Forest Management Guidelines Updates

Executive Summary 2025 Edition

The Minnesota Forest Resources Council (MFRC) was established under the Sustainable Forest Resources Act (SFRA) to address important forestry policy and practice issues through collaboration among a broad set of forest stakeholders. The SFRA requires the Council to develop and periodically update voluntary forest management guidelines (FMGs) for use on public and private forestland in Minnesota to minimize potential negative impacts of timber harvest and forest management activities.

The MFRC establishes these best management practices for timber harvesting and forest management on forested land in Minnesota in a publication titled Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers. These MFRC FMGs are a set of recommended voluntary practices designed to avoid and mitigate harvest-related impacts on water quality, wildlife, soil productivity, cultural resources, biodiversity, visual quality, and other forest resources. The FMGs were first published in 1999 and last updated in 2012.

The MFRC has now completed a 4-year FMG revision process and an updated version of “Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers” is available. A summary of the FMG revisions is provided below along with details on the review and update process. A full change log is provided in the Appendix.

Updates to the FMGs include new guidance on limiting the spread of terrestrial invasive plant species, 17 additions of "climate considerations" meant to enhance existing guidelines, and 17 minor clarifications and edits for consistent application of the guidelines. The last category of updates includes additional considerations or guideline language related to high-bank riparian management zones (RMZs), legacy patches, basal area retention goals for RMZs, leave tree selection, winter harvest, and erosion control on approaches to water bodies. Revisions are modest and are intended to maintain the flexibility of the guidelines while enhancing effectiveness and implementation rates. Accessibility and usability features have also been added to facilitate understanding and implementation of the guidelines.

FMG Review Process

The multi-pronged process to review and identify potential updates to the FMGs began in mid-2020 with a stakeholder survey that gathered feedback on users’ experiences with and perceptions of Minnesota’s voluntary site-level FMGs. The MFRC’s Site-Level Committee (SLC) used results from the survey,

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information from the Minnesota Department of Natural Resources' Guideline Monitoring Program, and a thorough scientific literature review, to inform their examination of the FMGs for potential updates.

Stakeholder Survey

Stakeholder survey respondents included public and private landowners and managers, loggers and technical service providers, scientific researchers and educators, MFRC members and partners, and the general public. This comprehensive survey aimed to identify and assess any potential opportunities for FMGs updates, and gain insight into FMGs training and usage across stakeholder groups. The survey results indicated that users of the FMGs generally felt the guidelines are not in need of significant changes; however, there were indications that some guidelines may not be well understood or consistently implemented.

Guideline Monitoring Program Review

The survey findings were supported by Guideline Monitoring Program reports that further indicated some inconsistencies with FMGs interpretation and the need for minor clarifications. The Guideline Monitoring Program reports also suggested that insufficient training/education, not the content of the FMGs, contributes to lower implementation of and compliance with some FMGs. In particular, the reports identified a need to re-emphasize opportunities for education and field training on FMG implementation to practicing foresters when possible.

Scientific Literature Review

A scientific literature review was conducted to identify recent advances in relevant peer-reviewed scientific research related to the FMGs since their last update. The literature review findings showed that research supports the fundamental practices outlined in current FMGs and highlighted the need for updates to FMGs informational reference material and listings such as those for endangered, threatened, and special concern species.

FMGs Review Process Findings

The SLC's multi-pronged approach to review the FMGs for potential updates concluded that no sections of the FMGs were identified as needing major modifications. The review findings identified potential clarifications and minor edits to improve communication and interpretation of the FMGs by users. The review findings also identified three FMGs topical areas requiring further investigation and peer review consultation involving specialists with substantial knowledge and experience in the topical areas, which are discussed below.

Peer Review Focus Group Engagement

Peer review focus groups were convened in 2023 to engage diverse and expert perspectives on FMGs topical areas identified as needing further investigation. These topics included riparian management zones/leave trees, climate change considerations, and invasive species. The SLC used input from these

peer review focus groups to guide proposed updates and inform recommended updates to invasive species guidance and the development of climate change guidance.

