

BEST MANAGEMENT PRACTICES GUIDE FOR FORESTRY INTERVENTIONS IN WOODED WETLANDS OF PRIVATE FORESTS IN QUEBEC

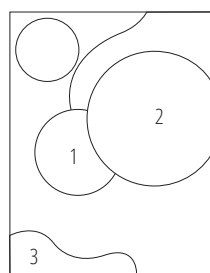
Document intended for woodlot owners and practitioners
involved in silvicultural treatments of the forest



Cover images identification and source

Cover images

1. Wetland forestry work in the Abitibi; source GFCA
2. Wooded wetland not prone to overflow; natural red spruce ecosystem with hydric drainage; source Jean Gaudet
3. Temporary pond; source AFBF



One-fourth of the cover, from top to bottom

1. Wooded peatland; source CRECQ
2. Wooded peatland; source CRECQ

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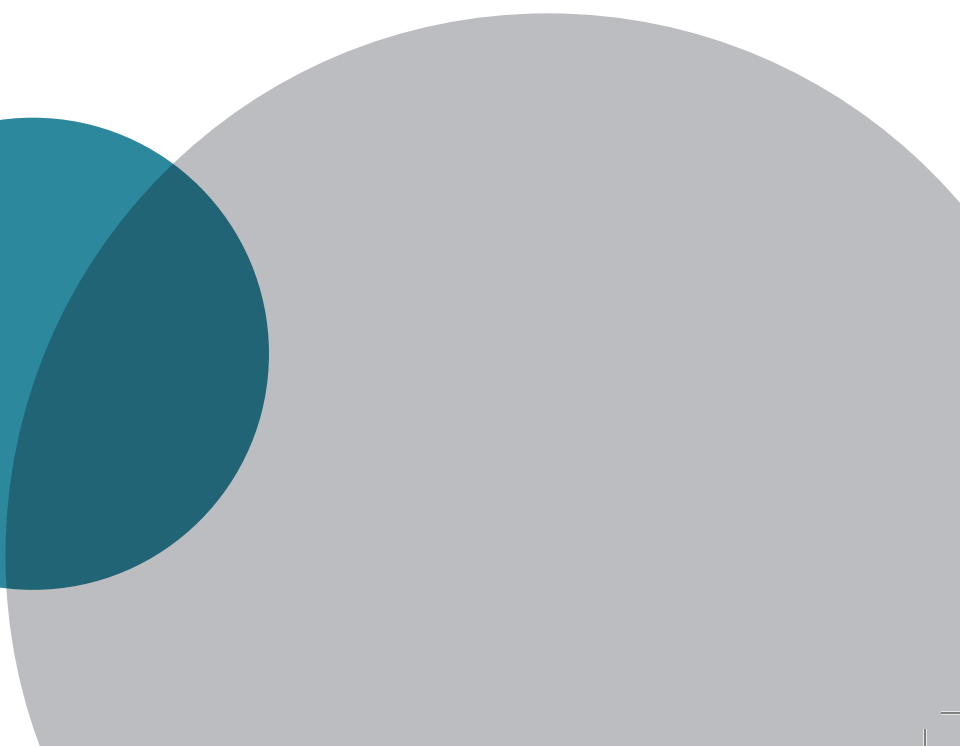
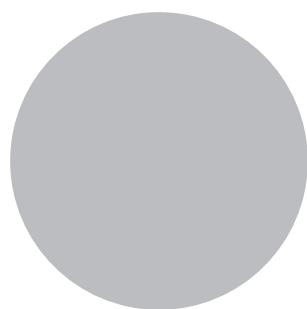
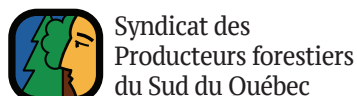
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To adequately represent the production team, which brought together as many male and female participants, the original text in French was feminized where appropriate (Translator note – does not apply to this English version).



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ACRONYMS AND ABBREVIATIONS

TREE SPECIES

WA	Ash	American Ash
BA		Black Ash
RA		Red Ash
WB	Birch	White Birch
YB		Yellow Birch
SV	Maple	Silver Maple
SM		Sugar Maple
RM		Red Maple
AE	Others	American Elm
BW		Basswood
BE		Beech
IW		Ironwood
PO		Poplars (all)
WO		White Oak
RO		Red Oak
WS	Spruce	White Spruce
BS		Black Spruce
RS		Red Spruce
WP	Pine	White Pine
JP		Jack Pine
BF	Others	Balsam Fir
EC		Cedar
TS		Hemlock
LR		Larch

AGENCY NAMES

Translator note : Agency names have been left in their original french form here and throughout the report

AFBF	Agence forestière des Bois-Francis
CDPNQ	Centre de données sur le patrimoine naturel du Québec
FPFQ	Fédération des producteurs forestiers du Québec
MELCC	Ministère de l'Environnement et de la Lutte contre les changements climatiques
MFFP	Ministère des Forêts, de la Faune et des Parcs
SPFSQ	Syndicat des Producteurs forestiers du Sud du Québec

LAWS AND REGULATIONS

LCMVF	Wildlife Conservation and Development Act (<i>Loi sur la conservation et la mise en valeur de la faune</i>)
LCPN	Natural Heritage Conservation Act (<i>Loi sur la conservation du patrimoine naturel</i>)
LEMV	Threatened or Vulnerable Species Act (<i>Loi sur les espèces menacées ou vulnérables</i>)
LEP	Endangered Species Act (<i>Loi sur les espèces en péril</i>)
LQE	Environment Quality Act (<i>Loi sur la qualité de l'environnement</i>)
RAMHHS	Regulation concerning activities in wetlands, bodies of water and sensitive environments (<i>Règlement sur les activités dans les milieux humides, hydriques et sensibles</i>)
REAFIE	Regulation concerning the supervision of activities based on their environmental impact (<i>Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement</i>)



FOREWORD

This guide aims to offer practical recommendations to forestry professionals, landowners and contractors involved in activities in wooded wetlands while considering the functional roles and ecological services of these ecosystems. Sound forestry practices in wooded wetlands can help maintain ecological integrity by reducing the footprint of forestry activities while supporting the full potential of the harvested sites. These recommendations can help carry out forest management activities aimed at sustainable development of forest resources in wooded wetlands.

In private forests, new regulations governing activities carried out in wetlands and near bodies of water took effect on December 31, 2020. Since then, most forestry operations are subject to an exemption from the authorization process with the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) when they comply with the regulations. In this regard, best management practices (referred throughout this document as BMPs) should not be confused with normative or silvicultural recommendations prescribed by a forest engineer. This guide does not contain any measurements, thresholds or specific distance intervals to be achieved. The user must always use BMPs in accordance with his legal obligations which impose minimum standards to be respected. The user must also show discernment and aim for an optimal adaptation of the mitigation measures that can be applied to each situation. This may involve going beyond the regulatory framework by providing, for example, conservation measures for rare natural forest communities when carrying out forestry work. To this end, other notebooks, manuals and guides specializing in various forestry activities exist and should be consulted. Several of these references are cited in this guide. Concretely, this document proposes BMPs that will make it possible to adapt forestry operations in wetlands to minimize the impacts on water, soil, biodiversity (fauna/flora) and the landscape that characterize them.

Coordinated by the Agence Forestière des Bois-Francs (AFBF), the production of this guide benefited from the discussions carried out within a multidisciplinary working committee bringing together several stakeholders coming from various organizations working to enhance the forest and environmental protection. This collaboration and consultation-based approach allowed fruitful exchanges of knowledge between the participants, who were always focused on obtaining consensus on the concepts presented in this guide. During revision, a scientific committee made up of five researchers brought the information to the cutting edge of knowledge. Its content has also been revised by forest engineers and private sector biologists to improve its applicability.

Chapter 1 introduces the context and key words allowing to continue reading the document with a global understanding of the concepts covered in the next chapters. **Chapter 2** presents a review of the main hydrological, ecological and forest characteristics of each wooded wetlands category covered in this guide **Chapter 3** presents, by forestry activity category, the complete list of BMPs to be followed in wooded wetlands. Finally, **Chapter 4** summarizes the recommendations and outlines the scientific basis supporting them.

GUIDE OBJECTIVES



Present useful references and knowledge to forest sector stakeholders regarding sustainable forest management of wooded wetlands.



Identify sound forestry intervention practices in wooded wetlands that minimize impacts on soils, flora, fauna, landscape and regeneration.



Make woodlot owners aware of the importance of adapting their forest management activities in wetlands.



Participate in the implementation of improvements to forest management activities in wooded wetlands.

CHAPTER 1

CONTEXT, SCOPE OF INTERVENTIONS AND CHALLENGES OF FORESTRY ACTIVITIES IN WOODED WETLANDS

1.1 CONTEXT

Wooded wetlands are ecosystems that maintain ecological functions and generate natural services for the population. Indeed, the dynamics of these environments promotes biodiversity by offering a variety of habitats to several animal and plant¹ species and to the associated natural forest communities².

Private woodlot owners in Quebec own significant portions of wetland areas in several regions of Quebec (Figure 1). According to a preliminary geomatics analysis, wetlands with forest potential (wooded wetlands) cover 11 %³ of the productive forest area⁴ in private forests. The conservation of these ecosystems therefore depends on the types of activities carried out on these properties. The application of best management practices (BMPs) promotes the maintenance of the ecological functions and services of wooded wetlands as required by sustainable forest management.

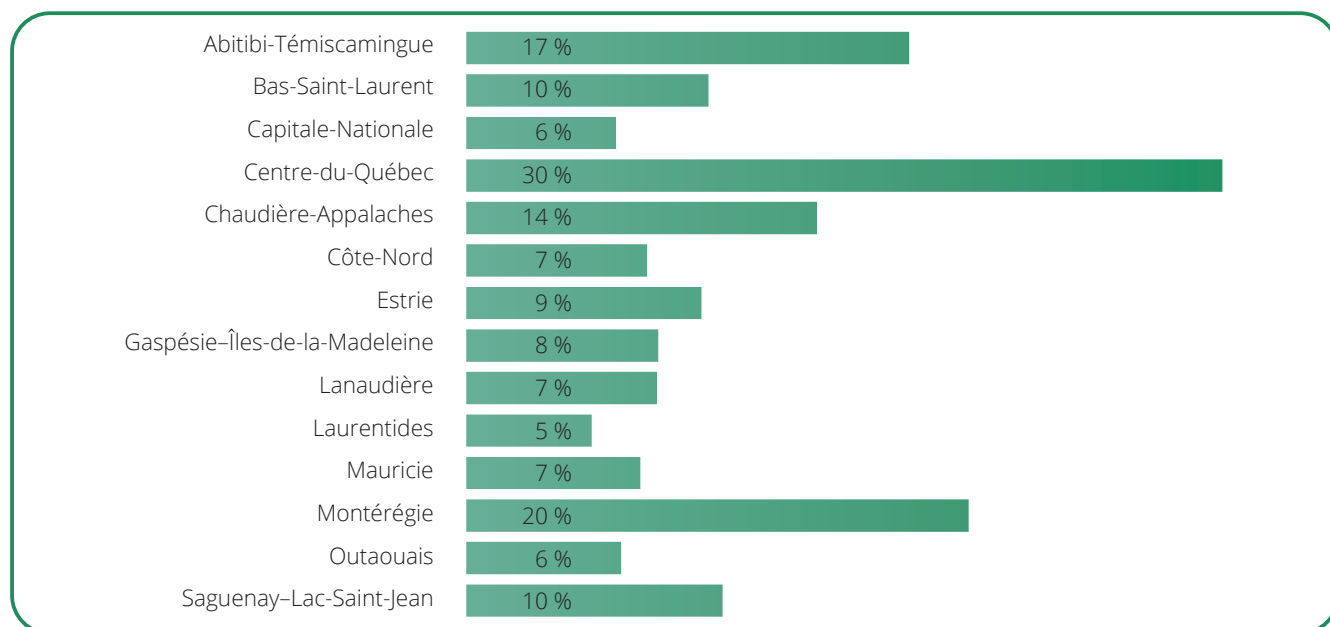


Figure 1 : Proportion of productive forest area identified as wooded mineral wetlands and wooded peatlands in private forest³

¹ Office of the Forestier en chef (2013-2018)

² See glossary

³ <https://www.foretprivee.ca/wp-content/uploads/2021/07/La-foret-privee-chiffree-2021.pdf>

⁴ See glossary

1.2 FRAMEWORK OF FORESTRY INTERVENTIONS IN WOODED WETLANDS

Forestry activities in wooded wetlands are carried out within the specific framework of sustainable forest management where laws, regulations, silviculture and sound practices coexist. Taking all of this into account requires carrying out inventory and validation work in the field, adopting sound forestry practices, and sometimes even the obligation to obtain authorization prior to work planning.

Table 1 : Role of BMPs compared to other forestry components of the intervention framework in wooded wetlands

SUSTAINABLE FOREST MANAGEMENT CRITERIA
Apply province-wide and are mandatory.
LAWS AND REGULATIONS
Apply to all work types and are mandatory.
SILVICULTURE
Generally applies at the natural community scale and manages its productivity by silvicultural scenarios up to prescription.
BMPS SILVICULTURE
Apply at the cut block scale, complement laws and regulations, support the six criteria for sustainable forest management and are voluntary.



1.2.1 SUSTAINABLE FOREST MANAGEMENT

The goal of sustainable forest management is to maintain or improve the long-term health of forest ecosystems to provide current and future generations with the environmental, economic and social benefits provided by these ecosystems. It is based on compliance with six fundamental criteria (Figure 2)⁵.

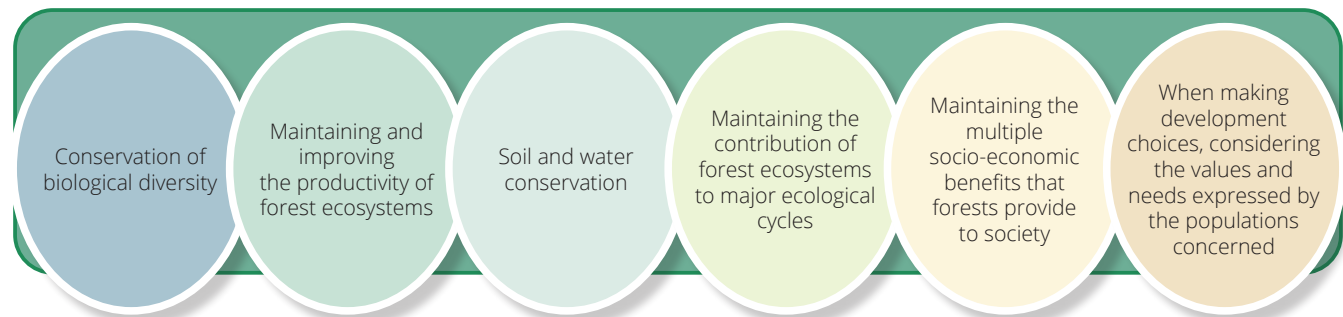


Figure 2 : Sustainable forest management criteria

The forest management activities likely to be carried out in these environments have been grouped into three categories (Figure 3). The first and second categories refer to notions of silviculture and the third to road construction for timber transport⁷ and access to the territory.



