ANALYSIS OF ISSUES

SUPPORT DOCUMENT FOR THE
TACTICAL INTEGRATED FOREST MANAGEMENT PLANS 2023–2028

Outaouais Region

Courtesy translation. If there is a discrepancy in interpretation due to the translation, please note that only the official document in French has legal value

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Ecological Issues

Ecosystem-based management is an approach that seeks to preserve healthy, and resilient ecosystems by focusing on reducing the gap between managed forest and natural forest. Since species are adapted to the historical fluctuations in forest attributes as shaped by the natural disturbance regime, keeping forests in a more natural state aims to preserve ecological processes and ensure the survival of most species. This concept is one of the means favoured under the *Sustainable Forest Development Act* to ensure the sustainable management of these forests. This is in line with Priority 1 of the second challenge in the Sustainable Forest Development Strategy: **“Manage forests in a manner that preserves the main features of natural forests”**.

To put ecosystem-based management into practice, an analysis of the main ecological issues raised by forest management activities is conducted for each management unit (MU). Determining forest management objectives and measures adapted to the local and regional realities will help reduce the gaps seen and be in line with the other objectives of the Tactical Integrated Forest Development Plans (PAFIT in French) in order to establish an all-encompassing management strategy.

The management measures specify the preferred means to ensure the objectives are achieved. These are carried out based on three solutions, namely exclusion, spatial and temporal distribution of the interventions and the adapted silvicultural treatments. The way in which these solutions will materialize each management unit is presented in the PAFIT, taking into account the synergies with other management objectives, the silvicultural potential and the local operational capacity.

To learn more, consult:
Ecosystem Management

Age Structure

Background

The forest age structure is defined as the relative proportion of stands in the various age groups, measured across a wide area (hundreds or thousands of km^2).

In natural forests, age structure is primarily determined by the disturbance patterns (fires, insect epidemics and windfalls) specific to each region. Forests where disturbances are common generally have a lower proportion of old-growth forests and more forests undergoing regeneration. In managed forests, logging operations add to the natural disturbances. Optimizing forest yield, which tends to involve harvesting trees before their growth slows down, may contribute to fewer stands exceeding the age of maturity.

Old-growth forests are an important habitat for several specialized species, some of which may be sensitive to a high concentration of forests undergoing regeneration in the landscape. Growing scarcity of old-growth forest stands and overabundance of regenerating stands are therefore likely to influence the biodiversity and ecological processes.

To learn more, consult:
Booklet 2.1 – Issues relating to forest age structure

Local Analysis of Issues

The approach used in analyzing issues will involve assessing the level of alteration of the age structure of managed forests versus moderate natural conditions.

Criteria

In order to identify issues related to the age structure of forests, two development stages were targeted given their respective biological role: the stage of regeneration and the stage of old-growth stands.

Development Stage	Definition
Regeneration	The abundance of stands in the “Regeneration” stage in a territory is an indicator of recently disturbed areas. This is generally associated with stands that are less than 4 m tall. In natural conditions, the abundance of regenerating stands is determined by disturbances such as fires, insect epidemics and severe windfalls. In the managed forest, the total cutting area (e.g., cutting with protection of regeneration and soils) becomes a determining factor for abundance at this stage.
Old-Growth	A stand reaches the “Old-Growth” stage if it starts to acquire certain characteristics, such as a diversified internal structure, large-dimension trees (given the species and site) and dead wood in varying degrees of decomposition. It is taken for granted that these characteristics begin to be achieved from a certain time following a disturbance of natural or human origin.

The following tables present the criteria used to differentiate between the two stages of development being examined. The criteria for the “Regeneration” stage are based on the original date of disturbance (human or natural) and the criteria for the “Old-Growth” stage are based on the age or basal area (BA). The thresholds vary according to the dominant forest composition and forest growth in the different bioclimatic domains.

Table 1 Age Thresholds Corresponding to “Regeneration” and “Old-Growth” Development Stages for Management Strata Followed According to Age Criterion

Bioclimatic Domain	Regeneration	Old-Growth
Balsam Fir-Paper Birch Forest	≤ 15 years old	≥ 81 years old
Balsam Fir-Yellow Birch Forest	≤ 15 years old	≥ 81 years old
Sugar Maple-Yellow Birch Forest	≤ 10 years old	≥ 101 years old

Table 2 Basal Area Thresholds Corresponding to the "Old-Growth" Development Stage for Management Strata Followed According to Basal Area Criterion

Site Family	Potential Vegetation[1]	Bioclimatic Domain	Total Basal Area (m^2/ha)
Red Oak	FC1, FE5 and FE6	All	22
Sugar Maple	FE2, FE3 and FE4	Sugar Maple Forest	26
Sugar Maple	FE3 and FE4	Balsam Fir Forest	25
Yellow Birch	MJ1, MJ2 and MS1	All	23
Pines and Hemlocks	RP1 and RT1	All	30
Eastern White Cedar	RS1 and RC3	All	29

Characterization

Assessing the level of alteration makes it possible to make a qualitative diagnosis of the situation by classifying the difference versus the natural forest[2] and the risks of causing biodiversity losses.[3] The level of alteration may be low, moderate or high based on the proportion of residual habitats defining the thresholds. For the "Regeneration" stage, the thresholds are based on the proportion of the territory area that they occupy, according to the bioclimatic domain. For the "Old-Growth" stage, the thresholds are established based on the intensity of changes versus the preindustrial profile.[4]

Table 3 Alteration Thresholds Used to Manage the Age Structure for Sugar Maple and Balsam Fir Stand Domains

Level of Alteration	Area Occupied by Development Stage (%)	
	Regeneration	Old-Growth
Low	< 20%	> 50% of the reference rate
Moderate	≥ 20 to 30%	≥ 30 to 50% of the reference rate
High	> 30%	< 30% of the reference rate

[1] Red Oak Stand (FC1), Sugar Maple-Eastern Hop-Hornbeam Stand (FE5), Sugar Maple-Red Oak Stand (FE6), Sugar Maple-Basswood Stand (FE2), Sugar Maple-Yellow Birch Stand (FE3), Sugar Maple-Yellow Birch-Beech Stand (FE4), Yellow Birch-Balsam Fir-Sugar Maple Stand (MJ1), Yellow Birch-Balsam Fir Stand (MJ2), Balsam Fir-Yellow Birch Stand (MS1), Red or White Pine Stand (RP1), Hemlock Stand (RT1), Balsam Fir-Eastern White Cedar Stand (RS1), Boggy Cedar-Balsam Fir Stand (RC3).

[2] Forest composed of indigenous species, which has not undergone major transformation resulting from large-scale industrial use.

[3] This step involves a certain degree of uncertainty, since knowledge of the minimum habitat characteristics needed to maintain the species is very limited.

[4] A reconstruction of the age structure was carried out based on scientific studies in the French document Le registre des états de référence (BOUCHER et coll., 2011).

Analysis Scale

The territorial analysis unit (TAU) was defined as being the "area in balance" where the proportion of age classes stabilizes versus the size ad frequency of total or severe natural disturbances. This scale allows to establish a common base to compare the current age structure with the age structure of a natural forest.[5] To be consistent with the dynamics of natural disturbances, the dimension of the units varies based on the associated bioclimatic domain:

- < 500 km^2 for the bioclimatic domains of Sugar Maple forest and Balsam Fir-yellow birch forest.
- < 1,000 km^2 for the bioclimatic domain of the Balsam Fir-Paper Birch forest.

Current State

The following tables present the levels of alteration of the "Regeneration" and "Old-Growth" development stages by TAU for the different management units.

These profiles are drawn up by the Office of the Chief Forester (BFEC in French) based on the previously presented thresholds (tables 1 and 2). These thresholds are also used to generate profiles of old-growth forests over the entire horizon of the calculation of the allowable cuts to ensure that the management strategy meets the targets related to this issue. The reference rates vary according to the homogeneous unit of vegetation in which the TAU is found.

The five main homogeneous vegetation units found in the Outaouais Region are, from south to north: WHFtB: Western hardwood forest, typically Sugar Maple and Basswood, WHFtY: Western hardwood forest, typically Sugar Maple and Yellow Birch, WMFtY: Western mixed forest, typically Sugar Maple and Yellow Birch, WMFnY: Western mixed forest, with Paper Birch, Balsam Fir and Northern Yellow Birch, and WMFtB: Western mixed forest, typically Paper Birch and Balsam Fir.

Table 4 Level of Alteration of the "Regeneration" and "Old-Growth" Development Stages by TAU for MU 071-51

TAU	Homogeneous Vegetation Unit	Area (ha)	"Regeneration" Stage	"Old-Growth" Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
071510001	WHFtY	33,615	0.6%	76%	40%	Low
071510002	WHFtY	32,125	2,2%	76%	42%	Low
071510003	WHFtY	33,665	1.9%	76%	43%	Low
071510004	WHFtY	40,047	1.0%	76%	46%	Low
071510005	WHFtY	34,639	1.6%	76%	44%	Low
071510006	WHFtY	24,671	1.9%	76%	34%	Moderate
071510007	WHFtB	16,286	1.7%	81%	41%	Low

[5] The productive forest areas excluded from harvesting (legally or administratively protected tenures, forest uses, operational constraints to harvesting) and located within the perimeter of the management units must be included in the reference territory for this analysis.

Table 5 Level of Alteration of the "Regeneration" and "Old-Growth" Development Stages by TAU for MU 071-52

TAU	Homogeneous Vegetation Unit	Area (ha)	"Regeneration" Stage	"Old-Growth" Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
1	WMFtY	33,396	3.0%	58%	32%	Low
2	WMFtY	38,805	5.4%	58%	42%	Low
3	WMFtY	41,337	2.5%	58%	38%	Low
4	WMFtY	31,407	3.0%	58%	36%	Low
5	WMFtY	31,580	5.2%	58%	31%	Low
6	WMFtY	30,409	6.3%	58%	37%	Low
7	WMFtY	40,688	10.0%	58%	29%	Moderate
8	WMFtY	43,416	4.4%	58%	33%	Low
9	WHFtY	25,676	0.4%	76%	27%	Moderate
10	WHFtY	31,976	1.9%	76%	23%	High
11	WHFtY	26,895	1.9%	76%	33%	Moderate
12	WHFtY	28,053	1.9%	76%	40%	Low
13	WHFtY	20,460	5.4%	76%	32%	Moderate
14	WHFtY	20,480	7.9%	76%	39%	Low
15	WHFtY	21,916	9.9%	76%	26%	Moderate
16	WHFtY	31,634	4.0%	76%	32%	Moderate

Table 6 Level of Alteration of the "Regeneration" and "Old-Growth" Development Stages by TAU for MU 072-51

TAU	Homogeneous Vegetation Unit	Area (ha)	"Regeneration" Stage	"Old-Growth" Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
1	WHFtB	30,030	1.4%	81%	42%	Low
2	WHFtB	26,672	1.0%	81%	26%	Moderate
3	WHFtB	44,741	1.6%	81%	27%	Moderate
4	WHFtB	32,396	2.2%	81%	30%	Moderate

Table 7 Level of Alteration of the "Regeneration" and "Old-Growth" Development Stages by TAU for MU 073-51

TAU	Homogeneous Vegetation Unit	Area (ha)	"Regeneration" Stage	"Old-Growth" Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
1	WHFtY	28,353	3.3%	76%	28%	Moderate
2	WHFtY	29,095	2.6%	76%	29%	Moderate
3	WHFtY	18,782	3.9%	76%	37%	Moderate
4	WHFtB	24,502	2.4%	81%	43%	Low
5	WHFtY	29,456	4.3%	76%	27%	Moderate
6	WHFtY	24,243	6.4%	76%	38%	Moderate
7	WHFtY	31,430	4.3%	76%	27%	Moderate
8	WHFtY	47,497	5.0%	76%	31%	Moderate
9	WHFtY	41,319	3.5%	76%	29%	Moderate
10	WMFtY	40,560	5.3%	58%	32%	Low
11	WHFtY	24,136	5.1%	76%	29%	Moderate
12	WHFtY	17,942	5.8%	76%	31%	Moderate

Table 8 Level of Alteration of the “Regeneration” and “Old-Growth” Development Stages by TAU for MU 073-52

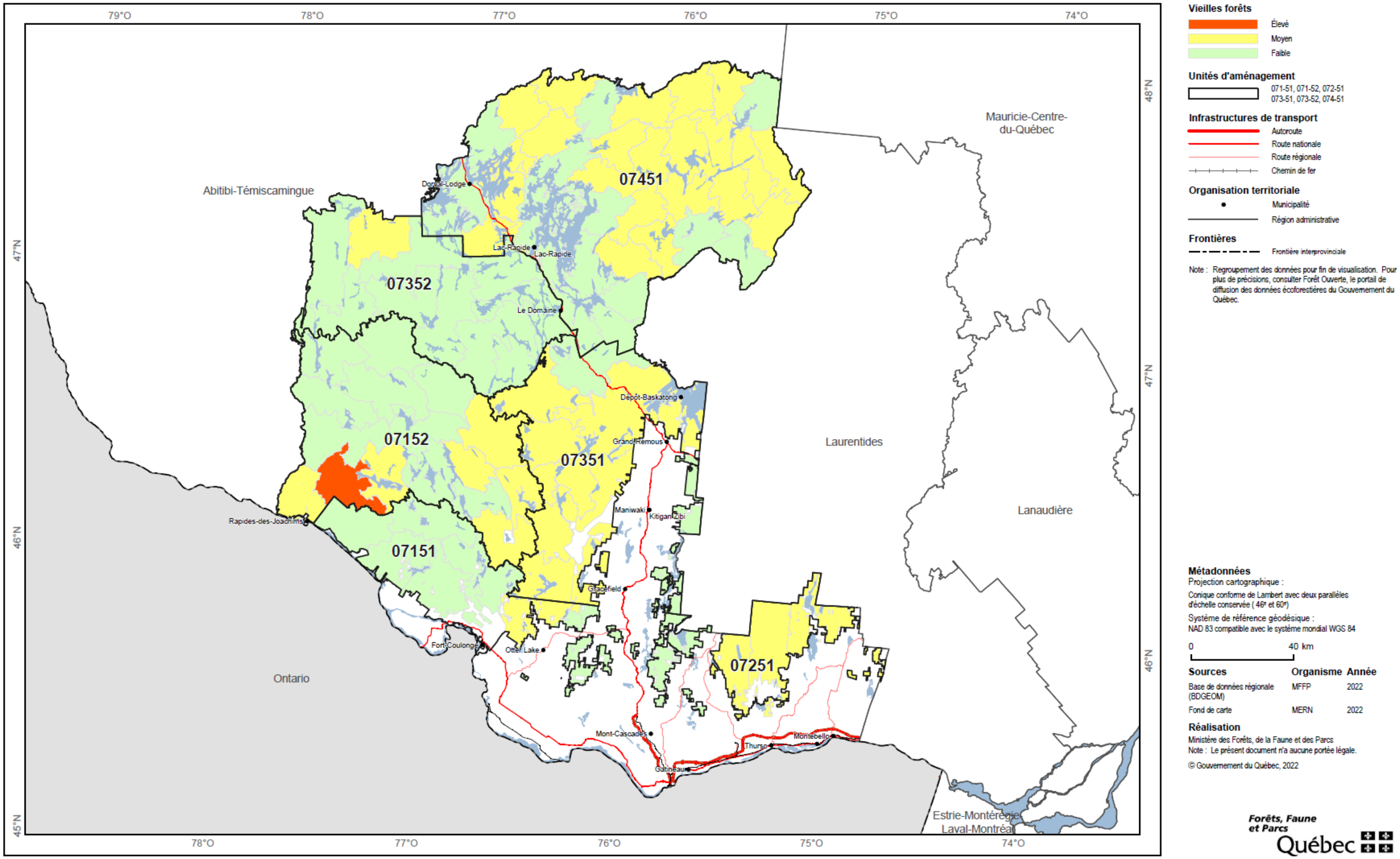
TAU	Homogeneous Vegetation Unit	Area (ha)	“Regeneration” Stage	“Old-Growth” Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
1	WMFnY	35,502	6.7%	67%	29%	Moderate
2	WMFnY	40,488	10.5%	58%	35%	Low
3	WMFtY	59,326	1.2%	58%	39%	Low
4	WMFtY	31,494	1.9%	58%	31%	Low
5	WMFtY	35,423	3.8%	58%	29%	Low
6	WMFtY	44,961	9.2%	58%	33%	Low
7	WMFtY	30,614	4.6%	58%	44%	Low
8	WMFtY	50,232	11.4%	58%	32%	Low
9	WMFtY	50,854	5.3%	58%	43%	Low

Table 9 Level of Alteration of the “Regeneration” and “Old-Growth” Development Stages by TAU for MU 074-51

TAU	Homogeneous Vegetation Unit	Area (ha)	“Regeneration” Stage	“Old-Growth” Stage		Level of Alteration, Combined
			Actual Rate	Reference Rate	Actual Rate	
1	WMFtB	24,405	6.2%	61%	30%	Moderate
2	WMFnY	23,234	2.3%	67%	30%	Moderate
3	WMFnY	25,022	2.8%	67%	32%	Moderate
4	WMFnY	25,526	5.6%	67%	42%	Low
5	WMFtB	22,822	7.4%	61%	29%	Moderate
6	WMFnY	19,463	1.6%	67%	37%	Low
7	WMFtB	23,568	4.7%	61%	20%	Moderate
8	WMFtB	24,078	4.0%	61%	22%	Moderate
9	WMFtB	20,291	6.9%	61%	30%	Moderate
10	WMFtB	25,513	6.2%	61%	34%	Low
11	WMFtB	25,257	2.3%	61%	24%	Moderate
12	WMFtB	22,587	2.0%	61%	19%	Moderate
13	WMFtB	23,700	5.7%	61%	22%	Moderate
14	WMFtB	24,580	3.5%	61%	27%	Moderate
15	WMFtY	25,253	6.5%	58%	26%	Moderate
16	WMFtY	26,226	4.7%	58%	30%	Low
17	WMFtY	22,758	5.5%	58%	31%	Low
18	WMFtY	20,040	10.0%	58%	22%	Moderate
19	WMFtB	23,485	3.4%	61%	24%	Moderate
20	WMFtB	22,791	6.9%	61%	22%	Moderate
21	WMFnY	21,164	7.2%	67%	21%	Moderate
22	WMFtB	25,467	3.0%	61%	25%	Moderate
23	WMFnY	30,198	2.3%	67%	37%	Low
24	WMFtY	21,131	1.9%	58%	24%	Moderate
25	WMFtY	22,373	3.8%	58%	20%	Moderate
26	WMFtY	20,324	3.9%	58%	37%	Low
27	WMFnY	21,877	8.4%	67%	38%	Low
28	WMFnY	15,281	16.5%	67%	42%	Low
29	WMFnY	18,072	7.3%	67%	32%	Moderate
30	WMFtY	24,928	12.1%	58%	51%	Low
31	WMFtY	19,500	7.5%	58%	44%	Low
32	WMFtY	18,963	11.2%	58%	44%	Low
33	WMFtY	20,143	12.6%	58%	38%	Low
34	WMFtY	24,246	6.4%	58%	27%	Moderate
35	WMFnY	28,795	4.8%	67%	54%	Low

The following figure illustrates these levels of alteration for all MUs in the Outaouais Region.

Figure 1 Level of Alteration of the “Regeneration” and “Old-Growth” Development Stages by TAU for MUs in the Outaouais Region (French only)



Objectives

The objectives pursued regarding the age structure of managed forests are to ensure that it resembles that which existed in the natural forest. The abundance of the “Old-Growth” stage presents the most alteration regarding the natural forest and it is from this stage that the targets have been established. Thus, the provincial requirement states that **at least 80% of the area of the MU must present an acceptable difference with the natural forest (low or moderate level of alteration)**. When the age structure state of the forests in a management unit does not immediately allow the established threshold to be reached, a restoration plan must be drawn up. This plan will initially consist of avoiding aggravating the situation in the short term by seeking to maintain the natural attributes and to achieve the objective over a realistic period of time.

