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

## 2019 BMP Monitoring Report

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# Executive Summary

The Wisconsin's Forestry Best Management Practices (BMPs) for Water Quality program conducted monitoring on federal and large landowner forests during the fall of 2019. Application of BMPs, along with their effectiveness, are recorded by BMP monitoring teams. Federal lands had 35 sites which were chosen for BMP monitoring and large landowners had 19 sites that were selected. Sites are timber sales which finished harvesting during the prior year of 2018 and must contain water resources within their boundary or be adjacent to water resources. 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.

*Federal*

The 35 sales monitored on federal forests included a total of 1,217 acres for an average of 35 acres per sale. Twenty-six of the sites were monitored 1-2 years after the sales were finished being harvested. Selection harvests were the most common silvicultural prescription utilized, with 21 sites listing that as a method. Eighteen sales had maple/basswood listed as a dominant timber type, making this the most common timber type for federal sales.

Water resources were very abundant on federal timber sales. Thirty-two of the 35 sites had wetlands located within or bordering the timber sales. Streams were the next most common water resource, with 15 sites documenting streams present. Only four sites contained lakes while five sites contained springs/seeps. For water resources that recommended a Riparian Management Zone (RMZ), 21 out of the 24 of the RMZs had either been expanded or used the recommended distance. Only one site did not contain a forest road and 31 of the 34 sites contained active forest roads. Many of the sites (22 of them) had either new roads built, or old roads improved. There was a mix of new and existing drainage structures found on the sites, with five sites containing both new and existing drainage structures, rather than one or the other. Stream crossings were rare, with only seven sites utilizing stream crossings and all seven used existing culverts as the crossing design. 2019 proved to be another year where severe weather was commonly noted to have taken place on sites prior to BMP monitoring efforts. Federal sites had over half of their sites noted as having severe weather present.

Federal sites contained a relatively high rate of BMPs being applicable to each of their sites. On average, 32.29% of BMPs were applicable to each site. Of the BMPs which were applicable, 92.9% were *applied correctly*, which is a slight drop from 96.3% correct application recorded in 2014. BMPs were *not applied* where they were needed at 5.8% of the time. Correct application varied over the five different monitoring categories, which is normal for all landowners. Four of the five monitoring categories boasted correct application rates 94% and up with 'Fuels, Waste, and Spills' getting a perfect 100%. 'Forest roads,' which historically has the lowest correct application rate, does not change this pattern on federal sites with an 84.9% correct application rate.

The effectiveness for protecting water quality remains exceptionally high when BMPs are used correctly at 99.5%. Three of the five monitoring categories received 100% effectiveness when

BMPs are used correctly. When BMPs are *not applied* correctly however, adverse impacts to water quality are observed 35.9% of the time, with 24.4% of the time they are *minor long-term* water quality impacts. Despite all the severe weather and slight dip in correct application of BMPs, no *major-long term* impacts were found on federal forests during 2019 BMP monitoring.

### *Large Landowners*

The 19 sales monitored on large landowners included a total of 1,938 acres for an average of just over 100 acres per sale. Eleven of the sales were monitored 1-2 years after the sales were finished being harvested. Selection harvests were the most common silvicultural prescription utilized, with 14 sites listing that as a method. Ten sales had maple/basswood listed as a dominant timber type, making this the most common timber type for large landowner sales.

The most common water resources on large landowner sites were wetlands, with 18 of the 19 sites containing or adjacent to them. Streams were the next most common water resource with seven sites documenting streams present. Only three sites contained lakes and one site contained springs/seeps. For water resources that recommended an RMZ, 11 out of 12 RMZs had either been expanded or used the recommended distance. Only one site did not contain a forest road and 15 of the 18 sites contained active forest roads. Only seven of the sites had either new roads built or roads which undergone improvement. All four sites that used drainage structures had existing drainage structures present and one of those sites had both new and existing drainage structures, making drainage structures in general not very common on large landowner sites. Stream crossings were also rare, with only six sites utilizing stream crossings and all stream crossings except one were on a forest road system. Contrary to federal sites, large landowner sites only recorded one site where severe weather had occurred.

Large landowner sites contained a moderate rate of BMPs being applicable to each of their sites. On average, 27.5% of BMPs were applicable to each site. Of the BMPs which were applicable, 90.5% were *applied correctly*, which is a slight drop from 94.7% correct application recorded in 2014. BMPs were *not applied* where they were needed at 7.2% of the time. Correct application varied over the five different monitoring categories. Although no monitoring category received 100% correct application, three categories had 96% or above. ‘Wetlands’ and ‘forest roads’ were the two categories that brought down the overall correct application rating, only receiving an 89.8% and 79.9% respectively.

The effectiveness for protecting water quality remains exceptionally high when BMPs are used correctly at 99.3%. Three of the five monitoring categories received 100% effectiveness when BMPs are used correctly. When BMPs are *not applied* however, adverse impacts to water quality are observed 64.4% of the time, with 46.7% of these observations being determined to have had a *minor-long term* water quality impact. One site contained two *major-short term* impacts to water quality found on the site’s forest road system.

# 2019 BMP Monitoring Sites Map

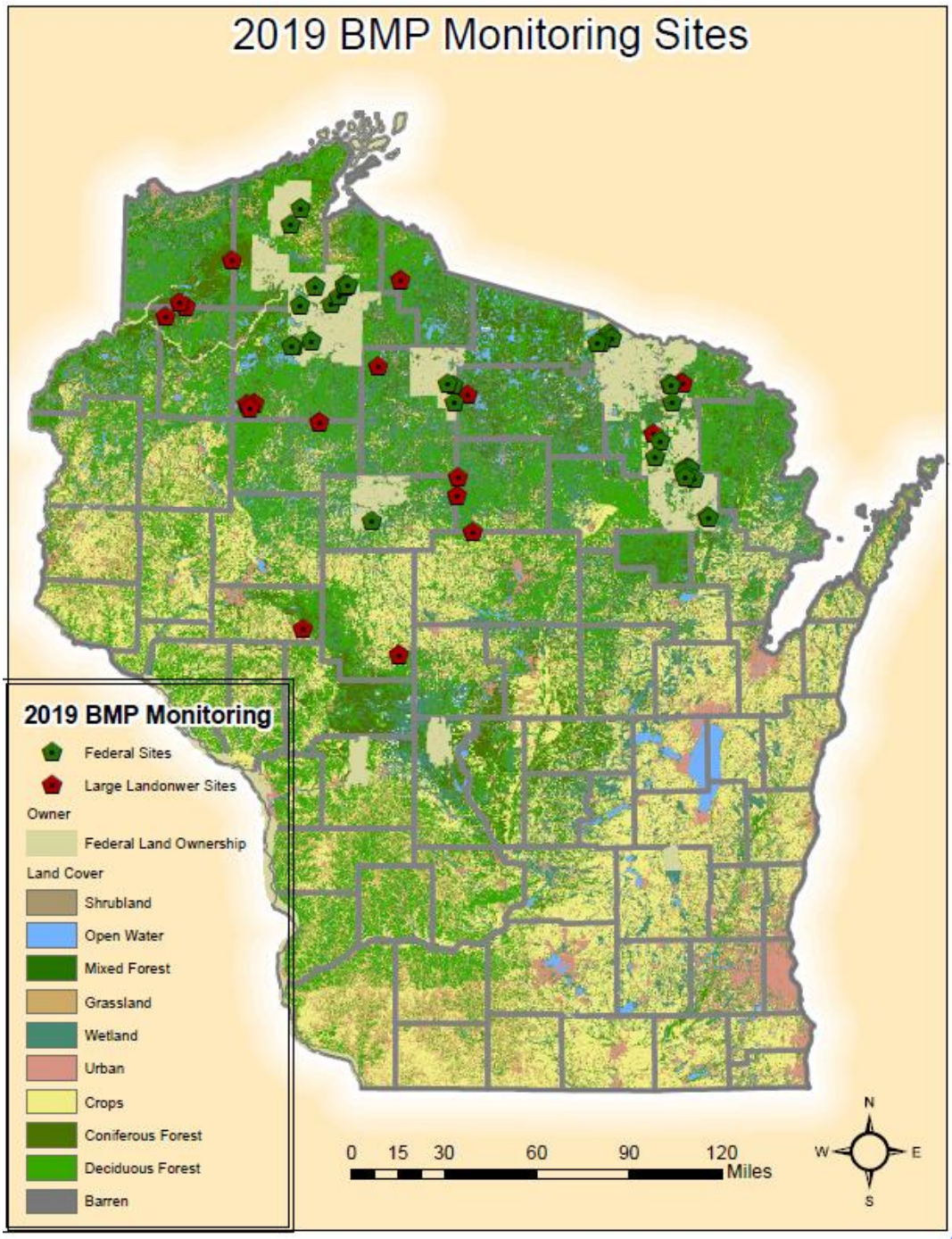



**Figure 1. The sites monitored by the 2019 BMP teams. Red markers represent large landowner sites and green markers represent federal sites. Note: Some dots are close together making the total number of sites difficult to determine on this map. Disclaimer: *The department has made reasonable efforts 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. Each state is required to develop either guidelines or regulations to reduce the pollution 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 its BMP program in 1995, and through monitoring, statistical analysis, and written reports, Wisconsin can 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 many landowners, monitoring a statistically valid sample size from each proved to be too demanding of a task.

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. It was also decided to have breaks, or years where no monitoring was conducted, which allows the BMP program to continually improve by incorporating new scientific research, refining BMPs based on past findings and then editing and adjusting the BMP manual if needed. 2019 is the second series of landowners monitored during the five-year cycle from 2018-2022, where the counties and the state were monitored in 2018, federal and large landowners were monitored in 2019, and NIP landowners will be monitored in 2020, followed by two ‘break’ years. There were no BMP manual changes since 2010 and no changes made to the monitoring sheets which teams used to collect data. Therefore, 2019, as well as 2018 monitoring, are directly comparable to the complete cycle of 2013-2017.

The landowners monitored in the fall of 2019 were federal and large landowners. Federal lands are under the authority of the United States Department of Agriculture under the United States Forest Service (USFS). The USFS has many of its own foresters, biologists and other resource professionals which have input on how timber sales are set up and harvested. In Wisconsin, the USFS has an agreement with the Wisconsin Department of Natural Resources (DNR) to help set up and administer timber sales through Good Neighbor Authority (GNA). Some of the sales monitored under the ownership in federal lands were in-fact set up by the DNR. This report does not distinguish between sales administered under the USFS and those by the DNR. This would introduce sub-samples where more sales would need to be monitored to reach statistically valid results.

Large landowners are usually, but not always, landowners who own land because of the timber and the financial benefit received upon harvesting. In the past these were referred to as industrial lands or timber company lands. Historically, there were relatively few companies which held vast expanses of land in Wisconsin. Today, the companies often change ownership,

and they are much smaller aggregations (parcels) than in the past. Regardless, they must have over 1,000 acres and be enrolled in the Managed Forest Law Program (MFL) with the DNR to be considered “large” landowners.

During the 2019 monitoring cycle, 436 federal sales and 207 large landowner sales were eligible to become BMP monitoring sites. All sales that were financially closed out during the calendar year of 2018 were initially eligible for BMP monitoring. To achieve a 95% confidence interval (see Appendix A), it was determined that 29 sales from federal lands and 27 sales from large landowners would need to be monitored. With 35 sales being monitored on federal lands, the 95% confidence interval was able to be obtained. Since only 19 sales were monitored for large landowners, the confidence interval of 95% was not able to be reached. Through the narrowing down process some sales may become ineligible for BMP monitoring because of their lack of water resources. Consequently, many of the potentially selected large landowner sites became ineligible. Sites that are chosen to be monitored must meet at least one of the following eligibility criteria:

- 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 on 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. This created somewhat of a paradox because the sample was too small to achieve the desired confidence interval but there were not enough water resource eligible sales for teams to monitor. So, despite not being statistically confident, the proportion of monitored sites to large landowner sites that were eligible for BMP monitoring were greater than any other subset of sites monitored in the past. One reason for this could be the general decrease in large land ownership from the past.

BMP monitoring teams are comprised of individuals (usually four to six) who have a wide background of expertise ranging from hydrology, soil science, ecology, conservation, silviculture and logging. Volunteers are asked to participate in BMP monitoring and include organizations such as the DNR, the County Forest Program, the US Forest Service and other groups which have participated in the past. To achieve consistent evaluations across all the different sites, there were trainings held for all participating teams, put on by the DNR Forest Hydrologist and the DNR BMP Forester. 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 2019 BMP efforts were closed between Jan. 1, 2018 and Dec. 31, 2018. 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 gone 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.

This leads to an observation variable called *harvest age*. Harvest age is determined by two methods. The first and most sure-fire way the monitoring teams can discover the sale age is by asking the timber sale administrator. The other way for teams to determine harvest age is to look at the growth of the trees within the sale. When teams looked at growth to determine harvest age, this would make sales starting age the following Spring season – when the new flush of vegetation growth occurs. This way of determining harvest age would make a sale harvested in the fall (after growing season) to be marked down as the same age as a sale cut during the late winter or early spring. This causes harvest age to be more relative than absolute, plus more ranged than precise, which is why the categories are broken down into ranges.

### *Federal*

Most of the sites (26 out of 35) monitored on federal lands were cut ‘1-2 years’ prior to monitoring and the rest were distributed between the other categories (Figure 2). Because of the excellent involvement with USFS volunteers, only one of the sites was ‘unknown.’ It’s also not surprising given the smaller sales that federal lands employ, that no sales observed ‘multiple years’ of harvest (at least in terms of growing season, calendar year changeover is not counted as ‘multiple years.’

### *Large*

Just like federal lands, large landowners had most of their sites harvested ‘1-2 years’ before the monitoring took place. However, with 11 of the 19 being in this group, it was not as heavily concentrated into the category of ‘1-2 years’ and only had one less site between the other age categories as compared to federal sites despite having much fewer sites overall. Three of the categories had one sale apiece, including ‘less than one,’ ‘unknown’ and ‘multiple.’ ‘More than two’ years was observed for five of the sites.

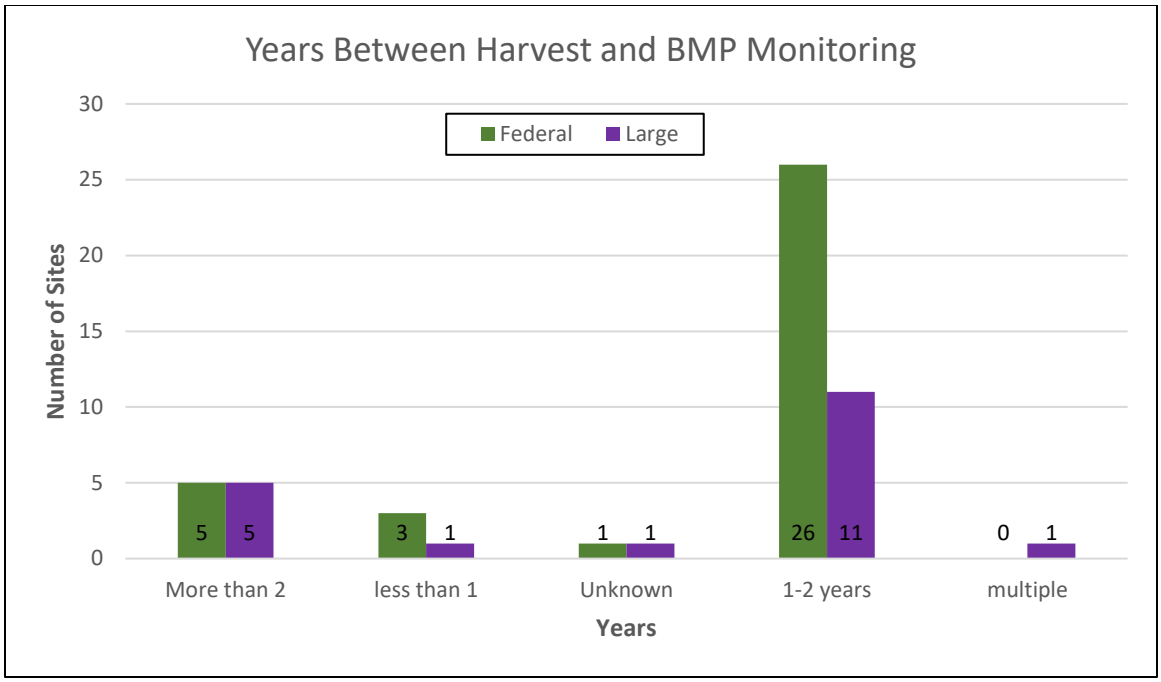


Figure 2. The time (in years) between the time of the harvest and when the monitoring team was on site.

## Harvest Size

The harvest size for any sale includes the entire area within the boundary of the sale. This usually includes areas of non-harvest such as: roads, reserve areas, wetlands and streams (unless they are large enough to be “mapped out” of the harvest area). 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.

### *Federal*

Even though federal lands had 35 sites that were monitored, only 1,217 acres were monitored making the average site, 35 acres (Table 1). This is not surprising when almost half of the sites (16) or 45% contained 0-25 acres and the smallest sale was only three acres in size. Federal forests, which have many different constraints and objectives when doing a timber harvest, often favor these smaller types of sales, which are usually not as financially beneficial for the logger (especially if they have a lot of equipment) because mobilization costs can really affect the feasibility of smaller sales. Conversely, small sales, in theory, lets smaller logging operations bid more effectively against larger operations with more equipment. Only six of the sales are in the top three land size categories and are over 50 acres (Figure 3).

*Large*

Large landowners averaged over 100 acres per site, which led to 1,938 acres being monitored over the 19 sites. Sites still averaged over 100 acres even after some sales are broken down into smaller segments, so they are more manageable for teams to effectively monitor them. Even while doing that, the largest sale was still 342 acres. Seven of the 19 sites monitored were over 100 acres, showing the strong preference for optimizing financial considerations, which makes sense given the primary purpose the landowners own the timbered land in the first place. This data echoes very similar patterns observed by both federal and large landowners when they were monitored in 2014. In fact, the average sale size for both landowners in 2019 were less than a three acre change from the averages found in 2014 sale size.

| **Table 1. Sale Size Information** | | |
|---|---|---|
| **Size by Acres** | **Large** | **Federal** |
| Acres Monitored | 1938 | 1217 |
| Average Acres per Sale | 102 | 35 |
| Smallest Sale | 14 | 3 |
| Largest Sale | 342 | 160 |

Table 1. Different information on sale sizes are shown in acres.

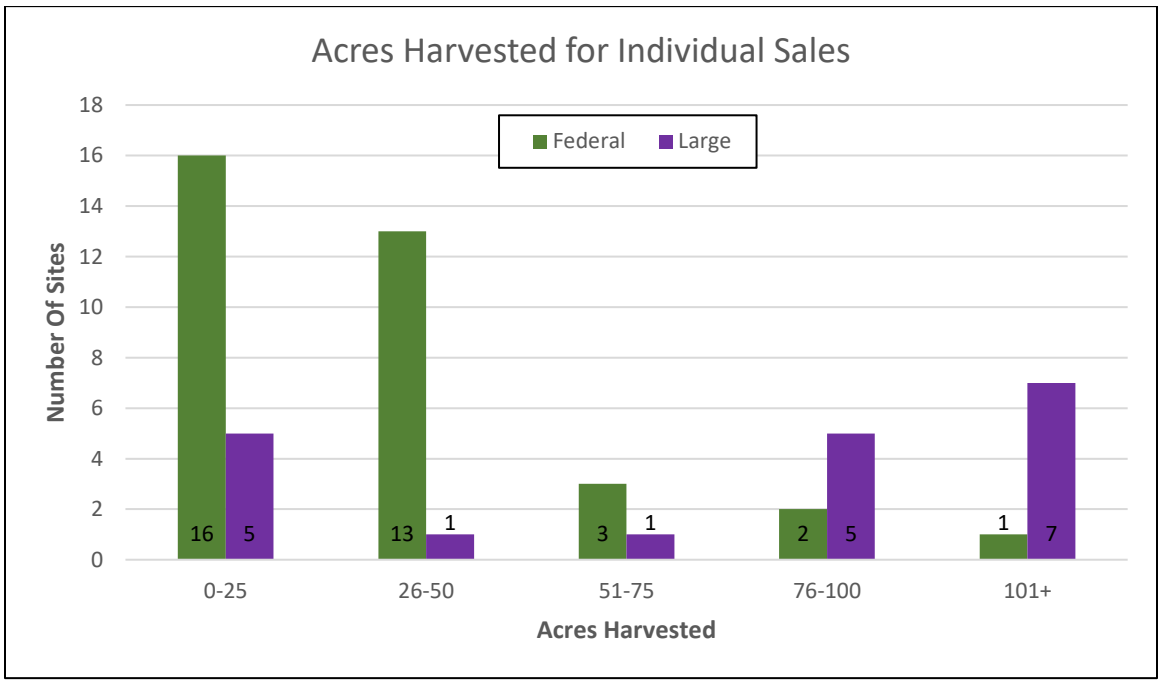



Figure 3. The number of sales that are in different acre size classes.

