

Forest Operations and Silviculture Manual

May 2020

**Ministry of Natural Resources
and Forestry**

Policy Division - Crown Forests
and Lands Policy Branch

Forest Operations and Silviculture Manual

Prepared under the Authority of the Crown Forest Sustainability Act, 1994

May 2020

Ministry of Natural Resources and Forestry

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Printed in Ontario, Canada

Publications and price lists are available from this office:
Service Ontario Publications

300 Water Street
Peterborough, ON, K9J 8M5
1-800-668-9938
www.serviceontario.ca/publications

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How to cite this manual:

OMNRF. 2020. Forest Operations and Silviculture Manual, Queen's Printer for Ontario, Toronto, ON. 21 pp

ISBN (pdf): 978-1-4868-4422-7

1 Foreward

3 The Policy Framework for Sustainable Forests

5 The overall context for forest management in Ontario is the Policy Framework for Sustainable
6 Forests that was approved by Cabinet in 1994. The framework sets broad direction for forest policy
7 and makes forest sustainability the primary objective of forest management. It helps to address
8 climate change by ensuring Ontario's forests contribute positively to the global environment. This
9 contribution is made through the application of the principles for sustaining forests.

11 Overview of the *Crown Forest Sustainability Act*

13 The *Crown Forest Sustainability Act*, 1994 (CFSA) came into effect on April 1, 1995. The Act is
14 enabling legislation, and provides for the regulation of forest planning, information, operations,
15 licensing, trust funds, processing facilities, remedies and enforcement, and transitional provisions.
16 The CFSA is designed to allow for the management of all forest-based values, while providing for
17 the sustainability of Crown forests. The CFSA defines sustainability as long-term Crown forest
18 health, and reflects the broad direction set out in the Policy Framework for Sustainable Forests.

20 A Manual Approach to Implementation of the *Crown Forest Sustainability Act*

22 The CFSA requires the provision of four manuals to guide various aspects of forest management in
23 Ontario. These manuals are prepared in accordance with Section 68 of the Act and are regulated in
24 accordance with Section 69(1) 29:

- 26 1. The Forest Management Planning Manual (FMPM);
- 27 2. The Forest Information Manual (FIM);
- 28 3. The Forest Operations and Silviculture Manual (FOSM); and
- 29 4. The Scaling Manual (SM).

31 The FMPM is the pivotal document that provides direction for all aspects of forest management
32 planning for Crown lands in Ontario within management units designated under the CFSA, with the
33 exception of the southern Ontario management unit.

35 The FIM describes the information requirements the MNRF has to support forest management. The
36 FIM also provides for the sharing and exchange of forest-related information between the MNRF
37 and Ontario's forest industry.

39 The FOSM sets out the over-arching principles and accepted approaches for forest
40 management, the standards for forest operations and silvicultural practices, the minimum
41 qualifications for forestry workers, and the procedures for the evaluation of forest
42 management in Ontario.

1 The SM contains instructions and standards for the measurement of Crown forest resources,
2 provides instructions for the authorized movement of Crown forest resources and sets out the
3 requirements for conducting scaling audits.

4 5 **Manual Revision** 6

7 The four manuals are revised, improved, and updated based on experiences in using the manuals,
8 and as new information becomes available. Revisions to the manuals will be made in accordance
9 with the CFSA regulation requiring public review and comment.

10 11 **Forest Management** 12

13 Forest Management is conducted in an adaptive management cycle. A FMP is prepared by a
14 plan author, who is assisted by an interdisciplinary planning team. The plan author must be a
15 registered professional forester, who certifies that the FMP has been prepared in accordance
16 with the FMPM. The FMP is implemented as scheduled in the annual work schedule and as
17 reported in the annual report. Following year five, the implementation of the FMP to date is
18 assessed and a determination is made as to whether the implementation of the FMP has
19 provided for the sustainability of the Crown forest and recommendations for future planning
20 are provided. The next FMP is prepared in consideration of recommendations from the year
21 five annual report; changes to the forest condition; updates to science and policy; and specific
22 efforts to confirm, update, or revise management objectives and practices.

