



Conservation Area Network Gap Analysis for Port Hawkesbury Paper LP FULA Lands for Eastern Mainland and Cape Breton



Indian Brook, Cape Breton

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Port Hawkesbury Paper

September 2023

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1. INTRODUCTION

Port Hawkesbury Paper LP (PHP) recognizes the importance that protected areas play in maintaining the natural biodiversity and ecological functions of Nova Scotia forests. In collaboration with government, PHP has assisted in significant contributions to the protected areas network of Nova Scotia through both legal and administrative set asides as managers of most Crown lands in Eastern Nova Scotia. In addition to protected areas, PHP implements a wide array of special management practices and conservation measures on the remainder of its holdings to sustain ecosystem function and natural biodiversity.

As a FSC (Forest Stewardship Council) certified company since 2008, the company is obligated to analyze and identify potential gaps in the completeness of the Conservation Areas Network on its certified Crown lands, as required by FSC criteria and indicator 6.5.

An ecological gap analysis¹, at its most basic level, is an assessment of how well a protected area system fits a nation's or region's biological diversity conservation goals. An ecological gap assessment can range from simple exercises based on a spatial comparison of biodiversity with current protected areas to complicated studies requiring extensive data collection and analysis, mapping, and the use of software decision-making tools.

Criterion 6.5 in the FSC Canada National Standard for Forest Management² states:

“The Organization shall identify and protect representative sample areas of native ecosystems and/or restore them to more natural conditions. Where representative sample areas do not exist or are insufficient, The Organization shall restore a proportion of the Management Unit to more natural conditions. The size of the areas and the measures taken for their protection or restoration, including within plantations, shall be proportionate to the conservation status and value of the ecosystems at the landscape level, and the scale, intensity and risk of management activities.”

As per the FSC National Forest Stewardship Standard of Canada (V-1-0) ([Standards \(fsc.org\)](https://www.fsc.org/standards)), elements assessed for inclusion in the gap analysis include “enduring features, representation of natural ecosystems, landscape connectedness, High Conservation Values, and High Conservation Value areas” (FSC Indicator 6.5.2). The entire area of ecological influence is used as inputs into the gap analysis. FSC Canada defines the area of ecological influence as:

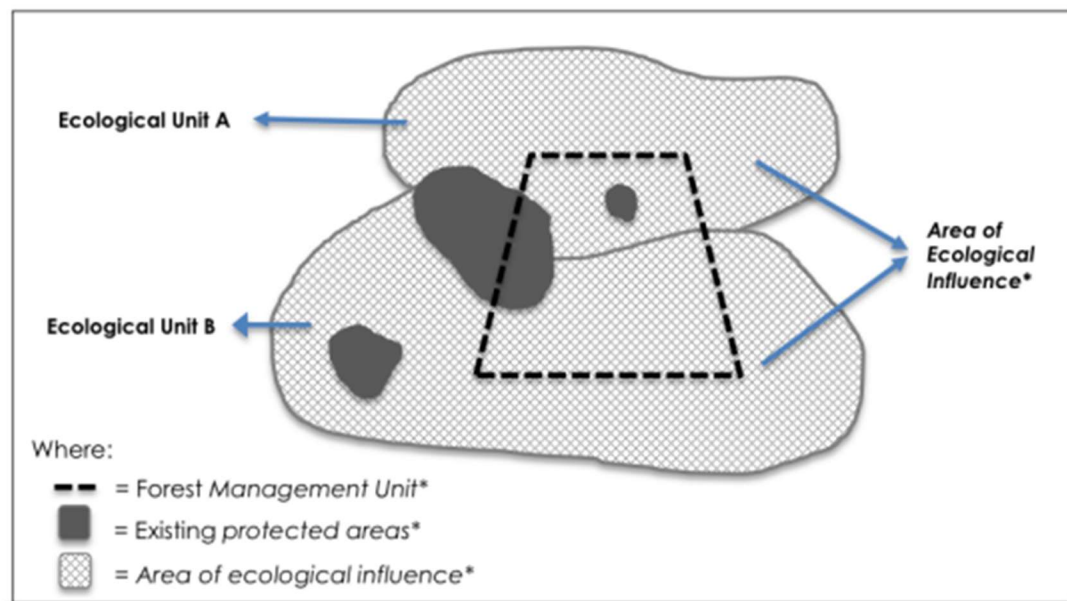
“the entire area encompassed by ecological units (e.g. eco-districts, biogeoclimatic zones) that occur at least partly within the management unit. The intent of using an area that extends beyond the Management Unit in the gap analysis is to incorporate a broader landscape* perspective into consideration of the Conservation Areas Network*. An analysis that takes account of a broad landscape* (i.e. including the area of ecological influence*) is better suited to providing an accurate assessment of conservation* gaps. There may be circumstances in which there is little protected area* encompassed by the Management Unit*, but considerably more in*

¹ Convention on Biological Diversity, [Ecological Gap Analysis \(cbd.int\)](https://www.cbd.int/gap/)

² https://ca.fsc.org/sites/default/files/2022-03/FSC-STD-CAN-01-2018%20EN_V1.pdf

the area of ecological influence. In such a circumstance, there may be fewer gaps than would be identified if only lands encompassed by Management Unit* were used in the analysis.” (FSC National Forest Stewardship Standard of Canada, p. 53).*

The below figure illustrates a management unit that contains two ecological units, so the area of ecological influence includes the total area of both ecological units. Data from the entire ecological area of influence should be used to complete the most fulsome gap analysis. Consultation and engagement with Indigenous, and interested and affected stakeholders, regarding the identification and management of designated conservation lands has commenced and is an ongoing process for PHP’s licensed Crown lands. The Conservation Area Network Gap Analysis is reviewed and updated as needed every five years with stakeholder engagement and peer review by one or more independent experts being completed.



Source: FSC National Forest Stewardship Standard of Canada, p. 53

Indicator 6.5.7 requires that:

The Conservation Areas Network must comprise a minimum of 10% of the area of the Management Unit. The extent of the Conservation Areas Network on the Management Unit is identified by considering:

1. *Relative extent of the Conservation Areas Network in the area of ecological influence*
2. *Contribution of the Conservation Areas Network to the attainment of regional, provincial, national, and international (e.g. Aichi biodiversity targets) conservation and protected area targets;*
3. *Best available scientific information and research regarding appropriate conservation targets;*
4. *Previous contributions of the Organization to Conservation Areas Network on lands that were formerly within the Management Unit; and*

5. Socio-economic considerations (e.g. implications for wood availability and harvest levels).

Additional requirements related to the ecological gap analysis are listed under Indicator 6.5.2, which states:

Using best available information, an analysis is used to identify potential gaps in the completeness of the Conservation Areas Network in the Management Unit. Elements considered for inclusion in the gap analysis address enduring features, representation of native ecosystems, landscape connectivity, High Conservation Values, and High Conservation Value areas.*

The analysis uses inputs from the entire area of ecological influence.

The results of the gap analysis are mapped.

To evaluate our progress in contributing to the protected areas of Nova Scotia and set forth a plan in moving forward, a Conservation Area Network Gap Analysis has been conducted on PHP's forest management unit and the broader natural landscape. This gap analysis relied on ArcGIS for data management, analysis, and map development, and the Nova Scotia Department of Environment & Climate Change (NSDECC) Natural Landscapes framework³. This framework provides a province-wide description of the many landforms and ecological features used in protected areas planning for Nova Scotia. Although PHP uses NSDNRR's Ecological Land Classification System (Neily et al, 2017) for its forest management planning and operations activities, the use of NSDECC's Natural Landscapes framework was chosen for this analysis to better align with the provincial government's protected areas planning and objectives. This framework is suitable for choosing and safeguarding representative (or typical) sections of Nova Scotia's unique Natural Landscapes. It is ensured that the natural processes that take place within and between groupings of whole ecosystems within Natural Landscapes are also safeguarded. This is a comprehensive strategy that considers the preservation of both well-known and yet-to-be-identified species and processes. Natural Landscapes are used by the Protected Areas Branch of NSDECC for conservation and protected areas planning, so this ecological gap analysis uses the same planning framework. Guidance and input from experts in the field of landscape and ecological management was also provided throughout the process and are represented by NSDNRR, Dalhousie University, Canadian Parks & Wilderness Society, and the Mi'kmaq Forestry Initiative.

For this analysis, the terms conservation and protection are used interchangeably as defined in the FSC Canada National Standard. The standard defines these terms as "management activities designed to maintain the identified environmental or cultural values in existence long-term. Management activities may range from zero or minimal interventions to a specified range of appropriate interventions and activities designed to maintain, or be compatible with maintaining, these identified values."

Beyond the standard, Natural Resources Canada identifies the terms "forest conservation" and "forest protection" with different meanings, both strategies work to preserve the biodiversity and ecosystems of forests. To achieve goals for forest health and biodiversity, especially in managed forests where harvesting takes place, a variety of actions, instruments, and approaches are referred to as "forest

³ [Ecological Framework | Protected Areas \(novascotia.ca\)](https://www.novascotia.ca/conservation/protected-areas/)

conservation”, while forest protection refers to the creation of legally protected parks and other areas excluded from management activities and to help preserve healthy ecosystems⁴.

As required by the FSC Canada standard, this analysis will be reviewed every five years and if new important information or methodology improvements become available, the analysis will be updated and peer reviewed. The establishment of new protected areas that address some of the previously identified gaps, or an updated landscape classification system that gives a better basis for identifying gaps are two examples of new information that may need revising the gap analysis.

1.1 Project Objectives

There are two main objectives in completing this analysis for PHP’s forest management unit:

1. Assess ecological representation at PHP’s management unit level:
 - a. What percent of Crown lands managed by PHP can be considered the Conservation Area Network?
 - b. How does this percentage compare to the minimum 10% requirement by FSC?
2. Assess ecological representation at the regional level within natural landscapes that contain any portion of PHP’s management unit:
 - a. What percent of each natural landscape consists of legal and pending protected areas, old growth areas, and other lands where conservation is the exclusive or primary objective?
 - b. Identify any ecological gaps for each natural landscape that may require additional area to meet conservation goals and targets.

World Wildlife Fund Canada (2019) defines the concept of ecological representation as “an ecosystem [that] should “represent” all ecosystem types, maintain all populations of native species, ecological and evolutionary processes, and allow for natural environmental change” (p. 1).

2. METHODS & ANALYSIS APPROACH

2.1 Study Area

The study area for this analysis includes the seven eastern counties of Nova Scotia (Pictou, Guysborough, Antigonish, Richmond, Cape Breton, Inverness and Victoria) and parts of Colchester, Cumberland, and Halifax counties. The geographic extent of this area is shown in Figure 1. The company manages approximately 520,000 hectares of Crown lands under a Forest Utilization License Agreement

⁴ [Conservation and protection of Canada’s forests](#)

(FULA) with the provincial government (Figure 2). The Crown license area shown in Figure 2 is considered the management unit.

