FINAL REPORT

MOC-FMP-2023

Ecologically-Based Forest Management Plan for Lands of the Municipality of the County of Colchester

We prosper from our resources…

PREPARED FOR

Municipality of the County of Colchester
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PREPARED BY

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….to inventory and incorporate ecological principles and practices into the management of the forests of the Municipality of the County of Colchester in support of multiple benefits to the community.

Table of Contents

620 Minas Lowlands (cont'd)

Cobequid Bay Lands

Belmont/Debert/Onslow Community Lands
Bible Hill/Brookside/North River Community Lands
Hilden Lower Truro Old Barns Community Lands
Salmon River Community Lands
Valley Community Lands
West Colchester United Arena Community Lands

630 Central Lowlands

Stewiacke River Park
Wittenburg Road
Cross Roads
Stewart Hill Road

Executive Summary

The Municipality has identified a requirement for the development of a comprehensive Forest Management Plan (FMP) for the land owned by the Municipality. It is the Municipality's intention that the FMP be based on sound principles of ecological forestry similar to the provincial approach to sustain forest ecosystems while obtaining benefits from the forest for society.

The County has a total land area of 365,371 hectares (902,466 acres) with forests the dominant feature of the landscape covering 303,583 ha (749,850 ac) or 83% of the total land area. The ownership of land in the Municipality is a complex patchwork of large and small parcels of privately held and provincial/federal (Crown) lands. The Municipality owns 1,681 ha (3,998 ac), approximately 0.5% of the County, described in 151 PIDs (property identifiers). These lands are concentrated around the Debert Industrial Park (1,049 ha) and the Colchester Waste Resource Management Park (320 ha) with the remainder scattered around the County, a significant number of these in the communities surrounding the Town of Truro.

Forest Resources Consultants Inc. of Truro was contracted to develop an ecological FMP that outlines a strategic vision for municipal forests and that balances the ecological integrity of these forests with their economic, social, recreational, and environmental value to the community. In addition to data from spatial and attribute data sets in the geographic information system (GIS) the FMP relied heavily on visitations to each property to assess the forest condition, biodiversity values, and current land use.

Municipal staff were extensively consulted to gain a better understanding of forest management practices on the properties and any municipal plans or operations that may relate to or affect the use of forest land.

To facilitate the organization and analysis of data the 151 properties were grouped and identified by an ecologically defined ecodistrict and location. Five ecodistricts dominate Colchester County and each creates a forest that reflects the physiographic (geology, soils, climate) setting that defines the ecodistrict (landscape). This arrangement of properties allowed the overall strategy for the management of the forest component of municipal lands to follow the principles of ecological forestry. It also accommodates aspects of forest management that may be required for adaptation to climate change.

Most of the lands of sufficient size for long term forest management are associated with the properties at Debert, Kemptown, and Truro Road. Forest treatments include salvage cutting (107.5 ha), planting (129.0 ha), pre-commercial thinning (36.0 ha), commercial thinning (46.2 ha), and irregular shelterwood (27.7 ha).

Tropical storm Fiona caused widespread wind damage on many of the Municipality's lands, mostly light to moderate, with a few areas of moderate to severe damage. In many cases it is not economically feasible to salvage this damage due to low volumes and/or low market value (i.e., poor quality balsam fir and low-grade hardwood). Where damage is moderate to severe, and where the treatment is thought to be economically feasible, salvage is recommended.

Executive Summary cont'd

This will help reduce fire risk and create opportunities for a new, more productive stand to be established either by natural regeneration or by planting.

Planting (reforestation) has been recommended for the four rehabilitated landfill properties, old field sites at Debert, and several locations following salvage. Using native species will help restore and sustain forest ecosystems and native biodiversity, enhance watershed management, and have carbon capture benefits.

Precommercial thinning is a stand tending silviculture treatment that can be used to promote early growth and development of long-lived species and increase forest productivity. This treatment can be used as a forest management treatment or in areas of recreational use to promote a desired forest composition. Commercial thinning is a partial harvest treatment used to maximize space and light to promote increased growth. It also allows harvest of poor quality and shorter-lived trees. Much of the municipal forest is young and not yet ready for commercial thinning. Irregular shelterwood is a partial harvesting system used to promote natural regeneration of long-lived species and to create uneven aged forests. It enhances biodiversity values by maintaining vertical and horizontal stand structure and is best applied in maturing stands.

Excluding Stewiacke River Park, municipal forests occurring in parks, recreational areas, and greenspaces are typically much smaller with limited traditional forest management options. With a primary goal to provide a safe experience for the public, trees and small stands of trees in these areas are still valuable for biodiversity and other ecological services. Based on field observations of municipal recreational areas during this project it was apparent that current tree and forest management in these areas was cognizant of biodiversity features and values. Continuing with this approach will help maintain and conserve biodiversity by favouring native, long-lived tree species and accommodating biodiversity features such as snags, downed deadwood, and special habitats (e.g., small wetlands, shrubs, streamside zones).

Ecosystem services was another value that became apparent on several properties. The forest lands associated with the Kemptown landfill were noted as important to maintaining water quality for both the Salmon and North Rivers. An extensive wetland of over 80 ha (200 acres) is associated with the Debert Airport Lands and provides the headwaters for several streams flowing to McElmonds Pond and eventually the Chiganois River. It is also home to black ash, a species at risk in Nova Scotia. Other properties were identified for their forested riparian and habitat values.

It was noted that although the holdings of forested land within the municipality is a small percentage of the total land base, these properties are sometimes the only publicly owned land in the immediate area. As such they provide not only recreational and forest timber value, they are often the only remaining forest providing natural forested habitat and ecosystem services.

1.0 Forest and Land Use Management Plan

1.1 Introduction

The Municipality of the County of Colchester (Municipality) is developing a Municipal Planning Strategy and Land Use Bylaw which includes a process to develop comprehensive land use planning policy and regulations for the entire county.

In this context, the Municipality has identified a requirement for the development of a comprehensive Forest Management Plan (FMP) for the land owned by the Municipality. It is the Municipality's intention that the FMP be based on sound principles of ecological forestry treating forests as ecosystems; e.g an Ecologically-based Forest Management Plan (EFMP).

Application of the EFMP will lead to improved management and protection of watersheds, forest health, and carbon sink. It could also aid in ongoing adaption to climate change and improve conditions for preventing the spread of wildfires and invasive species.

The EFMP will guide future decisions about the uses of municipal forested land, with the objective of protection of the integrity of the forest ecosystems and sustaining the recreation, aesthetic, and economic values that the forests provide for the community.

1.2 Background and Context

In the Municipality, forests play a vital role in local ecosystems, watershed health, wildlife habitats, and residents' enjoyment of parks and green spaces.

Forest management to date on Municipal owned land has been minimal and conducted on an as-needed basis. Lands in the Debert area have been identified as a priority area for forest management, as the Municipality owns large tracts of forested and partially forested land at the Debert Business Park. In June 2021, Council approved a request for silviculture work there as a one-time arrangement and identified the need for a forest management plan to inform longer-term decisions about the Municipality's forests**.**

In September 2022, post-tropical storm Fiona hit Atlantic Canada landing particularly hard in Newfoundland, PEI, Pictou County, and Cape Breton, as well as parts of Colchester County. Extensive damage to forest stands and innumerable felled trees across the County emphasizes the need for strategic forest management across the Municipality. There is an opportunity for forestry work that would benefit both the health of the forest ecosystem and the local economy and clean energy sector, including recovery of felled trees for biomass heating or other uses. Forest management may also help the Municipality's forest stands to become more resistant to, and recover from, natural disturbances (i.e., fire, wind, insect infestation). Planning can also inform what replacement trees may need to be planted to restore the aesthetic and ecological benefits of the tree stands in municipal parks while fostering a vibrant ecosystem.

As the climate warms, forest management becomes even more important. A recent Climate Change Risk Assessment published by the Province of Nova Scotia identifies that wildfires will be the greatest climate-related threat to the well-being of Nova Scotians by the 2050s, due to warmer and drier summer months. Well-managed, healthy forests can help to prevent forest fires and to limit their spread. Diverse ecosystems with greater biodiversity are also more resilient to invasive species. In general, mixed-species, multi-aged forests are better able to adapt to a changing climate.

Global warming will put pressure on water resources, underscoring the role of forests in watershed protection. Warming ocean surface temperatures in the North Atlantic also mean that severe storms such as post-tropical storm Fiona will land in Nova Scotia more frequently, fed by the warm water and maintaining their strength farther north. Forest management plays a role in maintaining forest health to reduce the number of downed trees as well as in helping to restore forests after an extreme weather event.

Planning development will be guided by the principles of ecological forestry, whereby forests are treated first and foremost as ecosystems. As stated in the Lahey Report (An Independent Review of Forest Practices in Nova Scotia, 2018):

> "Ecological forestry is primarily concerned with the effects of forestry on ecological values such as water, soil, and habitat for all of the species that inhabit and constitute those ecosystems. In place of the philosophy of mitigation, it seeks to align forestry with ecological protection and biodiversity conservation by integrating ecological knowledge (including traditional knowledge), principles, and concepts into how forestry is conducted……It seeks to combine the imperative of protecting ecological systems and biodiversity with the social importance of sustaining a productive and profitable forestry industry."

The ecological forestry concept also provides a framework for categorizing forested lands into three categories based on their intended management type and permitted uses. This framework is called the *triad model*, where the three categories or "legs" of the triad are:

i) protected land (for biodiversity);
ii) high production land (for timber resources); and
iii) land that forms an ecological matrix (majority of the land), calling for a mix of protection and resource production.

Planning is expected to follow the triad model, an adaptation of it, or another model that aligns with the principles of ecological forest as a foundation for the Ecologically-based Forest Management Plan (EFMP).

The EFMP should also incorporate and utilize other best practices and local standards where applicable, such as the Code of Forest Practice and Best Management Practices/Forest Planning in Municipal Drinking Water Supply Areas in Nova Scotia, and adhere to any mandatory regulations, such as the Statements of Provincial Interest and the Regulations Respecting the French River Watershed Protected Area (Protected Water Area - Municipality of Colchester).

1.3 Goals and Objectives

In support of the comprehensive planning and management of forest land, the following goals and objectives were identified:

i) to develop an EFMP for municipally owned forested land that outlines a strategic vision for municipal forests and includes immediate needs and long-term reestablishment goals;

ii) to integrate Western science and Traditional Knowledge about forests and ecosystems using the ecological forestry model;

iii) to leverage local knowledge and experience from the community; and

iv) to establish a plan that balances the ecological integrity of the municipality's forests with their economic, social, recreational, and environmental value to the community.

1.4 Deliverables

In order to work towards the attainment of the stated goals and objectives, the primary deliverable of this project is an Ecologically-Based Forest Management Plan (EFMP) for municipal land.

This EFMP includes aspects of the following:

a) An inventory of all municipally owned lands with forest stands 1 hectare in area and greater (can be an accumulation of lots), and which describes:
 i. The area of forested land
 ii. The age and health of the forest
 iii. The type/classification of forest, density, and predominant species of trees
 iv. The extent of biodiversity present
 v. Any ecologically sensitive ecosystems or protected or endangered wildlife species present
 vi. Whether the forest stand is integral to a wetland, watershed, or other ecologically or socially important feature
 vii. Whether the land is close proximity to identified lands with protected status (i.e. Parks and Protected Areas System for Nova Scotia).

b) A geographic information system (GIS) map showing all forest stands, with a list of attributes for each, including forest age, type, species, health, management status, activities, and other pertinent details.

c) A plan for management of each forest stand, including:

i. Type of management recommended, with specific details about maintenance, intensity level, cycle length, methods, and other pertinent details.
ii. Type of non-forestry activities recommended to be permitted on the land and recommended land uses/zoning.
iii. If using the ecological forestry triad model, which leg of the triad is assigned to the stand (i.e. predominantly for conserving ecological integrity, predominantly for producing timber, or for a balanced combination of conservation and production).

d) A summary of the community and stakeholder engagement process, including who was involved, how they were consulted, and what insights they provided.

e) A summary of any relevant research that was undertaken to complete the Ecological Forest

f) Management Plan and a list of sources consulted.

g) An analysis of any economic opportunities that may exist in relation to harvesting wood products. and

h) Recommended procedures and schedule for monitoring and evaluating activities and progress and updating the plan over time. This is to be in the form of an annual schedule of recommended maintenance activities on a per lot or stand basis.

1.4 Scope of Work

More specifically, to assist in attaining the goals and objectives, the following tasks were identified:

a) Review relevant municipal and provincial policies and regulations, including the Bird Habitat and Wetland Compensation Policy, Central Colchester Municipal Planning Strategy, and Statements of Provincial Interest.

These provincial sources must be consulted: Regulations - Forests - Wildlife Habitat and Watercourses Protection (novascotia.ca); Regulations - Forests - Forest Sustainability (novascotia.ca); and the Debert Archeological Standards: https://cch.novascotia.ca/sites/default/files/inline/images/debert_testing_standards.pdf

Copies of the Colchester Trail Strategy and the Municipal Parkland Strategy will be provided.

b) Research site history and previous land use and management practices.

c) Consult municipal staff to gain a better understanding of forest management practices to date on the properties and any municipal plans or operations that may relate to or affect the use of forested land. The municipal planning department is currently undergoing a mandatory county-wide plan and by-law exercise and should be engaged to ensure both plans are compatible and complementary.

d) Engage with community members and stakeholders who may be affected by management practices or changes to forest uses or who may be able to offer insights about the forest and its history, such as owners of abutting properties, forestry specialists, park users, local hunters and trappers, protected watershed area provincial management staff, if applicable, and researchers at Dalhousie University Agricultural Campus (related to climate change issues).

e) In keeping with the principles of ecological forestry, engage with organizations and individuals that hold local Traditional Knowledge, such as the Confederacy of Mainland Mi'kmaq, Ulnooweg Education Centre, and community leaders or Elders from Millbrook First Nation.

f) Conduct site visits, as necessary, and collect/assemble data about each forest stand.

g) Utilize GIS to document and display data collected and the results of the project.

h) Evaluate each forest stand through the lens of:

i. ecosystem integrity,
ii. ecoregions and ecodistricts;
iii. climate and global climate change impacts,
iv. general landforms, soil types, capabilities, and limitations,
v. fire hazard areas and concerns,
vi. exotic and invasive pests,
vii. invasive tree/weed concerns and land use interface issues,
viii. critical habitat areas and fragmentation (the need for wildlife corridors)
ix. threatened, endangered, and species of concern, and
x. water quality and availability, and any other locally relevant factors.

i) Identify goals for each property, in terms of wildlife preservation, soil and water conservation, biodiversity, timber products, and recreational and aesthetic value, etc.

j) Create a management plan for each property which includes an immediate plan of action, if applicable, and long-term operational plans.

k) Develop a strategy for monitoring and evaluation and updating the plan over time.

1.6 Methodology

The development of the EFMP involved identification and completion of the following six steps:

1) An initial meeting with the client's representatives where the proposed work plan and contract related details were reviewed and finalized. Any logistical issues such as availability of resources and/or personnel through the project period were addressed.

2) Completion of a review, research, consultation and engagement, as specified in Scope of Work **Section 1.4** (a through e).
This included: identification and review of relevant municipal and provincial policies and regulations; research into site history and previous land use and management practices in the County; and consultation with municipal staff to gain a thorough understanding of forest management planning and practices within land use planning in the county.

3) Investigation, sourcing, assembly and analysis of spatial and attribute data sets in a geographic information system (GIS) for Municipal lands.

This involved assembly of available GIS data in compatible format (ARC shape and/or gdb format).This included location and spatial extent of land parcels by PID (provided), plus technical data on the associated land and vegetation (considering soils, landforms and surficial geology, ecological setting, stand connectivity and natural disturbance regimes at the ecological district level (Ecodistrict) level. Data was then assembled at the forest unit or stand level, consisting of forest vegetation inventory (considering species at risk, potential old growth and climax forests, and others). It also included aspects of land and forest management and regulations such as current use, any protection and/or restoration status, wetlands and watercourse buffers, and others as identified.

Design and development of initial database and analysis matrix in a searchable/filterable spreadsheet (Excel) format incorporating relevant attribute data was completed. This included analyses to identify data gaps due to currency, biodiversity, results from Step 2, and other technical requirements for forest management and associated land use.

4) Planning and completion of site visits to verify and collect required additional inventory and land use data, including design of field collection procedures, complete associated data processing and complete and finalize the GIS database and spreadsheet analysis matrix.

5) Development of the Ecologically-Based Forest Management Plan which includes documenting the strategic goals and any tactical objectives and operational prescriptions for the various identified land parcels and stands, development of the final database and data analysis matrix spreadsheet and finalizing of the GIS data sets including map design and development.

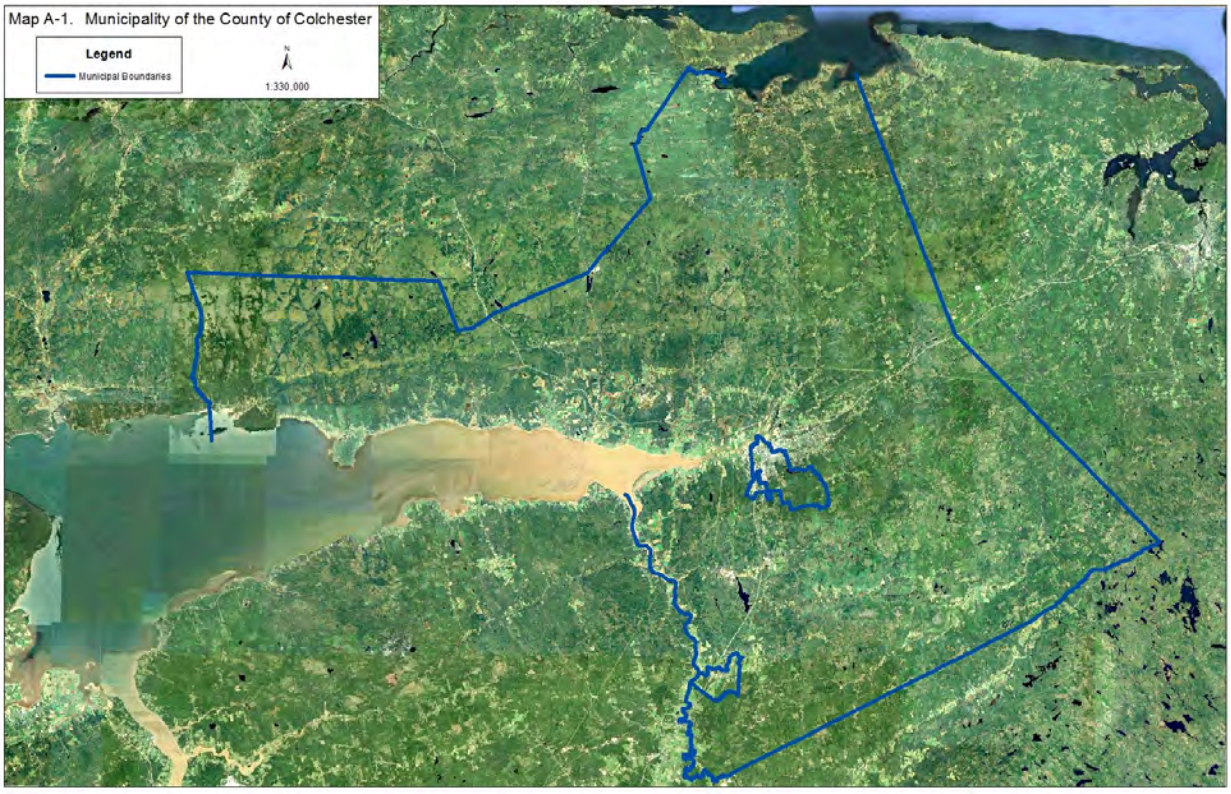
6) Delivery of a final EFMP report in paper and digital format in Draft as well as Final Report and presentation(s) to the client by senior staff, as requested.