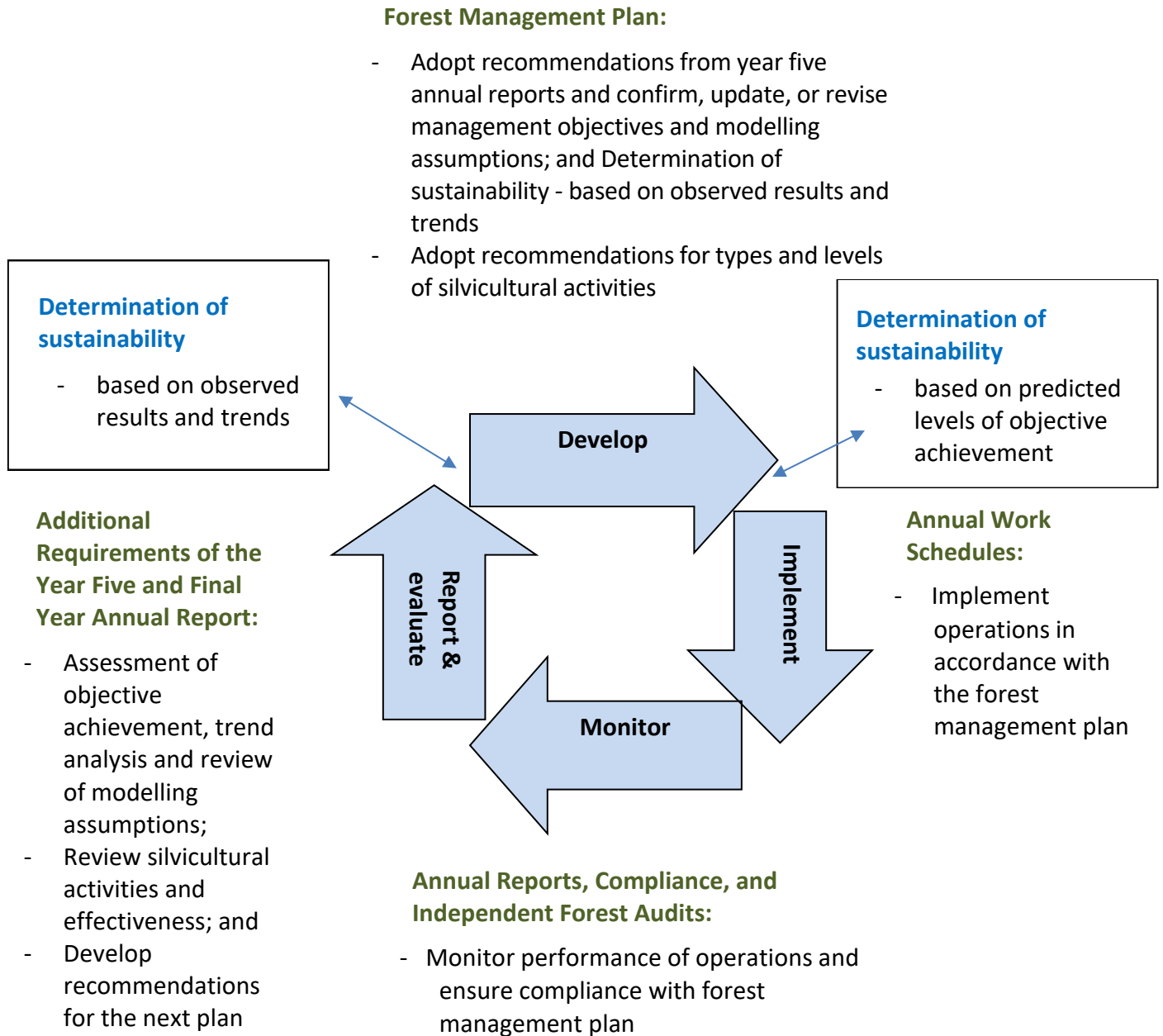
23
24 The MNRF and forest licensees who prepare and implement forest management plans are
25 highly trained and hold credentials (i.e., certification and professional licenses). To enable a
26 more competitive and efficient forest management planning process MNRF and the forest
27 industry must be risk-tolerant, results oriented, and recognize professional accountability.

28
29 MNRF will ensure that professional and technical training programs related to the preparation
30 and implementation of forest management plans are maintained and delivered so that the
31 knowledge of persons involved in the application of this manual is current.

32
33 Figure 1 provides an overview of the adaptive management cycle as it pertains to the provision of
34 forest sustainability in FMPs.
35

1 **Figure 1: Adaptive Management Cycle**

2
3



Climate Change Considerations

Healthy, resilient forests are best able to resist and adapt to climate change impacts. Ontario's sustainable forest management framework has been designed to ensure a healthy, and therefore, resilient forest. At the foundation of that framework is the CFSA that directs the conservation of large, healthy, and diverse forests and their associated ecological processes and biological diversity. Building from this foundation, the forest management guides - which are required to be used by each planning team when they develop a FMP - describe in more detail the objectives (e.g., diverse range of forest types and ages) and practices (e.g., conserve soil and water resources) that are consistent with a healthy, resilient forest. The FOSM then describes the standards used to incorporate Ontario's sustainable forest management framework into local decision making. All of this direction provides the flexibility to adapt local forest management actions to both resist and respond to potential climate change impacts. Regular monitoring, including that specified in this FOSM, provides the necessary feedback to evaluate the effectiveness of local decisions and Ontario's overall sustainable forest management framework in achieving healthy and resilient forests.