## Season of Harvest

The season of year a timber sale undergoes most of its harvesting 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. 'Season of harvest' was determined by the monitoring team asking the forest sale administrator for the seasons of activity – what season the actual harvest took place. If the sale was reported to have been cut in more than one season, each season was noted (this leads to the "duplication" of sale seasons, so one sale might be represented in Figure 4 in more than one column). Even a sale cut over multiple years could be listed under one or 'exclusive' season if it was cut during the same season for a few years. This is common with sales, especially winter sales, where it will take multiple years to finish a sale that is seasonally restricted to frozen ground. Anytime forest sale administrators were not available to be asked, the sale was listed as unknown.

*Federal*

The most common season of harvest for federal sites was 'winter,' where almost half the sites (17) listed winter as the exclusive season of harvest. The 'summer' and 'fall' season each had six sales listed under them. Four sales were marked as 'unknown' and one sale was listed as being harvested solely during the 'spring' season. Only one sale was cut during multiple seasons, part in the spring and part during the fall. This is not surprising, given the size of the federal sites, that most contractors would be able to finish them during one mobilization. It is important to note that not all sales cut during winter are because of water quality restrictions. Sometimes they are cut during winter for other restrictions like Natural Heritage Inventory (NHI) hits or diseases such as oak wilt. It is not common however, that sales are elected to be harvested during the winter because of the general price decrease experienced for forest products during this time.

Large

Large landowners had even more of their sites, as a percentage (68.4%), harvested exclusively during the 'winter.' That leaves very little room for other seasons, and indeed only one site was listed as being exclusively harvested during 'summer' and 'fall' and none during the 'spring.' Two sales were listed as 'unknown.' There were many more sites listed under multiple seasons for large landowners than federal lands, presumably due to their much larger size than federal sites. Every season had two or more sites listed under the multiple category with winter again being at the top with five sites.

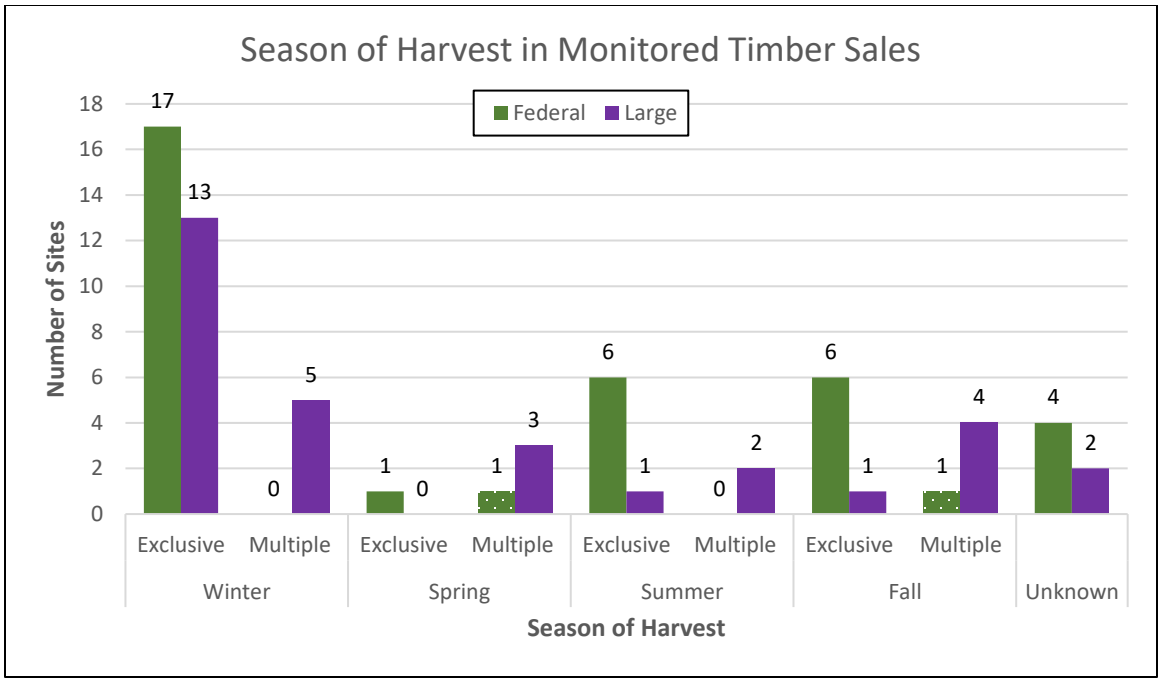



Figure 4. The number of sales shown to be harvest under any given season and if they were exclusively harvested during that season, or part of multiple harvest seasons.

## Water Resources

There were four types of water resources (lakes, streams, wetlands, springs/seeps) found in the 2019 BMP monitoring sites.

'Lakes' are designated by their characteristics, specifically, they need to have an Ordinary High Water Mark (OHWM) which is the line that forms the boundary between a terrestrial environment and an aquatic one. OHWMs are formed by the erosive forces that occur over time from moving water – either by current or wave action. OHWMs are not truly static nor dynamic and lakes can have OHWMs far above their current water level in times of drought or be submerged during periods of high rainfall – both on a seasonal and multi-year cycle. There is no specific size requirement for lakes. The helpful resource for both BMP monitoring teams and foresters alike to identify a lake is the DNR Surface Water Data Viewer (SWDV).

'Streams' also have an OHWM and for monitoring purposes, are broken down even further by their width and designated trout stream classification (Figure 6). Stream width and the presence of trout are important because these two factors help determine the width distance of the Riparian Management Zone (RMZ) on streams.

'Wetlands' need to meet the three specifications which define them: hydrology, vegetation and soils. However, for BMP monitoring purposes, wetlands are defined by the web resource of DNR Surface Water Data Viewer (SWDV) and verified by the monitoring teams when on site. Usually, monitoring teams use a change in vegetation to confirm they are in a wetland environment.

‘Springs and Seeps’ are the discharge or upwelling of water at specific point on a landscape. Springs and seeps vary greatly in size from nothing noticeable above ground to a three-foot wide stream straight from the ground. Unless they are found within a wetland environment or mapped stream system, they are very rarely identified on computer resources or timber sale maps. They can prove irksome during timber harvests because areas that seem to be dry or should freeze, will continually thwart road building or road winterizing activities for loggers. BMP monitoring teams noted springs and seeps when they encountered them during their site visits.

*Federal*

Wetlands were the most common water resource present in the 2019 BMP monitoring for federal lands with all but three of the 35 sites containing or crossing them in some way (Figure 6). The next most common was streams, where 15 sites listed streams as present. Springs/seeps along with lakes were also present but not as abundantly, where five sites and four sites listed them as present respectively. One key element is that any water resource may be listed as present if it interacts with the forest road system on the way into the sale, meaning it does not have to truly contain or border that resource.

*Large*

Wetlands were also the most common water resource present with only one site not interacting with wetlands in any meaningful way. Seven of the 19 sites contained, bordered or crossed streams. Lakes and springs/seeps were again not present to the same degree as streams or wetlands. Sites can have more than one water resource present and with all but one containing wetlands, that is more commonly the case. This overlap of water resources, by both federal and large landowners, shows the selection process of sites to be healthy, as it focuses teams’ attention to sites that have many potential BMPs applicable.

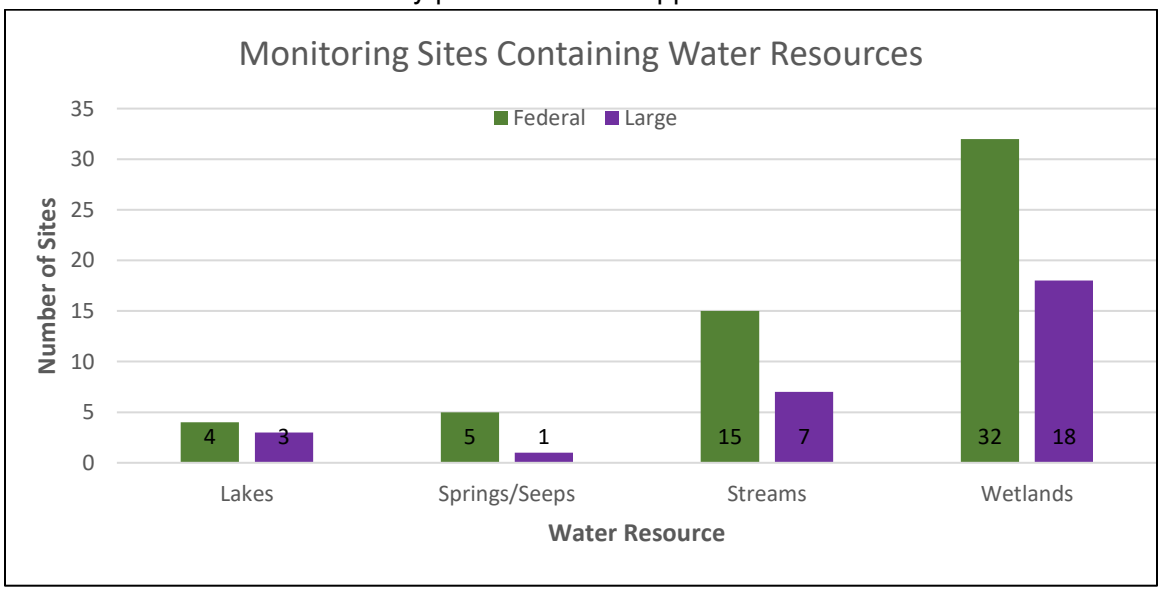



Figure 6. The number of sites that have water features in or around them.

Figure 7. Shows a border of a site where the sale was conducted next to a wetland.

## Riparian Management Zones

Riparian Management Zones (RMZs) are areas where forest management are modified next to a stream or lake in order to provide shade, soil stabilization and other functions. Excess heat or erosion caused by exposed soil in an RMZ can possibly lead to impacts to water quality. The two RMZ widths 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. The RMZs have different BMPs unique to each resource. RMZs width and the applicable BMPs can be modified, per the BMP manual, by foresters – based on professional judgment due to site-specific considerations, management objectives and other reasons. The monitoring team will note the recommended RMZ width, which can be one of the four following categories:

- The RMZ can be ‘increased’ in width.
- The RMZ can ‘meet’ the recommended width.
- The RMZ can be ‘decreased’ in width.
- The site may ‘not have used’ an RMZ.

An RMZ ‘not being used’ in a timber sale usually has another habitat type between the timber stand and the stream so that the timber stand never borders the stream directly. An example of this is a red pine thinning that transitions to alder/birch stream border. The alder/birch border will vary in its width to the stream causing the width of the RMZ from the red pine to the stream to

fluctuate but, an RMZ (of set distance) was not used because the birch/alder acted in the same ecological function as a “painted out” RMZ would.

Sites that have more than one class of stream or a lake and a stream less than three feet wide will be listed twice. This means that adding up the number of sites listed under the RMZ section will not equate to the number of sites that contain the water resources of ‘lakes’ and ‘streams.’

*Federal*

All but three water resources that called for an RMZ had their RMZ either increased or met the recommended distance (Figure 8). There was no clear breakdown by water resource either, meaning that one specific water resource did not always have their RMZ extended while another only got their RMZ decreased. RMZs were also used in every instance where they were called for, leaving the ‘RMZ not used’ category with not utilized. This data shows the strong timber sale set-up process the USFS carries out to ensure water resources which require an RMZ are recognized and end up with an RMZ of an appropriate distance.

*Large*

While large landowners did not have as many sites where water resources required an RMZ to be used, their breakdown looked similar to federal lands because almost all water resouces had an RMZ that was either increased or met the recommended distance. Five water resouces increased the recommended RMZ distance and six water resources had RMZs that used the recommeded distance. Again, there are no preferences on which water resources had their RMZs increased or met the recommended distance. Only one site from large landowners did not utilize an RMZ and no water resources had their RMZ distance decreased in width.

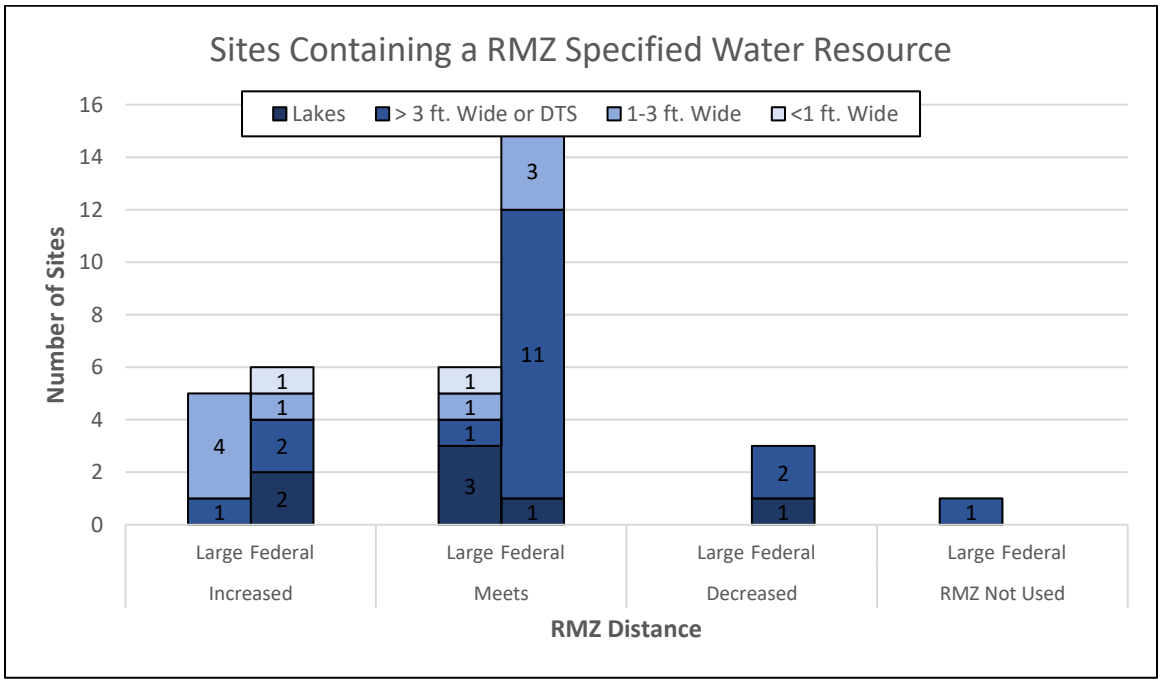



Figure 8. The number of sites that fit into different categories of RMZ recommendation distances.

Figure 9. A small stream has many trees left around it within the RMZ.

## Species Composition of Harvest Sites

Seven different timber type compositions were observed in the 2019 monitoring season. 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.

### *Federal*

Even though Federal lands are mostly in the northern part of the state and therefore located in fewer ecological landscapes than some of the other ownerships that undergo BMP monitoring, all seven different timber types were recorded for federal lands including two ‘other’ timber types (Figure 10). The vast majority of these are ‘maple/basswood’ and ‘aspen,’ however with 18 sites and 16 sites listing them as a dominant timber type, respectively. The middle of the group is ‘pine’ (seven sites), ‘spruce/fir’ with six sites, and ‘oak/hickory’ with four sites. Rounding out the least common timber types are ‘bottomland hardwoods’ (three sites), ‘other’ (two sites), and ‘swamp conifers’ (one site).

*Large*

'Maple/basswood' sites are also listed as the most dominant timber type for large landowners with 10 of the 19 sites listing them as dominant. 'Aspen' was tied with 'pine' and 'oak/hickory,' all having six sites listing them as a dominant timber type. 'Swamp conifers' and 'other' had one site each while no sites listed 'spruce/fir' or 'bottomland hardwoods' as dominant. Despite large landowner sites being almost three times the size, on average, they had slightly fewer timber types listed relative to the number of monitored sites. Thirty timber types were listed as dominant across 19 sites for large landowners, whereas 57 timber types listen across 35 sites for federal lands. So large landowners had slightly less diverse dominant timber types despite the vast difference in average sale acreage.

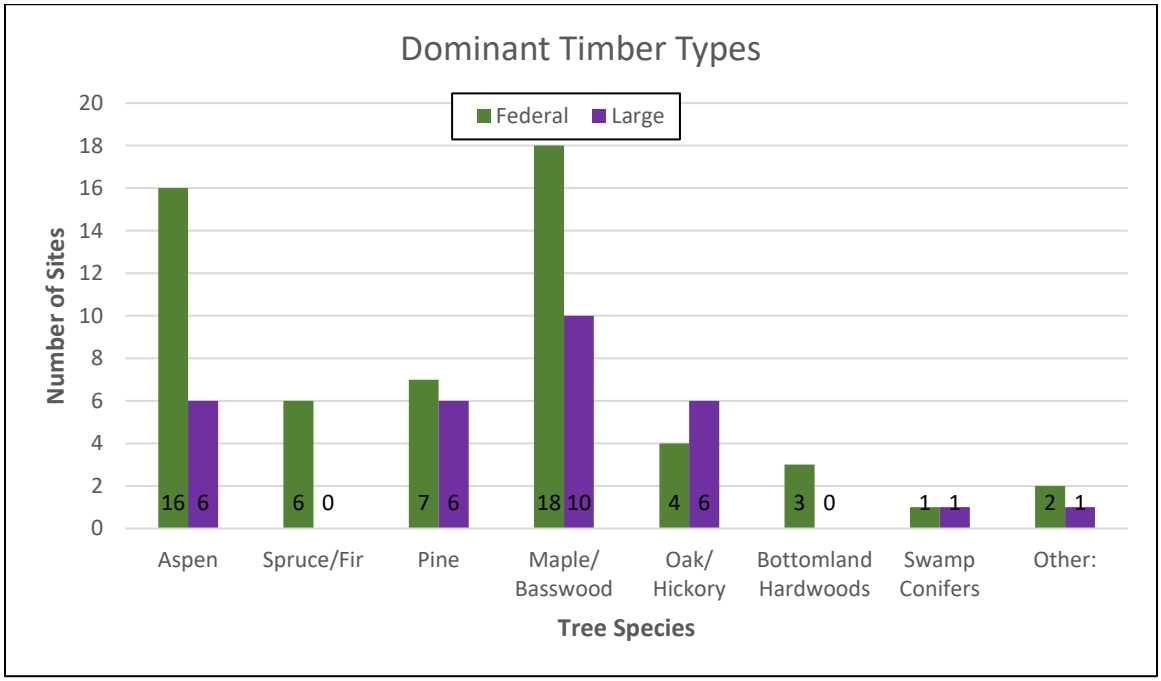



Figure 10. The number of sites that had different timber types listed as being dominant. Sites could be listed as having more than one dominant timber type.

## 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. Sites can have more than one type of silviculture prescription – this is common when there is more than one type of dominant timber type.

*Federal*

'Selection harvest' was the most common silviculture prescription used on federal lands by far, more than three times the frequency of the next most common harvest treatment (Figure 11). 'Clearcut' and 'clearcut with reserves' are the next most common with six sites apiece, followed closely by 'other.' Three of the sites were listed as 'salvage' and two with 'shelterwood.'

### *Large*

'Selection harvest' once again was the most common silviculture prescription used with 14 of the 19 sites on large landowners utilizing it. 'Clearcut' was second most common, with seven sites, followed with 'clearcut with reserves.' Only one 'shelterwood' and one 'other' site were listed. No 'salvage' silviculture prescriptions were used, which matches closely with monitoring teams listing extreme weather for federal lands and not large landowners.