2.0 Forest and Land Use – Inventory

2.1 General

The Municipality of the County of Colchester (MCC) is located centrally in Nova Scotia abutting the Northumberland Strait and the Minas Basin in the Bay of Fundy. It borders the Halifax Regional Municipality as well as the Municipalities of Pictou County, Cumberland, and East Hants. The County of Colchester (County) also contains the towns of Truro and Stewiacke, and Millbrook First Nation, a Mi'kmaq community which together have a population of approx. 51,500 (2021 Census).

The location and extent of the Municipality is presented in **Map A-1.**



The Municipality is also in Mi'kma'ki, the unceded territory of the Mi'kmaq, whose ancestors have lived on this land for over 11,000 years. Archaeological excavations in the Debert area in the west have uncovered evidence of a Paleo Indian settlement from the last ice age, thought to be a settlement of the first peoples to live in Canada and ancestors of the Mi'kmaq. As stated on the Mi'kmawey Debert Cultural Centre website: "Mi'kma'ki is a vast area. Its diverse landscapes, seascapes, rivers, plants, animals, fish, rocks, and islands are inseparable from Mi'kmaw people, language, stories, history, and spirit."

This region is a vibrant industrial, manufacturing, agricultural, commercial, and residential community with a long history of an economy driven by agriculture and forestry.

Ecodistricts. The County contains a diverse mixture of distinct natural landscapes. Ecologically, these can be classified as ecodistricts*****. These are distinct assemblages of topographic relief (e.g. lowlands and uplands), geology, landforms and soils, vegetation, water, fauna and land use.

*****Neily, P., Basquill, S., Quigley, K., and Keys, K. 2017. Ecological Land Classification for Nova Scotia. N.S. Dept. of Natural Resources, Report FOR 2017-3, 296 pp. + Map.)

2.2 Ecological Districts - Ecodistricts

There are ten distinct Ecodistricts in the County. These are presented in **Table I** along with area (in hectares and acres) and the proportion of the County each covers.

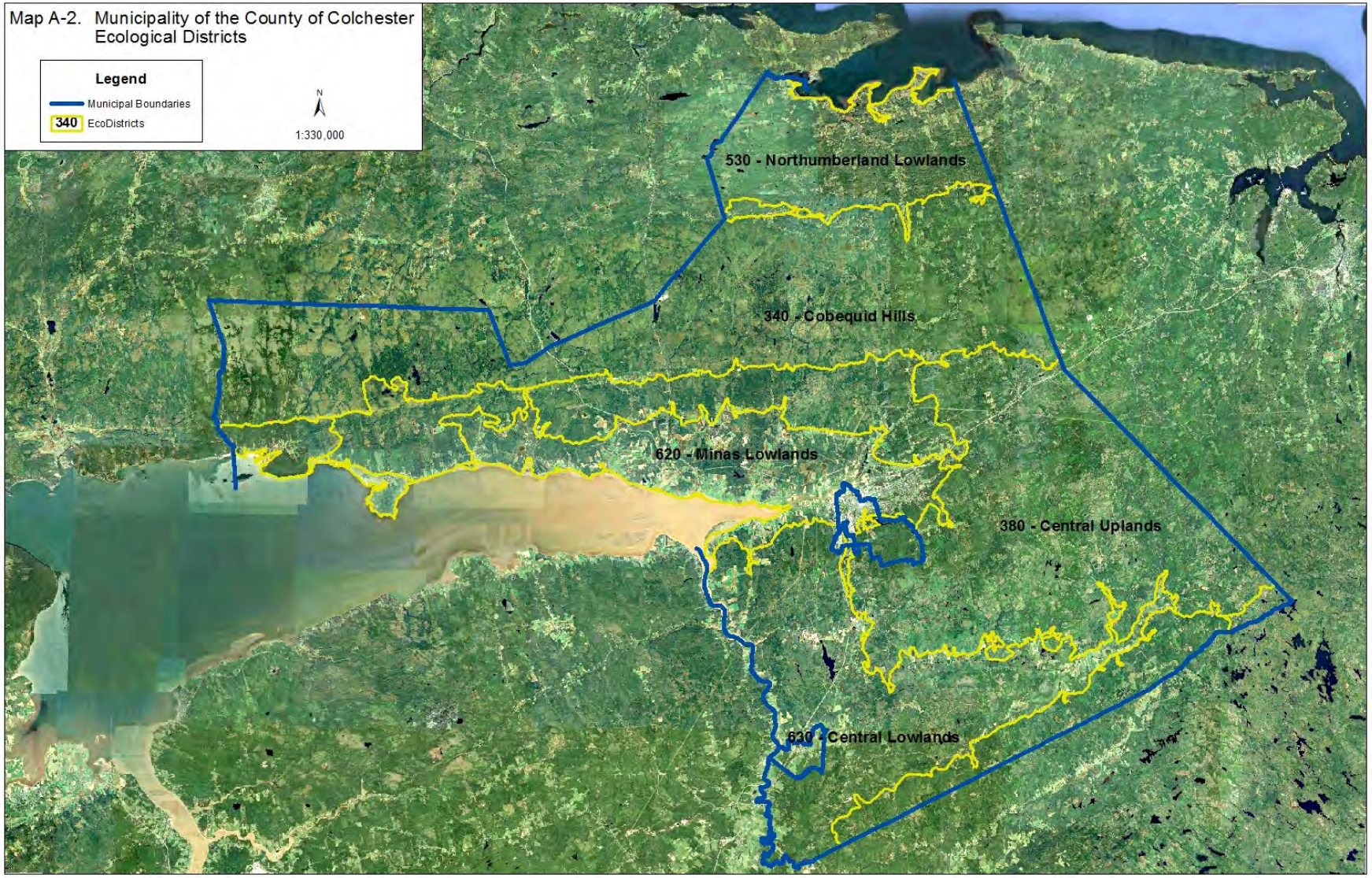
Table I. Breakdown of ecological districts (Ecodistricts) in Colchester County

EcoDistrict	Area (ha)	Area (ac)	Proportion (%)
340 Cobequid Hills	**95,082**	**234,853**	**26.0%**
350 Cobequid Slopes	37,080	91,588	10.1%
380 Central Uplands	**82,066**	**202,703**	**22.5%**
410 Rawdon/Wittenburg Hills	16,025	39,582	4.4%
450 Governor Lake	1,285	3,174	0.4%
530 Northumberland Lowlands	**29,801**	**73,608**	**8.2%**
540 Cumberland Hills	1,066	2,633	0.3%
620 Minas Lowlands	**38,440**	**94.947**	**10.5%**
630 Central Lowlands	**59,763**	**147,615**	**16.4%**
910 Parrsboro Shore	4,763	11,765	1.3%
Total	**365,371**	**902,466**	**100.0%**

Five Ecodistricts make up 84% of the county. Their location and extent in the Municipality is presented in **Map A-2**. These are:

- 340 Cobequid Hills - 26.0%;
- 380 Central Uplands - 22.5%;
- 530 Northumberland Lowlands - 08.2%;
- 620 Minas Lowlands - 10.5%; and
- 630 Central Lowlands - 16.4%.

(**Section 3.4** provides a more detailed description of each of the five major Ecodistricts.)


Map A-2. Municipality of the County of Colchester
Ecological Districts
Legend
Municipal Boundaries
340 EcoDistricts
N
1:330,000
530 - Northumberland Lowlands
340 - Cobequid Hills
620 - Minas Lowlands
380 - Central Uplands
630 - Central Lowlands

2.3 Forest and Land Use.

The County has a total land area of approx. 365,000 ha (901,500 acres). Forests are the dominant feature of the landscape, covering 303,583 ha (749,850 acres) or over 80% of the land area. The overall breakdown of the current land use in Colchester County is presented in **Table II**.

Table II. Current Land Use in Colchester County (2017/18 NSDNRR Forest Inventory)

Land Use	Area (ha)	Area (ac)	Proportion (%)
1. Forest	295,291	729,245	81%
2. Agriculture	31,186	77,029	8%
3. Wetlands and water	23,955	59,168	6%
4. Urban	8,853	21,867	3%
5. Miscellaneous	6,136	15,156	2%
Total	**365,371**	**902,466**	**100%**

The ecological characteristics of the forests of Colchester County vary by ecodistrict. The generalized characteristics of the forests of the five major ecodistricts are summarized as follows:

- The Cobequid Hills Ecodistrict (340) has large areas of intact forests of shade tolerant hardwoods, with stands extending from the crests to lower slopes of hills. Softwood stands occur at higher elevations on moister, level terrain, with shade tolerant mixedwood forests found along steep-sided ravines.
- The Central Uplands Ecodistrict (380) has fresh to fresh-moist, medium rich soils which support a red spruce/balsam fir forest. Shade tolerant hardwoods are present on the crests and upper slopes of hilly terrain. Red spruce, sugar maple, and yellow birch form mixedwood stands on the finer textured soils.
- The Northumberland Lowlands Ecodistrict (530) has fresh-moist to moist, medium to poor soils which support softwood forests of red spruce, hemlock, white pine and black spruce. Following disturbance, sites are usually reforested by early successional species such as balsam fir, red maple, grey birch, and both large-tooth and trembling aspen. Abandoned farmland typically reforests to speckled alders and willows, followed by forests of white spruce, tamarack and aspens.
- The Minas Lowlands Ecodistrict (620) has primarily softwood forests, with only a few well-drained hills with soils suitable for sugar maple, yellow birch, and beech. Red spruce, hemlock and white pine occur on well drained soils, especially along steep-sided slopes of streams and rivers. Most soils are imperfectly to poorly drained, supporting forests of black spruce and scattered with white pine. Near Debert, deep, dry, coarse sandy soils yield red pine and white pine. A few remnant floodplain forests of red maple, sugar maple, white ash and elm may be found on the heavily farmed alluvial soils along major rivers.

- The Central Lowlands Ecodistrict (630) forest has predominantly moist soils, many of which are fine textured, which support coniferous forests of black and red spruce, white pine, hemlock, and early successional forests of white birch, red maple, and aspen. On better drained hills late successional forest tree species such as yellow birch, red spruce, hemlock, sugar maple, and to a lesser extent beech, will occur.

(**Section 3.4** provides a more detailed description of the ecological setting and subsequent forests in each of these ecodistricts.)

2.4 Municipal Land Holdings.

The overall ownership of the land in the Municipality is a complex patchwork of large and small parcels of privately held and provincially owned (Crown) land.

The Municipality owns approx. 1,600 ha (3,952 acres) of land across the County, concentrated mainly at municipal parks and other recreational sites; the Debert Business Park, and the Colchester Waste Resource Management Park in Kemptown.

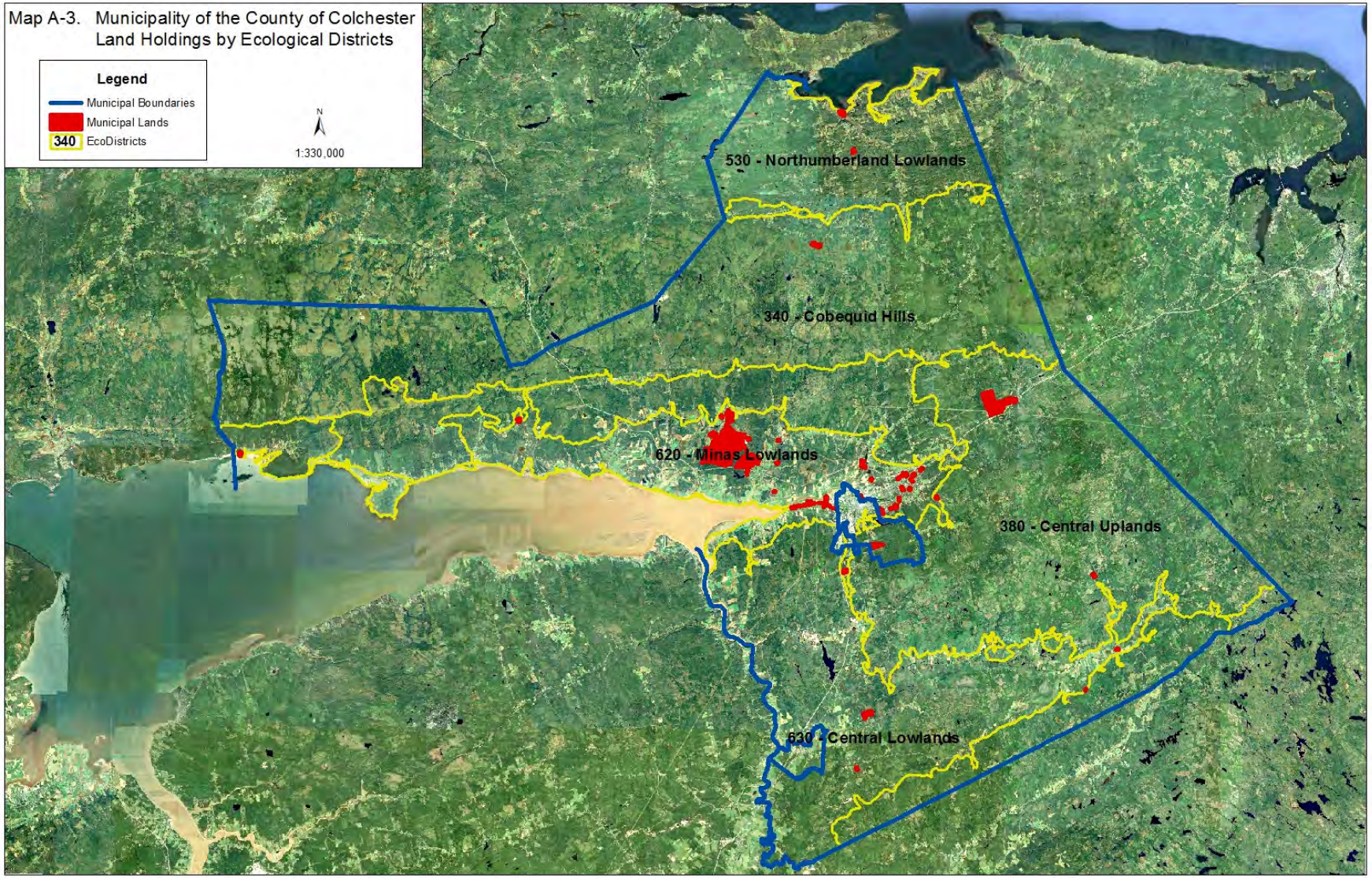
Table III provides a detailed breakdown of the various land parcels by Property Identification Number (PID).

Table III. Current Land Holdings of the Municipality of the County of Colchester.

PID Range	Area (ha)	Area (ac)	Average (ha)	Number of PIDs
< 0.5 ha	6.3	15.6	0.2	26
0.5 – 1.0 ha	25.1	62.0	0.7	31
1.0 – 5.0 ha	109.8	271.2	1.9	56
5.0 – 10.0 ha	76.4	188.7	6.4	12
>10 ha	1,400.5	3,459.2	60.6	23
Total	**1,618.1**	**3,996.7**	**10.6**	**151**

The location and extent of these lands in the Municipality is presented in **Map A-3.** There are two larger clusters of land holdings; in the Debert area (1,049 ha; 2,591 acres) and the Kemptown area (320 ha; 791 acres); as well as numerous scattered smaller parcels throughout the rest of the Municipality (249 ha; 614 acres).

Of these land holdings, approximately 391 ha (965 acres) in the Debert and Kemptown areas is primarily used for industrial and business development and contains only patches of scattered forest. The balance of approx. 1,227 ha (3,030 acres) is primarily forested land and is the main focus of this Ecologically-based Forest Management Plan (EFMP).


Map A-3. Municipality of the County of Colchester
Land Holdings by Ecological Districts
Legend
Municipal Boundaries
Municipal Lands
340 EcoDistricts
N
1:330,000
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630 - Central Lowlands

The approx. 1,618 ha (3,997 acres) of Municipal owned land (EFMP land) is all contained within the five major ecodistricts of the County. The detailed breakdown of the area by Ecodistrict is presented in **Table IV**. Within each Ecodistrict, the land holdings are subdivided into compartments or groups of parcels which are the basis for forest and land use inventory and mapping as well as management planning and implementation. A breakdown of the areas of the compartments by Ecodistrict is also presented in **Table IV.**

Table IV. Breakdown of Municipal EFMP lands by Ecodistrict and Compartment

EcoDistrict	Compartment	No. of Stands	Area (ha)	Area (acres)	Proportion (%)
340	Central New Annan	10	16.6	40.9	1.0%
380	Burnside Falls Park	5	5.5	13.5	0.3%
380	Gregg Road	1	2.1	5.2	0.1%
380	Kemptown Landfill / Industrial Park Woodlands	42	320.4	791.4	19.8%
380	Truro Road	9	37.6	92.7	2.3%
530	Nelson Memorial Park	5	15.2	37.5	0.9%
530	New Truro Road	3	7.1	17.6	0.4%
620	Cobequid Bay Lands				
	Belmont/Debert/Onslow Community Lands	5	7.3	18.0	0.4%
	Bible Hill/Brookside/North River Community Lands	10	21.9	54.0	1.4%
	Hilden Lower Truro Old Barns Community Lands	17	33.5	82.8	2.1%
	Salmon River Community Lands	11	16.0	39.4	1.0%
	Valley Community Lands	16	18.5	45.8	1.1%
	West Colchester United Arena Community Lands	7	19.0	46.8	1.2%
620	Debert Airport Lands	76	734.1	1,813.1	45.4%
620	Debert Industrial Lands North	14	39.6	97.9	2.5%
620	Debert Industrial Lands North Central	21	52.6	129.8	3.2%
620	Debert Industrial Lands South Central	15	60.6	149.6	3.7%
620	Debert Industrial Lands South	23	162.3	400.9	10.0%
620	Five Islands Lighthouse Park	4	8.7	21.4	0.5%
620	Montrose	2	6.5	16.2	0.4%
630	Cross Roads	1	1.4	3.6	0.1%
630	Stewart Hill Road	1	1.8	4.3	0.1%
630	Stewiacke River Park	9	28.0	69.1	1.7%
630	Wittenburg Road	2	2.1	5.3	0.1%
	Totals	309	1,618	3,997	100.0%

3.1 Forest and Land Use – Inventory and Management

3.1 Approach and Methodology

In concert with the previously identified context and requirements (**from Section 1**), the following approach and methodology were implemented. This included

Consultations. In July, August and September 2023, a number of formal consultation meetings were held with Municipal staff and other individuals working on various aspects of land use management on Municipal lands.

The main objectives of these meetings was to reach a better understanding of current and planned land use management and practices especially in relation to the role and impact on the forest component.

Meeting were held with:

A) Jennifer Mantin, Economic Development Officer, Municipality of Colchester;
B) Michael Sanders, Senior Archaeologist, CRM Group, Bedford, N.S.;
C) Phil Redden, Director Colchester Balefill Facility and Jessica Rushton, Manager of Balefill and Compost Operations; and
D) Craig Burgess, Manager of Recreation, Municipality Colchester and Hilary Paquet, Parks and Trails Coordinator, Municipality Colchester.

The focus of the initial and several follow up meetings with **Jennifer Mantin** were on current and planned business development, mainly on the Debert area lands associated with the Debert Business Park and airport. The significant archaelogical resources in the area were also discussed.

A second meeting was held in the Debert area with **Michael Sanders** on details of archaeological artifacts – sampling, methodology, location and recovery practices in relation to forest and forest management.

The meeting at the Colchester Balefill Facility with **Phil Redden** and **Jessica Rushton** discussed the current and future land use requirements there. Issues of note related to soil resources (clay), water quality and watershed management and protection, as well as recent wind damage to forests and associated fire hazard.

Consultations with **Craig Burgess** and **Hilary Paquet** concerned recreation and the role of trees / forest in the recreation experience, in and on the trails, green spaces and parks throughout the Municipality.

Results from these consultations and subsequent discussions provided significant direction to the structure of the subsequent inventory and management plan for forest lands with economic, archaeological and recreation assets.

Appendix B provides additional details of the topics of discussion at the various consultation meetings.

Data Assembly and Attribute Development. Based on the initial EFMP requirements and incorporating results from consultations, an initial data set for inventory, planning and management of the Municipal lands was developed.

The initial data set consisted of spatial location and attribute data assembled from existing sources. These included the NS DNRR forest and wetlands inventory, provincial watercourses, water bodies and transportation networks, as well as general available information on protected areas, significant wildlife habitat, rare and endangered species, invasive species, cultural and archaeological resources, ecological classification and mapping, and a number of others.