Figure 3 : Sustainable forest management activity categories

Sustainable forest management activities are practiced in several types of wetlands. In recent decades, some of these investments have been made, among other things, in plantations in wooded wetlands. To ensure their success, BMPs in wooded wetlands are essential to the success of silvicultural scenarios.

1.2.2 LAWS AND REGULATIONS

The Environment Quality Act (*Loi sur la qualité de l'environnement (LQE)*) and two of its regulations specify government expectations according to the type of supervision provided for activities carried out in wetlands and private forests. The regulation concerning the supervision of activities based on their environmental impact (*Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement (REAFIE)*) describes the activities that are exempt from the obligation to obtain an authorization or a declaration of compliance for several forestry activities carried out in wetlands. The regulation concerning activities in wetlands, bodies of water and sensitive environments (*Règlement sur les activités dans les milieux humides, hydriques et sensibles (RAMHHS)*) dictates some general standards to be followed when carrying out activities in wetlands and near water bodies so that they remain exempt from the REAFIE. When the work planned is outside the standards provided for in the regulatory framework of the LQE, ministerial approval is required before starting. In a privately owned natural environment, other laws, regulations and policies must be taken into consideration prior to planning forest activities. To obtain an overview of these, it is possible to consult the Field guide: BMPs for forest interventions in private forests (*Guide terrain : saines pratiques d'intervention forestière en forêt privée*)⁸ of the Fédération des producteurs forestiers du Québec (FPFQ), as well as the summary sheet of woodlot owner forest certification⁹ from the Syndicat des Producteurs forestiers du Sud du Québec (SPFSQ).

⁵ Office québécois de la langue française, terminology guide : <https://mffp.gouv.qc.ca/les-forets/vocabulaire/>

⁶ <https://mffp.gouv.qc.ca/les-forets/amenagement-durable-forets/criteres-indicateurs-amenagement-durable-des-forets/>

⁷ See « Roads » in the glossary

⁸ https://www.foretrivee.ca/wp-content/uploads/2016/06/Guide_des_Saines_Pratiques_FPFQ_WEB.pdf

⁹ <https://spbestrie.qc.ca/wp-content/uploads/2014/11/Guide-du-propri%C3%A9taire-certifi%C3%A9.pdf>

So that woodlot owners can have a better understanding of the new regulations, the FPFQ has produced a summary of the applicable regulations available at www.foretprivee.ca/mhh.
The FPFQ also offers training sessions.

1.2.3 BEST MANAGEMENT PRACTICES AND SILVICULTURE

There are several intervention methods that can help reduce or avoid disturbances^{10,11}. The implementation of BMPs in wooded wetlands aims to minimize the impacts of these interventions on water, vegetation, soil and species at risk at the cutting area scale. They can be applied at any time in all categories of forestry activities and can be adjusted according to site conditions and the elements to be protected. In general, they are not directly related to laws and regulations, but should be consistent with these. Their application allows for responsible practice of forestry activities as outlined in the six criteria for sustainable forest management mentioned earlier. BMPs therefore provide concrete solutions to the challenges of implementing sustainable use of forest resources.

Silviculture in general is the art and science of growing forests¹¹ by managing the establishment, growth, composition, health and quality of forest stands¹² at the larger scale of the natural forest community¹³. By itself, it constitutes a field of study and intervenes upstream of field work through the selection of various treatments depending on the nature of the forest stand. The treatments are presented in a chosen sequence named the silvicultural scenario. Clear and partial cutting are the two main families of regeneration processes aimed at restoring timber production of harvested sites mainly by protecting advance regeneration. Site preparation may also be carried out with the aim of creating microsites suitable to the establishment of a new tree cohort. Restoration involves planting trees when natural regeneration is insufficient. Finally, tending treatments aim to improve stand growth, quality and vigor and to define future stand composition.

Silviculture adapted to wetlands of conservation interest is a silvicultural approach that primarily puts maintenance of biodiversity at the forefront. It is recommended for natural communities whose forest dynamics are little or not known, or for communities sheltering species in a precarious situation, or that require adaptations such as connectivity corridors, old, rare forests or refuges, or those recognized as exceptional forest ecosystems. Furthermore, it may be necessary to adapt silvicultural scenarios to maintain the natural forest communities of these sensitive environments. On this topic, the committee of experts for this guide recommends calling on forest specialists (forest engineers, biologists) to propose optimized protection, enhancement or restoration methods for their preservation.

1.3 MAIN CHALLENGES OF FORESTRY INTERVENTIONS IN WOODED WETLANDS

1.3.1 IDENTIFICATION AND DELIMITATION OF WOODED WETLANDS

In fact, it can be difficult to know the physical limits of wooded wetlands since they support diverse natural forest communities with different productivities and ecological functions. There are many means to better recognize them on a woodlot (Table 2).

¹⁰ Jutras S., A.P. Plamondon (2020)

¹¹ Fédération des producteurs forestiers du Québec (2016)

¹² MFFP (2013)

¹³ See glossary



Table 2 : Main ways to recognize a wooded wetland or other hydrological attributes

MAPPING POTENTIAL WETLANDS

www.donneesquebec.ca

(Environment, natural resources and energy – Resource types – Interactive maps)

These maps have no legal value. They are intended to help owners and planners understand the spatial distribution of wetlands over the landscape at a scale larger than the woodlot.

FIELD GUIDE IDENTIFICATION AND DELIMITATION OF WETLANDS IN SOUTHERN QUEBEC

www.environnement.gouv.qc.ca/eau/rives/guide-identif-dellimit-milieux-humides.pdf

Presents a methodology for identifying wetlands. This methodology is based on vegetation, soils and biophysical indicators of a hydrological regime typical of these environments.

FOREST MANAGEMENT PLAN

www.foretprivee.ca/jamenage-ma-foret/plan-damenagement-forestier/
www.mffp.gouv.qc.ca/les-forets/forets-privees/plan-amenagement/

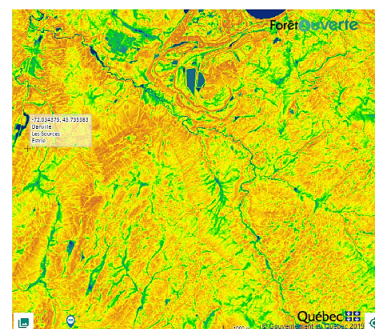
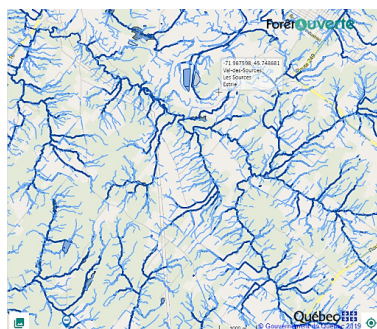
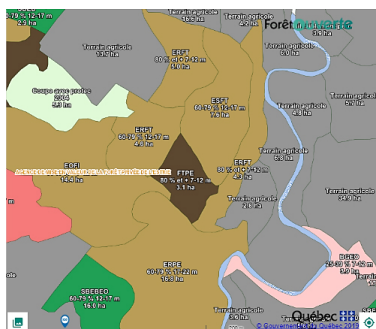
The forest management plan signed by a forest engineer provides good knowledge to owners about their woodlot and enables them to make informed development decisions. It can be enhanced with ecological, fauna and flora information if needed. It is a good tool for knowledge and forest planning at the woodlot scale.

Consulting competent specialists (biologists and forest engineers) for the proper identification of these site types allows owners to obtain advice specific to their wetland. These specialists can make a reconnaissance visit right up to the characterization of the wooded wetland to help guide decisions to be made. Contact regional private forest development agencies or regional environmental councils.

FOREST MAPPING

www.foretouverte.gouv.qc.ca

Technological tools are being developed at the provincial level to provide better mapping of wetlands and bodies of water to improve the planning of forestry activities. Here are three examples of easily usable geomatics products (in the order of presentation from left to right): the forest stands of the fifth inventory, potential streambed data and the topographic humidity index from LiDAR.



REGIONAL WETLANDS AND BODIES OF WATER PLAN

The Regional Wetlands and Bodies of Water Plan is a strategic planning document produced by a municipal county (MRC) that integrates the conservation of wetlands and water bodies into land use planning by structuring and promoting sustainable development. It is an excellent source of information for forestry stakeholders.

The Centre de données sur le patrimoine naturel du Québec (CDPNQ) disseminates information on the list of plant species that are threatened, vulnerable or likely to be designated: www.cdpmq.gouv.qc.ca

1.3.2 BIODIVERSITY PROTECTION

In the forest, we sometimes find the presence of vulnerable or endangered fauna and flora species, some of which are legally protected under the Natural Heritage Conservation Act (*Loi sur la conservation du patrimoine naturel (LCPN)*)¹⁴ or the Wildlife Conservation and Development Act (*Loi sur la conservation et la mise en valeur de la faune (LCMVF)*)¹⁵. It is important to find out about listed occurrences, to know the species that could be found in your region and, if necessary, to apply adequate protection measures. According to an analysis made by the MELCC based on data from the CDPNQ¹⁶ in 2020, nearly 20% of the known occurrences of plant species that are threatened, vulnerable or likely to be designated as threatened or vulnerable in Quebec in accordance with the meaning of the law are found in wooded wetlands in private forests¹⁷. In the presence of such species, the involvement of an expert is recommended before undertaking development work to ensure protection of these species. It is also possible to consult the guides for recognizing the forest habitats of threatened or vulnerable plants by region, as well as the CDPNQ website¹⁸.

Some natural communities¹⁹ are characterized by a unique biodiversity hosting a particular flora or fauna without necessarily being threatened or vulnerable in the sense of the law. They are unique through a combination of species that are rare in the region. Depending on the natural community situation, it may be advisable to carry out a professional diagnosis which will recommend, if necessary, appropriate silviculture²⁰ to consider the uniqueness of these wetlands creating interest for their conservation. In this context, it is preferable to call on specialists to identify the key elements of interest, and, if warranted, take advantage of their advice on the most appropriate site management approach and BMPs to be used.

1.3.3 INVASIVE EXOTIC PLANT SPECIES

Invasive exotic species can reproduce rapidly until they overtake native species in an ecosystem. Invasive non-native plant species take advantage of natural or anthropogenic disturbances and the lack of natural competition to proliferate²¹, thus affecting the natural dynamics of forests. Climate change may exacerbate their establishment and spread over large areas, in addition to favoring the introduction of new species. Severe invasion by invasive exotic species leads to a loss of biodiversity, alters the services provided by ecosystems and could reduce the productivity of certain forest stands or even the capacity of some forests to regenerate²². They may, in some cases, pose a risk to human health. It is therefore essential to take this problem into account when planning and carrying out work in a wooded wetland, for example by minimizing the canopy opening²³. The MELCC Sentinel detection tool, available on the government website²⁴, provides information on the various invasive non-native plant species and allows to visualize the observations to date on a map. The tool also makes it possible to transmit information to the ministry in order to improve knowledge and government orientations. Observations are based on volunteer reports and therefore underestimate the actual distribution of invasive exotic species. It is also possible to consult the tables in volume 1 of the Guide sylvicole du Québec (2013) (pages 241 to 275) to find out the particularities of each species according to different silvicultural treatments.

1.3.4 FOREST ROADS

Forest roads and culverts are infrastructures that facilitate access to the forest and allow its development. However, their construction is one of the forest management activities with the greatest impact on the environment. The network of forest roads can permanently modify the natural hydrology of the environment, fragment ecosystems while generating losses of productive area. In the context of private forests, the woodlot boundaries create additional constraints that prevent road building from avoiding a wooded wetland. BMPs in wooded wetlands therefore play a fundamental role in minimizing the effects of forestry activities on wooded wetlands. Those attributed to the construction of roads and culverts are particularly important because of their long-term presence and their impact on the environment. The topic of forest drainage is not covered in this guide since it is recognized as harmful to the forest environment and is prohibited in wooded wetlands. Nevertheless, it remains essential to ask the right questions about the future management of stands subject to forest drainage and to discuss them with specialists.

¹⁴ <https://cdpnq.gouv.qc.ca/publication.htm>

¹⁵ <https://mffp.gouv.qc.ca/la-faune/especes/especes-menacees-vulnerables/>

¹⁶ <https://cdpnq.gouv.qc.ca> to ask for information or to consult publications

¹⁷ Excluding regions where a framework already exists for the conservation of natural communities

¹⁸ <https://cdpnq.gouv.qc.ca/publication.htm>

¹⁹ See glossary

²⁰ See the glossary and section 2.1

²¹ Lavoie, C. (2019)

²² MRN (2013)

²³ Burnham, K. M., L. D. Thomas (2009)

²⁴ <http://www.environnement.gouv.qc.ca/biodiversite/especes-exotiques-envahissantes/sentinelles.htm>



CHAPTER 2

BASICS AND HYDROLOGICAL, ECOLOGICAL AND FORESTRY DESCRIPTIONS OF WOODED WETLANDS

2.1 BASICS

2.1.1 ECOLOGICAL FUNCTIONS

Ecological functions are defined as the ecological roles played by a given ecosystem and are related to its characteristics. These characteristics derive from the geomorphological²⁵ and climatic conditions of the ecosystem location. The more diverse the conditions of a site, the higher the number of ecological functions supporting a higher biodiversity.

Thus, wooded wetlands play an important role in supporting several ecological functions, especially regarding the quantity and quality of flowing water, biodiversity, as well as carbon sequestration, especially in peatland soils. Increased consideration of the ecological functions of wooded wetlands is necessary in the planning of forest development work. This will ensure that benefits of these services to users of the land are optimized while maintaining those of the natural organisms that feed, live and reproduce in the wooded wetlands. Maintaining these site conditions also supports several services that benefit communities.

2.1.2 ECOLOGICAL SERVICES

Ecological services correspond to the direct and indirect benefits that nature offers to humans. These services are usually divided into four categories: 1) sourcing of food, materials, fuel and medicine; 2) regulation of climate, water flow and pollination; 3) support for services with an indirect effect on humans, such as the major water cycles, carbon and soil formation; and finally, 4) socio-cultural, recreational, educational, aesthetic and spiritual services. The private forests of Quebec provide several services to forest owners and communities with, for example, the production of firewood, the supply of fibre for the forest industry, the harvesting of non-timber forest products and recreation, hunting and fishing. Ecological services, such as carbon sequestration and drinking water supply, are supported naturally by functional ecosystems. Maintaining these can represent substantial savings compared to the development of infrastructures to provide the same services.

