



MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

August 9, 2007

TO: Forest, Mineral and Fire Management Staff
Wildlife Staff

FROM: Lynne M. Boyd, Chief, Forest, Mineral and Fire Management
William Moritz, Chief, Wildlife

SUBJECT: Interim Rutting Guidance and Vegetative Erosion Control Guidelines
Appendix

Attached are the "Interim Rutting Guidance", "Vegetative Erosion Control Guidelines Appendix", and "Rutting and Timber Sale Contracts" for state forest management activities. The effective date for this guidance is August 13, 2007. The Interim Rutting Guidance should be applied to all Department land and resource management programs that occur on state forest lands, unless other direction takes precedence, (e.g. statutes, Director's Orders, DNR policy, etc.)

Timber sale proposals developed on and after August 13, 2007, should contain rutting specification(s) consistent with this guidance. In addition, staff should administer other timber sale contracts using the new rutting guidance, as long as the guidelines do not conflict with existing contract language. Attached is information on incorporating this guidance into timber sale contracts and administration. In your interactions with timber sale contractors or other contractors who operate on state forest land, please advise them of the new guidance, the effective date, and that current operations may be impacted, and that future activities will be affected.

The Interim Rutting Guidance and Vegetative Erosion Control Guidelines Appendix are included in the "Sustainable Soil and Water Quality Practices on Forest Land" (SWQ) manual that updates a 1994 publication on water quality best management practices (BMPs). In April, a draft SWQ manual was distributed internally and externally. Comments, as well as follow-up meetings between the Department, DEQ and stakeholders resulted in changes to both this interim guidance and SWQ manual which is still in draft.

The interim guidance was developed for consistency with SFI and FSC Lake States forest certification standards. The Vegetative Management Team, FMFM Management

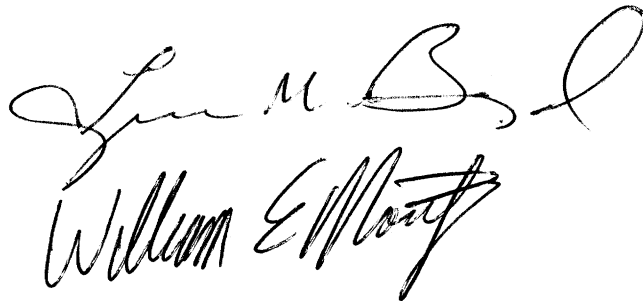
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Team, as well as staff from Fisheries, and Wildlife, have reviewed and commented on earlier versions of the Interim Rutting Guidance.

If you have questions regarding the Interim Rutting Guidance, please contact:

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Attachments



Jim M. Boyd
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Michigan State Forest Interim Rutting Guidance


Rutting occurs when soil strength is not sufficient to support the applied load from vehicle traffic (Figure 1). Rutting can affect aesthetics, biology, hydrology, site productivity and vehicle safety. In general, rutting can cause soil compaction and loss of forest productivity. Where channelized flow to an open water body occurs, rutting can result in sedimentation of an open water body which is illegal. While not always a water quality issue, excessive rutting is a signal that ongoing forest operations may need to be assessed and modified to limit or prevent further damage to soil and forest resources. Keep in mind that prevention is generally less difficult and less expensive than restoration!



Figure 1. Forest Road Rutting Damage

Specifications pertaining to rutting are difficult to establish because there are many factors that can intensify or diminish rutting impacts such as soil type, water table, forest type, slope, hydrology, type of equipment used, rain events and time of year. Table 1 (below) provides guidance on assessing rutting impacts and options for restoration. The rutting guidance should be applied in relation to the specific area being impacted. For example, on very wet sites it may be sensible to change or halt operations before the guidance parameters are reached. Conversely, deep ruts that exceed the guidance may not be a problem on a landing which will be smoothed and re-vegetated.