MU	Area and Percentage	Level of Alteration		
		Low	Moderate	High
071-51	ha	190,377	24,671	-
	%	89%	11%	0%
071-52	ha	298,881	67,268	31,976
	%	60%	34%	6%
072-51	ha	30,030	103,809	-
	%	22%	78%	0%
073-51	ha	65,063	292,252	
	%	18%	82%	0%
073-52	ha	343,393	35,502	-
	%	91%	9%	0%
074-51	ha	319,494	483,564	-
	%	40%	60%	0%

Management Measures

The management measures specify the means chosen to ensure that this threshold is maintained or reached, i.e., exclusion, the spatial and temporal distribution of the interventions as well as the adapted silvicultural treatments.

Exclusion

Portions of the territory where harvesting activities are prohibited (e.g., protected areas) or cannot be carried out because of different constraints (e.g., inaccessible sectors) are included in profiles of old stands and will allow ecological processes to be freely produced and allow attributes of natural old-growth stands to develop and persist over time.

Spatial and Temporal Distribution

Spatial Distribution for TAUs

The approach by territorial analysis unit makes it possible to discern the portions of the territory where the differences with the natural forest are the most significant, and for which efforts are needed to meet provincial requirements. Despite the achievement of the minimum requirements, maintaining TAUs at low levels of alteration within the management unit makes it possible to obtain conditions closer to natural conditions in places. This means covering a broader spectrum of biodiversity than would be possible by maintaining an average level over the entire territory, but also means modulating actions based on the forest context.

Risk Related to the Spruce Budworm (SBW) Epidemic

An analysis of the possible impact of the SBW epidemic on old-growth forests was conducted for MUs 071-52, 073-51, 073-52 and 074-51, which present areas in the Balsam Fir-Yellow Birch forest and the Balsam Fir-Paper Birch forest domains. Old-growth forests that are most at risk (low persistence classes) are considered destroyed by this epidemic over the next few years. These losses are low, but variable by TAU, and reached a maximum of 8.5% of old-growth forests for territorial reference unit 074-51.

Due to the low proportion of old-growth forests at risk according to the current profiles and the provincial target that has been adopted, the objectives for maintaining old-growth forests have not been affected by the losses anticipated by the epidemic.

Adapted Silvicultural Treatments

Partial Cut

The use of partial cuts, such as irregular shelterwood cutting with permanent cover or the selection cut, allows to create stands that retain certain attributes of old-growth forests and continue to carry out several of their ecological functions. Special attention must be paid when defining the harvesting methods in these stands to ensure that the key attributes associated with them are maintained (long-lived species, large stems, dead wood, structure, etc.). These interventions allow for the harvesting of part of the ligneous material of the old-growth stands maintained in the TAU.

Cultivation Process

The implementation of silvicultural treatments fostering long-lived species will ensure the maintenance over time of stands that can fulfil the role of old-growth forests.

Spatial Organization

Background

The spatial organization of the forest is the arrangement of forest stands in time and space.

In the natural forest, spatial organization results from the dynamics of disturbances (fires, insect epidemics and windfall) typical of the territory. For the bioclimatic domains of the Balsam fir forest, in the western portion, it is mainly fires from the hot and dry climate, while, in the east, the cool and humid climate leaves more room for insect epidemics. From the landscape scale, this gives rise to a matrix organized in large tracts of mature forests, interspersed with openings of various sizes. They can be large randomly distributed areas or diffusely distributed aggregations in the forest cover. Regarding the disturbance scale, variations in intensity can create a mix of different levels of disturbance and undisturbed stands. Thus, following a serious fire, there is always a certain portion of residual standing forest.

Wildlife species adapt to conditions created by natural disturbances. For example, some species will benefit from young stands for their food, while others will prefer the contiguous forest cover. The way in which spatial attributes are organized in a managed forest can therefore have an effect on the maintenance of biodiversity and the functioning of ecological processes. Those to which particular attention must be paid concern the rarefaction of large tracts, the loss of connectivity and maintenance of interior forest conditions.

Studies have shown that the block cutting and cutting with protection of regeneration and soil (BCU-CPRS) approach in the bioclimatic domains of the Balsam Fir forest did not offer adequate protection of these attributes and accentuated the differences with the natural forest. Therefore, a new approach to the distribution of forestry interventions has been developed. Its implementation is subject to a derogation from the regulatory standards until the update of the provisions of the Regulation respecting the sustainable development of forests (RSDF) applicable to these areas. The Ministry has not yet reviewed its priorities for the spatial organization of forests in the bioclimatic areas of the sugar maple forest. Since forest landscapes are more influenced by the formation of gaps from senescence or small windfalls in natural forests and by a dynamic of partial cuts in managed forests, the rules in effect remain those provided for in the RSDF.

To learn more about spatial organization of the forest in the bioclimatic domains of the Balsam Fir forest, consult:
Booklet 3.2.1 – Tactical and operational orientation
Booklet 3.2.2 – Basis of the approach

Local Analysis of Issues

The approach used in analyzing issues will involve applying a model for the distribution of forest interventions based on the natural forest and ensuring the availability of quality habitats.

Criteria

Issues related to the spatial organization of forests revolve around two important habitat attributes for the maintenance of species considered to be sensitive to development, namely the cover of a closed canopy forest and the interior forest.

Attribute	Definition
Closed canopy forest	The “closed canopy forest” or “closed forest” is made up of stands of 7 m or more in height. This height offers a canopy that allows most species to move.
Interior forest	The interior forest is the portion of the forest where the fauna and flora species live without being affected by environmental conditions (sunshine, wind, temperature, humidity, etc.) existing on the edge. The distance of the edge (edge effect) on the species dependent on the interior forest is approximately 75 m.[6]

Characterization

When dividing the territory into spatial organization compartments (SOC), operational aspects related to the harvest are taken into account. When the territory includes protected areas or bodies of water whose size is similar to that defined above, a specific SOC status is assigned to them. These preliminary analyses allow to form SOCs for the territory based on the following categories.

Table 10 Description of the Different SOC Categories

SOC Category	Description
Standard	Compartment in which total cutting areas are concentrated, with or without zones of recent natural disturbances (fires, windfalls, insect epidemics). Standard SOCs develop based on the proportion of stands 7 m or greater in height contained within them.
Protected area	A compartment not subject to any development.
Lake	Mapping compartment that includes large bodies of water on the scale of a SOC (20 km^2 in fir stands).

Like naturally disturbed forests, certain portions of the territory may be affected more strongly than others on the landscape scale. In order to monitor the state of the situation, a typological analysis based on the proportion of forests of 7 m or more in height inside a SOC will be carried out.

[6] Stands that were harvested using partial cuts cannot be deemed to have an interior forest but maintain the status of closed canopy forest. However, the effect of harvesting on the biophysical conditions of the forest diminishes as the canopy closes.

Table 11 Typology Used to Manage Spatial Organization of Forests

Typology of SOCs	Area Occupied by the Closed Canopy Forest (%)
Type 0 (T0)	0 to less than 30%
Type 1 (T1)	30 to less than 50%
Type 2 (T2)	50 to less than 70%
Type 3 (T3)[7]	70 to 100%

The classic chronology of interventions in a standard SOC provides for the first harvest of ligneous material, which will aim to optimize the maintenance of at least 30% of residual forests. When the harvested areas have reached 7 m or greater, a second pass can take place. The residual forest left during the initial pass will be harvested without, however, exceeding 30% so that the SOC can be eligible for forest status.

Regarding disturbances, the maintenance of residual forests comprising interior forest conditions must be ensured to meet the needs of the species associated with them. The Ministère des Ressources naturelles et des Forêts (MRNF) has selected two forms conducive to maintaining habitats or functional connectivity with the surrounding forest matrix. Analyses will be done to ensure that these forms of residual forest exist in sufficient quantities, and that they are distributed in such a way as to play their ecological role.

Table 12 Characteristics of Residual Forest Forms to Follow a Standard SOC

Form of Residual Forest	Bioclimatic Domains	Width	Size[8]	Inclusion[9]
Parcel	Balsam Fir	200 m	5 ha	-
Block	Balsam Fir	200 m	25 ha	≤ 10%

Analysis Scale

As ecosystem-based management is based on knowledge of the dynamics of natural disturbances, the spatial scale to be used for the analysis must be consistent with their effects both on the landscape and disturbance scales.

For the landscape scale, the “territorial analysis unit” was defined as the "area" where forest characteristics stabilize with respect to the size and frequency of natural disturbances. Regarding disturbances, SOC is intended as a means of reproducing the size of total or severe natural disturbances. The spatial scales of the TAU and SOC fit together to ensure complementarity for forest resource management. The dimensions associated with these spatial entities is presented in the table below. It varies according to the type of natural disturbance specific to each bioclimatic domain.

[7] This type corresponds to the definition of forest tract with closed cover.

[8] In fir foe: blocks or parcels of residual forest are not considered to be in one piece when they are crossed by a path that is part of the main network to be developed or maintained.

[9] Maximum percentage of the area of the block that can be occupied by the forest of less than 7 m or deemed landlocked and unproductive.

Table 13 Spatial Entity Based on the Different Bioclimatic Domains[10]

Spatial Scale	Spatial Entity	Size	Bioclimatic Domain
Landscape	Territorial Unit of Analysis	A maximum of 500 km^2	Balsam Fir-Yellow Birch Forest
		A maximum of 1,000 km^2	Balsam Fir-Paper Birch Forest
Disturbance	Compartment of Spatial Organization	An average of 20 km^2	Balsam Fir forest

Current State

The following figure and table provide an initial observation of the state of the territory based on SOC typology, including the location and abundance of the large tracts.

[10] The arrangements of scales for each MU are illustrated in Figure 2: SOC Category and Typology for Each TAU.

Figure 2 SOC Category and Typology for Each TAU (French only)

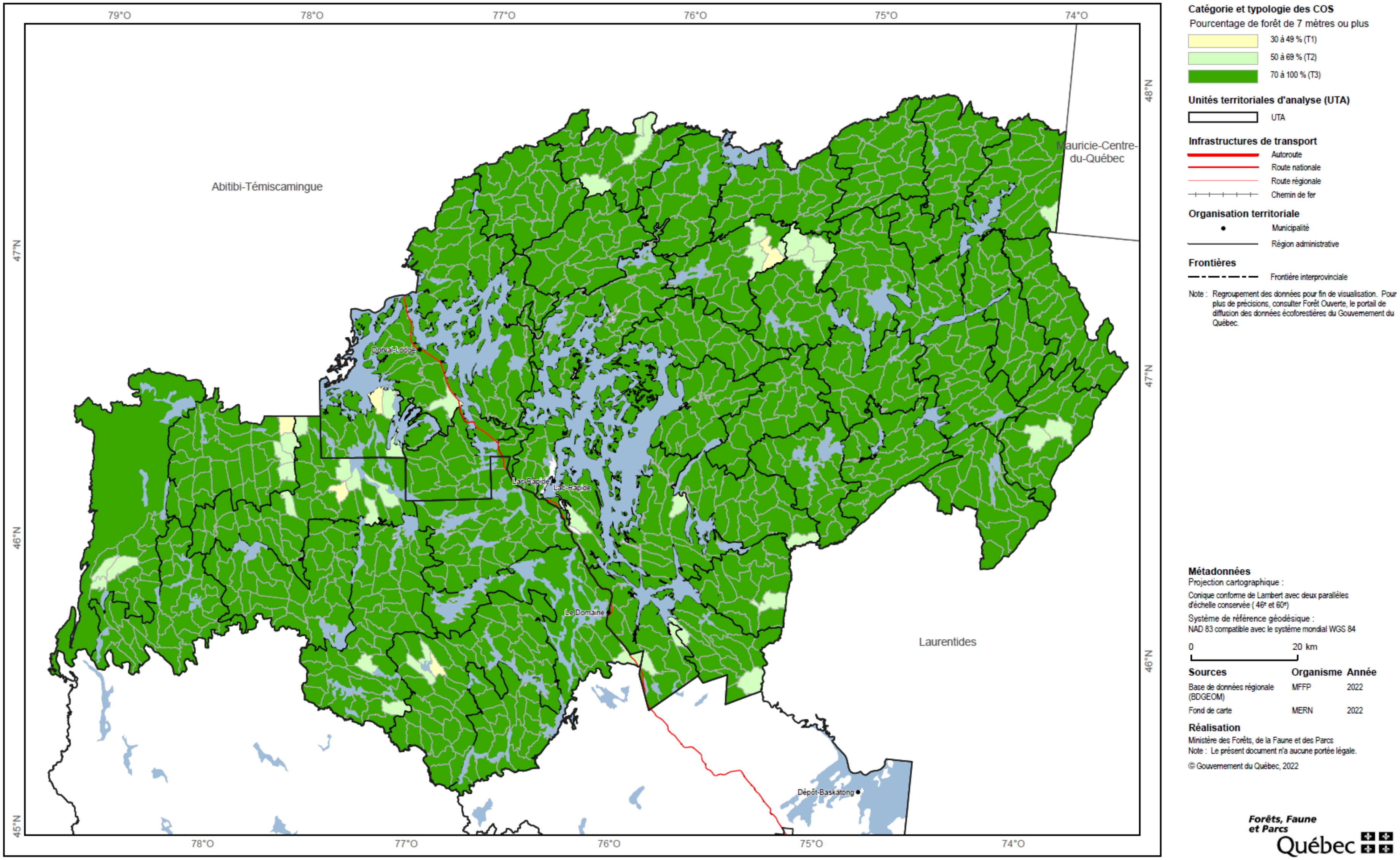


Table 14 Compilation of SOCs by TAU for MU 073-52

TAU	Productive Forest Area (ha)	Area of 7m or Greater		SOC T0 and T1	
		ha	%	ha	%
1	36,131	32,444	90	850	2,4
2	41,229	34,842	85	739	1,8
3	59,914	57,205	95	-	-
4	31,969	31,690	99	-	-
5	36,266	35,522	98	-	-
6	46,061	42,608	93	-	-
7	31,193	29,617	95	-	-
8	51,342	44,532	87	673	1,3
9	52,150	49,154	94	-	-

Table 15 Compilation of SOCs by TAU for MU 074-51

TAU	Productive Forest Area (ha)	Area of 7m or Greater		SOC T0 and T1	
		ha	%	ha	%
1	27,130	24,935	92	-	-
2	21,940	21,037	96	-	-
3	21,158	20,991	99	-	-
4	24,127	23,512	97	-	-
5	22,354	18,358	82	-	-
6	21,841	21,653	99	-	-
7	21,509	20,874	97	-	-
8	25,695	25,134	98	-	-
9	22,599	22,047	98	-	-
10	23,987	22,748	95	-	-
11	25,345	25,333	100	-	-
12	23,506	23,490	100	-	-
13	21,032	21,017	100	-	-
14	24,887	24,823	100	-	-
15	24,293	21,874	90	-	-
16	27,904	26,819	96	-	-
17	27,750	26,352	95	-	-
18	20,994	19,254	92	-	-
19	23,328	23,300	100	-	-
20	26,883	24,030	89	-	-
21	21,628	19,122	88	1,271	6
22	23,570	22,706	96	-	-
23	22,775	22,284	98	-	-
24	21,181	21,107	100	-	-
25	23,812	23,230	98	-	-
26	22,304	21,908	98	-	-
27	17,745	16,283	92	-	-
28	16,439	12,435	76	942	5,7
29	19,065	17,426	91	-	-
30	25,961	23,931	92	-	-
31	19,738	18,685	95	-	-
32	19,417	17,660	91	-	-
33	19,668	16,947	86	-	-
34	22,241	21,056	95	-	-
35	19,975	18,382	92	-	-
36	37,116	37,116	100	-	-
36	37,116	37,116	100	-	-
37	6,702	6,638	99	-	-

Objectives

The objectives of the approach are to maintain or restore key attributes related to the spatial organization of natural forests on both the landscape and disturbance scales.

To carry out the deployment of interventions on a managed landscape, the MRNF has established tactical level guidelines to be respected for the bioclimatic domains of fir forest.

RSDF/Guidelines
At least 30% of the productive forest area of the SOC must be maintained as forest 7 m or higher
At most 30% of the productive forest area of the TAU in a SOC of type 0 or 1
At least 60% of the productive forest area of the TAU must include stands of 7 m or higher

The threshold of 30% of residual forest is based on the average proportion observed in landscapes affected by fire, and corresponds to the minimum proportion of habitats to be preserved, taking into account the risks of causing biodiversity loss. This threshold also helps ensure financial profitability during a second harvesting run.

Landscape-scale requirements commonly aim to ensure the connectivity of the forest matrix. However, these have been adapted to be more in line with the natural disturbance regime for each bioclimatic domain. For the fir bioclimatic domains, they aim to control the proportion of type 0[11] and 1, so that the majority of the territory is occupied by SOCs dominated by closed-canopy forest. Not only will maintaining 60% closed-canopy forest leave enough passage habitats for species to move freely, but this indirectly fosters the creation or maintenance of forest stands (SOC type 3).

On the disturbance scale, the MRNF has established operational guidelines to respect in order to regulate quantity, configuration, distribution and representativity of the residual forest for fir stand bioclimatic domains.[12]

[11] This type of SOC results from natural disturbances or the history of cutting.

[12] In certain cases, the history of the territory does not allow the operational thresholds to be reached even before intervening in the SOC. The important thing will be not to aggravate the situation so that it can improve over time.

Guidelines
At least 20% of the productive forest area of a SOC must be organized into blocks of residual forest of 7 m or higher
At least 80% of the reference area[13] of a SOC must be found at least 600 m from the limit of a parcel or block of residual forest
At least 98% of the reference area of a SOC must be found at least 900 m from the limit of a parcel or a block of residual forest
At least 20% of the proportion of each major type of cover (softwood, mixed and hardwood) must be represented in stands of 7 m and high of the SOC after harvest[14]
At least 20% of the productive forest area of a SOC must be made up of forest of 7 m or higher, which has not been harvested for at least 25 years

The interior forest is one of the key elements in the configuration of residual forests, so that they can offer sensitive species a forest environment conducive to their survival. Those organized in the form of blocks have several ecological, social and economic advantages, which is why a minimum threshold is defined. The distribution of residual forests within SOCs is primarily aimed at maintaining the connectivity of residual habitats to promote the dispersion of biodiversity. As source habitat for recolonization of harvested areas, it is also important that the residual forest be composed of stands representative of those harvested (e.g., slope, density, stand type, site type, height class, etc.) This helps prevent forest stands that have less attractive characteristics for harvesting (e.g., species without buyers or inaccessible areas) from being overrepresented, especially since they are slated for future harvesting.

Management Measures

The management measures specify the preferred means to ensure the objectives are achieved. The solutions retained are exclusion, spatial and temporal distribution of interventions as well as appropriate silvicultural treatments.

Exclusion

The contribution of conservation forests (protected areas, biological refuges, etc.) to the spatial organization of forests must be taken into account at all planning scales. In the absence of serious disturbances, these portions of harvest-exempt territories are likely to maintain a high proportion of closed-canopy forests. Productive forest areas that are inaccessible (e.g., fragment) or have special arrangements can also be useful on the SOC scale. Depending on the area concerned, this contribution may be limited to that of a closed-canopy forest or possibly interior forest if it meets the criteria.

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[13] The reference area of a SOC is the area covered by a 900 m area around the potential forest parcels of the SOC.