The MNRF undertakes a program of effectiveness monitoring for the forest management guides to ensure that the direction in the guides is effective. The MNRF also considers the latest science during the reviews of forest management guides, including climate change research. Ontario's State of Natural Resources reporting supports the government's efforts towards climate change mitigation through the sharing of information and reporting on forest carbon balances.

In addition, the way Ontario's Crown forests are managed can influence the amount of carbon that is released into the atmosphere and stored in trees and harvested wood products i.e. mitigation. Sustainable forest management, supported by the framework described in this FOSM, can help mitigate climate change.

The MNRF continues to improve the understanding of climate change and its effect on Ontario's Crown forests working with other agencies and partners on research studies and sharing information. The sustainable forest management framework will be adapted to reflect this improved understanding over time to ensure the long-term health of Ontario's Crown forests.

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1.0 Introduction

1.1 Purpose and Function

This Forest Operations and Silviculture Manual (FOSM) functions as a directory of the approved policy and guidance that a forest manager must refer to during the preparation and implementation of a forest management plan (FMP). It is required under section 68 of the CFSA and contains provisions with respect to forest operations including:

- standards for forest operations
- standards for silviculture practices
- minimum qualifications for persons specified in this manual who are engaged in forest operations
- assessment procedures and standards to be used in the evaluation of forest operations and forest management

The Ministry of Natural Resources and Forestry (MNRF) relies on the professional judgement of forestry experts to manage the forest resource responsibly and sustainably within the context of a broad set of standards, guidelines and principles. These standards, guidelines and principles are prescribed through the guidance and direction set out in FOSM.

1.2 Organization of FOSM

This manual is organized into five sections:

- **Section 1** describes FOSM and its function within the broader context of forest management in Ontario.
- **Section 2** sets out the provincially approved guidance and direction that applies during forest management planning and implementation activities.
- **Section 3** outlines the minimum qualifications and certification program requirements for forestry workers to engage in forest operations.
- **Section 4** contains information about the evaluation of forest operations to ensure that the objectives of the forest management plan are being met.
- **Section 5** describes the ongoing maintenance of the policy and guidance referred to in FOSM.

Literature cited is provided at the end of the document. For a glossary of the terms used in FOSM refer to the FMPM.

1.3 Application of FOSM

All guidance and direction described in sections 2, 3, and 4 of this manual, including guidance and direction set out in associated policies referred to in those sections, will be used during the preparation of forest management plans and the implementation of forest operations (CFSA, section 7 to 23), as instructed by the Forest Management Planning Manual (FMPM). When local circumstances do not allow full adherence to the direction and guidance described in sections 2, 3, and 4 of this manual any deviation must be rationalized and documented as part of an approved forest management plan. For Crown forests where the FMPM is not applicable, and all other lands, the guidance and direction referenced in this manual may be useful but is not compulsory.

The guidance and direction referenced in this manual may be updated from time to time. When a specific document or title is referenced in FOSM refer to the most recent version of that document or its successor.

For the purpose of this Manual, the term 'forest manager' means the sustainable forest licensee, the Crown, or another designated party responsible for preparing and implementing a forest management plan.

1.4 FOSM's Associated Policies

Some sections of this manual refer to associated policies that provide additional guidance or direction to support implementation of the operational and silvicultural direction set out in this manual. Associated policies available at the time of writing are referred to by name. Additional associated policies, or revisions to existing associated policies, may be required from time to time. A listing and link to the most recent version of the associated policies will be posted on a publicly accessible website.

1.5 French Summary

Le *Manuel relatif aux opérations forestières et à la sylviculture* (MOFS) est l'un des quatre manuels utilisés pour réglementer la gestion forestière sur les terres de la Couronne en Ontario. Le MOFS fonctionne comme un répertoire de politiques et de directives approuvées qu'un gestionnaire forestier doit consulter au cours de la préparation et de la mise en œuvre d'un plan de gestion forestière. Il est nécessaire en vertu de l'article 68 de la *Loi de 1994 sur la durabilité des forêts de la Couronne* et comporte des dispositions portant sur les opérations forestières, notamment les suivantes:

- les normes relatives aux opérations forestières;
- les normes relatives aux pratiques sylvicoles;
- les qualités minimales requises des personnes, précisées dans le Manuel, qui effectuent des opérations forestières;

- les procédures et normes d'évaluation qui doivent être suivies pour l'évaluation des opérations forestières et de la gestion forestière.