This initial data set as developed is based on the polygon or stand / vegetation as the operational unit. This is the basis for assembly, storage, retrieval and analysis of information. It includes the following groups of attributes:

Group Name	Attribute Types
A. Administration	Spatial location data (in shapefile format) Unit labels, area, PID, community name Management Compartment name
B. Land Use Type	Primary and Secondary Forest, parks and recreation, green spaces, riparian zones, etc.
C. Forest Description	Ecological Classification – ecodistrict, soils, vegetation type Forest Inventory – species, maturity, density Other Indicators – wind and human disturbance, water, trails etc.
D. Regulatory Management Indicators.	Watercourse buffer zones, wildlife habitat, rare species, archaeological significance, and others
E. Silviculture	Recommended forest treatments and scheduling
F. Comments	Unit specific not otherwise noted

Additional details on the data groupings and individual attributes are enclosed as **Appendix C-1.**

Site Visits. To verify the initial data set and develop a final list of attribute data, every Municipal property (PID) was visited. The site visit also determined if there were forest management opportunities. If the site was being used for other purposes, e.g. parkland, industrial, recreation, or others, an assessment of the natural forest ecology of the site was completed, if possible.

In total, over 360 plots were used to describe forest and natural ecosystems of these lands. In addition, these plots, and other locations were used to confirm the forest composition and description as described on the initial forest inventory data.

For 228 of the plots a Forest Ecosystem Classification was completed to describe the soils, vegetation, and ecosite, which was then ecologically linked to stand-level management and planning. Many of the plots identified other ecological attributes such as watercourses, biodiversity features, old forest, uncommon or rare plants/trees, and windthrow disturbance (from Fiona and Juan).

During the stand-level assessments, points were also established to mark other land uses and issues such as historical (old foundations, military), trespass (ATV/motor cross trails, hunting blinds, camps, harvesting), old roads and trails, land use features (landfills, gravel pits and ponds), and recreational areas (parks, trails, playgrounds).

In addition, over 660 oblique images were taken to provide visual documentation of the variety of ecosystems and land use conditions present on these lands. A number of representative images are included throughout the report. Any or all images are available separately (jpeg format) if required.

3.2 Strategic Forest Management

The overall strategy for the management of the forest component of municipal lands has been developed to follow the principles of ecological forestry.

Ecological Forestry. This is an approach that protects ecosystems and biodiversity, supports economic growth, and keeps forests healthy and sustainable. It aims to manage forests in a manner that promotes the development and/or restoration of stands to climax vegetation types appropriate to local landscape, ecosite, and soil conditions. A fundamental component of ecological forestry is integrating natural disturbance regimes (NDRs) into management decision-making. This recognizes that forest ecosystems have evolved and adapted over time to dominant natural disturbance patterns (type, severity, and frequency), so that emulating these NDRs is the best way to maintain ecosystem function and biodiversity when conducting forest management activities. In Nova Scotia, dominant NDRs affecting forest ecosystems are fire, wind/hurricanes, and insects such as the spruce budworm, spruce bark beetle, and tussock moth.

Ecological forestry is primarily concerned with the effects of forestry on ecological values such as water, soil, and habitat for all the species that inhabit and constitute those ecosystems. It is an approach that gives priority to ecological protection (and enhancement) and biodiversity in determining how forest practices should balance environmental, social, and economic objectives and values, while at the same time recognizing the importance of each of these overlapping and intersecting categories of objectives and values.

Ecological forestry is applied on the landscape by dividing the forest landscape into three zones that work together to balance a range of interests. The three zones of this triad model are the conservation zone (e.g. protected areas), high production forest zone (e.g. tree farms), and the mixed forest or matrix zone (ecosystem-based management). This triad approach is currently being implemented on provincially owned lands (Crown lands) in Nova Scotia.

The mixed forest or matrix zone (ecosystem-based management) aspect of ecological forestry is the most appropriate for the strategic management of municipal lands.

In addition, aspects of ongoing climate change require consideration at the strategic and tactical level in planning and implementing forest management.

Climate Change Adaption. Climatically Nova Scotia is part of the Acadian Forest Region , a mixedwood forest that blends the conifer-dominated boreal forests to the north with temperate deciduous forests to the south. Although a small province, Nova Scotia supports a diverse range of tree species and over 100 recognized forest vegetation types. Several boreal tree species found in Nova Scotia are near the southern limits of their ranges (e.g., white spruce, balsam fir, black spruce, white birch), while other temperate species are nearer their northern limits (e.g., red oak, yellow birch, white ash, eastern white pine). Research projections indicate that there will be several “winners and losers” as climate change leads to shifts in optimal climate conditions and habitat suitability for some species.

These projected changes predict that some boreal species like black spruce, balsam fir, and white spruce will become severely maladapted and reduced under changing climate conditions, except perhaps in certain habitats like treed swamps (black spruce) and cooler coastal and high elevation forests (balsam fir and white spruce). In contrast, some temperate species like white pine, red oak, and red maple may thrive under new climate conditions.

These trends could impact local forest ecosystems and in particular forests found on dry, poor sites as are found at Debert. Here white pine is also adapted to these conditions and is commonly an associate species in these black spruce-dominated stands. With climate change, white pine could become the dominant species replacing black spruce on these sites, possibly in association with red maple and/or red oak.

Elsewhere, balsam fir, typically an early successional species and/or a short-lived species associated with long-lived red spruce and hemlock could be reduced. However, the ecological impact is unknown as the species has been exacerbated by short rotation harvesting, often to the detriment of red spruce.

It is likely that if mixedwood forests are enhanced by a warming climate there would be an increased resilience in these stands by enhancing biodiversity and structure. Research is also suggesting that climate change will also impact natural disturbance regimes, so that current management must account for the possibility of more frequent and/or intense wind events, as well as increased fire hazard. Therefore, harvest treatments should therefore try to also enhance wind-firmness of residual trees (e.g., by harvesting patches of variable size and distribution rather than conducting more uniform single-tree treatments), and reduce fire risk (e.g., by maintaining existing hardwood cover and managing ericaceous shrub build-up in softwood dominated stands).

The overall land holdings of the Municipality have a total area of 1,618 ha (3,997 acres). These holdings consist of 151 separate parcels distributed throughout the Municipality (see **Map A-3** and **Table III**) above. These land parcels range in size from less than 1 ha to greater than 710 ha.

Forest Management on Municipal Lands. The lands and the forest component are all intertwined with infrastructure and activities associated with land use related to landfills, business and industrial development, parks and recreation, as well as residential development.

These lands are contained in five major ecodistricts which form the underlying basis for the growth, development and management of the forests. Forest management has significant impacts on ecological values such as water quality and quantity, soil quality, wildlife habitat and biodiversity, aesthetics, safety issues and other values.

The forest component is a diverse mixture of tree species typical of the Acadian Forest Region and the local ecodistricts; softwood and hardwood species occurring in various mixtures. The forest structure is also diverse with a mix of age and maturity classes often in the same stand. The natural regeneration of many tree species is typically abundant following natural or human disturbance. The inventory identified 309 individual units or stands having unique combinations of forest type and land use.

The sites where the trees are growing are generally productive with stable ecological integrity. Most are capable of producing a mature healthy forest in a reasonable amount of time.

Current and recent forest management has been significant and appropriate in the parks and recreation areas but has been spotty at best in most other areas.

Significant disturbances due to wind events (Fiona recently and Juan previously) have impacted the type and extent of certain forest types (e.g mature balsam fir). This has also contributed to increased safety and fire hazard concerns. As lands are generally accessible, ongoing disturbance from human activities (ATV trails, litter/dumping, camps and shelters and others) is widespread as lands (other than parks) are generally uncontrolled with property boundaries unclear.

Given the nature of the land base and the forest component, it was decided to subdivide the lands into compartments based on geographic location within the ecodistricts. These compartments are the basis for forest and land use inventory and mapping as well as forest management recommendations.

Forest Compartments. There are 24 compartments, ranging in size from approximately 2 ha to 734 ha. A number of ecodistricts have more than one compartment. **Table IV** provides a detailed breakdown of the forest compartments by Ecodistrict, including areas (ha and acre) and proportions, as well as number of vegetation units or stands.

In **Section 3.3**, following, a summary of the type and extent of the various recommended forest treatments is enclosed, for each forest compartment.

In **Section 3.4**, following, for each ecodistrict and for each compartment contained within the ecodistrict, a detailed sub-report is enclosed. This includes an ecodistrict summary and compartment level detail including area, PIDs, discussion and recommendations as well as images and stand-based maps. The detailed stand-based inventory for each compartment is enclosed in **Appendix C-2**.

3.3 Recommended Forest Treatments and Practices

Priority Treatment Summary. A summary of the main priority recommended treatments is provided below. More detail on those treatments, as well as other, lower priority and/or longer term treatments can be found throughout individual ecodistrict sections.

Much more technical information on all types of forest management treatments is available from the NS DNRR and the Association of Sustainable Forestry (ASF).

An estimate has been made of the total area that could receive the different forest management treatments. The actual area treated will depend on various factors: access, markets, site conditions, contractor availability, etc.

Fiona Salvage Cutting (SC). Tropical storm Fiona caused widespread wind damage on many areas on MCC lands, mostly light to moderate, with a few areas of moderate to severe damage (blowdown, breakage and/or leaning trees). In many cases, it is not economically feasible to salvage this damage due to low volumes and/or low market value (i.e. poor quality balsam fir and low grade hardwood). Where damage is moderate and severe, and where the treatment is thought to be economically feasible, the salvaging of damaged trees has been recommended in order to clean up, reduce fire risk and create the opportunity for a new, more productive stand, to be established (either by natural regeneration of LIT species and/or the replanting of native species). Where maturing white pine are present in the overstory, they can be left as seed trees to provide seed and shade for desirable white pine natural regeneration.

The main priority areas for salvage cutting are:

Ecodistrict	Location	Stands
380	Kemptown Woodlands	22, 23 & 24 (Total 11.8 ac)
620	Debert Airport Lands	16, 31, 32, 34, 37, 75, 39, 40, 43, 45, 58, 62 & 64 (Total 157.8 ac)
620	Debert Industrial Lands	83, 84, 87, 89, 90, 94, 99, 109 & 146 (Total 64 ac)
620	Cobequid Bay – West Colchester United Area Lands	215 & 219 (Total 32 ac)

The total area recommended is 265.6 acres or 107.5 ha.

While there is scattered, patchy damage in many other areas, it is not economically feasible to salvage due to low volumes and/or low value trees damaged.

The County may wish to identify selected areas and/or PIDs for forest fire fuel loading assessments associated with the wind damage and consider some additional clean up treatments where the risk is considered to be high.

Planting (Reforestation) (PL). Planting trees is used when natural regeneration is insufficient or unacceptable following harvesting or any stand level natural disturbance. Planting can also be used to afforest sites that no longer support trees. Under the ecological triad tree planting followed by intensive forest management treatments, e.g., weeding and spacing, is an option for high production forests.

Tree planting on the municipal lands can be used to reforest salvaged forests damaged by natural disturbances such as hurricane and insects. Other opportunities for planting are reclaimed landfills, abandoned agricultural fields, or harvested areas where a return to late successional species is desired.

Often harvested areas may have some desirable regeneration but not enough to fully reforest the site. In these cases, the planting effort is called a fill-plant.

Whenever trees are planted, variable costs are directly related to the difficulty of the planting effort. Typically logging slash can reduce planter productivity. Stony soils also increase planting difficulty as does the size of the planting stock. Efforts to improve planter productivity include mechanical and/or chemical site preparation.

Tree planting can be done during most of the growing season but avoiding the driest times. Adequate site preparation and quality planting is required to achieve high levels of survival of the planted seedlings.

This recommendation to plant native trees and shrub species appropriate for the sites will help maintain/increase site productivity, and increase biodiversity values including wildlife habitat, enhance watershed functioning, and increase carbon capture potential.
Establishing planted forests in this recommendation is not considered to be equivalent to high production forestry.

Note: A federal/provincial government program, 2 Billion Trees , may be able to provide funding for planting previously non-forested sites, e.g., landfills, old fields.

Tree planting (reforestation) has been recommended in three different situations:

Condition	**Ecodistrict**	**Location**	**Stands**
1. Old landfills	630 630 530 620	Wittenburg Stewart Hill New Truro Rd Montrose	10 (4.1 ac) 12 (4.4 ac) 7 (11.4 ac) 6 (10.5 ac) Total 30.4 acres
2. Old fields	620 620	Debert Airport Debert Industrial	7 (8.7 ac) 100 (9.1 ac) Total 17.8 acres
3. Following salvage or harvest	620 620 620 380	Debert Airport West Colchester Arena Debert Industrial Kemptown Woodlands	16, 31, 32, 34, 37, 75, 39, 40, 43, 45, 58, 62 & 64 (157.8 ac) 215 & 219 (32 ac) 83, 84, 87, 89, 90, 94, 99, 109 & 146 (64 ac) 22, 23 & 24 (11.8 ac) Total 265.6 acres

The total area recommended is 318.8 acres or 129 ha.

The recommendation to plant a variety of native trees and shrubs will improve biodiversity, including wildlife habitat, watershed management and have carbon capture benefits. It is not planned to be high production forestry planting.

Precommercial Thinning (PCT). Pre-Commercial thinning (PCT) is an early intervention treatment that aims to reduce the number of stems in sapling to young stands of trees using a thinning or spacing saw. This allows for remaining crop trees to be released and maximize their growth, with a spacing between future crop trees of approximately 2m.

Timing of a PCT intervention is crucial to have a good growth response from the crop trees. Typical intervention timing is when the stand is 10-15 years of age or when crop tree heights are 2-6 meters for softwood and 5-9 meters for hardwood species.

Shade intolerant, pioneer, and/or non-merchantable species such as grey birch, alder, pin cherry, and/or trembling aspen are aimed to be removed in a pre-commercial thinning. Conversely, shade tolerant and long-lived species are favoured and managed for future stand development. Shade tolerant species such as red spruce, eastern hemlock, white pine, sugar maple, red maple and/or yellow birch carry a greater ecological and economic value in their products than shade intolerant species.

This stand tending silviculture treatment has been recommended in several young stands in order to promote the growth and development of LIT species:

Ecodistrict	**Location**	**Stands**
630	Stewiacke River Park	5 & 6 (7.8 ac)
380	Burnside Falls Park	10 & 14 (3.9 ac)
620	Debert Airport	67 (4.1 ac)
620	Debert Industrial	107, 124 & 127 (65.3 ac)
530	Nelson Memorial Park	4,5 (7.8 ac)

The total area recommended is 88.9 acres or 36 ha.

Commercial Thinning (CT). Commercial Thinning is the removal of poorest quality and shorter-lived trees from an immature stand of LIT trees. The purpose is to give the remaining long-lived trees increased space and light to promote better growth, and to harvest volume that otherwise might be lost to natural morbidity (ex. Balsam fir).

Tree species that respond well to commercial thinning are usually long-lived, shade-tolerant species including red spruce, hemlock, white pine, sugar maple, yellow birch, white ash and red oak.

Trees to be removed during the thinning operation include crooked, forked and damaged trees, as well as tree species that are not wanted for the final harvest. Trees to be retained as crop trees are those with straight stems and healthy bark. They are well-rooted and possess a vigorous crown.

Approximately one-third of the trees can be removed during a commercial thinning. As with any partial cutting technique, risks of blow-down and breakage increase as more trees are removed.

Unthinned buffers are often left along exposed edges of the treatment area to create more windfirm conditions, and some trees that make good wildlife habitat (dead snags, cavity tree, etc.) should also be left.

Commercial Thinning (CT) has been recommended in 2 stands:

Ecodistrict	**Location**	**Stands**
620	Debert Airport	56 & 57 (114 ac)

The total area recommended is 114 acres or 46.2 ha.

Irregular Shelterwood (IS) Harvest. The Irregular shelterwood harvest system is done in two or three steps, and uses the shade of the uncut trees to naturally regenerate the stand with LIT species, such as red spruce, hemlock, yellow birch, etc. It is applicable in stands where multiple species occur with varied life spans (i.e. some shorter lived species and longer lived species).

The objective is to provide extra growing time for the LIT species in the overstory (main canopy), to provide shade and seed of these preferred LIT species and conditions for this establishment and development, and to harvest shorter lived species, such as balsam fir from the overstory.

This treatment adds to biodiversity by keeping vertical and horizontal stand structure and the conditions to produce with vertical layer of LIT regeneration by revealing small openings in the canopy.

Irregular shelterwood harvests have been recommended in maturing stands with sufficient LIT species in order to harvest shorter lived species and promote the development of LIT natural regeneration.

This treatment has been recommended in the following stands:

Ecodistrict	**Location**	**Stands**
380	Truro Road	1, 2, 3, 4 & 5 (46.1 ac)
620	Debert Airport	61 & 68 (22.4 ac)

The total area recommended is 68.5 acres or 27.7 ha.

Ecological Park and Recreation Management (EPRM). The primary goal of tree and forest management in parks and recreational areas is to provide a safe experience for the public. A secondary goal should be to preserve natural features of the forest to help reduce our impact on the environment and biodiversity while supporting a recreational opportunity.
Biodiversity features at the stand level are described in A Field Guide to Forest Biodiversity Stewardship and include forest features such as snags, downed woody material, cavity trees, vernal pools, seeps and springs, raptor nests, and deer wintering areas to name a few. Best management practices for biodiversity features are described in the field guide as well as any legal requirements.

Recommendation: Based on field observations of municipal recreational areas during this project it was apparent that current forest management in these areas was cognizant of biodiversity features and values. It is recommended that this continues with ecologically (ecosystem) sensitive management practices that will help maintain and conserve biodiversity by favouring native tree species, especially long-lived species appropriate for the site.

Management Notes: Avoid planting with non-native species and/or native species not appropriate for the site. Some native species will be more adapted to climate change and includes red oak, white pine, and red maple. White ash and eastern hemlock are currently threatened by invasive pests with the outcome unknown currently. As has been witnessed by the impact of invasive species on elm and beech, it can be significant. However, management practices should continue to favour natural regeneration of these long-lived species.

Removal of downed coarse woody material (CWM) from parks and recreational areas is not necessary unless for safety or hazard reduction. Downed wood is valuable as it recycles nutrients and provides habitat. CWM greater than 30 cm provides the best opportunity for habitat. These larger pieces can be limbed out for aesthetics and/or safety. Pieces smaller than 30 cm can be chunked and delimbed.

Maintain snags and cavity trees where safe. As a rule of thumb dead or dying large hardwoods as well as white pine with their deeper rooting systems, undergo a vertical deterioration starting with the smaller branches and progressing to the larger branches and eventually the stem. Other mostly softwood species with a much shallower and wide spreading root system tend to uproot shortly after mortality.

Several tree and shrub species used in landscaping are aggressive and can negatively impact natural ecosystems by crowding out native species. Invasive tree species that are known to be aggressive include Norway maple, Scots pine, European ash, and English oak. Shrubs include glossy buckthorn, barberry, multiflora rose, and knotweed.

Ecological Park and Recreation Management (EPRM) has been recommended in the forested areas of all Municipal parks, as well as all less formal public greenspaces.

Forest Fire Hazard Considerations. Natural ignition of forest fires, usually by lightning, is infrequent in Nova Scotia. An average of four lightning caused fires per year was reported by the Department of Natural Resources and Renewables for the period 2012-2021. In this same period there was an average of 336 fires/year which burned an average of 365 hectares/year. Most of these fires are less than two hectares, a credit to the suppression efforts of DNRR and volunteer fire brigades. Nonetheless, in recent years several large fires have destroyed forests and property; Porter's Lake (1,925 ha), Spryfield (681 ha), Seven Mile Lake (395 ha), Horseshoe Lake (3,199 ha), Barrington Lake (23,525 ha), Goffs (595 ha) and Tantallon (950 ha). Climate change is expected to create opportunities for more frequent and larger fires in the future, regardless of the cause of ignition.