Public Comments

A formal public comment period for updates to the FMGs opened on April 16, 2024, and extended through May 16, 2024. Public comments received were reviewed and used by the MFRC to guide final FMG revision updates. The opening of the public comment period was publicized in the EQB Monitor, and members of the public were invited to review the FMG revision updates and submit comments via email to mfrc.info@state.mn.us with the subject line "FMG Updates Comments."

Conclusion

Recommended updates to the FMGs are modest but strategic and important to ensure the guidelines remain relevant and reflective of current science and management concerns. These recommended updates include new invasive plant species guidance, climate change considerations, and clarification or additional considerations related to riparian management zones, leave tree retention, erosion control, and other topics to guide and support the sustainability of our forestry operations. These updates are important to the credibility and relevance of the FMGs. They also are designed to provide operators and resource managers with the flexibility they need to apply guidelines to site-specific conditions. This flexibility has been foundational to the FMGs since their inception.

In addition to the adoption of FMG updates, the MFRC recognizes the need for renewed training, outreach, and education efforts to support consistent application of the updated FMGs. The comprehensive nature and complexity of the FMGs further supports the need for education on the long-term intent and function of guideline practices.

Although these updates address concerns of today, ongoing periodic review is essential for maintaining the FMGs' relevance to forestry and forest conditions in Minnesota.

Final MFRC Forest Management Guideline Revisions

Climate Change Considerations

Table 1. SLC consensus language introducing climate change considerations to the Minnesota Forest Resources Council Forest Management Guidelines.

Item	FMG Category	Location in FMGs	Revision (Changed/New Language in Blue)
1	Climate Change	After Purpose and before Rationale	Climate change and Minnesota forests… There is great concern about how climate change impacts Minnesota forest ecosystems. Minnesota's forests provide a variety of ecological, economic, and social benefits, but the productivity and functioning of Minnesota forests may be affected by climate change. The effects of climate change in Minnesota are projected to include warming temperatures, more frequent severe precipitation events, and increased periods of drought stress. These changes will be likely to impact the composition of Minnesota's forests, the operability of forest soils, disturbance patterns, etc., all of which have major implications for the ecological, economic, and social benefits that these forests provide. Managing forests in the face of climate change requires consideration of these changes in climate and the risks associated with these future changes. On-site application of some guidelines may be impacted by climate change. Managers and operators should consider these potential climate change impacts when planning and implementing these forest management guidelines. Some guidelines are especially relevant when considering long-term climate change impacts on Minnesota's forests and forest management. These guidelines are indicated by this "Climate Consideration" logo. When this logo is present, please consider consulting the following resources for specific climate change guidance for your site:

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			Northern Institute of Applied Climate Science ***"Climate Change and Minnesota Forests" – 2020 MFRC Report*** "Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis" – 2014 USDA Forest Service Report ***Minnesota Department of Natural Resources***
2	General Guidelines - RMZ On Steep Slopes	Page 48	✓ "Large precipitation events may become more frequent with climate change, increasing the risk of erosion on steep slopes. When implementing RMZs on steep slopes, such as in high bank forests, consider employing the following practices to protect bank stability: • Extend RMZ width **25ft** past the bluff to prevent slumping. • Avoid harvesting at the edge of the bluff when possible. • Harvest on frozen ground when feasible. • Utilize appropriate equipment and methods to minimize soil impacts.
3	General Guidelines - RMZ Large Floodplains	Page 48	✓**Consider climate change impacts to tree mortality in the RMZ** based on vulnerability assessments, invasive species, insect and disease threats, hydrologic changes, and other concerns**.**
4	General Guidelines - Erosion Control Forest Roads	Page 47 Page 35	✓ I**ncreased heavy precipitation events** may elevate the importance of using diversion structures on approaches to water crossings or on roads and trails within the RMZ to divert water off the right-of-way before it reaches the water body.

