

Table of Contents

Overview	4
Introduction	4
Study context	5
Geomatic methodology	7
Harvesting rate.....	8
Anthropic disturbances	8
Natural disturbances.....	9
Increase in and updating of baseline data	9
Mosaic cutting.....	10
Productive area over 7 meters	12
Productive area over 7 meters and over 90 years.....	12
Breaks in the hiding cover.....	14
Residual forest of 7 meters.....	14
Analysis results.....	15
Mosaic cutting.....	15
Harvesting rate.....	16
Breaks in the hiding cover.....	17
Stands over 7 meters and over 90 years.....	17
Conclusion.....	20
Mosaic cutting.....	20
Harvesting rate.....	21
Breaks in the hiding cover.....	21
Stands over 7 meters and over 90 years.....	21

Bibliography	21
--------------------	----

Overview

The Cree-Québec Forestry Board (CQFB) was created in September 2003, in keeping with the *Agreement Concerning a New Relationship Between the Gouvernement du Québec and the Crees of Québec* (a.k.a. Paix des Braves) ratified in February 2002, and mandated to ensure monitoring of Chapter 3 (Forestry) of the Agreement and to allow for close consultation of the Crees during the different stages of forest activity planning and management in order to implement the Adapted Forestry Regime (AFR). The Board also provides advice and recommendations to the Minister of Natural Resources and Forests and the Cree Nation Government.

This report presents results regarding compliance with provision 3.10.5 of the Agreement at the “individual blocks which constitute forested areas presenting wildlife interest for the Cree (25% area)” level.

Introduction

As a province rich in natural resources, Québec must promote sustainable management principles to guarantee its resource sustainability. Although economic development tied to harvesting the boreal forest often raises environmental concerns, e.g. biodiversity conservation, it is just as essential to consider the social, cultural and environmental impacts on Cree communities.

In a search for harmonious cohabitation between the Cree communities and the Québec government, the Agreement (a.k.a. Paix des Braves) was signed in 2002 for a period of 50 years. This Agreement seeks to give concrete expression to a shared will to carry out harmonized management of the Nord-du-Québec region’s resources while promoting increased Cree autonomy and taking charge of their own development. Chapter 3 of the Agreement provides for implementation of the Adapted Forestry Regime (AFR) and defines the objectives and specific terms and conditions governing forest activity management on AFR territory. The AFR targets greater consideration for the Cree traditional way of life, greater integration of sustainable development concerns and increased Cree participation in the various forest activity management processes.

To ensure that the Agreement is enacted properly, monitoring mechanisms must be implemented and ways to improve them in compliance with the target objectives must be sought constantly.

Study context

To preserve Cree traditional activities in the context of economic development of the territory, it was agreed, under the Paix des Braves (Agreement), to establish forested areas presenting wildlife interest for the Crees where specific management standards would be implemented to maintain or improve wildlife habitat over time. Today, these areas are more commonly called the 25% areas, since they represent one-quarter of the productive forested area of each trapline. In these areas, the Agreement stipulates:

“Specific management standards are applied to maintain or improve the habitat of very important wildlife species (moose, marten, beaver, hare, fish, caribou, partridge) and portions of each trapline will benefit from specific protection to improve the level of harmonization between forest development activities and traditional activities including hunting, fishing and trapping.” (3.10.1)

It is also important to note that:

“Within the selected areas, forest development activities will be planned with the priority goal of maintaining and improving a diversity of ecoforest stands, in terms of plant species, age classes and spatial distribution. With this in mind, it is possible to intervene in order to rejuvenate certain stands while still maintaining productive habitats throughout these areas of particular interest to Cree families.” (3.10.3)

For reference purposes, the specific management standards applied in the 25% areas are available in Appendix 3 of this document.