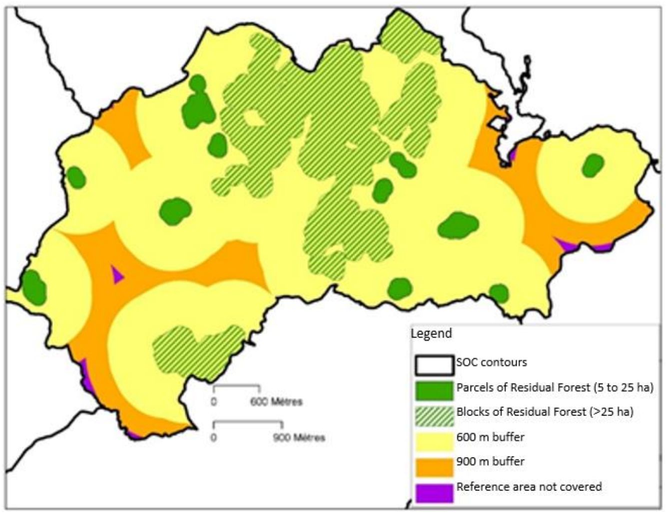
[14] If there are issues of composition or vulnerability to the spruce budworm, the solutions developed to respond to these issues must be applied as a priority.

Spatial Distribution

Spatial Distribution for SOCs

The closer the proportion of residual forest in a SOC approaches the minimum threshold of 30%, the more biodiversity associated with the interior forest will depend on residual forests being in line with configuration and distribution. This intraSOC planning can, however, be carried out with some flexibility in order to meet other objectives, such as the visual quality of landscapes or the maintenance of key habitats. A sound distribution of the blocks can mitigate the visual impacts resulting from the cut. For example, it is possible to make the shape of the residual forest more natural by not creating straight lines, geometric shapes and breaks in the ridge lines and by adapting them to the outline of the stands and the topography of the land.

Figure 3 Example of Distribution of Parcels and Blocks of Residual Forest Using the 600 m and 900 m Zones



Adapted Silvicultural Treatments

Partial Cut

The use of partial cuts allows to harvest a part of the ligneous material of closed-canopy forests maintained in a SOC. In a Balsam Fir-Yellow Birch Forest bioclimatic domain where a portion of the volumes of timber harvested come from partial cuts, attention must be paid to maintaining a sufficient proportion of residual forests that have not been harvested for at least under 25 years old.

Plant Composition

Background

Plant composition refers to the diversity and relative proportion of tree species and certain other plants on both the stand and landscape scales.

In the natural forest, the composition of the forests is shaped by the interaction of different factors, such as the type of soil, the climate and the disturbance regime (forest fires, insect epidemics, windfall) specific to each territory. For example, following a total or severe disturbance, shade-intolerant species are usually the first to be established, and then are gradually replaced by shade-tolerant species (natural succession). Certain natural disturbances, such as insect outbreaks or disease, can reduce the variety of specific tree species in the canopy. In managed forests, logging operations are added to natural disturbances, which, in return, are attempted to be managed. This substitution has contributed to limiting the creation of conditions conducive to the establishment and survival of species favoured by the passage of fire. If no canopy or regeneration management is carried out following logging operations, the proportion of shade-intolerant species could increase compared with the natural state. Similarly, selective harvesting of certain species without regard to their regeneration can also lead to their rarefaction; this was the case for pines and oaks from the mid-1800s.

Plant composition influences the availability of resources, such as light and substrates for flora, as well as the availability of food and habitats for fauna. The occurrence and severity of natural disturbances can also be influenced by plant composition. The rarefaction or invasion of certain species in the forest is therefore likely to have repercussions on the maintenance of biodiversity and ecological processes.

To learn more, consult:
Booklet 4.1 – Issues related to plant composition

Local Analysis of Issues

The issue analysis approach will consist in evaluating the degree of alteration of the composition of the managed forests compared with the average natural conditions.

Criteria

Changes in plant composition can occur for a particular species, a combination of species and even a type of forest canopy. In order to assess the composition issues on the territory, different sources of information can be used.

On the eco-forestry map, a species can be identified from the grouping of stand species. Each species can carry a code representing it individually or be included in a combination or association of species.

The species for which issues of rarefaction (↓) or invasion (↑) are understood are presented in the following table.[15]

Table 16 Species of Special Concern by Bioclimatic Domain

Group	Species	Sugar Maple Forest	Balsam Fir-Yellow Birch Forest	Balsam Fir-Paper Birch Forest	Spruce-Moss Forest
Softwood	Balsam fir	↑	↑	↑	↑
	White Spruce	↓	↓	↓	↓
	Red Spruce	↓	↓	↓	
	Eastern Hemlock	↓	↓		
	Eastern White Cedar	↓	↓	↓	
	White or Red Pine	↓	↓	↓	
Shade-tolerant hardwood	American Beech	↑	↑		
	Red Maple	↑	↑		
	Sugar Maple	↑	↑		
	Red Oak	↓	↓		
	Yellow Birch	↓	↓	↓	
Shade-intolerant hardwood	Paper Birch	↑	↑	↑	↑
	Poplars	↑	↑	↑	↑

The rarefied species selected for the Outaouais region are bur oak, swamp white oak, white oak and red oak, white pine and red pine and yellow birch, which are identified as a declining species.

Other species are also attracting attention with regard to this issue:

Butternut: The butternut or white walnut is on the list of vascular plants likely to be designated as threatened or vulnerable in Quebec and is also a designated endangered species listed in Appendix 1 of Canada's *Species at Risk Act*. Canker disease is attacking butternut throughout the entire distribution area.

Black Ash: The emerald ash borer is very aggressive in the region and its effects on the forests is hard to assess. The epidemic has already caused significant damage in cities (almost all trees have died).

Eastern White Cedar: In Outaouais, it is difficult to increase the proportion of eastern white cedar through natural regeneration. In addition, some sites are even less favourable due to their fragility and low trafficability, which prevent them from being put back into production. This is the case for sites whose ecological type is RC38 where there are peat cedar stands.

This ecological type is relatively rare, and mostly concentrated in the Maniwaki landscape unit. It is usually found on flat land or open depressions of low slopes, which are covered with organic deposits whose drainage is very poor, but that allow a slow circulation of internal waters. It is this circulation of water that explains the presence of species from richer environments, such as Yellow Birch or Black Ash, in the almost pure cedar stands that generally grow on these sites.

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[15] A summary of potential issues associated with plant composition and factors possibly involved in Quebec is presented in the appendix of Booklet 4.1 – Issues related to plant composition

Analysis Scale

The spatial scale to be used for this analysis should be ecologically consistent with the main factors influencing composition. A scale of higher levels, such as the bioclimatic subdomain or ecological region, can be used to establish a global diagnosis and will be easier to use as a common base for comparison with the historical description.[16] The analysis scale is management units.

Current State

Table 17 Initial Profile of Species in the Process of Rarefication in Accordance to Compilations for the 5th Ten-Year Inventory

MU	Area
071-51	76,651
071-52	78,120
072-51	11,898
073-51	44,488
073-52	10,635
074-51	5,664

Objectives

The objectives pursued with regard to plant composition of managed forests are to bring it closer to that of the natural forest. Given the time required for an action to have repercussions at the species group level, a short-term target may be difficult to achieve. Instead, the intention will be to aim to maintain or increase the proportion of species that are becoming rarefied or in decline, while considering other management objectives.

Management Measures

The management measures specify the preferred means to ensure the achievement of the objectives, and are deployed based on two solutions, namely exclusion and adapted silvicultural treatments.

Exclusion

Conservation forests (protected areas, biological refuges, exceptional forest ecosystems, etc.), inaccessible sectors or sites benefiting from special conditions will naturally evolve toward late-succession species specific to the potential vegetation (climatic stability stage).

[16] The productive forest areas excluded from harvesting (legally or administratively protected tenures, forest uses, operational constraints to harvesting) and located within the perimeter of the management units must be included in the reference territory for these analyses.

Adapted Silvicultural Treatments

Silviculture makes it possible to act on the composition of the treated stands. The silvicultural strategy for the management of a species provides for the application of a sequence of treatments as defined by a silvicultural scenario. A single silvicultural action may fulfil more than one objective by promoting the regeneration of species in the process of depletion, while countering the invasion by fir or intolerant hardwoods.

<u>Partial Cut</u>

The use of partial cuts in stands whose basal area contains enough endangered species makes it possible to make part of the ligneous material accessible, while maintaining contribution to composition targets. Shade-tolerant and semi-shade tolerant species like **White Pine**, **Yellow Birch** and **Red Oak** will benefit from the gradual opening of the canopy to become established or grow. Special attention must be paid when defining harvesting methods to ensure the maintenance of well-distributed seeds. Harvest intensity and opening pattern must also meet the requirements of the desired species at the expense of intolerant hardwoods. The priority removal of **Balsam Fir** and **Red Maple** will help reduce their abundance.

<u>Artificial Regeneration</u>

The use of this silvicultural treatment category is considered when the desired species regeneration is insufficient or when the site conditions are favourable for the survival and maintenance of the species in the process of rarefaction or in decline. Uniform planting consists of planting plants at regular intervals; it is mainly used following a clear-cut or total cutting. Fill planting, however, aims to ensure full forestation of naturally regenerated areas (e.g., gaps, harvest trails) and the desired species composition. These practices are aimed at species such as **White Pine**, **Red Pine** and **Red Oak**.

<u>Site Preparation</u>

Adequate germination beds foster the seed germination of **Yellow Birch.** Exposing the mineral soil or mixing the mineral and organic layers by means of scarification allows the creation of favourable microsites, in addition to temporarily eliminating herbaceous and shrub competition or resulting from **intolerant hardwoods** and pre-established **Balsam Fir**. This type of intervention is generally required before proceeding with reforestation but can also be applied following partial or variable retention cutting to take advantage of natural seeding.

<u>Education Treatment</u>

Once regeneration has been established, with the exception of beds that have been densely regenerated with the desired species and sites where competition is low, it is necessary to resort to training treatments to ensure the maintenance of the target composition.

Internal Structure

Background

The internal structure of stands is defined as the spatial and temporal arrangement of plant components, living and dead, of a stand.

In natural forests, the more time that has elapsed since the last major disturbance, the more likely a stand is to develop a complex structure (large trees, dead wood, gaps, understory of vegetation, etc.). Then, when natural disturbances occur, variations in their intensity mean that a certain proportion of living trees may remain in the form of patches or scattered stems through the standing dead wood. These remnants that are inherited from a previous stand as a result of a disturbance are called "biological legacies", and result in a diverse structure in the future stand. In managed forests, since forest rotations are shorter than natural disturbance cycles, stands have less time to re-develop a complex structure. During harvesting by partial or total cutting, harvesting methods and efforts to avoid "wasting" ligneous material can reduce the number of large trees and the recruitment of certain forms of dead wood. The overturning of snags as a safety measure and windrows formed during full-tree harvesting operations can also alter the spatial distribution of dead wood, and the role it may subsequently play.

The internal structure of stands influences the availability of feeding, breeding and shelter substrates for animal species. The same applies to substrates for the establishment and growth of plant species. Studies have shown that forests with high structural diversity also support a greater variety of species or functional groups.

To learn more, consult:
Booklet 5.1 – Issues relating to internal stand structure and dead wood

Local Analysis of Issues

The issue analysis approach will consist of evaluating the presence after cutting of biological legacies in the total cuts and complex structure attributes in the partial cuts.

Criteria

Aspects to take into account regarding the internal structure relate to the retention of key attributes such as:

- Snags and large-diameter trees;
- Hardwood trees in the mixed or boreal forest;
- Coniferous trees in the hardwood forest;
- Ligneous debris on the ground and snags with varying degrees of composition;
- Small ligneous debris that make up branches and crowns.

This retention can take different forms, i.e., the retention of individual trees, clumps or patches and helps improve the complexity of residual stands. To be considered as biological legacies, these must be maintained until the next revolution or rotation.[17]

Type of Retention	Definition[18]
Individual Stems	Retention of individual stems meeting specific characteristics dispersed throughout the cutting area. This type of retention should not be chosen when the presence of sparse stems may hinder the realization of the next treatments based on the silvicultural scenario (e.g.: site preparation).
Clumps	Area of approximately 150 to 500 m² containing a minimum of five live merchantable stems and within which no intervention has been or will be made. This type of retention should ideally be for areas that are not very vulnerable to windfall.
Patches	Area of more than 500 m² in the interior, for which no intervention has been or will be made. The patches are particularly useful for the safe retention of snags or unstable trees, in addition to limiting the risk of windfall.

Characterization

Characterization is calculated based on the rate of stand prescriptions that have biological legacies and on post-cutting data to validate the residual basal area (m^2/ha) of stems classified as "M" and "S" in partial cuts.[19]

Analysis Scale

As ecosystem-based management is based on knowledge of the dynamics of natural disturbances, the spatial scale to be used for the analysis must be consistent with their effects, both on the landscape and disturbance scales.

The spatial scales used are those of the management units on a larger scale, as well as the compilation units.

[17] Areas likely to be harvested in the near future (e.g., parcels and blocks of residual forest) cannot be associated with the notion of biological legacies since they are expected to play a temporary role.

[18] MFFP (2020).

[19] Tree classification system "MSCR" based on tree defect categories: M = tree doomed to die in less than 20 years; S = tree in decline at risk of degrading, but whose survival is not compromised within 20 years; C = defective tree to be kept, whose wood is not affected by decay; R = healthy and vigorous tree to keep in reserve.

Current State

Indicator	Target	2018	2019
Proportion of the area of total cuts in variable retention cutting having the retention measures of at least 5% of the merchantable volume	Plan at least 20% variable retention cuts with retention terms of at least 5% of merchantable volume	27% up to 73% depending on the MU	26% up to 100% depending on the MU
Residual basal area (m^2 /ha) of stems classified as “M” or “S” for the partial cuts	Maintain at least 1 m^2/ha of stems classified as “M” and “S” of large diameter (more than 36 cm of DBH[20], if possible > 40cm) in the areas of partial cuts.	DBH > 36 cm : 3 - 10 m^2/ha DBH > 40 cm : 1 - 2,6 m^2/ha	DBH > 36 cm : 3.3 - 6.5 m^2/ha DBH > 40 cm : 1 - 2,7 m^2/ha

Objectives

The objectives pursued regarding internal structure of managed forests are to ensure that it resembles that of the natural forest on the landscape scale and to ensure the maintenance of key structural complexity attributes on the cutover scale.

Management Measures

The management measures specify the preferred means to ensure the objectives are achieved. For the issue on internal structures, these are deployed based on two solutions, namely exclusion and adapted silvicultural treatments.

Exclusion

Portions of the territory where harvesting activities are prohibited (e.g., protected areas) or cannot be carried out due to various constraints (e.g., inaccessible sectors) will naturally develop attributes of complexity over time. Tree mortality from ageing will allow a new cohort to develop in the gaps, resulting in diversification in the structure. If a natural disturbance occurs, there will also be legacies of dead and living wood in varying quantities and forms, since these territories are not subject to recovery.

Adapted Silvicultural Treatments

<u>Partial Cut</u>

Using partial cuts makes it possible to create or maintain stands composed of at least two distinct cohorts of trees. Although this is already an attribute of complexity in itself, the effects of these long-term treatments on the availability of large-calibre live or dead trees are poorly documented. Measures that target the retention of key attributes should be incorporated into silvicultural prescriptions and harvesting guidelines (with or without marking).

Thus, in the partial cuts at minimal retention is at least 1 m^2/ha of stems classified as “M” and “S”[21] of 36 cm of diameter at breast height (if possible ≥ 40 cm). This threshold corresponds to that of 5% for a

[20] Diameter at breast height.

[21] M = tree doomed to die in less than 20 years; S = tree in decline at risk of degrading, but whose survival is not compromised within 20 years.

stand reaching a basal area of 20 m^2/ha. SOCs or TAUs where “operational” biological legacies are absent or present, but not very representative may be subject to additional efforts where relevant.

Variable Retention Cutting

In stands where total cuts are a large proportion of the silvicultural strategy, the use of variable retention cutting makes it possible to supplement old forests with a source of snags and ligneous debris for the future. The choice of retention methods will depend on the initial characteristics of the stands ready to be harvested, local management objectives and knowledge of the serious disturbances affecting the territory. To be considered as a variable retention cut, a minimum retention of 5% of the harvested volume (or treated area) must be planned in the form of biological legacies. In order to play the role of a seed tree, nesting tree or roost, it will be desirable to:

- promote the maintenance of mature and dying stems by 20 cm for stands dominated by black spruce or 40 cm for stands with mixed or tolerant hardwoods;
- promote the persistence of legacies by looking to reduce the vulnerability of stands to defoliating insects and the risk of windfalls;
- ensure an adequate distribution on the cutting area to avoid that large portions are not exposed to the influence of biological legacies (e.g., 25 to 50 stems/ha, no. clumps/ha).

Although it belongs to the family of total cuts, cutting with protection of small merchantable trees is a regeneration process that generates an irregular structure. It consists of harvesting trees whose diameter at breast height (DBH) is above a threshold of 13, 15 or 17 cm, and protecting as many softwood trees as possible whose DBH is below this limit. From this perspective, it may be advantageous, when a stand is eligible, to take advantage of it to achieve the objective of producing irregular stands.

Thus, in all management units, plan **at least 20% of variable retention cuts, which includes the retention measures of at least 5% of the merchantable volume**. Current literature points to the fact that 5 to 10% retention, on the stand scale, is a minimum proportion to be maintained so that the functional role of biological legacies is fulfilled.[22]

[22] GUSTAFSSON et coll. (2012).

Second-Growth Forests

Background

After regeneration cutting, it is possible that cultivation processes be applied in natural forest. The large-scale implementation of these processes is likely to result in the simplification and standardization of the internal structure of second-growth forests. Although cultivation processes are beneficial for maintaining the desired composition and properly managing competing vegetation, a number of concerns have been raised about the standardization of tree density and spatial distribution, simplification of vertical stand structure, reduction in lateral coverage, scarcity of fruit trees or scarcity of dense sapling stages.

In the stands at the regeneration and sapling stages, wildlife is diverse, and species are abundant. The systematic use of cultivation processes could have significant consequences on wildlife and on biodiversity in general, because the sapling stage is important for many key species in the ecosystem.[23]

Although a major disturbance is likely to re-create forests with regular structure, the naturally occurring regeneration cohort also exhibits some degree of heterogeneity.

To learn more, consult:
Booklet 5.1 – Issues relating to internal stand structure and dead wood

Local Analysis of Issues

The analysis of the territory makes it possible to find the portions of management units composed mainly of stands that have been the subject of cultivation processes. An analysis of the proportion of young strata that have been the subject of intermediate treatments[24] in the past 10 years was carried out. This made it possible to determine which portions of territory were at risk of presenting gaps in the attributes sought.

Criteria

From the up-to-date eco-forestry map, it involves listing the areas treated in precommercial thinning, in clearing and cleaning (natural stands and plantations), in stands at the sapling stages.

Characterization

The criterion analyzed is the proportion of the surface area of young stands treated by intermediate treatments during the last 10 years.

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[23] BUJOLD et coll. (2004).

[24] This analysis considers all types of intermediate treatments combined (precommercial thinning, cleaning, clearing, etc.). Additional analyses can be carried out if necessary to go a little further in understanding the repercussions of certain treatments.

Analysis Scale

As ecosystem-based management is based on knowledge of the dynamics of natural disturbances, the spatial scale to be used for the analysis must be consistent with their effects, both on the landscape and disturbance scales.

The spatial scales retained are those of the reference territorial units (TRU) for the management units in the domain of sugar maple stands[25] and the SOC for those in the domain of fir forest in order to assess the rate of treatment of young stands to detect the sites where there are high concentrations of cultivated stands.

Current State

To simplify the presentation of the results, a profile of the proportion of TRUs or SOCs according to the established threshold of 50% of the treatment rate of young strata at the MU scale is presented below.