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5	General Guidelines - Erosion Control	Page 63	✓ **Stabilize bare soil areas and install water diversion devices** and erosion control barriers where appropriate to prevent or minimize erosion and sedimentation from roads, skid trails and landings into surface water and cultural resource areas. … Erosion control is recommended for all approaches to wetland and stream crossings, and may be necessary in other situations depending on site-specific factors. **Potential increases in heavy precipitation and run-off associated with climate change serve to highlight the importance of proactive erosion control practices.**
6	General Guidelines - Maintaining Filter Strips	Page 35	✓ Consider additional stabilization measures. When **necessary, use** practices such as **distributed or concentrated** slash, straw bale barriers, establishment of vegetation by seeding, mulch, and silt fences, including instances when: • An area of soil is exposed within the filter strip… • Management objectives preclude the use of a filter strip… • Consider additional filter strip width and/or stabilization measures when overland flow resulting from increased precipitation may occur.
7	General Guidelines - Rare or Sensitive Species	Page 25	Considerations for Rare or Sensitive Species Additional Consideration ☛ Consider consulting with the DNR or other forest management experts on ways to maintain or enhance sensitive communities and sites while conducting forest management activities on or near them, **including consideration of climate change impacts. Consider local and regional forest habitat, watershed, or cooperative ecosystem management plans that may be relevant to your property. Technical and financial assistance to help the site contribute to those plans may be available from various sources**. For a specific listing of sensitive communities, see Part 2, Wildlife Habitat: Sensitive Communities and Sites, and Tree Species at the Edge of Their Range.

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8	General Guidelines - Designing Operations to Fit Site Conditions	Page 20	Designing Operations to Fit Site Conditions ✓ Consider climate change impacts on the preferred operating season, including winter conditions and changing precipitation patterns, which may limit access or load bearing capacity of the soil. Use lower ground pressure equipment on sensitive sites. Plan ahead to check and monitor frost depth and soil conditions.
9	Forest Roads	Page 11	Protecting water quality and water flow ❒ Incorporating guidelines to protect water quality into overall road project design can minimize the potential impact of roads on water quality, as well as alterations to normal water flow patterns. ❒ Consider potential high-flow events in the selection of culverts and crossing designs to accommodate potential higher intensity precipitation associated with climate change. ❒ During road construction, consider installing erosion control measures to minimize bare soil exposure and runoff. ❒ Consider climate change impacts on seasonal site operability when designing roads and wetland crossings. Additional road stabilization and/or crossing techniques may be needed.
10	Forest Roads - Winter Roads	Pages 22	Winter Roads Winter roads provide access under frozen ground conditions for timber harvesting and other timber management activities. With warming winters, winter rain events and shorter frozen periods, careful planning for winter road establishment, use, and decommissioning is important. Like all other roads, winter roads need to have provisions for adequate drainage to prevent or minimize erosion and sedimentation into wetlands and open water. …

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11	Forest Roads - Drainage	Page 30	✓ **Size culverts and other drainage structures** large enough to minimize impacts on water quality. Permanently and temporarily installed culverts should be at least 12 inches in diameter for ease of maintenance. Putting in culverts and drainage structures that are too small could result in washing out of the road. **Consider the potential for increased high-flow events due to changing precipitation patterns with climate change.** For sources of technical assistance, contact local SWCD offices, local NRCS offices or county highway departments.
12	Forest Roads - Erosion Control Spacing	Page 33, Tables ROAD-1&2	Insert footnote: Consider closer spacing of erosion control structures where increased frequency and intensity of precipitation events could result in higher volume and velocity of run-off. Consider flow accumulating area uphill from the practice and adjust accordingly where overland flow may add to run-off events.
13	General Guidelines - Rutting and Soil Compaction	Page 17	✓ **Plan to conduct forest management activities in wetlands when frozen** or when firm enough to support equipment being used. Evaluate the site based on weather conditions to ensure adequate support for equipment to prevent or minimize rutting. Examples of weather conditions that could be cause for concern **may increase with climate change and** include heavy rain, flooding, significant snow before frost, and three consecutive nights above freezing after frost has been established**.**
14	Rationale - Forest Soil Productivity	Page 12	Rutting is the creation of depressions made by the tires of vehicles such as skidders, log trucks and pickup trucks, usually under wet conditions. Rutting occurs when the soil strength is not sufficient to support the applied load from vehicle traffic. **The risks of rutting occurring may increase due to climate change and altered precipitation patterns.**
15	Reforestation - Species Selection	Page 8	Considerations • Climate change impacts