Factors influencing fire severity and extent are basically climate (weather) related and the amount and type of fuel. Less precipitation during any season can influence when fires may occur and the severity and extent of those fires. Hardwood forests are less likely to burn whereas softwood forests are always vulnerable. Compounding the severity of fires is the quantity of combustible fuel including not only the live standing wood volume but also logging slash and downed deadwood.

Factors other than dryness and wind that influence how fire moves (spreads) across the landscape includes type of forest (hardwood vs. softwood), fuel load, understory shrubs and trees, and fire breaks (fields, lakes, highways).

All forests are susceptible to fire but those dominated by Spruce-Pine forest ecosystems tend to occur on sites with drier soils, usually sands to loamy sands, similar to those found in Debert. These ecosystems also have a significant woody shrub such as lambkill, blueberry, huckleberry, and rhodora (ericaceous or heath-like plants).

Currently the red pine forests of Debert are nearing late maturity. As an early successional forest, the abundance of lesser vegetation and a needle carpet in the understory is typical. However, red pine, a moderately short-lived species, will slowly start to deteriorate and over time be replaced by a late successional stage of black spruce and white pine. During this replacement process more shrubs will start to take over the forest floor along with the black spruce and white pine regeneration. As the black spruce continue to grow into the red pine canopy, they become a "ladder" for fire to reach into the canopy and cause crown fires which can progress quickly across the landscape and are difficult to extinguish. The increased fuel load caused by flammable ericaceous shrubs on the forest floor also enhances the spread of ground fires.

Options for reducing fire hazard in these types of forests include reduction of the forest floor fuel load (woody shrubs), reduction of black spruce, and promotion of white pine, a long-lived species less prone to fire.

3.4 Forest Inventory and Management by Ecodistrict

3.4.1 Ecodistrict 340 Cobequid Hills

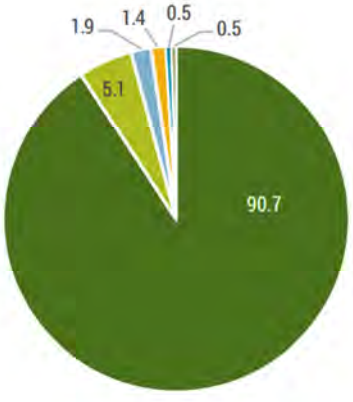
Number of PIDs: 1
Total Area: 16.6 ha (40.9 acres)

Ecodistrict Summary

The Cobequid Hills Ecodistrict (340) is a narrow upland in an east west orientation separating foothills and lowland ecodistricts to its north and south. A complex geological history underlies the hills and includes the prominent Cobequid fault which extends from Truro to Cape Chignecto. Recent elevational checks have revealed that the highest points on mainland Nova Scotia are in the hills behind Ski Wentworth. The Cobequid Hills encompasses watersheds with north and south running streams that leave the mountains in deep, steep-walled ravines and gorges in a series of falls or cascades. Freshwater. lakes and streams account for only 0.5% of the ecodistrict, with most lakes being small and shallow, excluding Folly Lake which has depths of over 30 m. Fresh, medium to rich soils support large intact Wabanaki-Acadian forests of shade tolerant hardwoods, with stands extending from the crests to lower slopes of hills. Softwood stands occur at higher elevations on moister, level terrain, with shade tolerant mixedwood forests found along steep-sided ravines. Wind exposure, snow, and ice breakage are sometimes limiting factors to quality hardwood growth.

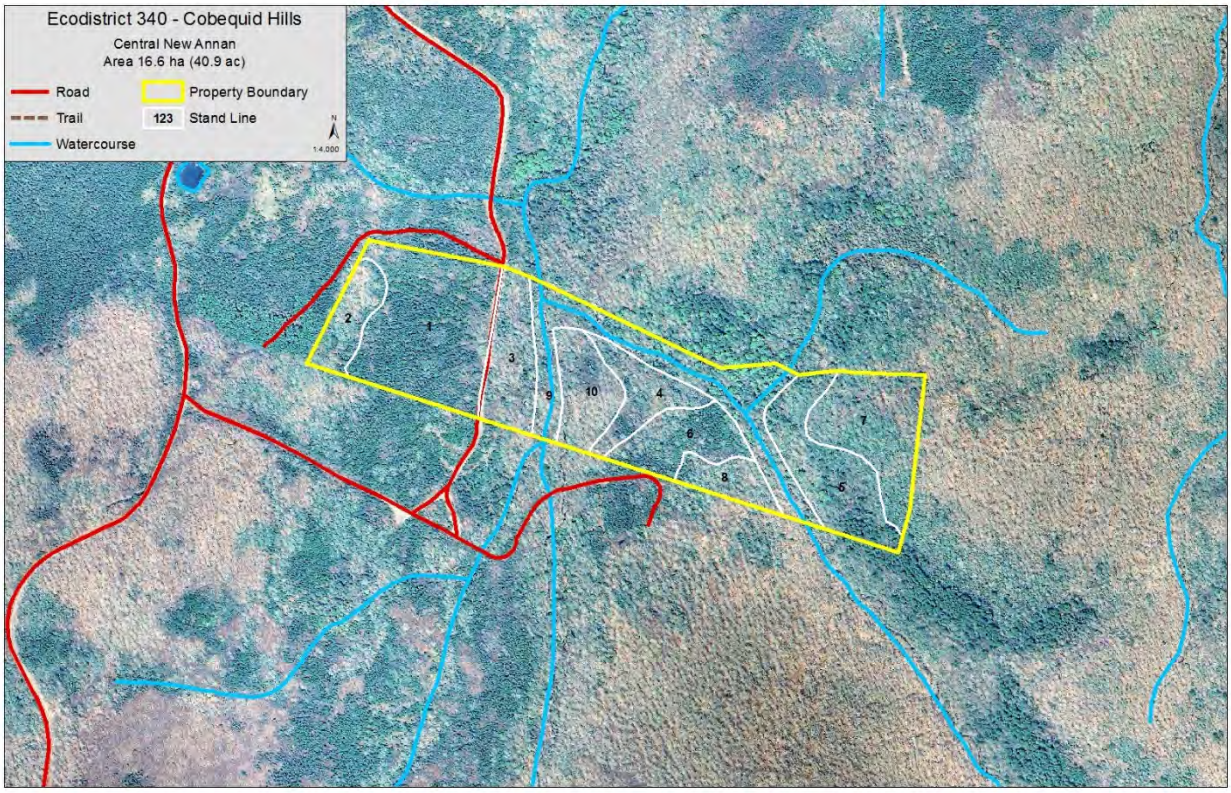
Ecodistrict 340 Percentage Land Cover

Forest/Woodland	90.7
Agriculture	5.1
Wetlands	1.9
Urban/Industrial	1.4
Water	0.5
Shrub/Heathland	0.5



Central New Annan

PIDs: 20097499
Area: 16.6 ha (40.9 acres)



There is only one MCC property in the Cobequid Hills near Warwick Mountain. Several small streams flowing from the Cobequid uplands merge in or near this block to form Munroe Brook, a major tributary of the French River. The property has seasonal access off the Mountain Road. Historically a portion of the property **(Stands 1,6)** was previously farmed but later abandoned and has reforested to white spruce and balsam fir. Rock walls are evidence of the early settlement history (**Image 1**). The largest portion of the property is a complex of very small hardwood floodplain forests along the streams **(Image 2)**. Late successional shade tolerant hardwood and mixedwood forests are typical of the well-drained slopes and steep sided ravines **(Image 3)**.

Aside from the small floodplain forests which typically have high flora diversity no other habitat or uncommon biodiversity feature was noted during the assessment. A normal quantity of snags and cavity trees are present as well as downed coarse woody material that can all provide habitat for a variety of wildlife.

Image 1. Rock wall or stone dump indicating a past history of land clearing and agriculture **(Stand 1)**.

Recommendations

Stand 1 is an old field site that reforested to white spruce which was harvested approximately 30 years ago. It then regenerated to mainly balsam fir with some white spruce. This stand should be monitored over the next 10 to 15 years, then clearcut and replanted to white spruce or red spruce.

Stand 6 is another dense, 30+ year old softwood stand dominated by balsam fir. Access permitting, this site should also be monitored and harvested and replanted to white spruce or red spruce, at the same time as Stand 1.

The remaining stands except for the riparian zone stream buffers are immature to mature tolerant hardwood stands comprised of sugar maple and yellow birch along with hemlock, white spruce and overmature balsam fir, which are currently experiencing mortality. Subject to gaining access, perhaps from adjoining properties, these areas could have an Irregular Shelterwood (IS) treatment to harvest the shorter-lived species (such as balsam fir and white spruce) and leaving long-lived, intermediate shade to high shade tolerant (LIT) species and creating suitable conditions for the establishment and/or development of LIT regeneration, e.g., sugar maple, yellow birch.

Image 2. Riparian forest alongside one of the many small streams at Warwick. Channel alteration and erosion is typical due to the spring snowmelt and during heavy periods of rain.

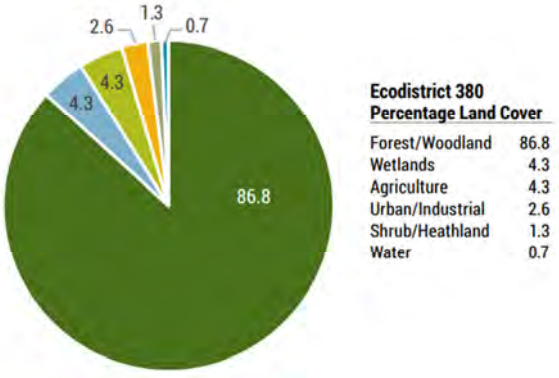
Image 3. Shade tolerant hardwood **(Stand 7)** on the upper slopes at Warwick with a strong layer of regenerating balsam fir. In these forests balsam fir seldom becomes part of the overstory due to the restraining effect of the dominant hardwood.

3.4.2 Central Uplands Ecodistrict 380

Number of PIDs: 14
Total Area: 365.5 ha (902.8 acres)

Ecodistrict Summary:

The Central Uplands Ecodistrict (380) is characterized by rolling uplands rising 270 m above sea level. The ecodistrict is wedged between the Cobequid Hills (340) and the Pictou Antigonish Uplands (330) and this central positioning on the mainland promotes connectivity for biodiversity throughout the province. The headwaters of numerous rivers originate in the uplands flowing to the Bay of Fundy, Northumberland Strait, or Atlantic Ocean. Freshwater streams and small shallow lakes cover only 0.7% of the ecodistrict. Fresh to fresh-moist, medium rich soils support a red spruce/balsam fir forest. Shade tolerant hardwoods are present on the crests and upper slopes of hilly terrain. Red spruce, sugar maple, and yellow birch form mixedwood stands on the finer textured soils. In the Central Uplands stand initiating natural disturbances include hurricanes, insects, and sometimes fire. However, the infrequency of stand-level natural disturbances creates the opportunity for late successional climax forests of red spruce, sugar maple and yellow birch to develop into old growth. Historically insect epidemics were unlikely to have caused extensive damage to the forests of the Central Uplands due to the mixedwood nature of the forest. Populations of spruce budworm and tussock moth have recently defoliated significant areas of the uplands – most notably in stands of balsam fir.

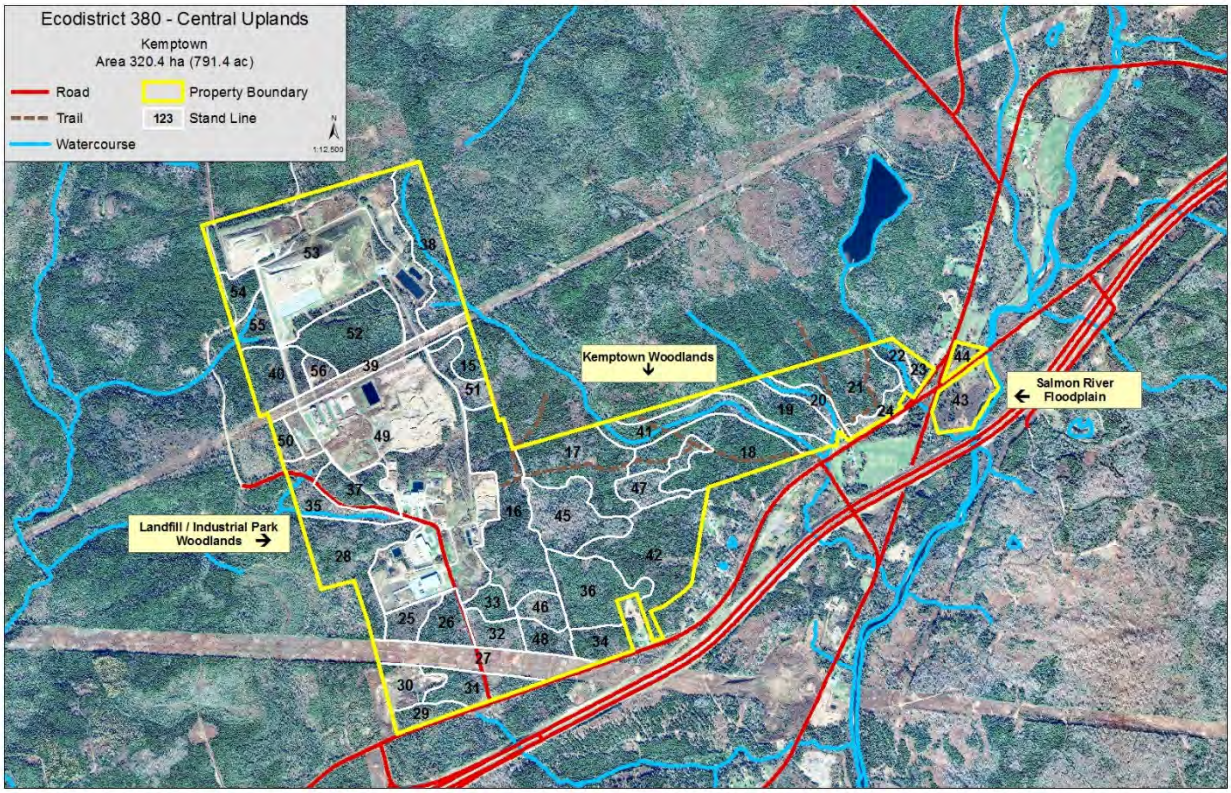


Most of the MCC property in the Central Uplands is located at or near the Kemptown Landfill with three smaller properties at Burnside, Greg Road, and Truro Road. Red spruce forests are typical of this ecodistrict and are well represented at all four properties. The Kemptown Landfill

area has been subdivided into three management blocks that reflect the dominant land use, as shown on the following map.

Kemptown

PIDs: 11
Area: 320.4 ha (791.4 acres)



Kemptown Landfill / Industrial Park Woodlands

This block comprises the western end of the Kempton lands and is 216.6 ha (535.1 acres) in extent.

As the primary use of these lands is for landfill and related operations and future expansion, long term forest management recommendations have not been suggested. Most forest stands in this area are immature, the result of harvesting 30 to 40 years ago. Patchy blowdown from Fiona is common along open stand edges and within stands, but overall is light to moderate. Some of these damaged trees could be cleaned up anytime when a contractor is working nearby. Otherwise, the timing of harvests will be mainly in relation to future landfill expansion and/or related industrial park development.

The Landfill / Industrial Park Woodlands are located on top of a significant hill that is the headwater source for streams leading to the North and Salmon Rivers. Two westward flowing streams feed the South Branch North River with one originating from near the composting facility and the other near the old Mingo homestead. Two unnamed streams flow south-easterly to the Salmon River, the longest (2.8 km) originates at the landfill near **Stand 38** and the smaller from **Stand 29**.

Fine textured, imperfectly drained clay loams to sandy clay loams dominate this portion of the property and would have supported a forest of red spruce with minor amounts of yellow birch, red maple, and white pine. Black spruce, tamarack and red maple are found on the poorly drained sites. Perhaps not surprising the best soils (moderately well drained gravelly clay loams) are where the old farm was located (foundation adjacent to the recycling depot) and extending along Mingo Road (portions of **Stands 28 and 35) (Image 1).** Mixedwood forests of yellow birch and red spruce most likely greeted the Mingo family when they first settled the area.

Aside from the wetland ecosystems in the undeveloped portion of this block the potential for species at risk or special habitats are low.

Glossy buckthorn, an aggressive non-native shrub, similar in stature to speckled alder, has become invasive on the landfill property. Not much can be done to control the spread of this specie once established. The fruit has a hard seed (like chokecherry) and is quickly dispersed by birds. The shrub produces viable seed in 2-3 years. Cutting the shrub only encourages it to aggressively stump sprout. Digging up of the root system is the only non-chemical control. Glossy buckthorn has the potential to significantly alter the ecology of wetlands and impact natural regeneration in upland forests.

Imperfect to poorly drained clay soil is dominant throughout this portion of the Kemptown property. As mentioned above the old Mingo homestead had the best drained soils with the lowest clay content. Although not definitive for determining the extent and depth of the clay content the sampling done during this assessment indicates that the soils with the highest clay content and depth appear to be in the vicinity of **Stands 40, 52, 54, and 55**.

Recommendations

Restoration of the yellow birch - red spruce mixedwood forest could be a long-term priority and reducing the balsam fir component of the red spruce forest can be achieved with management. Overall, the remaining forest on this portion of the property would benefit from a longer-term outlook if left unused for future landfill development.

Kemptown Woodlands

This block comprises the central area of the Kempton lands and is 97.3.8 ha (240.2 acres) in extent.

This parcel of woodlands is similar to the forest ecosystems of the Landfill / Industrial Park Woodlands with primarily imperfectly drained fine textured clay loams to sandy clay loams supporting an early successional forest of balsam fir and red spruce **(Image 2)**. Most of this forest is a product of clearcut harvesting about 30-40 years ago, tussock moth defoliation and mortality in 1995, and/or hurricane Juan wind throw in 2003. Evidence of the insect epidemic and hurricane can be seen by the large amount of downed coarse woody material on the forest floor **(Image 3)**. Scattered snags are also prominent throughout. On a few sites where soils are better drained mixedwood and hardwood stands can be found with red maple, yellow birch, balsam fir, and red spruce **(Stands 45 and 47)**. Black spruce, tamarack and red maple are typically found on poorly drained sites. There is also a large area of low stocked black spruce woodland on moist to wet soils of low nutrient content **(Stand 42)**. Three small stands of white spruce and tamarack near the Kemptown Community Centre have originated on old field/pasture lands **(Stands 22, 23 and 24)** and have significant windthrow from Fiona.

This parcel of woodlands gently slopes southeasterly towards the Salmon River using mainly two unnamed streams to channel the waters. The longest (2.8 km) originates at the landfill near **Stand 38** with a smaller tributary joining it from the east. Significant flowage also occurs from several ephemeral streams located along this gentle slope during spring snowmelt and rain events. A stream from Hingley Lake at the eastern most portion of this woodland block also flows to the Salmon River.

Aside from the wetland ecosystems and the riparian zones along the streams the potential for species at risk or special habitats are low. A small patch of remnant older red spruce (110 years) was noted in **Stand 18** but overmature trees of any long-lived species are uncommon.

Although the invasive shrub glossy buckthorn was scarcely noticed its potential to impact wetlands is high while its impact on softwood forests is still unknown.

Recommendations

Generally, this forest could be managed on a longer rotation to increase the forest composition to long-lived species such as red spruce and yellow birch thereby reducing the abundance of short-lived balsam fir.

Soils with a high clay content are typical throughout Kemptown Woodlands and have low internal drainage thereby creating operational difficulties for most of the year. This imperfect drainage also creates shallow rooting for most tree species and stands that are thinned are often susceptible to windthrow.

The forest management priority in this block should focus on maintaining the ecological integrity of the forest and to sustain and improve the forest's role in watershed management, helping ensure clean water coming from the active landfill development into Kemptown and the Salmon River.

Three significant watercourse buffers or riparian zones have been identified **(Stands 20, 22, and 41)**. Short and steep slopes are common along these watercourses and the maintenance of wider than required treed riparian zones is recommended, i.e., 30 meters on each side of the channel, rather than the provincially regulated 20 meters.