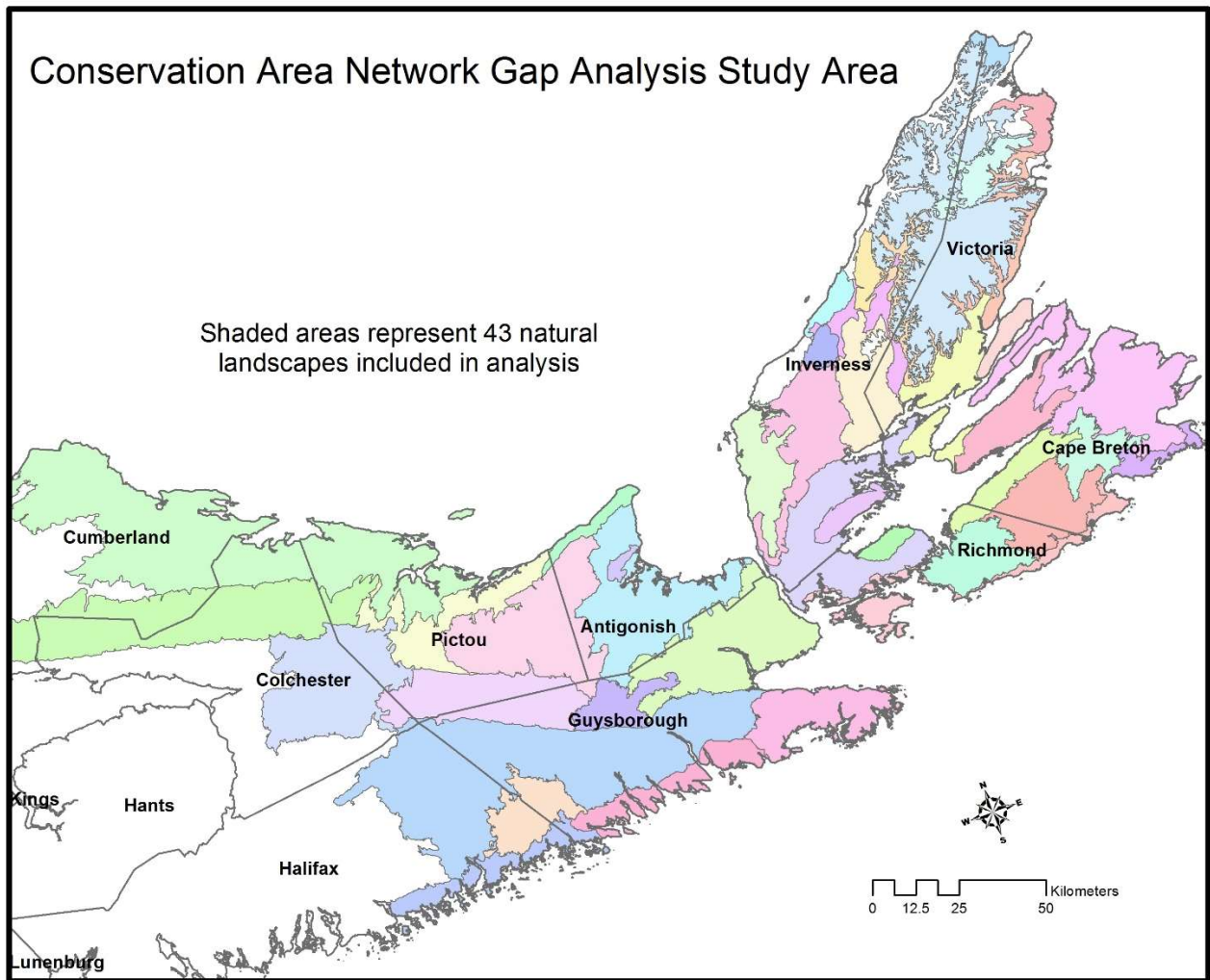


Figure 1. Study Area for Conservation Area Network Gap Analysis

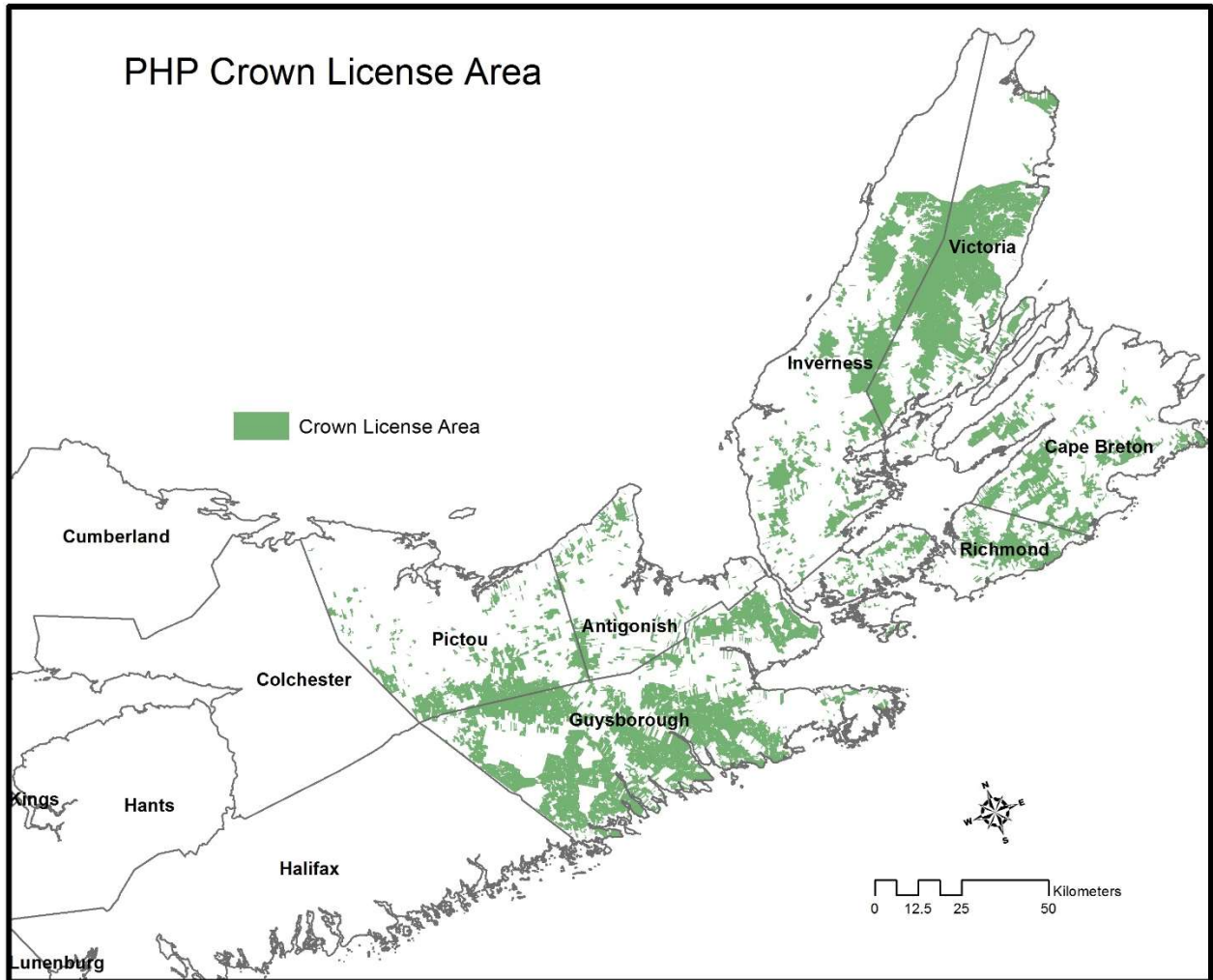


Figure 2. PHP Crown License Area

To meet FSC standard requirements, there were two spatially distinct regions used for the analysis. Identifying protected areas both inside the management unit (FULA) and outside the management unit (non-FULA, but within the seven eastern counties) was necessary to determine the conservation area network on Crown lands managed by PHP as well as determining whether any ecological gaps existed across the broader landscape (outside the management unit).

The area outside the management unit (Figure 1) includes the full extent of the natural landscapes and Eco-units mapped by the NSDECC that intersect PHP’s management unit (Figure 2) to assess the proportion of protected and conservation areas present at a regional scale. Protected and conservation areas included legal and pending protected areas (provincial and federal), old growth areas, and other conserved lands for biodiversity protection. This was considered the area of ecological influence as described in the above introduction, as required in the FSC standard.

2.2 Conservation Area Network Inputs

The protected and conserved data layers that make up the Conservation Area Network for this assessment are described below. Each type contributes to maintaining or restoring ecological integrity across the landscape such as species diversity, critical habitat, wildlife populations, and water quality. The total area for each data layer is provided as general information, however, these do not reflect the total area used in the analysis since there is some overlap between layers (e.g., old growth areas are found both inside and outside protected areas).

Legal and Pending Protected Areas			
Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
Provided by the Protected Areas Branch of the NSDECC as the most current data source for spatially delineated legal and pending legal protected areas. These areas are not available for forest management and contribute to the provincial protected areas program for protecting natural ecosystems in Nova Scotia.	Protection of representative examples of natural significance, sites and values, and contributing to wilderness recreation activities.	325,389 ha	82,554 ha

Old Growth			
Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
The NS Department of Natural Resources & Renewables (NSDNRR) recently updated its Old-Growth Forest Area Policy and accompanying spatial data. The current GIS layer lists all old-growth forests and old-growth restoration potential areas that are either protected under this	Protection and restoration of old-growth forests in Nova Scotia.	157,711 ha	49,063 ha

updated Policy and its precursor or as a part of federal/provincial parks and provincial wilderness areas ⁵ . All forest areas included in the layer are protected from forest management activities.			
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High Conservation Value Forest (HCVF) Conservation Areas

Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
These areas were first identified by the provincial government as potential future protected areas. As the protected area plan was finalized, certain areas were removed from the plan. PHP in collaboration with stakeholders during a 2015 HCVF assessment process identified which of the removed areas could be established as PHP conservation areas. The areas identified make up approximately 6,147 ha and have been conserved by PHP since 2015. Management activities are not permitted in these areas in situ.	Protection of intact forests for biodiversity conservation on PHP’s management unit.	6,147 ha	6,147 ha

Indigenous Protected & Conservation Area (IPCA)

Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
The IPCA concept was created by the federal committee ‘Indigenous Circle of Experts’ in	Protection and conservation of ecosystems by Indigenous governments.	9,688 ha	9,688 ha

⁵ <https://pubs.cif-ifc.org/doi/10.5558/tfc2023-018>

2018. IPCA's provide Indigenous governments the primary objective in protecting and conserving ecosystems through Indigenous laws, governance, and knowledge systems. Currently in NS, there is one IPCA that was delineated in 2022 northeast of the Eskasoni First Nation. This area is protected from all forest management activities.			
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Atlantic Coastal Plain Flora (ACPF)			
Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
NSDNRR has mapped a group of Atlantic Coastal Plain Flora that are legally listed under both the Species at Risk Act and the Nova Scotia Endangered Species Act. ACPF are "generally small, slow growing, and occur in habitats such as shorelines, fens, bogs, and estuaries ⁶ ".	Protection of known ACPF sites in NS.	1,679 ha	231 ha

Lichen Buffers (100 m and 200 m)			
Data Source/Description	Management Objective	Total Area (ha)	Total Management Unit PHP Area (ha)
Lichen buffers are created according to the provincial 'At-Risk Lichens Special Management	Conserve known lichen populations and provide sufficient habitat of the right	6,475 ha	3,789 ha

⁶ [Amended Recovery Strategy and Management Plan for Multiple Species of Atlantic Coastal Plain Flora in Canada - 2016 - Canada.ca](#)

Practices ⁷ for Crown land management. Potential lichen sites are surveyed by professional lichenologists and if found, the appropriate buffer width (100 m or 200 m depending on lichen species) is established. Within these buffers, no active forest management can occur. Data is updated and maintained by both PHP and NSDNRR for the management unit.	quality and quantity to allow for long-term self-sufficiency.		
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2.3 Natural Landscapes & Eco-Units

The natural landscapes framework for Nova Scotia is an essential planning and management tool for establishing protected areas. It offers a framework for choosing and safeguarding representative (or typical) sections of Nova Scotia's unique natural landscapes. The adoption of the framework as a foundation for the protection of one or more natural landscapes ensures that species and processes are maintained. This is a comprehensive strategy that considers the preservation of both well-known and yet-to-be-identified species and processes.⁸

The Natural History of Nova Scotia (Simmons et al., 1984), which was produced jointly by the Department of Lands and Forests (now Natural Resources & Renewables) and the Department of Education, served as the foundation for the identification and mapping of Nova Scotia's natural landscapes.

The local variation and distribution of landforms, vegetation communities, local climate, and the local natural disturbance regime are some examples of the various local environmental and biotic aspects or features that define a landscape. Natural landscapes often range in size from several to many square kilometres, and the ecosystems that exist within them are determined by the landforms, the flora, and other biological and physical elements.

There are 80 distinct landscape types in Nova Scotia and 43 of these types were used in this analysis (Figure 1; Table 1). The 43 natural landscapes that contain a portion of PHP's 520,000 hectare management unit are described in the report Natural Landscapes of Nova Scotia: Summary Descriptions⁹ for their climate, bedrock geology, physiography, surficial material, and dominant ecosystems.

⁷ [SMP_BFL_At-Risk-Lichens.pdf \(novascotia.ca\)](#)

⁸ [Ecological Framework | Protected Areas \(novascotia.ca\)](#)

⁹ [landscapes_report.pdf \(novascotia.ca\)](#)

Table 1. Natural Landscapes used in Conservation Area Network Gap Analysis

Natural Landscape #	Natural Landscape Name	Total Landscape Area All Land Ownerships (ha)
22	Northumberland Strait Plain	271,832
23	Cobequid Mountain	160,729
26	Central Rolling Hills	105,939
35	Eastern Shore Quartzite Plain	255,914
36b	Eastern Shore Drumlins (Moser River)	37,877
37	Eastern Shore Islands	36,031
38	Guysborough Headlands	37,515
39	Canso Granite Barrens	53,089
40	Aspen Drumlin Plain	25,702
41	St. Mary's Plain	77,787
42	Pictou River Hills	52,816
43	McArras Brook Dissected Hills	11,639
44a	Pictou-Antigonish Hills (Pictou)	109,799
44b	Pictou-Antigonish Hills (Antigonish)	3,972
45	South River Low Hills	100,584
46	Mulgrave Hills	103,727
47	Isle Madame Coastal Plain	22,051
48	Bras d'Or Lake Plain	90,120
49	Bras d'Or North Mountain Ridge	13,205
50a	Bras d'Or Fault Ridges (Sporting Mountain)	8,371
50b	Bras d'Or Fault Ridges (East Bay Hills)	27,662
51	Forchu Till Cliffs and Beaches	14,250
52	Barren Hill Drumlins	39,065
53	Mira River Drumlin Plain	53,684
54	Mira River Hills and Ridges	25,929
55	Louisbourg Cliffs	14,298
56	Sydney Plain	118,661
57	Boisdale Hills	37,290
58	Skye River Hills and Valleys	64,830
59	Judique Plain and Hills	40,797
62	Masons Mountain	8,541
63	Keppoch Mountain	47,702
64b	Cape Breton Boreal Plateau (Central)	178,695
65	Margaree-Middle River Valleys	20,935
66	Dunvegan Fluted Hills	9,941
67	Squirrel Mountain Foothills	11,955
68	Interior Steep Slopes	21,478
69	Central Cape Breton Hills	43,944
70	Kelly's Mountain	11,441
71	Eastern Coast Steep Slopes	25,662
72b	Northern Cape Breton Taiga (North Barren)	22,607

Natural Landscape #	Natural Landscape Name	Total Landscape Area All Land Ownerships (ha)
74	Northern Cape Breton Atlantic Slope	14,117
77	Meat Cove Steep Ridges	7,656

Within each natural landscape, landscape ecosystems or eco-unit types, have been spatially delineated to outline various ecosystem types. Although not field verified, eco-units were produced using various remote sensed GIS data to develop a predicted location of specific ecosystems. Mathematical models were used to create the eco-units based on the input data, which included elevation contour, hydrography, climate, bedrock geology, surficial geology, forest cover inventory, wetland classification, natural landscape and the eco-section layer of the ecological land classification system for Nova Scotia.¹⁰ Ecouints are classified using a seven-letter code made up of the elements shown in Table 2.

Table 2. Eco-units Classification System

Drainage	
W	Well drained
I	Imperfectly drained
P	Poorly drained
S	Saturated
X	Unclassified
Biotype	
SWD	Softwood forest
HWD	Hardwood forest
MWD	Mixedwood forest
CST	Coast
FWA	Open fresh water
OBA	Open barren
SBG	Shrub bog
TBG	Treed bog
SFE	Shrub fen
SSF	Seasonal flooded shrub flat
TSS	Tall shrub swamp
ESF	Emergent seasonal flooded flat
HED	Herbaceous emergent deep marsh
RBA	Rock barren
URB	Urban
XWD	Unknown
FWT	Water

¹⁰ Small Patch Ecosystems GIS Shapefile Document, NS Department of Environment & Climate Change

Topography	
CB	Coastal beach
CN	Canyon
DM	Drumlin
DS	Steep slope
HO	Hummock
KK	Hill
MS	Salt marsh
RD	Ridge
SM	Flat
WA	Water

2.4 Ecological Representation Thresholds

Ecological representation is determined based on how well a certain protected area captures the anticipated number of species and ecological processes. Due to the difficulty of quantifying all species and elements, plant species are often chosen as a substitute for biodiversity. The use of plants as surrogates is highly supported by recent studies (Margules and Sarkar 2007, Pharo et al. 2000, Sakar et al. 2005), in part because of the functional roles that they perform in ecosystems. While this approach is supported in the literature, plant communities can be affected by factors such as surrounding management, size of protected areas, edge influences, and degree of ecological connectivity.