In general, ruts in excess of 6 inches deep and 25 feet long are a concern in RMZs. Otherwise, ruts may be a concern when they are in excess of 12 inches deep and 50 feet long. Near these thresholds, managers and operators should assess whether ongoing operations will impact soils further, if modifications during operations would be effective and if restoration can moderate or rectify conditions.

 Anytime rutting causes sedimentation in a stream, lake or open water wetland, the activity causing the rutting must stop and immediate actions must be taken to prevent further sediment deposition. [Part 31, (Section 3109) Water Resource Protection (Discharge into State Waters), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)]

Rutting that does not cause sedimentation into a water body should be monitored for soil, soil structure and erosion impacts.

Surface water runoff from rain events can lead to ruts in a logging road. Such ruts collect runoff and increase the potential for erosion. Roads having slopes greater than 5% are especially vulnerable to the creation and deepening of ruts from rain events. Installing the proper water diversion devices -- such as diversion ditches or

broad-based dips -- at the appropriate intervals will periodically interrupt and divert stormwater runoff and decrease the volume and velocity of storm water runoff as it moves down slope. This reduces the potential for rutting. Proper grading, crowning of roads and shaping of roads based on soil and slope conditions can also reduce the potential for rutting. Steep roads (those with slopes greater than 10%) can become rutted very easily, so the driver/operator must use extra care when driving these roads with heavy loads or under wet conditions.

It is difficult to define guidelines related to the total length and configuration of skid trails across a forested stand, but in general the amount of skid trails should be minimized. Heavily-used trails (e.g. primary skid trails) may have more rutting than "one time only" trails or secondary skid trails. If secondary skid trails begin to resemble primary skid trails, then rutting may be too severe. Professional judgment should be used to identify excessive rutting and the overall impact of skid trails across a forested landscape.

Planning skid trails in advance can minimize the impact of rutting (Figure 2). In general, plan your skid trail layout to minimize the number and total distance of skid trails. On dry sites, the least impact to the soils may result from limited use of secondary skid trails as wood and equipment is 'funneled' through primary skid trails. On wetter sites, where repeated passes may cause equipment to 'break through' the organic mat, maximizing the use of one-time, secondary trails may provide the best protection to the soil resource. Slash, tire mats, or PVC pipe linked together with chain or cable can prevent equipment from breaking through the organic mat.

Inorganic materials (e.g. silt fence, tire mats) that were used for either rutting, erosion or sedimentation control, should be removed from the site shortly after the materials are no longer needed (e.g. grassy vegetation has established). In particular, a silt fence left in place long after its use has past can serve as a barrier to the travel of herptofauna (e.g. turtles, snakes, lizards, salamanders and frogs) and small mammals. Managers will need to assess whether the removal of materials will create more problems than leaving them.