Ce manuel est divisé en cinq parties:

- La **section 1** décrit le *Manuel relatif aux opérations forestières et à la sylviculture* et sa fonction dans le contexte plus général de la gestion forestière en Ontario.
- La **section 2** établit les directives et l'orientation provinciale approuvée qui s'appliquent pendant les activités de planification et de mise en œuvre de la gestion forestière.
- La **section 3** énonce les exigences du programme relatives aux qualités minimales et à la certification pour que les travailleurs forestiers exercent des opérations forestières.
- La **section 4** contient des renseignements sur l'évaluation des opérations forestières afin de s'assurer que les objectifs du plan de gestion forestière sont atteints.
- La **section 5** décrit le maintien continu de la politique et des directives mentionnées dans le *Manuel relatif aux opérations forestières et à la sylviculture*.

Toutes les directives et l'orientation qui sont décrites dans les sections 2, 3 et 4 de ce manuel, y compris celles dans les politiques connexes mentionnées dans ces sections, seront utilisées pendant la préparation des plans de gestion forestière et la mise en œuvre des opérations forestières (articles 7 à 23 de la *Loi de 1994 sur la durabilité des forêts de la Couronne*), conformément aux directives du *Manuel de planification de la gestion forestière*). L'orientation et les directives mentionnées dans ce manuel peuvent être utiles, mais ne sont pas obligatoires pour les forêts de la Couronne où le *Manuel de planification de la gestion forestière* ne s'applique pas, et toutes les autres terres.

Certaines sections de ce manuel se rapportent à des politiques connexes qui fournissent une orientation ou des directives supplémentaires permettant de soutenir la mise en œuvre des directives opérationnelles et sylvicoles énoncées dans ce manuel. Les politiques connexes accessibles au moment de la rédaction du présent document sont mentionnées par leur nom. Des politiques connexes supplémentaires ou la révision des politiques connexes existantes peuvent être nécessaires de temps à autre. Une liste des politiques connexes et un lien menant à la plus récente version de ces politiques seront affichés sur un site Web accessible au public.

2.0 Standards for Forest Operations and Silviculture Practices

The following sections describe the policies and guidance that pertain to the standards for forest operations and silviculture practices in Ontario's Crown forests.

2.1 Forest Management Guides

The forest management guides are a key component of Ontario's forest policy framework and an associated policy of FOSM. The guides provide evidence-based direction for forest managers, are used to support the long-term sustainability of our forest ecosystems, and help to address potential adverse effects of forest management on ecological, social and/or economic values in the forest.

The following is a description of the current suite of forest management guides.

2.1.1 The Landscape Guides

The Forest Management Guide for Boreal Landscapes (OMNR, 2014), and the Forest Management Guide for Great Lakes-St. Lawrence Landscapes (OMNR, 2010), (Landscape Guides) direct forest management activities that maintain or enhance natural landscape structure, composition, and patterns to provide for the long-term health of forest ecosystems in an efficient and effective manner. The Landscape Guides influence the setting of strategic direction in forest management planning at larger spatial scales.

2.1.2 Guide for Conserving Biodiversity at the Stand and Site Scales

The Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNR 2010) (Stand and Site Guide) provides direction on planning and conducting forest operations at the stand and site level so that forest biodiversity will be conserved and Ontario's forests will remain healthy and sustainable. The Stand and Site Guide provides complementary direction to the Landscape Guides to influence the composition and pattern of ecosystems at a variety of smaller spatial scales (e.g. less than 1 hectare to 10,000s of hectares).

2.1.3 Guide to Silviculture in the Great Lakes St. Lawrence and Boreal Forests of Ontario

The Forest Management Guide to Silviculture in the Great Lakes-St. Lawrence and Boreal Forests of Ontario (OMNRF, 2015) (Silviculture Guide) provides practitioners and forest management planning teams with information and direction to determine which silvicultural activities are likely to be effective in meeting local forest management objectives.

2.1.4 Guide for Forestry and Resource-based Tourism

The Management Guidelines for Forestry and Resource-based Tourism (OMNR, 2001) assist with planning forestry operations in those parts of Ontario's forest being used for both forestry and tourism. The guide facilitates discussions between the tourism and forest industries as they develop operational prescriptions such that both industries interests' are considered during the planning and implementation of operations.