2.1.3 FUNCTIONS AND ECOLOGICAL SERVICES FAMILIES IN THIS GUIDE











In this guide, a total of ten functions and ecological services inherent to wooded wetlands have been chosen. To facilitate reading, they are represented in ten pictograms so that they can be used as visual aids in connection with the text. The colors represent their respective families:



Figure 4 : Functions and ecological services families

²⁵ See glossary

Table 3 : Role description of the ten ecological functions and services targeted by the guide

	<p>SUSTAINABLE SUPPLY OF TIMBER</p> <p>A wooded wetland can be a timber supply site if managed with respect for current and future generations through the application of BMPs.</p>	<p>MAINTENANCE OF BIODIVERSITY</p> <p>A wetland can support diverse natural communities of plant and animal species, which promotes ecosystem resilience.</p>	
	<p>CARBON SEQUESTRATION IN WOOD AND SOILS</p> <p>Some wooded wetlands store carbon in the soil since the production of organic matter exceeds the decomposition, which improves the net carbon balance.</p>	<p>HABITAT OF FLORAL SPECIES AT RISK</p> <p>Wooded wetlands can harbor plant species designated as species at risk. They benefit from the protection of the LQE and LCPN regulations.</p>	
	<p>SUSTAINABLE SUPPLY OF NON-WOODY FOREST PRODUCTS</p> <p>A wooded wetland can supply edible and therapeutic food and provide materials for the making of cultural objects used in particular by First Nations. Big game, maple syrup, mushrooms, wild berries and various plants fall into this category.</p>	<p>HABITAT OF WILDLIFE SPECIES AT RISK</p> <p>Wooded wetlands can harbor wildlife species designated as species at risk. They benefit from the protection of the LQE and the LCMVF regulations.</p>	
	<p>SPECIFIC HYDROLOGY</p> <p>Some wooded wetlands help regulate water flow, filter and retain sediments and slow shoreline erosion. They improve the quality of surface and ground water in the watershed.</p>	<p>MAINTENANCE OF CONNECTIVITY</p> <p>A wooded wetland can link wildlife and plant populations together. This maintains the genetic heritage of plant and animal populations.</p>	
	<p>MAINTENANCE OF SOIL PHYSICAL PROPERTIES</p> <p>Wooded wetlands have fine soils, which allows a higher useful water content than other forest environments. On the other hand, the soil bearing capacity is low.</p>	<p>VISUAL LANDSCAPE QUALITY</p> <p>A wooded wetland can contribute to the aesthetic heritage of a region and represents an asset for nature observation, contemplation and non-motorized outdoor activities.</p>	



2.2 HYDROLOGICAL AND ECOLOGICAL DESCRIPTIONS BY CATEGORY OF WOODED WETLANDS

This guide presents a few ecological, hydrological and forest characteristics of wooded wetlands in Quebec. Most of these environments are found in depressions, the bottom of slopes, flat land or near waterways and lakes. However, there are also wetlands located on slopes where the water table is flush with the surface of the ground. These are sites with oblique drainage. All wetlands are sensitive to machinery traffic and require increased precaution during forestry work. In this guide, the images of the four sites chosen represent the water table levels when the site is in the dry phase (with a sun) and when it is in the high moisture phase (with clouds), either because of heavy rain or snowmelt, or by both at the same time, generating a flood in land prone to overflow. Their most relevant ecological and hydrological characteristics are described in the four sheets in the following sections. Forest characteristics are then described using the appropriate physiographic series²⁶.

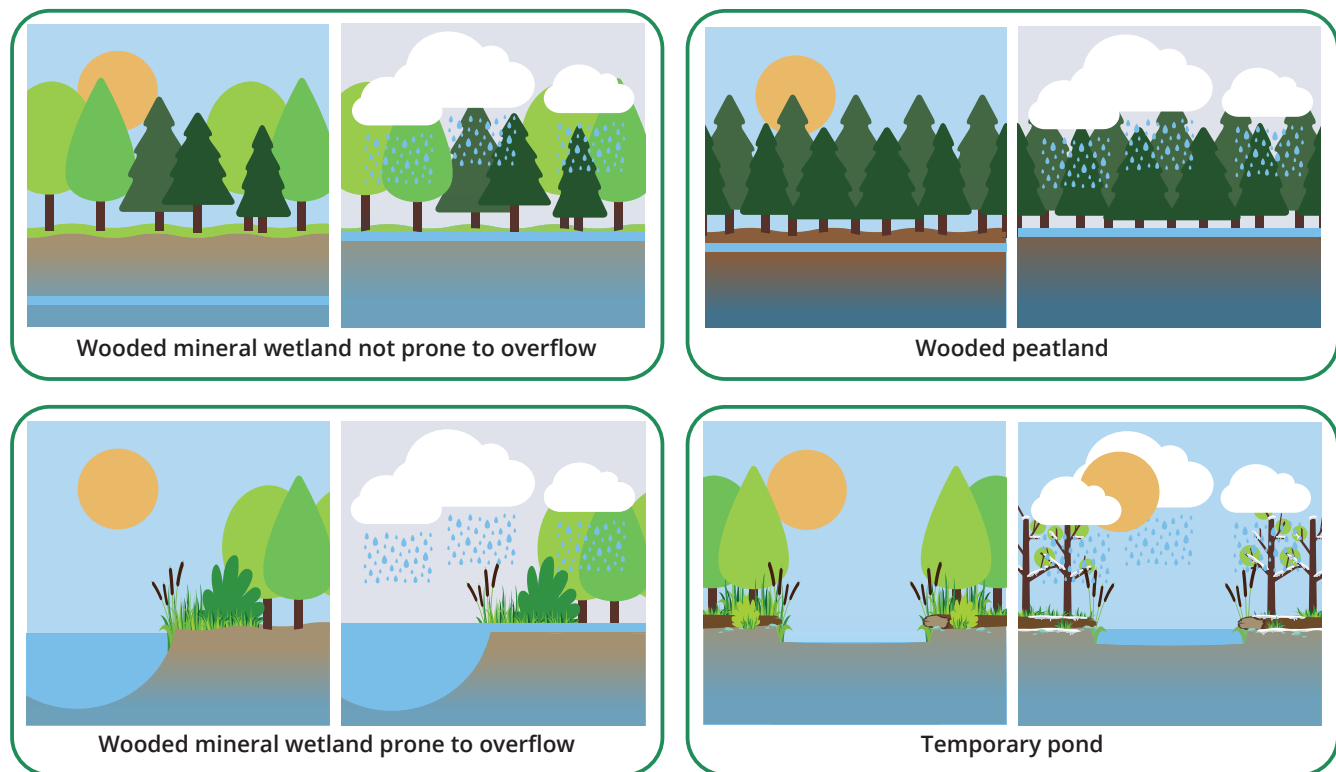
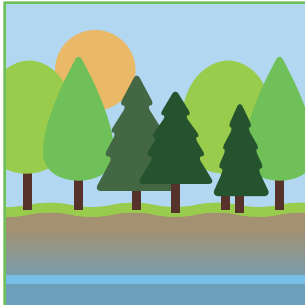


Figure 5 : Schematic of wooded wetland categories and of the temporary pond

²⁶ Those wanting to know more about the characteristics of these environments can consult several references on this subject. Nevertheless, the guide *Identification et délimitation des milieux humides du Québec méridional* remains a key reference. See number 2.1. in the reference list. See number 2.13 for information and layman synthesis.

2.2.1 CHARACTERISTICS OF WOODED MINERAL WETLANDS NOT PRONE TO OVERFLOW

WOODED MINERAL WETLAND NOT PRONE TO OVERFLOW



DEFINITION OF WOODED MINERAL WETLANDS

Wetlands containing trees over 4 m in height that cover at least 25% of the surface area of the wetland.

HYDROLOGICAL FEATURES

These are environments whose water supply is not associated with overflow episodes of a watercourse or lake. Soils are periodically saturated with water above the ground surface in hollows during snowmelt or when the water table rises after heavy rainfall. This phenomenon is very frequent since the water table is shallow. The mounds, generally above the water level, promote the growth of woody vegetation.



KEY FUNCTIONS AND ECOLOGICAL SERVICES



SPECIES POTENTIALLY AT RISK

FAUNA

- Four-toed salamander
- Olive-sided flycatcher

FLORA

- Bulbous Cardamine
- Follicle sedge
- Shagbark hickory
- Dwarf Ophioglossus
- Arum leaf knotweed

EXAMPLES OF RARE AND COMMON NATURAL FOREST COMMUNITIES

- *Butternut community*
- *Shagbark hickory community*
- *American elm community*
- *Red elm community*
- *Red maple community*
- *Black ash community*
- *White pine community*
- *Poplar community*
- Boreal poplar community
- Black spruce community
- Larch community
- Eastern cedar community
- Balsam fir community
- Red spruce community
- Yellow birch community
- Eastern hemlock community



2.2.2 FEATURES OF WOODED MINERAL WETLANDS PRONE TO OVERFLOW

WOODED MINERAL WETLANDS PRONE TO OVERFLOW



DEFINITION OF WOODED MINERAL WETLANDS

Wetlands containing trees over 4 m in height that cover at least 25% of the surface area of the wetland.

HYDROLOGICAL FEATURES

Environments whose water supply is associated with an adjacent lake or watercourse during flooding. The duration (from a few hours to a few weeks) and the frequency (several times a year or a few times a decade) of the floods are sufficient to influence the soils and the diversity of the vegetation found there. The relative elevation of this environment in relation to the level of the overflowing stream or lake is low.



KEY FUNCTIONS AND ECOLOGICAL SERVICES



SPECIES POTENTIALLY AT RISK

FAUNA

- Louisiana Waterthrush
- Canada warbler
- Wood turtle
- Blanding's turtle
- Four-toed salamander
- Olive-sided flycatcher
- Rusty blackbird

FLORA

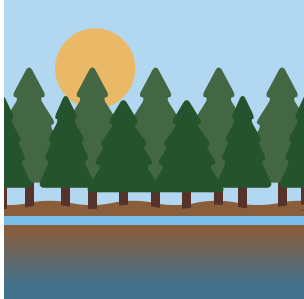
- Green dragon
- Butternut
- Swamp white oak
- Cattail sedge
- Peachleaf willow

EXAMPLES OF RARE AND COMMON NATURAL FOREST COMMUNITIES

- *Swamp white oak community*
- *Bur oak community*
- *Shagbark hickory community*
- *Hackberry Community*
- *Basswood Community*
- *Butternut community*
- *Eastern cottonwood community*
- Tree willow community
- Silver maple community
- Red maple community
- Black ash community
- Boreal poplar community
- Red ash community
- Alder community

2.2.3 FEATURES OF WOODED PEATLANDS

WOODED PEATLANDS



DEFINITION

Environment containing trees more than 4 m tall covering 25% or more of its surface area, whose soil surface is covered with peat resulting from the accumulation of partially decomposed organic matter, with a minimum thickness of 30 cm.

HYDROLOGICAL FEATURES

Environment where the water table is usually very close to the surface of the ground in wet periods and at shallow depth in dry summer periods. Thus, peat decomposition is slower than its accumulation. This results in carbon sequestration in the soil. The behavior of peat resembles that of a sponge: when the wooded peatland accumulates surface water, it becomes saturated and contributes to the increase in spring flood flows. When dry, it absorbs surface water and contributes to the reduction of water flows in the summer.



KEY FUNCTIONS AND ECOLOGICAL SERVICES



SPECIES POTENTIALLY AT RISK

FAUNA

- Olive-sided flycatcher
- Rusty blackbird
- Four-toed salamander

FLORA

- Showy lady's-slipper
- Southern Lister
- McCalla willow
- Pseudomonticola willow
- Follicle sedge
- Virginia Woodwardie

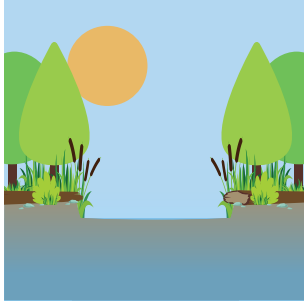
EXAMPLES OF RARE AND COMMON NATURAL FOREST COMMUNITIES

- *Red maple community*
- *Yellow birch community*
- *Rigid pine community*
- *Larch community*
- *Black spruce community*
- Eastern Hemlock community
- Balsam fir community
- Eastern cedar community
- Jack pine community



2.2.4 FEATURES OF TEMPORARY PONDS

TEMPORARY PONDS



HYDROLOGICAL FEATURES

Temporary ponds are shallow depressions (no more than 1 m deep) and small areas (usually 0.1 ha) rarely exceeding 0.4 ha. Depressions accumulate water during the snowmelt period. The small amount of water retained contributes to infiltration for 3 to 18 weeks after snowmelt, helping to recharge the water table. Water is generally present until June or later if the rains are abundant. The ponds are not connected to the hydrographic network and frequently contain a lot of woody debris.

KEY FUNCTIONS AND ECOLOGICAL SERVICES



SPECIES POTENTIALLY AT RISK

FAUNA

- Western chorus frog
- Blanding's turtle

FLORA

- Spiny sedge
- Follicle sedge
- Shagbark hickory
- Swamp white oak
- Virginia spring beauty
- Arum leaf knotweed



2.2.5 REGROUPED ADDITIONAL INFORMATION

Table 4 : Additional relevant ecological information by category of wooded wetlands and for the temporary pond identified in this guide

	WOODED MINERAL WETLAND NOT PRONE TO OVERFLOW	WOODED MINERAL WETLAND PRONE TO OVERFLOW	WOODED PEATLAND	TEMPORARY POND
Soil types	<p>Mineral soil that can be hydromorphic²⁷</p> <p>Mineral soil that can be hydromorphic or regosol</p>	<p>Mineral soil that can be hydromorphic or regosol</p>	<p>Organic soil²⁸ that can be hydromorphic</p>	<p>Mineral or organic soil</p>
Hydrological features	<p>Forest environment generally at the bottom of slopes and on flat ground²⁹ whose soils are occasionally saturated with water up to the surface.</p>	<p>Forest environment adjacent to a lake or a watercourse subject to recurrent overflow.</p>	<p>Forest environment at the bottom of slopes or on flat ground where the water table generally remains high.</p>	<p>Shallow depression in the ground that retains water from snowmelt and is not connected to the hydrographic network.</p>
Common floral and wildlife species	<p>Red maple, balsam fir</p>	<p>Silver maple, red and black ash, alders</p>	<p>Black spruce, larch</p>	<p>Many species, depends on location</p>
Main functions and ecological services				
Relevant structures for wildlife	<ul style="list-style-type: none"> Tree trunks and woody debris: shelter and food for amphibians and small mammals in all seasons, and spring reproduction in temporary ponds Low and shrubby vegetation: reproduction, food and shelter Forests adjacent to temporary ponds: shelter and food for amphibians Cavities in mature trees: nesting site for ducks and owls, and shelter for bats Snags³⁰ : reproduction and food for insectivorous birds Softwood canopy : shelter and food 	<ul style="list-style-type: none"> Tree trunks and woody debris: shelter and food for amphibians and small mammals in all seasons, and spring reproduction in temporary ponds Low and shrubby vegetation: reproduction, food and shelter Forests adjacent to temporary ponds: shelter and food for amphibians Cavities in mature trees: nesting site for ducks and owls, and shelter for bats Snags³⁰ : reproduction and food for insectivorous birds Softwood canopy : shelter and food 	<ul style="list-style-type: none"> Tree trunks and woody debris: shelter and food for amphibians and small mammals in all seasons, and spring reproduction in temporary ponds Low and shrubby vegetation: reproduction, food and shelter Forests adjacent to temporary ponds: shelter and food for amphibians Cavities in mature trees: nesting site for ducks and owls, and shelter for bats Snags³⁰ : reproduction and food for insectivorous birds Softwood canopy : shelter and food 	<ul style="list-style-type: none"> Tree trunks and woody debris: shelter and food for amphibians and small mammals in all seasons, and spring reproduction in temporary ponds Low and shrubby vegetation: reproduction, food and shelter Forests adjacent to temporary ponds: shelter and food for amphibians Cavities in mature trees: nesting site for ducks and owls, and shelter for bats Snags³⁰ : reproduction and food for insectivorous birds Softwood canopy : shelter and food
Exotic invasive species known	<p>Glossy and common buckthorn, common reed, emerald ash borer</p>	<p>Glossy and common buckthorn, japa-nese knotweed, common reed, emerald ash borer</p>	<p>Glossy buckthorn, common reed</p>	<p>Common reed, glossy and common buckthorn</p>

²⁷ See glossary

²⁸ In Quebec, a soil is classified as organic when the organic matter exceeds 30 cm in thickness.