The following table presents the distribution of the number of TRU or SOC according to the treatment rate of forest areas at the regeneration and sapling stage.

Table 18 Proportion of TRUs or SOCs Based on the Treatment Rate of Young Strata

Treatment Rate of Young Strata	MU 071-51		MU 071-52		MU 072-51		MU 073-51		MU 073-52		MU 074-51	
	TRU or SOC No.	%	TRU or SOC No.	%	TRU or SOC No.	%	TRU or SOC No.	%	TRU or SOC No.	%	TRU or SOC No.	%
< 50%	28	100 %	58	97 %	31	100 %	46	96 %	193	95 %	379	97 %
≥ 50%	0	0 %	2	3 %	0	0 %	2	4 %	11	5 %	11	3 %
Total	28	100 %	60	100 %	31	100 %	48	100 %	204	100 %	390	100 %

Objectives

The objectives pursued are to conserve dense sapling stands and distribute the treated areas in space. Achieving these objectives will allow second-growth forests to have more complex structural attributes to help conserve biodiversity.

In order to prevent the risks of homogenization of stands resulting from total cutting, it is necessary to avoid creating situations where recent intermediate treatments would be applied to more than 50% of young strata to mitigate potential impacts on wildlife. This will make it possible to preserve a proportion of the dense sapling stands, to distribute the areas treated on the territory and to maintain certain habitat attributes when an overrun is justified.

Management Measures

The exclusion of areas is the means chosen to respond to this issue.

Exclusion

[25] The TRU spatial scale is maintained in the domain of sugar maple forest since the development of the SOC has not yet begun in this bioclimatic domain. The notion of TRU should eventually be replaced by SOCs or TAUs, since there is an overlapping entity that does not provide added value.

Since intermediate treatments tend to reduce the quality of the wildlife habitat for approximately 10 years, a strategy of spreading the work over time is planned in order to avoid carrying out cultivation processes in the TRUs or SOC that exceed the 50% threshold.

This distribution of interventions will make it possible to ensure the availability of suitable habitats and to avoid making all young stands uniform in the short term.

In addition, in order to maintain biodiversity on a more local scale, it will be necessary to keep intact 10% of any block that has been the subject to a cultivation process whose surface area exceeds 40 ha.

Untreated areas should be limited to naturally regenerated stands. At all times, the appropriate cultivation process may be carried out in the artificially regenerated areas to ensure the success of the investments made.

Riparian Areas

Background

A riparian area is a transition zone between terrestrial and aquatic ecosystems, which generally includes a treeless zone, a wet riparian forest and a dry riparian forest. It extends over variable distances depending on the characteristics of the site, such as the topography and the nature of the soil.

Riparian areas generally are home to diverse vegetation and perform several hydrological and ecological functions that are essential to preserving the quality of aquatic habitats (sediment retention, reduction of shoreline erosion, heat shield, etc.). The proximity of water and the abundance of food also make riparian areas an attractive area for many wildlife species. These areas represent an essential or sought-after habitat for more than 50% of Quebec vertebrate fauna, and some depend on it to complete one or more stages of their life cycle.

Quebec regulations provide basic protection against forest management practices likely to compromise the integrity of riparian and aquatic environments, such as forest drainage, road construction, maintenance and the movement of machinery. Add to this the protection afforded by a 20 m wooded strip bordering a peat bog with a pond, a marsh, a swamp, a lake or a permanently flowing watercourse where only partial cutting is permitted. Studies show that the maintenance of these riparian strips, with a uniform width and without disturbing the ground, adequately ensures the protection of the physicochemical conditions of the water. In addition, the protection of riparian areas is enhanced by the conservation of certain sensitive wildlife habitats (waterfowl concentration areas, heronry, muskrat habitat, mudflats, salmon rivers, spawning grounds, riparian areas located in a containment area white-tailed deer). However, these measures may prove to be insufficient for certain specific ecological functions associated with large riparian areas (e.g., habitats of certain wildlife species, contribution of ligneous debris, etc.).

To learn more, consult:
Booklet 6.1 – Issues Relating to Riparian Areas

Local Analysis of Issues

The issue analysis approach will be to verify the need for additional protections to ensure the maintenance of the ecological functions of representative and diverse riparian environments. The riparian forest strip is measured from the edge of the riparian ecotone.

Objectives

- Preserve the integrity of an aquatic or riparian areas.
- Avoid bringing sediment into an aquatic or riparian areas.

Management Measures

The exclusion of areas is the means chosen to respond to this issue.

Exclusion

At the management unit level, the direction is to no longer conduct forest planning in the riparian forest strips identified in section 27 of the RSDF[26]. Forest interventions in the vicinity should be carried out with a view to minimizing impacts.

The riparian forest excluded from harvesting may over time develop attributes of structural complexity (irregular structure, dead wood, large stems, etc.) prized by certain species associated with these environments.

Stay tuned!
Developments are expected in the process of analyzing the ecological issues of riparian environments for the 2028–2033 period

[26] RSDF, section 27: A strip of woodland at least 20 m wide must be preserved alongside a peat bog with a pond, a marsh, riparian shrub swamp, lake or permanent watercourse.

Wetlands

Background

Wetlands (WL) are sites saturated with water or flooded for a long enough period to influence the nature of their soils or the components of their vegetation. They include shallow waters (< 2 m), marshes, swamps and bogs.

Wetlands perform essential ecological functions for the proper functioning of ecosystems. Some environments contribute to water filtration by promoting the deposition of sediments, and by limiting the input of nutrients (nitrogen and phosphorus) and metals into lakes and watercourses The high-water retention capacity of certain environments promotes flood control and mitigates the harmful effects of water movements on the territory (erosion and flooding). The accumulation of biomass in peatlands helps mitigate climate change by storing the carbon that it contains for long periods of time. Wetlands also support a particular flora and fauna procession, some species of which are considered threatened or vulnerable in Quebec. Isolated wetlands are often less frequented by predators and can play an important role during the breeding season, especially in the spring.

Several provisions are included in the RSDF and in Regulation respecting wildlife habitats to maintain the integrity of wetlands in riparian areas. The RSDF protects open peat bogs with ponds, marshes and riparian treed swamps by prohibiting forest management and requiring the maintenance of a 20 m wooded strip. Certain riparian wetlands are also protected by maintaining a 20 m riparian wooded strip on the edge of lakes or permanent watercourses. Moreover, no harvesting can be done on certain types of riparian treed swamps due to their rarity province-wide. However, some concerns remain regarding forested wetlands, isolated open wetlands or without ponds and temporary ponds. Practices such as mining, energy and forestry can compromise wetland diversity and integrity (e.g., altered hydrology, fragmentation, loss of connectivity). The protections offered by the large protected areas are not designed to preserve specific sites, but rather to establish a network of protected natural environments representative of the territory. For these reasons, additional measures must be taken locally to complete the protection of wetlands in order to ensure that the specific ecological functions of certain wetlands with high ecological value will be maintained.

To learn more, consult:
Booklet 6.2 – Issues Relating to Wetlands

Local Analysis of Issues

The issue analysis approach consists of checking that sufficient protections are in place to prevent the disappearance or deterioration of wetlands of high ecological value. Conservation value is inferred based on their rarity, extent, diversity, integrity or quality of habitat and ecological services.

Criteria

In general, we recognize among wetlands, shallow waters, marshes, swamps and bogs. The eco-forestry map can be used as basic information to draw up the table of wetlands from the ecological type or the land code.[27]

Types of Wetlands	Definition
Shallow water	Wetland characterized by the presence of permanent shallow (often less than 2 m), standing or flowing water. The flooding of the environment can fluctuate annually or daily depending on the body of water to which the environment is connected. The soil is rich in nutrients. There are floating or submerged plants.
Marsh	Non-forested wetland, permanently or irregularly flooded, dominated by emergent herbaceous plants, partially or completely submerged during the growing season.
Swamp	Wetland dominated by ligneous shrub or tree vegetation (4 m or more in height) covering more than 25% of the area and growing on mineral soil (gravel, sand, silt or clay). These lands are subject to seasonal flooding or characterized by a high water table and a circulation of water enriched with dissolved minerals.
Peat Bog	Wetland with poor or very poor drainage where peat (organic soil) accumulates faster than it decomposes and reaches a thickness of more than 40 cm. Some peatlands have tree cover (stems over 4 m high) equal to or greater than 25%, while others are open (unforested). Peatlands fed only by rainwater are called ombrotrophic (syn.: bog), while those that can also benefit from a circulation of water from the drainage basin enriched in minerals are called minerotrophs (syn.: fen).

The location of wetlands in relation to the hydrographic network influences their ecological function and the protection they receive. For example, a swamp subject to flooding helps regulate water flow, filter and retain sediment, and slow shoreline erosion. The riparian or isolated nature of these environments can be known with the ecological type (TOB9L, TOB9N, TOF9L, TOF8N, TOF8A and MA18R) or by analyzing the contacts with water bodies, watercourses, flooded areas and the ponds.

Wetland "complexes", which are formed by clusters of adjacent wetlands (e.g., located within 60 m), are also of particular ecological interest, the value of which can be characterized. Aquatic environments of small surface area (< 8 ha) can be part of the complex insofar as they are completely isolated. When delineating the complexes, it may be useful to check that the percentage of the area occupied by wetlands and aquatic environments remains dominant compared with that of well-drained terrestrial environments. The selected sites should tend, if possible, toward regular, compact and slightly tapered shapes.

Vernal ponds do not belong to a category of wetlands, but they can play a role in the survival of several species, including amphibians. These form in shallow depressions (often < 1 m) present in many forest environments. They are isolated from the hydrographic network and supplied with water by precipitation, snow melting or groundwater. They retain water in the spring for a period of about two months, and then dry up during the summer.

[27] Other information can improve this map (wetland maps produced by Ducks Unlimited Canada, Quebec topographic database, aerial photographs).

Vernal ponds must be analyzed separately, since most of these environments are not listed on eco-forestry maps due to their size, which is often below the detection limits of photo interpretation. They are also difficult to detect in the field during harvesting, when they are generally dry or hidden under snow. The analyst who has data collected from wildlife managers and users may choose to draw up a preliminary profile of the territory's vernal pools. The use of orthophotographs taken in the spring and carrying out reconnaissance activities in the field could improve the profile. A provincial guide for identifying vernal ponds currently being developed.

Characterization

The profile of the wetlands produced makes it possible to locate them and know their characteristics in order to prioritize them. This will distinguish between riparian, isolated wetlands and "complexes" of wetlands that meet the criteria for high ecological value wetlands. An assessment of wetlands that benefit from protection through the creation of protected areas or regulations will provide a better understanding of the threats these environments may face. In doing so, it will be possible to identify gaps in the protection of wetlands of great value due to their rarity and their particularities.

Table 19 Criteria for Evaluating Wetlands with High Ecological Value

Criteria	Precision
Rare Environments	Assessing the frequency and relative area of wetlands makes it possible to make a diagnosis of their rarity. Wetland types individually covering less than 0.1% of the territory or existing in a limited number of sites (e.g., fewer than five sites) will be retained as rare types. It is also recommended to order the types of wetlands in ascending order of area, and to draw the limit of rare types where their cumulative contribution reaches 0.5% of the total area of the reference territory.
High-Integrity Environments	Wetland little disturbed by man and presenting exemplary characteristics with regard to its extent or the continuity of its natural habitats. Some integrity indicators can be assessed for individual wetlands, but are primarily intended to be applied to “complexes”.
Habitats that support species of great importance	Environments constituting an essential habitat for the conservation of one or more threatened or vulnerable plant or animal species. This category can also be extended to wildlife habitats legally protected under the Regulation respecting wildlife habitats.
Environments of ecological services	Environments that provide essential ecological services, such as the presence of a specific wildlife site, the presence of a floodplain that reduces intense flood events downstream, the protection of a drinking water source downstream, etc.

When wetland complexes exist, particular attention must be paid to their size, the diversity of communities (number of different wetlands), the rare elements they contain and the integrity of these environments. To assess integrity, it is recommended to perform an assessment of the criteria of the table below. Complexes obtaining high values for the first two criteria and low values for the last two will be considered of greater integrity.

Table 20 Criteria for Evaluating the Integrity of a Wetland Complex

Criteria	Precision
Area in wetlands and aquatic environments	Sum of the surface area of wetlands and aquatic environments included in the perimeter, excluding the area of mesic or xeric environments that serve as a buffer or are landlocked.
Connectivity with Natural Environments	Proportion of the perimeter of wetlands in contact with a natural environment (lightly disturbed).
Fragmentation	Number of fragments generated by linear human features, such as logging roads, railways, power transmission lines, artificial drainage ditches and man-made dams.
Human Disturbances	The density (m/ha) of logging roads and the relative area of logging (%) or other human elements as well as the proportion of adjacent land cultivated, developed or modified by logging.

The data collected on vernal ponds will make it possible to know whether it is possible to predict to which type of environment (topography, deposit, drainage, ecological type, group of species) that they generally belong and the value they have as habitats for amphibian and reptile populations in the region. This profile will help the analyst determine whether these wetlands are subject to specific issues.

Analysis Scale

The spatial scale to be used for the analysis of wetlands corresponds to the perimeter of the management unit, including protected areas and landlocked territories. The territory selected must include all tenures (protected or not), without consideration for the uses, operational constraints and productivity of the forest land.

Current State

In order to complete the protection in place and to alleviate human pressure on the most vulnerable or remarkable types of wetlands, additional sites have been identified as **wetlands of interest** (WOI).[28] This addition of wetlands of interest enhances the current protection offer, while contributing to the overall effort to ensure that wetlands are fairly represented as natural environments in the network of protected areas. The following table presents a portrait of wetlands and wetlands of interest in area and in proportion to the reference territory.

Thus, the protected area includes wetlands, as well as 60-metre protection strips, these strips being essential to maintaining the integrity of wetlands. The protected area also includes non-wetlands that may occur within wetland complexes.

[28] New protected area status granted to the legal recognition of small natural sites specially designed to preserve wetlands of interest on forest lands in the domain of the State.

Table 21 Profile of Wetlands and Wetlands of Interest by Management Unit

MU	Reference Territory Area (ha)	Wetland Area (ha)	Percentage of WL Already Protected (%)	Area of Selected WOIs (ha)	Total Area of Protected WL (ha)	Total Percentage of Protected WOIs (%)
071-51	313,400	17,367	29,5	353	5,470	31,5
071-52	588,274	35,937	19,9	371	7,511	20,9
072-51	179,824	11,217	19,1	127	2,277	20,3
073-51	500,222	34,115	10,9	2,333	6,038	17,7
073-52	471,535	45,800	22,2	1,020	10,900	23,8
074-51[29]	1,043,579	107,734	5,1	12,877	7,229	17,1

Objectives

The objectives pursued with respect to wetlands are to ensure that sufficient protections are in place to ensure the maintenance of the ecological functions of high-value wetlands and isolated wetlands.

Wetlands of interest combined with wetlands included in protected areas represent at least 17% of the total area of wetlands in each MU.

The network formed by the riparian wooded strips ensures a certain connectivity between the riparian wetlands on the one hand, as well as between these environments and the residual forest habitat on the other hand. Since most isolated wetlands do not benefit from these protections, special attention must be paid to their immediate environment in order to reduce the risk that these environments will be weakened over time and facilitate their use by wildlife.

Depending on the importance of the issue regarding vernal ponds, efforts may be made to draw up a permanent map of known sites and agree on intervention methods adapted to these environments.

Management Measures

The management measures specify the preferred means to ensure the objectives are achieved. For the issue regarding wetlands, these unfold with the solution of exclusion.

Exclusion

Wetlands are recognized as unique and irreplaceable natural sites. Maintaining them in their natural state, before they are too altered by human activity, is preferable and more economical than restoring them. The concept of wetlands of interest has therefore been put in place to ensure the conservation of environments of high ecological value and of great importance for the maintenance of biodiversity or the quality of their ecological services.[30] The selection of areas of wetlands of interest to be achieved for each reference territory should be oriented in order of priority toward:

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[29] Accuracy for MU 074-51: wetlands of interest were selected to achieve the 17% target in this MU. However, consultation of this selection remains to be done with the community of Lac Barrière.

[30] Wetlands located in protected areas cannot benefit from additional legal status. However, wetlands of interest may include areas subject to regulatory or administrative protection so that they can be recognized as such and facilitate monitoring.

- naturally rare wetland types;
- the types of wetlands threatened with depletion due to human activities (certain types of exploitable peatlands, in particular);
- wetlands that are home to threatened or vulnerable species or other fragile elements;
- wetland complexes comprising sites selected in the previous steps;
- wetland complexes that stand out in terms of diversity and integrity, then those that provide ecological services that are useful to society;
- in the presence of complexes of the same value, the analyst will seek to select them so that they are evenly distributed between and within the catchment areas.

Potentially, proposals for wetlands of interest retained in the PAFIT could be included in the Registre des aires protégées au Québec [Register of protected areas in Quebec].

Stay tuned!
Developments are expected in the coming years regarding the inclusion of wetlands of interest in the Registre des aires protégées [Register of Protected Areas].

Species in need of special attention to ensure their survival

Background

The forest is home to many species of flora and fauna. Forest management operations that alter various forest attributes can impact the abundance, distribution, and survival of these species.

Ecosystem-based management is achieved through forest interventions that maintain a large share of the ecological attributes and functions of natural forests within managed landscapes (Application de l'aménagement écosystémique des forêts | Gouvernement du Québec (quebec.ca)). The Department uses this approach to ensure that habitat characteristics are maintained for the maximum number of forest species. Some species, however, depend on more critical attributes to maintain in a forest management context and therefore require more targeted protection and development actions. As such, in addition to the ecosystem-based management, special intervention and protection measures are applied to species with a precarious status, species of socio-economic interest, and species sensitive to forest management.

Local Analysis of Issues

The issue analysis approach involves ensuring the integration of the needs of species with a precarious status, socio-economic interest and sensitive to forest management.

According to a provincial analysis, the most relevant sensitive species to be used to validate the effectiveness of ecosystem-based management would be the American marten, pileated woodpecker, northern flying squirrel, fisher and ovenbird (Table 22).

The vital needs of these species are well documented. They are likely to react more strongly than other species to changes in the structure, composition and spatial organization of forest stands.

These are associated with critical habitat characteristics for wildlife: old hardwood and mixed stands, complex internal structure, dead wood and closed stands. A management that could satisfy the vital needs of these species would be suited to maintaining the diverse habitat conditions conducive to supporting other species.

Tableau 22 Sensitive species of provincial interest for the assessment of ecosystem-based management targets[31]

Bioclimatic Domain	Espèce sensible	Ecosystem-based issue			
		Age structure	Spatial organisation	Plant composition	Internal structure
Balsam Fir-Paper Birch Forest	American marten	X	X	X	X
	Pileated woodpecker	X			X
	Northern flying squirrel	X		X	X
Balsam Fir-Yellow Birch Forest	American marten	X	X	X	X
	Pileated woodpecker	X			X
	Northern flying squirrel	X			X
Sugar Maple Forest	Fisher	X	X	X	X
	Pileated woodpecker	X			X

[31] BUJOLD (2013)

	Ovenbird	X		X	X

Knowledge acquisition work are ongoing to better document the characteristics of important habitats for these species and estimate critical alteration thresholds relative to natural forests (e.g., minimum area of old-growth forests, minimum percentage of single-growth forests, minimum percentage of softwood forests, etc.).

Objectives

The objective is to ensure that the habitat needs of species with a precarious status, socio-economic interest and sensitive to forest management are taken into account. The strategy for addressing this issue in forest planning has two sub-objectives.

1) Observe the procedures or protection measures associated with wildlife habitats, such as

- white-tailed deer yards
- wildlife sites of interest
- threatened and vulnerable species

2) Consider the habitat needs of sensitive species to document and verify the ecological issues in order to adjust ecosystem-based management targets and solutions so they include these needs

Management Measures

The management measures specify the preferred means to ensure the maintain or the achievement of the objectives. They are deployed based on two solutions, namely exclusion and adapted silvicultural treatments.