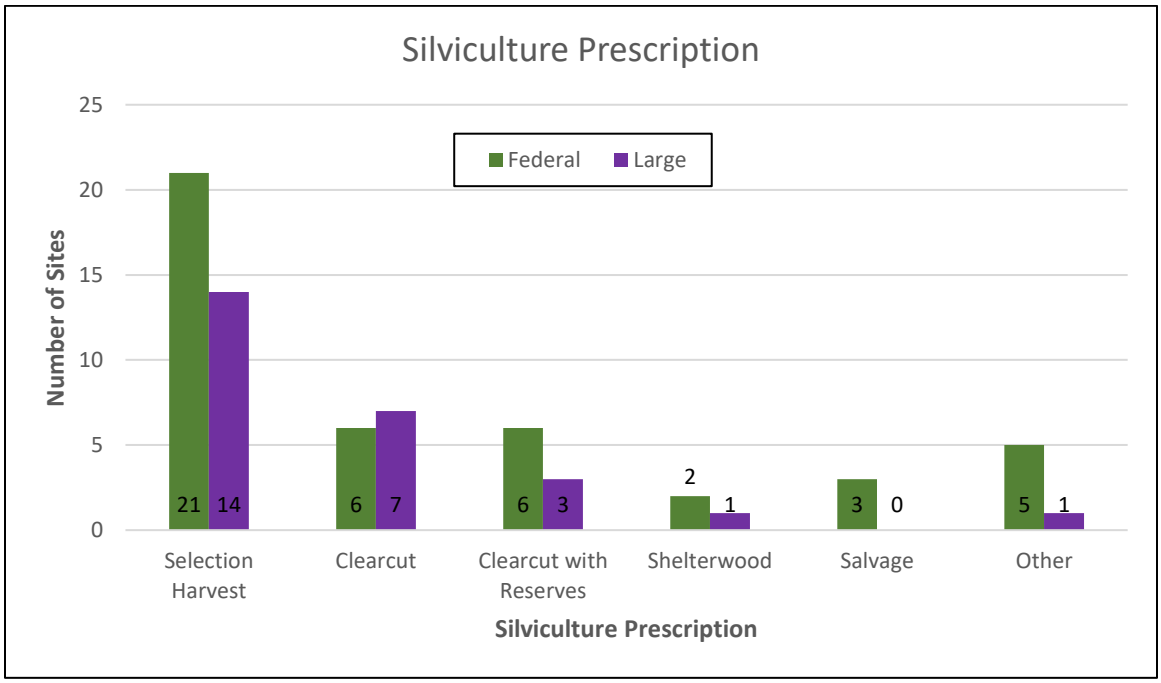



Figure 11. The number of sites with different silvicultural prescriptions. Sites can have more than one type of silvicultural prescriptions.

## 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. Often, TSIs are used due to the prevalence of invasive species within a timber stand. Treating invasive species before a timber harvest might provide a better opportunity to regenerate target tree species back into the timber stand.

### *Federal* and *Large* Landowners

Timber stand improvements were rare for both landowners. Two sites on large landowners performed 'crop tree release' and 'other' while the remaining 17 sites did not employ any TSI (Table 2). Federal lands had 29 sites where TSI was not utilized and six sites where 'other' and 'crop tree release' were used as a form of TSI. Neither landowners used pre-commercial thinnings which makes 2019 similar to other landowners monitored during past years.

| Table 2. Timber Stand Improvements | | |
|---|---|---|
| Timber Stand Improvements | Large | Federal |
| Pre-Commercial thinning | 0 | 0 |
| Crop tree release | 2 | 2 |
| Other | 2 | 4 |
| None | 17 | 29 |

Table 2. The number of sites that have different timber stand improvements.

## Harvest System

Harvesting systems are the processes loggers choose to get merchantable material (trees) to the market that is in turn dictated by the markets they are selling their product to and the equipment they have. Shortwood in harvesting system refers to trees that are leaving the forest land in smaller lengths, usually eight feet, but can be longer for lumber purposes. This can be done with numerous equipment types and is by far the most common system used. Tree-length is where the wood is going to be used for markets that use long pieces of timber, such as telephone poles. Whole tree is a system where the entire tree gets utilized, normally via chipping. Trees are normally skidded or grappled to a central landing that contains a large chipper. The tree is then chipped into tractor trailers then hauled off site. Harvesting systems that include 'other' usually involve a niche product.

### *Federal* and *Large* Landowners

It's a short story for the harvesting systems utilized for both landowners. 'Shortwood', also called cut-to-length, was the only harvesting system used while 'tree-length,' 'whole tree' and 'other' did not have any sites list them as a harvesting system (Table 3). Even though shortwood is by far the most common reported harvesting system regardless of the landowner, BMP monitoring sites have recorded others in the past. Whole tree can become common in areas of intense blowdown or salvage harvests, which a few federal sites were recorded to have.

| Table 3. Harvesting System | | |
|---|---|---|
| Harvesting System | Large | Federal |
| Shortwood | 19 | 35 |
| Tree-length | 0 | 0 |
| whole tree | 0 | 0 |
| other | 0 | 0 |

Table 3. The number of sites that have different harvesting systems utilized by the loggers.

## Equipment

The BMP monitoring teams determined the equipment used for the harvest operation using several methods. If the forester administering the sale was present, they simply asked him/her for that information. Otherwise, looking for signs of either wheel or track marks on the ground 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. This can be complicated by the fact that

most wheeled equipment can put tracks over sets of tires to achieve less ground pressure. For this study, tracked equipment was only that of plated metal tracks – not tracked up wheeled equipment.

### *Federal*

Even though there was not much diversity in harvesting systems, federal sites had diversity in equipment type, where both wheeled and tracked equipment on site was the most common with 16 sites (Table 4). Fourteen sites had exclusively 'wheeled' equipment on site and that is much different with only one site having exclusively 'tracked' equipment on site. Four sites did not know what type of equipment was used.

### *Large*

Large landowners mimic federal sites where 'both' was listed as the slight majority with eight sites followed closely by exclusively 'wheeled' equipment. 'Tracked' again was only exclusively used on one site and two sites were listed as 'unknown.' Large does have one site listed for 'other,' which could be hand cutting and livestock/small equipment, which is overall rare in Wisconsin but in certain locations where terrain is steep or difficult, can be common.

**Table 4. Equipment Type**

| Logging Equipment | Large | Federal |
|---|---|---|
| Tracked | 1 | 1 |
| Wheeled | 7 | 14 |
| Both | 8 | 16 |
| Unknown | 2 | 4 |
| Other | 1 | 0 |

Table 4. The number of sites that utilized different equipment types.

## 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.

In addition to building roads to handle the expected traffic for timber production needs, forest roads are increasingly being used by other forms of traffic as well. This is especially true for publicly owned land such as county and state land, because various user groups use forest

roads to access and enjoy their hobbies (such as hunters or bird watchers) or use forest roads as the foundation of their hobby (such as ATV or UTV users). This puts extra burdens on forest roads because they sometimes need to be built to a higher standard than the timber product would demand. If the road is not receiving extra funding from such extra user groups or through the landowner, the financial burden for maintaining and building of these forest roads might be put on the logger to a higher degree than what is needed for them to harvest the timber.

There are two ways public landowners mitigate this burden on the logger. One is to contract out road work to other private contractors, the other is to offer sales which use the road to be sold at lower costs. Then, that increased profit can be used on road building for the landowner. Regardless of the arrangements made, the application of forest road BMPs become even more important to build and maintain a road that does not harm water quality.

It is important to note that all types of road design and constructions can be successful at preserving water quality. This greatly depends on several factors: road traffic, seasonal closures, soil characteristics, topography and grade, roadbed additions and drainage control structures. If all the variables are considered correctly, water quality will not be negatively impacted by building and maintaining forest roads.

Figure 12. A forest road is shown to be gated, where only authorized users are permitted past depending on the time of year.

## Road Presence

### *Federal*

Federal forest road systems can be complicated compared to other landowners because of the large, uninterrupted national forests where their timber harvesting takes place. Normally, public gas tax roads that are not maintained by the forest landowner are the roads that are excluded from the study. In other words, named and signed roads are not scrutinized during BMP monitoring. This is normally a pretty clear line where a named public road ends and a landowner-maintained forest road begins, and therefore BMP monitoring. However, the USFS roads often have numerous derivations where a local town government gets paid to maintain a forest road owned by the USFS, or they are internally named and mapped but not on public road maps. This means it is a little less clear where BMP monitoring should start. In general, the federal forest roads were excluded if they were a mapped road, usually with two names (one on public maps, the other on forest service maps). These types of roads see on-road vehicle traffic regularly and usually have standard road signs. Roads that are designed with forest service numbering followed by a letter (264a for example) were included for monitoring. Public traffic and signage are less common for these roads.

All but one of the federal sites had forest road(s) present (Table 5). Many of those sites had forest roads which were already in existence (33 sites), but a decent number (22 sites) recorded forest roads being improved recently as well. Almost all the sites contain active forest roads (31 out of the 34 sites), whereas relatively few (12 sites) had inactive forest roads. Inactive forest roads are defined as temporary roads which are closed after the harvest. Forest roads that are bermed off or closed with boulders are considered inactive. Gates are usually considered part of an active forest road system but depending on the frequency of traffic allowed behind the gate, can be considered inactive as well. Forest roads on federal lands utilized a mixture of new and existing drainage structures, where eight sites had new drainage structures and 11 sites and existing drainage structures.

### *Large*

Eighteen of the 19 large landowner sites had forest roads present with all those sites having forest roads present to some degree before the timber harvest which prompted the 2019 BMP monitoring. Less than half (seven sites) had forest roads undergo improvement for or since the timber harvest. Active roads were also more common than inactive roads by a ratio of 3:1. Large landowner forest roads were less likely to employ drainage structures, but four sites contained existing drainage structures and one site contained new drainage structures.

| Table 5. Road Characteristics | | | |
|---|---|---|---|
| Road Characteristics | | Large | Federal |
| Sites with Roads Present | | 18 | 34 |
| Road Building | Existing | 18 | 33 |
| | Improved | 7 | 22 |
| Road Use | Active | 15 | 31 |
| | Inactive | 5 | 12 |
| Roads with Drainage Structures | New | 1 | 8 |
| | Existing | 4 | 11 |

Table 5. The number of sites that utilized forest roads and the different road characteristics found on monitoring sites.

### Water Control Structures on Forest Roads

*Federal*

Most of the drainage structures used on federal lands were existing and new cross drain culverts. Division ditches were the next most common drainage structure when two and three listed as have existing and new structures respectively (Table 6). No water bars were utilized on the forest road system and three sites had new broad-based dips as drainage structures.

*Large*

Drainage structures on large landowner sites were not common but cross drainage culverts were found on a few sites, four with existing and one with new culverts. The only other drainage structure found was diversion ditches, which was listed as present in two sites.

| Table 6. Drainage Structures | | | |
|---|---|---|---|
| **Drainage Structures** | | **Large** | **Federal** |
| Cross Drain Culverts | Existing | 4 | 9 |
| | New | 1 | 3 |
| Diversion Ditches | Existing | 2 | 2 |
| | New | 0 | 3 |
| Water Bars | Existing | 0 | 0 |
| | New | 0 | 0 |
| Broad Based Dips | Existing | 0 | 0 |
| | New | 0 | 3 |

Table 6. The number of sites that used different types of water control structures on their forest road systems.

## Severe Weather

One of the biggest wild cards when it comes to preserving water quality during a timber harvest is the amount of precipitation that falls during a timber harvest. Plans can be made for sites with numerous water features such as streams and wetlands and will receive bids accordingly, but

precipitation is always an unknown. Small amounts can make sales that are normally difficult to harvest, much more manageable.

Unfortunately, the opposite is also true; timber sales that appear to be easy and straightforward, can become an operational or logistical nightmare when large amounts of precipitation falls. This can be true whether the precipitation falls on a higher yearly or seasonal average or over a short period like a storm event. Both came into play for 2019 monitoring, especially for federal lands. Much of the northern part of Wisconsin has had higher precipitation since 2014, this is leading to elevated water levels in wetlands and seepage lakes. Higher amounts of precipitation, even as a yearly average, for an extended length of time can really put strain on the forest road system. BMP issues can develop where there were never any issues in the past.

To cap it all off, a large storm hit during the summer of 2019 that made some potential BMP monitoring sites on federal lands not able to be monitored because of all the blowdown. For some sites that endured the storm event but still had access, this meant a large precipitation event from the storm was overlayed on top of the higher yearly precipitation average. Teams take data as a group consensus based on visual cues and/or from a monitoring team member who is familiar with precipitation and storm events. Extreme weather will be recorded if it is the cause for the sale set-up, or a storm event takes place independently after timber sale set-up all the way to when the monitoring teams visit the site.

### *Federal*

More than 50% of sites on federal lands were recorded to have extreme weather (Table 7). This is completely different from 2014 BMP monitoring where no sites were recorded as having extreme weather. This is much closer to the data coming in from 2018 where both the county and state had around 50% of their sites record extreme weather. Most of 2019, along with 2018, were recorded as having higher than average annual precipitation for the past several years, and not just in a single event. Just four of the sales listed a singular storm event which triggered recording the site for extreme weather.

### *Large*

Unlike, federal lands, large landowner sites did not record much extreme weather. In fact, only one site listed extreme weather. This is unusual because the lands of large landowners are not only located close to federal lands in many cases, but also to county and state lands which recorded extreme weather during 2018. This could be a bias coming from the BMP monitoring teams because all county, state, and federal BMP monitoring teams usually have first-hand knowledge of the sites because many employees of the ownerships often volunteer to participate in BMP monitoring when it is that ownership being monitored. Volunteers from large landowners are less common. The one site that did record extreme weather did so because of higher than average precipitation.

| Table 7. Extreme Weather | | |
|---|---|---|
| **Extreme Weather Recorded** | **Yes** | **No** |
| Large | 1 | 18 |
| Federal | 19 | 16 |

Table 7. The number of sites that exhibited signs of extreme weather.

Figure 13. This site showcased the above average precipitation taking place on many federal sites. This forest road is holding water despite soils not being listed as hydric, as the surrounding aspen and pine tree species would also indicate.

# Results

## *Overview*

During the 2019 Wisconsin Forestry Best Management Practices for Water Quality monitoring season, 54 sites were visited by the monitoring teams and included 35 sites for federal lands and 19 sites for large landowners. 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 they 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 used evaluating application and effectiveness. There are several different application categories that describe how the landowner either used, or did not use a given BMP, as applicable. In turn, BMP effectiveness is rated for individual BMPs and are also divided into the different categories of application.

## *BMP Application*

The first element that a monitoring team must decide when evaluating 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.

## BMP Application Rates

With the wide range of applicable BMPs, there are more BMPs that are not applicable to each site than ones that are. This is usually true even when sites have multiple water resources present. Stream crossings, both on forest roads and on skid trails (timber harvesting section) make up a disproportionate amount of questions, 38 out of the 119. They are also broken down into the infrastructure type used so even if a site uses a culvert on a forest road, and a temporary timber mat stream crossing on a skid trail, they still won't have all the BMP applicable for stream crossings.

Another example would be sites that contain forest roads that do not have all forest roads BMPs applicable to each site. Sites with forest roads do not always have newly constructed forest roads, drainage structures on those forest roads, or a need to apply erosion control on forest roads. It becomes clear even when a site has a fair number of water resources, because of the numerous micro divisions within each of the main monitoring categories, many BMPs are not applicable. During the 2019 BMP monitoring, 32.3% of BMPs were applicable on federal lands and 27.5% of BMPs were applicable on large landowner sites (Figure 14). It is this smaller proportion of the BMPs, which are supposed to be implemented on site to protect water quality, that this report will focus on. From here on in, the percentages of BMPs which were *applied correctly*, *applied but incorrectly*, *not applied where needed*, and *insufficient information*, will be expressed out of the smaller group of only the BMPs that were applicable to each site, not the total of 119 BMPs that could potentially be applicable.

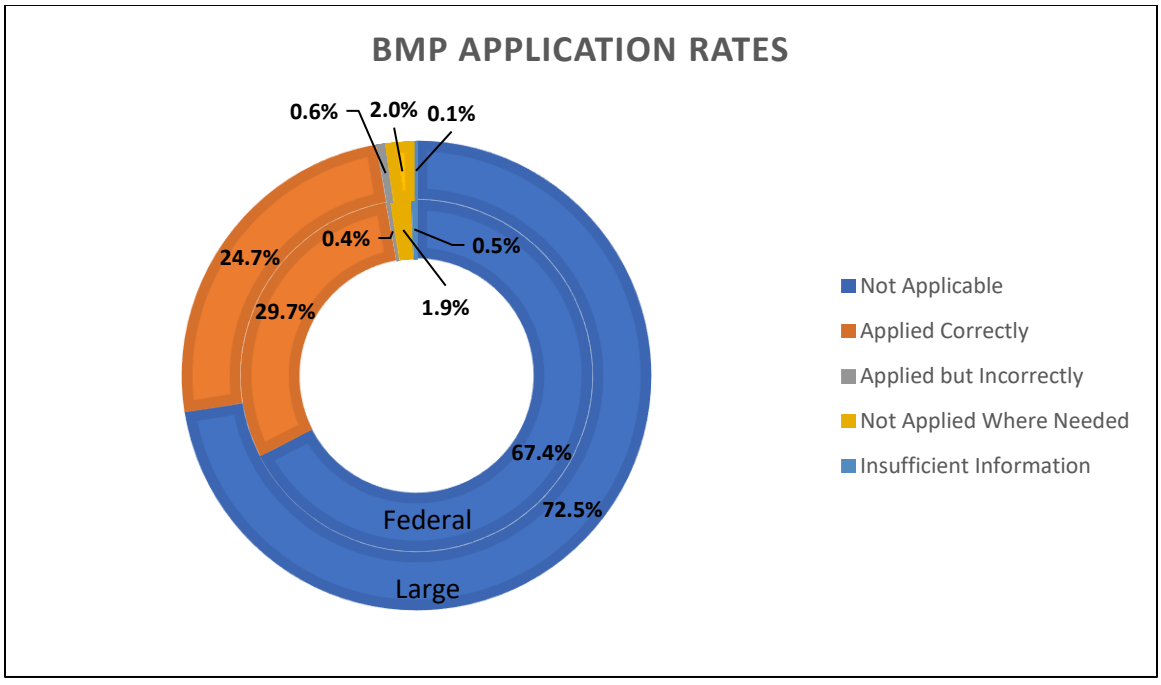



Figure 14. This shows the percentage of BMPs that were applicable for the monitoring teams to evaluate on application and effectiveness.

*Federal*

The total application for federal lands was 94.2% and the *correct application* was slightly less at 92.9% (Figure 15). Only 5.8% of the time, was a BMP applicable to a site and it was *not applied*. BMPs *applied incorrectly* would be the difference between the BMPs which were applied and BMPs that are *correctly applied*, leaving just 1.3% of BMPs *applied incorrectly*. This is slightly less than in 2014 where federal lands had a 96.3% correct application rate, meaning correct application dropped 3.4%.

*Large*

The total application for large landowners was 92.8% and the *correct application* was still above 90%, coming in at 90.5%. BMPs were *not applied* where they were needed for 7.2% of the time. That leaves the *incorrectly applied* BMPs at 2.3%. This is lower than 2014 where correct application of BMPs was 94.7%.