The Cree-Québec Forestry Board’s latest status report (2013-2018) on implementation of the Paix des Braves’ Adapted Forestry Regime (AFR) showed that although these provisions are implemented and complied with, some tallymen and some of the territory’s users continue to be dissatisfied with management of the 25% areas. According to the tallymen and Cree users of the territory who participated in the five-year CQFB status report:

- They see no differences in the management approach used in the 25% areas and the rest of their trapline.
- Wildlife habitat quality is not really better in the 25% areas compared to the rest of the trapline.

Similar observations were made in the preceding CQFB status report, which covered the period 2008-2013.

Since the Agreement has existed for more than 20 years and the tallymen and users are dissatisfied with management of the 25% areas, it is legitimate to assess achievement of Agreement objectives using the current management approach and to investigate the source of this dissatisfaction.

In January 2023, a discussion between the CQFB Secretariat and the Cree members of the Waswanipi Joint Working Group (JWG) shed light on what might potentially explain this discrepancy. Currently, the Ministère des Ressources naturelles et des Forêts (MRNF) assesses whether the provisions of section 3.10.5 are complied with or not at the trapline level. However, the 25% areas identified by the tallymen can be divided into numerous territories, all of equal importance for maintaining their traditional activities.

On August 29, 2023, the Cree First Nation of Waswanipi Natural Resources Department tabled an assessment report on Waswanipi's 25% areas. The report's conclusion shows that 8% (28 out of 372) of the blocks comprising Waswanipi's 25% areas do not comply with section 3.10.5 b. These results indicate that proper assessment of the Adapted Forestry Regime's 25% areas is, in fact, justified.

This analysis addresses assessment of compliance with certain Agreement provisions (3.10.5) at the level of each block composing the forested areas presenting wildlife interest for the Crees (25% areas) in the traplines located in Adapted Forestry Regime territory.

Objectives:

Assess compliance with Agreement provision 3.10.5 at the level of each block composing the forested areas presenting wildlife interest for the Crees (25% areas) in the traplines managed under the Adapted Forestry Regime. More specifically, within the blocks presenting wildlife interest, the following points were analyzed:

- a) Only mosaic cutting should be applied in these areas, unless better techniques are developed to protect wildlife habitats;
- b) When planning mosaic cutting, the terms and conditions set out in Schedule C-2 of the Agreement are applied, with the following amendments:
 - i) at least 50% of the productive area within stands over seven (7) meters in height must be left standing. At least 10% of this area is composed of forests over ninety (90) years old;
 - ii) within the selected areas, the location of the residual forest blocks to be preserved is decided by the Minister in cooperation with the Cree tallyman;
 - iii) the blocks are spread over the area in such a way that they are interconnected. Where necessary, breaks in the hiding cover should not be more than thirty (30) meters wide;
 - iv) the residual forest must be left standing for a period long enough to allow the forest regeneration to reach a minimum average height of seven (7) meters.
- c) With the consent of the Cree tallyman, the area annually subjected to logging could exceed the applicable annual rates indicated below, to the extent that, over a maximum of two (2) years, the total area harvested respects the sum of these annual rates. In such case, logging will not be permitted in these areas during the year following the aforesaid period of two (2) years.
- d) If an agreement cannot be reached with the Cree tallyman, the annual rate of harvesting authorized in forested areas presenting wildlife interest for the Cree will be modulated according to the level of prior disturbance in each trapline. In a trapline where the level of disturbance in the last twenty (20) years is less than 15%, new logging activities may be carried out on an annual maximum of 4% of the productive area of the forested areas presenting wildlife interest of said trapline. This annual percentage shall be reduced to 3% when the overall level of disturbance is between 15% and 30%, and to 2% when the overall level of disturbance is between 30% and 40%.

Geomatic methodology

The methodology was implemented with the help of an automation process using ModelBuilder in ArcGIS Pro programmed in Python 3. While most geomatic processing was carried out in ArcGIS Pro, a part related to Canopy Height Model (MHC) was carried out in QGIS using the GRASS library to reduce machine calculation time. The projected coordinate system used for all geomatic analyses was EPSG 32198, NAD83 Quebec Lambert.