2.1.5 Guide for Cultural Heritage Values

The Forest Management Guide for Cultural Heritage Values (OMNR, 2007) ensures that cultural heritage values are safeguarded during forest management activities in Crown forests.

2.2 Silviculture Direction

2.2.1 Regeneration Standards

A forest operations prescription (FOP) is a site-specific set of harvest, renewal and tending activities expected to manage a forest stand or group of forest stands from its current state, to a future desired forest state, with regard to structure and condition.

A regeneration standard is an important component of the FOP, describing the required level of observable measures of a regenerating area to provide confidence that the target stand condition (i.e. mature) can be achieved.

A management standard describes the criteria used to evaluate the results of a partial harvest treatment when regeneration (establishment or release) is not the immediate and/or primary objective. Management standards are typically applied to individual tree selection, irregular shelterwood (or portions of), shelterwood preparation cuts, and thinning. Management standards must be consistent with the associated desired future forest condition and treatment package.

Further direction on setting regeneration standards and management standards will be described in silviculture policy implementation direction and related technical documents as associated policies of FOSM.

2.3 Forest Trusts

The MNRF established two forestry trusts, the Forest Renewal Trust (FRT) and the Forestry Futures Trust (FFT), as set out in sections 48 to 51 of the CFSA. The trusts provide dedicated funding for silviculture, protection, and other operations in the forest. Timely renewal of the forest following harvest is critical to achieving forest management objectives and ensuring

sustainability of the forest. The FRT provides for reimbursement of costs for eligible renewal activities to be implemented to meet the standards in the approved FMP.

The FRT and the FFT are administered by a trustee in accordance with trust agreements entered into between MNRF and the trustee. The trustee issues payments out of the trust funds in accordance with MNRF direction. From time to time policies or guidelines respecting the Forestry Trusts (operation, reimbursement, interpretation, etc.) may be developed and made available as part of FOSM's associated policies.

2.4 Aerial Application of Pesticides

Pesticides (e.g., herbicides and insecticides), are sometimes used in forest management. Herbicides are used to meet forest management plan objectives (e.g. caribou habitat) by controlling vegetation that competes with desirable regeneration (e.g., conifer seedlings). Insecticides may be required to protect areas of the forest from insects such as jack pine budworm and spruce budworm. Planning, notice, consultation, and approval requirements for aerial herbicide and insecticide projects are set out in the FMPM.

FOSM's associated policy titled Ontario's Buffer Zone Guidelines for Aerial Application of Pesticides in Crown Forests of Ontario (OMNR, 1992), provides direction on appropriate buffer zones during aerial application of pesticides for renewal, tending or protection. MNRF may update or establish additional associated policies related to application of pesticides.

2.5 Forest Genetic Resource Management

Managing genetic diversity and ensuring an effective planting and direct seeding regeneration program requires the use of well adapted plant material. Well adapted plant material refers to trees that are adapted to their growing environment now and in the future. Biologically and/or climatically based seed transfer guidelines have been established across the province to identify areas where the movement of tree seed and stock have a reasonable probability of producing well adapted planting material.

FOSM's associated policy, Seed Zones of Ontario (MNRF, 2010), provides direction on seed management and stock movement. MNRF may update or establish additional associated policies related to forest genetic resource management.

3.0 Minimum Qualifications for Forestry Workers

The following text provides the minimum qualifications for specific forestry workers involved in operations on Crown forests. Sustainable forest management relies on the skill, knowledge, and experience of a wide variety of people requiring various technical and professional qualifications to carry out their work (feller and skidder operators, pesticide applicators, professional engineers, scalers, professional foresters, etc.). Those qualifications are articulated in various legislation, regulations, and policies and not included in FOSM.

3.1 Tree Marking

Tree markers are trained to adapt forest operations prescriptions for stands managed under the selection and shelterwood silviculture systems to unique site characteristics including variability in terrain, forest stand type, cutting history, habitat conditions, ecological features, and social values. The Ontario Tree Marking Guide (2004) is an associated policy of FOSM used to implement the direction in the Silviculture Guide.

In order to carry out tree marking in a Crown forest, a person must possess a valid Level 1 certificate in tree marking issued by or under the authority of MNRF. In order to audit tree marking that has been carried out in a Crown forest, a person must possess a valid Level 2 certificate in tree marking issued by or under the authority of MNRF. Apprentice and pre-certification audit markers, that are working towards full certification, may mark trees under the supervision of a certified tree marker that reviews and endorses their work.