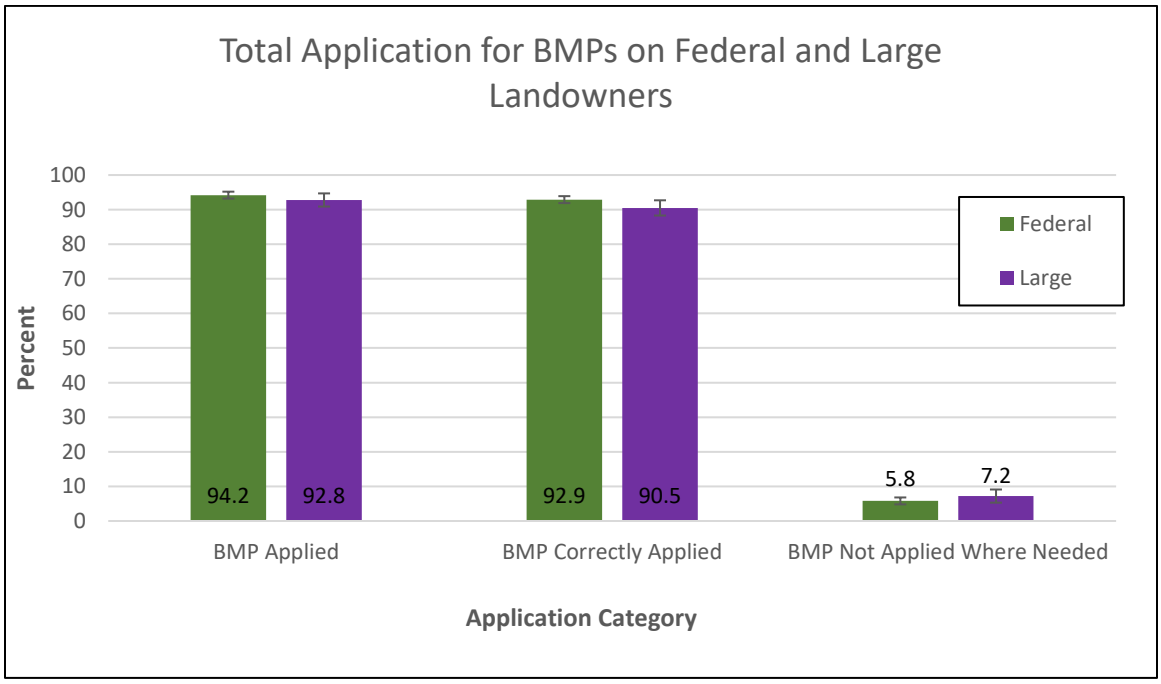



Figure 15. This figure shows the application rates of different application categories, as a percentage on county and state sales, for BMPs that were determined by the monitoring teams to pertain to the site.

## 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 correct 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.
- Forest roads are often used by other user groups, who may have very different goals for their use of properties forest road and be ignorant of BMPs and how to best protect water quality.

This is compared with BMPs for the monitoring category 'fuels, waste, and spills.' To achieve a high correct application rate in this monitoring category, trash or spills must be cleaned up – if they occurred at all.

### *Federal*

As expected, most of the BMP monitoring categories received high rates of BMP *correct application*. 'Fuels, waste and spills', 'RMZs' and 'Timber harvesting' had all above a 97% rating (Figure 16). 'Wetlands' were not far behind with a 94.4% correct application rating. Lagging behind, like usual (for all landowners, throughout all years), are 'forest roads' with only an 84.9% correct application rate.

On federal sites, this is the only monitoring category that dropped by more than 2% from BMP monitoring in 2014. This is also the second highest correct application rate for forest roads of the four landowners monitored during 2018 and 2019. This could very well be more reflective of the above average amount of precipitation that has occurred in much of Wisconsin since 2014. It's quite possible that rather than an engineering change in road design, BMP implementation rate, or even vehicle use rate, forest roads are degrading faster because of all the precipitation they are receiving. BMPs like number 28, "construct roads to remove water from road surfaces" and number 42 "keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs" are examples of BMPs that, during dry times, are much more likely to applied correctly and during wetter times, are more likely to have ponding water, or rutting, which would indicated there are BMPs that are not applied when needed. It is also possible that the increased user demand has caused more damage on the forest road systems. The access that forest roads provide, is becoming more important to a growing group of individuals for one reason or another. With both increased demand and increased precipitation occurring, a confounding mixture of the two may have created the decrease in correct BMP application. What seems unlikely is federal land managers or the loggers who work on them are becoming less inclined to use BMPs on forest roads. If this was the case, one would expect a decline in multiple monitoring categories to be present, but because other categories are staying almost the same, any answer must be primarily focused on the decrease experienced on forest roads.

Another point of data that steers the conversation away from only an increase in precipitation that then caused the decrease in correct application, is the observations from other monitoring categories. They should have also been heavily influenced by precipitation, mainly wetlands and general rutting – which would be reflected in the timber harvesting category – but they did

not drop nearly as much in correct application ratings as forest roads did. Only a minor drop from 98.7% to 97.7% occurred in timber harvesting, and 96.1% to 94.4% in wetlands was recorded. Therefore, extreme amounts of precipitation alone should not have dropped correct BMP application rates for forest roads in 2014 from 92.9% to 84.9% in 2019, or 8%. Other users, whose use has only been increasing on forested properties, federal lands included, along with the high precipitation totals over the past five years, combined with not adding drainage structures, or addressing both increased users and precipitation, may have caused federal lands to have a dramatic drop in correct BMP application – just like two of the other landowners monitored during 2018 and 2019. All four landowners had their correct application rate drop in forest roads, state and county lands marginally, whereas federal and large landowners both dropped by more than 8%.

*Large*

The three major differences between large landowner and federal lands are:

- Correct application rates are slightly lower for each monitoring category.
- 'Wetlands' experienced more of a significant drop from 2014 from 98% to 89.8% in 2019.
- 'Forest roads' had even more of a significant drop in correct application rates between 2019 and 2014.

'Fuels, waste, and spills,' along with 'RMZs' gained a few percentage points between the two and 'timber harvesting' dropped less than 1%. Just as in the federal case, there could be numerous explanations for this decrease, but likely the combination of factors coming together, with the key features being increased precipitation and greater non-forestry use of forest roads resulted in the decrease.

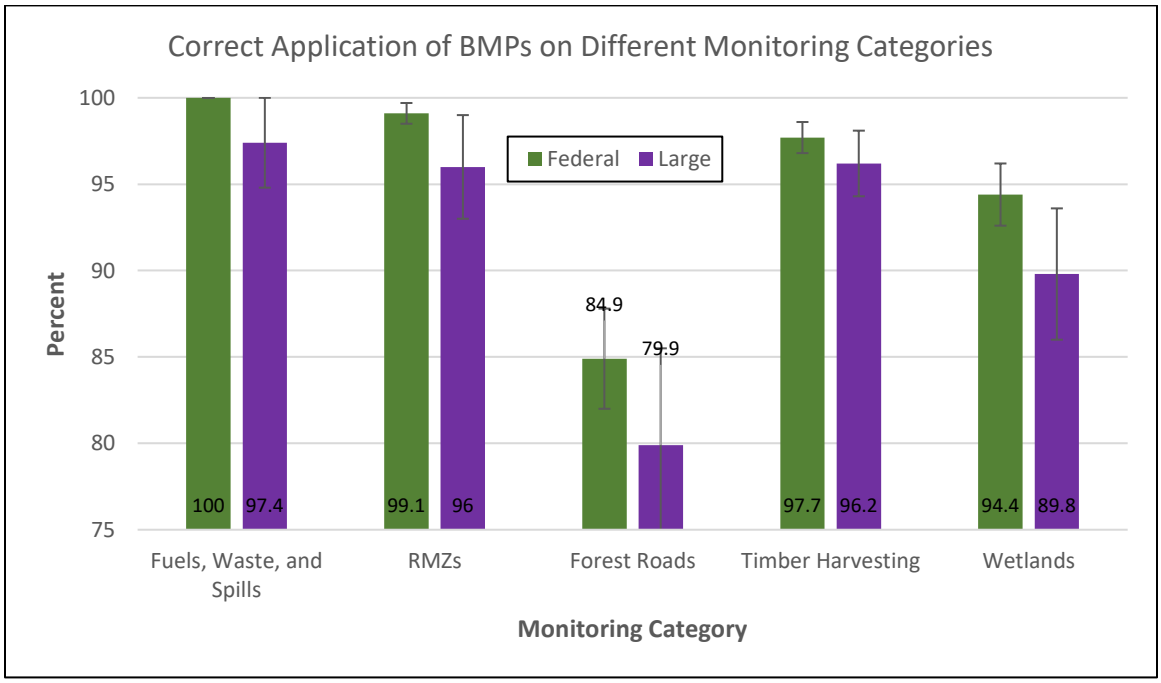



Figure 16. This shows the application rates between the five different monitoring categories.

## 2019 BMP Correct 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, 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.

### *Federal*

2019 was the first year the *correct application* rate dropped since the BMPs program start since 1995 on federal lands (Figure 17). Despite this most recent drop, 2019 rate of 92.9% was still higher than 91% in 1995-1997. Throughout all of BMP monitoring, federal lands have always been above ninety percent correct application.

### *Large*

Large landowners took a step backward in 2019 and had slightly lower *correct application* rate than when the BMP program first started in 1995-1997. This was however, only 0.5% lower in 1995-1997, but 4.2% lower than 2014 which is more comparable. With 2019's data, the overall trend – was BMP correct application going up or down over time – was shifted from positive to basically flat, technically negative by less than a tenth of a percent.

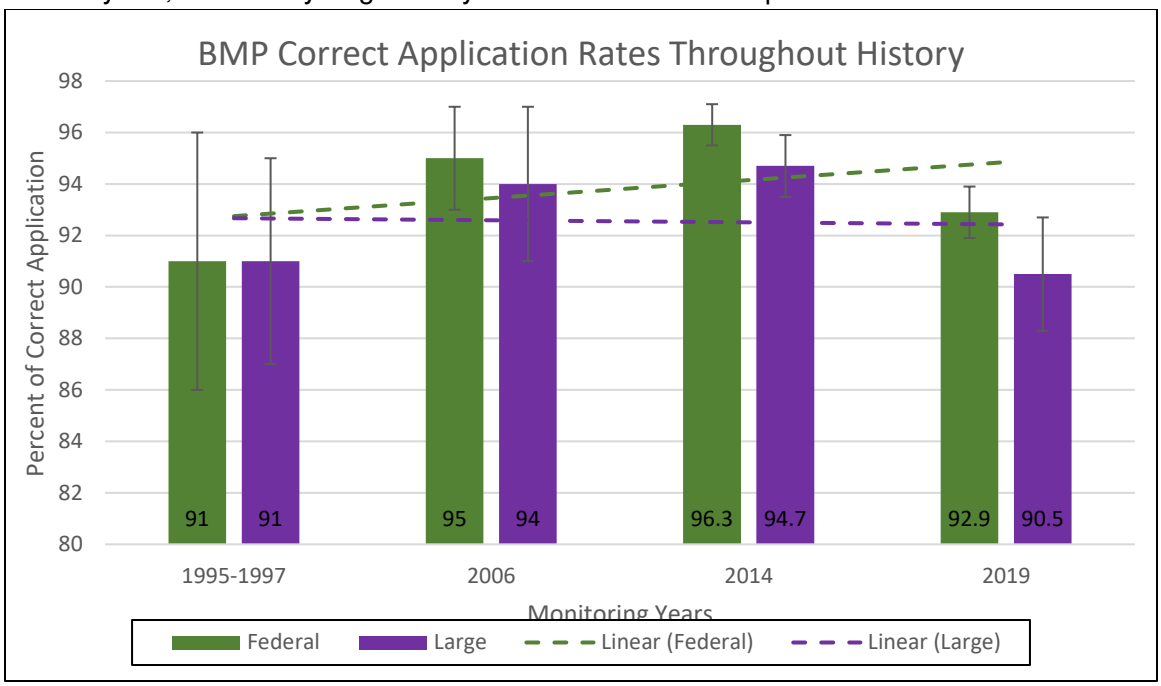



Figure 17. This figure shows the *correct application* rates throughout the state's BMP program history, from its start in 1995 to current day, 2019. Trend lines have been added to show the overall change in application rates, which is growth for federal lands and slightly negative for large landowners.

*Federal*

Figure 18 shows what was written about earlier where the negative change in 'forest roads' correct application rates is visible when compared to past years and other monitoring categories. Another notable change is how 'RMZs' correct application has increased dramatically from 1995-1997 to 2019. 'Fuels, waste, and spills' along with 'timber harvesting' have seen little change throughout the years and have consistently remained high. 'Wetlands' have remained constant after a drop occurred from 1995-1997 to 2003.

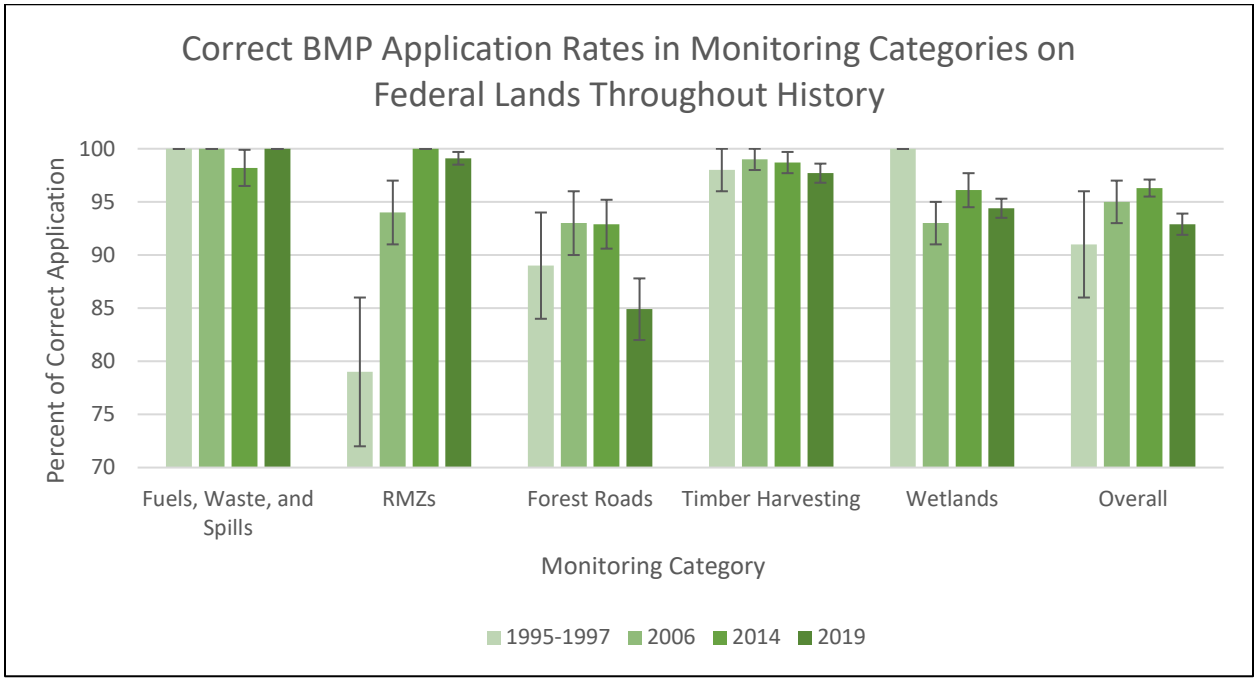



Figure 18. The different monitoring categories have varying *correct application* rates throughout the time federal lands have been monitored under the BMP program.

*Large*

Large landowner sites show 'fuels, waste, and spills' have stayed the same high correct application rate all the way from the start of the BMP program in 1995-1997 to 2019 (Figure 19). 'RMZs' have jumped up dramatically after their first low correct application in 1995-1997 to 2006 and stayed right around 95% since 2006. 'Forest roads' follow a similar pattern to federal sites where the lowest correct application was observed in 2019, where before it was hovering around the 90% range. 'Timber harvesting' is almost constant. 'Wetlands' show close to the same correct application rates for the start of BMP monitoring in 1995-1997 as in 2019, just about 90%, but in 2006 and 2014 it was much higher closer to 98%. Overall, because most categories stayed the same or decreased, this leads to the overall decrease in correct application discussed earlier.

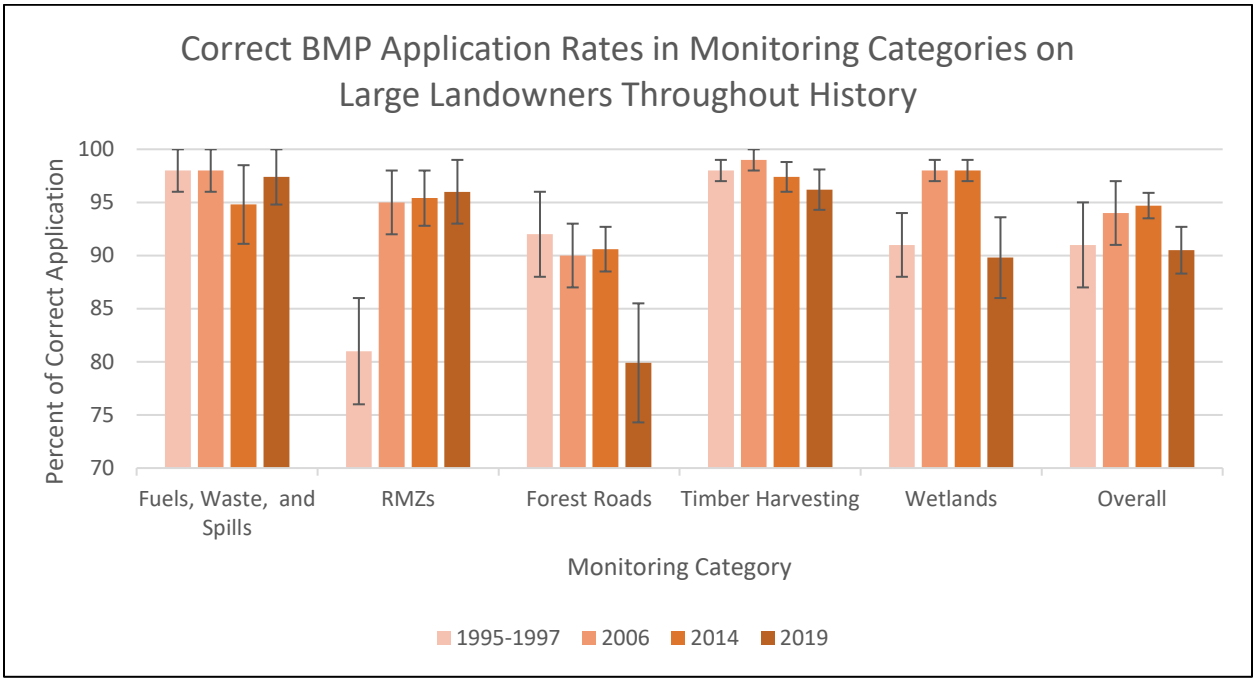



Figure 19. The different monitoring categories have varying *correct application* rates throughout the time large landowner sites have been monitored under the BMP program.

## *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 a slight adverse impact on water quality.

- *Major* refers to a significant adverse impact on water quality.

By describing these impacts as a reflective point in time, it means that the best professional expertise is used to rate how an impact is occurring on a specific site at that current time. For example, a newly installed stream crossing that features an undersized culvert might be functioning well at the time of BMP monitoring. The team would be looking for evidence of overtopping, past road failures, and debris clogging the culvert. If none of these are currently exhibited by the site, this culvert would be rated as BMP *applied correctly* with *no adverse impact* to water quality for effectiveness. The teams will not take stream calculation measurements to determine the actual size of culvert needed but only take observational cues as evidence. The culvert, for all purposes, simply may not have been tested during a major storm event and will wash out during said storm event. This is the main reason that sites are not monitored immediately after harvest and are allowed at least one growing season to establish trends before BMP monitoring occurs. This also allows vegetation to regrow on the potential soil disturbance that occurred during the sale. Only the soil disturbance that fails to revegetate, which is also more likely to be a water quality impact, to be visible during BMP monitoring.

## BMP Effectiveness for *Correctly Applied* BMPs

### *Federal*

Similar to past findings both with federal sites and with all other landowner sites, federal sites have extremely high rates of protecting water quality when BMPs have been *correctly applied* (Figure 20). Three of the five categories scored 100% for protecting water quality, while the other two categories, ‘timber harvesting’ and ‘wetlands’, scored 99.7% and 98.2% respectively. Overall, this led to protecting water quality 99.5% when all monitoring categories were combined.

### *Large*

Large landowner sites mirror that of federal sites, where water quality is protected when BMPs have been *applied correctly*. The same three categories got a perfect 100% and the other two categories were very close to the federal rates, where ‘timber harvesting’ scored 99.3% and ‘wetlands’ protected water quality 98.1% of the time. This makes the total rate for protecting water quality when BMPs are applied correctly 99.3%.