Research, ecological land classification systems, and GIS analysis are all integral components to determine if an area includes all the elements of genes, species and ecosystems. For the mapped eco-units in Nova Scotia, the degree to which a certain protected habitat accurately illustrates the anticipated number of species and ecosystem components in the landscape was the basis of ecological representation. In a protected habitat, representation was deemed good when there were 75% to 89% of the expected species present, and complete when there were 90% of the expected species (Cameron 2022, pers. comm.).

A recent [State of Protected Areas Report](#) (Cameron 2021) summarizes species-area relationships (SAR) for each natural landscape using plot and transect data for plants. Since species richness varies from landscape to landscape, a particular level of protection is required in each landscape to ensure sufficient capture of species throughout the province. The amount of land required to safeguard certain percentages of the province's total number of species or of each natural landscape is also summarized in the [State of Protected Areas Report](#) (Table 3 and Figure 4 below). For instance, 60% of the province must be protected to capture 90% of the plant species, and 66% of the province must be protected to capture 90% of the bird species. Approximately 48% of the plant species and 66% of the bird species are captured if 20% of the province is protected.

Table 3. Percent of number of plant and bird species protected based on total percent area protected in Nova Scotia

% Area Protected	% of Number of Plant Species Protected	% of Number of Bird Species Protected
4	35	30
8	40	53
12	43	58
16	46	61
20	48	66
30	80	74
40	84	79
50	88	84
60	91	88
66	93	90

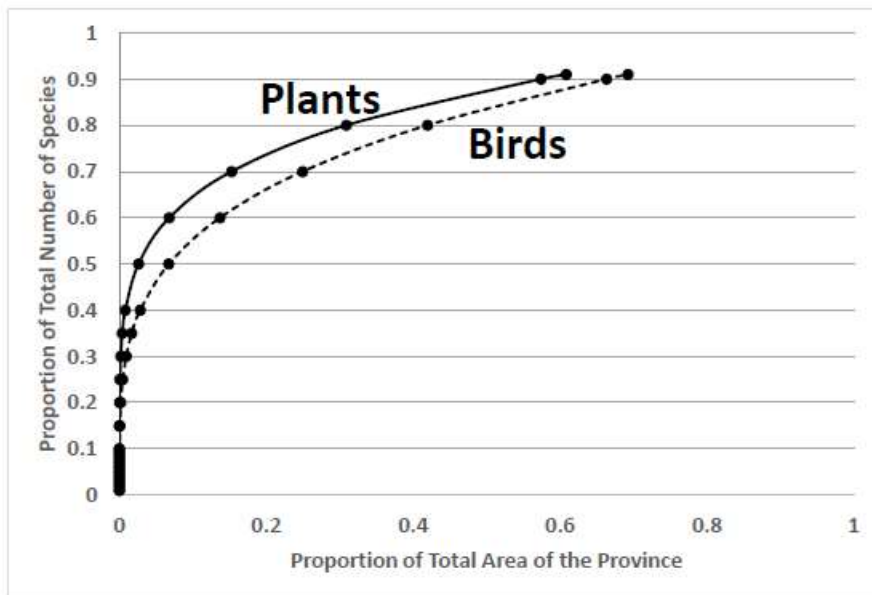


Figure 4. Species Area Relationship curves with mean provincial values for bird and plant species in Nova Scotia

Based on the leveling off points along the species area relationship curve, the below thresholds in Table 4 were identified internally by NSDECC (pers. comm. Cameron 2023). The below table is colour-coded to identify those that are least to well-represented by protected areas (pers. comm. Cameron 2023).

Table 4. Colour codes used to assess gaps in eco-units.

% Protected	Colour Code	Definition/Criteria	Representivity Rank
0 to 5	Red	Likely to contain less than 55% of the expected number of species	Very poor
5.1 to 17	Orange	Between 55 and 70% of the expected number of species	Poor
17.1 to 24	Yellow	Between 70 and 75% of the expected number of species	Fair
24.1 to 59	Light green	Between 75 and 89% of the expected number of species	Good
59.1 to 100	Dark green	90% or more of the expected number of species	Complete

Using the above colour-coded table, gaps were identified for natural landscapes where the percent protected was less than 17% and PHP managed at least 50% of the Crown land. The threshold of 17% for identifying gaps is supported by the Aichi Biodiversity Target # 11 of the Convention on Biological Diversity¹¹. Under Strategic Goal C “To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity”, Target 11 states:

“By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and integrated into the wider landscapes and seascapes.”

¹¹ [Aichi Biodiversity Targets \(cbd.int\)](http://cbd.int)

2.5 Management Unit Assessment

The below steps were used to assess the Conservation Area Network on PHP's forest management unit. The Conservation Area Network must meet the minimum requirement of 10% as per the FSC standard.

1. Compile legal and pending protected areas, and old growth areas in GIS. This creates a layer that only represents areas protected under legislation (existing and pending) or the provincial policy for old growth areas (Figure 5). The Union function in ArcGIS was used to remove all overlaps so areas were not double counted (Figure 6).
2. An overlay with PHP's management unit was completed to identify the percent of the management unit under protection or conservation.
3. The percent Conservation Area Network was determined as follows:
 - a. $\% \text{ CAN} = \text{Sum of protected and conserved areas} / \text{Management Unit area}$
4. The resulting % CAN was compared to the FSC minimum requirement of 10%, and any deficit or surplus was reported.

2.6 Regional Representation Assessment

The below steps were used to assess regional representation of protected areas across 43 unique natural landscapes.

1. Determine the natural landscapes that overlap with PHP's management unit.
2. Extract the full extent of natural landscapes from the provincial dataset (Figure 1).
3. Compile legal and pending protected areas, old growth areas, High Conservation Value Forest (HCVF) protected areas, Indigenous Protected and Conserved Areas, Atlantic Coastal Plain Flora protected sites, and lichen 100 m and 200 m protected buffers (Figure 7). These data layers spatially define areas that are protected or conserved from all forest management activities and contribute to the calculation of the Conservation Area Network Gap Analysis. The Union function in ArcGIS was used to remove all overlaps so areas were not double counted.
4. The percent protected area was calculated in each Natural Landscape for the total landscape area, as well as calculating the percent protected in each Natural Landscape for the PHP management unit lands. This gives an indication of how much protection is at the Natural Landscape scale as well as how much protection is established on PHP management unit lands for comparison between the two scales.
5. For natural landscapes where the percent of PHP's management unit lands per Natural Landscape is 50% or greater, and where percent protected on PHP's management unit lands is less than 17% (Aichi Biodiversity Target # 11 – Convention on Biological Diversity), the Natural Landscape was identified as having ecological gaps. The threshold of 50% or greater of PHP's management unit lands per Natural Landscape was chosen since the majority of the Natural Landscape is located within PHP's FULA lands and provide the best opportunities and influence by PHP on closing any ecological gaps that may exist. Natural landscapes with less than 50% Crown land managed by PHP are viewed as important for government to consider additional

protected areas efforts while balancing the needs of other land and resource users (e.g. wind farm development, recreation and trails).

6. For natural landscapes identified as having ecological gaps, further analysis was completed to calculate the percent of each biological eco-unit protected in the identified Natural Landscape on PHP's forest management unit.
7. The percent of biological eco-unit protected was further assessed using the thresholds shown in Table 4 above to identify the most under-represented eco-units needing additional conservation measures.

3. RESULTS

3.1 Management Unit

The area inside the management unit (Figure 2) represents all Crown lands licensed to PHP for forest management. Previous contributions by the organization to conservation lands that were formerly within the management unit, but are now removed from forest management activities, were also considered as part of inside the management unit as allowed in the FSC standard (indicator 6.5.7, page 53) as areas that count towards conservation (Figure 5). These conservation lands would have been identified during the first phase of delineating Crown wilderness protected areas as well as during the 2012 protected areas planning process by the NSDECC. Figure 6 illustrates the Conservation Area Network results with overlaps removed between protected areas and old growth areas. Approximately 18% of PHP's management unit is identified as the Conservation Area Network, which meets FSC's requirement of a minimum of 10%.

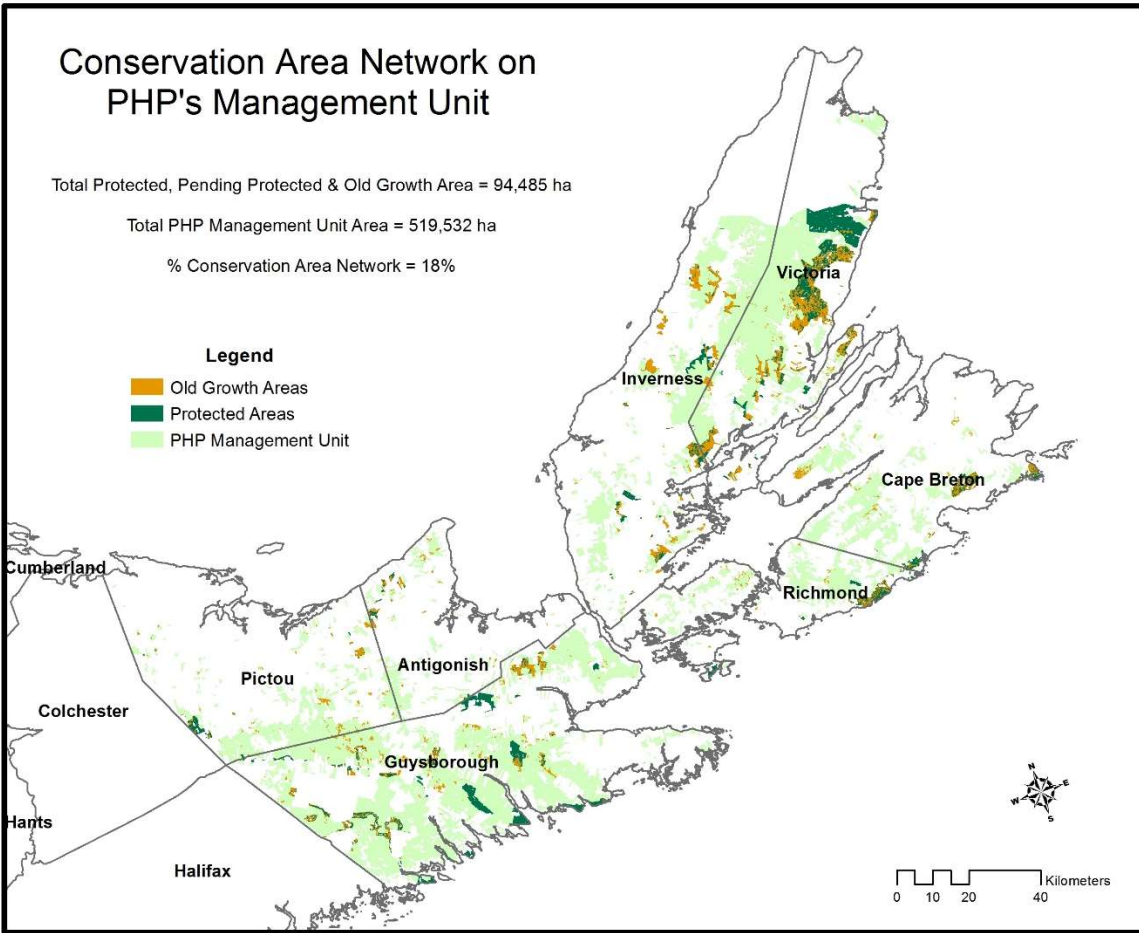


Figure 5. Protected and Old Growth Areas on PHP's Management Unit

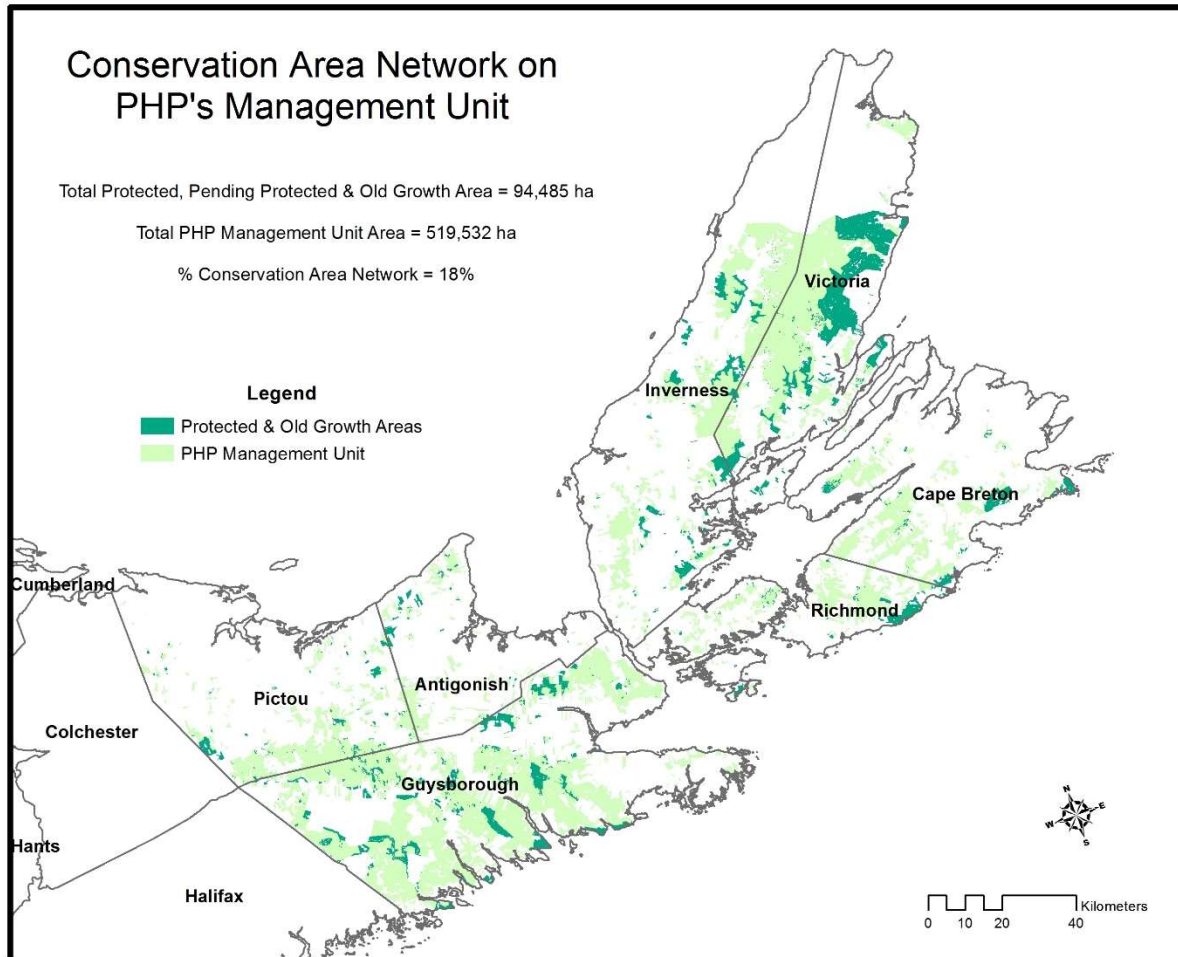


Figure 6. Conservation Area Network on PHP's Management Unit

3.2 Regional Representation Assessment

Unlike the Conservation Area Network where only protected and old growth areas were used, the inputs of what could count towards protected or conserved were broadened for the regional representation assessment. As a land manager of Crown land, PHP implements other effective conservation efforts for preserving natural habitats, preserving biodiversity and threatened species, that contribute to a healthy function forest ecosystem. In addition to protected and old growth areas, the additional inputs outlined in section 2.1 were also included in assessing regional representation of ecosystem protection. These included PHP's HCVF Protected Areas, Indigenous Protected and Conservation Area, Atlantic Coastal Plain Flora, and Lichen Buffers (100 m and 200 m) (Figure 7). These data layers spatially define areas that are protected or conserved from all forest management activities and contribute to the calculation of the ecological gap analysis. The Union function in ArcGIS was used to remove all overlaps so areas were not double counted.