²⁹ There are exceptions as explained in the text (section 2.3)

³⁰ See glossary

2.3 FORESTRY DESCRIPTIONS OF WOODED WETLANDS BY SPECIFIC ECOLOGICAL REGION

This section is for those who need additional information on the specific parameters of forest planning for wooded wetlands. The ecological regions share similar topography and landforms shaped by geomorphological processes and a common geological history and have been delineated on a map by the Ministère des Forêts, de la Faune et des Parcs (MFFP) (Figure 6).

The physiographic sequences of the ecological type recognition guides³¹ have been adapted to create physiographic fact sheets of the ecological regions where the proportion of productive forest area identified as wooded mineral wetlands and wooded peatlands is the highest. The usefulness of a physiographic sheet consists in showing at a glance the extent of the ecological types³² within the same ecological region in terms of mix of potential tree species, physical characteristics of surface deposit and drainage, and constraints of forestry interventions. They do not provide the current forest cover, which depends on the history of natural disturbances and forest management activities carried out. To this end, relevant information from the forest station guides³³ was selected by ecological region. The information contained in the tables of each physiographic sheets allows to estimate the areas associated with the ecological type belonging to wooded wetlands (Table 5) and to know the relative potential productivity³⁴ of the associated forest station type³⁵. In addition, the descriptive table of the physiographic sheets lists forest management constraints, both about the circulation of machinery and about the risk of plant competition after harvesting. The potential productivity relative to each region is not available for all forest types. This is the case for ecological type FO18 and MJ18 of the St. Lawrence plain and that of MF18 of the lower Outaouais plain and the Montreal archipelago where wooded wetlands are present. Therefore, a comparison with another similar ecological type has been made and the information is presented in italics. Thus, Table 5 presents the five selected ecological regions arranged in physiographic sheets in the following subsection. It also provides the total areas of hydric and subhydric drainage for each of them.

In forestry, the MFFP's ecoforestry map provide the soil drainage classes, which help to predict, among other things, the trafficability constraints of machinery during forestry activities. The average drainage assigned to the ecological types of wooded wetlands is called "hydric" (appendix 1). This is different from the word "hydric" on the MELCC maps. There is another category of average drainage called "subhydric". These environments are not automatically classified as wetlands on the MFFP ecoforestry map, but can be identified as potential wooded wetlands on the MELCC map. These sites may have low bearing capacity for machinery as well as a particular fauna and flora. If in doubt, it is important to check their characteristics in the field with a specialist.

³¹ Gosselin, S. (2009)

³² See glossary

³³ Cyr, G. (2017)

³⁴ Not to be confused with the productive forest area of the AAC calculations. See glossary.

³⁵ See glossary

Table 5 : Surface area summary of hydric and subhydric drainage environments by ecological region on the ecoforestry map of the 4th inventory (public and private forests combined) linked to the administrative regions with the highest proportion of wooded wetlands³⁷

ECOLOGICAL REGION	CODES	ADMINISTRATIVE REGION* ASSOCIATED TO ECOLOGICAL REGION	AREA (HA) OF ECOLOGICAL TYPES ASSOCIATED TO WOODED WETLANDS (HYDRIC DRAINAGE) ³⁸	AREA (HA) AND PROPORTION (%) OF ECOLOGICAL TYPES ASSOCIATED TO SUBHYDRIC DRAINAGE ENVIRONNEMENTS ³⁹
St-Lawrence plains	2 b	Centre-du-Québec (without the Appalaches)	115 185	292 150 (72)
Abitibi plains	5 a	Abitibi-Témiscamingue (Abitibi)	608 161	701 870 (54)
Lac Saint-Jean plains	4 e	Saguenay-Lac-Saint-Jean (Lac-Saint-Jean)	38 150	59 095 (61)
The Baie-des-Chaleurs coastline	4 g	Gaspésie-Îles-de-la-Madeleine (Gaspésie)	12 401	49 700 (80)
The Montreal archipelago and lower Outaouais plains	1 a	Outaouais, Montréal, Montérégie-Est	42 566	137 487 (76)

*Note : Sometimes an administrative region has several ecological regions.

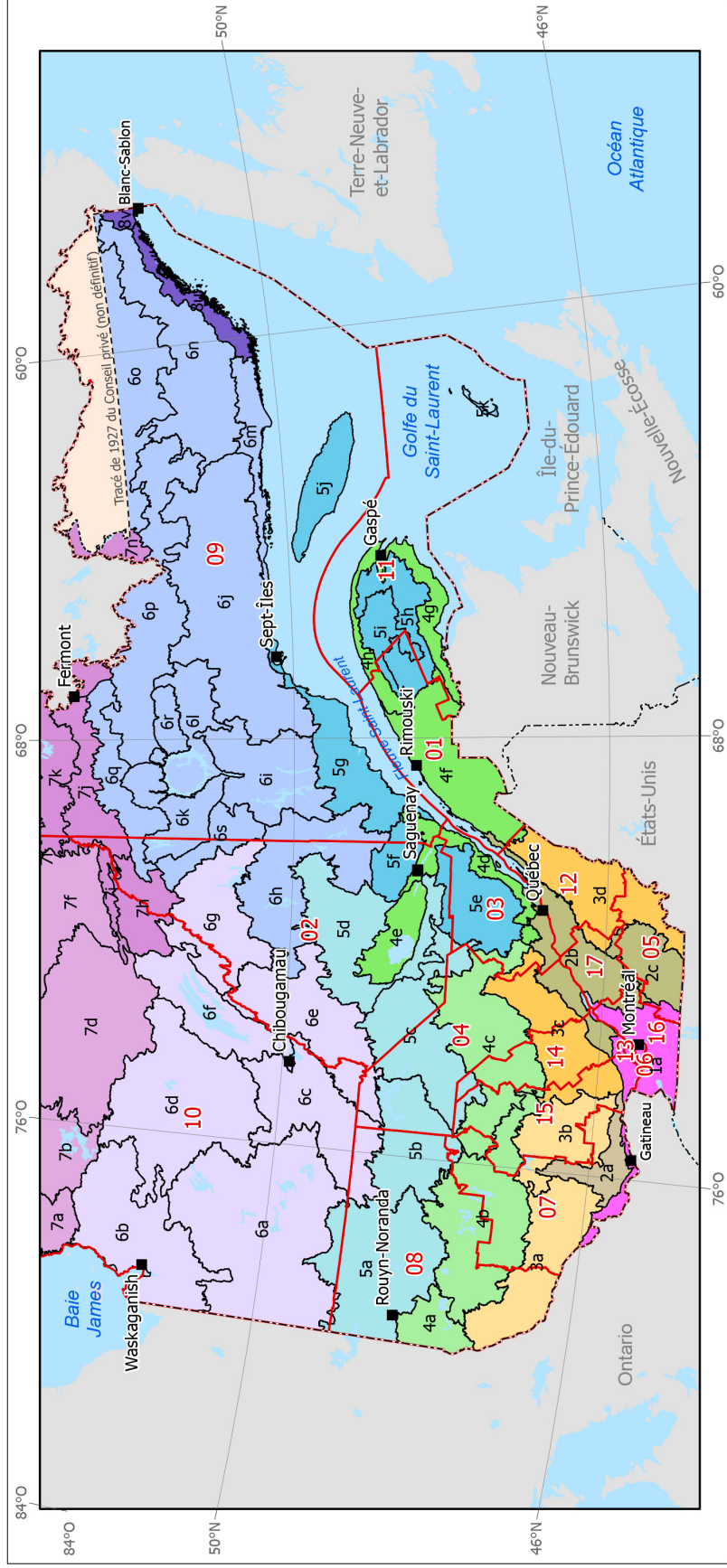
³⁶ MFFP (2020)

³⁷ FPFQ (2021)

³⁸ The wetlands with subhydric drainage and without forest cover are excluded

³⁹ The wetlands without forest cover are excluded but drainage classes 31, 40, 41 are included





Légende

ZONE BORÉALE

- Sous-zone de la toundra forestière *
- Toundra forestière *

Sous-zone de la forêt boréale ouverte

- Pessière à lichens **

Sous-zone de la forêt boréale fermée

- Pessière à mousses **
- Sapinière à bouleau à papier **

ZONE TEMPÉRÉE NORDIQUE

- Sapinière à bouleau jaune **

Sous-zone de la forêt mixte

- Érablière à bouleau jaune **
- Érablière à tilleul **
- Érablière à caryer cordiforme

Frontière internationale

Frontière interprovinciale

Frontière Québec-Terre-Neuve-et-Labrador
(cette frontière n'est pas définitive)

Région écologique

Région administrative

Non cartographié

* Sous-domaine bioclimatique Côte-Nord.
** Les couleurs distinguent respectivement les sous-domaines bioclimatiques Ouest et Est.

Source

Données Frontières et classification écologique de la Faune et des Parcs

Organisme Ministère des Forêts, de la Faune et des Parcs

Année 2021

Réalisation et diffusion Ministère des Forêts, de la Faune et des Parcs
Direction des inventaires forestiers

Note : Le présent document n'a aucune portée légale.
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Forêts, Faune et Parcs Québec

Projection cartographique

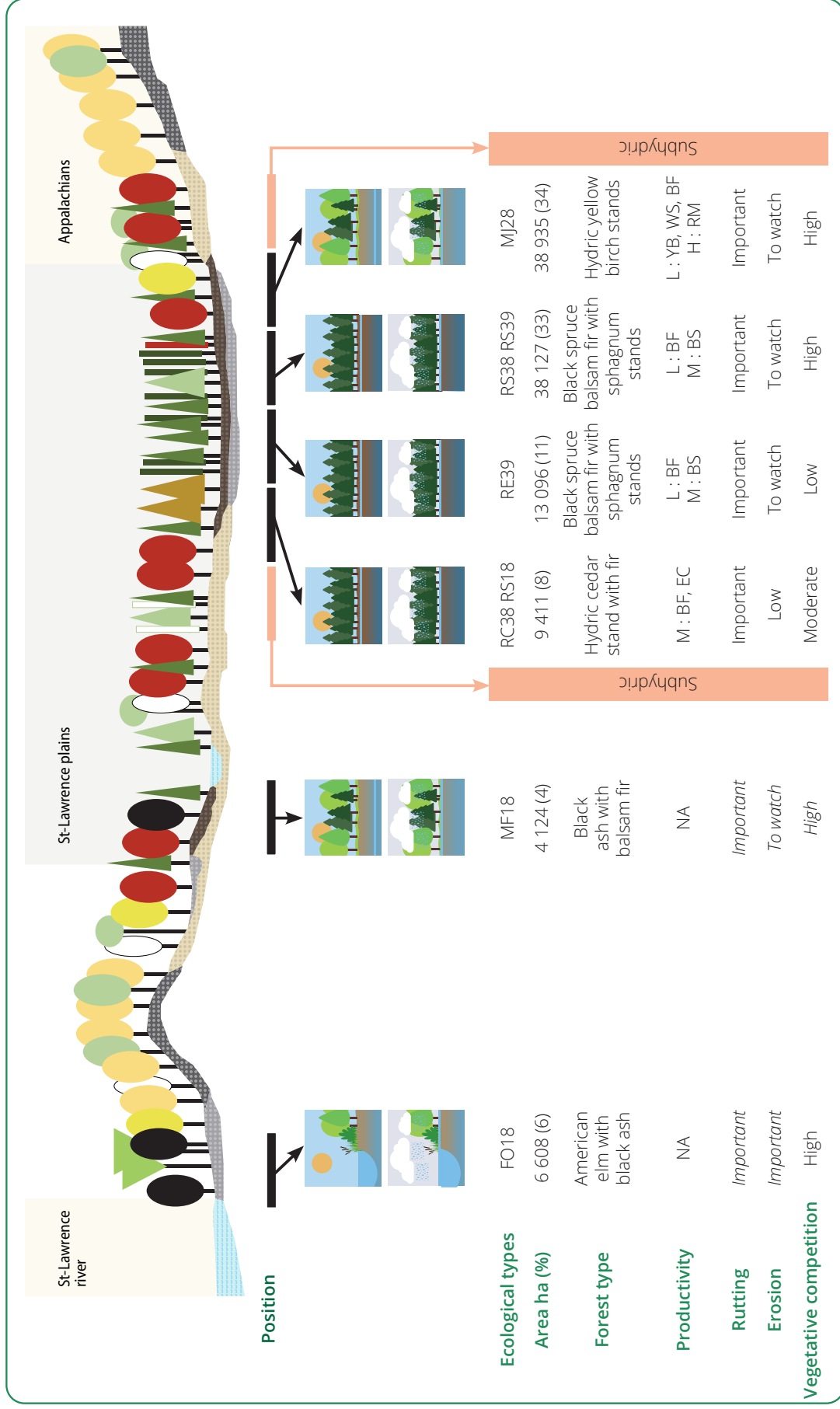
Conique de Lambert avec deux parallèles d'échelle conservée (46° et 60°)

0 100 200 km

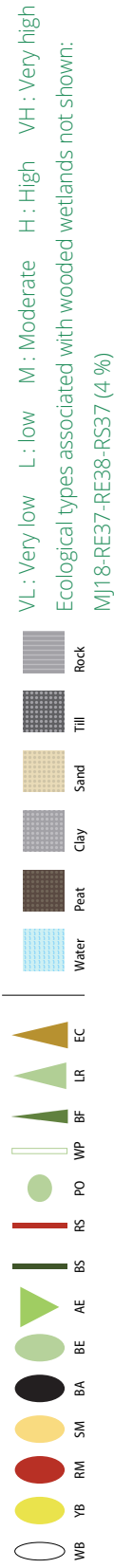
Figure 6 : Contours of the zones grouping the ecological regions (black lines) and administrative regions (red lines) as described in the ecological types identification guide of Quebec