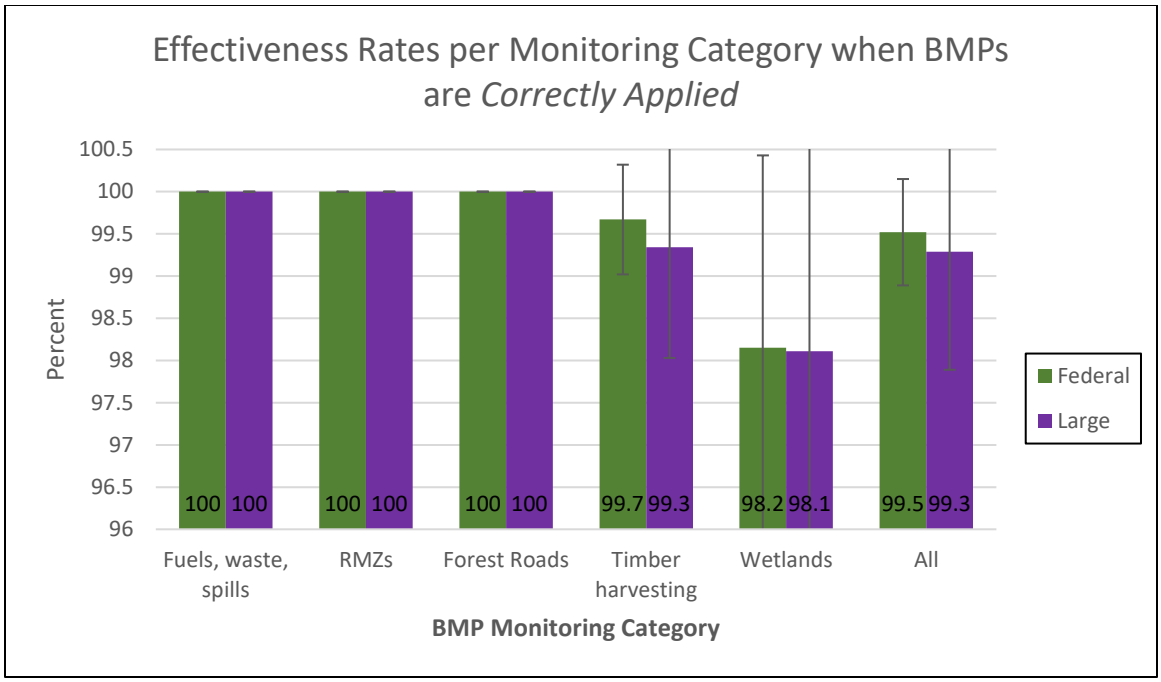



Figure 20. Effectiveness rates for different monitoring categories when BMPs are *correctly applied* to a site.

## BMP Effectiveness for *Not Applied* BMPs

### *Federal*

When BMPs are *not applied* to a site where they are needed, water quality is not protected near as often. In the case of federal sites, water quality is only protected 64.1% of the time compared to the previous 99.5% of the time. Another way to state this would be water quality impacts were observed 35.9% of the time when BMPs are *not applied*. Even though this is quite a large drop, from 99.5%, federal sites experienced much less impact when a BMP was *not applied* when compared to large landowners during 2019 BMP monitoring and both county and state sites monitored in 2018. These three landowners only protected water quality around 30% (28.4% - county, 30.6% - state, and 35.6% - large). So, when federal sites have 64.1%, that is close to double the other landowners. Even with the larger room for error, remember that only 30% or so BMPs are applicable to each site and 90+% of those are *applied correctly*. That means these calculations are based off only 10% out of 30% of all BMPs that are applicable. This smaller group leads to larger error bars (Figure 21) but considering the other three landowners are within 8% from each other and federal is almost 30% greater of the highest other landowner, error doesn't seem to offer a good explanation for this finding. One hypothesis is the larger amount of precipitation showed where BMPs were not used, but water quality impacts had yet to manifest. Conversely, in dry years, it can be more difficult for BMP teams to tell if BMPs are needed or if they simply have not been tested.

As an example, on the monitoring form BMP #22 notes "select road locations that allow for drainage away from road." During drier years, it can be difficult for a team to determine if the road would pond water, if there was more rain. Or correspondingly, to be able gather the visual

data of the road being dry, as a function of the road following the BMPs and therefore selecting a road location that allows drainage away from the road. Since BMP data is gathered through visual means and a point-in-time, unless the road would obviously hold water if there was more precipitation, BMP monitoring teams will, and are instructed to, rate this BMP as being *applied correctly* with *no impacts* to water quality observed. However, if there was more precipitation and water was starting to pond on the road, but no rutting had begun to take place, it becomes evident that the road was not placed in a location that allows for drainage even if there is *no impact* to water quality. This example offers one explanation for why water quality would still be protected even when BMPs are not being applied. It does not answer why the other three landowners did not experience the same increase in water quality protection for BMPs that were *not applied*. This higher relative rate of water quality protection when BMPs are *not applied* means water quality impacts did not increase proportionally to the drop in correct BMP application. Hence, water quality impacts found on federal lands during 2019 BMP monitoring may have been close to the same, or even less than those found during 2014, despite BMP *correct application* dropping from 96.3% in 2014 to 92.9% in 2019. Figure 21 also shows once again, that despite this drop in application rate, no *major short-term* or *major long-term* impacts to water quality were observed in any of its 35 sites.

### *Large*

Large landowner data, as mentioned previously, looks a lot more like the data collected during 2018 for county and state land. Water quality was protected 35.6% of the time when BMPs are *not applied*, translating to water quality being impacted 64.4% of the time. Most of water quality impacts found on large landowner sites when BMPs were *not applied* are in the category of minor long-term, 46.7%. Few are in the *minor short-term* category, at 13.3% and almost none are found in the *major short-term* impact category, 4.4%. No *major long-term* impacts were observed when BMPs were *not applied*.

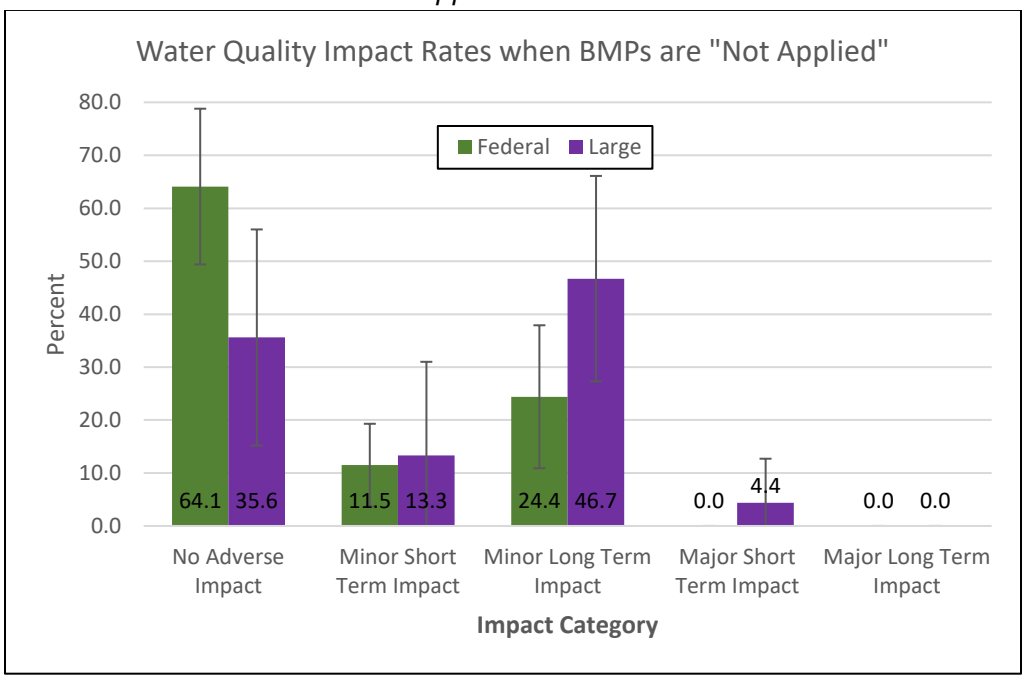


Figure 21. Water quality impact rates are broken down into the five effectiveness categories when BMPs are *not applied* where they are needed.

## BMP Effectiveness in Different Application Categories

The vast difference between water quality impact rates for BMPs that were *applied correctly* vs. *not applied* are illustrated in figure 22. It shows that when BMPs are *correctly applied*, there is no adverse impact nearly 100% of the time and when they are *not applied*, impacts will be observed much more frequently (35.1% for federal and 64.4% for large landowner sites). Figure 22 emphasizes protecting water quality from silvicultural activities is as straightforward as using BMPs correctly when deemed necessary but when they are not used, water quality impact rates skyrocket. No other BMP application categories (BMPs *applied incorrectly* for example) are shown due to its extremely small sample size.

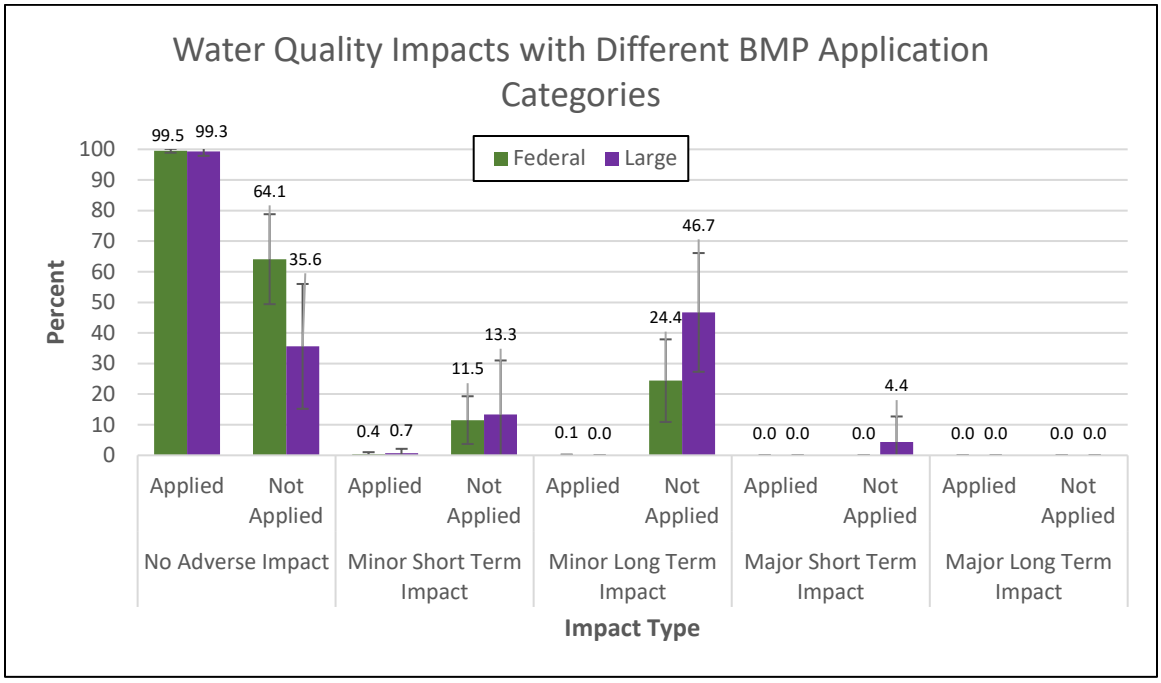



Figure 22. Water quality impacts are shown in the five BMP effectiveness categories when the application rates are either *applied correctly* or *not applied*.

# Conclusion and Recommendations

2019 BMP monitoring is the fourth time where federal and large landowners have been monitored if the first years are counted as one set (1995-1997). While county-owned lands received the first measurable decline since the start of the program during 2018, it was a slight regression so not as much of a concern was expressed, since state *correct application* rates stayed the same. 2019, however, paints a clearer picture because both federal and large landowners *correct application* rates decreased like those of the county during 2018. What's more, after the large landowner *correct application* rates were compared to past years, the overall trend is no longer positive, another first time for any of these four landowners.

It has been clear that three of the four landowners recording such high occurrences of extreme weather in the form of overall and individual precipitation events has had an impact on the BMP *correct application* rate. This, combined with both federal and large landowners taking a plunge in their *correct application* on 'forest roads' almost exclusively (besides large landowner sites decrease with 'wetlands' as well), highlights how above average precipitation can impact BMPs.

Higher precipitation is not the only variable no doubt, instead it is magnified by the ever-growing pressure from recreational demand using wheeled traffic – throughout multiple seasons. It is also noticeable that recreational vehicles have been increasing in size and weight throughout the past few years. Not only are larger UTVs replacing the smaller ATVs, but the size of each class of vehicle is becoming larger, faster, heavier and more powerful. With recreational traffic and storms not showing any tendency to subside in future years, Wisconsin's best way to continue to improve water quality on all public lands would be to focus on 'forest roads.' This should include discussions of where such traffic is ecologically appropriate and sustainable, which may bring access restrictions on some forest roads while simultaneously focusing funds to build better and provide routine maintenance to the forest roads that are left open. This will better protect water quality by more appropriately following the BMPs and bring the *correct application* of BMPs within the forest road category, back to a positive trend.

BMPS that are *applied correctly* still have the best chance of protecting water quality, with both landowners achieving water quality protection above 99% percent of the time. Despite having higher precipitation and high user demand, only one large landowner site recorded any *major* impacts to water quality. Federal lands did not record any from their 35 monitored sites. With the *minor* impacts being much more prevalent than *major* impacts, the focus should be applying the "little" elements of the BMP manual. Foresters, loggers and contractors are doing an excellent job spending the extra time around highly sensitive areas like stream crossings and RMZs. To improve water quality rates, small elements like re-crowning forest roads after the sale, or installing broad based dips on even gradual slopes should be the focus going forward. These are the types of BMPs that are not always applied – partly because they are not always recognized as needed. Often time – they only become evident after an exceptionally wet, stormy or heavily used season.

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

- 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 to incorporate new scientific findings on water quality and to ensure clear understanding of all BMP rules, guidelines and goals.
- Discussion with the BMP Advisory Committee: which seeks to support and bolster Wisconsin's BMP program to protect water quality while addressing needs of the communities involved with and affected by silviculture.

In addition, it should be recognized by all public land managers, the potential growing user demand of public property and how storms may test even the best designed timber sales. Nowhere is this more evident than 'forest roads,' which remain the number one way to increase protection on water quality by implementing Wisconsin's BMPs correctly.

# **Appendix A:** Methods

*Selection of Timber Harvests*

During the 2019 monitoring cycle, 436 federal sales and 207 large landowner sales were eligible to become BMP monitoring sites. All sales that were financially closed out during the calendar year of 2018 were initially eligible for BMP monitoring. To achieve a 95% confidence interval, it was determined that 29 sales from federal lands would need to be monitored and 27 sales from large landowners would need to be monitored. With 35 sales being monitored on federal lands, the 95% confidence interval was able to be obtained. Since only 19 sales were monitored for large landowners, the confidence interval of 95% was not able to be reached.

All the calculations for sample size determination and application and effectiveness analyses are run in a statistical computer program called R.

While it is helpful to have monitoring sites spread across the state – so they encompass the full variability of Wisconsin's diverse forest landscape – it is not a requirement as stated in 'Water Resources' section. Rather, any site that meets the criteria for monitoring can be monitored and spatial relation to other monitoring sites is not considered.

*Bias and Limitations*

Bias, regarding 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.

To prevent some areas of 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: field checking, and satellite review through DNR Surface Water Data Viewer and Google Earth.

One minor way bias is introduced is by the eligibility criteria, it intentionally selects sites that have BMPs applicable to it and sites that are possible for teams to walk (less than ½ mile to the sales edge) or drive to. 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.

The last area of bias is one common to almost all BMP programs – how sites are rated for effectiveness at protecting water quality. The two elements that lead to bias through effectiveness ratings come from:

- how effective (or not effective) a BMP was is only judged as it is presented at a specific point in time to the monitoring teams
- being qualitative(observational) rather than quantitative(measurable)

When effectiveness is rated from a specific point in time, it only allows the monitoring team a narrow view of what could be happening on site. Variables as simple as snow cover, can make BMPs appear to be more or less effective than they actually were. More complicated variables, like scheduled maintenance on forest roads, can greatly increase the effectiveness of BMPs compared to when the monitoring teams evaluate the site.

When effectiveness is rated from a qualitative standpoint, it allows monitoring teams to be more flexible on how they rate a site. This allows for professional judgment of the team as a whole, and as individuals, be expressed as they rate the site for effectiveness. Bias is introduced because not every team or team member has the same professional judgment and they may rate sites different from other teams or individuals. The reason the ratings are done as a qualitative measure is because of time, practicality, and cost is greatly reduced compared to monitoring done using quantitative measures. One way to reduce this professional judgment bias is by the monitoring training held every year for individuals that participate in BMP monitoring. This allows for a greater consistency across individuals and monitoring teams for the recorded effectiveness.

# **Appendix B**: Eligibility Criteria –Field Form

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

**Tony Evers, Governor**
**Preston Cole, Secretary**
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

## Eligibility Criteria - Field Form

2019 Federal and Large Landowners 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:** 2019 BMP Monitoring Teams

**Team 1**: Jessica Krusensterna, Ann Dassow, Mark Farina, Lauren Soergel

**Team 2**: Nicky Martin, Michael Filtz, Robert Huray, Jake Raj, Matthew Monahan

**Team 3**: Katy Walker-Daniels, Karl Linnemanstons, Tyler Wickham, Michael McNelly

**Team 4**: Chris Duncan, Jeremy Hubbard, Chris Ester, Roberta Kunzman

**Team 5**: Andrew Neveln, Sam Williams, Kyle Johnson, Jesse Sebero

**Team 6**: Joseph LeBouton, Logon Jones, Steve Probst, Jim Mineau, Grant Ebert

**Team 7**: Bryan Patek, Katie Mallum, Randy Mell, Tom Gjerde

**Team 8**: Jeff Nyquist, Kris Wimme, Ken Pemble, Rich LaValley

**Team 9**: Hillary Keller, Shawna Monroe, Taylor Dorsey, Dan Buckler

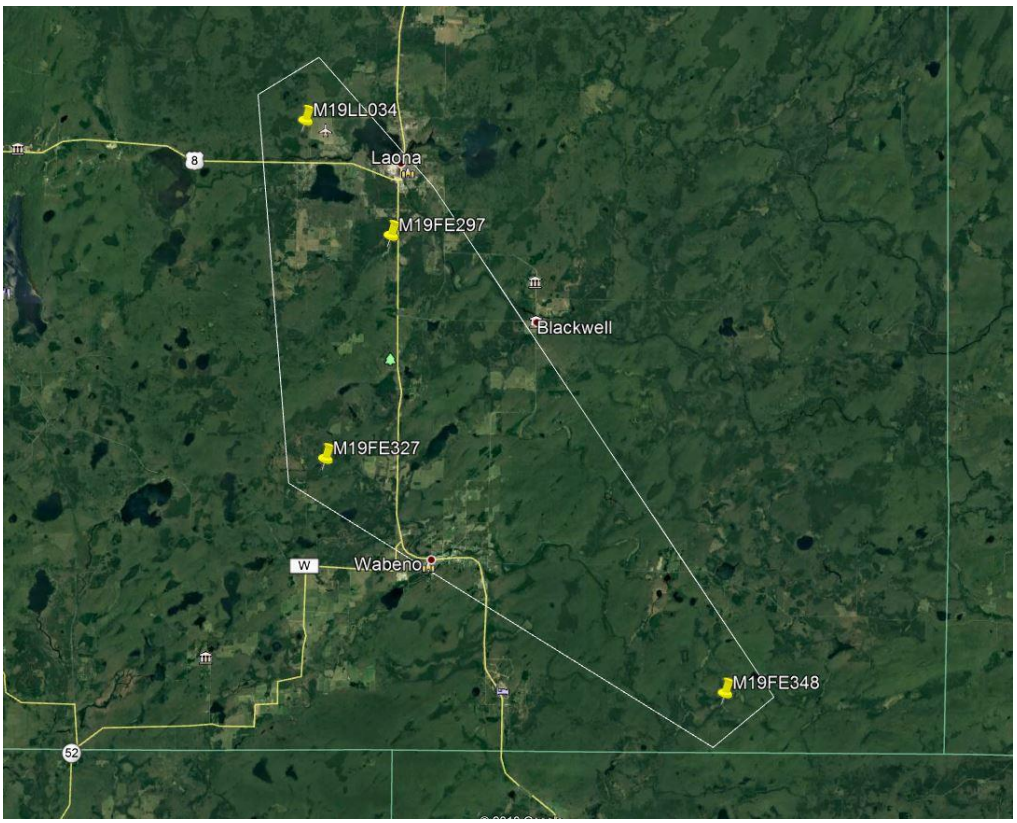
**Team 10**: Nolan Kriegel, Jaden Hoeft, Ruth King, Shane Staudenmaier