Figure 2. Skid trail layout

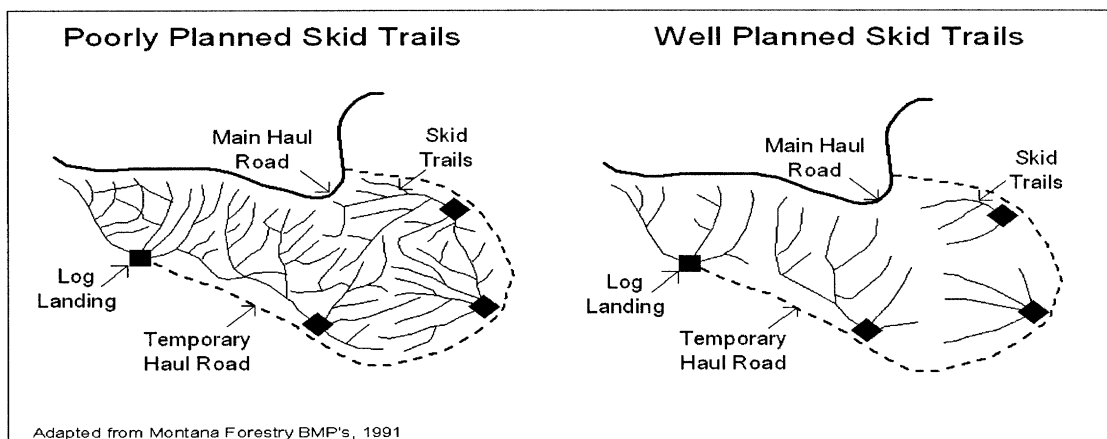


Table 1. Guidance Pertaining to Rutting

Location	Rutting condition concerns	Examples of Preventative Measures Before and During Forest Operations *	After Forest Operations: Restoration
Everywhere	The discharge of sediment into a surface water body is in a violation of Part 31, Water Quality Protection, NREPA, PA 451, 1994. Enforcement action and daily fines by DEQ may result if the discharge is not stopped.	Stop operations until discharge can be halted; see below for possible measures to be taken	See below
Riparian Management Zones (RMZ)	Ruts that are approximately 6 inches deep and 25 feet long	<p>Areas prone to rutting may require frequent inspections</p> <p>Halt or modify operations if rutting concerns begin to develop.</p> <p>Note that landings are not permitted within RMZs.</p> <p>For sloped forest roads, install rock check dams in drainage ditches using rock 3-12 inches in diameter and use water bars at appropriate intervals (water bars can be made from old conveyor belts or other rubberized material).</p> <p>For roads, fill in ruts as conditions allow, apply geotextile fabric over rutted and susceptible areas, then apply gravel or crushed rock (Class 22a dense graded aggregate) at a depth no less than 3 inches (6 inches is optimal)</p> <p>Be aware of vehicle safety concerns on forest roads. Rutting may require frequent grading during rainy seasons.</p>	<p>Review site conditions and determine if site remediation would cause more damage to soil resources and site productivity than leaving ruts as they are.</p> <p>For roads, repair ruts. Disc, plow, grade. Seed and mulch per recommended procedures (see Vegetative Erosion Control Guidelines Appendix). Check dams and water bars should be left in place until grassy vegetation is firmly established.</p> <p>For skid trails, ruts could be smoothed if this does not cause further resource damage.</p>
Other forest operation areas	Ruts that are approximately 12 inches deep and 50 feet long	<p>Silt fences can be used at edges of landings or other active areas to prevent movement of sediment off site. Slash or logs can be used for skid trails to prevent movement of sediment offsite.</p> <p>For off-road areas, e.g. skid trails, susceptible to rutting, use slash, log corduroy, tire mats, or 4-inch PVC pipe linked together with chain or cable.</p> <p>Review site conditions and determine if site remediation would cause more damage to soil resources and site productivity than leaving ruts as they are.</p>	<p>When landings are no longer needed, smooth, seed and mulch (see Vegetative Erosion Control Guidelines Appendix).</p> <p>Remove barriers and non-native materials (tire mats, PVC pipe, etc.) after their use is no longer required and their removal does not create additional problems</p>

* these are examples of measures and materials which can be used to prevent rutting problems; for additional examples, see Blinn, Temporary Stream and Wetland Crossing Options for Forest Management, USDA NCRS Gen. Tech. Report #202, 1998
<http://www.ncrs.fs.fed.us/pubs/gtr/other/gtr-nc202/>.

Michigan State Forest Interim Rutting Guidance Vegetative Erosion Control Guidelines Appendix

Introduction

The purpose of this document is to provide information to facilitate the successful and timely re-establishment of vegetation following earth change activities. In most situations, vegetation is the best means of controlling wind or water erosion and preventing sediment transport and off-site sedimentation.

This document focuses on methods for the quick establishment of vegetative ground cover and establishing permanent native vegetative ground cover. It also discusses what environmental regulations apply regarding establishing vegetative cover for erosion control.