Stands 17, 18, 19, 21, 34 and 42 are all immature softwood stands dominated by balsam fir, the result of harvests 30 to 40 years ago. Fiona damage is patchy and light to moderate overall. Due to the short life span of balsam fir (40-60 years) and the imperfectly drained clay soils, commercial thinning is not recommended.

These stands should be monitored closely over the next 10 to 15 years, as balsam fir is susceptible to windthrow, breakage and several pests and diseases. In 10 to 15 years, or sooner if there is any damage, these stands should receive a partial cut treatment such as strip cut, patch cut or irregular shelterwood cut, in order to harvest the maturing balsam fir over a 5 to 10 year period, and create the opportunity for the establishment and development of longer lived species suitable for these sites, such as red spruce, yellow birch, red maple and white pine, either by planting or natural regeneration or a combination of both.

Stands 22, 23 and 24 are small areas in the extreme eastern section bordering old highway 4 and the Kemptown Community Centre. Fiona damage is severe here and a salvage harvest is recommended to be done soon, prior to wood quality deterioration; followed by planting of red spruce **(Image 4)**.

<u>Salmon River Floodplain</u>

This smaller block comprises the eastern area of the Kempton Woodlands and is 6.5 ha (16.1 acres) in extent.

Gravelly silt and sandy loam soils underlie the floodplain of the Salmon River. Abandoned fields and shrubland occupies most of the area **(Stands 43 and 44, Image 5)** with a few patches of white spruce and a large alder wetland. The stream from Hingley Lake flows through the lower portion of the block. A gravel berm along the river protects much of the area from annual flooding and where floodwaters do advance onto the floodplain it is only 10-12 m and mainly along the portion closest to Highway 104.

The original forest on the floodplain was most likely a mix of sugar maple and elm. A healthy elm of 25 cm in diameter was noted near the old highway 104 bridge. No species at risk or uncommon floodplain species were noted during the summer assessment period, which is surprising given that one of the more unique floodplain ecosystems in Nova Scotia is only 1.5 km upstream. At that site several uncommon flora are found such as wild leek, blue cohosh, and

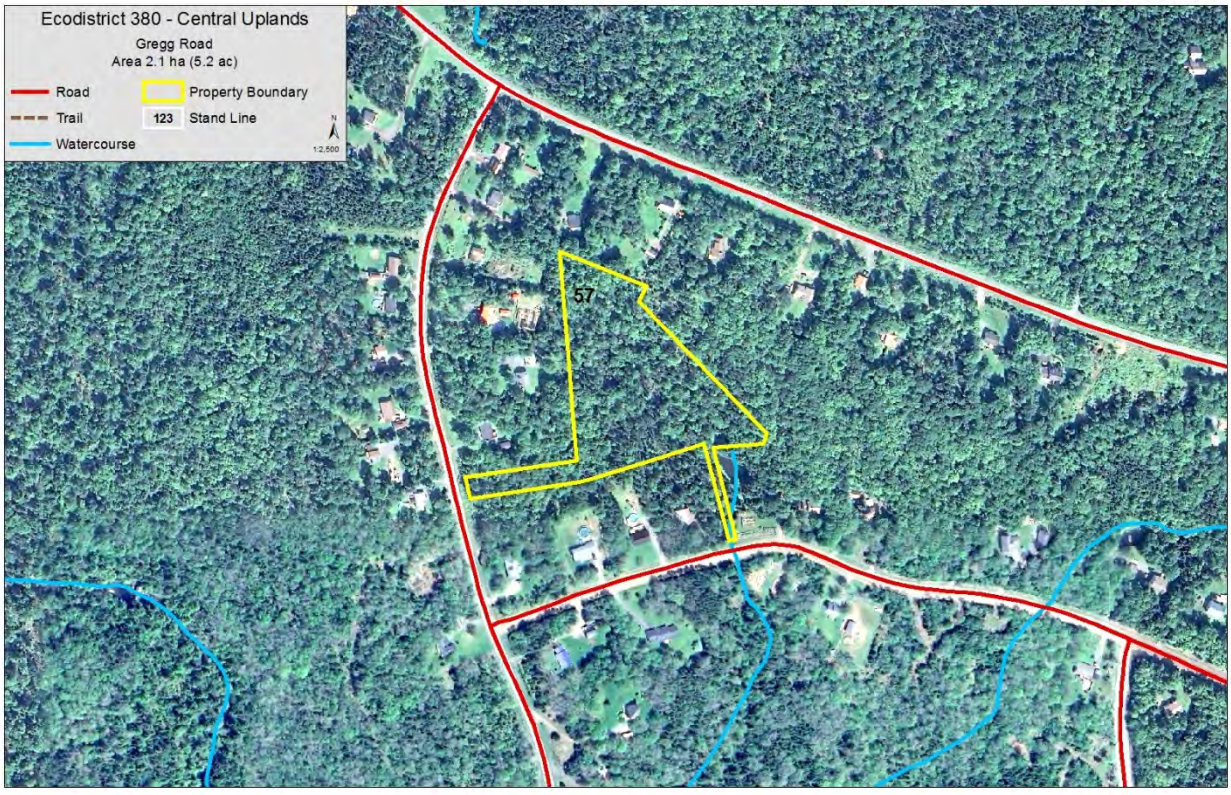
horse gentian plus typical floodplain species such as bloodroot, and ostrich fern. *Clematis virginiana* (a climbing vine) was noted along some of the gravelly outwashes in this block along the Salmon River.

The abundance of mast producing shrubs such as highbush cranberry, serviceberry, pin cherry, hawthorn, and wild apple provide a valuable food source for many bird species (cedar waxwing was noted during the survey).

The invasive shrub glossy buckthorn was not noticed but its potential to impact old field sites is known to be significant, often replacing alder as the dominant shrub. Active ATV trails were noticed throughout the area with one trail leading to a gravelly outwash along the Salmon River and frequently used for campfires, etc.

Gregg Road

PIDs: 20053682
Total Area: 2.1 ha (5.2 acres)



This small stand represents a mid-successional mixedwood forest dominated by red spruce and red maple but with several other species present such as large-tooth aspen, white spruce, sugar

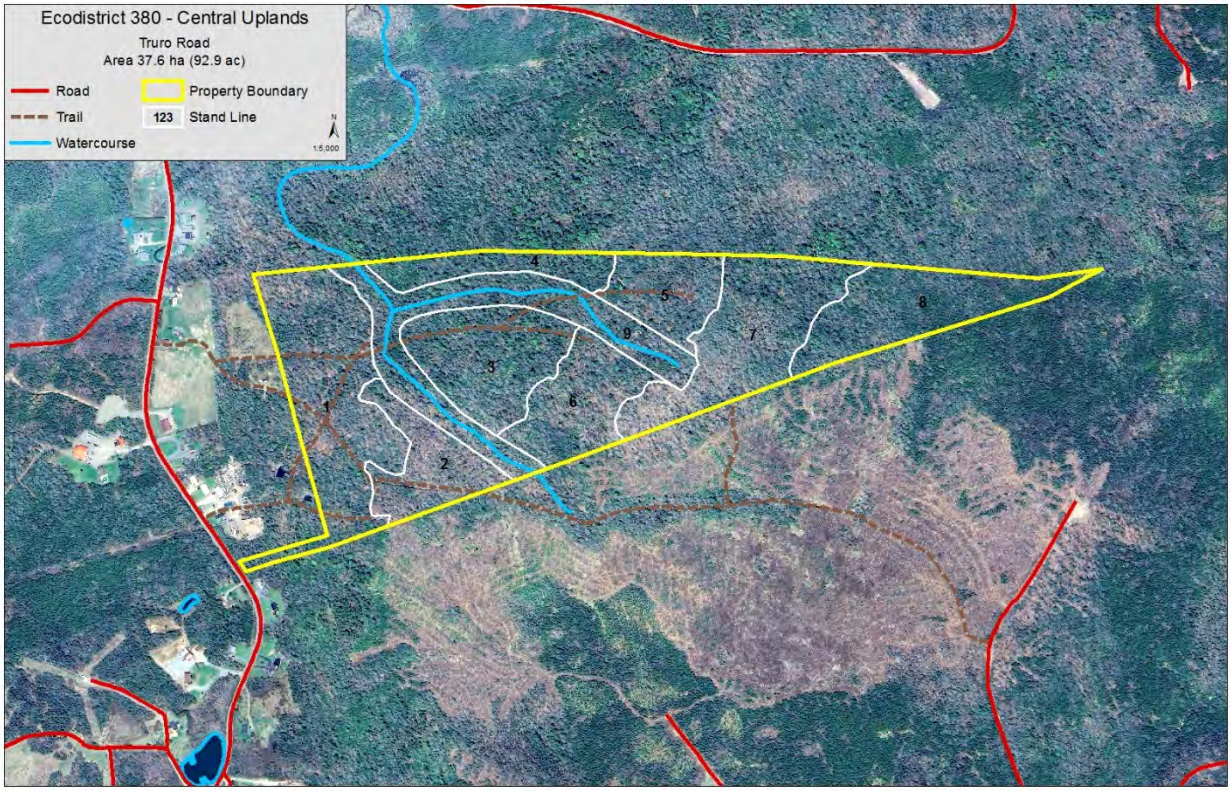
maple, and yellow birch plus the ever-present balsam fir. Occupying a mid to upper slope position soils are well drained sandy loams with inclusions of shallow soils over the quartzite bedrock. Rock outcrops and stone dumps are encountered as well as springs and seeps which feed a small stream. Past windthrows and balsam fir mortality has opened portions of the canopy for regeneration to shade tolerant species such as red spruce and yellow birch creating an uneven-aged stand. With time a late successional Acadian mixedwood forest of red spruce, yellow birch and sugar maple is likely.

Recommendations

This municipal green space is relatively undeveloped but does have potential for walking trails due to the varied terrain and long-lived tree species present. Fiona damage is light to moderate, and if trail development is done, some cleanup would be necessary. Otherwise, no treatments are recommended.

Truro Road

PIDs: 20171138
Area: 37.6 ha (92.8 acres)



The moist rich fine textured soil of this property supports an impressive shade tolerant mixedwood forest of yellow birch, red spruce, and hemlock (MW1, MW3). **Stand 1** has been partially logged in the past but the red spruce and red maple forest (MW2) is a good example of an uneven-aged forest located on moderately moist to moist soils showing strong microtopography (pit and mound surface relief, evidence of a history of windthrow). Although it has been selectively logged in the past, the forest has responded with a continuing cover of sugar maple, white ash, yellow birch, hemlock, and red spruce. Despite the past harvesting early successional species (white birch, aspen) are uncommon. The stands are generally immature to mature with scattered remnants of older trees representing the previously harvested age classes. There are many seeps and swales throughout this woodlot with one of the best examples of a forested swale in **Stand 5 (Image 7)**. No vernal pools were noted but could be present. These features provide wildlife habitat throughout the year. In the spring bear and deer will forage on the sedges that are the first plants to emerge. Amphibians also use these areas for breeding, hatching, and feeding and as refuge when travelling. Where the forest is strong to shade tolerant hardwoods **(Stands 2,7) (Image 8)** there are inclusions of a rich forest vegetation type, TH3 - Sugar maple -white ash / Christmas fern, which has the highest species richness of any upland hardwood ecosystem in the province. Although not apparently abundant, there are hardwood snags and cavity trees present that are valued for nesting and perching, and multi-stemmed mature yellow birch are favoured by goshawks for their nest placement.

There was evidence of recent use of old logging trails by ATV's, partial harvesting, and an old camp **(Image 6)**.

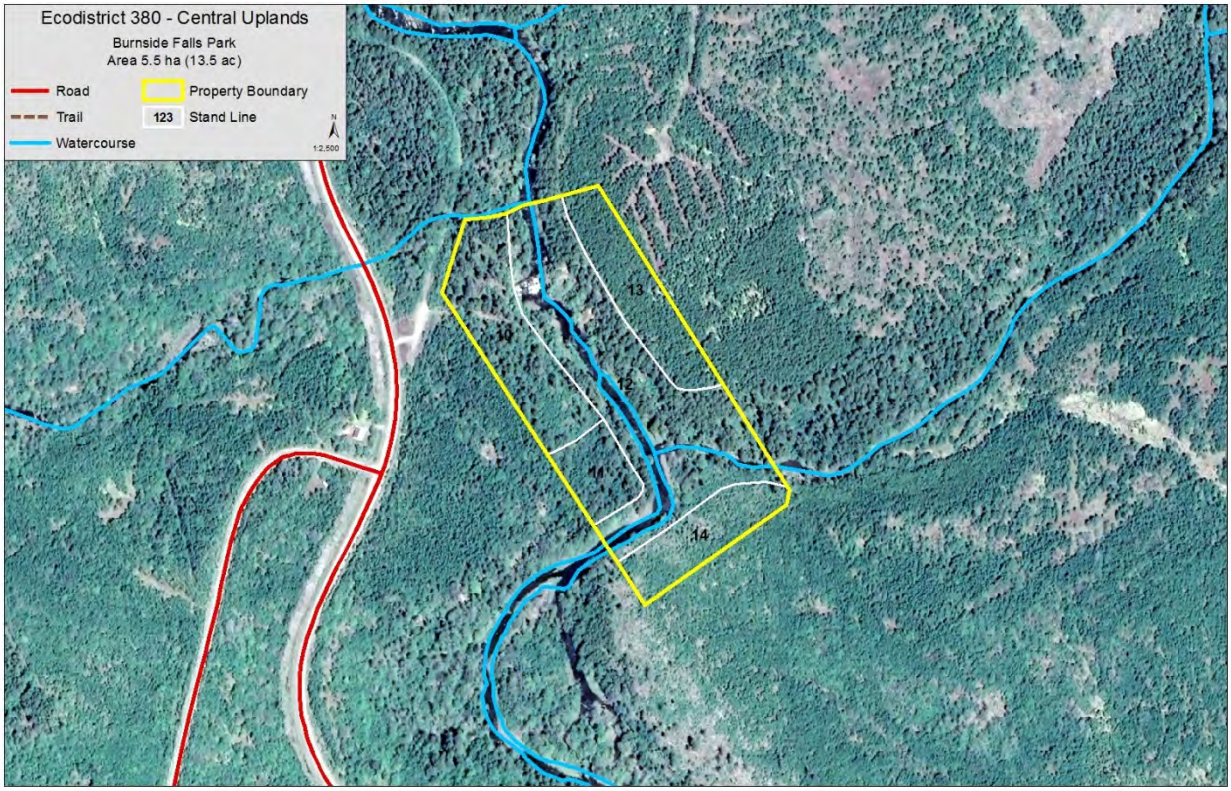
Recommendations

Stands 1,2,3,4 and 5 are all maturing mixedwood stands with good percentages of long lived tolerant species, such as red spruce, yellow birch, hemlock, red maple, and white ash; along with shorter lived balsam fir which is dying out in places. Fiona damage is light to moderate.

An irregular shelterwood (IS) harvest is recommended to be done, over the next five years, leaving the high quality, long lived trees and creating small openings to encourage the establishment and development of the long lived tolerant species.

Burnside Falls Park

PIDs: 20323598
Area: 5.5 ha (13.5 acres)



A mature red spruce forest (SH5) on the steep slopes of the Pembroke River **(Image 9)** represents the late successional forest associated with this ecosite condition. Soils are moderately deep well drained sandy loams with shallower soils and exposed sandstone and conglomerate bedrock on the steep slopes. Hurricane Juan and tropical storm Fiona have caused extensive windthrow and breakage in several locations **(Stands 10 and 12)** but a strong layer of red spruce regeneration is present. Early old growth red spruce (>100 years) **(Image 10)** is found along the north banks of a small tributary **(Stand 12)** where it joins the Pembroke River. Across from the confluence there is a remnant old growth red spruce with a dense understory of pole size red spruce – a good example of a response to a past wind disturbance.

Recommendations

Ecological Park and Recreation Management (EPRM) is recommended for the public used portions of **Stands 10 and 12**, maintaining safe trails, etc. and encouraging red spruce regeneration. Heavy Fiona damage in parts of **Stand 10** has been cleaned up and the red spruce regeneration there would benefit from a PCT treatment. **Stand 14** is a young balsam fir, red spruce and yellow birch stand, resulting from past wind disturbance. A PCT treatment would

benefit the red spruce regeneration, but due to extensive old blowdown on the ground, it would be very challenging to do. **Stand 13** would be a good candidate for a commercial thinning, but due to the high blowdown risk, EPRM is recommended (the adjacent stand on another ownership was thinned a few years ago but suffered severe wind damage and has been recently salvage clearcut).

Images for Central Uplands Ecodistrict 380

Image 1. Young balsam fir in **Stand 34**.

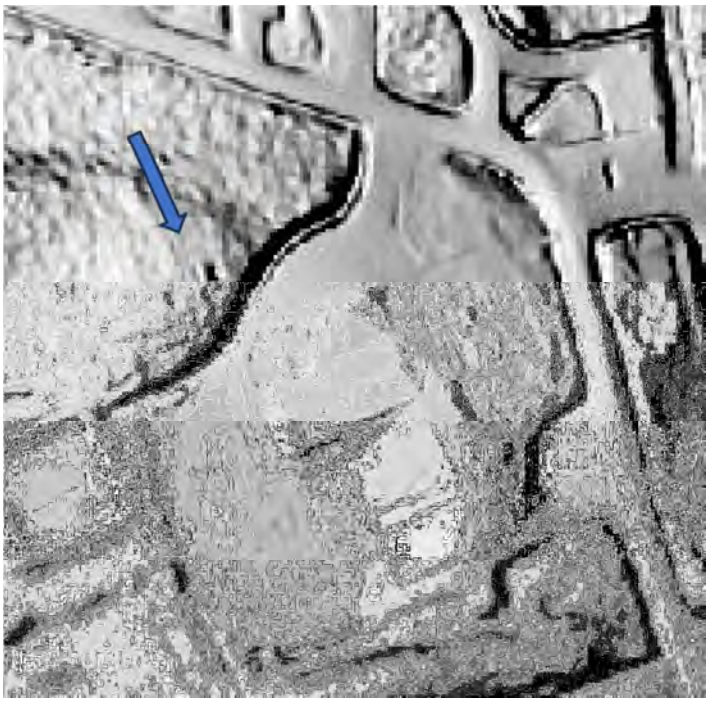


Image 2. Mingo foundation next to Kemptown recycling depot.

Image 3. Downed coarse woody material from hurricane Juan.

Image 4. Fiona windthrow at **Stand 22**, notice balsam fir snags from tussock moth mortality ca 1995. This stand was one of the few unharvested on this property ca 1995.

Image 5. Salmon River Floodplain **(Stand 43)** as seen from the old TCH highway.

Image 6. Old camp at Truro Road **(Stand 6)**.

Image 7. Mixedwood red spruce/red maple/yellow birch at Truro Road **(Stand 8)**.

Image 8. Tolerant hardwood forest at Truro Road **(Stand 7).**

Image 9. Pembroke River at the Burnside Falls Park.

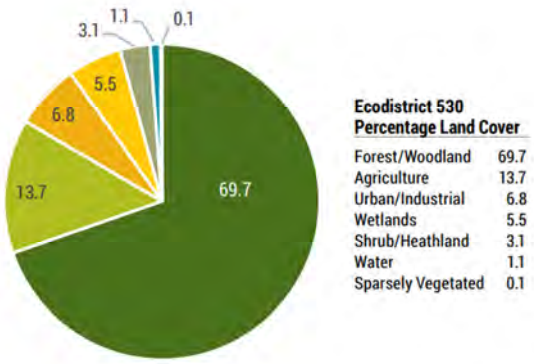
Image 10. Mature red spruce forest **(Stand 12)** along Pembroke River at the Burnside Falls Park.

3.4.3 Northumberland Lowlands Ecodistrict 530

Number of PIDs: 3
Total Area: 24.9 ha (61.6 acres)

Ecodistrict Summary

The Northumberland Lowlands Ecodistrict (530) is a broad linear landscape extending along the Northumberland Strait characterized by favourable agricultural soils, relatively mild climate, and gentle relief. Elevations on this low plain seldom exceed 50m above sea level. Freshwater in rivers and lakes occupies only 1.1% of the total area. However, beaches and coastal flats are important feeding areas for shorebirds, particularly during spring and fall migrations. The surficial till is derived from sedimentary rocks such as red sandstones, siltstones, and shales. Fresh-moist to moist, medium to poor soils support softwood forests of red spruce, hemlock, white pine, and black spruce. Following disturbance, either by natural causes or forest harvesting, sites are usually reforested by early successional species such as balsam fir, red maple, grey birch, and both large-tooth and trembling aspen. Abandoned farmland typically reforests to speckled alders and willows, followed by forests of white spruce, tamarack, and aspens.