Harvesting rate

Analysis of the harvesting rate allowed us to assess the anthropic and natural disturbances that occurred each year of the Agreement (2002-2023), thereby facilitating annual monitoring of the harvesting rate for each 25% block (block that is part of the 25% area).

Anthropic disturbances

To monitor anthropic disturbances, the geomatic analysis integrated the technical and financial activity reports (RATFs) from 2013 to 2023. For prior years (1982-2012), anthropic disturbances were based on the provincial forest management activities shapefile available through the MRNF (Ministère des Ressources naturelles et des Forêts – Québec department of natural resources and forests). The updated ecoforest shapefile was not included in the anthropic disturbances analysis because it keeps only the most recent disturbance, which could underestimate the effects of past harvesting activities. For example, harvesting with protection of regeneration and soils (CPRS) carried out in 2012, followed by scarification in 2013, would keep only the disturbance due to scarification and ignore the CPRS. To ensure that all logging documented was included, a shapefile was generated using the RATFs and the provincial forest management activities shapefile. RATF data and provincial management activities data were verified and corrected to eliminate duplication and discrepancies likely to overestimate anthropic disturbances. Logging work and its variants were taken into consideration but forest management activities were excluded from anthropic disturbances.

Anthropic disturbances were classified into two categories: 1) harvesting with protection of regeneration and soils (CPRS) and 2) partial cutting (CP). Characterization of these harvesting types was based on the 4th 10-year ecoforest stratification inventory.

To begin with, management work was eliminated from each RATF along with the provincial silvicultural treatments shapefile. Salvage logging was also excluded (these disturbances were considered to be of natural origin). From 1982 to 2023, anthropic disturbances were grouped by harvesting type (CPRS, CP) and by year in order to merge micro polygons, thereby reducing the number of entities in the shapefile in order to facilitate processing. A topology was created in ArcCatalog to validate the geometric entities of the provincial silvicultural treatments shapefile, which sometimes presented duplication of the same treatment over several consecutive years. The “Find Overlaps” tool was used to identify and eliminate this duplication.

The geoprocessing tools “Erase” and “Append” were then applied to update the shapefile. “Erase” allows the geometric entities associated with past work to be deleted and “Append” updates the shapefile with new disturbances. This methodology ensures that only the most recent logging disturbance is kept in the shapefile, by chronological order of modelling. Finally, the micro polygons generated by the “Eliminate” tool were deleted

to avoid any undesirable influence on analysis of residual polygons. Then, this anthropic disturbances data was integrated into the updated ecoforest stands.

Natural disturbances

The updated ecoforest shapefile, downloaded in February 2023, was used to identify natural disturbances and determine the years they occurred. These natural disturbances were monitored over 40 years (1982-2022) and categorized into epidemics, windfall, dieback and forest fires. Natural disturbances with no precise year were kept and considered permanent. Although the 2023 forest fires were integrated into the ecoforest shapefile, their mapping remains preliminary, a fact that could result in overestimating burnt areas and overestimating blocks under the thresholds established.

The same geomatic methodology as for anthropic disturbances was applied: geoprocessing was used to merge by year and disturbance type. This processing was automated using ModelBuilder to generate a natural disturbance shapefile, ensuring that only the most recent natural disturbance was kept. Finally, a topology was created to validate potential geometric discrepancies. All data was integrated into the updated forest stands.

Increase in and updating of baseline data

The ecoforest shapefile was updated primarily in 2011, 2012 and 2013, with integration of the RATFs until 2021 and the updates carried out until 2023, with a three-year period between the time the treatment took place and its integration into the shapefile. However, this does not mean that the photo-interpretation dates from 2021; the RATFs were integrated into the ecoforest stands until 2021. Photo-interpretation of the traplines used to “reinterpret” the ecoforest shapefile comes from the 4th 10-year inventory, conducted approximately 5-10 years ago. Because an update of ecoforest stands for the Nord-du-Québec region is scheduled for 2025-2026, ecoforest stand heights and ages used in this analysis date from about 5-10 years ago.