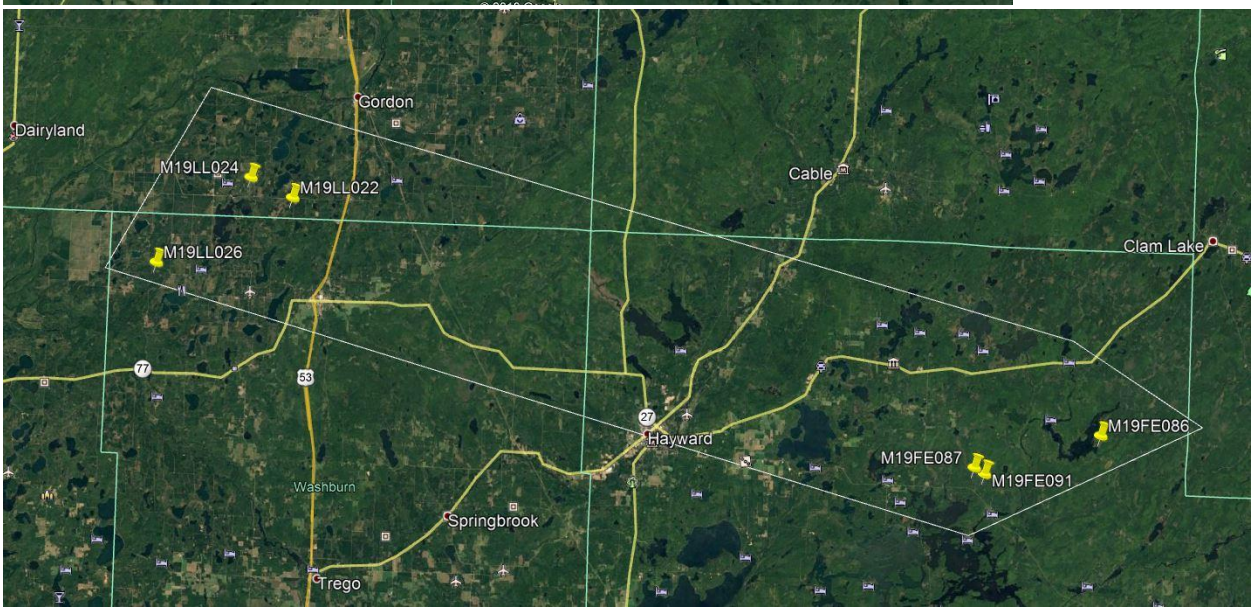
**Team 11**: Dave Kafura, Alex Rowe, Gabriel Esquibel, Sue Reinecke

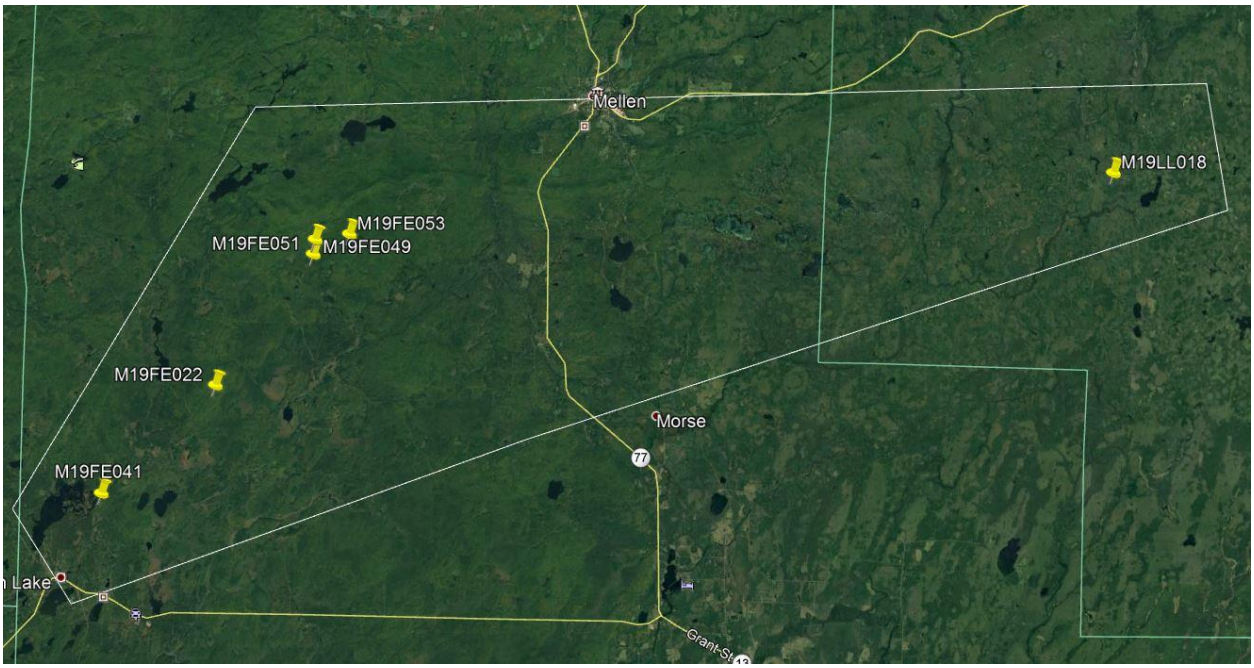
**Team 12**: Jennifer Jefferson, Sara Sommer, Darrell Pierson, Ryan Schleifer

Team Leaders are underlined

# **Appendix D:** BMP Monitoring Team Maps

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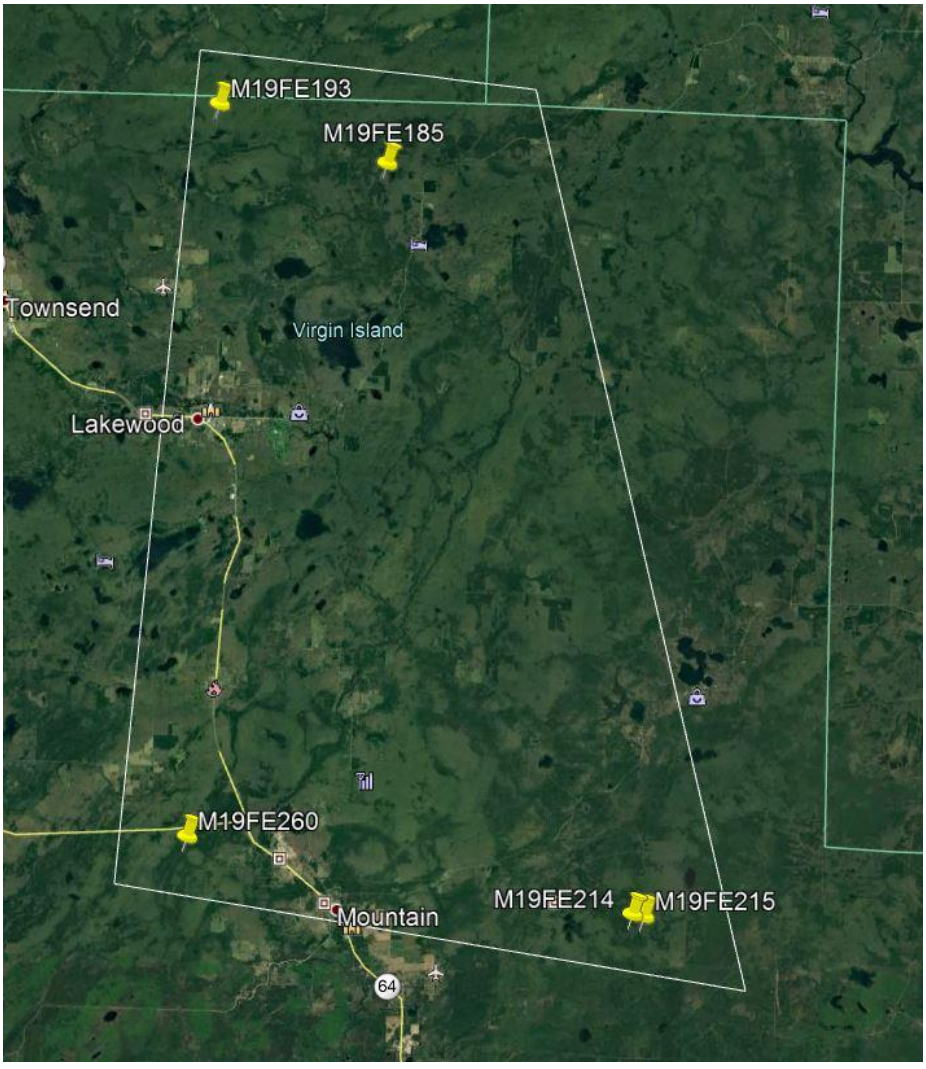
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Mountain
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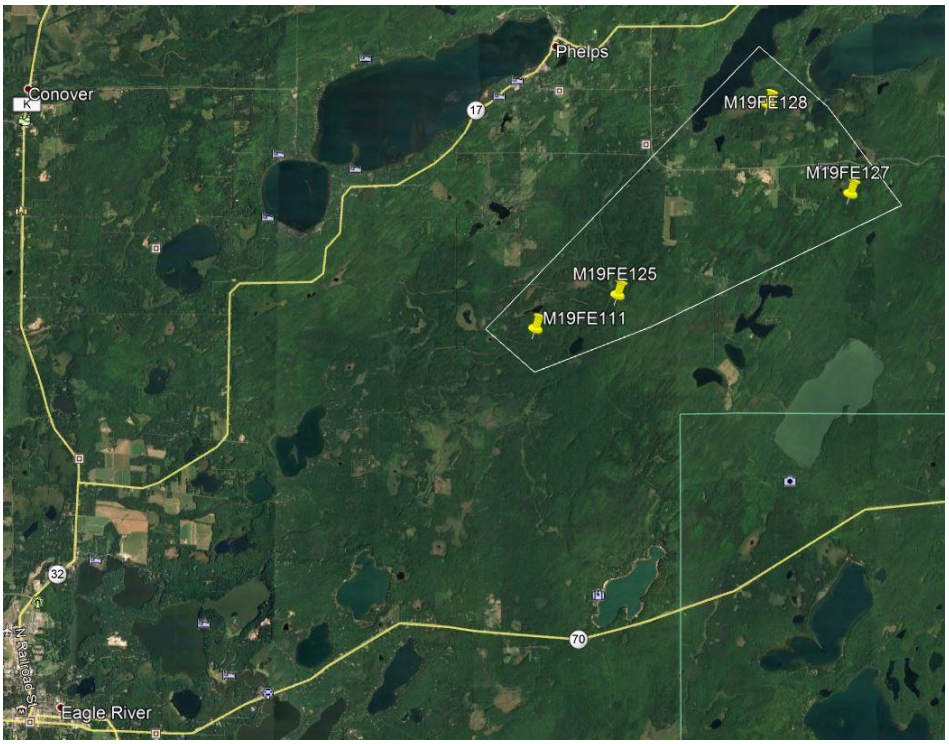
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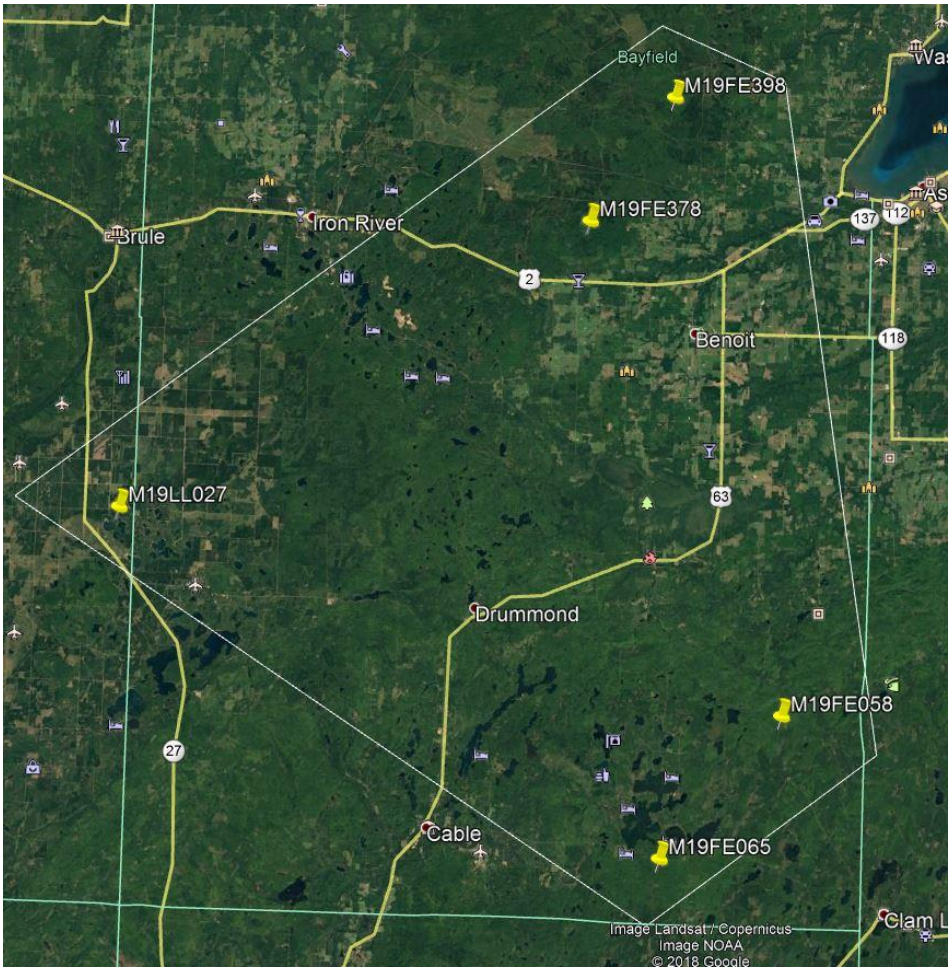
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Image Landsat / Copernicus
Image NOAA
© 2018 Google