Nelson Memorial Park and a landfill reclamation along the New Truro Road are the only properties located in the Northumberland Lowlands.

Nelson Memorial Park

PIDs: 200897521, 20477600
Area: 15.2 ha (37.5 acres)

The moist, fine textured soils over most of the park were formerly farmed. Sloping to the Waughs River estuary this site once supported a late successional forest of red spruce, hemlock, and white pine. Natural disturbances such as hurricanes and insects would have infrequently disturbed this upland forest creating opportunity for long-lived, uneven-aged old growth. Red oak may have been a minor component especially along the river. The occurrence of balsam poplar near the old farm site (monument) were most likely planted for shade by the early settlers. Currently the larger mature balsam poplar have been damaged by hurricane but there is abundant saplings (originating from roots of the older trees) nearby. Scattered apple trees and mountain ash provide forage for birds and deer. Mature red oak with regeneration of varying heights is abundant.

There is a small, young to immature softwood plantation (**Stand 3**) bordering the northern edge of the open field parkland. Norway spruce, red pine and white spruce were planted there about 20 to 25 years ago.

Recommendations

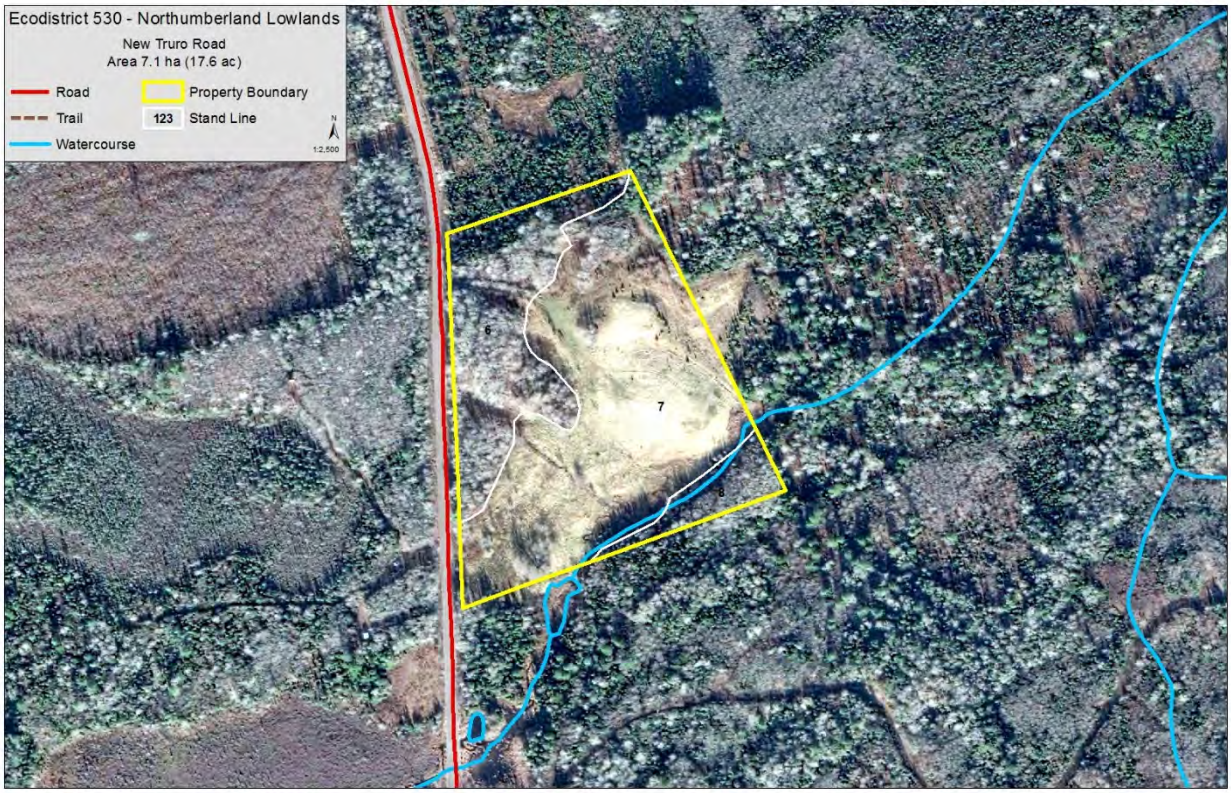
Stands 4 and 5 had severe wind damage during Fiona and some salvage/cleanup of blowdown has been done. The remaining large residual red oak (**Image 1**) should be relatively windfirm going forward, and should be left standing, providing vertical stand structure, seed and bird resting and perching sites. The abundant aspen regeneration, along with red oak, white pine, grey and white birch, white spruce, and balsam fir, should be allowed to grow and develop for another five years or so, and then have a PCT to control density, favouring any red oak, white pine, and white spruce, as well as any other long-lived shade tolerant species such as hemlock, red spruce, sugar maple, yellow birch. It would also be good to favour some of the balsam poplar around the old farm site as a reminder of past planting by the early settlers.

Walking trails are located through all parts of this lot, and future management and future management activities should maintain safe and useable conditions. Refer to the Ecological Park and Recreation Area Management section of this report.

Image 1. Red oak was one of few trees able to withstand tropical storm Fiona at Nelson Memorial Park.

New Truro Road

PID: 20089082
Area: 7.1 ha (17.6 acres)



With a gentle southerly aspect sloping towards a small stream the fine textured soils of this area would have supported a forest of white pine, red spruce, and black spruce. White spruce, balsam fir, and red maple would have been lesser components in late successional forests. Windstorms would have been the most damaging natural disturbance with fire possible. Evidence of an earlier farm (foundation) and pasture was noted along the New Truro Road. Mast producing species such as wild apple trees and mountain ash are present providing forage for many bird species. The former landfill has been revegetated to grass species along with a small, unsuccessful planting of non-native Manitoba maple (**Image 2**).

Recommendations

Subject to any on-going reclamation requirements **Stand 7** could be planted with native trees and/or shrubs species, such as white pine, serviceberry, etc. to improve wildlife habitat and carbon capture benefits. If left as is, this site is likely to seed in with shade intolerant species (aspen, grey and white birch) and shrubs during the next 20 years.

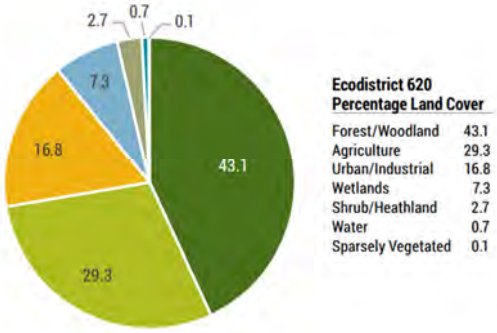
Image 2. Revegetating landfill site at New Truro Road. A few scattered Manitoba maple have survived from a previous revegetation project.

3.4.4 Minas Lowlands Ecodistrict 620

Number of PIDs: 72
Total Area: 1,180.5 ha (2,915.8 acres)

Ecodistrict Summary

The Minas Lowlands Ecodistrict (620) wraps around the coast of Cobequid Bay, from Tennecape on the Noel Shore to Lower Economy in Colchester County. It is a narrow ecodistrict encompassing level to gently rolling lowlands until it approaches the end of Cobequid Bay where it widens and extends inland following the valleys of several rivers including the Salmon, North, Chiganois, and Debert. Despite its proximity to the Bay of Fundy, the ecodistrict is somewhat sheltered from stronger oceanic climatic influences and although slightly cooler than the Annapolis Valley many similar crops such as corn and strawberries are productive and profitable. There are only a few lakes in the ecodistrict and most freshwater occurs in streams and rivers.

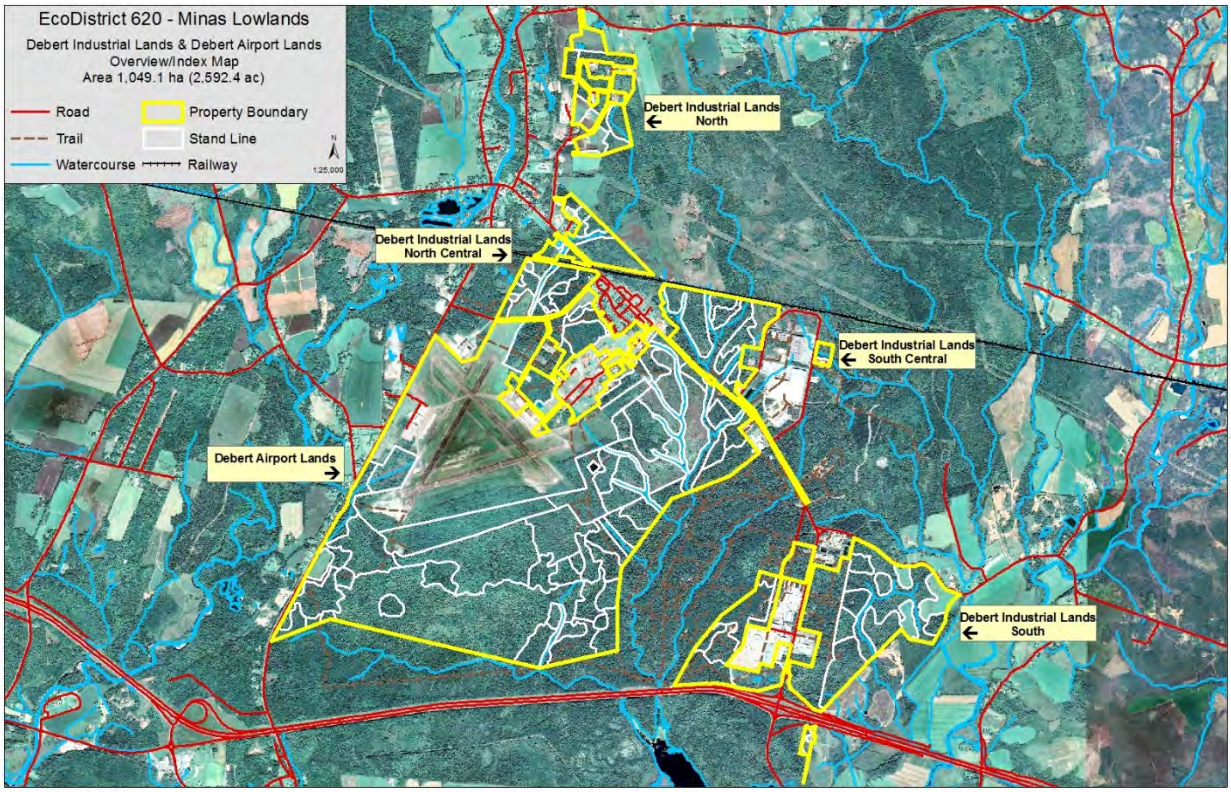


Triassic sandstones and red siltstones underlay the ecodistrict. Thick glacial fluvial deposits of sand and gravel occur along the rivers at the end of Cobequid Bay and these have been quarried extensively for aggregate. Extensive tidal flats occur on both sides of Cobequid Bay and inland along the rivers, created by the twice daily erosional and depositional actions of the tides of the Bay of Fundy. Construction of dykes has been used to claim farmland from the tidal salt marshes which surround the bay. Softwood forests dominate the landscape, with only a few well-drained hills with soils suitable for sugar maple, yellow birch, and beech. Red spruce, hemlock and white pine occur on well drained soils, especially along steep-sided slopes of streams and rivers. Most soils are imperfectly to poorly drained, supporting forests of black spruce and scattered with white pine. Near Debert, deep, dry, coarse sandy soils yield red pine and white pine. A few remnant floodplain forests of red maple, sugar maple, white ash and elm may be found on the heavily farmed alluvial soils along major rivers. Fire and hurricane have been the predominant natural disturbances with occasional stand-level mortality by spruce budworm and tussock moth. Windthrow and breakage caused by Hurricane Juan in 2003 was extensive in this ecodistrict, especially where soils were imperfectly and poorly drained. A warm and sheltered climate has enhanced agricultural opportunities on almost all soil types, and a

significant portion of the ecodistrict has been converted to farmland. Alluvial soils along major rivers have been used extensively for farming with the result that natural riparian floodplain forest of elm, white and black ash, and sugar maple are now rare.

The municipal properties of the Minas Lowlands ecodistrict have been subdivided into three groups, Cobequid Bay Lands, Debert Industrial Lands, and Debert Airport Lands. The majority of the land base in this ecodistrict is associated with the Debert Industrial Park. The remaining properties are typically greenspaces and small lots that are distributed throughout the ecodistrict with many near the communities of Valley, Salmon River, Lower Truro, and Old Barns.

The following Debert Overview/Index Map shows the four Industrial Lands groupings, as well as the Airport Lands:



Debert Industrial Lands

Number of PIDs: 22
Total Area: 315 ha (778.2 acres)

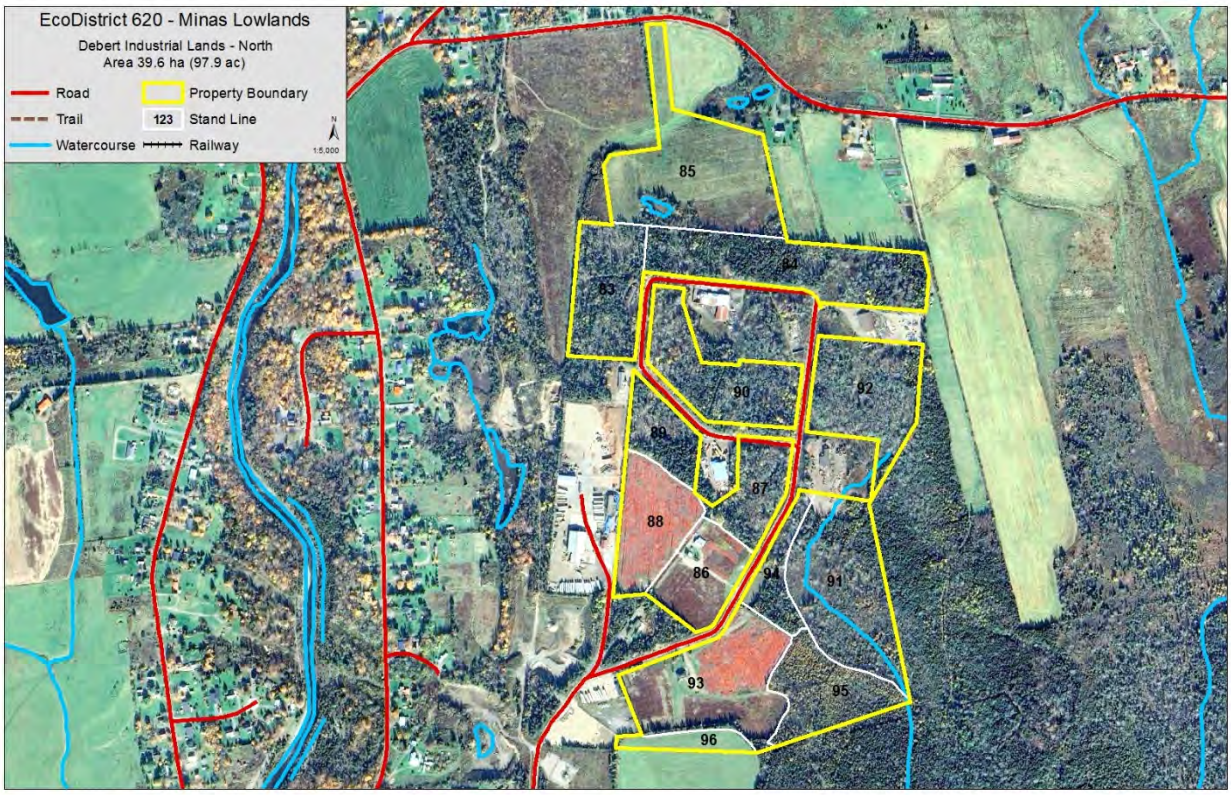
The area associated with the Debert Industrial Lands is primarily the developed Debert Industrial Park, home to several regional distributors, manufacturers, and supply companies. It also includes several municipal properties that are either sold, pending sale, or with development priority. Those properties that are undeveloped are typically forested although there are several agricultural parcels used for blueberries and forage production. A large part of the Debert Industrial Lands are identified in the Debert Special Places Act and require archaeological assessment for Paleo-Indian artifacts using procedures described in the Debert Standards.

Four maps are used to provide geographic location of the properties to facilitate descriptions and management recommendations – Debert Industrial Lands North, Debert Industrial Lands North Central, Debert Industrial Lands South Central, and Debert Industrial Lands South.

Much of this area is underlain by soils originating from deposits of sand which were partly or wholly stratified by glacial meltwater. These sandy glaciofluvial deposits are classified as the Truro soils series and cover 2.4% of the county, primarily in the Minas Lowlands ecodistrict. The soils have high acidity and low fertility and where well drained support a late successional forest of white pine and black spruce. When drainage is restricted, wetland forests are dominated by red maple, black spruce, balsam fir, and tamarack. Truro soils underlie most of the area along McElmond Road to Dakota Road including Camp Debert and Lancaster Crescent. When forests are severely disturbed such as by fire pure stands of red pine and jack pine represent an early successional stage of forest development. However, failing another fire, these pine forests will slowly succeed to black spruce and white pine. Elsewhere in this group the soils are derived from glacial tills and tend to be less sandy. On these slightly more fertile soils late successional forests of red spruce and white pine are typical.

Debert Industrial Lands North

Area: 39.6 ha (97.9 acres)



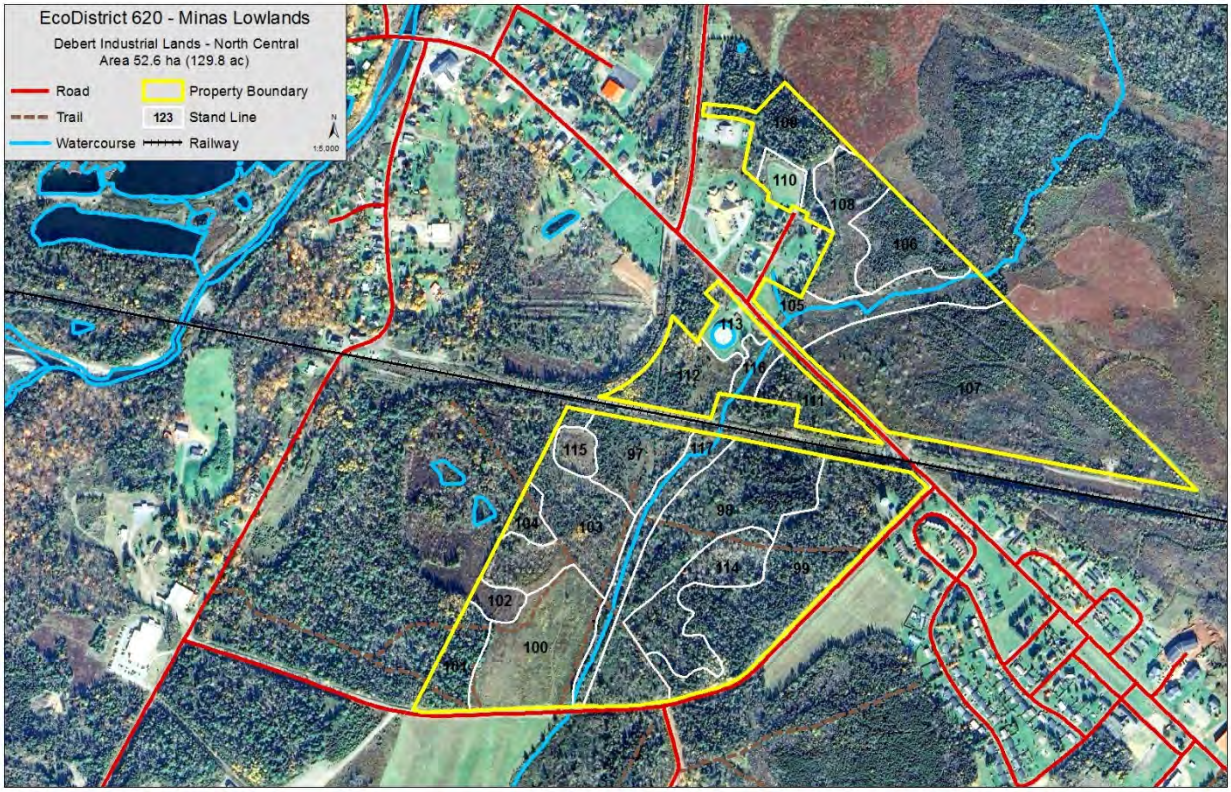
The lands located along Dakota Drive include a land-use mix of light industrial, mature forests, agricultural fields, and wetlands. Infrastructure from the former military base includes old foundations and buildings. The well drained soils here support a red spruce, balsam fir forest with scattered white pine **(Image 1)**. Moist soils tend to have more red maple and balsam fir but still with a component of red spruce. Much of this forest has been severely impacted by Fiona. **Stand 85**, mostly an old field white spruce forest, has extensive windthrow **(Image 2)**. Two significant wetlands **(Stands 91 and 92)** have a well developed Red maple / Cinnamon fern / Sphagnum (WD2) ecosystem. These wetlands drain to the Debert River. As wetlands they are an important biodiversity feature with many bird species, including several species at risk, using this forest ecosystem as breeding habitat. Black ash, a species at risk and protected in Nova Scotia, was found in both wetlands.