Exclusion

Areas of the territory where harvesting cannot occur due to different constraints will allow ecological processes to occur freely and the attributes specific to each of the above issues to develop and perpetuate over time.

Adapted Silvicultural Treatments

The terms and conditions selected or the reference documents where they are recorded are presented to the PAFIT in section 1.4 for the white-tailed deer yards, the wildlife sites of interest and the threatened and vulnerable species.

For sensitive species, some of their habitat needs can be met by the development conditions defined for all the ecological issues previously identified. There are currently no specific terms and conditions for these.

Timber Production Issues

The Québec Timber Production Strategy relies on a forest management approach based on improving the characteristics of trees (their quality[32]) in order to better meet the needs of industry and markets, as well as increasing the quantity of wood available, harvested and processed. The combination of these two elements (quality and quantity) defines the value of the wood available for harvesting.

The section below presents the regional vision, a portrait of the gap between supply and demand at the regional level, the choice of star species as well as the issues and objectives of timber production retained within the framework of the Regional Timber Production Strategies. The indicators and targets selected to meet these objectives are presented in the 2023-2028 Tactical Integrated Forest Management Plans for the Outaouais region. It should be noted that the PAFIT benefit from a periodic update, which will make it possible to improve the Regional Timber Production Strategies, if necessary.

Regional Vision

The Direction Générale des Forêts de Outaouais (DGFo-07, Outaouais Forest Management Department offers an all-encompassing vision, specifying the main objective of the Timber production strategy:

> "In a sustainable development approach, the DGFo manages its forests to promote access to high value forest products today and for future generations. This management aims to obtain the best forest yields for the transformation of wood into sought-after products, thus allowing the forestry sector to prosper."

This vision will be clarified as work progresses in the development of the regional timber production strategy.

Discrepancies Between the Offer and Demand

The profile of the gap between supply and demand is an important input in the process of identifying the issues related to timber production since it makes it possible to assess whether the current supply meets the needs of industrialists in terms of quantity and quality by species or groups of species. It also makes it possible to assess whether all of the volumes of wood produced by the forest on the territory of the management units and planned by the local offices with regard to the targets of the management strategy and the management objectives, are harvested by rights holders and, where appropriate, identify solutions to promote harvesting in the short, medium and long term.

While the forest management strategy and allowable cuts are assigned at the level of the management unit, supply guarantee volumes are allocated at the regional level. The regional scale was chosen to analyze the gap between supply and demand and to have a common basis for the comparison of all the variables.[33]

[32] The quality of wood is defined mainly by its mechanical properties, the quality of its fibre and its appearance.

[33] Additional analyses from the data available at the MU can be carried out as needed to detect issues that may arise at this scale.

In order to identify the issues related to the management of supply and demand, it is important to understand the difference between the main terms used to describe the volumes of wood and their quality. The tables below therefore present a definition for each of them.

Table 23 Terms Used to Qualify Wood Volumes

Term	Definition
Gross allowable cut	Corresponds to the volumes calculated by the BFEC for each management unit and residual forest area. These figures are presented by the Chief Forester when determining the allowable cut.
Net allowable cut	Corresponds to the BFEC allowable cut to which the MRNF's Direction de la gestion de l'approvisionnement en bois (DGAB, Wood Supply Management Department) applies reductions (decay, saw cuts, hardwood sawing scrap and correction for the difference in volume definition gross merchant between the ten-year inventory and the measurement standards). These values are taken from the provincial matrix applied to forecast harvest stock tables.
Attributable Volume	Corresponds to the net allowable cut from which the DGAB, in cooperation with the DGFo, subtracts volumes that cannot be subject to forest rights due to requirements related to forest certification, the terms administration, stratum freezes, firewood harvesting or certain government commitments.
Attributed Volume	Corresponds to the attributable volume (in part or in full) that is subject to forest rights.
Harvested Volume	Corresponds to the volume of wood harvested and measured, which also includes unused ligneous materials.

Table 24 Terms Used to Define the Quality of Wood[34]

Category	Element	Description
Transformable Volume	Peeling	Volume of logs deemed suitable for peeling.
	Sawmills	Volume of logs deemed suitable for the sawmill(s) (logs). Depending on the species, different sawing qualities are considered (Sawmill, F1, F2, F3, F4).[35]
	Pulp	Volume of logs deemed suitable for pulpwood.
	Other	Volume of other products (e.g.: post, shingle).
Non-Transformable Volume	Merchantable branches	Branches from the last forks whose diameter at the end at a distance of 1 m from the fork is at least 9 cm on bark.[36]
	Saw cuts	Proportion of gross merchantable volume reduced to sawdust during harvesting and cutting operations. The proportion being considered is 1%.
	Inventory adjustment	Relative difference in gross merchantable volume between the definition of the inventory and the measurement concerning the minimum diameter of use.[37] The relative reduction to be made varies according to the species and the diameter at breast height of the trees.
	Scrap	Cutting residue deemed unsuitable for processing.

[34] Source: Ministère des Forêts de la Faune et des Parcs (2018).

[35] The Petro grading is a classification of hardwood logs, developed in Quebec by Petro and Calvert 1976). The F1, F2 and F3 classes correspond to the Petro classes from the classification of hardwood logs, and the F4 class corresponds to the addition, by the Ministère des Ressources naturelles et de la Faune, of a "billon" class during the cutting studies carried out during of the 2000s.

[36] Even if the merchantable branches are normally part of the attributable volume, they are generally not transported to the factory and enhanced. For this reason, they have been classified in the non-transformable volume.

[37] 9 cm over bark in the inventory vs 9 cm under bark in the instructions on measuring timber.

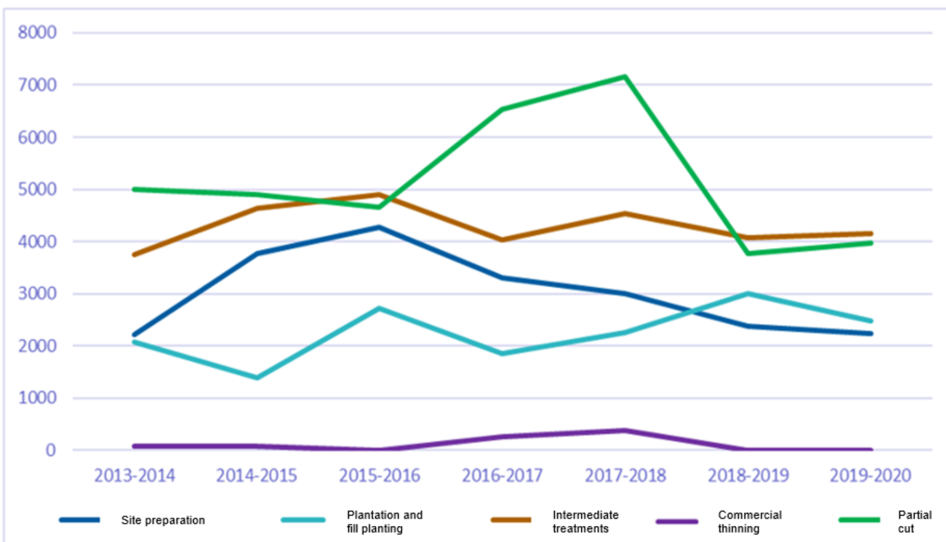
	Decay	Volume of wood considered unsuitable for processing due to deterioration resulting from the activity of fungi which modify its weight, colour, texture and strength.

Assessment of Past Silvicultural Investments

The assessment of the areas having been the subject of silvicultural investments on the territory of the management units of the region shows the efforts made for the establishment and education of regeneration, as well as the levels of partial cuts.

The data used comes from the technical and financial activity report (RATF) and is broken down by type of silvicultural treatment. The following figure presents the annual report of the areas having been the subject of silvicultural investments on the territory of the management units of the region since 2013.

Figure 4 Assessment of the Areas (ha) Having Benefited from Silvicultural Investments on the Territory of the Management Units of the Outaouais region



Intermediate treatments (in plantations and natural regeneration), as well as partial cutting are the most represented in terms of areas having benefited from silvicultural investments. However, there has been a notable drop in the level of partial cuts since 2018. The annual area under site preparation work has been slightly down since 2015 and slightly up for planting work (including planting and refilling). Annual commercial thinning is marginal.

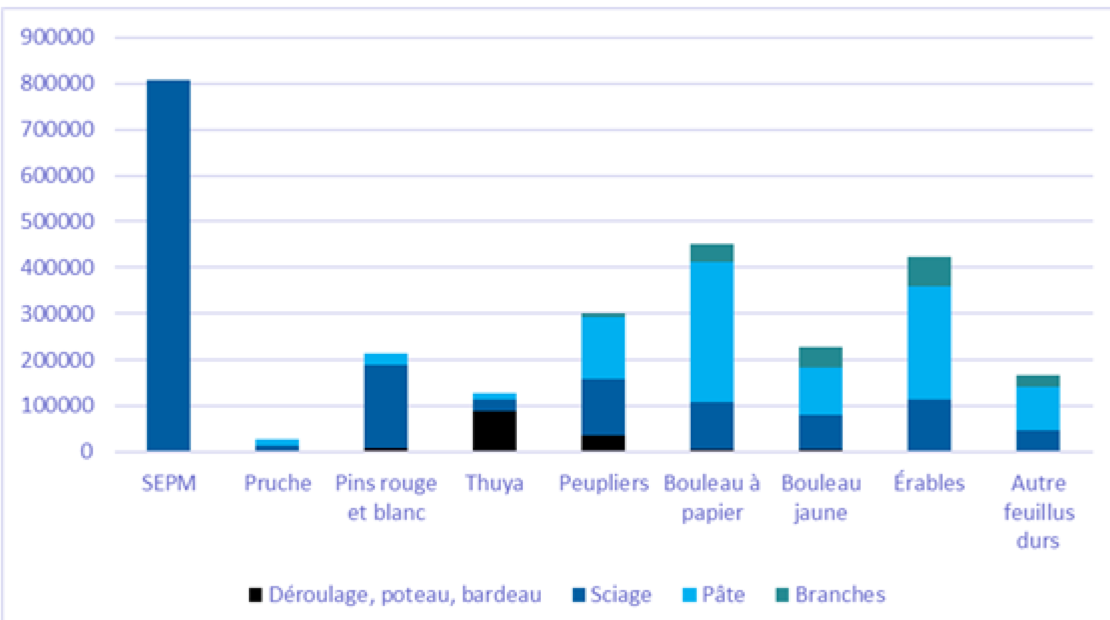
Profile of the Offer

The timber supply corresponds to the net allowable cut of any so-called commercial species, whether or not it currently finds buyers. This is the potential timber material that can be harvested sustainably from the management units in the region. The table and figure below present a breakdown of timber supply at the regional level by species or group of species and detailed according to the estimated quality class (peeling, sawing, pulp and others).

Table 25 Breakdown by Species or Group of Species and Quality Class of the Net Allowable Cut Forecast for the Territory of the MUs of the Region for the Five-Year Period 2018-2023[38]

Species or Group of Species	Quality (m³/year)			TOTAL
	Peeling, post, shingle	Sawmills	Pulp	
SEPM[39]	1,550	805,700	0	807,250
Eastern Hemlock	0	11,950	14,150	26,100
Red and White Pine	7,600	180,300	25,300	213,200
Eastern White Cedar	87,200	26,600	12,650	126,450
Poplars	35,050	123,400	133,500	291,950
Paper Birch	3,950	102,700	304,350	411,000
Yellow Birch	4,850	76,100	103,400	184,350
Maples	0	113,450	245,350	358,800
Other hardwoods	1,300	45,550	95,500	142,350
TOTAL	**141,500**	**1,485,750**	**934,200**	**2,561,450**

Figure 5 Breakdown of Timber Supply Volume by Quality 2018-2023[40] (French only)



On the regional scale, the portion of the sawmill quality of the net allowable cuts represents 58%. The SEPM group dominates this category, followed by hardwoods, red and white pines and poplars. The pulp quality represents 34% of the allowable cuts, coming mainly from hardwood species. The volume of peeling, post, shingle quality represents 5% of the net allowable cuts of the Eastern White Cedar and Poplars. Lastly, the volume associated with branches from hardwoods totals 7% of the net allowable cut.

[38] Source of data: DGAB (2020).
[39] The SEPM Group is a is made up of the following species: Balsam Fir, Spruce, Jack Pine and Larch.
[40] Source of data: DGAB (2020).

Profile of the Demand

Wood demand corresponds to the consumption needs of regional primary processing plants and those located outside the region that obtain their supplies from the regional territory. This profile presents the processing capacity of primary processing plants, their average annual consumption by industrial sector, as well as the contribution of volumes from management units in the region compared with volumes from private forests. It also presents the results of the areas that have been harvested by regeneration cutting and by partial cutting since 2013.

Capacity and Consumption of Primary Processing Plants

It is difficult to respond adequately to the different demands for wood from the region and from outside because of the great diversity of regional forests, the history of preferential exploitation of strata with a high presence of desired species and lack of demand for a variety of species. The very sharp drop in demand for hardwood pulpwood since the closure of the Thurso mill in 2019 has complicated the already difficult situation for primary processing mills.

Rising fuel costs and other transportation costs have also limited the ability of mills located outside the region to have access to quality fibre at a competitive price and those located in the region to obtain supplies from the whole territory.

Several factories closed their doors over the last decade, among them, the sawmill in Rapide-des-Joachims maintained part of its harvesting operations, but the volumes are intended for other factories of the group located out of the region.

For sawn hardwoods, the woods available in the region compete with the woods produced in Ontario and New York State. These imports supplement the supply of quality wood to the mills without generating pulpwood that is problematic to dispose of.

Demand for poplars and pines exceeds regional supply. In addition, these volumes in demand are associated with a large proportion of species less desired, which makes the management of these strata very difficult while ensuring the sustainability of harvests over time.

Wood from private forests is also affected by the problems of lack of market for hardwood pulpwood and the cost of transport. Added to these problems is the decrease in the marketing of timber from private forests, which can be explained by several factors, including the increase in the use of land for purposes other than timber production (conservation, vacationing, hunting, etc.) and the slight increase in prices paid by processing plants. Thus, even if the allowable cut calculated for the private forest is close to 1.6 M m^3/year, the latest reports from the Agence des forêts privées de l’Outaouais present volumes delivered to mills going from 18% to 13% of the allowable cut for the years 2018 to 2020.

Table 26 Average Annual Processing Capacity of Primary Processing Plants in the Region in 2019 (m³/year)[41]

Industrial Sector	Annual Volume of Softwood Permits 2019 (m³/year)	Annual Volume of Hardwood Permits 2019 (m³/year)		TOTAL Volume of Permits 2019 (m³/ha)
		Poplars	Hardwoods	
Pulp, Paper and Boards	45,095	792,340	950,670	1,788,100
Sawmills	1,235,575	15,475	467,750	1,718,800
Other	14,690	-	13,910	28,600

The average annual consumption of primary processing plants in region 07 from 2015 to 2019 is 2,145,846 m³/year. Forty-one percent (41%) of the volumes are hardwood, 34% softwood and 25% poplar.

Table 27 Average Annual Consumption of Primary Processing Plants in the Region and Outside the Region for the 2014-2019 Period (m³/year)[42]

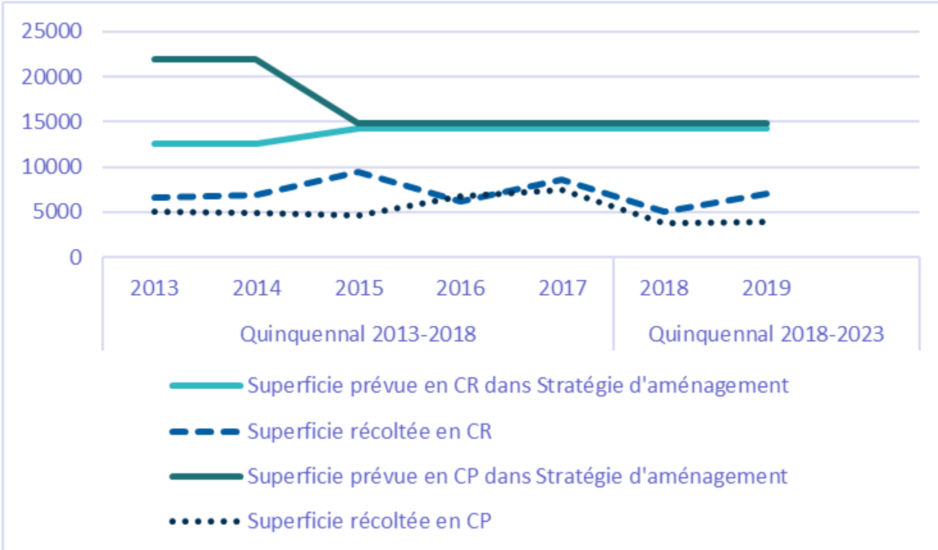
Industrial Sector	Average Annual Softwood Volume 2014–2019 (m³/year)	Average Annual Hardwood Volume 2014–2019 (m³/year)		Total Average Annual Volume 2014–2019 (m³/ha)	TOTAL Volume for 2019 (m³/ha)
		Poplars	Hardwoods		
Pulp, Paper and Boards	63,467	535,250	543,303	1,142,020	1,123,042
Sawmills and Other	548,232	3,438	174,779	726,449	716,970
Regional Private Forest Delivery	68,865		96,591	165,456	-
Private Forest Delivery Outside Region	41,084		70,837	111,921	-
Total Private Forest Delivery	109,949		167,428	277,377	353,499

Harvest Assessment

The assessment of areas that have been harvested by total cutting or partial cutting shows the difference between what was planned in the management strategy and the areas harvested. The areas provided for in the strategy are established in accordance with the allowable cut volumes. The following figure shows the results of areas harvested by regeneration cutting and by partial cutting from 2013 to 2019.

[41] Source: DIRECTION DU DÉVELOPPEMENT ET DE L'INNOVATION DE L'INDUSTRIE (DDII).
[42] Data from the Registre forestier, Consumption Cube, DMIPF, MFFP, June 2020 and DDII.

Figure 6 Partial Cutting (CP) and Regeneration Cutting (CR) Areas Provided for in the Integrated Forest Management Strategies in Comparison with the areas in CP and CR Harvested per Year Since 2013 on the Territory of the MUs of the Outaouais region[43] (French only)



Gap Between the Offer and Demand

In addition to aiming to increase the harvest of available timber volumes, the Regional Timber Production Strategies should look at reducing the gap between the potential offered by the forest and its actual use. This gap is assessed on the basis of data relating to the net allowable cut (supply) and the volumes harvested (demand).

[43]Data source: PAFIT and RATF from 2013-2014 to 2019-2020.