This shapefile was updated up to 2023 to include logging and forest fires. However, forest stands were not aged according to the growth curve for height or age.

LIDAR data was collected between 2017 and 2022 by trapline, with the majority of acquisitions dating from 2017 to 2019. Although there is a 6-7-year gap with the LIDAR data, photo-interpretation tends to slightly overestimate stand height, which should, theoretically, give similar results. Further, for stand age, age classes are defined in 20-year intervals. We chose to keep this default parameter since a stand aged 1 year in 2012 would be assigned the 10-year age class in the ecoforest shapefile. If we age this stand by 11 years (2012-2023), age class 30 (10+11=21) would be assigned despite the fact that the stand is 12 years old.

Mosaic cutting

The following criteria were assessed for mosaic cutting:

- a) For each logging sector identified in an operational integrated forest management plan (PAFIO), the residual stands to be preserved and those to be cut are shown clearly on maps;

This criterion was not assessed since the data was not available. However, in standard forest planning, the logging sectors are shown in the PAFIO.

- b) Subject to the forest management strategies adopted in the tactical integrated forest management plan (PAFIT), in the first phase, logging priority is given to the most mature stands, in order to minimize timber losses;

This criterion was not assessed since the PAFIO was not available. However, this criterion is integrated into the *Regulation respecting the sustainable development of forests in the domain of the State* (RADF).

- c) The harvested areas vary in size. At least 20% of the blocks must be less than fifty (50) hectares and at least 70% must be less than one hundred (100) hectares. No more than 30% of the blocks are larger than one hundred (100) hectares, and no block may exceed one hundred and fifty (150) hectares;

For the geomatic processing, the "Intersect" tool was used with the anthropic disturbances shapefile and the 25% blocks. This gave us the hectareage harvested in each 25% block.

- d) The residual stands to be preserved are located in priority in mixed forests, as they are relatively rare and play an important role in wildlife habitats;

This criterion is complied with: All blocks show mixed stands. The “Erase” tool was applied to the ecoforest stands and to the anthropic disturbances shapefile, followed by the "Intersect" tool with the 25% blocks. This processing, carried out by chronological iterations every year of the Agreement, allows us to progressively remove all logging from the ecoforest stand shapefile. The natural disturbances shapefile was not removed from the ecoforest shapefile for two reasons: 1) doing so could distort the analysis by leaving some blocks without residual forests. Recent disturbances, like the 2023 forest fires, could therefore overestimate the blocks under the established thresholds; 2) natural disturbances are not directly linked to mosaic cutting or forest planning. However, they are tied to ecological factors that ecosystem management seeks to integrate in order to limit logging in other areas.

- e) The forest to be preserved between two cutting areas is at least equal in size to the area of the stand harvested (this equivalency may also be calculated for a set of stands located within an annual harvesting sector);

“Cutting area” designates a single holding that was subjected to the same type of logging in a specific harvesting year. Using the shapefile previously generated, it is possible to erase logging in chronological order and to verify the area kept in each 25% block. This criterion is applied and complied with over a 5-year period, i.e. the PAFIO’s duration.

- f) The residual forest is composed of productive forest stands more than seven (7) meters high (this will include many remaining stands of twelve (12) meters high, in light of the present composition of the standing forest);

This criterion is complied with: all blocks have stands more than seven (7) meters high and each has at least two (2) stands over twelve (12) meters high. The stand height measurement methodology using LIDAR was applied with the “Focal Statistics” tool. Note that the criterion does not specify the number of stands over twelve (12) meters to preserve.