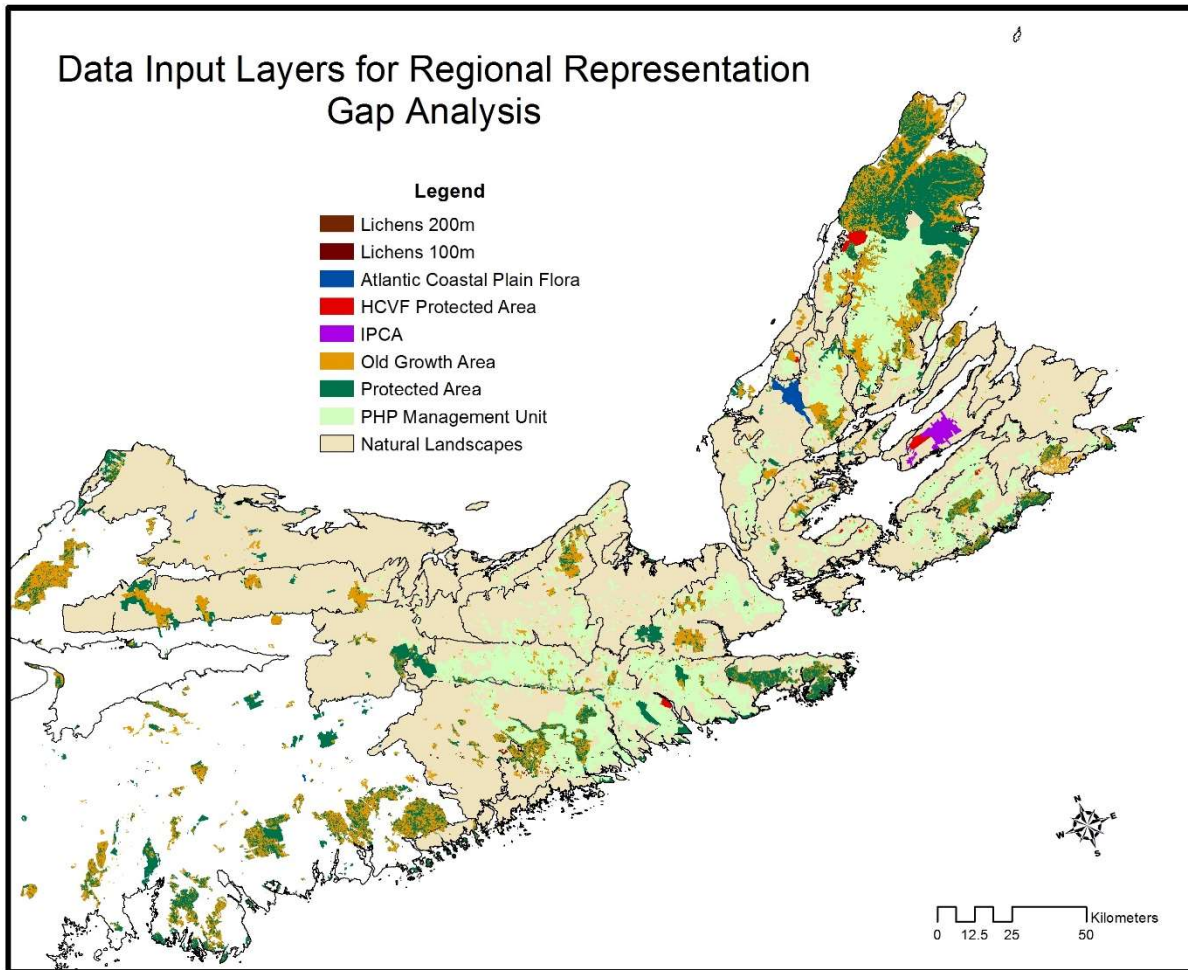


Figure 7. Data Input Layers for Regional Representation Gap Analysis

As was done for the management unit assessment, the data input layers for the gap analysis were unioned together to remove all overlaps. Figure 8 shows the final protected and conservation area input layer.

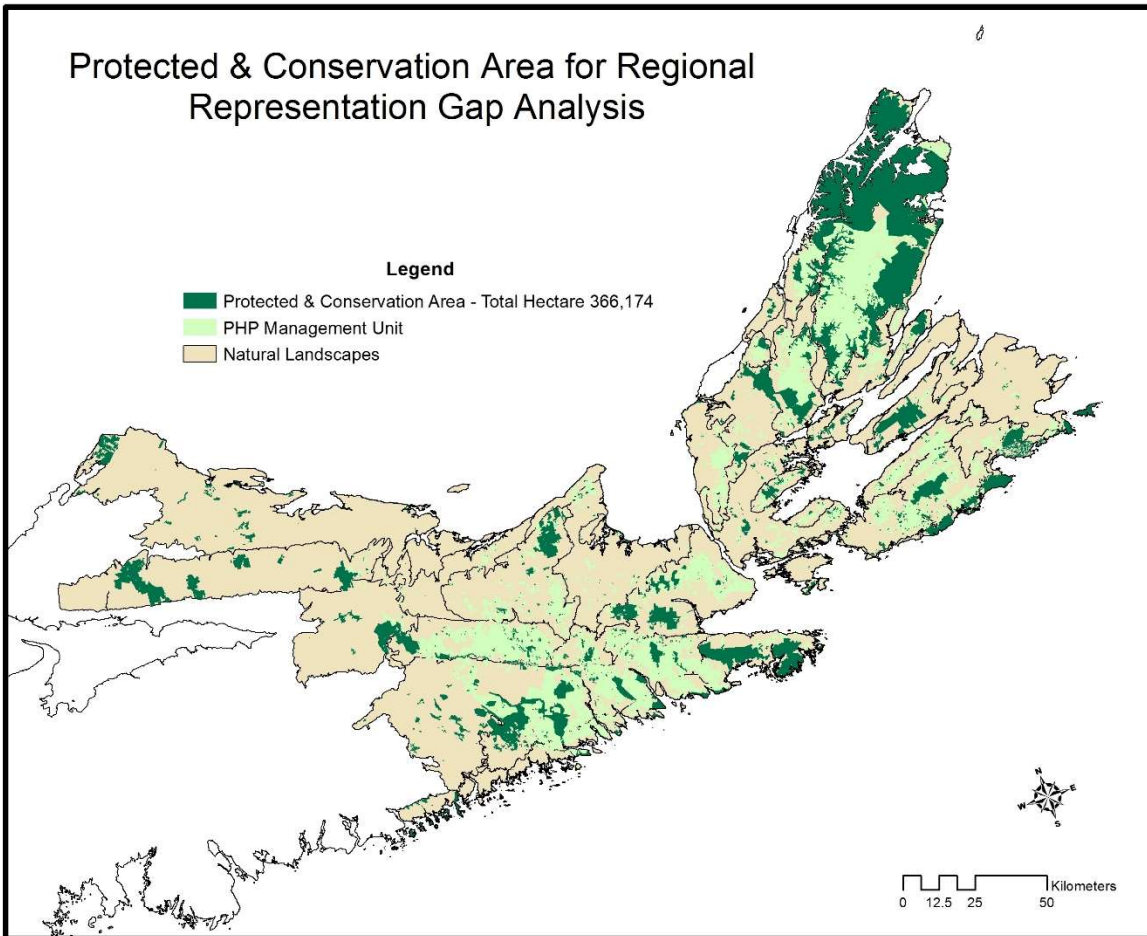


Figure 8. Protected and Conservation Area for Regional Representation Gap Analysis

Using the steps outlined in section 2.5, the percent protected for each natural landscape was calculated using the protected and conservation area data shown in Figure 8. The calculation was completed for the entire natural landscape as well as for the area managed by PHP for comparison. Identifying how much land PHP manages within each landscape as well as how much of that land is under protection/conservation provides a clearer picture of how much influence PHP has in contributing to closing ecological gaps. Table 5 provides a summary of protection for each natural landscape.

Values shown in red for percent protected by PHP and percent protected by natural landscape represent those that are below the 17% Aichi target. Rows highlighted in orange are natural landscapes where PHP manages 50% or more of the Crown land and the percent protected by PHP is less than the 17% Aichi target. The threshold of 50% or greater of PHP’s management unit lands per Natural Landscape was chosen as those areas where PHP can have the most influence on closing any ecological gaps that may exist. These natural landscapes, Guysborough Headlands and St. Mary’s Plain, were highlighted as containing ecological gaps which required further analysis.

Table 5. Summary of Results for Protected Area by Natural Landscape

NL #	NATURAL LANDSCAPE	PROTECTED ON FULA LANDS BY NATURAL LANDSCAPE			PROTECTED ON ALL LANDS BY NATURAL LANDSCAPE			% Land Managed by PHP per Natural Landscape
		Total Land Protected by PHP (ha)	Total Land Managed by PHP (ha)	% Protected by PHP	Total Land Protected (ha)	Total Natural Landscape Area (ha)	% Protected	
22	Northumberland Strait Plain	38	278	14%	10034	271823	4%	0%
23	Cobequid Mountain	167	1232	14%	19809	160729	12%	1%
26	Central Rolling Hills	890	2853	31%	7465	105939	7%	3%
35	Eastern Shore Quartzite Plain	11288	83467	14%	24427	255914	10%	33%
36b	Eastern Shore Drumlins (Moser River)	1309	10742	12%	11606	37877	31%	28%
37	Eastern Shore Islands	34	1726	2%	4106	36031	11%	5%
38	Guysborough Headlands	3021	20587	15%	3657	37515	10%	55%
39	Canso Granite Barrens	535	9172	6%	19611	53089	37%	17%
40	Aspen Drumlin Plain	1763	9175	19%	2210	25702	9%	36%
41	St. Mary's Plain	3438	41327	8%	7906	77787	10%	53%
42	Pictou River Hills	106	2293	5%	146	52816	0%	4%
43	McArras Brook Dissected Hills	54	1628	3%	228	11639	2%	14%
44a	Pictou-Antigonish Hills (Pictou)	3334	22954	15%	9574	109799	9%	21%
44b	Pictou-Antigonish Hills (Antigonish)	40	127	31%	40	3972	1%	3%
45	South River Low Hills	566	7014	8%	1119	100584	1%	7%
46	Mulgrave Hills	5302	33816	16%	12977	103727	13%	33%
47	Isle Madame Coastal Plain	438	916	48%	991	22051	4%	4%
48	Bras d'Or Lake Plain	1330	8920	15%	3748	90120	4%	10%
49	Bras d'Or North Mountain Ridge	1898	4102	46%	2672	13205	20%	31%
50a	Bras d'Or Fault Ridges (Sporting Mtn.)	186	2019	9%	281	8371	3%	24%

NL #	NATURAL LANDSCAPE	PROTECTED ON FULA LANDS BY NATURAL LANDSCAPE			PROTECTED ON ALL LANDS BY NATURAL LANDSCAPE			% Land Managed by PHP per Natural Landscape
		Total Land Protected by PHP (ha)	Total Land Managed by PHP (ha)	% Protected by PHP	Total Land Protected (ha)	Total Natural Landscape Area (ha)	% Protected	
50b	Bras d'Or Fault Ridges (East Bay Hills)	289	9393	3%	559	27662	2%	34%
51	Forchu Till Cliffs and Beaches	2671	3091	86%	7412	14250	52%	22%
52	Barren Hill Drumlins	1153	12252	9%	1838	39065	5%	31%
53	Mira River Drumlin Plain	2147	21394	10%	8300	53684	15%	40%
54	Mira River Hills and Ridges	683	5128	13%	708	25929	3%	20%
55	Louisburg Cliffs	2332	3086	76%	7144	14298	50%	22%
56	Sydney Plain	1058	3749	28%	1863	118661	2%	3%
57	Boisdale Hills	6823	8187	83%	9944	37290	27%	22%
58	Skye River Hills and Valleys	1312	7322	18%	9133	64830	14%	11%
59	Judique Plain and Hills	73	8033	1%	422	40797	1%	20%
62	Masons Mountain	1019	3785	27%	1126	8541	13%	44%
63	Keppoch Mountain	5754	24378	24%	9606	47702	20%	51%
64b	Cape Breton Boreal Plateau (Central)	26045	100338	26%	97095	178695	54%	56%
65	Margaree-Middle River Valleys	209	735	28%	366	20935	2%	4%
66	Dunvegan Fluted Hills	745	855	87%	801	9941	8%	9%
67	Squirrel Mountain Foothills	1219	3813	32%	1289	11955	11%	32%
68	Interior Steep Slopes	3852	8371	46%	12377	21478	58%	39%
69	Central Cape Breton Hills	2582	7272	36%	4478	43944	10%	17%
70	Kellys Mountain	1820	3620	50%	3003	11441	26%	32%
71	Eastern Coast Steep Slopes	6429	8413	76%	15444	25662	60%	33%
72b	North Cape Breton Taiga (North Barren)	787	4904	16%	15959	22607	71%	22%
74	Northern Cape Breton Atlantic Slope	65	3261	2%	9509	14117	67%	23%
77	Meat Cove Steep Ridges	1	43	1%	5193	7656	68%	1%

3.2.1 Natural Landscapes with Ecological Gaps

To determine the most under-represented areas in each natural landscape with ecological gaps, the biological eco-units were used to identify how much area is protected for each eco-unit (Table 6). The thresholds shown in table 4 above provided the assessment of level of representation by using the colours red (very poor), orange (poor), yellow (fair), light green (good) and dark green (complete).