Table 28 Gap Between Supply and Demand on the Territory of Management Units in the Outaouais Region

2013–2018 Period	SEPM	Eastern Hemlock	Pines	Eastern White Cedar	Poplars	Paper Birch	Yellow Birch	Maples	Other hardwoods	TOTAL
Gross allowable cut	795,760	33,680	190,980	122,760	294,740	445,520	230,540	465,980	169,300	2,749,260
Net allowable cut	764,680	33,110	184,920	114,720	276,238	403,738	197,594	411,104	147,874	2,533,979
Attributable Volume	675,863	29,030	161,456	97,555	242,165	305,901	138,963	326,459	113,341	2,090,732
Attributed Volume	406,590	6,700	124,710	47,550	233,600	263,257	77,133	288,520	95,420	1,543,480
Harvested Volume	512,911	4,373	45,563	11,246	197,246	138,357	34,848	188,858	126,321	1,259,723
Attributable Volume/ Net Allowable Cut Ratio	88%	88%	87%	85%	88%	76%	70%	79%	77%	83%
Attributed Volume/ Attributable Volume Ratio	60%	23%	77%	49%	96%	86%	56%	88%	84%	74%
Harvested Volume/ Attributed Volume Ratio	126%	65%	37%	24%	84%	53%	45%	65%	132%	82%
Harvested Volume/ Net Allowable Cut Ratio	67%	13%	25%	10%	71%	34%	18%	46%	85%	50%

2018–2023 Period	SEPM	Eastern Hemlock	Pines	Eastern White Cedar	Poplars	Paper Birch	Yellow Birch	Maples	Other hardwoods	TOTAL
Gross allowable cut	859,800	27,100	223,400	140,000	327,400	499,700	258,400	466,800	189,100	2,991,700
Net allowable cut	807,250	26,100	213,200	126,450	291,906	410,982	184,355	358,767	142,337	2,561,347
Attributable Volume	690,128	20,515	191,413	95,946	260,149	325,403	158,507	317,096	131,001	2,190,157
Attributed Volume	647,100	6,500	152,100	30,250	251,950	290,750	121,500	306,000	125,750	1,931,900
Harvested Volume (2018–2021)	387,518	6,135	61,149	10,698	198,842	145,338	29,004	146,623	93,433	1,078,741
Attributable Volume/ Net Allowable Cut Ratio	85%	79%	90%	76%	89%	79%	86%	88%	92%	86%
Attributed Volume/ Attributable Volume Ratio	94%	32%	79%	32%	97%	89%	77%	97%	96%	88%
Harvested Volume/ Attributed Volume Ratio (2018–2021)	60%	94%	40%	35%	79%	50%	24%	48%	74%	56%
Harvested Volume/ Net Allowable Cut Ratio	48%	24%	29%	8%	68%	35%	16%	41%	66%	42%

Sources: BFEC, BMMB, DGAB

The findings for the two periods (2013–2018 assessment and partial assessment for 2018–2023) show that the forest potential is not used in its entirety.

Different factors explain these regional differences, mainly:

- Factory closures and a lack of buyers to benefit from an optimal industrial structure;
- High proportions of less desirable or non-buyer species, as well as large volumes of pulpwood;
- A high mix of species that creates challenges in the integration of crops;
- A concentration of harvests in areas closer to factories and main roads;
- Harmonization difficulties.

Actions must be put in place to enhance commercial species that are available but little used and increase the potential for certain groups of species.

Star Species

A star species is defined as a species whose value, in particular the potential for transformation and the ability to grow on certain sites, gives it a priority place in the management strategy, among all the species constituting the basket of regional forest products.

The main characteristics of a star essence are:

- Physical properties (density, strength, colour, etc.) that meet a demand on the markets for wood products and give it a higher value than other species;
- Adaptation to the climate and to certain sites in a region;
- Potential for value creation and transformation.

The determination of the so-called "star" species is an important element, because it makes it possible to target the species which constitute safe bets. In order to make the selection, an overall assessment of all the species found in the region was carried out with regard to the following criteria:

- The availability of each species and historical use;
- Assessment of the area with high biophysical potential of each species;
- Industrial demand and consumption (factory needs and harvest);
- Resistance to risks associated with climate change, grazing, insects and pathogens;
- The value of products associated with each species;
- The management effort and success rates of each species, as well as their productivity.

The star species and the reasons that led to the choice are presented below.

Star species	Justification
Yellow Birch	-High value in peeling and sawing qualities -Abundance of sites suitable for species -Ease of adaptation to climate change
Sugar Maple	-Species in demand -High financial value -Good growth potential (productivity) -Abundance of sites suitable for species -Ease of adaptation to climate change
White Spruce	-Species in demand -Abundance of sites suitable for species -Good growth potential
Black Spruce	-Species in demand -Abundance of sites suitable for species
Red Oak	-Species on demand -High financial value -Good growth potential (productivity) -Ease of adaptation to climate change
Poplars (POP)*	-Species in demand -Good growth potential (productivity) -Abundance of sites suitable for species -Easily convertible -Ease of adaptation to climate change

*Precisions for the classification of **poplars** as star species:

- This classification applies only in the fir-yellow birch and fir-white birch sub-domains where it will be favoured over paper birch;
- This classification does not apply in the maple domain;
- This classification will not modify the harvest orders in the partial cuts. Thus, star species, such as sugar maple, red oak, yellow birch and spruce, take precedence over poplar;
- This classification will not lead to an increase in regeneration cuts compared with partial cuts for the other star species in the strata dominated by tolerant species.

Other species are also greatly desired for processing, including white and red pines, which are said to be “to be promoted” and silvicultural treatments aim to increase their proportion in managed stands.[44] In the Regional Timber Production Strategies, pines have no additional production objectives compared with those already defined via the ecological issue related to the plant composition of forests. In addition, the regional silvicultural filter adapts the treatment when the white and red pines and/or red oak reach more than 25% of the basal area to be redirected to irregular shelterwood cutting with slow regeneration or to cutting with a seed bank.

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[44] Reference: Forestry Glossary, available online.

Although the aim is to produce wood and create wealth with all species making up the basket of regional forest products, special attention is paid to star species and species to be promoted in management choices and silvicultural investments.

Selected Wood Production Issues

The three main issues raised in the regional wood production strategy are those related to the productivity, composition and health of the forests. These issues include 11 wood production objectives for which different management methods or actions to be taken have been identified.

1) Issue Associated with Forest Productivity

The first objective of the national timber production strategy[45] is to increase the production of wood with the desired characteristics. The regional timber production strategy takes up this objective and identifies silvicultural solutions influencing these characteristics, such as volumes per hectare, species composition, tree size and the quality of the wood in appearance.

According to the 2013-2018 report produced by the Chief Forester, the unit productivity of management units varies between 0.1 and 2.1 m^3 per hectare per year (m^3/ha/year) at the provincial level, for an average of 1.3 m^3/ha/year. For the Outaouais region, the average is above this provincial average, i.e., 1.5, varying from 1 to 1.7 depending on the MU.[46] Unit productivity per management unit is obtained by dividing allowable cuts by the area over which they are assessed. This measure is dependent on growing conditions, management work carried out and government decisions.[47]

Softwood Species Component

Background

After a first harvest, changes in forest composition are likely to occur. The reduction in softwoods may result from the combined effect of the reduction in seed trees resulting from logging and the relative scarcity of favourable germination beds without measures being taken to ensure their regeneration.

Larger stems ensure a variety of interesting products for processing and reduce the production of chips. Larger diameter stems have a greater proportion of sawing. In addition, the production of wood with larger diameters lowers operating costs by reducing harvesting effort given the distribution of the total equivalent volume over a smaller number of stems.

Local Analysis of Issues

The “Portrait de l’évolution de la forêt publique sous aménagement du Québec méridional des années 1970 aux années 2000”[48] presents the evolution of the standing volume by species based on the compilations of the 1st, 2nd and 3rd ten-year inventories.

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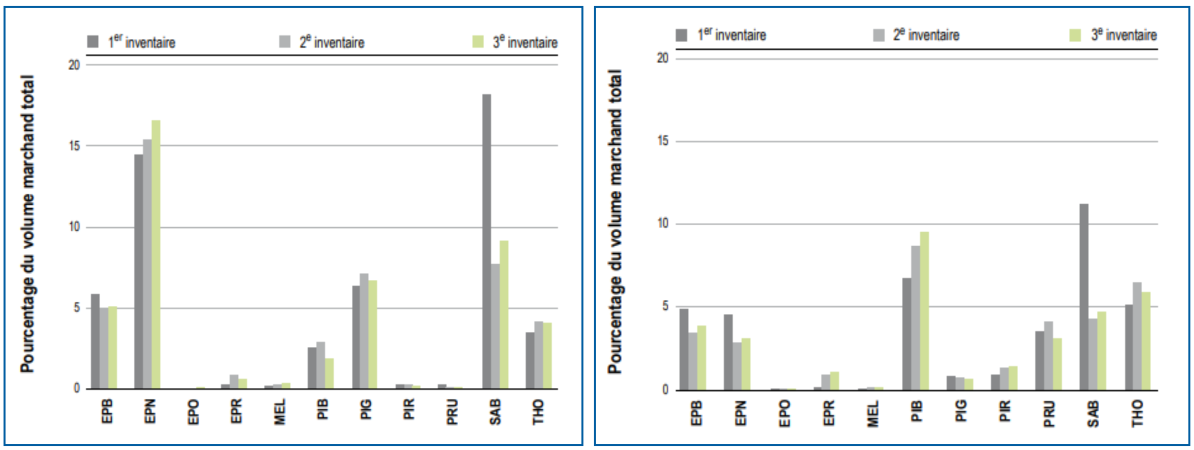
[45] MFFP (2020).
[46] CHIEF FORESTER (2021). Rapports de détermination 2023-2028 pour les unités d’aménagement de la région de l’Outaouais.
[47] Chief Forester (2020).
[48] MRNF (2009).

The relative importance of spruce volumes varies according to the type of spruce for the Western Balsam Fir-Yellow Birch subdomain and the Western Sugar Maple-Yellow Birch subdomain (Figure 7).

For the Western Balsam Fir-Yellow Birch subdomain, the volumes of White Spruce and Red Spruce decreased, while those of Black Spruce were more abundant in the third inventory than during the first two inventories. For the Western Sugar Maple-Yellow Birch subdomain, the volumes of Black Spruce and White Spruce decreased, while those of Red Spruce were more abundant in the third inventory than during the two first inventories.

Figure 7 Changes in the Volume of Softwood Species for the Western Balsam Fir-Yellow Birch Subdomain (a) and the Western Sugar Maple-Yellow Birch Subdomain (b) (Images taken from the MRNF, 2009) (French only)

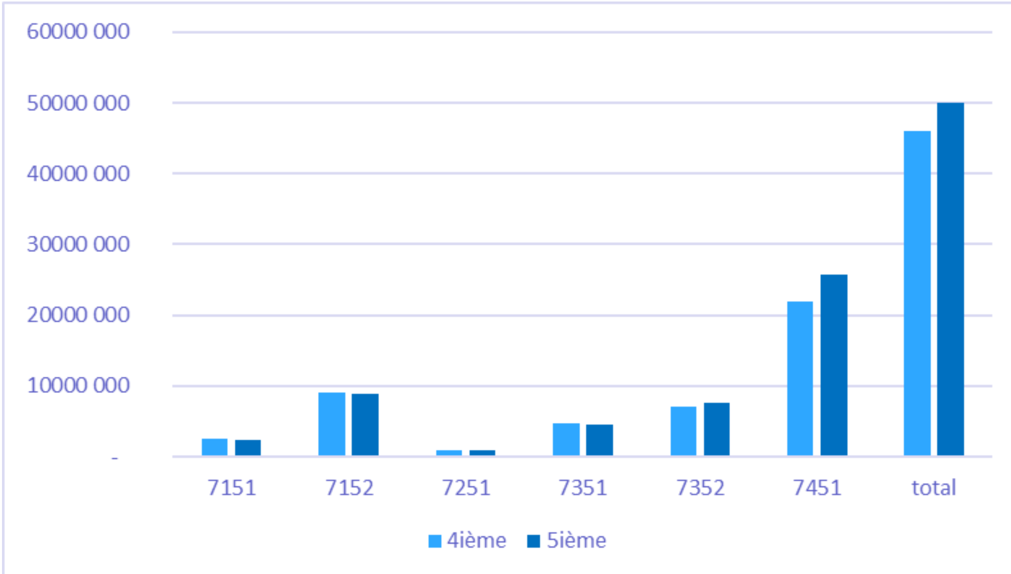


(a) (b)

At the regional level, the data come from the comparison of the inventory programs of the 4th and 5th ten-year inventory. The 5th ten-year inventory allowed to obtain the most recent data currently available.

The following figure shows the changes in spruce volumes between the 4th and 5th ten-year inventory. Overall, we note that spruce volumes are stable with a slight increase from the 4th ten-year inventory to the 5th ten-year inventory. This increase is mainly observed in MU 074-51.

Figure 8 Profile of the Changes in Spruce Volumes (m³) Between the 4th and 5th Ten-Year Inventories[49]



In a context of climate change and in the face of other composition and health issues (see following sections), efforts are being considered to maintain these proportions in the future. Referring to Table 28 of the supply/demand gap analysis section, the SEPM group remains a group of species of interest for harvesting.

The report of the Study Commission on the management of Quebec's public forests[50] presented the observation that the quality of trees harvested had considerably decreased for the 1977–2002 period. Several factors influence the quality of SEPM stems, among others, the average volume per rod and the diameter of the stems.

This report also showed that in Quebec, the average volume of resinous stems (SEPM group made up of fir, spruce, jack pine and larch) at harvest had gone from 170 dm^3/stem in 1977 to 110 dm^3/stem in 2002. In the Outaouais region, they went from 205 to 151 dm^3/stem during these same 25 years, i.e., a drop of 26%.

Objectives

Within the framework of the regional timber production strategy, the objectives set in relation to the issue of productivity are to maintain or increase the production of the star softwood species, increase the average volume per stem of softwood star species and increase the production of quality start species softwood lumber.

[49] Source of data: Direction des inventaires forestiers (2022).

[50] Commission d'étude sur la gestion de la forêt publique québécoise (2004).

Management Measures

- Carry out basic or intensive spruce plantations. These treatments make it possible to increase wood production per unit area, compared with that of the natural forest. Plantation maintenance work will be necessary to allow the seedlings planted to remain free to grow, which will ensure long-term yields;
- In softwood stands resulting from plantations or having benefited from pre-commercial thinning, carry out commercial thinning. Commercial thinnings make it possible to concentrate growth on a limited number of stems, thus providing increased growth space allowing the diametrical increase of the thinned stems.[51] They also help maintain tree vigour and reduce the mortality rate in the residual stand;
- Respect the ages of maturity by type of forest and by bioclimatic domain according to the growth potential of the stands.[52]

Hardwood Species Section

Background

The Portrait de la forêt feuillue et mixte à feuillus durs au Québec: Survol historique[53] (Profile of the Hardwood Forest and Mixed-to-Hardwoods Forest in Quebec: A Historical Overview) report that in the past, the targeted harvesting of certain species and certain partial cuts have impoverished or degraded several forest stands in southern Quebec. These harvests have changed the composition of the stands and reduced the number of vigorous quality stems that compose them.

In most regions, the surplus of low-quality stumpage constitutes a real obstacle to the silviculture of hardwoods. Thus, the timber production strategy aims to increase the value of hardwood forests by increasing the production of valuable species and the quality of the stems produced.

Several initiatives have been launched over the past few years to document and address issues relating to hardwood forests, including the establishment of the hardwood forest project, the Comité sur l’impact des modalités opérationnelles des traitements en forêt feuillue (CIMOTFF, Committee on the impact of operating conditions of hardwood forest treatments), as well as the working group and sub-group of the Cellule d’intervention sur la vitalité de l’industrie forestière (Intervention Unit on the vitality of the forest industry) in the Outaouais and Laurentides regions.

Total cut harvesting carried out in the past in softwood and mixed softwood-dominated stands favoured the development of White Birch and Poplar. To enhance this resource, a poplar processing plant was set up, a plant that also consumes Paper Birch. The timber production strategy must therefore provide for interventions fostering poplars in order to ensure their long-term production.

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[51] LATRÉMOUILLE and LAROUCHE (2014).
[52] See Subsection 1.2.2.1 of the tactical integrated forest management plans 2023–2028.
[53] BOULET and PIN (2015).

Local Analysis of Issues

The phenomenon of the decline of sugar maple combined with that of the proliferation of American beech in maple stands raises many questions and has worried planners for several years. In 2017, the Forest Research Department of the MRNF published a scientific opinion documenting these phenomena.[54] Sugar maple was present in just over half of the productive forest stands in the northern temperate zone of Quebec during the 1990–2002 period, and it represented 14% of the total merchantable volume. Since the 1970s, the relative density (proportion of the number of stems represented by a species) and the relative abundance in basal area (proportion in basal area represented by a species) of maple have decreased in the majority of sub-regions of the Sugar Maple-Yellow Birch and Balsam Fir-Yellow Birch domains. The succession index developed to describe the compositional changes taking place in the stands reveals that the recruitment of young sugar maple stems is insufficient to ensure the future maintenance of the representativeness of the species in the forest canopy. Silvicultural actions are therefore necessary to promote the development of sugar maple.

For the quality aspect of the wood, the proportion of quality sawing (A and B) represents on average 25% for sugar maple, yellow birch and red oak according to measurement data for the 2013-2018 period.

Objectives

The productivity objectives for hardwood species are to maintain or increase production of star hardwood species, increase production of quality timber from star tolerant hardwood species and rebuild forest capital in depleted and degraded forests.

Management Measures

In tolerant hardwood stands:

- Carry out site preparation, fill planting or intermediate treatments aimed at promoting the growth and regeneration of sugar maple, yellow birch and red oak;
- Carry out selection cutting, commercial and/or differentiation thinning;
- Preserve a sufficient residual basal area in desired quality species after cutting for commercial thinning, differentiation thinning, selection cutting and irregular shelterwood cutting with permanent cover in order to ensure the sustainable nature of timber production.
- Respect a rotation schedule before intervening in stands treated with partial cutting (selection cutting and irregular shelterwood cutting with permanent cover);
- Review the criteria associated with regeneration (seedlings and sapling) before cutting;
- Define the procedures for applying commercial or differentiation thinning treatments for tolerant and low-tolerant hardwood stands;
- Improve the decision-making flowcharts for the silvicultural treatments to be applied in sugar bushes and yellow birch stands (hardwood and mixed) according to the advancement of new

[54] DIRECTION DE LA RECHERCHE FORESTIÈRE (2017).

knowledge and review the methods of application of irregular progressive cutting with slow regeneration;

- During forest monitoring, analyze the combinations of treatments carried out in relation to the target composition that do not meet the success criteria for forest monitoring and identify possible solutions;
- Continue the process of documenting the discolouration and mineralization of sugar maple;
- Track sustainability indicators[55] and set targets afterward;
- Develop an identification key for depleted and degraded strata in order to characterize them and complete the portrait of the state of the forest in each MU. Develop a specific strategy for these stands.

In poplar hardwood stands and poplar softwood stands:

- Carry out precommercial thinning work;
- Target poplar stands aged 90 years and over for an increased harvest from 2023 in MUs 071-51, 071-52 and 074-51 in order to avoid significant losses of areas in poplar production. This increased harvest should favour a return to poplar to the detriment of a natural succession dominated by balsam fir and paper birch.

2) Issue Related to Forest Composition

Softwood Species Component

Background

Invasion by balsam fir can first be observed at the regeneration stage, following the cutting of a stand composed of spruce or other softwoods. Balsam fir typically produces very dense, shade-tolerant seed banks that can quickly dominate the site after disturbance. When pre-established fir regeneration is abundant, cutting can promote an increase in the proportion of fir in the dominant canopy. After a first harvest, changes in forest composition are likely to occur. This phenomenon occurs to the detriment of black spruce, red spruce, white spruce, white pine, hemlock and cedar, depending on the sites.[56]

Although fir is an “acceptable” species, it is less desirable and of lower value compared with spruce.[57] Its proportion influences processing costs (up) and the value of the basket of products (down).