With respect to erosion control, the key legislation (and its administrative rules) that applies here is Part 91, Soil Erosion and Sedimentation Control (SESC), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). As discussed in the manual, *"Sustainable Soil and Water Quality Practices on Forest Land"*, Part 91 applies whenever there is an "earth change" (e.g. removal of the vegetative cover and soil disturbance by a bulldozer) that is one or more acres in size or within 500 feet of a water body. Refer to the manual's section 2, "Laws and Permits" and "Appendix C – List of Applicable Laws in Michigan", for more information regarding Part 91 and its requirements.

Natural revegetation of areas in which the vegetative ground cover has been removed rarely occurs with the rapidity or vigor required to prevent erosion. Consequently, methods that quickly re-establish vegetative ground cover are required. Seeding using grass species is the most commonly used and most effective means of re-establishing vegetation.

For erosion control, many governmental agencies and landowners have relied heavily on using certain non-native and invasive plant grass species. However, increasingly, it is being recognized that these species can cause ecological damage. Alternatives are being sought to control erosion using grass species native to the region and state. An additional consideration is to use native plant species seed of a locally adapted genotype (seed from local populations of native species), as locally adapted genotypes often have better long-term growth.

Definitions That Apply To This Document

Native plants are naturally occurring species that existed in Michigan prior to European settlement.

Native plant genotypes are represented by genetic strains that have evolved in Michigan and are assumed to be adapted to Michigan's conditions.

Non-native species are species that were not naturally occurring in Michigan prior to European settlement. Some of these plants have had little impact on native species; others have had direct negative impacts on native species.

Invasive non-native plants are species that have had direct negative impact on the State's natural resources. These plants are very aggressive and out-compete native plants. Examples include autumn olive and purple loosestrife.

Native and Introduced Species

Within the natural resource management field, as well as the general public, there is increasing concern regarding current and potential future damage to native ecosystems due to the establishment and spread of certain non-native plant species (e.g., garlic mustard, purple loosestrife, crown vetch). These non-native species are referred to as “invasive”, as they disrupt native ecosystems that maintain or conserve native plant and animal biodiversity.

Many non-native grasses and other plant species introduced in the past and promoted for erosion control have proved to be less beneficial for their intended purpose than native species. Some of these introduced species have become invasive or noxious. However, many non-native plant species, such as those used for erosion control, are economical and readily available relative to native plant species.

Native species can be expensive and only available from a limited number of suppliers. Despite these factors, forest land managers and others are realizing long-term ecological and economic benefits by re-establishing locally adapted genotypes of native vegetation for erosion control and other restoration efforts.

In Michigan, the Department of Natural Resources (DNR), and federal land management agencies emphasize or, in some cases, require the use of native species vegetation, and, if available, locally adapted genotypes on the lands they manage. The DNR encourages the use of native seed or native vegetation on private lands as well.

To meet legal requirements and prevent soil from eroding into a water body, certain introduced species may be used, especially if quick establishment of vegetative cover is needed. However, this document only recommends those non-native species that are not considered to be invasive, which are most likely to promote the natural succession of the site to native ground cover or are not likely to interfere with the native seed applied at a later date.

Planning and Site Assessment

Proper planning and site assessment is essential to ensure erosion control and establishment of native ground cover. The selection of plant species to use and establishment procedures should match the plant's adaptations to local site conditions, including:

- available sunlight
- slope
- topography
- local climate
- soil drainage class
- soil texture
- proximity to environmentally-sensitive areas or natural plant communities
- soil fertility
- soil pH

To ensure proper establishment, a soil test may need to be taken at the site and soil amendments (e.g., fertilizer and lime) may need to be applied. In many cases, soil amendments will not be necessary when using suitable native plants. Managers should plan to stockpile the topsoil that was removed from the site during road and landing construction, to later use when topsoil is needed for the re-establishment of vegetative ground cover.

Site Preparation.