- g) The residual forest between two cutting areas is at least two hundred (200) meters wide (long strips of unvarying width must be avoided);

This criterion was analyzed over the five-year period 2018-2023. A cutting area corresponds to contiguous blocks where the same type of cutting is carried out in the course of a given harvesting year. The minimum cutting areas were validated, ensuring 200 meters in width between cutting carried out in different years within the same 25% block, with a 10-meter tolerance for blocks of distances varying between 190 and 200 meters. The "Buffer" and "Intersect" tools were used: “Buffer” to set a distance of 190 meters and “Intersect” to find non-compliant areas. The majority of blocks complied with the established criteria although some cases of non-compliance were observed due to slight discrepancies in distance, which required an additional tolerance of 20 meters. This criterion stipulates that long strips of unvarying lengths must be avoided, although no quantitative restriction is imposed.

- h) The residual forest is left standing for a period long enough to allow new growth to achieve the required level of development (minimum three (3) meters);

- a. Except for the protective strips described in paragraph a of section 3.12.1, Chapter 3 of the Agreement, no residual forest may overlay an existing legally protected area or a site described in section 3.13, Chapter 3 of the Agreement unless the Cree tallyman agrees otherwise.

This criterion is complied with and is in line with the criterion “The residual forest is composed of productive forest stands more than a seven (7) meters high [...] . »

Productive area over 7 meters

“Productive area over 7 meters” was analyzed in two ways: 1) using the ecoforest stands and 2) using the LIDAR-derived Canopy Height Model (MHC). The productive area was based on the 4th 10-year inventory’s ecoforest shapefile. The unproductive stands (CO_TER) in the shapefile were deleted.

An initial analysis was conducted using data from the 3rd and 4th 10-year inventories as well as LIDAR data. However, this analysis showed inconsistencies due to discrepancies between these different sources. Consequently, analysis was ultimately performed using the ecoforest shapefile updated with the 2023 data.

The methodology for assessing canopy height is based on the MRNF methodology. The raw MHC data tends to slightly underestimate real canopy height. To correct this underestimation, “Focal Statistics” geoprocessing was applied, using the maximum statistic and a circular cell to simulate the forest canopy. Then, “Focal Statistics” was applied a second time to obtain this height’s average. Reclassification and polygonization were performed to produce the statistics. This methodology is based on the “User’s Guide: Products derived from LIDAR data” published by the Ministère des Ressources naturelles et des Forêts. Although the processing was not done using GRASS software, as explained in the Guide, the tools used in ArcPro are methodological equivalents. No field validation was carried out.

Productive area over 7 meters and over 90 years

At this stage, two data sources were used: 1) the ecoforest shapefile and 2) LIDAR data. Canopy height was produced using the methodology in the previous stage. The updated ecoforest map was used to determine stand age. The age classes in the “Old” category were considered to be 90 years or over.

Table 17
Age class codes by stand structure

Stand structure	Age class										
	0-20yrs		21-40yrs		41-60yrs		61-80yrs		81-100yrs		101+yrs
Regular (even-aged stand)	10		30		50		70		90		120
	Young (origin ≤ 80 yrs)								Old (origin > 80 yrs)		
Regular (uneven-aged stand)	Young, uneven								Old, uneven		
Irregular	Young, irregular								Old, irregular		
Layered	1010	--	--	--	--	--	--	--	--	--	--
	1030	3010	3030	--	5050	--	7070	--	9090	--	12012*
	1050	5010	3050	5030	5070	7050	7090	9070	90120	12090	--
	1070	7010	3070	7030	5090	9050	70120	12070	--	--	--
	1090	9010	3090	9030	50120	12050	--	--	--	--	--
	10120	12010	30120	12030	--	--	--	--	--	--	--

*Since this field allows only 5 characters, the last "0" has been omitted in the 120-120 layering.

Source: Ecoforest stratification inventory

<https://mffp.gouv.qc.ca/documents/forets/inventaire/norme-stratification.pdf>

Height codes above 4 are considered over 7 meters.