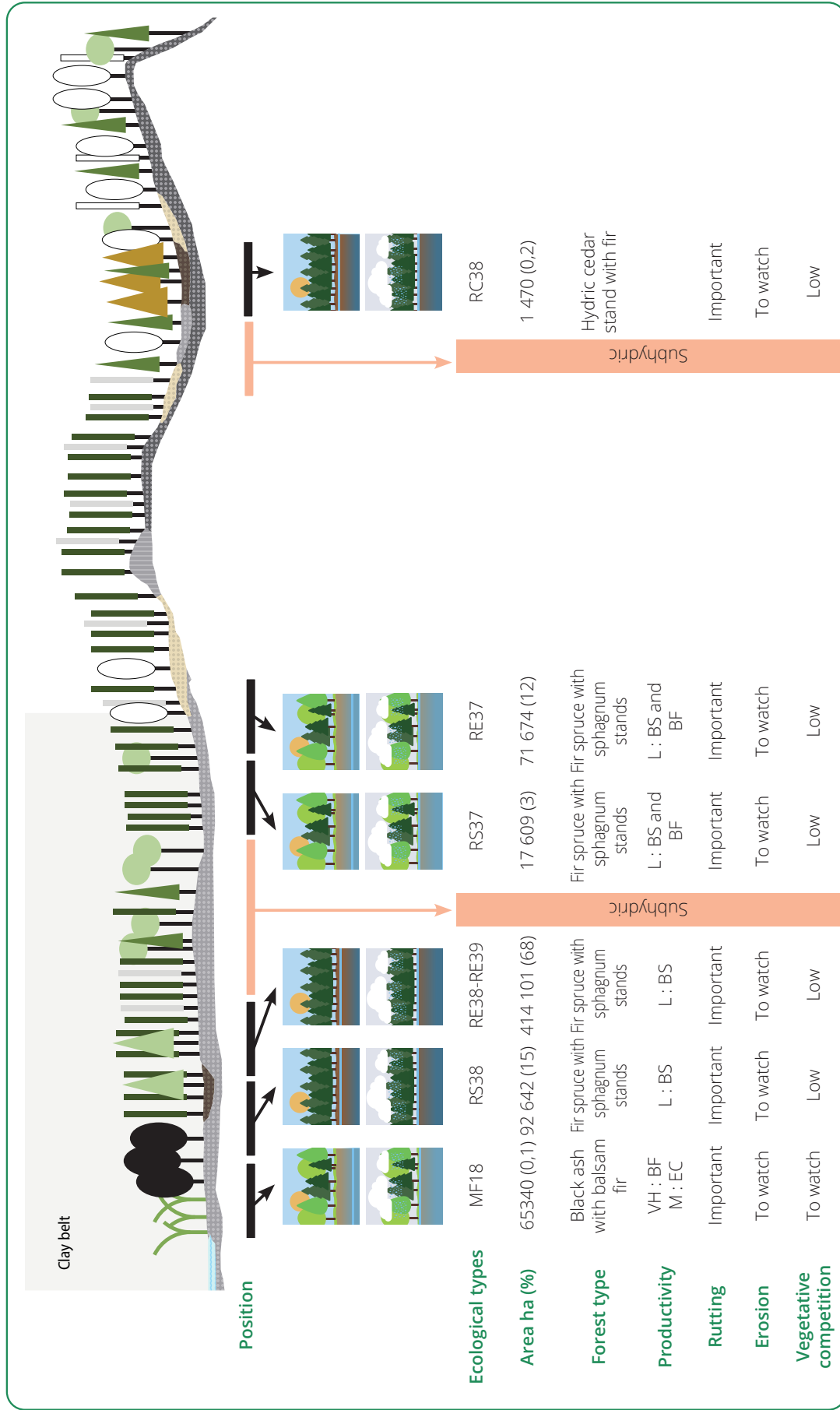
2.3.1 PHYSIOGRAPHIC SHEET FOR WOODED WETLANDS OF THE ST-LAWRENCE PLAINS (2B)



Legend



2.3.2 FICHE PHYSIOGRAPHIQUE DES MILIEUX HUMIDES BOISÉS DE LA PLAINE DE L'ABITIBI (5 a)



Legend

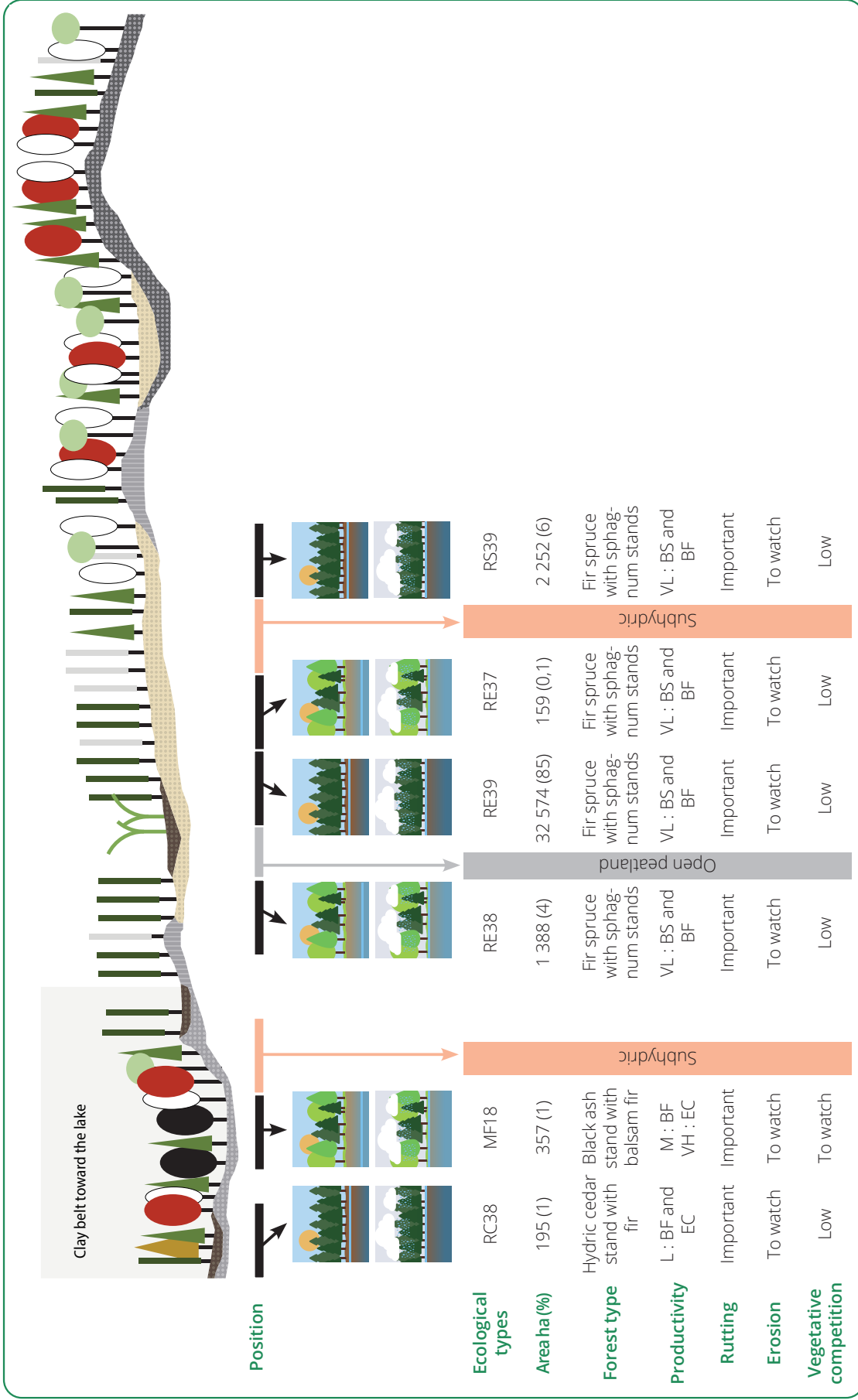


VL : Very low L : low M : Moderate H : High VH : Very high
 Ecological types associated with wooded wetlands not shown:
 RS18-RS37P-RS39 (2 %)

⁴⁰ It is mentioned that the sites associated with this station type are often smaller than 4 ha and therefore too small to be mapped, which means that the real importance of this station type in the region is probably higher.



2.3.3 PHYSIOGRAPHIC SHEET FOR WOODED WETLANDS OF THE LAC SAINT-JEAN AND SAGUENAY PLAINS (4e)



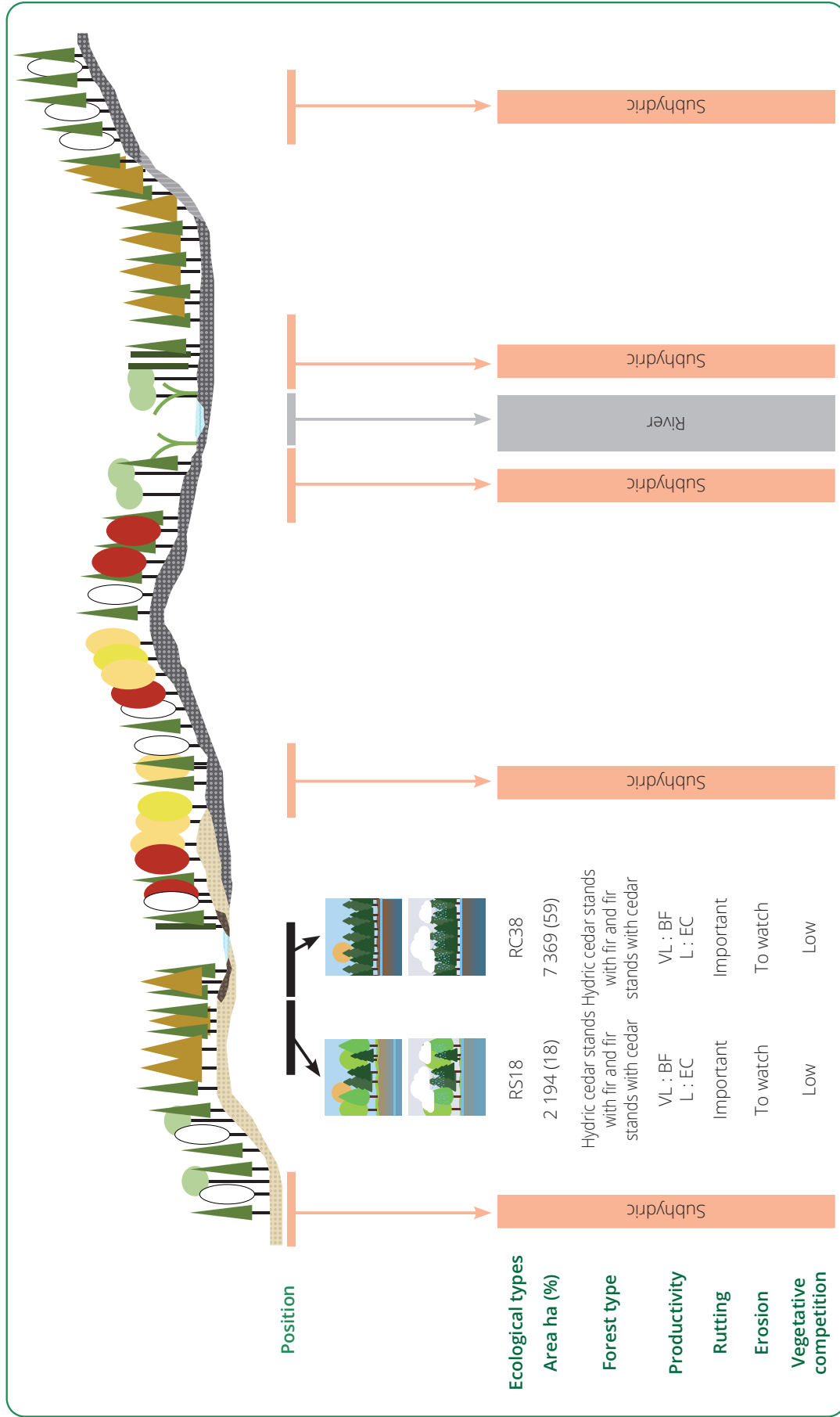
Légende



VL : Very low L : low M : Moderate H : High VH : Very high
 Ecological types associated with wooded wetlands not shown:
 FO18-MS18-MS68-RS37-RS38 (4 %)



2.3.4 PHYSIOGRAPHIC SHEET FOR WOODED WETLANDS OF THE BAIE DES CHALEURS COAST LINE (4 g)



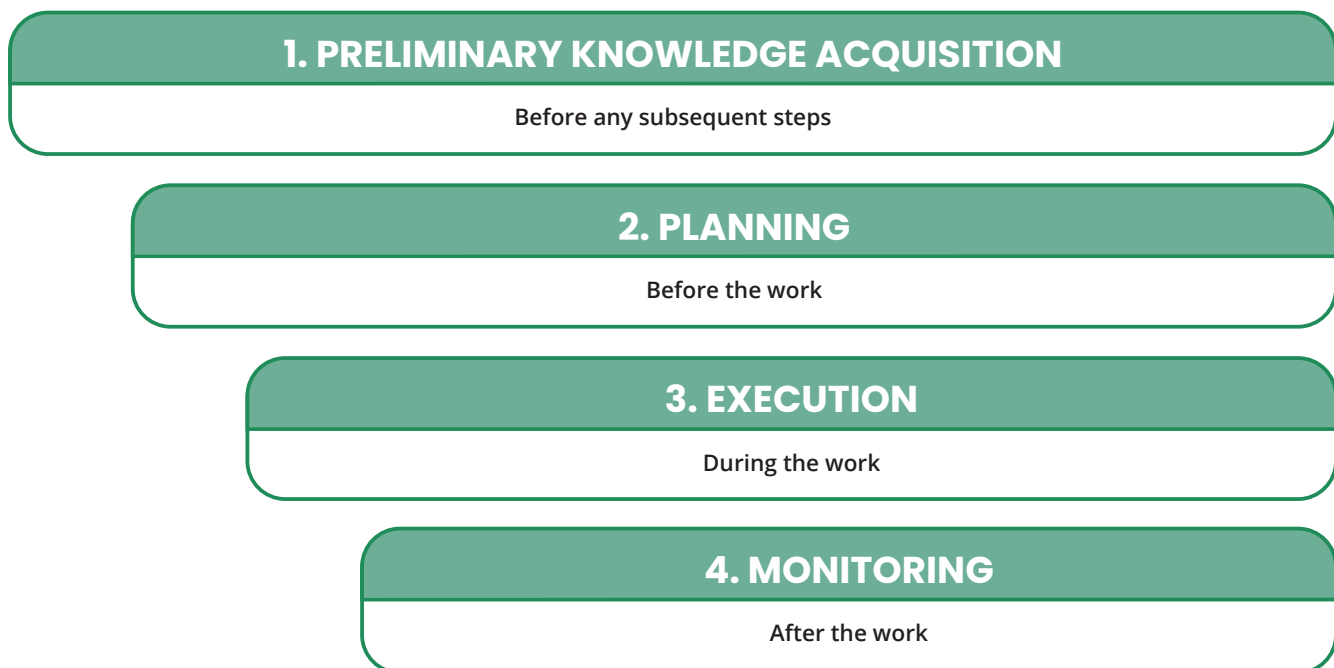
CHAPTER 3

PROCESSES AND IMPLEMENTATION OF BEST FORESTRY PRACTICES IN WOODED WETLANDS

3.1 PROCESSES

BMPs in wooded wetlands are part of a four-step implementation process (Table 6).

Table 6 : The four essential steps to implementing BMPs in a forestry project



3.2 DESCRIPTION OF THE FOUR STEPS

3.2.1 STEP 1 – PRELIMINARY KNOWLEDGE ACQUISITION

This essential step aims first and foremost at gathering all the information necessary to complete the project. Second, it is also used to analyze the needed skill sets in order to differentiate between those already in hand and those that should be improved or if professional expertise is required to carry out the project. To do this, the inverted pyramid in Figure 7 presents five hierarchical levels of actions recommended in the background knowledge acquisition step about wooded wetlands. The actions are then detailed in Figure 8.