Table 6. Percent Protected by Eco-Unit in the Guysborough Headlands Natural Landscape

Biological Eco-Unit Description	Eco-Unit Code	Total Eco-Unit Area (ha)	Total Protected Area (ha)	% Protected
Herbaceous emergent deep marsh	HEDXSXM	107	1	1.1%
Shrub fen poorly drained unclassified	SFEPXXX	309	4	1.4%
Softwood well drained unclassified hummock	SWDWXHO	2112	33	1.6%
Open barren well drained unclassified	OBAWXKK	649	13	2.0%
Rock barren well drained unclassified	RBAWXKK	54	1	2.4%
Rock barren imperfectly drained hummock	RBAIXHO	78	2	2.7%
Softwood imperfectly drained unclassified flat	SWDIXSM	255	7	2.7%
Softwood well drained unclassified ridge	SWDWXRD	1026	28	2.8%
Softwood well drained unclassified drumlin	SWDWXDM	556	16	2.9%
Open fresh water unclassified water	FWAXXWA	1694	52	3.0%
Open bog poorly drained unclassified	OBGPPXX	333	12	3.7%
Softwood well drained unclassified	SWDWXKK	5858	354	6.0%
Treed bog poorly drained unclassified	TBGPXXX	661	44	6.7%
Water poorly drained unclassified	FWTPXXX	129	11	8.3%
Softwood imperfectly drained unclassified ridge	SWDIXRD	1676	176	10.5%
Rock barren imperfectly drained ridge	RBAIXRD	9	1	12.5%
Rock barren well drained ridge	RBAWXRD	394	52	13.3%
Tall shrub swamp unclassified	TSSPXXX	28	4	14.0%
Softwood imperfectly drained unclassified hummock	SWDIXHO	7228	1065	14.7%
Open barren imperfectly drained unclassified ridge	OBAIXRD	221	39	17.5%
Softwood well drained unclassified	SWDWXKM	203	38	18.9%
Coast well drained unclassified	CSTWXKM	1	0	21.9%

Biological Eco-Unit Description	Eco-Unit Code	Total Eco-Unit Area (ha)	Total Protected Area (ha)	% Protected
Softwood unclassified coastal beach	SWDXXCB	56	12	22.3%
Coast imperfectly drained unclassified hummock	CSTIXHO	82	20	24.4%
Rock barren coastal beach	RBAXXCB	6	2	25.9%
Open barren well drained unclassified drumlin	OBAWXDM	92	24	26.2%
Shrub bog poorly drained unclassified	SBGPXXX	3468	966	27.9%
Coast unclassified coastal beech	CSTXXCB	100	29	29.6%
Open barren well drained unclassified	OBAWXKM	2	1	31.5%
Open barren imperfectly drained unclassified hummock	OBAIXHO	909	337	37.1%
Coast well drained unclassified hill	CSTWXKK	34	14	43.0%
Coast well drained unclassified hummock	CSTWXHO	7	3	47.1%
Open barren unclassified coastal beach	OBAXXCB	70	38	54.1%
Coast imperfectly drained unclassified ridge	CSTIXRD	4	4	97.7%

Table 7. Percent Protected by Eco-Unit in the St. Mary's Plain Natural Landscape

Biological Eco-Unit Description	Eco-Unit Code	Total Eco-Unit Area (ha)	Total Protected Area (ha)	% Protected
Open fen unclassified	OFEPXXX	22	0	0.0%
Herbaceous emergent deep marsh	HEDSXSM	64	0	0.0%
Softwood well drained unclassified ridge	SWDWXRD	790	12	1.5%
Softwood well drained unclassified hill	SWDWXKK	8983	249	2.8%
Shrub bog unclassified	SBGPXXX	959	27	2.8%
Mixedwood well drained unclassified hummock	MWDWXHO	590	23	3.9%
Hardwood well drained unclassified hill	HWDWXKK	523	29	5.6%
Softwood imperfectly drained unclassified ridge	SWDIXRD	1257	78	6.2%
Mixedwood well drained unclassified hill	MWDWXKK	1459	91	6.2%
Hardwood well drained unclassified hummock	HWDWXHO	503	33	6.6%
Hardwood imperfectly drained unclassified hummock	HWDIXHO	31	2	7.1%
Softwood well drained unclassified hummock	SWDWXHO	20376	1640	8.1%
Open fresh water unclassified water	FWAXXWA	2473	292	11.8%
Treed bog unclassified	TBGPXXX	1095	131	11.9%
Open bog poorly drained unclassified	OBGPPXX	187	25	13.4%
Treed fen unclassified	TFEPXXX	287	42	14.6%
Mixedwood well drained unclassified drumlin	MWDWXDM	900	145	16.1%
Softwood imperfectly drained unclassified hummock	SWDIXHO	13380	2237	16.7%
Seasonal flooded shrub flat unclassified	SSFPXXX	118	22	18.6%
Softwood well drained unclassified drumlin	SWDWXDM	3148	592	18.8%
Tall shrub swamp unclassified	TSSPXXX	1259	241	19.1%
Shrub fen unclassified	SFEPXXX	905	173	19.2%
Hardwood well drained unclassified drumlin	HWDWXDM	182	38	20.7%
Mixedwood imperfectly drained unclass hummock	MWDIXHO	126	27	21.2%
Softwood imperfectly drained unclassified flat	SWDIXSM	443	100	22.5%
Softwood poorly drained unclassified flat	SWDPXSM	661	169	25.5%
Unknown well drained unclassified drumlin	XWDWXDM	797	271	34.0%
Emergent seasonal flooded flat unclassified	ESFPXXX	32	14	45.0%

3.2.2 Other Conservation Measures for Filling Ecological Gaps

Since PHP only has influence on the Crown lands it manages for increasing or establishing conservation areas to fill gaps, only those parcels of land that PHP manages and outside the protected and conservation areas already used in this gap analysis as inputs were used. Currently, there are special management practices in place for several species at risk and other ecological values. In the Guysborough Headlands and St. Mary's Plain natural landscapes, there are special conservation zones for the endangered mainland moose, the threatened wood turtle, and wetlands of special significance. These areas are mapped in PHP's GIS for operational planning as conserved, since management activities are not allowed in these zones. Although not legally protected, these zones are not permitted for operational planning through the review and approval process with the NSDNRR for Crown land management (unless as explained further below for moose shelter and retention patches).

Mainland Moose Special Management Practices

In 2003, the Nova Scotia Endangered Species Act (S.N.S. 1998, c.11) designated the mainland moose (*Alces alces americana*) as Endangered due to the species' small, diminishing population and the numerous, complex threats it faces. A variety of forest and wetland habitat types that offer food, shelter, and suitable temperature conditions are necessary to meet the complex habitat needs of moose (NSDNRR 2020). There is little knowledge on specific geographical and temporal habitat preferences and limiting variables. However, new research suggests that moose in Nova Scotia may experience thermoregulatory stress during warm seasons and may rely on mature stands that offer sufficient cover (NSDNRR 2020).

In 2012, the NSDNRR developed Special Management Practices for the endangered mainland moose. These practices are required on Crown land for forest management within the five significant Mainland Moose Population Concentration areas mapped by NSDNRR (Figure 9). Several special management practices are required within these areas related to moose shelter patches, moose retention patches, moose bog buffers, roads and access points, and coarse woody debris.

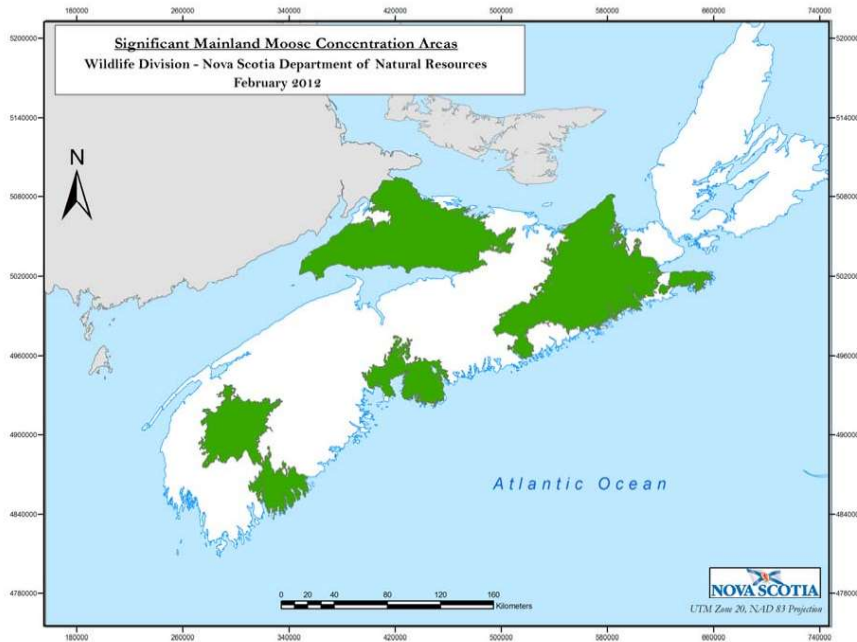


Figure 9. Mainland Moose Population Concentration Areas

When planning forest harvest activities on Crown land in the concentration zones, moose shelter patches are required in mature closed-canopy coniferous stands to provide adequate shelter for minimizing physiological stress from elevated temperatures (NSDNRR 2020). Mature closed-canopy coniferous stands that are used as shelter patches must be large enough and have a structure to maintain an interior temperature lower than the ambient temperature above the canopy or in adjacent cuts to successfully reduce moose thermal stress in summer and late winter (NSDNRR 2020). Special management practices for mainland moose requires a minimum of 6 hectare (or two 3-hectare patches) of shelter patch within 250 m of the edge of every forest harvest area, which is understood as a single or group of harvest polygons. A harvest plan may involve a single or number of individual harvest polygons. A 50-hectare harvest is designated by the Forest/Wildlife Guidelines and Standards for Nova Scotia as a discrete unit requiring one or more travel corridors and, as a result, as the upper limit at which additional shelter patches are necessary. A minimum of 12% of the harvest polygon must be made available as shelter patches in harvest areas larger than 50 hectares, and no shelter patch may be smaller than 3 ha. Patches of protection that connect to places like watercourses, wetlands, and connectivity management zones also increase the ecological value of those patches. Shelter patches that are totally isolated (i.e., have no trees or regrowth beyond 2 metres away from the patch) cannot be smaller than 5 hectares. Larger, more evenly spaced-out shelter patches are desirable. Shelter patches that give efficient thermal protection also offer protection from predators and other environmental stressors (NSDNRR 2020).

Different from moose shelter patches, moose retention patches are portions of coniferous stands that are maintained in the larger managed stand to provide shelter for moose as they move among different

habitat types for foraging, and thermal and protective cover. These areas must be placed so that moose will always be 100 metres or less from forest cover (NSDNRR 2020).

Moose bog buffers is another conservation practice to provide concealment for moose using open wetlands and aquatic habitats. In addition to 20 metre forested buffers required adjacent to watercourses under The Wildlife Habitat & Watercourse Protection Regulations, a 20-metre forested buffer is required around all open bogs, which is not required under the regulation but is stipulated in NSDNRR's Special Management Practices (SMP) for Endangered Moose. These 20-metre open bog buffers are conserved and management activities are not permitted.

Moose shelter and retention patches are established by PHP under specific habitat conditions as required in the SMP for endangered moose. Retention and shelter patches are maintained as such on the landscape and not available for future forest management unless and until the remaining patches are still large enough to meet SMP requirements. Additionally, if there are other stands that meet or exceed the patch criteria, then older patches can be harvested. However, this will only occur in about 30-40 years from when the original patches were established due to the requirement for meeting habitat conditions. Harvesting within moose shelter patches are also not permitted unless an extraction trail is needed through a patch where alternate access to a harvest area is not available. PHP aims to establish shelter patches in a forest area where use for future extraction trails will not be needed through a shelter patch. To date, PHP has not established an extraction trail through a patch nor approached NSDNRR for approval to establish an extraction trail.

When the harvested forest that required the shelter patch regenerates and offers adequate thermal cover, the shelter patch can be removed as a residual stand and converted into viable forage habitat. Adequate thermal cover in forests adjacent to shelter patches require the following characteristics:

- 50-80% softwood; and
- \geq 12 metres height; and
- Crown closure \geq 60% (NSDNRR 2020)

Based on the above characteristics, it is presumed that shelter patches can become available for forest management in approximately 30-35 years from when first established.

Wetlands of Special Significance

The Nova Scotia Wetland Conservation Policy (NSDECC September 2011; revised October 2019) outlines objectives and implementation activities for the prevention of net loss of wetlands in Nova Scotia through conservation efforts. The policy describes a Wetland of Special Significance (WSS) as:

- *all salt marshes*
- *wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts*

- *intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the NS–EHJV*
- *wetlands known to support at-risk species as designated under the federal Species at Risk Act or the Nova Scotia Endangered Species Act*
- *wetlands in designated protected water areas as described within Section 106 of the Environment Act*

Government will not support or approve alterations proposed for a WSS or any alterations that pose a substantial risk to a WSS, except:

- *alterations that are required to maintain, restore, or enhance a WSS;*
- *alterations deemed to provide necessary public function, based on an Environmental Assessment (if required) with public review or other approvals (e.g., Wetland Alteration Approval) as appropriate. (NSDECC 2011, pp. 11-12)*

Wetlands of Special Significance have been mapped and are established as conserved zones in PHP's GIS. Approximately 126,650 ha of these wetlands have been identified and delineated.

Wood Turtle Special Management Practices

Throughout their range, wood turtles are a listed "species at risk". They are classified as "threatened" (COSEWIC 2007) on the federal level and threatened (2013, provincially) due to their vulnerability to anthropogenic activities and land use practises. Wood turtles require both riverine and wooded habitat. Frequently, mixed woods with an established shrub canopy and open areas are home to wood turtles. In July 2012, NSDNRR released Special Management Practices on Crown land for Wood Turtles. While conserving the habitats necessary for vital life activities including overwintering, basking, nesting, and foraging, special management practices for wood turtles aim to minimize their general sensitivity to land use throughout their active period.