[55] See Subsection 1.2.2.1 of the tactical integrated forest management plans 2023–2028
[56] MFFP (2016).
[57] BUREAU DE MISE EN MARCHÉ DES BOIS (gouv.qc.ca)

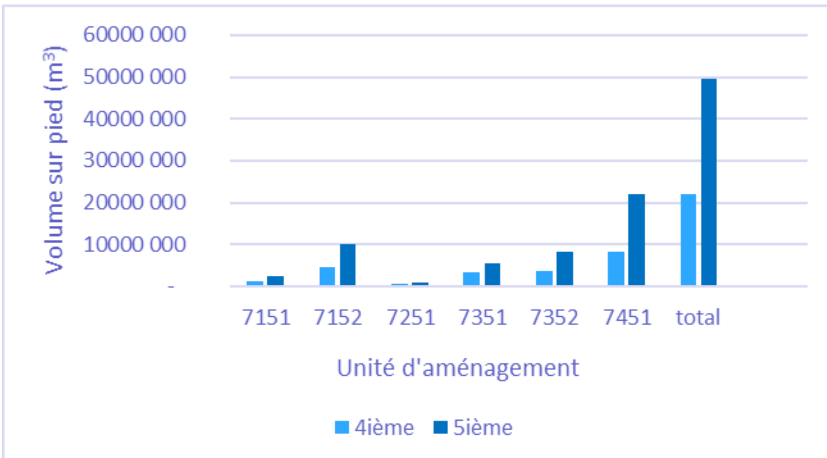
In softwood stands, leaf cover combined with weak pre-established regeneration have also adversely affected the development and maintenance of stands dominated by softwoods. Invasion by intolerant hardwoods depends on the type and season of harvest, pre-cut composition, ongoing regeneration, and the frequency of natural and human disturbances.

Local Analysis of Issues

The evolution of standing fir and spruce volumes and the evolution of areas dominated by softwoods are used to analyze the issue.

The following figure shows a significant increase in fir resulting from the last spruce budworm outbreak. The increase in the growing stock from one decade to another varies from one MU to another (north-south gradient), but overall, for the region, there is a strong increase during the last decade corresponding to more doubled, going from 21,974,075 m^3 in the 4th ten-year inventory to 49,432,165 m^3 in the 5th ten-year inventory.

Figure 9 Profile of the Changes in Volume in Fir Between the 4th and 5th Ten-Year Inventories



According to the compilations of the 4th ten-year inventory, the fir/spruce ratio in terms of gross standing merchantable volume was 53%. This ratio rose to 99% with the data for the 5th ten-year inventory.

Table 29 Gross Merchantable Volume of Spruce and Fir Trees (compilation of the 4th and the 5th ten-year inventory)

Ten-year inventory	Species	071-51	071-52	072-51	073-51	073-52	074-51	Total
4th	Spruce	2,504,395	9,083,652	822,220	4,780,687	7,023,336	21,887,532	46,101,822
	Balsam Fir	1,339,756	4,455,222	611,001	3,438,302	3,744,732	8,385,061	21,974,075
	Balsam Fir/Spruce Volume Ratio	53%	49%	74%	72%	53%	38%	48%
5th	Spruce	2,349,937	8,890,403	917,454	4,505,922	7,650,562	25,725,521	50,039,801
	Balsam Fir	2,418,780	10,022,575	914,155	5,587,428	8,333,899	22,155,328	49,432,165
	Balsam Fir/Spruce Volume Ratio	103%	113%	100%	124%	109%	86%	99%

Evolution of Areas by Type of Cover

On the scale of the bioclimatic subdomains, the profile of the changes in areas of the type of coniferous cover from the 1st ten-year inventory to the 3rd ten-year inventory[58] shows that the dominance of the coniferous cover is tending to decrease, as is the area of the coniferous stands.

In the Western Balsam Fir-Yellow Birch stand, a decrease in the areas of spruce and fir stands was observed, accompanied by an increase in the areas of intolerant hardwood stands. Since the first forest inventory, the relative importance of areas of the softwood cover type has decreased by 8% in favour of the deciduous, mixed and regenerating cover types.

In the Western Maple-Yellow Birch stand, since the first inventory, the relative importance of the areas of the softwood cover type has decreased by 10%, to the benefit of that of the areas of the hardwood cover type, which increased by 9%. The relative importance of the areas decreased for all the synthetic groups of species dominated by conifers between the first and the third inventory.

Regionally, there was a 7% decline in the “softwood” cover type between the 1st and 2nd ten-year inventory to the benefit of hardwood and mixed covers. Subsequently, the proportion of the type of softwood cover stabilized following the passage of SBW in the 1970s. The most recent ten-year inventory shows a slight increase, mainly due to the reconstruction of fir forests since this last epidemic.

[58] MRNF (2009).

Table 30 Change in the Types of Cover Between the 1st and 5th Ten-Year Inventories[59]

Management Unit	Types of Cover	Ten-Year Inventories									
		1st		2nd		3rd		4th		5th	
		Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
71	Hardwood	216,936	32%	292,982	43%	297,155	43%	266,706	39%	294,450	44%
	Mixed	289,894	42%	260,234	39%	310,422	45%	335,851	49%	278,460	42%
	Softwood	181,071	26%	122,510	18%	83,545	12%	82,646	12%	97,900	15%
		687,900	**100%**	**675,726**	**100%**	**691,122**	**100%**	**685,202**	**100%**	**670,810**	**100%**
72	Hardwood	72,760	59%	79,027	65%	75,184	61%	72,025	59%	83,700	68%
	Mixed	39,623	32%	35,113	29%	40,006	32%	45,657	37%	30,100	25%
	Softwood	9,951	8%	8,061	7%	8,430	7%	5,261	4%	8,600	7%
		122,335	**100%**	**122,201**	**100%**	**123,621**	**100%**	**122,943**	**100%**	**122,400**	**100%**
73	Hardwood	172,775	26%	285,444	44%	288,288	43%	251,038	38%	288,620	45%
	Mixed	305,434	46%	254,794	40%	275,593	42%	311,041	47%	240,970	38%
	Softwood	184,288	28%	103,292	16%	99,130	15%	97,715	15%	109,200	17%
		662,496	**100%**	**643 53**	**100%**	**663,011**	**100%**	**659,794**	**100%**	**638,790**	**100%**
74	Hardwood	106,173	13%	273,504	37%	304,585	40%	189,118	24%	177,960	23%
	Mixed	449,847	57%	260,351	35%	260,689	34%	87,608	49%	328,850	43%
	Softwood	232,980	30%	211,927	28%	205,332	27%	213,580	27%	255,790	34%
		789,001	**100%**	**745,782**	**100%**	**770,606**	**100%**	**790,306**	**100%**	**762,600**	**100%**
Total	Hardwood	568,644	25%	930,958	43%	965,211	43%	778,887	34%	844,730	38%
	Mixed	1,084,799	48%	810,492	37%	886,710	39%	1,080,157	48%	878,380	40%
	Softwood	608,290	27%	445,791	20%	396,438	18%	399,202	18%	471,490	21%
		2,261,732	**100%**	**2,187,240**	**100%**	**2,248,359**	**100%**	**2,258,245**	**100%**	**2,194,600**	**100%**

Selected Objectives

In order to respond to the spruce composition issue, the following two objectives have been retained within the framework of the regional timber production strategy: increase the proportion of spruce to fir and maintain stands dominated by softwood on suitable sites.

The identification of suitable sites makes it possible to predict the selection of suitable sites for reforestation in the context where only a portion of the areas harvested in the even-aged strata is subject to it. The identification of these sites also allows some predictability on the accesses required and to be maintained for the application of such silvicultural scenarios.

In a context of climate change in which the proportion of hardwoods tends to increase, the objective is therefore to concentrate investments dedicated to the management of softwoods on the best sites for the production of these species.

[59] Source for Inventory 1 to 4 data and for 5th ten-year inventory: Direction des Inventaires Forestiers.

Management Measures

- Spruce planting scenarios are the main elements retained to achieve these objectives.
- Carrying out non-commercial work in sites conducive to naturally regenerated softwoods will contribute more marginally to the achievement of these objectives. This work promotes the growth of spruce stems and allows them to grow freely and ultimately maintain stands of pure or predominantly softwood.

Tolerant Hardwood Component

Background

Three main factors that affect the composition of the hardwood forest are identified as part of the Regional Timber Production Strategies, discolouration and Mineralization of Sugar Maple, Beech and red maple invasion.

Discolouration and Mineralization of Sugar Maple: Heartwood staining in sugar maple is a natural process related to crown wounds (slow healing of broken branches, pruning defects) as well as trunk wounds (splits, frostbites and logging wounds). In addition to staining, sugar maple wood sometimes has longitudinal spots or stripes called "mineralization spots". The various studies carried out on the subject in Quebec have shown that the age of the stems as well as their growth and station conditions have an impact on the level of colouration observe.[60]

Beech Invasion: Since the 1970s, we have witnessed the decline of certain maple stands, particularly those located on soils relatively poor in nutrients. Opportunistic secondary species better adapted to the site, notably American Beech, would benefit from the additional light supply to the soil and the increased mortality of maple regeneration. Consequently, a cohort of beech saplings is developing rapidly in several maple stands in Quebec, causing an imbalance in the structure and a change in the composition of the stands. In the southern management units of the region, tolerant hardwood stands dominated by sugar maple are generally invaded by beech.

Sugar bushes with 15% or more of the basal area in American Beech in the upper canopy are considered to be at high risk of American Beech invasion and mortality losses associated with beech bark disease. At this level of 15%, we generally observe abundant regeneration (seedlings and sapling) in American Beech, it is often over-represented compared with that of the desired species, including sugar maple.[61]

Red Maple Invasion: One of the most drastic changes to the forests of North America during the 20th century is the increase in Red Maple.[62] It now dominates several stands of oak, pine and other hardwoods. Its growing importance in forest ecosystems since the early 1900s is attributable not only to disturbances, but also to the abandonment of agriculture, the fight against forest fires for examples. After cutting, the growth space occupied by the shoots of red maple stumps is at least three times greater than that occupied by the other species grouped together. The superior capacity of the species

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[60] OUIMET and SAUCIER 1994 and HAVRELJUK et coll. (2013).
[61] BILODEAU-GAUTHIER et coll. (2021).
[62] LORIMER (1984).

to regenerate by sprouts is fostered following cuttings, which have allowed a strong recruitment of small stems in the lower levels.

Red maple is an undemanding, opportunistic and "super-generalist" species. It is difficult to remove once established. The species tolerates a wide variety of seedbeds and various drainage conditions. In particular, it is more shade-tolerant than other pioneer species such as Pin Cherry and Trembling Aspen.[63] Future climatic conditions do not seem to affect it and if we rely on its increase in the Northeastern United States, the growing conditions in the Outaouais will be even more favourable to it.

Local Analysis of Issues

Discolouration and Mineralization of the Sugar Maple

For all hardwood species used as appearance wood, the colour of the wood has a significant influence on the value of the boards produced. Discolouration of hardwoods, in addition to that associated with the formation of heartwood, can also develop as a result of wounds on trunks or breakage of branches.

Sugar maple rated high in stumpage quality can have a very different value when sawn, depending on the extent of internal staining of its wood. This varies according to trees and regions.[64] The development and silviculture of maple stands can take this particularity into account.[65]

The more difficult growing conditions encountered near the northern limit of the sugar maple range result in the development of lower quality logs. Discoloured sawn timber fetches lower market prices. Due to its higher selling price, light sugar maple wood (sapwood) is sought after by manufacturers. It has also been shown that the proportion of staining increases with the age of the stems as well as their growing conditions.[66]

According to Ouimet and Saucier[67], wood mineralization in sugar maple is formed by polyphenols and precipitates of potassium, magnesium and mainly calcium and is attributable to injuries caused by various agents and factors. According to the authors of the study conducted in the Outaouais region, it is the growth conditions and soil fertility that are the main factors related to mineralization. The ecological parameters reflecting the fertility of the soil, directly associated with the growing conditions (type and thickness of humus, drainage, physico-chemical properties), are closely linked to the rate of mineralization. This increases with the degree of podzolization and the accumulation of organic matter in the dead cover. The thickness of the humus, the quality class of the stem and the geological nature of the bedrock provide a first approximation of the mineralization rate of sugar maples in this region of Quebec. In the Outaouais region, their results showed that stem quality class D has an average mineralization rate of 60%, twice as much as the other quality classes.

For the Outaouais region, a zone of greater discolouration and mineralization was identified in the Balsam Fir-Yellow Birch domain in MUs 073-52 and 074-51. Since the forestry crisis of the 2000s, the work planned in the sugar bushes and stands of tolerant hardwoods in these MUs has only been very

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[63] Publications du quebec.gouv.qc.ca - Red Maple
[64] ACHIM et coll. (2010).
[65] MRN (2013).
[66] HAVRELJUK et coll. (2013), BARAL et coll. (2013).
[67] OUIMET et SAUCIER (1994).

partially carried out due to the difficulty of profitably transforming the sawlogs harvested and the difficulty in selling pulpwood generated by the planned work.

Due to the greater discolouration of the larger logs, the sugar maple harvesting diameter is set below the diameter of financial maturity proposed by the report of the Committee on the impact of operating conditions of hardwood forest treatments.[68] On sites favourable to yellow birch, the objective will be to increase the proportion of this species in these stands.

Invasion of Tolerant Hardwood Stands by American Beech

As mentioned in the previous issue, the decline of sugar maple and the invasion of American beech in forest stands have been documented phenomena for several decades across the Northeastern United States. Selective logging in stands dominated by sugar maple has long had the effect of leaving a larger proportion of beech trees standing after logging. This companion species of the sugar bush is found at the northern limit of its distribution area in Quebec and is generally not valued by the sawmill industry. In many maple stands, beech regeneration dominates the understory, limiting the development of sugar maple. In fact, since the early 1990s, several studies have shown an increase in beech seedlings and young trees in Quebec maple stands. During the same period, other studies in sugar bushes reported a decrease in sugar maple regeneration as well as stem dieback and an increase in mortality.

The following figures are taken from the scientific advisory “Expansion du hêtre à grandes feuilles et déclin de l’érable à sucre au Québec: portrait de la situation, difficultés, défis et pistes de solution”[69] [Expansion of American beech and decline of sugar maple in Quebec: portrait of the situation, difficulties, challenges and possible solutions], produced by the DRF. These figures present the average variation in the number of beech (Figure 10) and sugar maple (Figure 11) stems in the inventory plots of the 2nd ten-year forest inventory compared with the 4th ten-year forest inventory. They highlight the increase in beech and the decrease in sugar maple in 20 years.

[68] SAUCIER et coll. (2014)

[69] DIRECTION DE LA RECHERCHE FORESTIÈRE (2017).

Figure 10 Average Change in the Number of Beech Stems in Parcels in the 2nd and 4th Ten-Year Forest Inventories (French only)

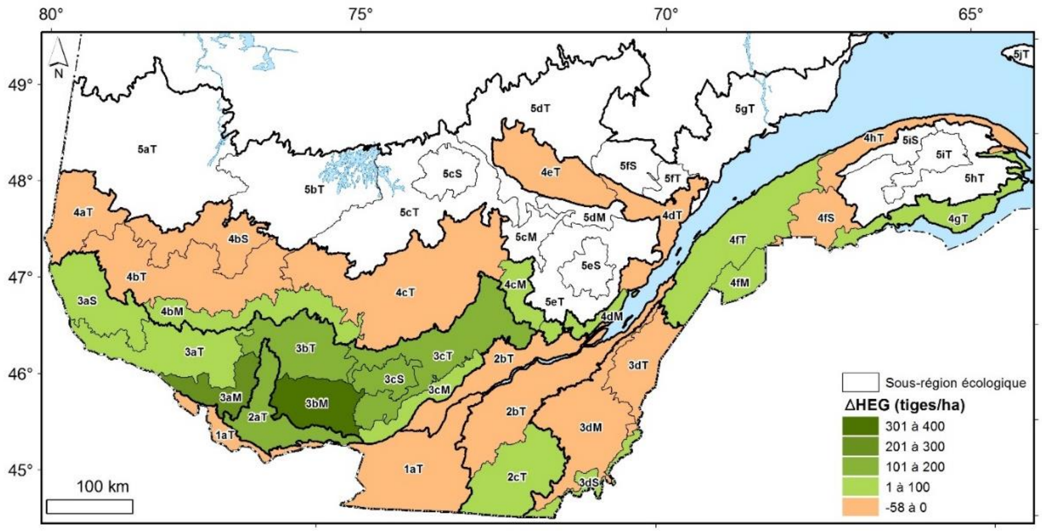


Figure 11 Average Change in the Number of Sugar Maple Stems in Parcels inn the 2nd and 4th Ten-Year Forest Inventories (French only)

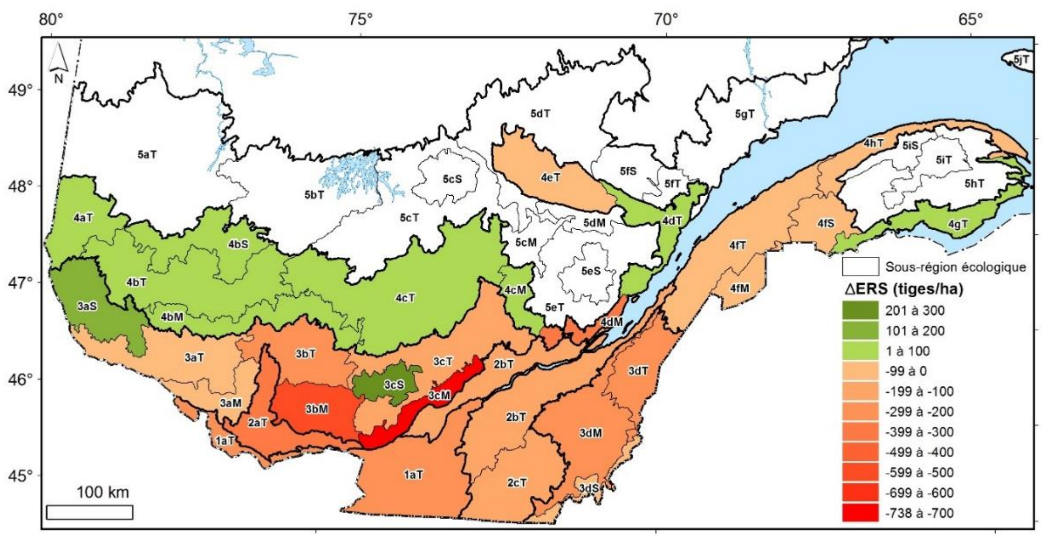


Table 31 presents, by MU, the breakdown of maple stand areas, of which the proportion of total basal area occupied by American Beech exceeds 15% for the 4 MUs in the southern part of the region.

Table 31 Maple Stand Areas Where the Proportion of the Total BA Occupied by Beech Exceeds 15%

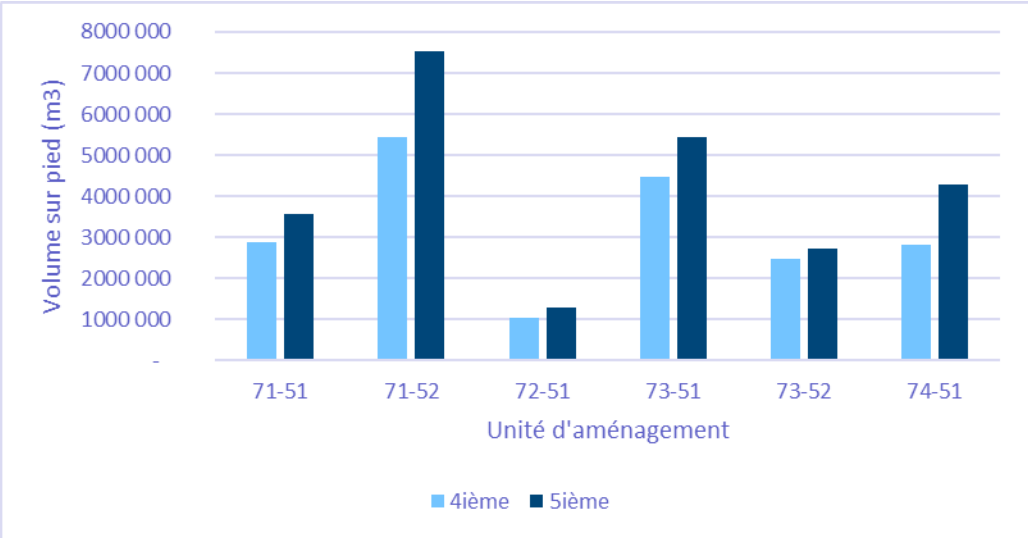
MU	Area (ha) +15% total basal area of American Beech	Proportion of Maple Stands Affected
071-51	32,526	33%
071-52	24,340	27%
072-51	18,236	21 %
073-51	44,521	31%
Total	**119,623**	**29%**

Nearly a third of the sugar bushes in the south of the region have a basal area of beech greater than 15% of the total basal area.