A level 1 certificate is obtained through a three-step process of:

1. Completing an MNRF approved tree marking course
2. Passing an MNRF approved examination process
3. Passing an audit of a minimum of 8 ha of forest marked to a valid prescription

A level 2 certificate is obtained by completing an MNRF approved level 2 course and passing the associated examinations.

Level 1 and level 2 certificates are valid for a period of 5-years and can be renewed through successful completion of an MNRF approved tree marking refresher course.

Tree marking courses and examinations will be guided by and consistent with the Ontario Tree Marking Guide (OMNR, 2004) or its replacement. MNRF may issue additional associated policies related to tree marking and tree marking audits.

3.2 Forest Operations Compliance Inspectors

The MNRF maintains a program for the mandatory training and certification of forest operations compliance inspectors. This program, including compliance inspector certification processes and competency requirements are described in the Forest Compliance Handbook (OMNR 2014), an associated policy of FOSM.

Only a certified forest operations compliance inspector may conduct compliance inspections of forest operations on Crown lands. A certified forest operations compliance inspector may inspect and report on access, harvest, renewal, and maintenance operations on Crown lands and the harvest of Crown trees on private land. Forest operations compliance certification is not required for persons engaged in effects or effectiveness monitoring, or those who are undertaking other forms of monitoring or operational oversight described in the Forest Compliance Handbook.

3.3 Fire Suppression

Anyone working in Crown forests and expected to use fire suppression equipment must be adequately trained to use that equipment. In order to work longer during higher fire danger periods, a forest manager, or other forest resource licence holder must be capable of providing fire suppression operations that meet the *trained and capable* standard as set out in the Industrial Operations Protocol (OMNRF: P00466, 2018) established by MNRF, and Ontario Regulation 207/96.

4.0 Evaluation of Forest Operations and Management

Evaluation of forest operations and management typically provides an assessment of forest management activities against a standard, rule or guideline. Some of these standards, rules, or guidelines are set out provincially (e.g. scaling) and some are set out in Forest Management Plans (e.g. regeneration standards)

Assessment of forest management activities is carried out through two primary means: monitoring and auditing.

4.1 Monitoring

This manual addresses the monitoring of:

- Short-term effects of forest management (e.g. regeneration standards)
- Compliance with:
 - prescriptions of the forest management plan
 - other site-specific permits, rules, etc.
- Effectiveness of forest management activities

4.1.1 Assessment Standards for the Evaluation of Regeneration

A key principle of Ontario's forest sustainability framework is to ensure that regeneration efforts are achieving the standards established in the FMP. This is achieved through a silvicultural monitoring program. Additional standards for Ontario's silvicultural monitoring program will be described in silviculture policy implementation direction and related technical documents as associated policies of FOSM.

4.1.2 Compliance Monitoring

Compliance monitoring describes the comprehensive program used to monitor forest operations. It encompasses a range of complementary activities (e.g., education, communication, planning, inspecting and reporting) designed to encourage and ensure adherence to the legislative framework. Requirements for communication, planning, inspecting and reporting are directed under the Forest Information Manual and the Forest Management Planning Manual and detailed in the Forest Compliance Handbook (OMNR, 2014) or updated versions of these manuals and handbook.

Compliance inspection, a key component of compliance monitoring, examines operations and activities to evaluate adherence to the standards and requirements of approved FMPs, the Scaling Manual, permits, and legislation. Inspections of forest operations will be carried out in accordance with the Forest Compliance Handbook, an associated policy of FOSM.

4.2 Auditing

Independent forest audits (IFAs) are conducted on each forest management unit as required by the CFSA and its regulations.

IFAs assess compliance of forest management activities with the CFSA, the forest management planning process, and planned versus actual forest management activities. IFAs also assess the effectiveness of forest management activities in achieving management objectives and, where applicable, assess a licensee's compliance with the terms and conditions of the Sustainable Forest Licence.

The Independent Forest Audit Process and Protocol (OMNRF, 2019) (as may be updated), an associated policy of FOSM, must be followed by auditors and auditees to meet the requirements of Ontario Regulation 160/04 governing independent forest audits.

5.0 Maintenance of FOSM and associated policies

This manual, as well as the associated policies, are based on a foundation of adaptive management. Sections 2, 3, and 4 of this manual describe the direction applicable to forest managers at the forest management unit scale. This section describes the requirements and guiding principles for the maintenance of FOSM and its associated policies, consistent with an adaptive management approach.

5.1 Principles

This manual and associated policies are part of a policy framework that includes strategic, operational, and administrative policies. Many of the strategic policies are not implemented at the management unit scale, but rather guide and influence the nature of the policies that are. This section describes those strategic policies and concepts that will be used to guide the development, review, and revision of FOSM and its associated policies.