Height Classes

Average height (m) of dominant and codominant stems	Code
Greater than or equal to 22 m	1
Greater than or equal to 17 m and less than 22 m	2
Greater than or equal to 12 m and less than 17 m	3
Greater than or equal to 7 m and less than 12 m	4
Greater than or equal to 4 m and less than 7 m	5
Greater than or equal to 2 m and less than 4 m	6
Less than 2 m	7

Source: Ecoforest stratification inventory

<https://mffp.gouv.qc.ca/documents/forets/inventaire/norme-stratification.pdf>

Breaks in the hiding cover

The “breaks in the hiding cover” criterion stipulates “where necessary” plan for breaks in the hiding cover not more than thirty (30) wide between logging areas in order to promote a forest cover. A 5-meter tolerance was accepted with regard to breaks in the hiding cover, i.e. 35 meters. Using the data on anthropic disturbances, geomatic analysis was used to validate the distances between logging carried out in a given 25% block in the same year. The majority of blocks identified as under the thresholds established for the “breaks in the hiding cover” criterion were due to forest road rights-of-way. Processing applied included using the “Buffer” tool followed by the “Intersect” tool in a model allowing iteration of the geometric entities. Then, blocks under the established thresholds were validated visually.

Residual forest of 7 meters

The Canopy Height Model (MHC) was used to estimate average canopy height in the forest stands harvested. The tool used was “Zonal Statistics”, which allows us to average pixel height per stand. For the years preceding LIDAR acquisition, updated ecoforest shapefile height data was used.

LIDAR data was analyzed to evaluate canopy height by calculating an average in the stands that experienced disturbances. This method makes it possible to separate stands into two categories of canopy height (over and under 7 meters) in order to assess the residual forest of 7 meters. The analysis was not carried out for the last 5 years since the forest is currently regenerating. Further, some data was missing to allow us to assess the criterion over the entire duration of the Agreement.

Analysis results

The results are presented by criterion, i.e. compliance with mosaic cutting, breaks in the hiding cover, harvesting rate and stands over 7 meters and over 90 years. Another table recapitulates success for all criteria and for each community for the study period, i.e. 2002-2023. It is important to remember that this report presents “non-compliance” with regard to the Agreement only in the context in which each of the 25% blocks was analyzed independently of the others. Since the Agreement makes no distinction as to the level (scale) of analysis for the 25% areas, these so-called “situations of non-compliance” do not really constitute non-compliance in the context of the Agreement.

Mosaic cutting

Number of blocks not compliant with mosaic cutting (3.10.5 c), 2002-2023*

<i>Community</i>	<i>Number of non-compliant blocks</i>	<i>Total number of blocks</i>	<i>Annual percentage of non-compliance (2002-2023)</i>
Mistissini	7	103	0.32%**
Nemaska	0	5	0%
Oujé-Bougoumou & Mistissini	1	7	0.68%
Oujé-Bougoumou	2	62	0.15%
Waskaganish	0	19	0%
Waswanipi	24	255	0.44%

Total	34	451	0.36%
--------------	-----------	------------	--------------

*Analysis of mosaic cutting according to principle g “the residual forest between two cutting areas is at least two hundred (200) meters wide (long strips of unvarying width must be avoided)” was carried out over the period 2018-2023, rather than over the entire duration of the Agreement, i.e. 2002-2023.

** Example of calculation for Mistissini: 7 non-compliant blocks divided by a total of 103 blocks and multiplied by 100 = 6.8 %. This result, i.e. 6.8%, divided by 21 years = 0.32%

The annual rate of compliance with Agreement provisions with regard to “mosaic cutting” for each block composing areas of wildlife interest over AFR territory as a whole is 99.64%. No significant difference is noted between communities.

Harvesting rate

Number of blocks not compliant with the harvesting rate (3.10.5 c) provided for in the Agreement, 2002-2023

<i>Type of non-compliance</i>	<i>Number of cases of non-compliance</i>	<i>Total number of blocks</i>	<i>Annual percentage of non-compliant blocks (2002-2023)</i>
Pre-Agreement disturbances	25	451	0.26%
Natural disturbances	74	451	0.78%
Anthropic disturbances	20	451	0.21%
Total	119	451	1.26%

The annual rate of compliance with Agreement provisions with regard to the “harvesting rate” for each block composing areas of wildlife interest over AFR territory as a whole is 99.79%, given that discrepancies caused by natural disturbances before and after the Agreement came into force cannot be taken into account.