The purpose of site preparation is to have good contact between soil and seed to achieve acceptable levels of germination. For temporary roads, landings and primary skid trails, site preparation generally occurs after harvest operations have been completed. Where disturbed/bare soil sites are small and soil compaction is minimal, it may be suitable to use a hand rake to prepare the seedbed (e.g., secondary skid trails in a RMZ on dry, upland or non-saturated soils).

Topsoil Use

It is essential for successful and quick revegetation to have a suitable depth of firm, but friable topsoil. Part 91 erosion control guidelines state that disturbed sites have a minimum of 3 to 4 inches of firm, but friable topsoil. However, these same guidelines allow for professional judgment and knowledge as to what depth of native topsoil will work as a suitable seedbed. Stockpiled topsoil that was removed from the site during road or landing construction should be re-applied when the constructed roads and landings are no longer required for operational or other forest management purposes (e.g. access to replant tree seedlings after a clear-cut has occurred).

On sloped areas, prior to re-application of topsoil, roughen the subsoil to prevent a shear or smooth surface and slippage of the topsoil. Typically, surface roughening is accomplished by running tracked equipment (e.g. bulldozer) up and down the sloped area. If more topsoil is required to provide suitable seedbed germination, acquire topsoil from a source native to the area. Use topsoil that is not contaminated with non-native, weedy and invasive species.

Part 91 administrative rules state that a person shall complete permanent soil erosion control measures for all disturbed land areas within 5 calendar days after final grading or the final earth change has been completed. However, when seedbed preparation and/or seeding must be delayed due to weather, climate, seasonal conditions or certain resource management issues (pertinent to the site), then *appropriate* temporary erosion control (e.g. mulch) and sedimentation control measures (e.g. silt fence) shall be installed and maintained until seedbed preparation and seeding can commence.

Seeding and Erosion Control– Native and “Safe” Non-Native Species Use

Seed may be applied by hand, mechanical spreader, seed drill, or by hydro-seeding. Some native species must be applied with a drill.

Two objectives should be considered when seeding:

- 1) What is required to meet Part 91 requirements (quick establishment of vegetative cover and minimal erosion and sedimentation)?
- 2) Long-term establishment of native vegetation.

To meet both of these objectives usually requires, at a minimum, the application of grass seed that is fast growing and provides fairly quick erosion control. As with other Best Management Practices (BMPs), there are a number of options based on the conditions of the site and when the seed is applied.

Seeding Recommendations

Seed Rates

All seeding rates, such as those stated in Table 2, are in pounds of "pure live seed" (PLS). In the case of certain native species, this can be significantly more than the weight of bulk seed. When accounting for the amount of PLS, one will need to purchase and use more bulk seed than the weight per acre recommendations given for a particular seed species. Use the following formula to derive the required weight of bulk seed from the PLS rate. Germination, hard seed (a characteristic of legume seeds), and purity percentages are found on the information label attached to all commercially purchased seed.

$$\text{Pounds (lbs) of Bulk Seed} = \frac{\text{lbs PLS}}{(\text{purity} * + \text{hard seed}*)(\text{germination}*)}$$

*express % purity, hard seed, and germination in hundredths; i.e. 97% = 0.97

For example, a seed label indicates Canada Wild Rye that has a germination rate of 90%, no hard seed content, and a purity of 97%. The "Cool Season" seed mix from Table 2 requires 4 pounds of Canada Wild Rye PLS/acre. Compute the bulk seed rate as follows:

$$\text{Lbs of bulk Canada Wild Rye seed} = \frac{4}{(0.97 + 0)(0.90)} = \frac{4}{0.873}$$

Lbs of bulk Canada Wild Rye seed = 4.6 (which is the equivalent of 4 lbs of PLS)

Table 1 provides a list of native and non-native ground cover species (grasses and forbs) to consider for erosion control. Table 1 provides, by plant species, the soil texture, soil moisture, and sunlight requirements for successful germination and establishment. The comments portion contains information as to whether a species is native or non-native, perennial or annual and (for grasses only), if it is considered a warm season or cool season grass.

