	1	0	0	1	0	0
35. Check drainage structures to ensure that they are not filling with sediment or other debris. Clean if needed.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	5	4	1	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	1	0	0	1	0	0
36. Install cross drain culverts long enough to extend beyond the road fill.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
37. Construct broad-based dips deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely.	Not Applicable	28					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	0	2	1	0	0
38. Use seed, mulch and/or erosion control netting where necessary to minimize soil erosion into lakes, streams and wetlands.	Not Applicable	21					
	Insufficient Information	1					
	Applied Correctly	8	8	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0

	Not Applied	2	0	1	1	0	0
39. Install sediment control structures where necessary to slow the flow of runoff and trap sediment until vegetation is established at the sediment source.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	4	4	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	0	2	1	0	0
40. Maintain, clean and/or replace sediment control structures until areas of exposed soil are stabilized.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
41. Inspect the road system at regular intervals. Clear debris from drainage structures to prevent clogging that can lead to washouts.	Not Applicable	15					
	Insufficient Information	1					
	Applied Correctly	16	16	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
42. Keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs.	Not Applicable	12					
	Insufficient Information	0					
	Applied Correctly	20	20	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
43. Shape road surfaces periodically to maintain proper surface drainage. Fill in ruts and holes with gravel or compacted fill as soon as possible to reduce erosion potential.	Not Applicable	12					
	Insufficient Information	0					
	Applied Correctly	18	17	1	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	1	0	2	0	0
44. Remove berms along the edge of the road if they will trap water on the road.	Not Applicable	20					
	Insufficient Information	0					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	3	2	0	1	0	0
45. When dust control agents are used, apply them in a manner that will keep these compounds from entering lakes, stream and groundwater.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
46. Remove all temporary drainage and crossing structures.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0

47. Shape all road system surfaces to maintain proper surface drainage, if necessary.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	6	6	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
48. Inspect and maintain road surfaces, drainage structures, and crossings to minimize erosion.	Not Applicable	25					
	Insufficient Information	0					
	Applied Correctly	8	8	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
49. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
50. Install stream crossing structures at right angles to the stream channel.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
51. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
52. Minimize channel changes and the amount of excavation or fill needed at the crossing.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
53. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
54. Use soil stabilization practices on exposed soil at stream crossings.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
55. Design, construct and maintain	Not Applicable	27					

stream crossings to avoid disrupting the migration/movement of fish and other aquatic life.	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	4	1	0	3	0	0
56. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
57. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.	Not Applicable	27					
	Insufficient Information	0					
	Applied Correctly	4	4	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	0	0	2	0	0
58. Install culverts that extend at least 1 foot beyond the road fill.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
59. Install culverts that are large enough to pass flood flows.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	1	1	0	0	0	0
60. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
61. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
62. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.	Not Applicable	30					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
63. Keep culverts clear and free of debris so that water can pass	Not Applicable	28					
	Insufficient	0					

unimpeded at all times.	Information						
	Applied Correctly	3	3	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	1	0	1	0	0
64. Locate fords where stream banks are low.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
65. Locate where the stream bed has a firm rock or gravel streambed.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
66. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
67. Anchor temporary structures on one end with a cable or other device so they do not float away during high water.	Not Applicable	32					
	Insufficient Information	1					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Timber Harvesting							
68. Use existing landings if possible.	Not Applicable	13					
	Insufficient Information	0					
	Applied Correctly	20	20	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
69. Locate landings on frozen ground or on firm well-drained soils with a slight slope or that have been shaped to promote efficient drainage.	Not Applicable	1					
	Insufficient Information	0					
	Applied Correctly	32	32	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
70. Locate residue piles (sawdust, chipping residue, and other material) away from areas where runoff may wash residue into streams, lakes or wetlands.	Not Applicable	10					
	Insufficient Information	0					
	Applied Correctly	23	23	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
71. Where possible, keep skid trail grades less than 15%. Where steep	Not Applicable	9					
	Insufficient	0					

grades are unavoidable, break the grade and install drainage structures at recommended intervals. Grades greater than 15% should not exceed 300 feet in length.	Information						
	Applied Correctly	24	24	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
72. Use existing skid trails if they provide the best long-term access.	Not Applicable	17					
	Insufficient Information	0					
	Applied Correctly	16	16	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
73. Limit the length and number of skid trails, landing, and stream crossing to the minimum necessary for conducting the harvest operation and to meet the landowner's objectives.	Not Applicable	0					
	Insufficient Information	0					
	Applied Correctly	33	33	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
74. Whenever possible, winch logs up steep slopes if conventional skidding could cause erosion that affects water quality.	Not Applicable	25					
	Insufficient Information	0					
	Applied Correctly	8	8	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
75. Avoid operating equipment where excessive soil compaction, rutting, or channelized runoff may cause erosion that affects water quality.	Not Applicable	1					
	Insufficient Information	0					
	Applied Correctly	30	30	0	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	1	1	0	0	0	0
76. Fill in ruts, apply seed and mulch, and install sediment control structures and drainage structures on skid trails and landings where needed to prevent erosion and sedimentation into surface waters.	Not Applicable	13					
	Insufficient Information	0					
	Applied Correctly	16	16	0	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	3	1	1	1	0	0
77. Inspect soil stabilization practices periodically during and after harvest operations to insure that they are successful and remain functional.	Not Applicable	16					
	Insufficient Information	0					
	Applied Correctly	16	16	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
78. Do not dispose of or pile slash in areas where runoff may wash slash into lakes, streams, or wetlands.	Not Applicable	1					
	Insufficient Information	0					
	Applied Correctly	32	32	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
79. For winter harvesting, mark stream channels, dry washes, and	Not Applicable	29					
	Insufficient	0					