5.1.1 Policy Framework for Sustainable Forests

The Policy Framework For Sustainable Forests (OMNR, 1994) (as may be updated) will be used as the foundational guiding document in the development, review, and revision of the four regulated manuals and FOSM's associated policies. It expands upon the principles introduced in the CFSA by articulating: the goal for Ontario forests; principles for sustaining forests (e.g. emulation of natural disturbance); principles for using forests (e.g. long-term viability of forest-based communities); principles for decision making (e.g. best available science); and key concepts such as ecosystem based management and balancing of the diverse needs of forest users, including Indigenous peoples and northern communities.

CFSA Principles (1994)

- 1) Large, healthy, diverse and productive Crown forests and their associated ecological processes and biological diversity should be conserved.
- 2) The long-term health and vigour of Crown forests should be provided for by using forest practices that, within the limits of silvicultural requirements, emulate natural disturbances and landscape patterns while minimizing adverse effects on plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values [CFSA ss. 2 (3)].

5.1.2 Guiding concepts and strategic policies

This section describes the key concepts that MNRF will use to guide the development, review, and revision of FOSM's associated policies. In some cases, the concepts are articulated in a policy or statement of government, in other cases they are a further refinement of the principles, concepts, and strategies described in the CFSA and the Policy Framework for Sustainable Forests.

Coarse and Fine Filter

The coarse and fine filter approach to biodiversity conservation asserts that by maintaining a broad array of forest conditions, a broad array of species will be sustained (the coarse filter), and those species which have specialized requirements will be afforded further habitat provisions (fine filter) to ensure their health and continuity. MNRF applies the coarse and fine filter as a strategy to achieve the principles of the CFSA. The Landscape Guides and Stand and Site Guide provide examples of this concept in practice. The coarse and fine filters are applied at multiple spatial scales.

Taking a Broader Landscape Approach

Alongside the coarse and fine filter, the policy paper Taking a Broader Landscape Approach (OMNR, 2013) emphasizes the importance of taking broader landscape approaches, which means implementing management actions in an integrated way, over larger areas of land and water, and over longer time periods.

Old Growth Forests

The Old Growth Policy for Ontario's Crown Forests (OMNR, 2003), provides provincial direction for the identification and conservation of old growth conditions and values in Ontario's Crown forests. The old growth policy provides a two-pronged approach for conserving old growth by providing natural heritage protection (maintenance, protection and/or restoration of old growth in parks and conservation areas) and direction for forest management planning to maintain, protect and/or restore old growth in managed forests while permitting a sustainable harvest.

While the Old Growth Policy remains an important guiding document for the development, review, and revision of FOSM's associated policies, the management unit level requirements of the Old Growth Policy have been replaced by MNRFs forest management guides, currently the Landscape Guides and Stand and Site Guide.

Effective and Efficient

The purpose of the CFSA is to ensure the long-term health of our forest ecosystems for the benefit of the local and global environments, while enabling present and future generations to meet their material needs. The concept of effective and efficient will be applied to policy development, review, and revision. Effective refers to how well a policy achieves its objective. A policy that concedes a critical element or threshold to improve efficiency is not effective. Efficient is a measure of the opportunity cost (time, land, etc.) of implementing the policy. An efficient policy achieves the objective without unnecessary burden (restrictions, workload). MNRF will consider economic impacts in the development, review, or revision of associated policies.

Evidence Based

The development, review, and revision of FOSM's associated policies will be based on the best available evidence. Evidence can take many forms including the results of monitoring programs, traditional knowledge, results of directed research, expert knowledge, synthesis of scientific reports/papers, etc. For each new or revised associated policy a description of how evidence influenced the nature of the policy will be prepared. The description will be scaled to the scope and nature of the policy and may include a formal background and rationale document (or section in the policy), background information incorporated into training material, or a simple statement of rationale in a communication product associated with release of the policy. Forest management guides will include a formal background and rationale document (e.g. Stand and Site Guide) or equivalent (e.g. Landscape Guide science and information packages).

5.2 Uncertainty and Adaptive Management

MNRF will use an adaptive management framework to address uncertainty.

The following concepts will be used to guide the implementation of an adaptive management framework for the development, review, and revisions of FOSM's associated policies.

Adaptive management is an iterative cycle of continual improvement, where policy, developed based on the best available information, is treated as hypotheses, and monitoring of the policy as it is implemented forms part of the evaluation of the hypotheses. The policy is then revised based on the new knowledge and lessons learned from implementation and evaluation, or from new science and technology.