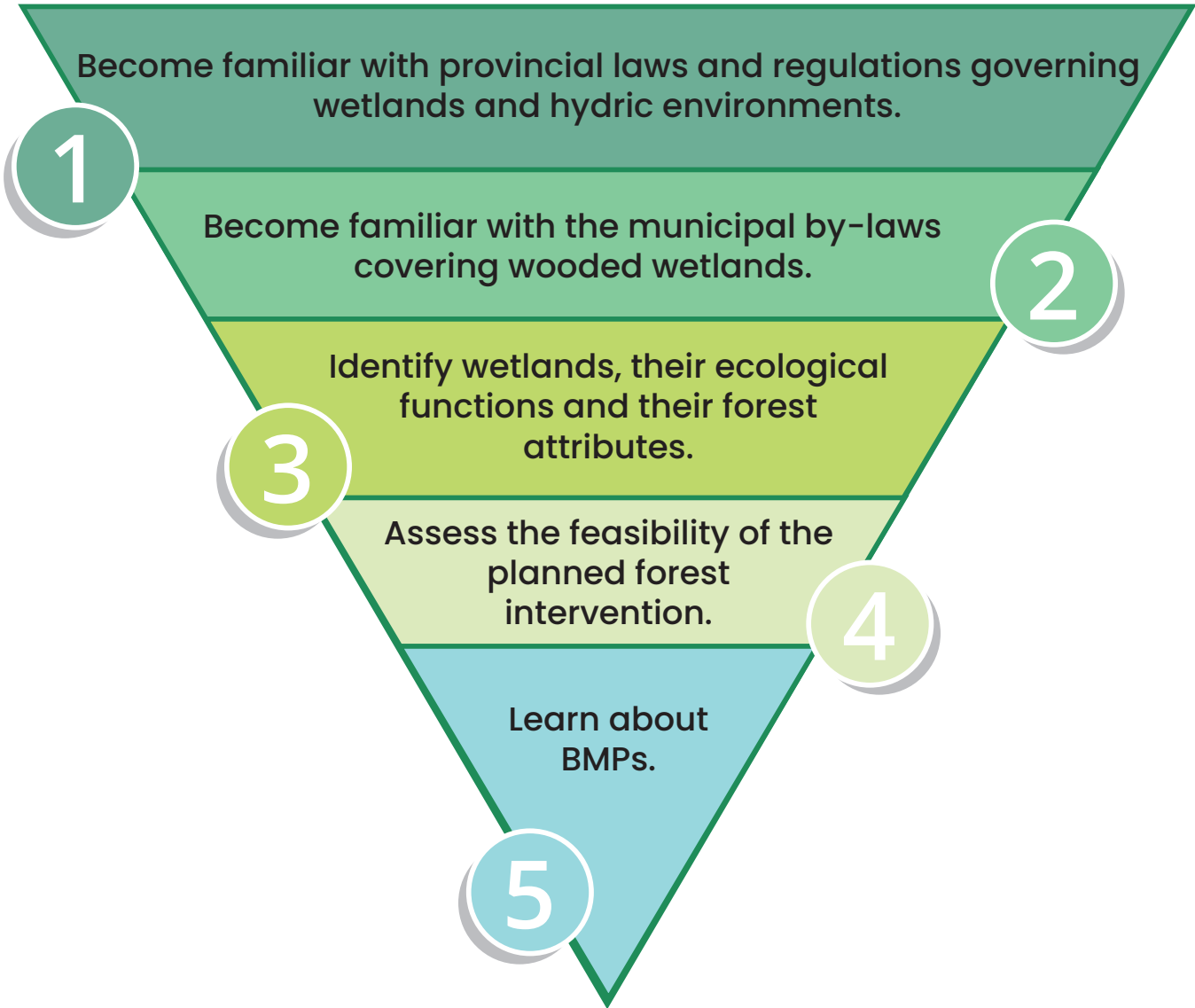


Figure 7 : Hierarchical diagram of the recommended five actions in the preliminary knowledge acquisition process



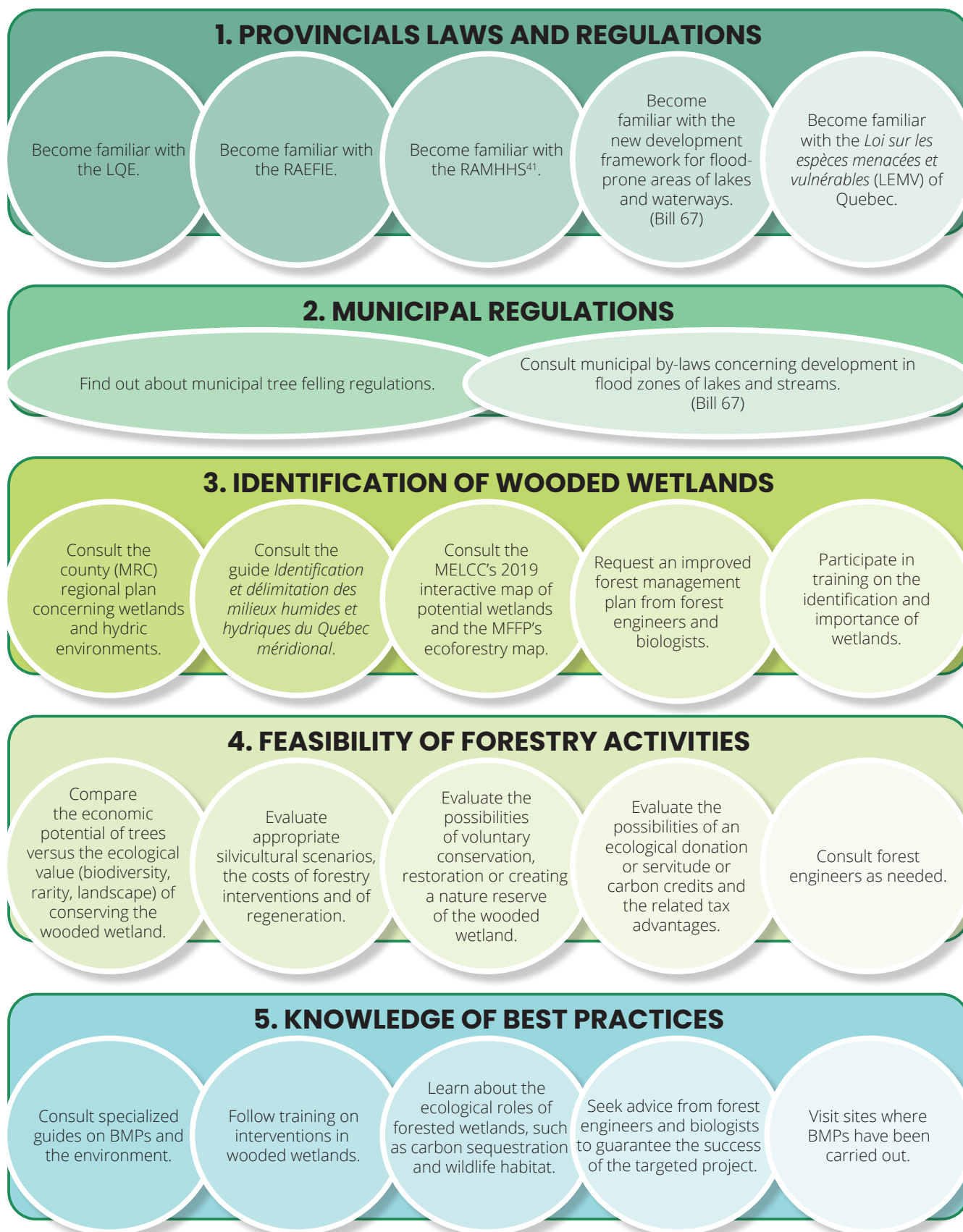


Figure 8 : Details of the recommended five actions in the preliminary knowledge acquisition process of wooded wetlands

⁴¹ An up-to-date summary of laws and regulations is available here: www.foretrpivee.ca




3.2.2 STEPS 2-3-4 — PLANNING, EXECUTION AND MONITORING

If through step one the relevant knowledge acquisition for the project (actions 1-2-3, figure 7) and the feasibility assessment of the forestry activity (action 4, figure 7) are deemed positive, steps 2, 3 and 4 (main sustainable forest management activities) can follow. Sustainable forest management activities involve the planning, execution and monitoring that follow one another in a logical sequence of carrying out the work in the forest. This guide focuses more specifically on road building and culvert installation, felling and processing of wood, transportation and the regeneration of the sites.

3.3 DETAILED PRESCRIPTION SHEETS OF BEST PRACTICES IN WOODED WETLANDS FOR SPECIFIC FORESTRY ACTIVITIES

BMPs are organized by activity to be carried out in the field according to the step concerned, i.e. planning, execution and monitoring (Table 7). In these sheets, it is possible to identify the families of ecological functions and services for each of the BMP. In addition, each of the BMP is linked to one or more references that are easy to find in the bibliography by thematic number.

Tableau 7 : Example of the information structure in the BMP prescription sheets for wooded wetlands of private forests in Quebec

FOREST ACTIVITY		
Concerned step		
Planning 	Execution 	Monitoring 
The BMP		
Function and ecological services family color (See figure 4 on page 9)		
References classified by theme number in the bibliography		



3.3.1 ROAD AND CULVERT BUILDING, PLANNING AND EXECUTION



Plan narrow road allowance to minimize disturbing vegetation that can lead to the loss of productive forest area. Ref.: 3.25 – 3.49



Restrict the road allowance to the minimum width for the safe circulation of machinery. Ref.: Expert committee



Replant the road allowance to maximize the regeneration success. Ref.: Expert committee



Plan the road and culvert construction schedule over the long term, considering the periods of fish run-up and low water levels. Ref.: 3.19 to 3.22 – 3.26 to 3.29



Install water crossings outside the fish run-up periods. Ref.: 3.27 – 3.40



Avoid forest road construction in flora and fauna species at risk habitats, rare natural communities and near a temporary pond. Ref.: 2.1



Locate water sources, resurgences, temporary ponds and other depressions in the woodlot in order to optimize the overall planning of operations. Ref.: 3.5 – 3.25 – 4.10 to 4.12



Identify soil drainage classes and check their link with soil bearing capacity and direction of water flow. Ref.: 3.18 – 3.22 – 3.25 – 3.26 – 3.30



Plan short road lengths, choosing the best-drained areas of the wetland. Ref.: 3.22



Plan the installation of the water crossing where the riparian zone is the narrowest. During winter, choose a location with low water flow to promote freezing. Ref.: 3.22 – 3.25



Plan the road construction in a direction parallel to the flow of the water and divert water towards the forest to minimize sedimentation in the wetland. Otherwise, provide enough culverts with an adequate diameter to ensure the free flow of water from the wetland. Ref.: 3.7 – 3.18 to 3.22 – 3.25



Compact snow on temporary winter roads to accelerate frost penetration. Ref.: 3.25



Avoid using materials that can contaminate the environment (wood chips and sawdust) to increase the duration of freezing on temporary winter roads. Ref.: 3.25



When building water crossings, **control erosion and capture sediments at the source.** Ref.: 3.39



Install water crossings during periods of low water flows. Ref.: 3.27 – 4.40



When constructing a road that is not parallel to the direction of water flow, **install several culverts of adequate size at the correct height** to ensure free water flow to the wetland during flood periods. Ref.: 3.26



Collect the sediments in the ditches using filters or sediment pits while waiting for the stabilization of the road ditches after the revegetation. Ref.: 3.39



Use a biodegradable geotextile or a log bridge to increase the bearing capacity of a road crossing a wetland while reducing the quantity of material generated from digging the ditches. Ref.: 3.25



Reduce the permanent road network density to reduce the fragmentation of wildlife habitats. Ref.: 3.49 to 3.53 – 4.25

3.3.3 WOOD EXTRACTION, PLANNING AND EXECUTION



Avoid rut creation by anticipating early thaws and heavy rains to maximize the productive regenerated forest area after harvest. Stop operations as soon as the first thaw occurs or when the soil bearing capacity is no longer adequate after heavy rains. Ref.: 3.14 – 3.36



Restrict machine travel to designated trails to minimize loss of productive forest area and to protect high and low advance regeneration. Caution: spruce sphagnum stands, whose humus layer is less than 40 cm thick, and which are poorly regenerated could be an exception. Regeneration has better growth and is more abundant when mineral soil is mixed with organic matter. Ref.: 3.8 – 3.9 – 3.36



Avoid the movement of machinery on large woody debris that serves as shelter for wildlife. Ref.: 4.15 – 4.16



Avoid travelling over large woody debris on the ground that has started to decompose and serve as shelter for wildlife. Ref.: 4.15 – 4.16



Do not circulate in riparian protection strips, in temporary ponds or in species at risk habitat. Ref.: 3.1 – 3.18



On the slopes upstream of a wetland, use the flats if possible, **to direct the water towards the forest floor** and plan to add other diversion structures as soon as possible after the harvest. Plan skidding on the slopes only during dry periods. Ref.: 3.19 – 3.22



Choose forwarders with a low ground pressure (e.g., wide tires, light weight). Ref.: 3.14 – 3.18 – 3.21 – 3.22



Plan the location of skid trails on soils with adequate bearing capacity, i.e., on frozen ground, avoiding soils saturated with water and leaving woody debris in the skid trails. Ref.: 3.14 – 3.18 – 3.20 – 3.22



Plan skid trails in a direction parallel to the natural water flow of wetlands. Ref.: 3.25 – 3.26 – 3.41 – 3.42



Interrupt skidding temporarily as soon as the bearing capacity of the soil is no longer sufficient (first thaw and during heavy rains). Move machinery to a drier location to avoid rutting. Ref.: 3.36



Compact snow in the skidding trails with an unloaded machine to promote frost penetration into the ground. Ref.: 3.18 – 3.21 – 3.22



Create a mat of branches or tops placed perpendicular to the path to increase the soil bearing capacity in areas difficult to freeze. Ref.: 3.18 – 3.22



Reduce the footprint on the site by using machinery that is adapted to the soft ground (low ground pressure, wide tires, winch and long boom) and adapt the techniques (reduced payload, flexible and progressive driving). Ref.: 3.36



Minimize the introduction of sediments in the water or wetland environment by installing runoff diversion structures (soil berms, canals) to direct water flows likely to occur in gently sloping wetlands or on slopes upstream from wetlands. Ref.: 3.18 – 3.39



Travel empty in reverse with the skidder to access the wood from the back of the block to avoid turnarounds outside the skidding trail. Encourage straight line travel as much as possible. Ref.: 3.18 – 3.21

3.3.4 FOREST REGENERATION, PLANNING AND EXECUTION



Through different silvicultural scenarios, **aim to protect high and low natural regeneration**. If the density remains insufficient, favor in-fill planting or the planting of mixed and adapted species. Ref.: 3.1 – 3.43



Consider natural mounds when planning the planting of seedlings, as these are favorable microsites for seedling growth. Ref.: 3.25 – 3.45



Favor the planting of seedlings on natural mounds or raised microsites to protect them from seasonal flooding. Ref.: 3.18 – 3.25



Mix mineral soil and organic matter when the ground has a sphagnum layer of less than 40 cm to stimulate growth and regeneration. Ref.: 3.9 – 3.46 – 3.47 – 3.48



Delineate the protection riparian strips of shoreline, temporary ponds and alder groves from known habitats of flora and fauna species at risk. Ref.: 3.25



If possible, plan certain forestry activities after the third week of July to avoid the bird nesting period. Some regeneration tending work could be done in the winter. Ref.: 3.4 – 3.24 – 4.18



Check for the presence of invasive exotic plants and assess alternatives to counter the spread, such as avoiding land preparation at this location. Ref.: 3.2 – 3.35



Respect the boundaries of natural regeneration clumps and the residual standing stems essential to wildlife needs. Ref.: 3.4 – 3.24



During stand tending or mechanical clearing activities, **preserve low vegetation** and maintain as filler stems fruit trees and shrubs used as shelter and food by wildlife. Ref.: 3.4



During regeneration tending work, **spread the work over a long period** to reduce the impact on wildlife. Ref.: 3.4



Follow the work schedule outside the bird nesting period. See the planning stage. Ref.: 3.4 – 3.24 – 4.18



Avoid brush clearing and site preparation work in temporary pond protection strips that are planned. Ref.: 3.5 – 4.12



During pre-commercial thinning, **aim to retain the maximum number of stems per hectare** to maintain a density that meets wildlife needs. Ref.: 3.4



Avoid site preparation methods that create furrows to reduce the risk of erosion. Ref.: 3.18



Check the height of the water table. If high, it is preferable to do site preparation by mounding. Ref.: 3.25 – 3.45



Arrange the windrows of forest residues in such a way as to provide openings (doors) to facilitate the movement of wildlife. Reduce and vary the length of windrows and avoid pushing woody debris into the residual forest. Ref.: 3.4



3.3.5 MONITORING FOR ALL FORESTRY ACTIVITIES



Do not use winter roads during summer to protect the establishment of natural regeneration.