Breaks in the hiding cover

Number of blocks not compliant with interconnection requirements (3.10.5 c), 2002-2023

<i>Community</i>	<i>Number of non-compliant blocks</i>	<i>Total number of blocks</i>	<i>Annual percentage of non-compliant blocks (2002-2023) %</i>
Mistissini	25	103	1.15
Nemaska	1	5	0.95
Oujé-Bougoumou & Mistissini	1	7	0.68
Oujé-Bougoumou	20	62	1.53
Waskaganish	0	19	0
Waswanipi	84	255	1.56
Total	131	451	1.45

The annual rate of compliance with Agreement provisions with regard to “breaks in the hiding cover” for each block composing areas of wildlife interest over AFR territory as a whole is 98.55%.

Stands over 7 meters and over 90 years

Number of blocks not compliant with the threshold of percentage of productive area of stands 7 m+ and 90 years+ (3.10.5 b) in areas of wildlife interest, 2002-2023

<i>Type of non-compliance</i>	<i>Number of non-compliant blocks (7m+)</i>	<i>Total number of blocks</i>	<i>Percentage %</i>	<i>Number of non-compliant blocks (90yrs+)</i>	<i>Total number of blocks</i>	<i>Percentage %</i>
<i>Pre-Agreement disturbances</i>	20	451	4%	30	451	7%
<i>Natural disturbances</i>	125	451	28%	67	451	15%
<i>Anthropic disturbances</i>	15	451	3%	13	451	3%
<i>Total</i>	160	451	35%	110	451	24%

The rate of compliance with Agreement provisions with regard to maintaining the productive areas of “stands over 7 meters and over 90 years” for each block composing areas of wildlife interest over AFR territory as a whole varies significantly depending on the type of disturbance considered. It is 97% for both provisions (7 m+ and 90 years+) since natural disturbances before and after the Agreement came into force cannot be considered non-compliant. Natural disturbances, primarily forest fires, caused more than 80% of the cases of non-compliance.

Number of blocks not compliant with the threshold of percentage of productive area of stands 7 m+ and 90 years+ using LIDAR (3.10.5 b) in forested areas of wildlife interest, 2002-2023

<i>Type of non-compliance</i>	Number of non-compliant blocks (7m+)	Total number of blocks	<i>Percentage %</i>	Number of non-compliant blocks (90ans+)	Total number of blocks	<i>Percentage %</i>
Pre-Agreement disturbances	18	451	4%	29	451	6%
Natural disturbances	71	451	16%	62	451	14%
Anthropic disturbances	18	451	4%	17	451	4%
Total	107	451	24%	108	451	24%

The rate of compliance with Agreement provisions with regard to productive areas of “stands over 7 meters and over 90 years” using LIDAR data for each block is 96%. Blocks under the established thresholds due to anthropic disturbances showed a slight increase (1%) using LIDAR data.

The difference between the results can be explained by the tendency of photo-interpretation to slightly overestimate canopy height although the ecoforest shapefile was updated more than 10 years ago (2011-2013). While the LIDAR data reflects reality more accurately, most of this data was acquired between 2017 and 2019 and its age could result in discrepancies with current conditions in the field. An update of the ecoforest shapefile is planned for 2025-2026.

Number of blocks not compliant with the threshold of percentage of productive area of stands 7 m+ and 90 years+ using LIDAR and ecoforest stands (3.10.5 b) in areas of wildlife interest, 2002-2023

Methodology	Number of non-compliant blocks using ecoforest stands	Total number of blocks	Percentage %	Number of non-compliant blocks using LIDAR	Total number of blocks	Percentage %
Anthropic disturbances	19	451	4%	25	451	6%

The blocks of wildlife interest deemed to be under the established thresholds due to anthropic disturbances are often considered such in both sub-categories in the analysis using ecoforest stands. LIDAR-data-based analysis shows a larger number of blocks under the established thresholds overall, i.e. blocks that fail in at least one of the categories. This difference can be explained by the consistency in ecoforest stand data, where causal relationships exist between stand height and age. These relationships are less obvious using LIDAR data.