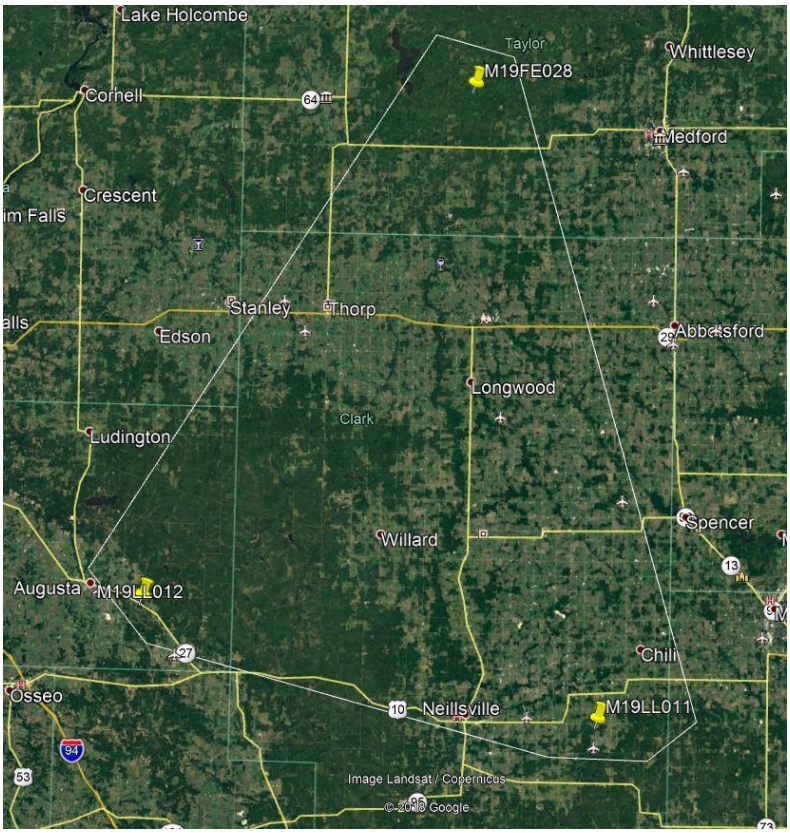
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Image Landsat / Copernicus
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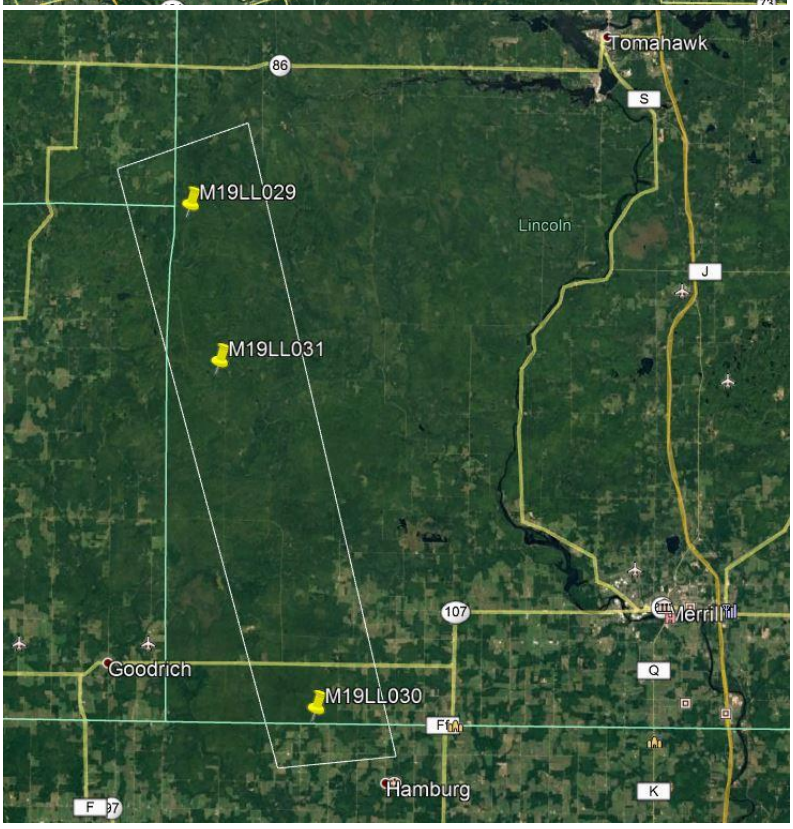
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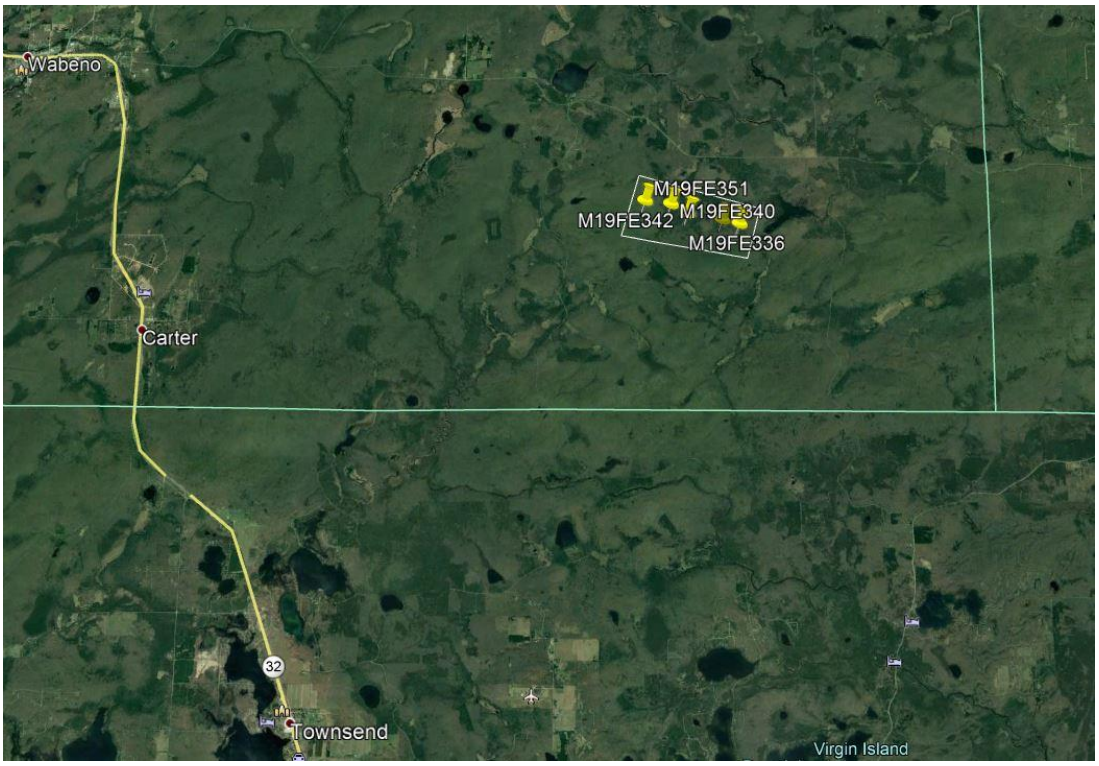
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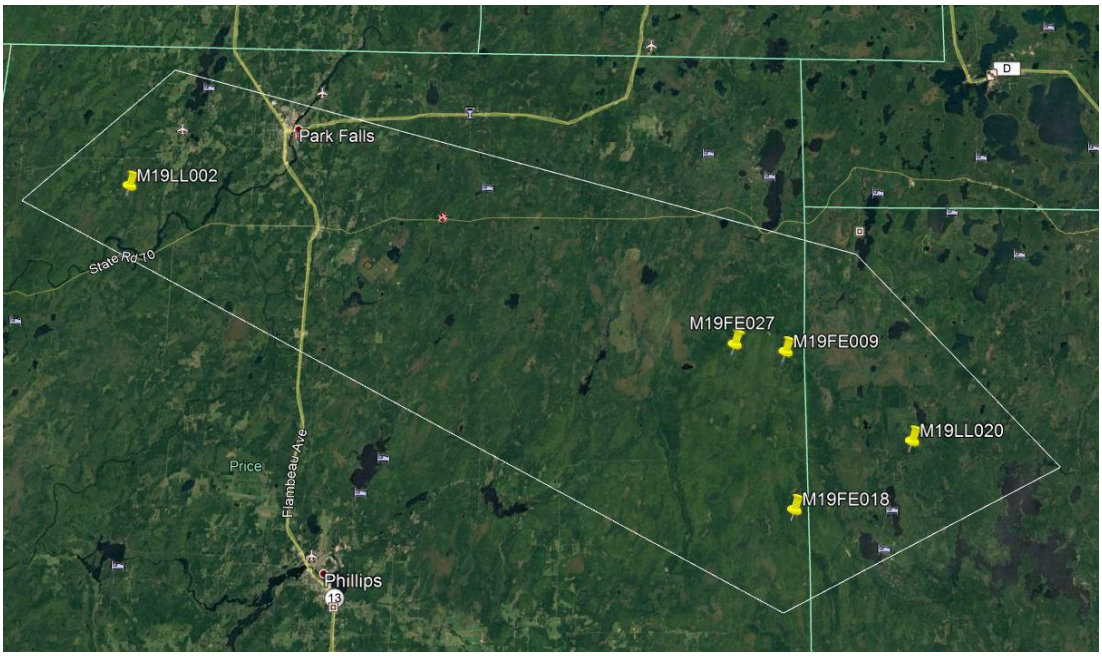
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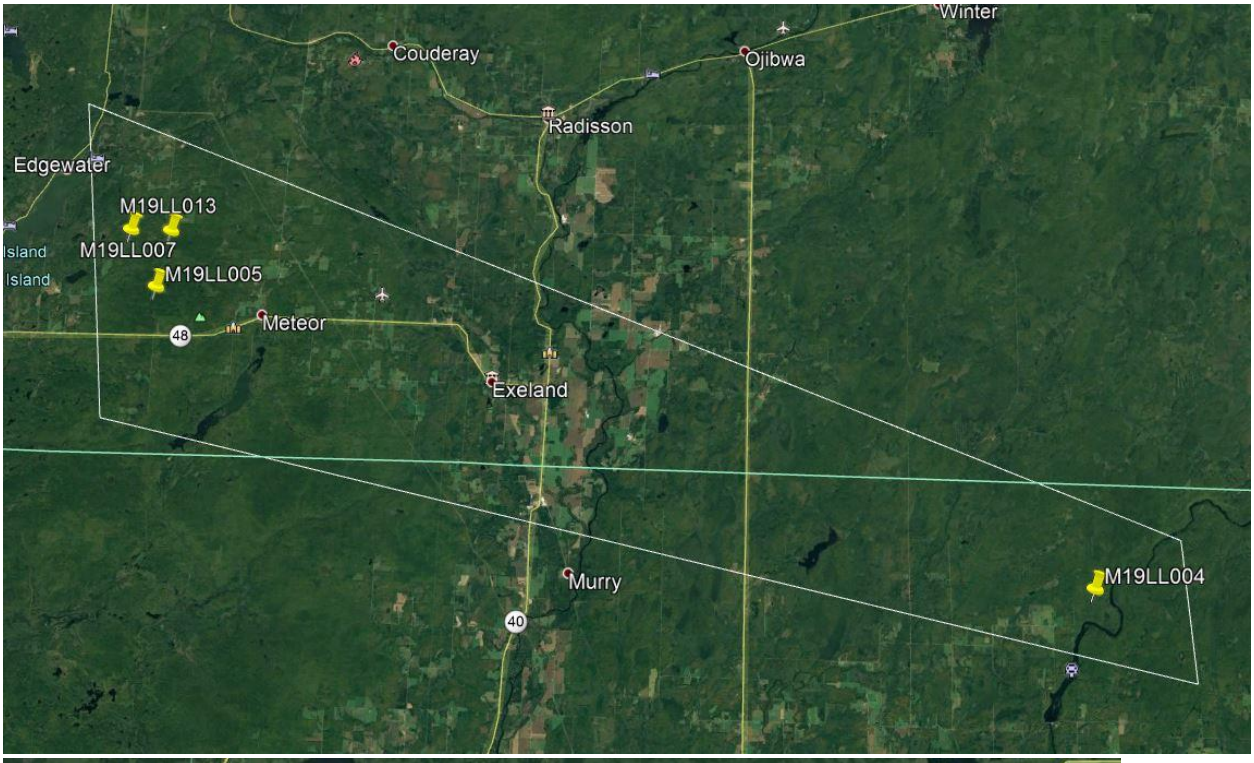
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Murry
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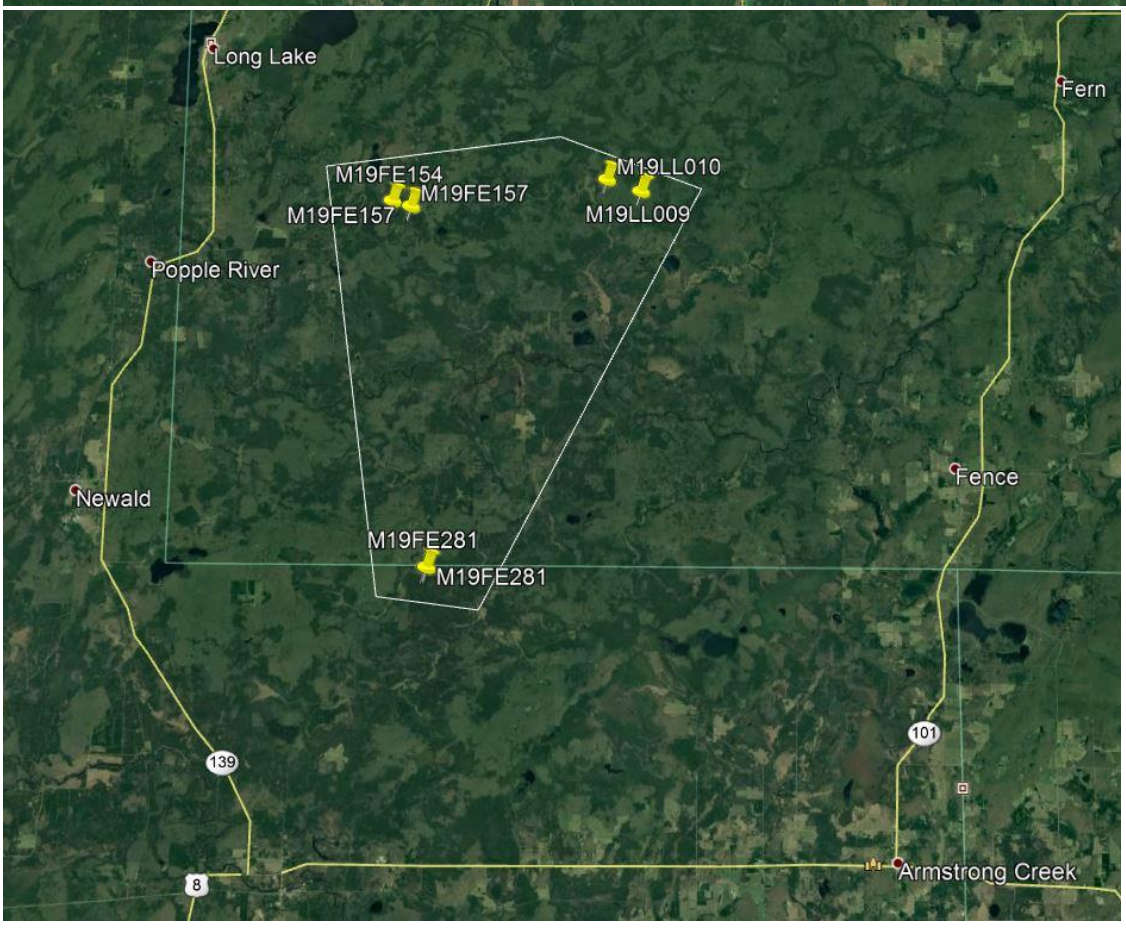
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M19LL009
Popple River
Fence
Newald
M19FE281
M19FE281
101
139
8
Armstrong Creek

# **Appendix E:** BMP Monitoring Worksheet

## 2019 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:

| | | |
|---|---|---|
| Team 1 | Team 2 | Team 3 |
| Team 4 | Team 5 | Team 6 |
| Team 7 | Team 8 | Team 9 |
| Team 10 | Team 11 | Team 12 |

Non-Team Members: _____

Age of Harvest:

| | | |
|---|---|---|
| ❑ Less than 1 y.o. | ❑ 1 to 2 y.o. | ❑ More than 2 y.o. |
| ❑ Unknown | ❑ Multiple years | |

Acres Harvested: _____

Weather Conditions:

| | | |
|---|---|---|
| ❑ Sunny | ❑ Partly Sunny | ❑ Cloudy/Overcast |
| ❑ Rain | ❑ Snow | ❑ Drought |

Any Extreme or Rare Weather Events?

❑ Yes ❑ No

Please explain:

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

| **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).<br>❑ Yes – stream(s).<br>Go to next question. | | ❑ No.<br>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.<br>Go to next question. | | ❑ No.<br>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.<br>❑ Exceeds the minimum standard of 100 feet.<br>❑ Is less than the minimum standard of 100 feet.<br>❑ An RMZ was not used. | | |
| B-f. If the RMZ width was modified, it was… | ❑ Increased _____ feet.<br>❑ Decreased _____ feet. | | |
| B-g. The basal area retained within the RMZ was… | ❑ 0 – 20 sq. ft./acre<br>❑ 20 – 40 sq. ft./acre<br>❑ 40 – 60 sq. ft./acre<br>❑ 60 – 80 sq. ft./acre<br>❑ More than 80 sq. ft./acre | | |
| B-h. The **pre-harvest** condition of the RMZ was… | ❑ Forested the entire width<br>❑ Forested greater than 50% of the width<br>❑ Forested less than 50% of the width<br>❑ 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.<br>Go to next question. | ❑ No.<br>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.<br>❑ Exceeds the minimum standard of 35 feet.<br>❑ Is less than the minimum standard of 35 feet.<br>❑ An RMZ was not used. | | |
| B-k. If the RMZ width was modified, it was… | ❑ Increased _____ feet.<br>❑ Decreased _____ feet. | | |
| B-l. The basal area retained within the RMZ was… | ❑ 0 – 20 sq. ft./acre<br>❑ 20 – 40 sq. ft./acre<br>❑ 40 – 60 sq. ft./acre<br>❑ 60 – 80 sq. ft./acre<br>❑ More than 80 sq. ft./acre | | |
| B-m. The **pre-harvest** condition of the RMZ was… | ❑ Forested the entire width<br>❑ Forested greater than 50% of the width<br>❑ Forested less than 50% of the width<br>❑ Not forested (tag alders or sedge meadow) | | |

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| ***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.<br>Go to next question. | ❑ No.<br>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.<br>❑ Exceeds the minimum standard of 35 feet.<br>❑ Is less than the minimum standard of 35 feet.<br>❑ An RMZ was not used. | |
| B-p. If the RMZ width was modified, it was… | ❑ Increased _____ feet.<br>❑ Decreased _____ feet. | |
| B-q. The basal area retained within the RMZ was… | ❑ 0 – 20 sq. ft./acre<br>❑ 20 – 40 sq. ft./acre<br>❑ 40 – 60 sq. ft./acre<br>❑ 60 – 80 sq. ft./acre<br>❑ More than 80 sq. ft./acre | |
| B-r. The **pre-harvest** condition of the RMZ was… | ❑ Forested the entire width<br>❑ Forested greater than 50% of the width<br>❑ Forested less than 50% of the width<br>❑ 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.<br>Go to next question. | ❑ No.<br>Go to Section D – Timber Harvesting. |
| C-b. What best describes the forest road design? (Check all that apply.) | ❑ Crowned<br>❑ Out-sloped | ❑ In-sloped<br>❑ Flat |
| C-c. What best describes the predominant construction of forest roads? | ❑ Roads are below the grade of adjoining land.<br>❑ Roads are at grade with no ditch constructed.<br>❑ Roads have an excavated ditch less than 1 foot deep.<br>❑ Roads have an excavated ditch greater than 1 foot deep.<br>❑ Roads were created by cut and fill on side slopes.<br>❑ Roads were constructed of fill material with no excavation.<br>❑ Roads are a combination of these types. | |
| C-d. Was there an existing forest road system for this timber sale? | ❑ Yes.<br>Go to next question. | ❑ No.<br>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.<br>Go to next question. | ❑ No.<br>Go to Question C-f. |
| 22. Select road locations that allow for drainage away from the road. | | |

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| 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 new or existing drainage structures located on forest roads? | ❑ Yes. Go to next question. | | ❑ No. Go to Question 38. |
| 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.<br>❑ Existing cross drain culvert(s)<br>❑ New open-top culvert(s)<br>❑ Existing open-top culvert(s)<br>❑ New broad-based dip(s). Go to Question 37.<br>❑ Existing broad-based dip(s)<br>❑ New water bar(s)<br>❑ Existing water bar(s)<br>❑ New diversion ditch(es)<br>❑ Existing diversion ditch(es)<br>❑ 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. | | | |

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| 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. | | | |
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| ***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.<br>❑ Existing stream crossing used. Go to Question 55.<br>❑ Both new and existing stream crossings used. Go to next question. | | |

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| 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<br>❑ Culverts<br>❑ Fords<br>❑ Pole fords (PVC or logs)<br>❑ Timber mats<br>❑ Frozen snow/ice crossing<br>❑ Other: _____<br>❑ 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.<br>Go to next question. | ❑ No.<br>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.<br>❑ Existing culvert(s) were used. Go to Question 63.<br>❑ 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. | | | |

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| 63. Keep culverts clear and free of debris so that water can pass unimpeded at all times. | | | |
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| ***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. | | | |
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| **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. | | | |
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| ***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. | | | |
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| ***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. | | | |

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| 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. | | | |
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| ***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.<br>❑ Existing stream crossing used. Go to Question 92.<br>❑ 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. | | | |

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| 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<br>❑ Culverts<br>❑ Fords<br>❑ Pole fords (PVC or logs)<br>❑ Timber mats<br>❑ Frozen snow/ice crossing<br>❑ Other: _____<br>❑ 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.<br>Go to next question. | ❑ No.<br>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.<br>❑ Existing culvert(s) were used. Go to Question 100.<br>❑ 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.<br>Go to next question. | ❑ No.<br>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.<br>❑ Existing ford(s) were used. Go to Question D-h.<br>❑ 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. | | | |
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| ***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

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| ***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.<br>❑ Slash was from trees harvested in the wetlands.<br>❑ 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. | | | |

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| 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.<br>Go to next question. | ❑ No.<br>Go to Question F-d. |
| F-b. Was there a skid trail or forest road in a spring or seep? | ❑ Yes.<br>Go to next question. | ❑ No.<br>Go to Question F-d. |
| F-c. What was the impact on the spring or seep? | ❑ No adverse impact to water quality.<br>❑ Minor short-term impacts to water quality<br>❑ Minor long-term impacts to water quality.<br>❑ Major short-term impacts to water quality.<br>❑ Major long-term impacts to water quality. | |

***Timber Harvesting***

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| F-d. What is the dominant cover type(s) of the harvested area? (check all that apply) | ❑ Aspen<br>❑ Spruce/Fir<br>❑ Pine<br>❑ Maple/Basswood<br>❑ Oak/Hickory<br>❑ Bottomland Hardwoods<br>❑ Swamp Conifers<br>❑ 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<br>❑ Spruce/Fir<br>❑ Pine<br>❑ Maple/Basswood<br>❑ Oak/Hickory<br>❑ Bottomland Hardwoods<br>❑ Swamp Conifers<br>❑ Other: |
| F-f. What best describes the silvicultural prescription(s) used? | ❑ Clearcut<br>❑ Clearcut with reserves<br>❑ Shelterwood<br>❑ Seedtree<br>❑ Selection harvest<br>❑ Other: |
| F-g. What best describes the timber stand improvements that were used, if any. | ❑ Pre-commercial thinning<br>❑ Crop tree release<br>❑ Other:<br>❑ None |
| | ❑ Shortwood (cut-to-length) |

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| F-h. What best describes the type of harvesting system(s) used? (check all that apply) | ❑ Tree-length (pole skidding)<br>❑ Whole tree (chipping operation)<br>❑ Other: | |
| F-i. What best describes the logging equipment used? | ❑ Wheeled<br>❑ Tracked<br>❑ Both<br>❑ Other: | |
| F-j. Was this a salvage operation? | ❑ Yes | ❑ No. |
| F-k. What season(s) did harvesting occur? | ❑ Spring (March – May)<br>❑ Summer (June – August)<br>❑ Fall (September – November)<br>❑ Winter (December – February)<br>❑ 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<br>❑ 2 = Poor<br>❑ 3 = Average<br>❑ 4 = Good<br>❑ 5 = Excellent | |
| F-o. How would you rate this site for its overall impact on water quality? | ❑ 1 = Severe impacts to water quality<br>❑ 2 = Moderate impacts to water quality<br>❑ 3 = Slight impacts to water quality<br>❑ 4 = Negligible impacts to water quality<br>❑ 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 |
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F-p. Was This sale seasonally restricted due to water quality concerns?