Recommendations

Stands 83, 84, 87, 89, 90 and 94 all have severe wind damage from Fiona and are recommended to have a salvage harvest soon, followed by planting of red spruce, if these areas will remain undeveloped for many years; otherwise, the cut areas should be left to regenerate naturally.

Debert Industrial Lands North Central

Area: 52.6 ha (129.8 acres)



Most of this area has been significantly disturbed at one time either during the operation of the former military base/airport or as farmland. Forest has returned to most of the land. The lands north of the rail line **(Stand 107)** have been previously harvested and support a poorly stocked young forest of black spruce, white pine, and tamarack **(Image 3)**. On the south side of the rail line the old field forests of white spruce, aspen, and tamarack and scattered wild apples have had moderate windthrow from Fiona. The best old field soils are in **Stands 98 and 99** and are well drained. Elsewhere **(Stands 97, 100 to 104 and 112)** the old field soils become gravelly (glacial fluvial origin). The small stream dissecting this block has been modified, probably during construction of the airfield, and eventually enters an artificial drain system under the airport en route to the Debert River.

Recommendations

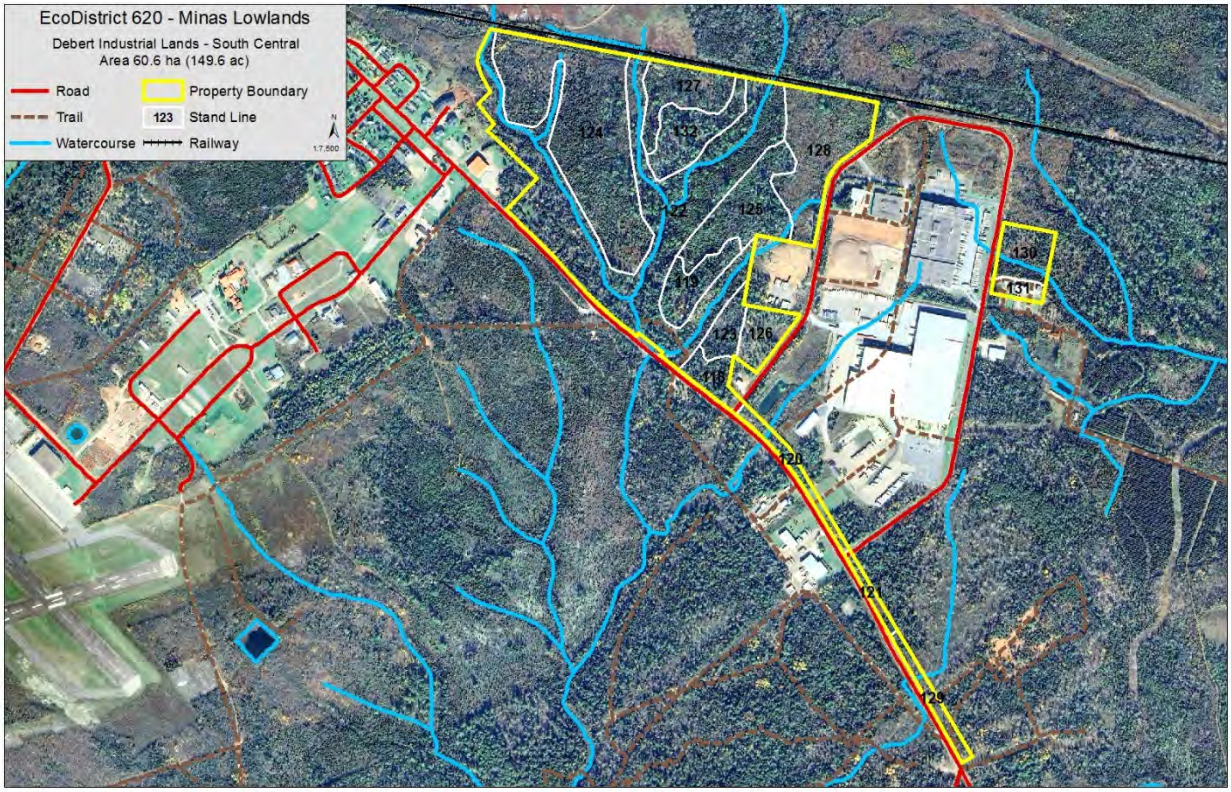
Stands 99 and 109 should have a salvage harvest as soon as possible, followed by planting of red spruce.

Stand 100 could be planted with native trees and/or shrubs to complement the existing, but patchy, white birch and aspen regeneration.

Parts of **Stand 107** would benefit from a PCT treatment, favouring LIT species.

Debert Industrial Lands South Central

Area: 60.6 ha (149.6 acres)



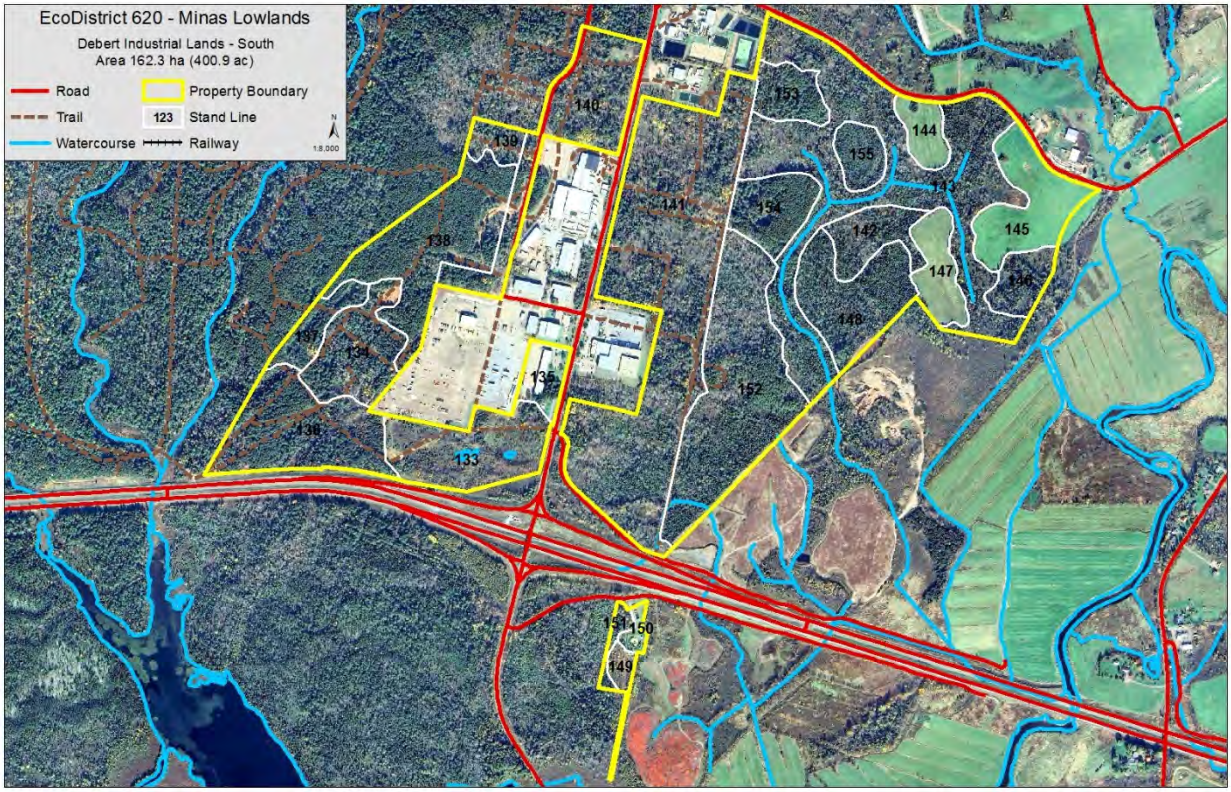
This block of properties is extensively dissected by many small streams, tributaries of Galloping Brook. On the undeveloped portion **(Stands 122, 124, 127 and 132)** a large part of the area had been harvested about 20-25 years ago and has regenerated to balsam fir, white pine, red spruce, red maple, and white birch. Unharvested patches and riparian zones along the streams have been significantly windthrown by Fiona and in the lower part of Stand 124, unharvested areas of balsam fir were windthrown during Hurricane Juan. Of note are the very large white pine that were left following the harvest **(Image 4)**; these trees are exceptional in terms of diameter, height, and straightness of bole. These stands have some of the better soils for forest growth in the Debert area. From a landscape perspective, Galloping Brook is a natural major corridor for biodiversity connecting lands to the north of the railway to McElmond's Pond in the south. The Chiganois River riparian zone to the east has been converted to agricultural land uses and may not provide the corridor values of the past.

Recommendations

Stands 124 and 127 could benefit from a PCT treatment if done soon, as trees are now at the upper height limit; LIT species should be favoured.

Debert Industrial Lands South

Area: 162.3 ha (400.9 acres)



The former Debert Military Camp was decommissioned in the 1950's and much of the severely disturbed area naturally regenerated to pure forests of red pine (Image 5). Elsewhere, red pine mixed with black spruce, white pine, jack pine, and large-tooth aspen. Some areas remained sparsely forested and covered with low woody shrubs such as broom crowberry, blueberry, and lambkill. Scattered throughout the site older red pine that were the seed trees are now approaching 125 years. This area is primarily associated with the woodlands surrounding Ritchie Brothers Auctions, Kohler Windows, and Tim Hortons Depot.

Throughout these stands are reminders of the military base and training grounds. Building foundations are overgrown, e.g., **Stand 134** (Images 6 and 7), and old trenches and 'foxholes' have melded into the forest floor microtopography. All-terrain vehicle trails, and motocross trails are abundant through much of this area, e.g., **Stand 138**, with some following old roads but much has been apparently added without permission or structured planning.

Biodiversity features in this area are minimal. The most notable is the uncommon open woodland ecosystem – Red pine - White pine / Broom crowberry / Grey reindeer lichen (OW2) which is globally limited to Nova Scotia. Several species of high conservation concern may

occur in this ecosystem which was noted in a few areas, but its presence is strongly related to site disturbance from 1940-1950.

A complex wetland/riparian ecosystem **(Stand 143)** winds its way around well drained sandy knolls, some of which have been cleared for agriculture, in the northeastern portion of this block. The stream is a tributary of the Chiganois River. The forest is dominated by red maple with balsam fir and tamarack. Black ash, a species at risk and protected in Nova Scotia, was noted at several locations in the wetlands.

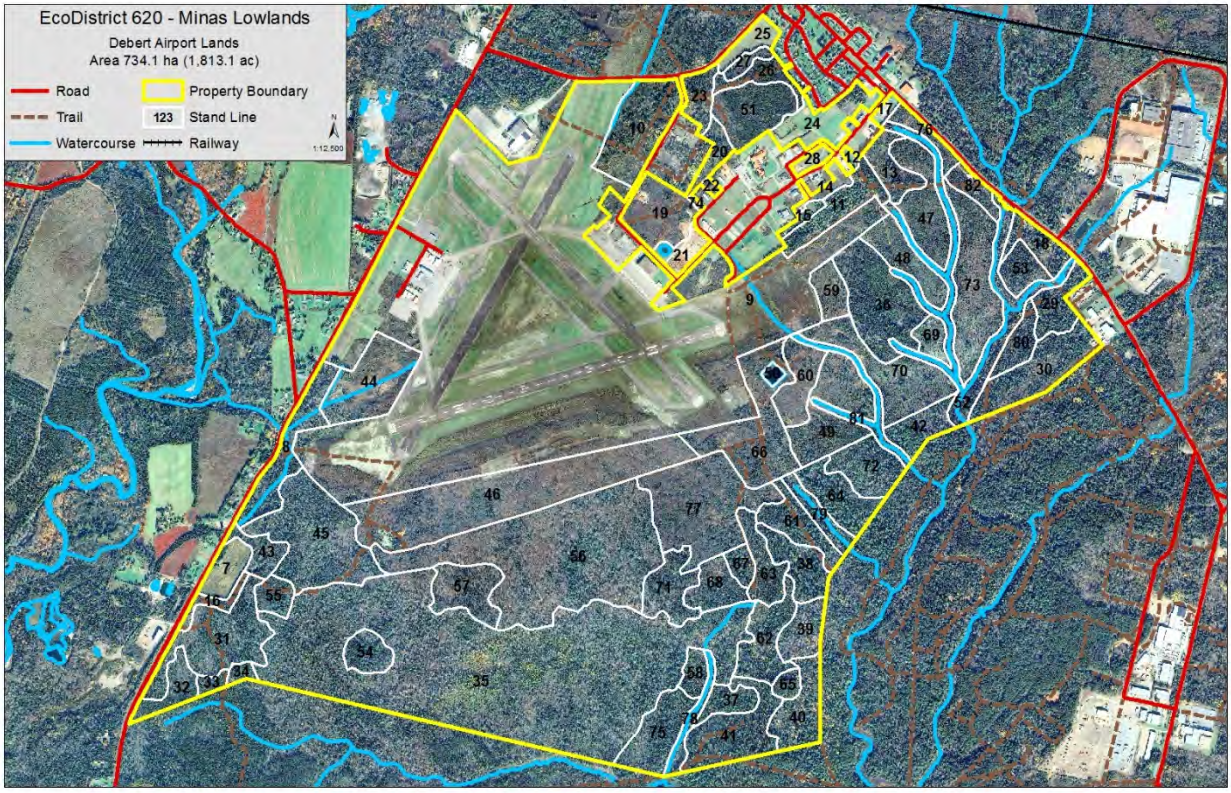
Recommendations

Stand 146 should have a salvage harvest, followed by planting of white spruce and/or red spruce.

Debert Airport Lands

PIDS: 9

Area: 734.1 ha (1,813.1 acres)



Including the four mapped areas of the Debert Industrial Lands this block of lands is the most diverse in terms of forest ecosystems, soils, and land use and has many ecological values both locally and at the broader landscape scale.

Most of the land used for the Debert airport originates from glacial till deposits and are less sandy than those of the business park. Known as the Woodville soil series they also occur primarily in the Minas Lowlands and occupy 4.2% of the county. Late successional forests tend to be red spruce with white pine, white spruce, and black spruce; hemlock is uncommon. The longevity of red spruce creates opportunity for old growth forests as severe stand level natural disturbances such as fire and hurricane are infrequent. Where soils are slightly richer and better drained shade tolerant hardwood such as yellow birch, red maple and sugar maple can occur. Another significant portion of this group is underlain by gravelly loamy sand to gravelly loam glaciofluvial soils, especially along the Debert River and notably along the Masstown Road. The subsoil material contains an abundance of rounded gravels originating from the Cobequid Uplands and moved by glacial meltwaters to the lowlands. These soils are known as the Hebert soil series and are found throughout the county (2.5%) along most rivers and large streams. Forests on these soils tend to be a mix of red spruce, black spruce, and white pine.

A low ridge, 300 m to the south of the Debert airport rises from the generally level terrain and forms the height of land between the Debert and Chiganois Rivers. Forests on this ridge **(Stands 46, 56, 57 and 77)** tend to be dominated by yellow birch and red maple with some sugar maple. Soils here are loamy and slightly richer. Where the forest has been cleared to facilitate site lines at the airport the revegetation is strongly dominated by aspen, grey birch, and red maple. In a softwood dominated landscape this hardwood provides biodiversity values for a variety of wildlife, most notably bird species that prefer leafy trees for habitat. Deer will also find forage value in this forest.

Further south of the hardwood ridge an extensive wetland **(Stand 35)** provides the headwaters for several streams flowing towards McElmonds Pond. Totalling over 200 acres (80 ha) this large, forested wetland is underlain by wet sands and deep organic soils. The sparse to moderately stocked forest is dominated by red maple, balsam fir, black spruce, and tamarack with scattered white pine, aspen, and black ash, a species at risk. In the middle of this wetland is a 10 acre well stocked forest **(Stand 54)** of red spruce and balsam fir on better drained soils. This stand is currently being used as a deer wintering area with an extensive network of trails leading to and from this important cover. The surrounding wetland forest has had significant windthrow damage caused by hurricanes Juan and Dorian which has resulted in extensive sprouting of red maple. These are currently being heavily browsed by the deer.

Another rise occurs east of the runways on the former CFB Debert base. However, no streams of significance occur to drain water from this area to either the Debert or Chiganois Rivers, most likely due to the porous nature of the gravelly, sandy, subsoil. Close to the residential areas **Stands 26 and 51** include a mix of young balsam fir, red spruce, and white pine with a remnant overstory of older individuals including red maple. This forest has potential to provide refuge habitat in a busy industrial landscape.

The spruce-pine forest on the eastern portion of this block was harvested ca 2000 and has since been re-planted and pre-commercially thinned. Much of the planted area also includes naturally regenerated black spruce and white pine. **Stand 69** and the southern portion of **Stand 73** are poorer site conditions and forest stocking is low with much of the area in heavy cover of ericaceous shrubs (lambkill, blueberry, sweet fern) and reindeer moss (Image 10,11). **Stand 36** is a well stocked black spruce forest and is likely important habitat in this landscape of younger forests. A well used deer blind and a cleared shooting lane was noted here as well as ATV trails connecting to the former Debert base. Several streams dissect this area all leading to Galloping Brook and eventually the Chiganois River and together may provide a significant connectivity feature in this landscape (Image 12).

The lower southeast corner of the block has some of the poorest lands supporting forests with black spruce, red, jack, and white pine, red maple, white birch, and large-tooth aspen **(Stands 39 to 41 and 62)**. Windthrow has been moderate to severe. This forest reflects the typical forest that would occur on these types of soils under natural disturbances such as fire and windthrow compared to pure red pine forests on the Debert Industrial Lands South.

A little north of the poor soils the influence of site increases the fertility slightly increasing the component of red spruce **(Stands 61,63,64,67,68 and 71).** Earlier successional forests on these sites have red maple, white birch, and large-tooth aspen **(Stands 38 and 72)** and have significant windthrow from Fiona. Another deer blind and shooting lane was also found here. (Image 9).

Yellow birch, red maple forest (Stand 56).

Recommendations

Several stands, mainly in the southern portion should have a salvage harvest **(Stands 16, 31, 32, 34, 37, 39, 40, 43, 45, 50, 62, 64 and 75)** followed by planting of red spruce, white spruce or white pine, depending on site conditions. Alternatively, where white pine is present in the overstory, they can be left as sod trees to promote good natural white pine regeneration.

Stand 7 is an old field which could be planted with native trees and/or shrubs.