Conclusion

Geomatic analysis of the blocks composing forested areas of wildlife interest enabled us to assess forest-related practices in the territory, in keeping with the Paix des Braves Agreement's sustainable management criteria and objectives. The results show that the main factor responsible for non-compliance with Agreement provisions are the impacts created by forest fires. Forest planning complies more than 97% with all Agreement provisions on all blocks comprising areas of wildlife interest. This result must be interpreted in the context where the planning scale recognized in the Agreement is not the "block" but "forested areas of wildlife interest" as a whole.

Mosaic cutting

This criterion was predominantly complied with: cases of non-compliance concern areas exceeding 100 ha (criterion c) and a minimum width of 200 meters for residual forest between cutting areas (criterion g).

Harvesting rate

Anthropic disturbances have a marginal effect on the number of cases of non-compliance based on the “harvesting rate” criterion. Their limited impact indicates that cutting was planned in order to reduce logging. Natural disturbances resulted in more blocks under the established thresholds compared to the beginning of the Agreement, an increase that is largely due to the 2023 forest fires.

Breaks in the hiding cover

The trend observed shows that increasing access roads for logging impacts compliance with the “break in the hiding cover” criterion. Although these infrastructures are essential for accessing the territory, both for logging and for local communities, they fragment the landscape and reduce forest habitat continuity, thus compromising ecological connectivity between residual forest blocks. The width of forest road rights-of-way could be reduced to limit breaks in the hiding cover exceeding 30 meters.

Stands over 7 meters and over 90 years

Analysis shows that the tallymen’s choice of the 25% areas before the Agreement was signed (pre-Agreement) and natural disturbances explain most of the blocks under the thresholds for the percentage of productive areas of 7m+ and 90yrs+.

Bibliography

Achim, A. (2020). Les stades évolutifs de forêt. <https://youtu.be/oLRnyzF6OFk>

Agreste. (2010). Utilisation du territoire. Agreste.Agriculture.Gouv.Fr, 1. <http://agreste.agriculture.gouv.fr/enquetes/territoire-prix-des-terres/teruti-lucas-utilisation-du/>

Beaupré, P. (Ingénieur forestier), Gravel, J. (Ingénieur forestier), Cormier, D., Québec (Province). Ministère des forêts, de la faune et des parcs. D. de l’aménagement et de l’environnement forestiers, & Québec (Province). Direction de la recherche forestière. (n.d.). Fiches d’aide à la décision pour les traitements sylvicoles au Québec.

Chiasson, G., & Montpetit, A. (2020). Communautés forestières et gouvernance : quelles articulations ? *Revue Gouvernance*, 17(2), 1. <https://doi.org/10.7202/1073108ar>

Forget, É., Drever, R., & Lorenzetti, F. (2003). Changements climatiques: impacts sur les forêts québécoises - revue de littérature. 57.

Fournier, M., Forestière, R., Boucher, Y., Perrault-Hébert, M., Fournier, R., & Auger, I. (2017). AVRIL 2017 ans Recherche forestière INNOVATION et ÉVOLUTION. www.mffp.gouv.qc.ca/forets/connaissances/recherche

Glon, É., & Vachon, B. (1996). Enjeux et réalités du développement local au Québec / Issue and realities of local development in Quebec. *Revue de Géographie de Lyon*, 71(3), 261–267. <https://doi.org/10.3406/geoca.1996.6230>

Gouvernement du Canada. (2012). Notions fondamentales de télédétection.

Mani, A., & Walbridge, S. (n.d.). Python Across the ArcGIS Platform.

Toms, S. (2015). ArcPy and ArcGIS - Geospatial Analysis with Python. In Packt Publishing (Vol. 1, Issue 1).