Invasion of Tolerant Hardwood and Softwood-Tolerant Hardwood Stands by Red Maple

Little sought after for processing due to its poor quality, red maple is on the increase in several types of forests due to previous partial disturbances that have favoured its maintenance and reproduction. The compilations of the 4th and 5th ten-year inventories show an increase in Red Maple on the territory of all management units in the region.

Figure 12 Profile of the Changes in Volume of Red Maple Between the 4th and 5th Ten-Year Inventory



Selected Objectives

The objectives of the timber production strategy in the face of these hardwood forest composition issues are to increase the proportion of yellow birch in the maple discolouration and mineralization zone, to reduce the proportion of American beech in tolerant hardwood stands and reduce the proportion of red maple in tolerant hardwood and softwood tolerant hardwood stands

These objectives aim to promote the regeneration and growth of tolerant hardwoods star species and to reduce the presence of less desirable species in managed forests.

The anticipated effects of climate change on the future of the red maple habitat, which seem favourable for the future, limit us in our objective of reducing the presence of the red maple on the areas developed in partial cutting in the forest types of tolerant hardwoods and softwood-tolerant hardwoods. This development aims to promote tolerant hardwoods such as sugar maple, yellow birch and red oak to allow them to occupy a larger share of the future stand. The relative abundance of red maple in a stand is also concomitant with a decline in biodiversity and in the production of quality timber.

Management Measures

- Define a strategy for the management of sugar maple, red maple and yellow birch in the maple staining and mineralization zone. Continue the documentation approaches for Sugar Maple coloration and mineralization.
- Carry out site preparation, fill planting and/or intermediate treatments (release, cleaning, precommercial thinning, training) aimed at promoting sugar maple, red oak and yellow birch. This work will allow to reduce the quantity of American Beech after treatment. Release and cleaning are intended to clear regeneration and competitive sugar maple saplings caused by American Beech stems;
- In stands of tolerant hardwoods and softwood-tolerant hardwoods treated in partial cutting, reduce the proportion of red maple and American Beech in the stand and monitor the evolution of the proportions after cutting.
- Perform slow regeneration irregular shelterwood cutting in the Maple-American Beech and American Beech stands to salvage the mortality associated with beech bark disease within the next 20 years (in a context with a pulpwood buyer).

3) Issue Related to Forest Health

Two major disturbance agents currently affect forest health: spruce budworm and beech bark disease.

Spruce Budworm

Background

The spruce budworm is an insect pest that has a major impact on the vitality and growth of stands made up of balsam fir, white spruce and black spruce. A native insect, the spruce budworm plays an important ecological role in the rejuvenation of softwood forests, mainly in the bioclimatic domains of fir forest. This defoliating insect feeds mainly on new fir needles (by far its favourite host) and spruce. Historically, SBW populations reach the epidemic stage at intervals of thirty to forty years, the time to reconstitute sufficient fir volumes to support a new epidemic. In the Outaouais region, the history of preferential harvesting of pines and spruces has favoured the regeneration of fir, which was very affected by the epidemic of the 1970s, which led to an increase in stands of intolerant hardwoods and mixed stands.

A new SBW epidemic is currently raging in Quebec. In the west of the province, the epidemic began in Abitibi-Témiscamingue in 2007, where during the first years, it progressed only a few kilometres annually, while intensifying. Since 2015, the epidemic has been progressing rapidly eastward and has reached the Outaouais in 2018. In 2021, the areas affected reached 12,229,847 ha, including more than one million hectares with varying degrees of defoliation in the Outaouais forest region.[70] This insect poses a threat to forests dominated by balsam fir and white spruce. Indeed, the region's fir forests have recovered following the epidemic that raged in the 1970s and they are again threatened by

[70] MFFP (2021).

SBW. The objective pursued is therefore to minimize the effects and repercussions of the epidemic on the volumes of fir and spruce wood[71], the hosts of this insect.

Local Analysis of Issues

A map of the area defoliated annually is updated by the Direction de la protection des forêts (DPF, Forest Protection Department). Valid for 2021, this is presented in “Profile of the Territory and its Occupants” document. The following table presents the regional assessment of these areas by class of defoliation by management unit. In total, more than 1 million hectares suffered defoliation in 2021. Defoliation is assessed as light over 64% of this area, while moderate and severe defoliation represent 34% and 3% respectively. The most affected management units are 074-51, 073-52 and 071-52 totalling more than 97% of the defoliated area of the entire region.

Table 32 Area (ha) Affected by SBW from 2019 to 2021 in the Outaouais Region by Management Unit, by Defoliation Class

MU	Year	Defoliation Class			Total
		Slight	Moderate	Severe	
071-51	2021	622	-	-	622
	2020	4,855	7	-	4,862
	2019	-	-	-	
071-52	2021	155,253	37,842	7,221	200,316
	2020	127,007	63,005	580	190,593
	2019	1,227	-	-	1,227
072-51	2021	-	-	-	-
	2020	-	-	-	-
	2019	-	-	-	-
073-51	2021	23,157	539	-	23,696
	2020	7,062	-	-	7,062
	2019	-	-	-	
073-52	2021	204,340	96,571	1,599	302,509
	2020	142,034	158,931	3,004	303,969
	2019	75,486	23,714	2,095	101,294
074-51	2021	268,469	211,142	17,952	497,564
	2020	280,561	38,916	-	319,476
	2019	7282	-	-	7,282
R07	2021	651,842	346,093	26,772	1,024,707
	2020	561,519	260,859	3,584	825,962
	2019	83,995	23,714	2,095	109,804

[71] MFFP (2014).

Vulnerability expresses the probability that trees will die after several consecutive years of severe defoliation caused by SBW. In general, vulnerability is the result of the conditions that favour or do not favour repeated defoliation and the ability of the tree to survive it. The notion of vulnerability applies to the scale of the tree and can, by extension, apply to the scale of the stand, the landscape or a territory. It makes it possible to identify and classify[72] the areas most at risk of serious decline and thus direct harvests.

At the stand level, susceptible species may be considered vulnerable to varying degrees. The decreasing order of species vulnerability is balsam fir, white spruce, red spruce and black spruce. The variables used to assess vulnerability are the importance of the fir tree in the forest composition (spruces are not considered highly vulnerable in the vulnerability assessment), the stage of development by bioclimatic domain and sub-domain and site quality.

Overall, the region has a low level of vulnerability to SBW. All of the areas of vulnerability classes 1 - Very high and 2 - High represent nearly 120 000 ha, i.e., 5% of the overall productive forest area, which indicates that fir stands composed solely or mainly of fir are relatively rare. Stands of vulnerability classes 4- Low, 5- Very low and “No Class”[73] stands represent more than 80% of the area of the region. The medium vulnerability class represents 14% of the productive forest areas of the region.

The region has gradiented vulnerability that increases from south to north. The 2 southernmost MUs (071-51 and 072-51) have the lowest levels of SBW vulnerability, i.e., barely 3% of the areas classified as vulnerability 1, 2 and 3. MU 073-51 and 071-52 follow, with 8% and 20% of classes 1, 2 and 3, respectively. Lastly, MU 074-51, 073-52 are the most vulnerable to the passage of the epidemic with class 1, 2 and 3 vulnerability percentages of 68% compared with all the areas of the region for these three classes.

Table 33 Area and Relative Importance of Vulnerability Classes (1 to 5) for MUs of Outaouais

MU	1 Very High		2 High		3 Moderate		4 Low		5 Very low		No class None		Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)
071-51	131	0%	3,599	2%	5,686	3%	2,371	1%	74,351	36%	119,611	58%	205,749
071-52	573	0%	30,681	7%	52,677	11%	22,757	5%	168,432	36%	194,568	41%	469,687
072-51	122	0%	2,068	2%	3,259	3%	1,145	1%	27,114	25%	75,408	69%	109,116
073-51	127	0%	11,336	3%	24,321	7%	12,931	4%	74,243	21%	222,915	64%	345,873
073-52	125	0%	20,207	6%	65,345	21%	31,868	10%	94,697	30%	101,263	32%	313,505
074-51	1,031	0%	51,022	7%	154,452	20%	84,639	11%	269,491	34%	220,877	28%	781,512
Total	2,109	0%	118,914	5%	305,739	14%	155,712	7%	708,326	32%	934,642	42%	2,225,441

[72]The classification criteria can be found in the guide on ecosystem-based management in the context of a spruce budworm outbreak (MFFP, 2014).
[73]Vulnerability "unclassed" stands are deciduous stands, mixed or softwood stands with a 10-year age class, or stands without canopy cover (recent origin).

Objective

The objective is to reduce the risk of spruce budworm.

Management Measures

- Plan preventive harvesting of the strata most vulnerable or affected by SBW. Harvesting these strata will reduce the overall vulnerability of the territory to SBW;
- Apply a moratorium on systematic pre-commercial thinning and commercial thinning in natural mixed and softwood stands;
- Depending on the severity of the epidemic, preparation of special recovery plans to harvest lost ligneous material.

Beech Bark Disease

Background

In addition to the problem of beech invasion in sugar bushes, there is beech mortality associated with beech bark disease. The disease is caused by two pathogenic fungi, *Neonectria faginata* and *N. ditissima*. It occurs when fungal spores enter through wounds in the bark, including those caused by the beech scale insect, *Cryptococcus fagisuga Lindinger*, an exotic insect from Europe, or the filamentous scale insect, *Xylococculus betulae (Pergande),* native to North America. Although the disease is most often associated with the presence of these insects, climatic stresses, including summer droughts, high temperatures and winter cold can make the tree susceptible to *Neonectria* infections.

Beech bark disease was introduced in 1890 via the importation of beech scale into Nova Scotia. It then appeared in Quebec in 1965 in Bas-Saint-Laurent (Témiscouata) and has since progressed westward.

In 2019, beech scale insect and disease were still progressing and were found in five Canadian provinces and 17 US states.

This disease affects the quality of American Beech wood and the sustainability of harvesting this species due to the premature mortality of the stems. These therefore no longer offer the possibility of developing high-value sawlogs due to this disease. In addition, individuals resistant to the disease are rare and difficult to identify. This also has the effect of limiting the production of beechnuts, an important source of food for more than twenty species of wildlife. This disease has a considerable impact on its host, American beech, and therefore on the dynamics of forest stands.

Local Analysis of Issues

In the Outaouais region, beech scale insect and beech bark disease were first identified in 1997 and 1998. In 2008 and 2009, a special project of the DPF focused on updating the distribution of beech scale and bark disease. The results supported local observations that beech scale insect and disease had spread to the area. The beech scale insect was then present in almost all the territory of the Outaouais where the beech is present, except for a band in the north where the winter temperatures prevented the beech scale insect from establishing itself. The historic drought of 2012 in the Outaouais contributed to weakening the stems of beech trees affected by beech bark disease, which led to high stem mortality in MU 072-51.

The results of an inventory carried out in the region in 2018 and 2019 allow us to establish that the destruction phase is widespread east of the Gatineau River in MU 072-51. The mortality phase extends to the whole of MU 073-51 and the eastern part of MU 071-51. As the progression of beech scale insect and beech bark disease is variable within an MU itself, particular attention is paid during the silvicultural diagnosis and the hammering to the sanitary state of the American Beech stems.

Objectives

The objective is to reduce the risk of cortical disease.

Management Measures

- Reduce the proportion of beech trees in the upper canopy;
- After the beech harvest, carry out site preparation, fill planting and/or intermediate treatments to promote sugar maple, red oak and yellow birch.

Regional and Local Issues

Maple Syrup Production in Public Forests

The development of the maple syrup industry in public forests revolves around the areas designated as priority maple syrup potential (PAP in french). These areas are mainly determined according to forestry criteria, the objective of which is to provide stands suitable for maple syrup production in the short term. The criteria currently used to determine these areas are the maple potential evaluated by the density of taps and the proportion of the total basal area in maples.

Given the upcoming release of the Plan directeur ministériel pour le développement de l'acériculture en forêt publique (Departmental Master Plan for the Development of Maple Syrup in Public Forests) and the resulting action plan, these criteria could change.

In addition to having to meet forestry criteria, the areas must have undergone several stages of consultation before being designated as PAP. Among the entities consulted are the Indigenous communities, the Quebec Ministère de l'Énergie et des Ressources Naturelles (MERN), the Ministère de l'Agriculture, des Pêches et de l'Alimentation (MAPAQ), the Québec Maple Syrup Producers and the members of the Local Tables for Integrated Land and Resource Management (TLGIRT). A public consultation stage is also necessary to finalize this process.

In the Outaouais region, the work to determine the PAP has been completed. This approach made is possible to identify nearly 1,700 hectares intended primarily for maple syrup production (MSP) in MU 071-51 (44 ha), MU 072-51 (586 ha) and MU 073-51 (1,073 ha). For information purposes, the area offered under an intervention permit or in the process of being so by the MRNF to maple syrup producers, following the increase in the global quota for 2021 by the PPAQ, is 212 hectares in MU 073-51. This growth will bring the total area under maple syrup license to 971 hectares.

Management of Maple Syrup Potential to Be Prioritized

The only silvicultural treatments eligible in these areas are those ensuring the preservation of maple potential. This work also allows the extraction of a certain volume to supply the factories of the region, in particular from hardwoods. For the areas under permit, the permit holder could also keep wood for personal use of his operation, as stipulated in the conditions of the permit.

Lastly, the Sustainable Forest Development Regulation contains several articles concerning the management of areas under permit, in particular Section 71, which also provides that the maximum width of the right-of-way of a road located within the limits of a maple grove operated for maple purposes or having a maple potential to be prioritized is 20 m.

Issues of the Table régionale de gestion intégrée des ressources et du territoire de l'Outaouais

The discussions held at the Table régionale de gestion intégrée des ressources et du territoire de l'Outaouais (TRGIRTO, Outaouais Regional Integrated Land and Resource Management Panel) are intended to ensure that the Ministry takes into account, from the start of planning and throughout it, the issues identified by consensus by the members of the table for the conservation and development of all the resources and functions of the environment. The TRGIRTO defines local and regional objectives in terms of sustainable forest management and recommends to the Ministry their integration into the Integrated Forest Management Plans. The Ministry then examines the Table's recommendations and incorporates the recommendations it adopts into the Integrated Forest Management Plans. This approach contributes to increasing the benefits and spin-offs for the communities, in particular through a mutual understanding of the respective interests of the various actors in the same territory. The list of issues raised by the TRGIRTO is presented in the following table.

Table 34 Issues Raised by the TRGIRTO as Part of the PAFIT 2023-2028

Themes	Issues
Ecosystem management	Forest age structure
	Spatial organization
	Plant composition
	Internal structure and dead wood
	Wetlands and riparian areas
	Threatened or vulnerable species
	Protection of wildlife sites of interest
	Impact on forest soil
	Landscape connectivity
Specific wildlife habitats	Fur-bearing animal habitat
	Moose habitat
	Fish habitat
	Small game habitat
	Deeryards
Forest landscapes	Quality of forest landscapes
Coexistence with all users	Quality of forest experience
	Operational harmonization process
	Hunter environment
	Territorial limits of structured wildlife areas
Supply of ligneous material	Supply in volume and quality
	Supply costs
	Impact of forest harvesting machinery on regeneration and soils in partial cutting treatments
Local communities and workers	Creation and sharing of wealth for the benefit of communities and forest workers
Road network	Accessibility of natural resources via a sustainable strategic road network
Global changes	Climate changes
Integrated land and resource management	Development of a vision by the TRGIRTO
Development of forest resources	Development of maple syrup production potential

Issues of Indigenous Communities

As part of the PAFIT development work, the Indigenous communities present in the Outaouais region were invited to share their strategic issues. Several exchanges took place between the MRNF and the Indigenous communities participating in the process in order to document these issues and determine the means to respond to them. This approach contributes to improving the consideration of the interests, values and needs of the Indigenous communities present in the forest territories. The list of issues raised by Indigenous communities is presented in the following table.

Table 35 Issues Raised by the Indigenous Communities as Part of the PAFIT 2023–2028

Issues	Communities
Intensification of forest management	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Protection of the White Pine	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Protection of Eastern Cedar	Anicinape of Kitcisakik
Access to white birch for artisanal use	Kitigan Zibi Anishinabeg
Protection of riparian areas and wetlands	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Adapted Operational Integrated Forest Management Plans consultation schedule	Kitigan Zibi Anishinabeg
Maintain and protect old-growth forests	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Diversity and complexity of forest composition and internal structure at the stand and landscape scale	Kitigan Zibi Anishinabeg
Protection of moose habitat	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Protection of fur-bearing animal habitat	Kitigan Zibi Anishinabeg
Rare plants and wildlife species	Kitigan Zibi Anishinabeg
Identification and protection of cultural areas used by community members	Kitigan Zibi Anishinabeg and Anicinape of Kitcisakik
Consideration and maintenance of various ecosystem services	Kitigan Zibi Anishinabeg
Fragmentation and connectivity corridors for flora and fauna	Kitigan Zibi Anishinabeg

Issues Relating to Volume Management

Allowable cuts correspond to the maximum volume of annual timber harvests by species or group of species that can be harvested, while ensuring the renewal and development of the forest on the basis of sustainable forest management objectives. This allowable cut comes from all eligible stands present in a management unit regardless of their spatial location.

In a context of forestry operations and wood processing, other elements not integrated into the allowable cut must be considered. The different market conditions (value of wood, labour, etc.), the distance from the resource as well as the consideration of regional issues sometimes present conditions that make the volumes of allowable cuts difficult to harvest by rights holders under normal financial conditions. This situation reflects a gap between the needs of rights holders and the capacity of the forest to meet these needs in a sustainable way.

Issues Relating to Forest Planning

In March 2013, the Ministry and the Conseil de l’industrie forestière du Québec (CIFQ, Quebec Forest Industry Council) reached an initial agreement on the sharing of roles and responsibilities for certain forest planning activities. This agreement was mainly intended to allow the industry to continue applying for forest certification and to optimize the planning of harvesting activities. During the review of the agreement, the CIFQ emphasized to the Ministry the importance it gives to the consideration of economic issues in the forest planning process and the need to integrate indicators and targets. By signing the agreement, the Ministry recognized the need to integrate financial profitability indicators and targets into forest planning and to work with the industry, to establishment of targets to be met.

In February 2021, following the work of the Cellule d’intervention sur la vitalité de l’industrie forestière des régions de l’Outaouais et des Laurentides, the Minister announced the establishment of a 5-year collaborative planning pilot project in the Outaouais.

Professional and Administrative Signatures

Ressources naturelles et Forêts Québec

Professional and Administrative Signatures Form

Analysis of Issues – Support Document to the *Tactical Integrated Forest Management Plans*

Management Units 071-51, 071-52, 072-51, 073-51, 073-52 and 074-51

Professional Liability

This document has been produced under my professional responsibility from all the relevant information available to date and in compliance with the laws and regulations in effect. I recommend that the Minister's representative approve it.

Isabelle Paquin, F. Eng. Date

I also certify that the following forest engineers have contributed to its development for the work cited below:

Sébastien Meunier, F. Eng., M. Sc. Date

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