existing culvert locations before snowfall.	Information						
	Applied Correctly	4	4	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
80. Use selection harvests or patch clear-cuts within 35 feet of the dry wash to promote tree species appropriate to the site.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
81. Avoid locating roads and landings within 35 feet of the dry wash unless necessary for crossings.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
82. Operate wheeled or tracked equipment within 15 feet of the dry wash only when the ground is frozen or dry.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
83. Do not harvest fine woody material within 15 feet of the dry wash.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
84. Minimize soil exposure and compaction to protect ground vegetation and the duff layer.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
85. Avoid cabling logs across the dry wash, where feasible, to prevent damage to the banks of the dry wash.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
86. Identify optimum stream crossing locations: straight and narrow stream channels; low banks; firm rocky soil; keep approaches at the least gradient possible.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
87. Install stream crossing structures at right angles to the stream channel.	Not Applicable	32					
	Insufficient Information	0					

	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
88. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
89. Minimize channel changes and the amount of excavation or fill needed at the crossing.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
90. Limit construction activity in the streambed to periods of low or normal flow. Keep use of equipment in the stream to a minimum.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
91. Use soil stabilization practices on exposed soil at stream crossings.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	2	2	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
92. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	1	0	0	0	0
93. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
94. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream.	Not Applicable	31					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	1	0	0	0
95. Install culverts that extend at least 1 foot beyond the road fill.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0

	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
96. Install culverts that are large enough to pass flood flows.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
97. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
98. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
99. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
100. Keep culverts clear and free of debris so that water can pass unimpeded at all times.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
101. Locate fords where stream banks are low.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
102. Locate where the stream bed has a firm rock or gravel streambed.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
103. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0

	Not Applied	0	0	0	0	0	0
104. Anchor temporary structures on one end with a cable or other device so they do not float away during high water.	Not Applicable	33					
	Insufficient Information	0					
	Applied Correctly	0	0	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
Wetlands							
105. Whenever practical, avoid locating roads and landings in wetlands; otherwise use extreme caution.	Not Applicable	5					
	Insufficient Information	0					
	Applied Correctly	28	28	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
106. Whenever possible, forest management activities in wetlands should occur on frozen ground to minimize rutting.	Not Applicable	10					
	Insufficient Information	0					
	Applied Correctly	18	18	0	0	0	0
	Applied Incorrectly	2	0	1	1	0	0
	Not Applied	3	3	0	0	0	0
107. Do not dispose of or move upland slash into a wetland. Slash from trees harvested within the wetland may remain in the wetland.	Not Applicable	5					
	Insufficient Information	0					
	Applied Correctly	26	26	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	2	2	0	0	0	0
108. Keep slash out of open water.	Not Applicable	9					
	Insufficient Information	0					
	Applied Correctly	24	24	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
109. Whenever practical, avoid equipment maintenance and fueling in wetlands.	Not Applicable	8					
	Insufficient Information	0					
	Applied Correctly	25	25	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
110. Whenever practical, avoid locating roads and landings in the wetland filter strip; otherwise use extreme caution.	Not Applicable	14					
	Insufficient Information	0					
	Applied Correctly	19	19	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
111. Minimize soil exposure and compaction to protect the ground vegetation and the duff layer in the wetland filter strip.	Not Applicable	15					
	Insufficient Information	0					
	Applied Correctly	18	17	1	0	0	0
	Applied Incorrectly	0	0	0	0	0	0

	Not Applied	0	0	0	0	0	0
112. Operate equipment in the wetland filter strip only when the ground is firm or frozen.	Not Applicable	17					
	Insufficient Information	0					
	Applied Correctly	15	14	1	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
113. Construct upland approaches to the wetland so the surface runoff is diverted away from the road approach prior to reaching the wetland.	Not Applicable	26					
	Insufficient Information	0					
	Applied Correctly	6	6	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	1	0	0	0
114. If landings are necessary in a wetland, build them to the minimum size required for the operation and to achieve the landowner's objective.	Not Applicable	32					
	Insufficient Information	0					
	Applied Correctly	1	1	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
115. Avoid operating equipment in areas of open water, springs, or seeps.	Not Applicable	23					
	Insufficient Information	0					
	Applied Correctly	10	10	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	0	0	0	0	0	0
116. Provide for adequate cross-road drainage in roads to minimize changes to natural surface and subsurface flow in the wetland.	Not Applicable	27					
	Insufficient Information	0					
	Applied Correctly	5	4	1	0	0	0
	Applied Incorrectly	1	0	1	0	0	0
	Not Applied	0	0	0	0	0	0
117. Use low ground pressure equipment, such as wide tire or tracked equipment, if necessary to minimize rutting.	Not Applicable	21					
	Insufficient Information	0					
	Applied Correctly	11	11	0	0	0	0
	Applied Incorrectly	0	0	0	0	0	0
	Not Applied	1	0	0	1	0	0
118. Minimize rutting in wetlands by conducting forestry activities on firm or frozen ground that can support the equipment.	Not Applicable	21					
	Insufficient Information	0					
	Applied Correctly	9	9	0	0	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	2	1	0	1	0	0
119. Cease equipment operations when rutting becomes excessive.	Not Applicable	22					
	Insufficient Information	0					
	Applied Correctly	10	9	0	1	0	0
	Applied Incorrectly	1	0	0	1	0	0
	Not Applied	0	0	0	0	0	0