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16	Fire Management	Page 9	Additional Considerations ☛ **Consider maintaining the diversity** of mast sources on the site, as well as some level of current production of mast sources. For example, establish fuel breaks around key pockets of mast-producing shrubs along the edges of prescribed burn sites. ☛ **Climate change may increase the risk of wildfire** or change the frequency and intensity of wildfires when they occur.
17	Forest Productivity - Forest Soil Productivity	Page 7	For example, soils susceptible to severe compaction or rutting under **expected** climatic conditions should be identified as requiring harvest under frozen ground conditions or with specialized equipment. **Consider how climate change impacts may influence forest soil productivity and operability.**

General Clarifications and Updates

Table 2. General Forest Management Guideline clarifications and updates.

Item	FMG category	Location in FMGs	Revision (Changed/New Language in Blue)
1	General Guidelines - RMZ	Page 44	"Recommended minimum residual basal area for all RMZ's is 60 ft2**. (80 ft2 if using as leave tree clump)**
2	General Guidelines - RMZ	Page 46	✓ Retain at least four leave logs per acre **when harvesting within an RMZ.** Use sound forest management where insect and disease concerns exist. See *General Guidelines: Providing Coarse Woody Debris.*

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3	Timber Harvesting - Leave Trees	Page 40	**Harvesting within clumps is acceptable** as long as the function of the clump is retained, key leave trees are not disturbed, and the clump is not doubling as a legacy patch. * To retain the functionality of the clump, do not reduce the basal area below 80 ft2/acre in trees 6 inches DBH or larger**. (Including forested RMZs that are serving as leave tree clumps)**
4	General Guidelines - Leave Trees	Table GG-3, Page 58	Move ash to the "fair" suitability rating in Table GG-3 on page GG-58.
5	Timber Harvesting - Leave Trees	Page 38	"Plans for leave tree retention should be designed to achieve specific **wildlife, silvicultural, and landscape objectives**, and tailored to site-specific conditions.
6	General Guidelines - Water Quality	Page 23	✓ Plan Forest management activities to avoid-**developing infrastructure** in wetlands **and filter strips,** including landings, skid trails and roads. Where avoidance is not practical, minimize impacts by limiting the extent of **infrastructure in wetlands.**
7	Timber Harvesting - Water Quality	Page 24	✓Avoid locating landings *and yarding areas* in wetlands, filter strips or RMZs where possible (or where upland areas are available).
8	General Guidelines - Water Quality	Page 9	Under "Secure aerial photographs" check point: Sources of this information include local Soil and Water Conservation District (SWCD) offices, **National Wetlands Inventory (NWI),** local USDA Natural Resource Conservation Services (NRCS) offices, local Department of Natural Resources (DNR) offices, and county land departments.
9	General Guidelines - Planning	Page 12	*A*dd as final bullet point under "Identify resources, features, and site conditions": • Consider visiting the site during snow free conditions when these resources, features and site conditions may be most visible

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10	General Guidelines - RMZ	Page 46	✓ ~~**Create or**~~ Retain at least four leave logs per acre **within RMZs when harvest activities are conducted within RMZs**. Use sound forest management where insect and disease concerns exist. See *General Guidelines: Providing Coarse Woody Debris.*
11	Pesticide Use - Spills & Spill Kits	Page 12	Forestry pesticides that are spilled can enter surface water or ground water. Spills near or in geologically sensitive areas have a high probability of a portion of the spill reaching ground water**. Equip site with a minimum of one spill kit during pesticide application.**
12	Rationale - Wildlife Habitat Endangered, Threatened, and Special Concern Species (ETS) Forest Biomass Harvesting - ETS Brushland Biomass Harvesting - ETS	Pages 24-38 Pages 20-21 Page 21	Table WH-3 • Confirm that all listings are current • FMH 20 Remove: "If a bald eagle nest occurs on or near the site, see Recommendations for Avoiding and Minimizing Impacts at http:// files.dnr.state.mn.us/natural_resources/animals/ birds/eagles/ factsheet.pdf"
13	Timber Harvesting -	Page 31	TH page 31