Verify compliance with the planning instructions.



Put at the forefront your BMPs in wooded wetlands by sharing your experiences with other stakeholders.



Frequently visit your property to observe any changes



Ensure that any ground disturbance has not reduced the productive forest area of the site. If the rutting threshold has been reached, carry out corrective work with the on-site material during the dry period and while preserving environmental integrity. Ref.: 3.24



Monitor the survival and growth of planted seedlings. If the mortality rate is too high, correct the situation based on the current standards in place at the *Agences régionales de mise en valeur des forêts privées* of Quebec. Ref.: 3.13



Ensure free-to-grow conditions throughout the plantation evolution by adjusting the interval of time between treatments for particular wildlife species. Ref.: 3.4



Check that culverts and ditches evacuate water away from the streams and maintain sedimentation basins when necessary.



Monitor the presence of beavers that could clog culverts. If necessary, use specialized and recognized techniques in these situations to maintain water flow. Ref.: 3.32 to 3.34 – 3.38



Check that the number of wildlife trees left per hectare on the harvest site is sufficient.



Check for new colonies of invasive exotic plant species. If present, control the spread by uprooting, stump removal or tarping. Ref.: 3.35



Monitor the state of water crossings, ditches and sedimentation ponds. Stabilize the bare soil of the backfill-cuts with appropriate materials such as woody debris, grass seeds, legume seeds or straw not contaminated by invasive species.



Prevent erosion and stabilize bare soil with physical barriers in the skid trails.



Maintain runoff diversion structures towards the forest floor and add more as needed. If necessary, build sediment pits. They can be filled when erosion is controlled.



Remove all winter bridges before snow melt to allow free flow of water. Remove branches and woody debris from the stream bed to maintain its flow.



Check that culverts ensure the free flow of water. If necessary, adjust their height and stabilize them with stones and biodegradable geotextile.

3.3.6 BEST PRACTICES SUMMARY BY FORESTRY ACTIVITY

ROAD AND CULVERT CONSTRUCTION

- 1 Plan for narrow road allowance.
- 2 In-fill plant the road allowance.
- 3 Plan the construction schedule over the long term.
- 4 Avoid plant and animal species-at-risk habitats, rare natural communities, shelters and exceptional forest ecosystems.
- 5 Locate and avoid certain wetlands (springs, resurgences, temporary ponds).
- 6 Identify drainage classes.
- 7 Plan for short road lengths.
- 8 Install water crossings during low water flow episodes, at the shortest point between two banks and outside the fish run-up periods.
- 9 Plan roads to be built parallel to the water flow direction.
- 10 Control erosion and capture sediments at the source.
- 11 Increase the ground bearing capacity by compacting the snow on winter roads.
- 12 Avoid using materials that could contaminate the environment.
- 13 Install enough suitably sized culverts.
- 14 Plan the work to be done when the water table is at its lowest.
- 15 Reduce the density of the permanent road network.

FELLING AND PROCESSING OF WOOD

- 1 Ensure proper equipment is used (wide tires, light weight, long boom).
- 2 Locate sensitive environments and adjust the protection strips width to the habitat to be protected.
- 3 If necessary, plan silvicultural treatments adapted to the preservation of wetlands of interest for conservation (rare natural communities, shelters, exceptional forest ecosystems, etc.).
- 4 Mark enough wildlife trees per hectare.
- 5 Respect the boundaries of wildlife and plant species at risk habitats.
- 6 In the presence of invasive exotic plants, clean machinery away from lakes and streams.
- 7 Maintain a protective strip of riparian forest cover near wetlands
- 8 Aim to preserve stands at the bottom of slopes.
- 9 Promote delimiting at the stump and debris positioned in the trails.
- 10 Avoid sharp turns.
- 11 Prevent winter bridges from sinking into the ground.
- 12 Stack wood away from wet areas.
- 13 Avoid felling trees toward streams.
- 14 Have an oil spill control kit nearby.
- 15 Preserve wooded corridors between two clear cuts.
- 16 Plan cut boundaries that follow the natural contours of the landscape.

WOOD EXTRACTION

- 1 Avoid the creation of ruts by anticipating early thaws and heavy rains to stop or move machinery elsewhere.
- 2 Avoid machinery traffic on large woody debris.
- 3 Do not travel with machinery within the protection strips.
- 4 Reduce the footprint on the ground by using a suitable forwarder (wide tires, light weight).
- 5 Plan the skid trail locations on soils with adequate bearing capacity.
- 6 Plan skid trails parallel to water flow.
- 7 On slopes, plan skidding only during the dry period and use the flat areas to direct the water towards the forest floor.
- 8 Create a mat of branches or tops to increase soil bearing capacity.
- 9 Minimize sediment input into streams with water diversion structures.
- 10 Travel in reverse when empty with the skidders.

FOREST REGENERATION

- 1 Aim to protect high and low natural regeneration.
- 2 Prioritize natural mounds for reforestation.
- 3 If possible, plan site preparation after the nesting period (third week of July).
- 4 Check for the presence of invasive exotic plants and adjust the treatments as needed.
- 5 During regeneration tending work, preserve low vegetation and fruit-bearing shrubs, avoid the nesting period and stay out of protection strips of temporary ponds.
- 6 Schedule regeneration tending work over a long period and aim for maximum stem retention.
- 7 Delineate the protection riparian strips.
- 8 Check the height of the water table.
- 9 Avoid choosing a site preparation method that creates furrows.
- 10 Arrange the windrows of forest residues to provide openings (doors).

MONITORING OF ACTIVITIES

- 1 Do not use winter roads during the summer.
- 2 Visit your woodlot frequently to observe changes.
- 3 Monitor plant survival and growth.
- 4 Do not exceed the rutting threshold and remediate if necessary, using on-site material.
- 5 Adjust the stand tending work schedule around the wildlife specific characteristics.
- 6 Check that culverts and ditches drain water away from streams.
- 7 Monitor beaver presence and follow-up.
- 8 Check the number of residual wildlife trees per hectare.
- 9 Check for the appearance of new colonies of invasive exotic species.
- 10 Regularly monitor watercourse crossings, ditches and sedimentation ponds
- 11 Prevent erosion and stabilize exposed soil.
- 12 Maintain water diversion structures.
- 13 Remove all winter bridges before snow melt.
- 14 Ensure culverts allow for a free flow of water.



CHAPTER 4

CONCLUSION: WHAT TO REMEMBER?

4.1 BUILDING ROADS IN WOODED WETLANDS AND MAINTAINING UNRESTRICTED WATER FLOW

BMPs in wooded wetlands applicable to road construction aim to minimize disturbance of the environment (soil, vegetation) and the free flow of water while providing access to the territory and safe operations.

Forest drainage is not a sound BMP.

Forest roads modify the flow of water. They can influence the duration of water retention, water quality in temporary ponds and disturb the metamorphosis of amphibians before the summer dry period. Roads also act as a barrier to amphibian migration to other wooded wetlands if their position does not take the ecological functions of these ponds into account. Digging road ditches down to mineral soil is normal practice in swamps and shallow peatlands. During floods however, the soil particles that detach from the freshly exposed mineral soil can be transported into streams. Measures aimed at building water crossings without obstructing the free flow of water are essential to the application of BMPs. Precautions must be taken to reduce erosion such as not creating ditches when they are not essential and monitoring ditches regularly. By planning the deployment of the road network over the long term and by applying techniques adapted to wooded wetlands, it is possible to limit impacts, reduce construction and maintenance costs, and increase the lifespan of these infrastructures while protecting wetlands and bodies of water^{42,43}. In addition, it is important to ensure that the road network density is not too high since this leads to a productivity loss⁴⁴ and fragments the landscape⁴⁵. In this regard, it is necessary to consult specialized references pertaining to roads in wet environments before proceeding with the work.

Forest roads are complex. Consult specialized references on this topic.

4.2 FELLING AND PROCESSING TIMBER IN WOODED WETLANDS WHILE MAINTAINING BIODIVERSITY

BMPs in wooded wetlands applicable to wood harvesting aim to minimize the alteration of wildlife and plant habitats, and of biodiversity. Compared to clear cuts, partial cuts, also called cuts with variable retention of living trees (removal < 50% of the basal area), represent a silvicultural option which can maintain the richness and abundance of birds on certain sites and improve, among other things, small fauna habitat⁴⁶ while allowing, in the case of selection harvesting, continuity of profitable wood harvesting in the long term⁴⁷. According to Jutras and Plamondon (2020), partial cutting reduces the short term rise in the water table after a harvest. However, the rise in water table promotes the recharge of deeper water tables and is reabsorbed in the medium term in most of the sites mentioned in the literature review, regardless of the cut type (clear or partial). In spruce-sphagnum forests, scientific research has shown that partial cutting helps maintain the growth of advance regeneration and reduces site paludification caused by clear cuts⁴⁸. Nevertheless, partial cuts should be avoided when there is a risk of windthrow (strong wind and shallow rooting) especially in balsam fir stands⁴⁵ or when invasive exotic species can take advantage of the canopy shade

⁴² Collard, A. (2011)

⁴³ Partington M, C. Gillies, B. Gingras, C. Smith, J. Morissette (2016)

⁴⁴ Blinn, C., R. Dahlmann, R. Mattson, A. James, A. Thompson, A. Michael (1999)

⁴⁵ Patrick, D.A, Jr. M.L. Hunter and A.J.K. Calhoun (2006)

⁴⁶ Gustafsson, L., S. C. Baker, J. Bauhus, W. J. Beese, A. Brodie and J. Kouki (2012)

⁴⁷ Ruel, J. C., D. Fortin, D. Pothier (2013)

⁴⁸ Proulx R., S., Jutras, S., Leduc, A., M. J. Mazerolle, N. J. Fenton, Y. Bergeron (2021)

over the species to be promoted⁴⁹. Partial cut results are mixed in relation with the mortality rate of the residual stand in the boreal forest⁵⁰. Clearcuts make it possible to reproduce the beneficial effects of intense fire on the growth and abundance of black spruce regeneration in spruce-sphagnum forests where the organic layer is less than 30 cm thick⁵¹. This results in optimal growth of black spruce regeneration compared to winter cuts because of the higher number of microsites. Considering that the soils of wooded peatlands are also important carbon sinks⁵², the possibilities to offset greenhouse gas emissions of a future carbon market remain to be explored. Maintaining mature trees in protective strips around temporary ponds is beneficial to amphibians, particularly in places where large woody debris is abundant. Finally, it is essential to maintain trees with characteristics favorable to nesting animals, especially in the south of the province where large diameter trees enable the creation of interesting cavities.

Having a management plan enhanced with ecological information is a planning BMP.

4.3 WOOD EXTRACTION IN WOODED WETLANDS AND SOIL PROTECTION

BMPs in wooded wetlands relevant to timber extraction aim to control soil erosion in wetlands and slopes with oblique drainage to minimize sediment inputs into the hydrographic network. Assessing and accounting for water content in the soil can reduce rutting, compaction, loss of vegetation, runoff and safety hazards during mechanized operations. The choice of equipment or the adaptation of available machinery can minimize the negative effects of operations in wetlands. In most cases, it is preferable to operate the equipment during the winter on frozen ground, but there is an exception: sphagnum peatlands (ecological type RE38-39) have a better regeneration chance when the work is done in the summer. Indeed, the soil disturbances generate more microsites (see Section 4.2).

Choosing a low ground pressure forwarder is a BMP.

4.4 REGENERATION OF WOODED WETLANDS AND PROTECTION OF BIODIVERSITY

BMPs in wooded wetlands applied to planting, scarification, tending of plantations and stand education aim to minimize disturbances to avian fauna and small fauna that use low vegetation for shelter and breeding. The density and the distribution coefficient of plants or natural regeneration are important elements to evaluate to increase the lateral visual obstruction which is essential for fauna. When possible, the nesting period should be avoided for all tending work. The windrows should be laid out so as to leave openings for the passage of wildlife into the adjacent forest. Invasive exotic plants must be located and controlled with the appropriate methods⁴⁸.

Moduler la densité des plants mis en terre ou de la végétation concurrente en fonction des besoins fauniques est une saine pratique.

⁴⁹ Martel, M.-J. (2021)

⁵⁰ Bose, A. K., B.D. Harvey, S. Brais, M. Beaudet, A. Leduc (2014)

⁵¹ Lafleur, B., N. J. Fenton, D. Paré, M. Simard, Y. Bergeron (2010)

⁵² Campagna, M. (1996)



GLOSSARY

ADAPTIVE SILVICULTURE TO CLIMATE CHANGE: silvicultural approach aimed at increasing the resilience of species and ecosystems to climate change by, for example, facilitating the movement of species in the landscape in order to promote their distribution, their genetic diversity and to maximize opportunities for adaptation.

ADAPTIVE SILVICULTURE TO WETLANDS OF INTEREST FOR CONSERVATION: silvicultural approach to conservation that puts the maintenance of biodiversity at the forefront. It is recommended for natural communities whose forest dynamics are little or not known and which are home to species at risk or requiring adaptations such as connectivity corridors, old, rare or refuge forests, or those recognized as exceptional forest ecosystems.

BRUSHING AND CLEANING: treatment aimed at controlling competing vegetation in order to free the future trees of desired species at the sapling stage.

CLEAR CUTS: type of cuts aimed at freeing up growth space to allow the establishment or development of a new cohort by harvesting all or almost all (more than 50% of trees 10 cm and over) trees of merchantable dimensions. The soil and advance regeneration are protected during the operation in accordance with the regulation on sustainable forest management.