Role of Science

Science will be considered at all stages of the policy development cycle. Adaptive management has been designed to mirror the scientific process. Policies are treated as hypotheses, outcomes predicted, measured, and evaluated, and may be revised as necessary based on the knowledge generated. To ensure an adaptive management approach can be implemented, new or revised associated policies will include a clear statement of purpose and/or objective(s).

While adaptive management can be an efficient means of increasing knowledge, both the practicality of what can be investigated, and the nature of the practice, can be limiting. Adaptive management is often passive, only exploring a limited set of alternative approaches. A key part of implementing an adaptive management approach is a parallel system of scientific investigations to explore and reduce uncertainties. This may include examining alternatives that are not tenable in a real-world case (e.g. high risk of negative outcome), examining details that can only be measured in a controlled environment (i.e. eliminate the influence of all but one variable), and replicating results to support conclusions. In the development, review, and revision of FOSM's associated policies MNRF will identify key uncertainties to inform scientific investigations.

As part of an adaptive management approach, Ontario supports and undertakes scientific research (e.g. forest genetics, aquatic and terrestrial ecosystems, nutrient dynamics, ecosystem classification, forest inventories, climate change, silviculture, etc.) and monitoring (e.g. forest health, silviculture effectiveness, fish and wildlife, growth and yield, etc.) in order to continually improve its understanding and implementation of the forest management system, and to ensure evidence-based policies are informed by the best available science.

Effectiveness Monitoring

The effectiveness of all of FOSM's associated policies will be monitored (e.g. compliance, silviculture monitoring, IFA's, etc.). New or revised Forest Management Guides will include a description of the approach to effectiveness monitoring.

The Forest Management Guide effectiveness monitoring program evaluates outcomes and relies on hypothesis-based monitoring to test how well direction in the guides produces intended results. Guide effectiveness monitoring is often designed, led, and implemented by MNRF science staff with direction regarding the principles of study design, study area selection, and areas of critical uncertainty provided by the Effectiveness Monitoring of Forest Management Guides Strategic Direction (Rempel et al 2011). Guide effectiveness monitoring studies may also be conducted by other research organizations or scientists such as the federal government and universities and often relies heavily on monitoring and other information collected by forest industry.

Effects Monitoring

While effectiveness monitoring is testing a policy's ability to achieve stated objectives, effects monitoring includes more general outcomes in both natural (e.g. conservation of soil and water resources) and human (e.g. continuity of angling opportunities) systems. Effects monitoring includes both unanticipated effects and anticipated effects not related to the objective of the policy.

Effects monitoring is done, as needed and where appropriate, through monitoring and scientific studies to survey and record the effects of certain operations. The knowledge gained is then incorporated into the relevant policy document. Such monitoring and scientific studies may be conducted by MNRF or by other organizations (e.g., federal government, universities, forest industry, or other forest research organizations).

Policy Review

The associated policies of FOSM will be reviewed, as required, based on ongoing consideration of a broad range of evidence including:

- Results of applicable scientific investigations
- Results of monitoring programs
- Feedback from practitioners, Indigenous peoples, and stakeholders
- Advances in technology and changes to operational practices

Forest management guides will be reviewed at least once every ten years.

Role of PFTC

MNRF will maintain a committee, known as the Provincial Forest Technical Committee (PFTC), to advise the MNRF on how to ensure that Forest Management Guides are kept current with respect to scientific knowledge and forest management practices, by acting as a review board for proposed changes to existing Forest Management Guides, and recommending priorities for work on new or existing Forest Management Guides. Members will be selected by MNRF based on professional disciplines required to fulfill the duties of the committee.

5.3 Maintenance of FOSM

MNRF will monitor feedback from the adaptive management framework, changes to legislation and regulations, changes in government policy/direction, and consistency across the 4 regulated manuals (i.e. FMPPM, FIM, Scaling, and FOSM). FOSM will be amended or revised as required.

As a regulated manual, it is neither practical nor necessary to update FOSM to reflect minor changes in the policy documents named in this manual. When a specific document or title is referenced in FOSM, it should be understood as a reference to the most recent version of that document or its successor. A listing and link to the most recent versions of the associated policies will be posted on a publicly accessible website.

5.3.1 Policy Transfer

Transfer of knowledge regarding FOSM and associated policies will occur as required, and in concert with FMPPM training where feasible, to ensure the manual and associated policies are applied consistently. When interpretation challenges are encountered in one geographic region, the resolution will be communicated to the other regions.

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