Key for Information in Tables 1 and 2			
SOIL	MOISTURE	LIGHT	REGION
S - Sand	D - Dry	S - Full Sun	UP-Upper Peninsula
L - Loam	M - Moist	P - Partial Shade	NLP-Northern Lower Peninsula
C - Clay	W - Wet	Sh - Shade	SLP -Southern Lower Peninsula
M - Muck			SW - Statewide

Table 1. Native & Non-Native Plant Species To Use For Erosion Control In Forest Land

SPECIES NAMES Common (<i>Latin</i>)	SOIL	MOISTURE	LIGHT	REGION	Comments
Grasses:					
American beach grass (<i>Ampophila breviligulata</i>)	S	D	S	SW	Native perennial, dune stabilization – use plugs, not seed
Annual rye (<i>Lolium multiflorum</i>)	S-L-C	D-M-W	S, P, Sh	SW	Non-native annual, temporary cover
Big bluestem (<i>Andropogon gerardii</i>)	S-L-C	D-M-W	S	SW	Native perennial, warm season grass*
Creeping red fescue (<i>Festuca rubra</i>)	S-L-C	D-M-W	S, P	SW	Non-native perennial
Indian grass (<i>Sorghastrum nutans</i>)	S-L-C	D-M-W	S-P	NLP, SLP	Native perennial, warm season grass*
June grass (<i>Koeleria micrantha</i>)	S-L-C	D-M	S, P	SW	Native perennial, cool season grass**
Little bluestem (<i>Schizachyrium scoparius</i>)	S-L	D-M	S, P	SW	Native perennial, warm season grass*, dune stabilization
Oats (<i>Avena sativa</i>)	S-L-C	D-M	S, P	SW	Non-native annual, temporary cover
Redtop (<i>Agrostis gigantea</i>)	L, C, M	M-W	S	SW	Non-native perennial, cool season grass**
Switchgrass (<i>Panicum virgatum</i>)	S-L-C	D-W	S	SW	Native perennial, warm season grass*
Wild-rye, Canada (<i>Elymus canadensis</i>)	S-L	D-M-W	S, P, Sh	SW	Native perennial, cool season grass**
Wild-rye, Virginia (<i>Elymus virginicus</i>)	L-C	M-W	S, P, Sh	SW	Native perennial, cool season grass**
Forbs (Wildflowers)					
Legumes:					
Alsike Clover (<i>Trifolium hybridum</i>)	L-M	D-M-W	S, P	SW	Non-native, perennial, good for forest roads in northern hardwoods
Lupine (<i>Lupinus perennis</i>)	S-L	D-M	S - P	SLP + Newaygo Co.	Native perennial, butterfly host, nectar source
Medium Red Clover (<i>Trifolium pratense</i>)	S-L-C	D-M-W	S, P	SW	Non-native, perennial legume, good for forest roads in northern hardwoods
Round-headed bush clover (<i>Lespedeza capitata</i>)	S-L	D-M	S	SLP + Newaygo Co.	Native perennial legume, wildlife food
White Dutch Clover (<i>Trifolium repens</i>)	L-C-M	D-M-W	S, P	SW	Non-native, perennial legume, good for forest roads in northern hardwoods