Recent new initiatives between the federal government and provinces regarding species at risk strive towards safeguarding critical habitat for species at risk on non-federally controlled land. In place of creating its own recovery plan, Nova Scotia adopted the proposed federal recovery strategy for wood turtle in February 2020, along with the standards for identifying essential habitat. Using the federal critical habitat designation and mapped areas, along with previously known areas of core habitat identified by the Nova Scotia government, the core habitat for wood turtles in Nova Scotia have now been expanded to include both levels of data (ECCC 2021).

Currently, the 2012 Special Management Practices for Wood Turtle are under review by NSDNRR, so it is better aligned with the recovery strategy to effectively protect critical habitat (D. Crossland, pers. comm. 2022). In the meantime, all areas identified as critical habitat for wood turtles are considered protected. These areas are mapped for the Crown lands that PHP manages and are excluded from all forest planning and operational activities.

3.2.3 Results in Guysborough Headlands Natural Landscape

To determine if moose bog buffers, moose retention and shelter patches, wood turtle critical habitat, and wetlands of special significance contribute to closing ecological gaps in the Guysborough Headlands natural landscape, the areas were unioned in GIS to remove overlaps and excluded any area that overlapped with the protection and conservation data that was used initially in the regional representation assessment. Figure 10 below shows each layer prior to the union for Guysborough Headlands. These areas are shown only for the PHP management unit. Wood turtle critical habitat is not known to occur in this natural landscape, so it is not included as a gap filling input. Figure 11 shows the unioned layer of the moose patches, moose bog buffers, and wetlands of special significance that exist outside of the protected and conservation already used in the analysis. It is this area that was used to calculate gap filling contributions.

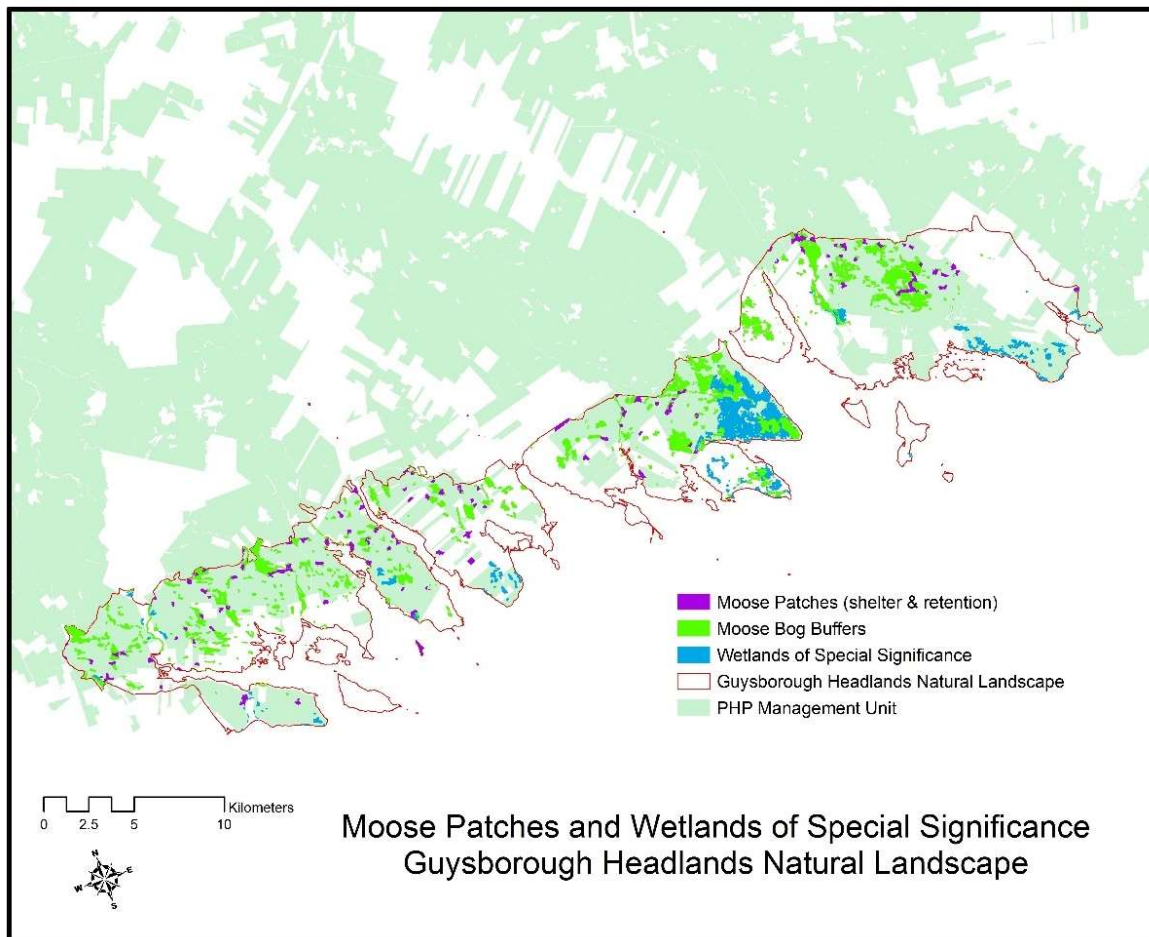


Figure 10. Moose & Wetlands Areas in Guysborough Headlands Natural Landscape

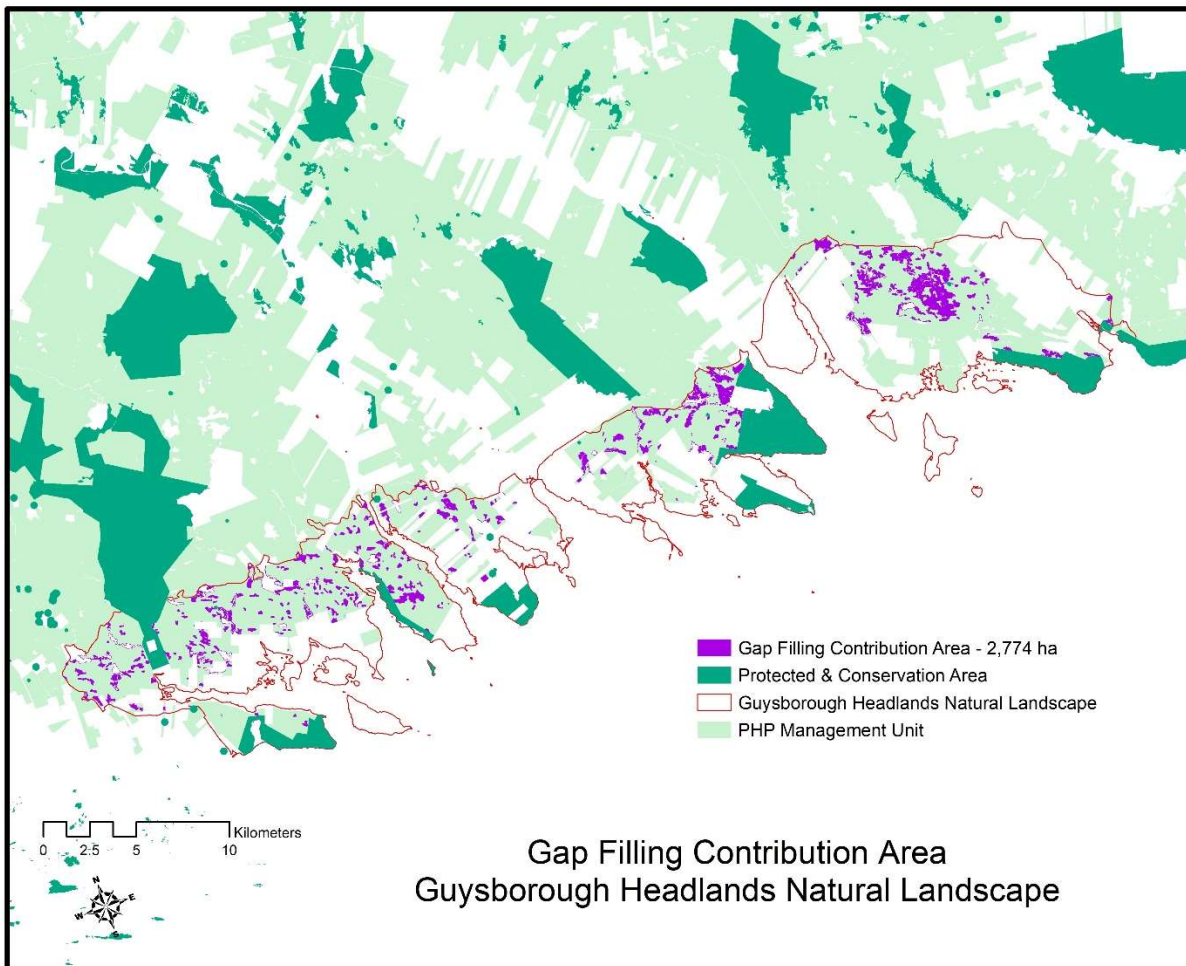


Figure 11. Gap Filling Contribution Area in Guysborough Headlands Natural Landscape

The below table summarizes the area of protected and conserved for eco-units categorized as very poor, poor and fair (same as shown in Table 6), but also includes the gap filling contribution area to determine how much total area and percent change there is towards closing ecological gaps. The biggest impact made is in the very poor category with 11 eco-units changing from very poor representation down to three eco-units. Also, three eco-units moved from very poor to good or complete representation, while some eco-units saw no change in representation or moved up one level in the classification.

Table 8. Protected & Gap Filling Contribution Area for Guysborough Headlands Natural Landscape

Eco-Unit Code	Total Eco-Unit Area (ha)	Total Protected Area (ha)	% Protected	Total Eco-Unit Area in PHP Mgmt Unit (ha)	% Eco-Unit in PHP Mgmt Unit	Total Area Gap Filling in PHP Mgmt Unit (ha)	Total % Protected & Gap Filling
Herbaceous emergent deep marsh	107	1	1.1%	47	44%	20	20.2%
Shrub fen poorly drained unclassified	309	4	1.4%	240	78%	160	53.0%
Softwood well drained unclassified hummock	2112	33	1.6%	1752	83%	301	15.8%
Open barren well drained unclassified	649	13	2.0%	538	83%	96	16.8%
Rock barren well drained unclassified	54	1	2.4%	37	69%	1	4.5%
Rock barren imperfectly drained hummock	78	2	2.7%	24	31%	0	2.7%
Softwood imperfectly drained unclassified flat	255	7	2.7%	130	51%	40	18.3%
Softwood well drained unclassified ridge	1026	28	2.8%	942	92%	114	13.9%
Softwood well drained unclassified drumlin	556	16	2.9%	90	16%	8	4.3%
Open fresh water unclassified water	1694	52	3.0%	202	12%	106	9.3%
Open bog poorly drained unclassified	333	12	3.7%	263	79%	222	70.4%
Softwood well drained unclassified	5858	354	6.0%	2655	45%	222	9.8%
Treed bog poorly drained unclassified	661	44	6.7%	469	71%	44	13.4%
Water poorly drained unclassified	129	11	8.3%	13	10%	1	8.8%
Softwood imperfectly drained unclass ridge	1676	176	10.5%	1222	73%	85	15.5%
Rock barren imperfectly drained ridge	9	1	12.5%	2	20%	0	12.5%
Rock barren well drained ridge	394	52	13.3%	308	78%	16	17.3%
Tall shrub swamp unclassified	28	4	14.0%	6	21%	0	14.0%
Softwood imperfect drained unclass hummock	7228	1065	14.7%	4088	57%	274	18.5%
Open barren imperfect drained unclass ridge	221	39	17.5%	199	90%	9	21.8%
Softwood well drained unclassified ?	203	38	18.9%	203	100%	17	27.2%
Coast well drained unclassified ?	1	0	21.9%	1	99%	0	21.9%
Softwood unclassified coastal beach	56	12	22.3%	9	16%	0	22.3%
Coast imperfect drained unclass hummock	82	20	24.4%	16	19%	0	24.4%

3.2.4 Results in St. Mary's Plain Natural Landscape

Similar to the Guysborough Headlands, the gap filling contribution area was made up of moose bog buffers, moose patches, wetlands of special significance, and included wood turtle critical habitat area for the St Mary's Plain natural landscape. Areas were unioned in GIS to remove overlaps and excluded any area that overlapped with the protection and conservation data that was used initially in the regional representation assessment.

Figure 12 below shows each layer prior to the union for St. Mary's Plain. These areas are shown only for the PHP management unit. Figure 13 shows the unioned layer of the moose patches, moose bog buffers, critical wood turtle habitat, and wetlands of special significance that exist outside of the protected and conservation already used in this analysis as inputs. It is this area that was used to calculate gap filling contributions.