Item	FMG category	Location in FMGs	Revision (Changed/New Language in Blue)
	Managing Slash Water Quality		✓ **Keep logging residue out of all streams,** lakes and open water wetlands, and seasonal ponds, except in cases where residue placement is specifically prescribed for fish or wildlife habitat. DELETE following text: Make reasonable effort to keep upland logging residue out of all seasonal ponds and non-open water wetlands.
14	Timber Harvesting	Page 34	Incorporate water diversion devices **and consider erosion control practices** where needed during timber harvest activity….
15	Pesticide Use	Page 5	✓**Planning is the essential first step** in reducing pest problems. Maintaining water quality and protecting other resources is an important consideration in all aspects of pesticide operation planning. **Consider any sensitive native plant communities (see Appendix J: Sensitive Native Plant Communities) on site prior to pesticide application.**
16	Wildlife Habitat - Legacy Patches	Page 51	Site sensitivity, and therefore the need for legacy patches, is dependent upon soil compressibility, soil drainage and time of year of harvest. In practice, a legacy patch ~~**is similar**~~ **provides additional protection** to a leave tree clump (see General Guidelines: Retaining Leave Trees), ~~**except**~~ **in** that a legacy patch: ❒ Is not disturbed with regard to soil compaction, litter removal and alteration of hydrology ❒ Does not need to be considered on all sites ❒ Is representative of the site In practice, a leave tree clump may also serve as a legacy patch if a legacy patch is determined to be necessary on the site (Table WH-5, WH p.45).
17	General Guidelines -	Page 4	The guidelines are supplemented from time to time by "Additional Considerations," which provide additional guidance to further promote the sustainability of forest resources. "Additional considerations" and the term "consider" are included as a supplement to the guidelines to provide for careful thought in reaching suitable resource management decisions. These terms are

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	Additional Considerations		intended to provide as much flexibility and choice as possible in effectively balancing forest management needs and resource sustainability.

Invasive Terrestrial Plant Species Guidelines

General Guidelines, Pages 25-30

Scope

The guidelines outlined in this section are designed to control the spread of invasive plant species during timber harvesting operations. Other forest management and recreational activities also contribute to the spread of invasive species, and comprehensive planning and control methods may be necessary for effective invasive species management. Regulated invasive insects such as the emerald ash borer are not addressed in these guidelines, but there are several existing laws that govern their control and transport which are outlined in the additional resources listed below. Invasive insect pests are regulated by the Department of Agriculture and are not specifically addressed here.

Introduction

The spread of invasive species is one of the greatest threats to sustainable forestry and the maintenance of native ecosystems and the many benefits they provide. Invasive species are those species not native to Minnesota whose establishment causes or is likely to cause economic, environmental, or human harm. Once established, invasive species are generally able to outcompete many of our common native species, inhibit regeneration and growth of our native forests and reduce biodiversity. The ecological and economic impact of invasive species is tremendous, underlying an urgent need to utilize practices that inhibit their establishment and spread.

There are several laws in Minnesota which govern the transport, control, and eradication of invasive species (see resources listed below). Of particular applicability to forestry is the Noxious Weed Law, which prohibits sale or transport of certain plant species and their reproductive parts including many that are considered invasive such as buckthorn, garlic mustard, and non-native thistles. The recommended practices outlined below are not intended to replace the requirements of the Noxious Weed Law and other related regulations but will assist landowners and managers with compliance of those regulations by providing a range of practices to limit the establishment and spread of invasive species.