SPECIES NAMES Common (<i>Latin</i>)	SOIL	MOISTURE	LIGHT	REGION	Comments
Other Wildflowers:					
Black-eyed Susan (<i>Rudbeckia hirta</i>)	L-C	D-M	S-P	SW	Showy native perennial, yellow
Butterfly weed (<i>Asclepias tuberosa</i>)	S-L	D-M	S	SW	Showy native perennial, orange
Common milkweed (<i>Asclepias syriaca</i>)	S-L	D-M	S-P	SW	Native perennial, pink, butterfly food
Horsemint (<i>Monarda punctata</i>)	S-L	D-M	S	SW	Native perennial, white/pink
Lance-leaved coreopsis (<i>Coreopsis lanceolata</i>)	S-L-C	D-M	S.P	SW	Showy native perennial, yellow
Starry false solomon-seal (<i>Smilacina stellata</i>)	S	D-M	S-P	SW	Native perennial, dune stabilization, white
Wild Bergamot (<i>Monarda fistulosa</i>)	S-L-C	D-M	S	SW	Showy native perennial, pink
* Warm season grasses = most of their growing occurs during the warm summer months, July, Aug, Sept. ** Cool season grasses= most of their growing occurs in cool, spring months, May, June					

Table 2. Two Examples of Seed Mixtures Using Native Plants

Mix type	Common Name	Rate. lbs/acre
Cool Season	Canada Wild-rye	4
	Wild Virginia-rye	5
	Annual rye	5
Warm Season	Big Bluestem	4
	Indian grass	3
	Switchgrass	1
<i>Note: For the Upper Peninsula, substitute Little Bluestem for Indian Grass</i>		

Other Items to Consider When Planting Native Species in a Forested Setting:

While Part 91 erosion control guidelines can contain helpful information, they were developed with the primary purpose of establishing grass cover on construction sites after final grading has been completed. The next paragraph provides a few additional considerations specifically designed for natural resource management purposes. For more specific technical information as to the proper timing, soils and general methods to ensure long-term establishment of a native plant seeding, contact the firm from which you purchased the seed.

As with introduced grasses, native grass/wildflower seed germination success requires good seed contact with soil. Depending on the site conditions, prepare the soil as needed and either handsaw or use a prairie drill such as the Tye drill, Truax drill, or the John Deere Rangeland drill. If hand sowing, it is advisable to mix the

seed with a contact mulch such as wetted sand or vermiculite. If hand sowed, rake or drag the seed in so that it is lightly covered with soil. Roll the site with a roller or drive over it to firm seed into the soil. Do not roll the site, if the soil is wet so as to avoid soil compaction. Hydro-seeding is generally not recommended for wildflower and prairie grass seeding, as it does not ensure firm seed-to-soil contact.

Mulch Use after Seed Application

In some cases, applying the detritus from the forest floor may be considered, if erosion is not an immediate threat, the site is not near a water body, and conditions are right for seed within the detritus to establish.

In most situations, it will be appropriate to apply a light covering of clean, weed-free straw with some moisture content, as this will increase germination rates. This is particularly helpful on dry sandy soils and heavy clay soils. Straw should just cover the soil surface, but not bury it. Some soil should be visible through the straw. Chopping and blowing the straw onto the area is the best method, as chopped straw is less susceptible to being blown away by the wind. On steep slopes, hold the straw in place by using biodegradable stakes and mesh over the straw. Never use field hay, as it invariably contains innumerable weed seeds.

Conclusion

These guidelines are just that, guidelines as of early 2007. Introduced plant species used for erosion control and site stabilization have been researched and used for a long time. Conversely, the amount of information available regarding the use of native plant species for erosion control and site stabilization is far less, especially with respect to what will work for the various ecological regions of a given state, such as Michigan. Hence, it is essential that users of these guidelines keep abreast of vegetation erosion guideline updates. Use professional judgment and past experience as to what will prevent erosion, meet Part 91 requirements, and result in the establishment of native vegetation genotypes adapted to the local site conditions.

The DNR and Department of Environmental Quality (DEQ), recognize that the use of native species is more expensive than using introduced species and are more difficult to obtain. However, native species with local region genotypes are the species best adapted to the site conditions and survival for the long-term, without harm to the environment or Michigan's biodiversity conservation efforts.