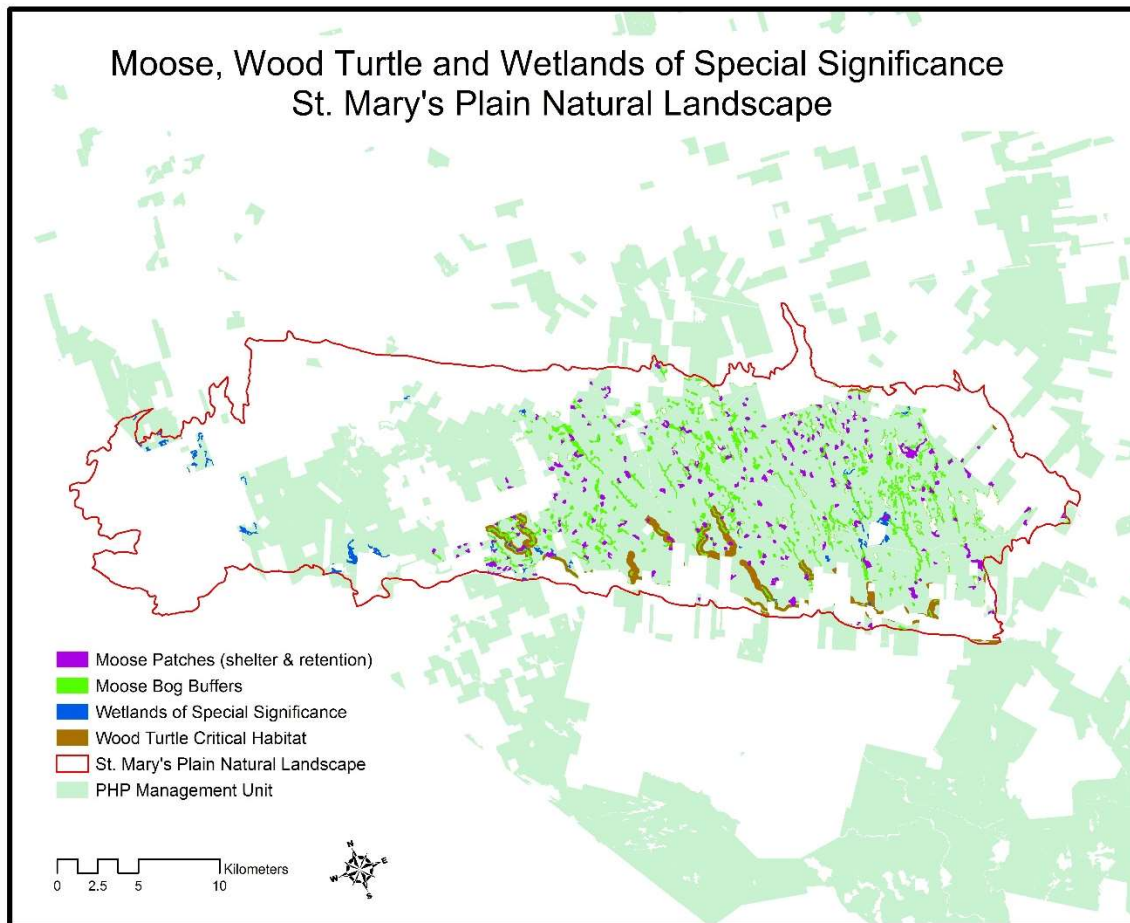


Figure 12. Moose, Wood Turtle, and Wetlands of Special Significance in St. Mary's Plain Natural Landscape

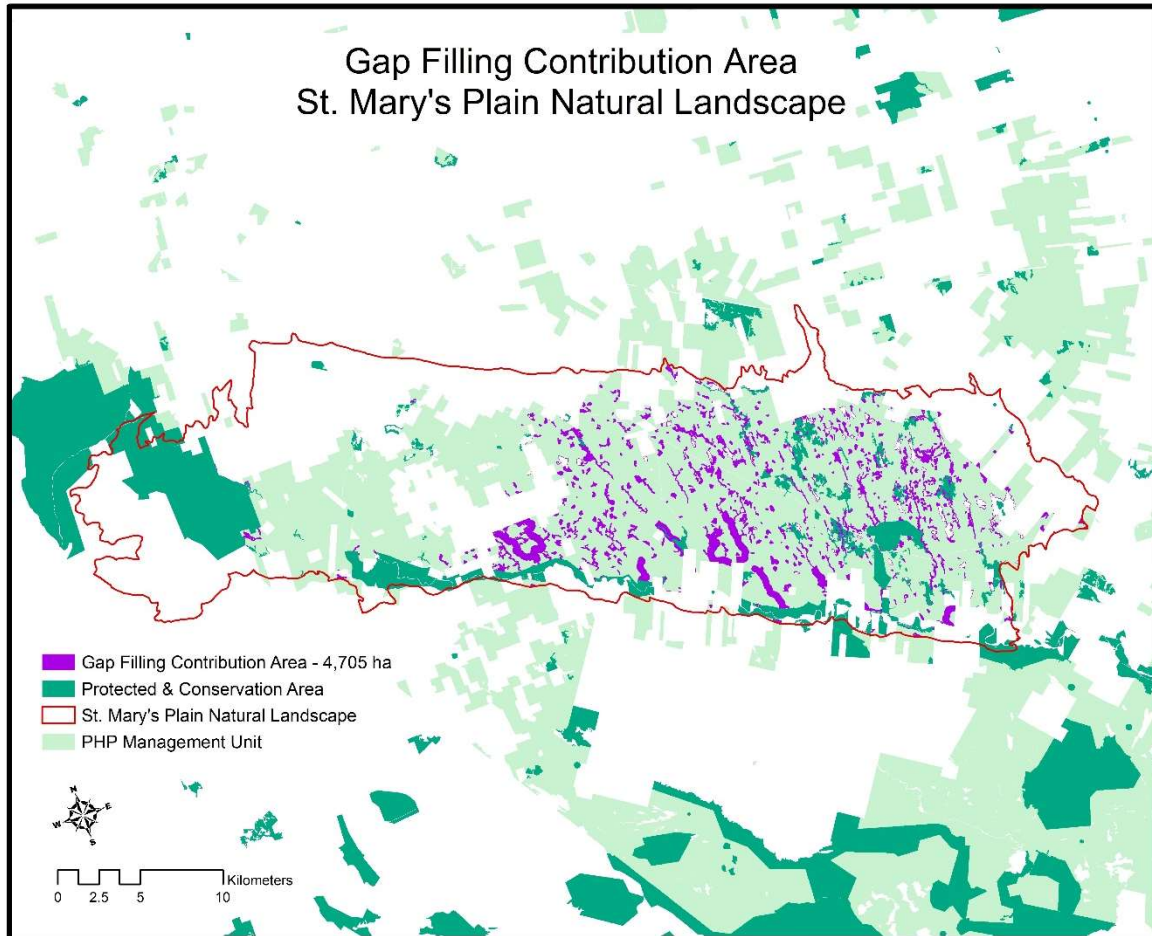


Figure 13. Gap Filling Contribution Area in St. Mary's Plain Natural Landscape

The below table summarizes the area of protected and conserved for eco-units categorized as very poor, poor and fair (same as shown in Table 7), but also includes the gap filling contribution area to determine how much total area and percent change there is towards closing ecological gaps. Of the six eco-units that had very poor representation, three remain as very poor while the other three eco-units moved to good representation. For eco-units classified as poor and fair, about half of them moved into either the fair, good, or complete category.

Table 9. Protected & Gap Filling Contribution Area for St. Mary's Plain Natural Landscape

Eco-Unit Code	Total Eco-Unit Area (ha)	Total Protected		Total Eco-Unit Area in PHP Mgmt Unit (ha)	% Eco-Unit in PHP Mgmt Unit	Total Area Gap Filling in PHP Mgmt Unit (ha)	Total % Protected & Gap Filling
		Area (ha)	% Protected				
Open fen unclassified	22	0	0.0%	9.0	41%	8.8	41%
Herbaceous emergent deep marsh	64	0	0.0%	21.5	33%	17.8	28%
Softwood well drained unclassified ridge	790	12	1.5%	457.3	58%	0.0	2%
Softwood well drained unclassified hill	8983	249	2.8%	3118.3	35%	219.2	5%
Shrub bog unclassified	959	27	2.8%	847.6	88%	306.8	35%
Mixedwood well drained unclass hummock	590	23	3.9%	157.0	27%	8.8	5%
Hardwood well drained unclassified hill	523	29	5.6%	177.0	34%	7.7	7%
Softwood imperfectly drained unclass ridge	1257	78	6.2%	1064.1	85%	66.2	11%
Mixedwood well drained unclassified hill	1459	91	6.2%	171.9	12%	3.5	6%
Hardwood well drained unclassified hummock	503	33	6.6%	58.2	12%	5.8	8%
Hardwood imperfect drained hummock	31	2	7.1%	1.1	4%	0.0	7%
Softwood well drained unclassified hummock	20376	1640	8.1%	14591.9	72%	1790.3	17%
Open fresh water unclassified water	2473	292	11.8%	200.4	8%	42.1	14%
Treed bog unclassified	1095	131	11.9%	776.1	71%	49.9	17%
Open bog poorly drained unclassified	187	25	13.4%	155.7	83%	90.8	62%
Treed fen unclassified	287	42	14.6%	123.5	43%	32.8	26%
Mixedwood well drained unclassified drumlin	900	145	16.1%	560.7	62%	22.9	19%
Softwood imperfect drained unclass hummock	13380	2237	16.7%	8154.8	61%	771.9	22%
Seasonal flooded shrub flat unclassified	118	22	18.6%	11.4	10%	3.5	22%
Softwood well drained unclassified drumlin	3148	592	18.8%	1821.5	58%	98.5	22%
Tall shrub swamp unclassified	1259	241	19.1%	848.6	67%	379.2	49%
Shrub fen unclassified	905	173	19.2%	387.4	43%	195.6	41%
Hardwood well drained unclassified drumlin	182	38	20.7%	99.6	55%	0.4	21%
Mixedwood imperfect drained hummock	126	27	21.2%	38.1	30%	6.5	26%
Softwood imperfectly drained unclassified flat	443	100	22.5%	170.5	39%	63.6	37%

The below table provides additional information to understand how the gap filling contributions affected the broader protected and conserved area percentages for the Guysborough Headlands and St. Mary’s Plain natural landscapes. At the landscape level, the gap filling contributions increased the percent protected by PHP from 15% to 28% for the Guysborough Headlands, and 8% to 20% for the St. Mary’s Plain landscape. These increases have moved the two landscapes above the 17% minimum target set for each natural landscape.

Table 10. Total Protected & Conserved Area with Ecological Gaps Filled for Guysborough Headlands and St. Mary’s Plain Natural Landscapes

NATURAL LANDSCAPE	Total Land Protected by PHP (ha)	Total Land Managed by PHP (ha)	% Protected by PHP	Total Land Protected (ha)	Total Natural Landscape Area (ha)	% Protected	% Land Managed by PHP per Natural Landscape	Total Land Area Added for Protection (ha)	Total % Protected/Conserved with Ecological Gaps Filled in PHP Mgmt Unit
Guysborough Headlands	3021	20587	15%	3657	37515	10%	55%	2774	28%
St. Mary’s Plain	3438	41327	8%	7906	77787	10%	53%	4705	20%

3.2.5 Monitoring Contributing Habitats for Ecological Gaps

Although the contributing habitats for moose, wood turtle, and wetlands are conserved by PHP through policies or special management practices issued by NSNDRR, a monitoring system will be put in place to assess each year whether the areas have been reduced or become available for forest management due to changes in policy or direction by the provincial government. It is not expected that areas will be reduced or returned to forest management, however, it is important to assess whether there are any changes that could reduce the amount of conserved area in the Guysborough Headlands and St. Mary's Plain natural landscapes. Monitoring and reporting will be provided in PHP's Annual Monitoring Report, which tracks how PHP is performing against sustainable forest management indicators and high conservation value objectives and targets. This report is publicly available on the PHP website at [Sustainability | Port Hawkesbury Paper](#).

4. SUMMARY

This ecological gap analysis was completed for PHP's management unit and the broader landscape to meet requirements of the FSC Canada National Standard for Forest Management. The analysis was completed for two different regions. The first and smaller region is the Conservation Area Network which includes lands under management by PHP. The analysis shows that PHP has met the minimum requirement of 10% protected land on the management unit with 18% protected by Crown wilderness areas, other legal and pending protected areas, and old growth areas.

At the broader regional scale, a protected and conservation area analysis was completed using NSDECC's natural landscapes framework. Using ecological representation thresholds created through research by NSDECC, the Aichi Biodiversity Target of 17% for biodiversity conservation, and minimum of 50% of lands managed by PHP within natural landscapes, a summary of how well each of the 43 natural landscapes in PHP's operating area met these targets was developed (Table 5). Of the 43 natural landscapes, two were identified as having ecological gaps. These two natural landscapes were further analyzed to identify where the gaps exist. Using other conservation measures currently being implemented through government policies or special management practices that were not included as original inputs into the analysis, resulted in ecological gaps being filled.

As any new information or data related to protected and conservation areas or improved methodology becomes available, the ecological gap analysis will be reviewed and updated at least every five years or sooner. Any substantial changes to the gap analysis will be peer reviewed by an independent expert.

APPENDIX A: PHP's HCVF Conservation Areas

Background

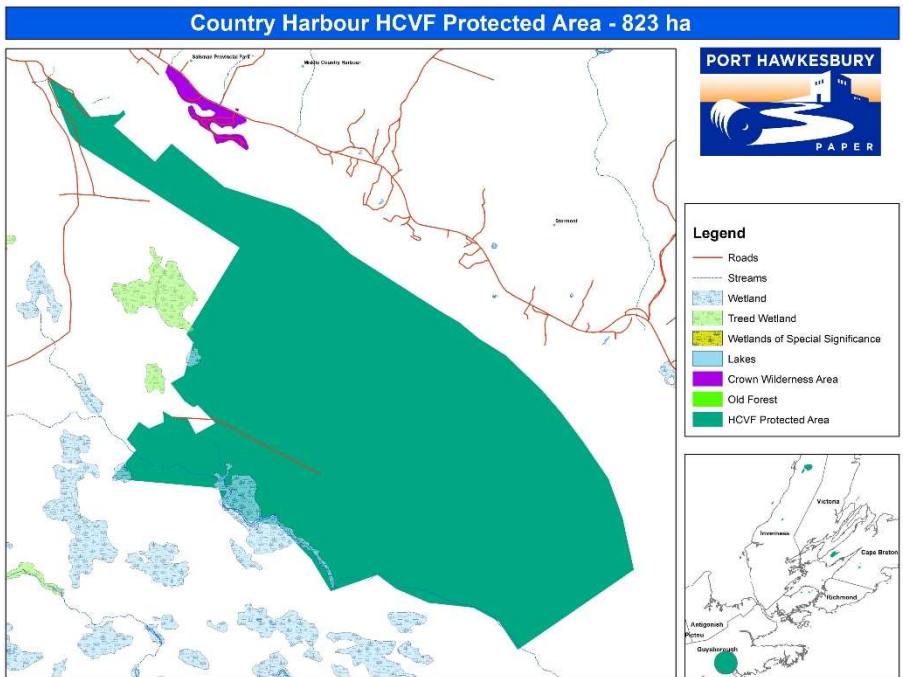
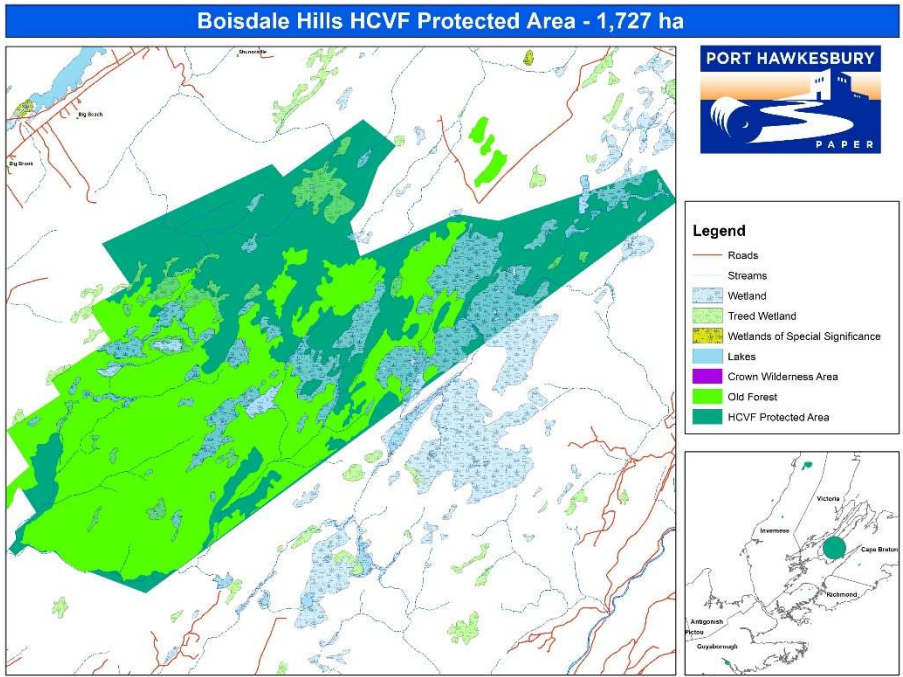
The company completed a High Conservation Value Forest (HCVF) assessment with interested stakeholders in 2008-09 to fulfill requirements of the FSC Maritime Standard. Large landscape level forests such as existing and proposed protected areas, and large forest remnant patches, were assessed under category 2 of the HCVF assessment using results from the Colin Stewart Forest Forum which was completed in 2005-06. The company was an active participant of the Forum to help identify large forest remnant patches that could contribute to the expansion of the provincial protected areas plan. Until the provincial protected areas process was finalized with recommendations provided by the Forum, a moratorium on all forest management was placed in the identified areas. Following the submission of candidate protected areas to government from the Forum, the government continued the process with public consultation, resulting in a final protected area proposal in August 2013.