- ❑ Yes – All of the sale was completely restricted due to water quality concerns
- ❑ Yes – Some of the sale (____%) was partially restricted due to water quality concerns
- ❑ No – None of the sale was restricted due to water quality concerns

## **Appendix F-1**: BMP Monitoring Results for Federal Sites

| **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 BMP's | Not Applicable | 4165 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 35 | 35 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 2. Collect all waste lubricants, containers and trash (i.e. grease cartridges). | Not Applicable | 0 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 35 | 35 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| **Riparian Management Zones** | | | | | | | |
| 3. Locate roads outside the RMZ, unless necessary for stream crossings. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 4. Locate landings outside the RMZ. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 5. Do not dispose of or pile slash within the RMZ. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 6. Minimize soil exposure and compaction to protect ground vegetation and the duff layer. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Not Applied | 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 | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 8. Operate wheeled or tracked equipment within 15 to 50 feet of the OHWM when the ground is frozen or dry. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 9. Do not harvest fine woody material within 50 feet of the OHWM. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 10. Use selection harvests and promote long-lived tree species appropriate to the site. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 16 | 16 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 11. Harvesting intervals should be a minimum of every 10 years. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 13. Develop trees 12 inches DBH and larger. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 31 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 15. Do not harvest fine woody material within 15 feet of the OHWM. | Not Applicable | 31 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 16. Use selection harvests and promote long-lived tree species appropriate to the site. | Not Applicable | 31 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 4 | 4 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| 17. Harvesting intervals should be a minimum of every 10 years. | Not Applicable | 31 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 4 | 4 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 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 | 31 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 4 | 4 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 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 | 34 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 1 | 1 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| 20. Do not harvest fine woody material within 15 feet of the OHWM. | Not Applicable | 34 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 1 | 1 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| **Forest Roads** | | | | | | | | |
| 21. Use existing roads when they provide the best long- term access. | Not Applicable | 2 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 33 | 33 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| 22. Select road locations that allow for drainage away from the road. | Not Applicable | 13 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 22 | 22 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| 23. Where possible, locate roads on well-drained soils. | Not Applicable | 13 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 22 | 22 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |
| 24. Minimize the number of stream, dry wash, and wetland crossings. | Not Applicable | 13 | | | | | | |
| | Insufficient Information | 0 | | | | | | |
| | Applied Correctly | 22 | 22 | | | | | |
| | Applied Incorrectly | 0 | | | | | | |
| | Not Applied | 0 | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25. Locate roads outside of riparian management zones and wetland filter strips, except at crossings | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 21 | 21 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 0 | | | | | |
| 27. Construct roads to follow natural contours and minimize cut and fills. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 21 | 21 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 28. Construct roads to remove water from road surfaces. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 19 | 19 | | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 2 | 1 | 1 | | | |
| 29. Construct stable cut and fill slopes that will re-vegetate easily, either naturally or artificially. | Not Applicable | 22 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 13 | 13 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 30. Do not bury debris in the road base. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 5 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 31. Install drainage structures to remove water from road surface and ditches. | Not Applicable | 20 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 14 | 14 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 0 | | | | | |
| 32. Install a berm at the inlets of drainage structures, if needed, to direct water into the structures. | Not Applicable | 26 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 7 | 7 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | 1 | | 1 | | |
| 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 | 6 | 6 | | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 2 | 1 | 1 | | | |
| | Not Applicable | 22 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 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. | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 11 | 11 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 1 | 1 | | | | |
| 35. Check drainage structures to ensure that they are not filling with sediment or other debris. Clean if needed. | Not Applicable | 22 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 9 | 9 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 4 | 4 | | | | |
| 36. Install cross drain culverts long enough to extend beyond the road fill. | Not Applicable | 24 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 11 | 11 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 32 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 38. Use seed, mulch and/or erosion control netting where necessary to minimize soil erosion into lakes, streams and wetlands. | Not Applicable | 29 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 40. Maintain, clean and/or replace sediment control structures until areas of exposed soil are stabilized. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 41. Inspect the road system at regular intervals. Clear debris from drainage structures to prevent clogging that can lead to washouts. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 5 | 5 | | | | |
| 42. Keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs. | Not Applicable | 5 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 12 | 12 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 17 | 12 | 1 | 4 | | |
| 43. Shape road surfaces periodically to maintain proper surface drainage. Fill in ruts and holes with gravel or | Not Applicable | 5 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| compacted fill as soon as possible to reduce erosion potential. | Applied Correctly | 20 | 20 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 10 | 5 | 1 | 4 | | |
| 44. Remove berms along the edge of the road if they will trap water on the road. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 13 | 13 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 4 | 3 | | 1 | | |
| 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 | 30 | | | | | |
| | Insufficient Information | 5 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 46. Remove all temporary drainage and crossing structures. | Not Applicable | 30 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 47. Shape all road system surfaces to maintain proper surface drainage, if necessary. | Not Applicable | 24 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 2 | | | 2 | | |
| | Not Applied | 5 | 3 | 1 | 1 | | |
| 48. Inspect and maintain road surfaces, drainage structures, and crossings to minimize erosion. | Not Applicable | 23 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 7 | 7 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 5 | 4 | 1 | | | |
| 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 | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 50. Install stream crossing structures at right angles to the stream channel. | Not Applicable | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 51. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life. | Not Applicable | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 52. Minimize channel changes and the amount of excavation or fill needed at the crossing. | Not Applicable | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 54. Use soil stabilization practices on exposed soil at stream crossings. | Not Applicable | 33 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 55. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life. | Not Applicable | 28 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 56. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream. | Not Applicable | 29 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 57. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream. | Not Applicable | 28 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 58. Install culverts that extend at least 1 foot beyond the road fill. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 59. Install culverts that are large enough to pass flood flows. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 60. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Not Applied | 0 | | | | | |
| 62. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 63. Keep culverts clear and free of debris so that water can pass unimpeded at all times. | Not Applicable | 29 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 0 | | | | | |
| 64. Locate fords where stream banks are low. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 65. Locate where the stream bed has a firm rock or gravel streambed. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 66. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| **Timber Harvesting** | | | | | | | |
| 68. Use existing landings if possible. | Not Applicable | 8 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 27 | 27 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 35 | 35 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 9 | | | | | |
| | Insufficient Information | 1 | | | | | |
| | Applied Correctly | 25 | 25 | | | | |
| | Applied Incorrectly | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Not Applied | 0 | | | | | |
| 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. | Not Applicable | 7 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 27 | 27 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 72. Use existing skid trails if they provide the best long-term access. | Not Applicable | 5 | | | | | |
| | Insufficient Information | 1 | | | | | |
| | Applied Correctly | 29 | 29 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 35 | 35 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 74. Whenever possible, winch logs up steep slopes if conventional skidding could cause erosion that affects water quality. | Not Applicable | 23 | | | | | |
| | Insufficient Information | 4 | | | | | |
| | Applied Correctly | 8 | 8 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 75. Avoid operating equipment where excessive soil compaction, rutting, or channelized runoff may cause erosion that affects water quality. | Not Applicable | 0 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 33 | 32 | 1 | | | |
| | Applied Incorrectly | 2 | | 1 | 1 | | |
| | Not Applied | 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 | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 15 | 15 | | | | |
| | Applied Incorrectly | 2 | | 2 | | | |
| | Not Applied | 1 | | 1 | | | |
| 77. Inspect soil stabilization practices periodically during and after harvest operations to insure that they are successful and remain functional. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 5 | | | | | |
| | Applied Correctly | 16 | 16 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 78. Do not dispose of or pile slash in areas where runoff may wash slash into lakes, streams, or wetlands. | Not Applicable | 0 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 35 | 35 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 79. For winter harvesting, mark stream channels, dry washes, and existing culvert locations before snowfall. | Not Applicable | 31 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 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 | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 81. Avoid locating roads and landings within 35 feet of the dry wash unless necessary for crossings. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 82. Operate wheeled or tracked equipment within 15 feet of the dry wash only when the ground is frozen or dry. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 83. Do not harvest fine woody material within 15 feet of the dry wash. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 84. Minimize soil exposure and compaction to protect ground vegetation and the duff layer. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 85. Avoid cabling logs across the dry wash, where feasible, to prevent damage to the banks of the dry wash. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 87. Install stream crossing structures at right angles to the stream channel. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 88. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| | Not Applicable | 34 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 89. Minimize channel changes and the amount of excavation or fill needed at the crossing. | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 91. Use soil stabilization practices on exposed soil at stream crossings. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 92. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 94. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 95. Install culverts that extend at least 1 foot beyond the road fill. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 96. Install culverts that are large enough to pass flood flows. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 97. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 98. Firmly compact material around culverts, particularly the bottom half. To prevent crushing, cover the | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| top of culverts with fill to a depth of 1/3 the culvert diameter or at least 12 inches, whichever is greater. | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 99. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 100. Keep culverts clear and free of debris so that water can pass unimpeded at all times. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 101. Locate fords where stream banks are low. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 102. Locate where the stream bed has a firm rock or gravel streambed. | Not Applicable | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 103. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate. | Not Applicable | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 34 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| **Wetlands** | | | | | | | |
| 105. Whenever practical, avoid locating roads and landings in wetlands; otherwise use extreme caution. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 32 | 31 | 1 | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 106. Whenever possible, forest management activities in wetlands should occur on frozen ground to minimize rutting. | Not Applicable | 5 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 23 | 22 | 1 | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 6 | 5 | | 1 | | |
| 107. Do not dispose of or move upland slash into a wetland. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Slash from trees harvested within the wetland may remain in the wetland. | Applied Correctly | 31 | 31 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 0 | | | | | |
| 108. Keep slash out of open water. | Not Applicable | 10 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 25 | 25 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 109. Whenever practical, avoid equipment maintenance and fueling in wetlands. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 2 | | | | | |
| | Applied Correctly | 30 | 30 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 110. Whenever practical, avoid locating roads and landings in the wetland filter strip; otherwise use extreme caution. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 32 | 32 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 111. Minimize soil exposure and compaction to protect the ground vegetation and the duff layer in the wetland filter strip. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 32 | 32 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 112. Operate equipment in the wetland filter strip only when the ground is firm or frozen. | Not Applicable | 7 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 28 | 28 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 30 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 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 | 35 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 115. Avoid operating equipment in areas of open water, springs, or seeps. | Not Applicable | 29 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | 1 | | | |
| 116. Provide for adequate cross-road drainage in roads to minimize changes to natural | Not Applicable | 30 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| surface and subsurface flow in the wetland. | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | | 2 | | |
| 117. Use low ground pressure equipment, such as wide tire or tracked equipment, if necessary to minimize rutting. | Not Applicable | 26 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 9 | 8 | | 1 | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 118. Minimize rutting in wetlands by conducting forestry activities on firm or frozen ground that can support the equipment. | Not Applicable | 25 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 8 | 7 | 1 | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 1 | | | 1 | | |
| 119. Cease equipment operations when rutting becomes excessive. | Not Applicable | 26 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 8 | 8 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | 1 | | | |

## **Appendix F-2**: BMP Monitoring Results for Large Landowner Sites

| **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 BMP's | Not Applicable | 2261 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | 19 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 2. Collect all waste lubricants, containers and trash (i.e. grease cartridges). | Not Applicable | 0 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| **Riparian Management Zones** | | | | | | | |
| 3. Locate roads outside the RMZ, unless necessary for stream crossings. | Not Applicable | 11 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 8 | 8 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 4. Locate landings outside the RMZ. | Not Applicable | 10 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 8 | 8 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 0 | | | | | |
| 5. Do not dispose of or pile slash within the RMZ. | Not Applicable | 10 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 9 | 9 | | | | |
| | Applied Incorrectly | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Not Applied | 0 | | | | | |
| 6. Minimize soil exposure and compaction to protect ground vegetation and the duff layer. | Not Applicable | 10 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 9 | 9 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 8. Operate wheeled or tracked equipment within 15 to 50 feet of the OHWM when the ground is frozen or dry. | Not Applicable | 15 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 9. Do not harvest fine woody material within 50 feet of the OHWM. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 10. Use selection harvests and promote long-lived tree species appropriate to the site. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 11. Harvesting intervals should be a minimum of every 10 years. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 13. Develop trees 12 inches DBH and larger. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 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 | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 15. Do not harvest fine woody material within 15 feet of the OHWM. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 16. Use selection harvests and promote long-lived tree species appropriate to the site. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 17. Harvesting intervals should be a minimum of every 10 years. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 20. Do not harvest fine woody material within 15 feet of the OHWM. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| **Forest Roads** | | | | | | | |
| | Not Applicable | 1 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21. Use existing roads when they provide the best long-term access. | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 22. Select road locations that allow for drainage away from the road. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 23. Where possible, locate roads on well-drained soils. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 24. Minimize the number of stream, dry wash, and wetland crossings. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 25. Locate roads outside of riparian management zones and wetland filter strips, except at crossings | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 15 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 27. Construct roads to follow natural contours and minimize cut and fills. | Not Applicable | 15 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 28. Construct roads to remove water from road surfaces. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | | 2 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 29. Construct stable cut and fill slopes that will re-vegetate easily, either naturally or artificially. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 30. Do not bury debris in the road base. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 31. Install drainage structures to remove water from road surface and ditches. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 1 | | | 1 | | |
| | Not Applied | 1 | | | 1 | | |
| 32. Install a berm at the inlets of drainage structures, if needed, to direct water into the structures. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 33. Provide erosion protection at the outlets of drainage structures to minimize erosion and disperse the water. | Not Applicable | 17 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 2 | 1 | 1 | | | |
| | Not Applied | 0 | | | | | |
| 35. Check drainage structures to ensure that they are not filling with sediment or other debris. Clean if needed. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 36. Install cross drain culverts long enough to extend beyond the road fill. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Not Applied | 1 | | | 1 | | |
| 37. Construct broad-based dips deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 38. Use seed, mulch and/or erosion control netting where necessary to minimize soil erosion into lakes, streams and wetlands. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 40. Maintain, clean and/or replace sediment control structures until areas of exposed soil are stabilized. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 41. Inspect the road system at regular intervals. Clear debris from drainage structures to prevent clogging that can lead to washouts. | Not Applicable | 8 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 10 | 10 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 42. Keep traffic to a minimum during wet periods and spring break-up to reduce maintenance needs. | Not Applicable | 5 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 7 | 7 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 6 | 4 | | 2 | | |
| 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 | 4 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 10 | 10 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 5 | 2 | | 2 | 1 | |
| 44. Remove berms along the edge of the road if they will trap water on the road. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | | 1 | |
| 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 46. Remove all temporary drainage and crossing structures. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 47. Shape all road system surfaces to maintain proper surface drainage, if necessary. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 48. Inspect and maintain road surfaces, drainage structures, and crossings to minimize erosion. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | | 2 | | |
| 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 50. Install stream crossing structures at right angles to the stream channel. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 51. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 52. Minimize channel changes and the amount of excavation or fill needed at the crossing. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 54. Use soil stabilization practices on exposed soil at stream crossings. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 55. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 56. Use diversion ditches, broad-based dips, or other practices on the road approaches to prevent road runoff from entering the stream. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 57. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream. | Not Applicable | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 58. Install culverts that extend at least 1 foot beyond the road fill. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 59. Install culverts that are large enough to pass flood flows. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| | Not Applicable | 19 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 60. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water. | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 62. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 63. Keep culverts clear and free of debris so that water can pass unimpeded at all times. | Not Applicable | 15 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 1 | | | 1 | | |
| 64. Locate fords where stream banks are low. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 65. Locate where the stream bed has a firm rock or gravel streambed. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 66. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |

| **Timber Harvesting** | | | | | | | |
|---|---|---|---|---|---|---|---|
| 68. Use existing landings if possible. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 16 | 16 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | 19 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 5 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 14 | 14 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 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. | Not Applicable | 7 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 12 | 12 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 72. Use existing skid trails if they provide the best long-term access. | Not Applicable | 6 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 13 | 13 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | 19 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 74. Whenever possible, winch logs up steep slopes if conventional skidding could cause erosion that affects water quality. | Not Applicable | 16 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 75. Avoid operating equipment where excessive soil compaction, rutting, or channelized runoff may cause | Not Applicable | 0 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 16 | 1 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| erosion that affects water quality. | Applied Incorrectly | 2 | | 2 | | | |
| | Not Applied | 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 | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | 2 | | | |
| 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 | 3 | 3 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 78. Do not dispose of or pile slash in areas where runoff may wash slash into lakes, streams, or wetlands. | Not Applicable | 2 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 16 | 16 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 79. For winter harvesting, mark stream channels, dry washes, and existing culvert locations before snowfall. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | 1 | | | | |
| 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 | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 81. Avoid locating roads and landings within 35 feet of the dry wash unless necessary for crossings. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 82. Operate wheeled or tracked equipment within 15 feet of the dry wash only when the ground is frozen or dry. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 83. Do not harvest fine woody material within 15 feet of the dry wash. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 84. Minimize soil exposure and compaction to protect ground vegetation and the duff layer. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 85. Avoid cabling logs across the dry wash, where feasible, to prevent damage to the banks of the dry wash. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 87. Install stream crossing structures at right angles to the stream channel. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 88. Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 89. Minimize channel changes and the amount of excavation or fill needed at the crossing. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| | Not Applicable | 19 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 91. Use soil stabilization practices on exposed soil at stream crossings. | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 92. Design, construct and maintain stream crossings to avoid disrupting the migration/movement of fish and other aquatic life. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 94. Stabilize approaches to crossings with aggregate or other suitable material to reduce sediment entering the stream. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 95. Install culverts that extend at least 1 foot beyond the road fill. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 96. Install culverts that are large enough to pass flood flows. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 97. Install culverts so there in no change in the stream bottom elevation. Culverts should not dam or pool water. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 99. Use riprap around the inlet and outlet of culverts to prevent water from eroding and undercutting the culvert. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 100. Keep culverts clear and free of debris so that water can pass unimpeded at all times. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 101. Locate fords where stream banks are low. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 102. Locate where the stream bed has a firm rock or gravel streambed. | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 103. Use temporary stream crossings such as timber mats, pole fords, or frozen fords when appropriate. | Not Applicable | 18 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 1 | 1 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 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 | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| **Wetlands** | | | | | | | |
| 105. Whenever practical, avoid locating roads and landings in wetlands; otherwise use extreme caution. | Not Applicable | 1 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 0 | | | | | |
| 106. Whenever possible, forest management activities in wetlands should occur on frozen ground to minimize rutting. | Not Applicable | 4 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 13 | 12 | 1 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Applied Incorrectly | 1 | 1 | | | | |
| | Not Applied | 1 | 1 | | | | |
| 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 | 1 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 108. Keep slash out of open water. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 15 | 15 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 0 | | | | | |
| 109. Whenever practical, avoid equipment maintenance and fueling in wetlands. | Not Applicable | 1 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 18 | 18 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 110. Whenever practical, avoid locating roads and landings in the wetland filter strip; otherwise use extreme caution. | Not Applicable | 1 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 16 | 16 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | | 2 | | |
| 111. Minimize soil exposure and compaction to protect the ground vegetation and the duff layer in the wetland filter strip. | Not Applicable | 1 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 17 | 17 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 0 | | | | | |
| 112. Operate equipment in the wetland filter strip only when the ground is firm or frozen. | Not Applicable | 3 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 15 | 15 | | | | |
| | Applied Incorrectly | 1 | | 1 | | | |
| | Not Applied | 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 | 14 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 2 | 2 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 3 | 1 | 1 | 1 | | |
| 114. If landings are necessary in a wetland, build them to the minimum size required for the | Not Applicable | 19 | | | | | |
| | Insufficient Information | 0 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| operation and to achieve the landowner's objective. | Applied Correctly | 0 | | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 115. Avoid operating equipment in areas of open water, springs, or seeps. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 6 | 6 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 0 | | | | | |
| 116. Provide for adequate cross-road drainage in roads to minimize changes to natural surface and subsurface flow in the wetland. | Not Applicable | 13 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | | 1 | | |
| 117. Use low ground pressure equipment, such as wide tire or tracked equipment, if necessary to minimize rutting. | Not Applicable | 11 | | | | | |
| | Insufficient Information | 2 | | | | | |
| | Applied Correctly | 4 | 4 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | 1 | 1 | | |
| 118. Minimize rutting in wetlands by conducting forestry activities on firm or frozen ground that can support the equipment. | Not Applicable | 11 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 7 | 6 | 1 | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 1 | | 1 | | | |
| 119. Cease equipment operations when rutting becomes excessive. | Not Applicable | 12 | | | | | |
| | Insufficient Information | 0 | | | | | |
| | Applied Correctly | 5 | 5 | | | | |
| | Applied Incorrectly | 0 | | | | | |
| | Not Applied | 2 | | 1 | 1 | | |