A number of Michigan firms which produce seed native to Michigan have formed an association called the Michigan Native Plant Producers Association. Their website is: <http://www.mnppa.org/>. Another source for information is the Michigan Wildflower Association. Their website is: <http://www.wildflowersmich.org/>. Another related site is the Michigan Association Conservation District's website on native plants. This website is: <http://www.macd.org/nativeplants/nphome.html>. Many county conservation districts sell native plants, as well as provide general and technical information regarding the uses and benefits of various native plant species.

RUTTING AND TIMBER SALE CONTRACTS

Current Contract (07/31/2007)

General Condition and Requirement

4.2 - Maintenance (2/04)

The purchaser shall maintain all existing roads in a condition equal to or better than the condition prior to the sale.

5.2 - Conduct of Operations (7/07)

The Purchaser shall conduct all operations under this contract in a safe, workmanlike manner and shall minimize soil damage, including, but not limited to erosion and compaction; damage to young growth; and damage to trees left standing. The Purchaser shall take all reasonable precautions to prevent pollution of air, soil, and water by the Purchaser's operations. All operations including slash, landings, and skid trails are to be confined within the Sale Area unless approved by the Unit Manager or their representative, thereby making them part of the Sale Area.

5.3 - Stream Protection (2/04)

In accordance with Parts 31, 91, 301, 303, and 305, 1994 PA 451, no equipment is to be operated over or through streams except on approved stream crossings. Operations shall be conducted to prevent debris from entering stream courses. Any fill placed in wetlands as a result of harvest operations must be removed. Purchaser is responsible for implementing all Best Management Practices (BMPs) as outlined in the DNR publication "Water Quality Management Practices on Forest Land" even if not specifically mentioned in this contract. All roads, streams, and wetland crossings must conform to the BMPs.

5.4 - Soil Protection (2/04)

The Purchaser shall avoid operating equipment when soil conditions are such that excessive damage will result as determined by the Unit Manager or their representative.

Standard Conditions and Requirements

Note: There are numerous standard specifications that can be picked to protect soil and water. In addition, new specifications can be created by a forester/technician by creating a unique specification or working with Lansing to create or modify a standard specification. Standard specification 5.4.1 – Rutting restriction, is the only 'pick-list' specification that deals directly with rutting.

5.4.1 - Rutting restriction

Operations are to cease immediately if equipment and weather conditions result in rutting of << ** 6 >> inches or greater in depth. The Unit Manager or their representative may restrict hauling and/or skidding if ruts exceed the specified depth. With the Unit Manager

or their representative's approval, the Purchaser may return to the area when the weather conditions have changed and/or the risk of rutting has decreased.

Contract Changes Implemented for Interim Rutting Guidance

General Condition and Requirement

No changes.

Standard Conditions and Requirements

5.4.1 - Rutting restriction, general

Operations are to cease immediately if equipment and weather conditions result in rutting of roads which is << 12 inches or greater in depth and 50 feet in length >>. In addition, operations are to cease immediately if equipment and weather conditions result in rutting on skid trails which is << 12 inches or greater in depth and 50 feet in length >>. The Unit Manager or their representative may restrict hauling and/or skidding if ruts exceed the specified depth. With the Unit Manager or their representative's approval, the Purchaser may return to the area when the weather conditions have changed and/or the risk of rutting has decreased.

5.4.7 - Rutting restriction, Riparian Management Zone (RMZ)

Within the Riparian Management Zone (RMZ), as shown on the attached Timber Sale Map, operations are to cease immediately if equipment and weather conditions result in rutting of roads which is << 6 inches or greater in depth and 25 feet in length >>. In addition, operations are to cease immediately if equipment and weather conditions result in rutting on skid trails which is << 6 inches or greater in depth and 25 feet in length >>. The Unit Manager or their representative may restrict hauling and/or skidding if ruts exceed the specified depth. With the Unit Manager or their representative's approval, the Purchaser may return to the area when the weather conditions have changed and/or the risk of rutting has decreased.