CLEARING: piling of logging residues in windrows or heaps for facilitating planting, scarification or other treatments.

COMMERCIAL THINNING: harvesting a portion of the merchantable trees (>9.1 cm diameter at breast height [1.3 m]) from a plantation or natural stand to improve its quality by removing the defective or less productive trees.

CONSERVATION: set of practices including protection, restoration and sustainable use, all aimed at preserving biodiversity, restoring species or maintaining ecological services for the benefit of current and future generations⁵³.

ECOLOGICAL TYPES: global classification unit that expresses both the physical characteristics of an environment and the ecological characteristics of the vegetation that grows there (composition, structure and dynamics)⁵⁴.

FISH RUN-UP: migration of fish to the spawning site (from downstream to upstream).

BMPS IN WOODED WETLANDS: general working methods guidelines that can be applied voluntarily to avoid or minimize the impact of activities on the functions and ecological services of ecosystems based on the latest knowledge. These are consistent with applicable laws and regulations, but they do not replace them.

FOREST ROADS: all road structures providing access to forest land and its resources. Includes roadways, generally unpaved, ditches, road allowance, as well as all structures allowing the passage of water under the roadway such as bridges, water crossings and culverts.

FOREST STATION: grouping of ecological types on an area covering similar ecological zones. Groupings of ecological types are based on: 1) the potential productivity of the main associated species, 2) silvicultural constraints or constraints related to the sensitivity of environments, and 3) the plant process dynamics⁵⁵.

⁵³55 Limoges, B., G. Boisseau, L. Gratton and R. Kasisi (2013)
⁵⁴64 Gosselin, J. (2005)

⁵⁶2 Cyr, G. (2017)

HYDROMORPHIC: is said of a soil whose features are largely caused by temporary or permanent water saturation. It presents poor to very poor drainage conditions in the first 30 centimeters of the mineral soil, resulting in the presence of marked speckles or gleying (usually gray horizon). It may give off a sulfur (rotten egg) smell.

HYGROPHILOUS: characteristic of a plant that grows in water or on a substrate that is, at least periodically, in anaerobic condition due to excess water. This includes the common and occasional species of wetlands described in the guide Identification et délimitation des milieux humides du Québec méridional (2014). The word hydrophyte used in this document is a synonym of a hygrophilous plant.

LOW WATER LEVEL: minimum flow of a stream calculated over a given time step during low water periods.

NATURAL COMMUNITY: grouping of forest species growing in specific drainage and surface deposit conditions of wooded wetlands and the main plants associated with the hydrological features of these environments. The definition of these terms is the result of discussions between biologists and forest engineers seeking a common terminology between the plant association concept used by biologists and the ecological types used by foresters. This classification is unique to this guide. You can consult the list of the main natural communities in appendix 1.

PARTIAL CUTS: a regeneration process that involves making periodic cuts of trees selected individually or in groups (small gaps) in a multi-age stand while helping it reach or maintain an irregular structure that allows the establishment of regeneration.

PLANTING: manually or mechanically plant seedlings of the desired species at regular (planting) or random (restocking or in-fill plant) spacing to fill in poorly regenerated areas. Its main objectives are to restore forest cover, make full use of the productive capacity of the site, improve stand value and restore or maintain its biodiversity by establishing seedlings of diverse species.

PRODUCTIVE FOREST AREA: areas where forests produce more than 30 m³/ha in less than 120 years. A productive forest area included in the AAC calculation takes into account the constraints and other uses prohibiting harvesting, as well as other forest management elements such as non-forest areas (for example agricultural or wet areas); inaccessible areas (e.g., mountain peaks); steep slopes greater than of 41%; and other forest areas where harvesting is prohibited (e.g. complete conservation areas)⁵⁶.

PRE-COMMERCIAL THINNING: cutting a portion of the unmerchantable trees to promote the development of desired species future trees.

RARE WOODLAND (FOREST): forest not widespread and defined by several criteria such as total area, ecological type, species groups and evolutionary stage⁵⁷. The amount of these forests is specific to each region and is sensitive to urban development, agriculture, ground transportation and harvesting that is not adapted to the conditions of these ecosystems.

RELATIVE POTENTIAL PRODUCTIVITY: average value obtained from the calculated values for each species per ecoforestry polygon using mathematical models that integrate potential vegetation, climate and physical environment variables^{58,59}.

RUT: furrow measuring at least 4 m in length opened in the ground by the wheels or tracks of a motorized or non-motorized machine; in organic soil, torn ground cover is considered a rut while in mineral soil a rut has a depth of more than 20 cm measured from the litter surface⁶⁰.

SCARIFICATION: manual or mechanized operation that involves disturbing the humus layer and the low competing vegetation to loosen the mineral soil and mix it with organic matter to create planting microsites.

SITE PREPARATION BEFORE PLANTING: operation carried out after harvest to create a favorable environment to regeneration establishment and growth. This can include scarifying, windrowing, mounding, clearing invasive vegetation and mulching.

SNAG: dead tree whose roots are still anchored in the ground (standing). The causes of mortality are multiple and often combined: competition, senescence, lightning, wind, fire, disease, insects or human activity⁶¹.

SPECIES AT RISK: species designated as special concern, threatened or endangered by the Government of Canada under the Species at Risk Act (SARA) (S.C. 2002, c. 29) and species designated as threatened, vulnerable or susceptible to be by the Government of Quebec under the Threatened or Vulnerable Species Act (LEMV) (R.S.Q., c. E -12.01).

⁵⁶ Agence forestière des Bois-Francs (2015)

⁵⁷ Conseil régional de l'environnement du Centre-du-Québec (2021)

⁵⁸ Müssenberger, F., S. Miron, M. Riopel, J. Bégin and J. -P. Saucier (2010)

⁵⁹ Périé, C., L. Duchesne and M.-C. Lambert (2012)

⁶⁰ Fédération des producteurs forestiers du Québec (2020)

⁶¹ Lang Y., G. Perreault and C. Dion (2015)

SUSTAINABLE DEVELOPMENT: activities that meet current needs without compromising the ability of future generations to meet theirs. Sustainable development is based on a long-term vision that considers the inseparable nature of the environmental, social and economic dimensions of development activities.

SYNTHETIC DRAINAGE: capacity of the soil to circulate water based on the presence of organic soil, the cover of certain characteristic species, the slope class, topography and humus thickness⁶².

TEMPORARY POND: an environment made up of shallow depressions in an open or forest environment (no more than 1 m deep) and of an area rarely exceeding 0.4 ha. It is not connected to a stream or a lake (absence of fish). Water accumulates there following snow melt or during heavy rains. The pond can be completely dried up during the low water period.

WILDLIFE TREE: tree of high interest to wildlife, used for food, nesting or shelter. It can be alive, senescent or dead. Trees with wildlife value can be recognized by signs of use by wildlife (nests, woodpecker holes)⁶³.

WOODED WETLANDS: the working committee for this guide has defined three categories of wooded wetlands subject to sustainable forest management: a) wooded mineral wetland not subject to overflow, b) wooded peatland, c) wooded mineral wetland subject to overflow. This choice of categories allows an optimal understanding of the hydrological behavior of these environments⁶⁴. The temporary pond is not a wetland, but it can be found in many forest environments and plays an essential water role for the survival of several species, especially amphibians⁶⁵.

- **MINERAL WETLAND:** land subject to seasonal flooding or characterized by soil permanently or temporarily saturated with water and comprising ligneous, shrubby or arboreal vegetation growing on mineral soil covering more than 25% of its area.
- **WOODED WETLAND:** wetland containing trees over 4 m in height that cover at least 25% of the area.
- **MINERAL WETLAND NOT PRONE TO OVERFLOW:** wetland whose water supply is not associated with episodes of overflow of a stream or lake. Water comes mainly from precipitation (rain and snow) or from a rise in the water table.
- **MINERAL WETLAND PRONE TO OVERFLOW:** wetland whose water supply is linked to the overflow of water from a stream or lake.
- **PEATLAND:** land area covered with peat, resulting from the accumulation of partially decomposed organic matter with a minimum thickness of 30 cm, and whose water table is usually at the same level as the ground or near its surface.
- **WOODED PEATLAND:** peatland with trees over 4 m in height over 25% or more of its area.

⁶² Gosselin, J. (2005)

⁶³ Lang Y., G. Perreault and C. Dion (2015)

⁶⁴ Jutras, S. and A. P. Plamondon (2021)

⁶⁵ Agence régionale de mise en valeur des forêts privées du Bas-St-Laurent (2012)

THEMATIC LIST OF REFERENCES

THEME 1 : LAWS AND PROVINCIAL REGULATIONS

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APPENDIX 1

NON-EXHAUSTIVE LIST OF COMMON NATURAL COMMUNITIES AND ECOLOGICAL TYPES CORRESPONDING TO THE THREE CATEGORIES OF WOODED WETLANDS COVERED BY THIS GUIDE

WOODED WETLANDS PRONE TO OVERFLOW

ECOLOGICAL TYPE CODE	ECOLOGICAL TYPE DESCRIPTION	ASSOCIATED NATURAL COMMUNITIES	A FEW VEGETATIVE SPECIES ASSOCIATED
FO18	Elm black ash stands on thin to thick organic or mineral deposits, with hydric drainage, minerotrophic	Swamp white oak stands	Sensitive fern
		Cottonwood community	Shrubby willow, red osier dogwood, reed grass
		Tree willow community	red osier dogwood, reed grass
		Silver maple stands	Sensitive fern, ostrich fern, Canada lettle
		Red maple stands	speckled alder, sensitive fern, ostrich fern, royal fern, cinnamon fern
		Red ash stands	Sensitive fern, ostrich fern, Canada lettle
		Black ash stands	Speckled alder, sensitive fern, ostrich fern, royal fern, cinnamon fern
		Boreal poplar stands	Speckled alder, red osier dogwood, reed grass, sensitive fern

MINERAL WOODED WETLANDS NOT PRONE TO OVERFLOW

ECOLOGICAL TYPE CODE	ECOLOGICAL TYPE DESCRIPTION	ASSOCIATED NATURAL COMMUNITIES	A FEW VEGETATIVE SPECIES ASSOCIATED
FO18	Elm black ash stands on thin to thick organic or mineral deposits, with hydric drainage, minerotrophic	Butternut community	Speckled Alder, winterberry, cinna-mon Fern, royal fern
		Black ash stands	Sensitive fern, ostrich fern, royal fern, cinnamon fern
		Red maple stands	Speckled alder, highbush cranberry, winterberry, sensitive fern
MF18	Black ash balsam fir stands on thin to thick organic or mineral deposits, with hydric drainage, minerotrophic	Black ash stands	Speckled alder, willow, royal fern, cinnamon fern, sensitive fern
		American elm stands	Speckled alder, willow, royal fern, cinnamon fern, sensitive fern
		Red elm stands	Speckled alder, willow, royal fern, cinnamon fern, sensitive fern
MJ18	Yellow birch balsam fir and sugar maple stands on thin to thick organic or mineral deposits, with hydric drainage, minerotrophic	White pine stands	Speckled Alder, winterberry, cinna-mon fern, royal fern
		Trembling aspen stands	Cinnamon fern, sensitive fern
		Yellow birch stands	Cinnamon fern, sensitive fern
		Red maple stands	Speckled alder, highbush cranberry, winterberry, sensitive fern
MJ28	Yellow birch balsam fir stands on thin to thick organic or mineral deposits, with hydric drainage, minerotrophic	Eastern hemlock stands	Cinnamon fern, sensitive fern
		Trembling aspen stands	Cinnamon fern, sensitive fern
		Yellow birch stands	Cinnamon fern, sensitive fern
		Red maple stands	Speckled alder, highbush cranberry, winterberry, sensitive fern
		Boreal poplar stands	Speckled alder, red osier dogwood, reed grass, sensitive fern
RE37	Black spruce sphagnum stands on thin to thick mineral deposits, hydric drainage, ombrotrophic	Eastern hemlock stands	Cinnamon fern, sensitive fern
		Larch stands	Mountain holly, speckled alder, sphagnum
RE38	Black spruce sphagnum stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Black spruce stands	Mountain holly, speckled alder, leatherleaf, rosemary, swamp laurel, sphagnum
RS18	Eastern cedar balsam fir stands on thin to thick mineral deposits, hydric drainage, minerotrophic	Black spruce stands	Mountain holly, speckled alder, sphagnum
		Balsam fir stands	Whiterod, dwarf raspberry, sphagnum
		Boreal poplar stands	Speckled alder, sphagnum
RS37	Balsam fir black spruce and sphagnum stands on thin to thick mineral deposits, hydric drainage, ombrotrophic	Balsam fir stands	Speckled alder, cinnamon fern, sphagnum
RS38	Balsam fir black spruce and sphagnum stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Red spruce stands	Speckled alder, cinnamon fern, sphagnum
		Balsam fir stands	Speckled alder, cinnamon fern, sphagnum



WOODED PEATLANDS

ECOLOGICAL TYPE CODE	ECOLOGICAL TYPE DESCRIPTION	ASSOCIATED NATURAL COMMUNITIES	A FEW VEGETATIVE SPECIES ASSOCIATED
MJ18	Yellow birch balsam fir and sugar maple stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Red maple stands	High blueberry, sphagnum
MJ28	Yellow birch balsam fir stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Red maple stands	Speckled alder, leatherleaf, sphagnum
RC38	Peaty eastern cedar balsam fir stands on organic deposits, hydric drainage, minerotrophic	Cedar stands	Speckled alder, mountain holly, sphagnum
RE38	Black spruce sphagnum stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Larch stands	Mountain holly, speckled alder, leatherleaf, rosemary, swamp laurel, sphagnum
		Black spruce stands	Mountain holly, speckled alder, leatherleaf, rosemary, swamp laurel, sphagnum
		Jack pine stands	Mountain holly, speckled alder, leatherleaf, rosemary, swamp laurel, sphagnum
RE39	Black spruce sphagnum stands on organic deposits, hydric drainage, ombrotrophic	Rigid pine community	High blueberry, leatherleaf, sphagnum
		Larch stands	Leatherleaf, rosemary, swamp laurel, common cranberry, sphagnum
		Black spruce stands	Leatherleaf, rosemary, swamp laurel, common cranberry, sphagnum
		Jack pine stands	Leatherleaf, rosemary, swamp laurel, common cranberry, sphagnum
RS38	Balsam fir black spruce and sphagnum stands on thin to thick organic or mineral deposits, hydric drainage, minerotrophic	Balsam fir stands	Speckled alder, cinnamon fern, sphagnum
RS39	Balsam fir black spruce and sphagnum stands on organic deposits, hydric drainage, ombrotrophic	Hemlock stands	Speckled alder, cinnamon fern, sphagnum
		Balsam fir stands	Speckled alder, cinnamon fern, sphagnum





Chapter 1

introduces the context and key words of the document allowing the reader to continue reading with a global understanding of the concepts covered in the following chapters.

Chapter 2

presents a review of the main hydrological, ecological and forest characteristics of each wooded wetlands categories covered in this guide.

Chapter 3

presents, by category of forest activities, a complete list of BMPs to follow when working in wooded wetlands.

Chapter 4

summarizes the recommendations and broadly explains the scientific basis supporting them.