The final Colin Stewart Forest Forum report recommended 84,502 hectares within the company's Crown license area for protection. Most of the sites were included in the government's protected plan released in 2013. However, following the Forum and government's protected area work, a review and update of the large landscape level forests moratorium sites was required since not all proposed areas for protection were accepted into the final protected area plan. In 2014, the company established a HCVF review committee with representation from government, environmental organizations, and academia. The purpose of the review was to assess sites that were not included in the government's final protected area plan to: 1) determine which moratorium sites were no longer required as HCVFs, and 2) for those moratorium sites determined by the committee to still be required for HCVs, to modify boundaries using best available information and expert advice and develop appropriate management prescriptions. The HCVF committee recommended establishing several areas to be voluntarily conserved by PHP. A total of eight HCVF protected areas were identified totaling 6,147 hectares with a commitment of no management activities (harvest, road building, silviculture) and have been maintained since established in 2015. Annual monitoring to ensure no management is undertaken is reported in PHP's Annual Monitoring Report available on the PHP website.

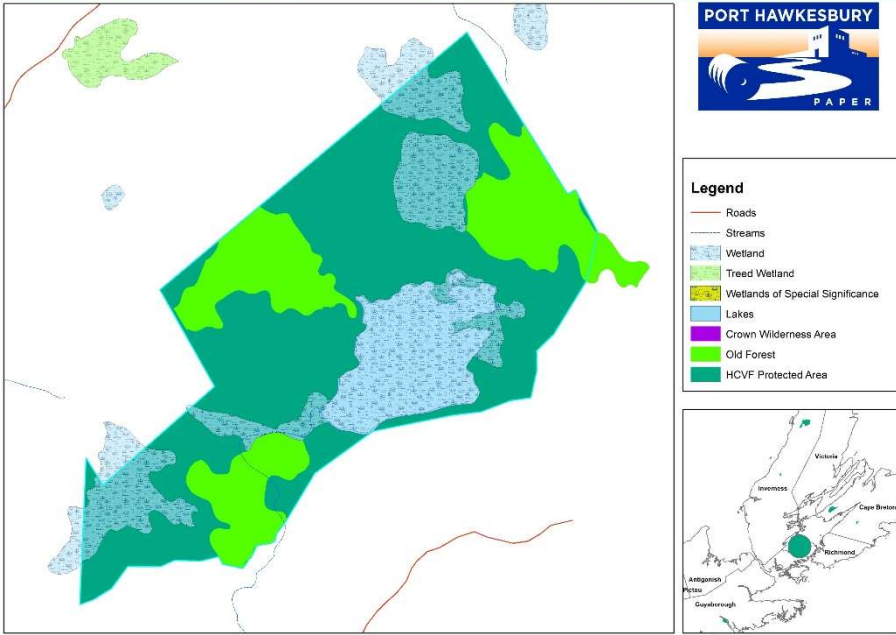
Currently, PHP's conserved areas are under consideration by the Nature Conservancy of Canada as possible contributions to the federal government's conservation network. Other Effective Area-based Conservation Measures (OECMs), developed via cooperation between federal, provincial, territorial, municipal jurisdictions, and Indigenous Peoples, have become a Pan-Canadian instrument for conservation. OECMs are a powerful and significant conservation tool that rewards land managers and owners for managing the land for a specific purpose while also delivering biodiversity conservation results on par with protected areas. These significant places contribute to the development of a robust, varied conservation network that is well-connected and reflective of Canada's various topographic regions¹².

¹² [Conservation and protection of Canada's forests](#)

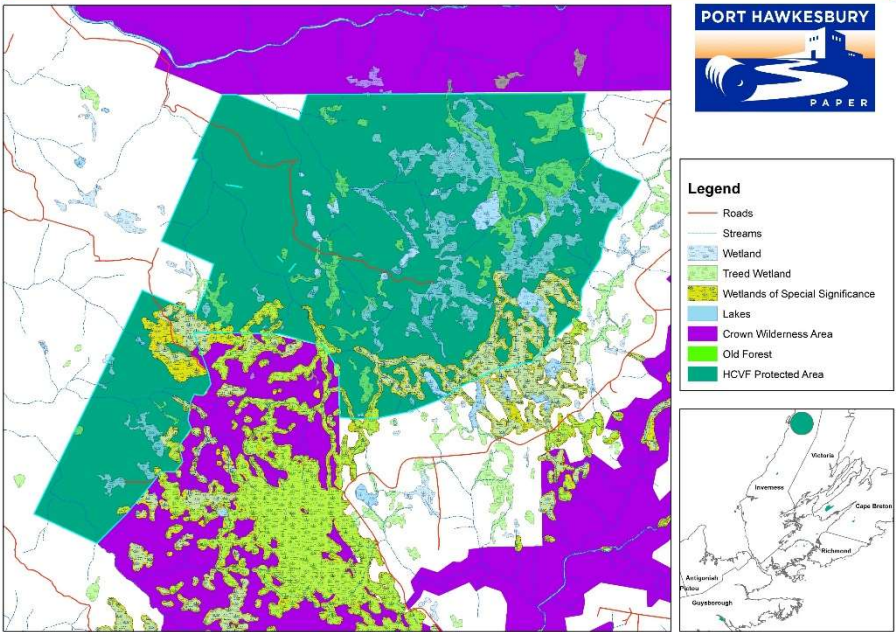
PHP's HCVF Conserved Areas



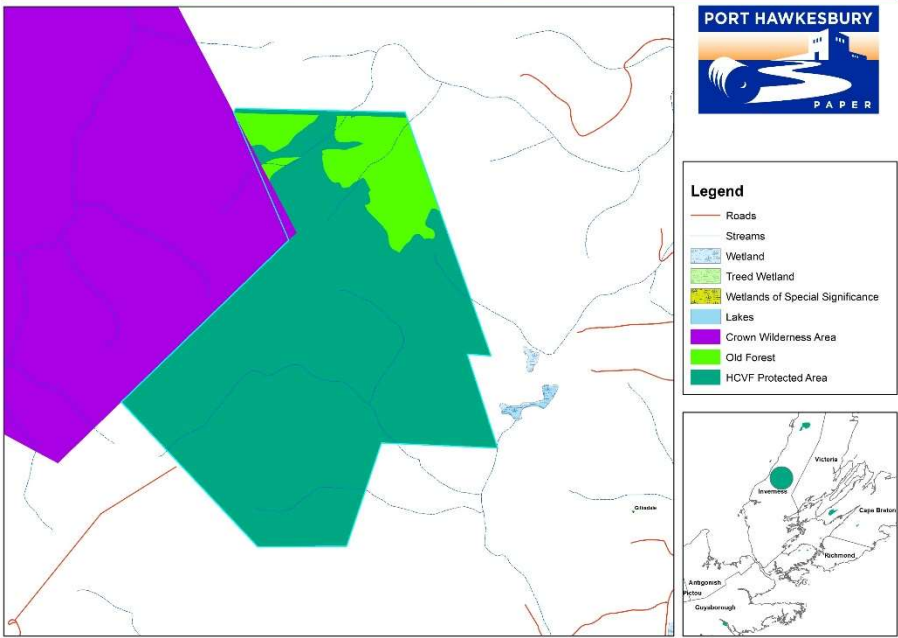
Hill Lake HCVF Protected Area - 113 ha



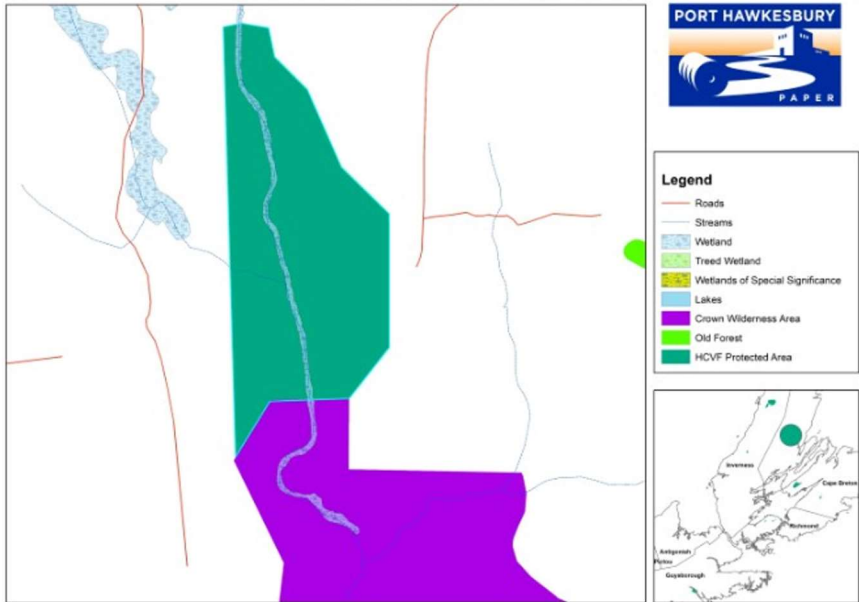
Jim Campbells Barren HCVF Protected Area - 2,844 ha



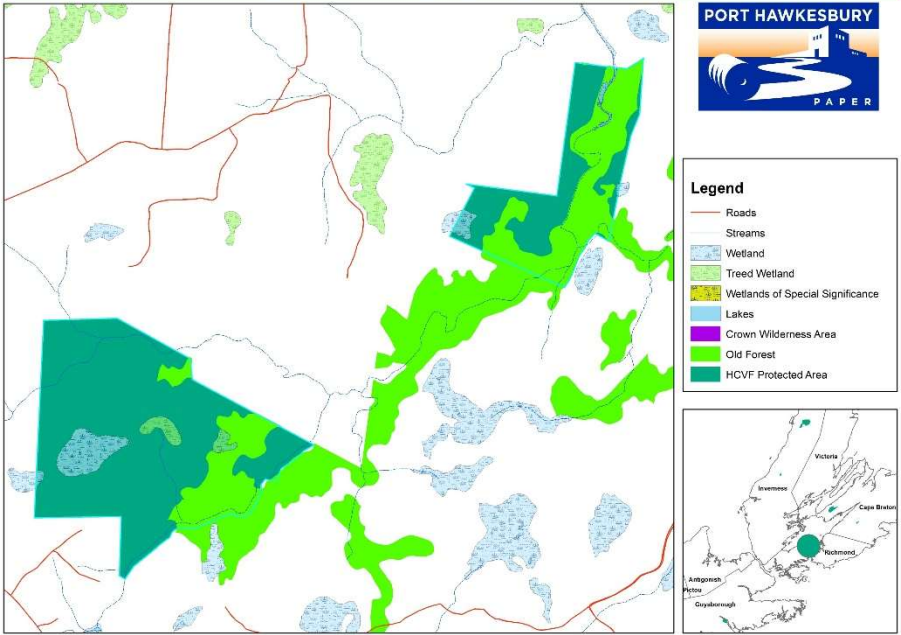
Masons Mountain HCVF Protected Area - 197 ha



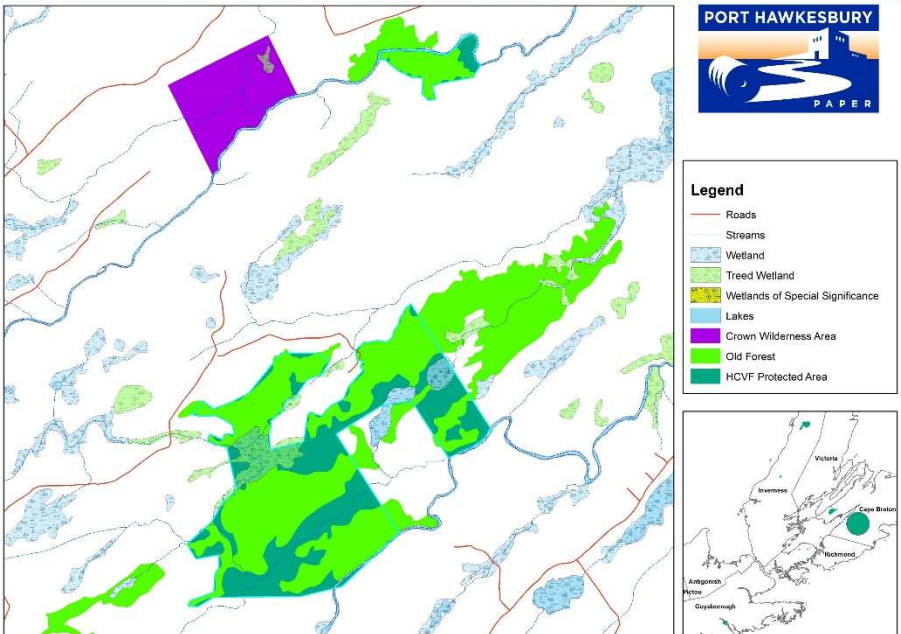
North River HCVF Protected Area - 27 ha



Oban HCVF Protected Area - 170 ha



Salmon Gaspereaux HCVF Protected Area - 240 ha



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