Timber harvesting can increase the spread of invasive species by creating conditions conducive to their transport, establishment and growth. One of the most efficient approaches to slow the spread of invasive species during timber harvesting is to evaluate and develop a plan to address any threat prior to commencing operations. Because planning is fundamental to application of invasive species guidelines, landowners and resource managers are the primary entities responsible for determining and applying appropriate guidelines for their specific site conditions and desired future stand conditions. Communication of the invasive species plan to loggers will be essential for effective plan implementation. Working together, landowners, managers, and loggers will be critical to slowing the spread of invasive species during timber harvesting operations.

Pre-harvest Planning Guidelines

Prior to designing the timber harvest or putting the sale out for bid, landowners or managers should utilize the following planning guidelines as appropriate to control the spread of invasive species during timber harvesting operations.

- Become familiar with invasive species common to your area of operation including their identification and life cycle.
- Review the existing invasive species laws and regulations to determine any regulatory requirements that might be associated with your timber harvesting operation.
- Consider contacting the local county agricultural inspector (weed inspector) to learn more about invasive species known to occur in or around the planned harvest area, and to learn about treatment options.
- If materials including fill, soil, plants or seeds, will be brought to the site, ensure practices to limit the spread of invasives are used when procuring and transporting material.
- Inspect the site for the presence of invasives, the severity and extent of infestation, and delineate areas of infestation in the harvest plan.
- Consider using one or more of the following options depending on the severity of infestation and the threat of spread:
    - Where feasible, implement pre-operation treatments to control known infestations. Use control measures such as mowing, herbicide application, mechanical pulling, or prescribed fire to reduce invasive species populations where appropriate. Some examples when control may be necessary include Common and glossy buckthorn, Common tansy, Non-native knotweeds, and Wild parsnip.
    - Avoid or minimize the time of contact with areas of high infestation, including cutting those areas last if possible (e.g., work from least to most invaded areas).
    - If possible, schedule harvest operations for seasons when the likelihood of spread is reduced (e.g., winter).
    - Utilize existing roads and landings to minimize the amount of disturbed area in the harvest unit whenever possible.
    - When possible, utilize equipment and practices that minimize the amount of vegetation and soil disturbance while meeting objectives for desired future stand conditions.

Recommended practices during and following operations

- Use the following practices when appropriate to limit the spread of invasive species during and following timber harvesting operations.
    - Manipulate stand structure to minimize germination of invasive species seeds.
    - Retain or promote native vegetation communities during operations.
    - Minimize soil and plant disturbance when not required for regeneration of the stand.
    - Make reasonable efforts to remove plant propagules (seeds, roots, shoots, etc.) on clothing, equipment, vehicles, and logs prior to arriving at and leaving the harvest site.

- Avoid traveling between infested and clean sites during operations if possible. If avoidance is not possible, plan activities to visit all clean sites prior to visiting infested sites.
- Re-vegetate the site as soon as possible following harvesting using appropriate non-invasive species and silvicultural methods.
- Match the species to the site resources to ensure healthy native plant communities capable of competing against invasive species.
- Conduct post-harvest monitoring to assess if follow-up activities are necessary to limit the spread of invasive species.

Useful Resources

- MDA – noxious weed law, regulations, educational info
  http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol.aspx
- DNR terrestrial invasive plants
  http://mndnr.gov/invasive-plants
- SFI "Minnesota's Forest Invaders: Guide to Invasive Species"
  https://minnesotaforests.com/wp-content/uploads/2023/09/Invasive-Species.pdf
- Private Landowners — MN Forest Industries (minnesotaforests.com)
  https://minnesotaforests.com/private-landowners/
- National Invasive Species Information Center
  http://www.invasivespeciesinfo.gov/unitedstates/mn.shtml
- University of Minnesota's Minnesota Invasive Terrestrial Plants and Pests Center (umn.edu)
  https://mitppc.umn.edu/
- Minnesota Invasive Species Advisory Council Minnesota's Urban and Community Forest Best Management Practices for Preventing the Introduction, Establishment, and Spread of Invasive Species
  https://files.dnr.state.mn.us/natural_resources/invasives/terrestrialplants/is-bmp.pdf
- DNR contractor prevention
  https://www.dnr.state.mn.us/invasives/dnrlands.html