Stands 56 and 57 are immature tolerant hardwood stands, with yellow birch and red maple predominating. These stands could have a commercial thinning treatment to favour the better formed yellow birch and create good conditions for yellow birch regeneration.

Stands 61 and 68 could benefit from an Irregular Shelterwood (IS) treatment.

Stand 67 could have a PCT treatment if done as soon as possible, due to tree height.

Cobequid Bay Lands

PIDs: 39

Area: 116.1 ha (286.9 acres)

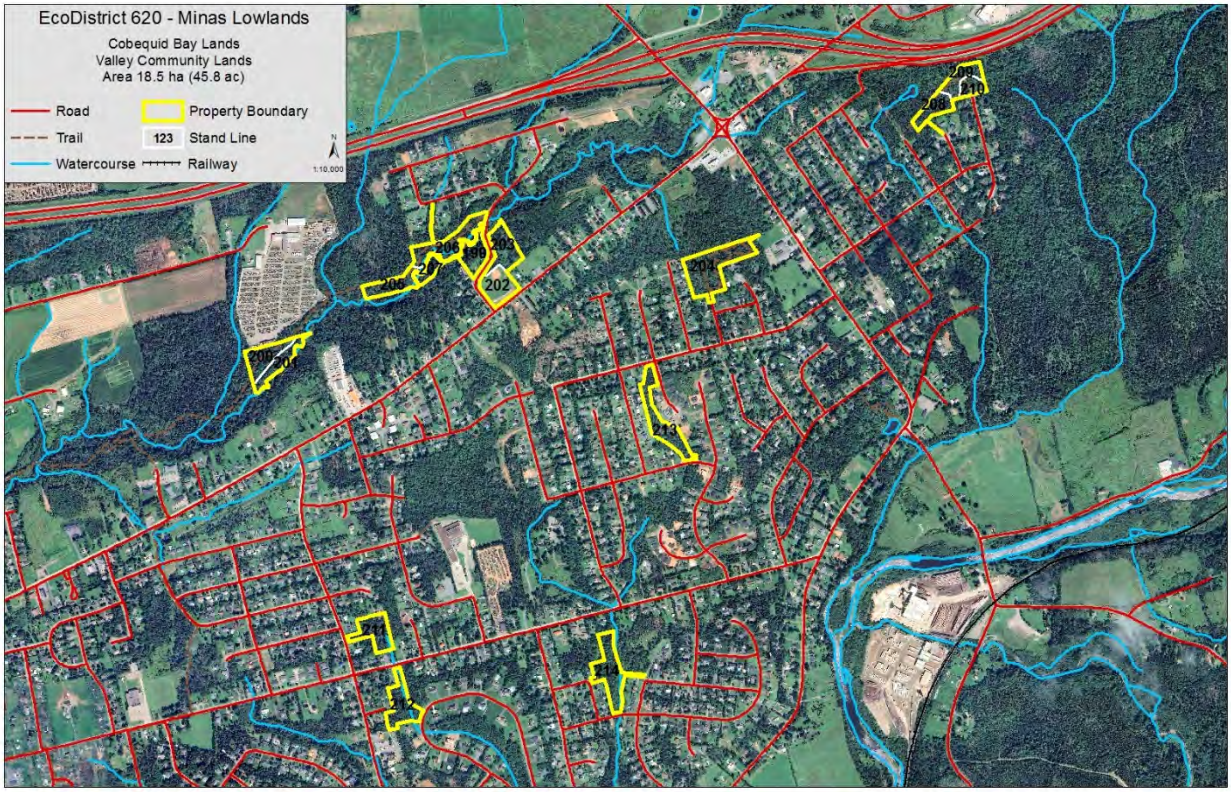
Properties in this group represent a wide range of forest ecosystems including upland and wetland forests. Many of the properties are associated with streams and brooks and include significant and varied riparian ecosystems. Past land use has also influenced the woodlands on many of the properties including aggregate mining, subdivision development, farmland, abandoned railroad, and commercial infrastructure. Due the varied nature of the forest ecosystems, soils, and ecology the properties of this group have been further divided into five groupings of community lands to facilitate description and discussion (Valley Community Lands, Salmon River Community Lands, Bible Hill/Brookside/North River Community Lands, Hilden/Lower Truro/Old Barns Community Lands, and Belmont/Debert/Onslow Community Lands). Another three properties have individual descriptions due to their location and/or size.

Generally, these properties are small and independent from any nearby forests. Many have a linear context associated with streams or rivers. Others are well developed recreational areas with trails and playgrounds. Overall, the forested properties, due to their isolation from larger forested areas are important locally for biodiversity reasons.

North River forest and wetlands (Stand 162, Bible Hill/Brookside/North River Community Lands).

Valley Community Lands

Area 18.5 ha



Location	PIDs	Area (ha)	Land Designation	Features	Forest Ecosystem(s)
Phoebe Lane Parkland	20230173 Stands 208-210	2.1	Greenspace	Peeper's Path Ice Skating Pond	Black spruce wet forest Red spruce/balsam fir
Valley Nature Trail	20032025 Stand 204	2.4	Greenspace	Trail	Red spruce/balsam fir/white pine
Teviot St. Tower Dr., Valley	20317467 Stand 213	1.6	Greenspace	Riparian	Riparian slope forest of red spruce and fir
Pictou Road, Ballfield	20030532 Stand 202	2.4	Recreation	Ballfield	Minor component of significantly disturbed forest
Cobequid Trail, Farnham Brook	20454872 20317988 20428082 Stand 200, 201 205-207	6.0	Greenspace	Farnham Trail	Riparian shrubland Riparian forest of white spruce, fir, red maple, elm, alders Riparian slope forest of red spruce/hemlock

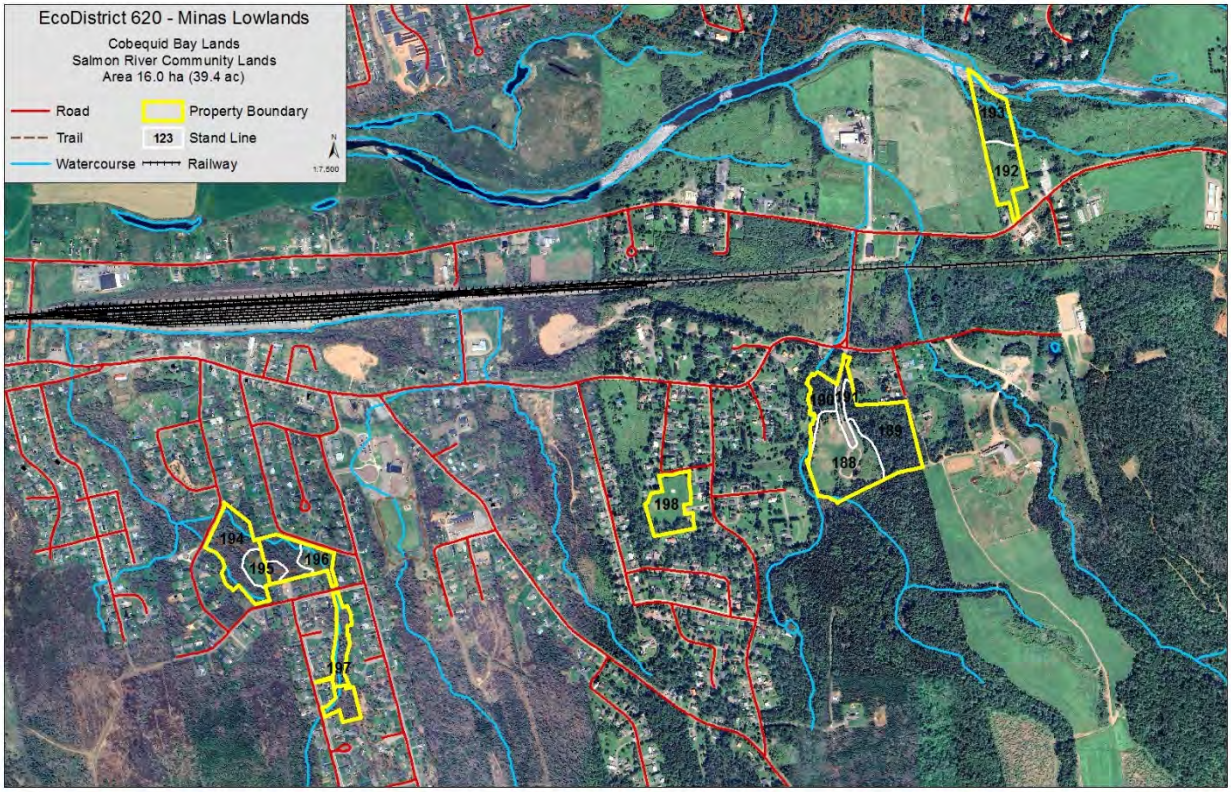
Vernon Street, Valley	20432530 Stand 199, 203	1.7	Greenspace	Riparian	Riparian shrubland and wetlands
Lexington Drive, Valley	20431912 Stand 212	1.2	Greenspace	Riparian	Riparian shrubland and wetlands
Village Line Ave., Valley	20317715 Stand 211	1.1	Greenspace	Riparian	Riparian shrubland and wetlands

Recommendations

Several properties have well developed trails (Valley Nature, Peeper's Path, Cobequid Trail and Farnham Brook Trail) through natural forest conditions. Present management activities have maintained this natural setting providing a safe experience for trail users. Preserving features such as snags, downed coarse woody material, vertical stand structure, and careful trail location around wet site features such as seeps, swales, and ephemeral flowage helps reduce our impact on biodiversity while providing a recreational opportunity. Refer to the Ecological Park and Recreation Management section for more information on best management practices.

Salmon River Community Lands

Area 16.0 ha



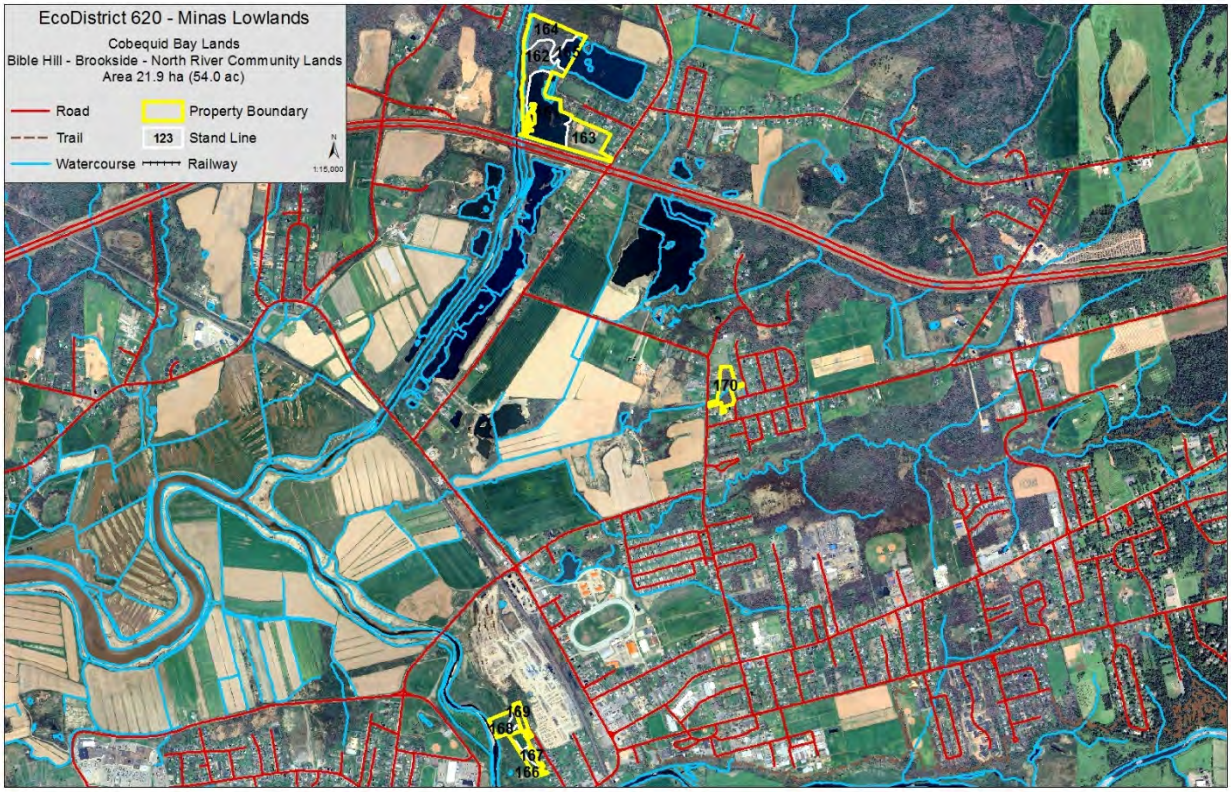
Location	PIDs	Area (ha)	Land Designation	Features	Forest Ecosystem(s)
Salmon River Road (Montgomery Field)	20035507 Stands 192, 193	2.5	Greenspace	Agriculture	Riparian shrubland
Former Salmon River School	20037073 Stands 188-191	6.7	Development	Hiking trails Parkland	Old field white spruce/aspen forest
Nancy Avenue Park	20038550 Stand 198	1.5	Recreation	Playground	
Birch Street Park, Salmon River	20320776 20039970 20041042 Stands 194-197	5.3	Recreation	Playground Trails	Riparian shrubland Riparian slope forest of red and white spruce

Recommendations

Trails are associated with developed recreational playgrounds and facilities and may or may not include forested conditions. Nonetheless, where these trails have traversed through woodlands, natural conditions have been maintained. Informal trails have also been noted on the former Salmon River School site taking advantage of old access roads and trails. Refer to the Ecological Park and Recreation Management section for more information on best management practices.

Bible Hill/Brookside/North River Community Lands

Area 21.9 ha



Location	PIDs	Area (ha)	Land Designation	Features	Forest Ecosystem(s)
Vimy Rd. to Corey Dr., Brookside	20318358 Stand 170	1.5	Greenspace		Riparian forest Wetland (shrubs)
Avon Street, Bible Hill	20058780 20458220 20058913 Stands 167-170	4.0	Greenspace	Sewer	Riparian shrubland Marshland Wetland
North River Ballfield	20421186 Stands 161-165	16.4	Recreation	Ballfield ATV Trails Ponds Aggregate mining	Early successional forest of red maple, aspen, balsam fir, white spruce, serviceberry Riparian forest Wetlands

Avon Street

This property encompasses lands that would have once been at the interface of the extent of tidal saltwater from Cobequid Bay and the freshwater of the Salmon River prior to the construction of the dykes. Aside from the volunteer management of some of the property (lawn extensions) wildlife are extensively using the shrublands and wetlands.

North River Ballfield

Along the North River an ATV trail has been established on the gravelly berm associated with past aggregate mining and traverses the entire property **(Stands 214 and 216)**. Entry points for the trail were not determined. However, this is a very scenic trail along the river further enhanced when combined with the ponds and wetlands associated with the aggregate mining. The forest is a young, messy mixture of red maple, white spruce, white birch, grey birch, trembling aspen, tamarack, alders, willows, and serviceberries. Biodiversity value is high for this area as it provides breeding habitat for a variety of bird species including waterfowl. Beaver, muskrat, and most likely otter use the area due to its adjacency to the North River.

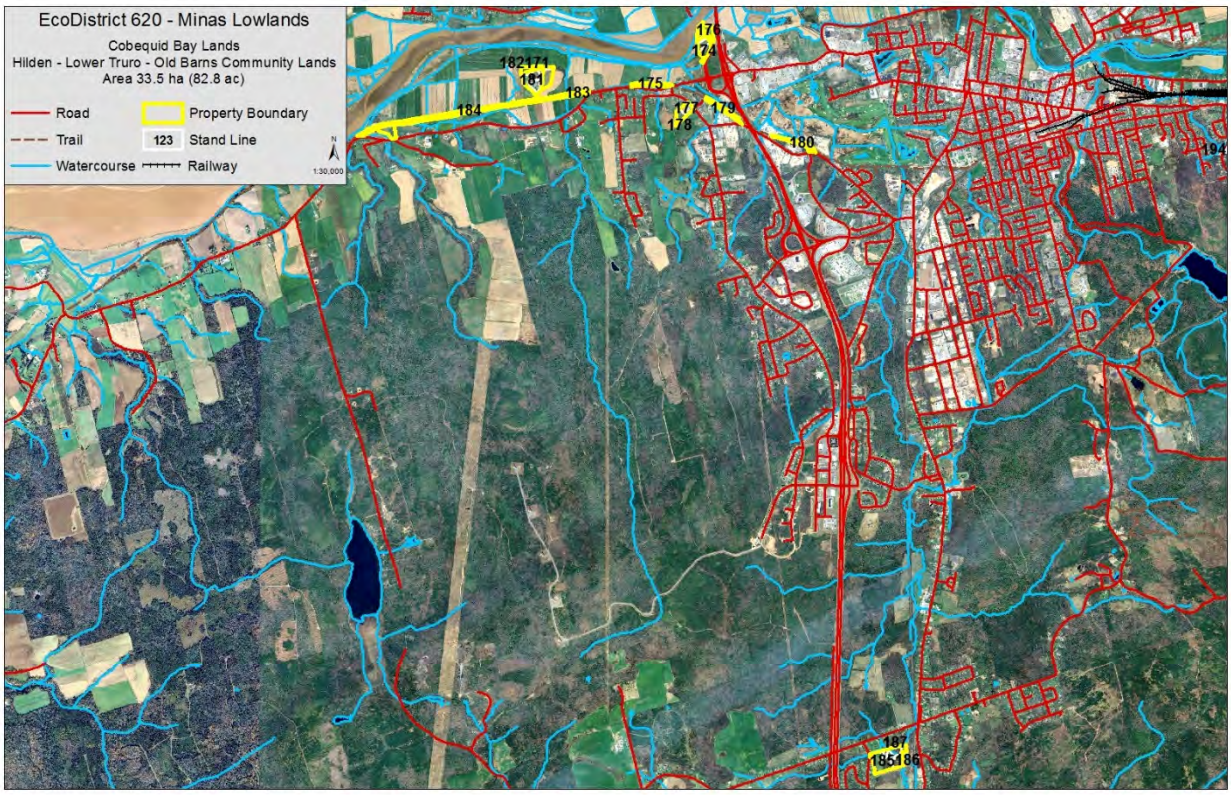
Recommendations

Maintaining biodiversity values on these properties in the absence of any further recreational development should be considered. Refer to the Ecological Park and Recreation Management section for more information on best management practices.

Beaver activity viewed from the ATV trail near the North River ponds (**Stand 162**, Bible Hill/Brookside/North River Community Lands).

Hilden/Lower Truro/Old Barns Community Lands

Area 33.5 ha



Location	PIDs	Area (ha)	Land Designation	Features	Forest Ecosystem(s)
Hilden Park, Wm. Russel Road	20208203 Stands 185, 186 and 187	6.8	Recreation	Ballfield Playground Parkland Old Field	Riparian shrubland
Cobequid Trail Stands 175, 179,180,183 and 184	20327714 20449708 20327748 20327722 20327755 20327714	17.6	Recreation	Trail	No woodlands
Colchester Wastewater Treatment Plant	20314175 Stands 171, 181 and 182	3.9	Industrial	Field	Forest windbreak (40 m width)
Municipal	20431920	2.0	Industrial	Buildings	No woodlands

Public Works Depot	Stands 177, 178			Field	
Fundy Discovery Site	20210357 20210332 20210340 Stands 174, 176	3.2	Recreation	Playground Parkland Trails Buildings	No woodlands

Hilden Park, Wm. Russel Road

Alder shrubland and meadows provide important habitat for many bird species including woodcock. Much of this area is imperfectly to poorly drained and historically has had some use for forage production and pasture. Wild apple trees are scattered throughout. Eventually it is expected that red maple, tamarack, and white spruce will reforest the better drained soils.

Cobequid Trail

Along Cobequid Bay the Cobequid Trail utilizes the abandoned railroad base. This right-of-way provides a narrow setting for any forest growth, but trees have established at a few locations. White spruce and aspen have tolerance for salt spray which can be significant along these trails. Additionally, the strong winds can be hard on tree structure causing breakage and uprooting.

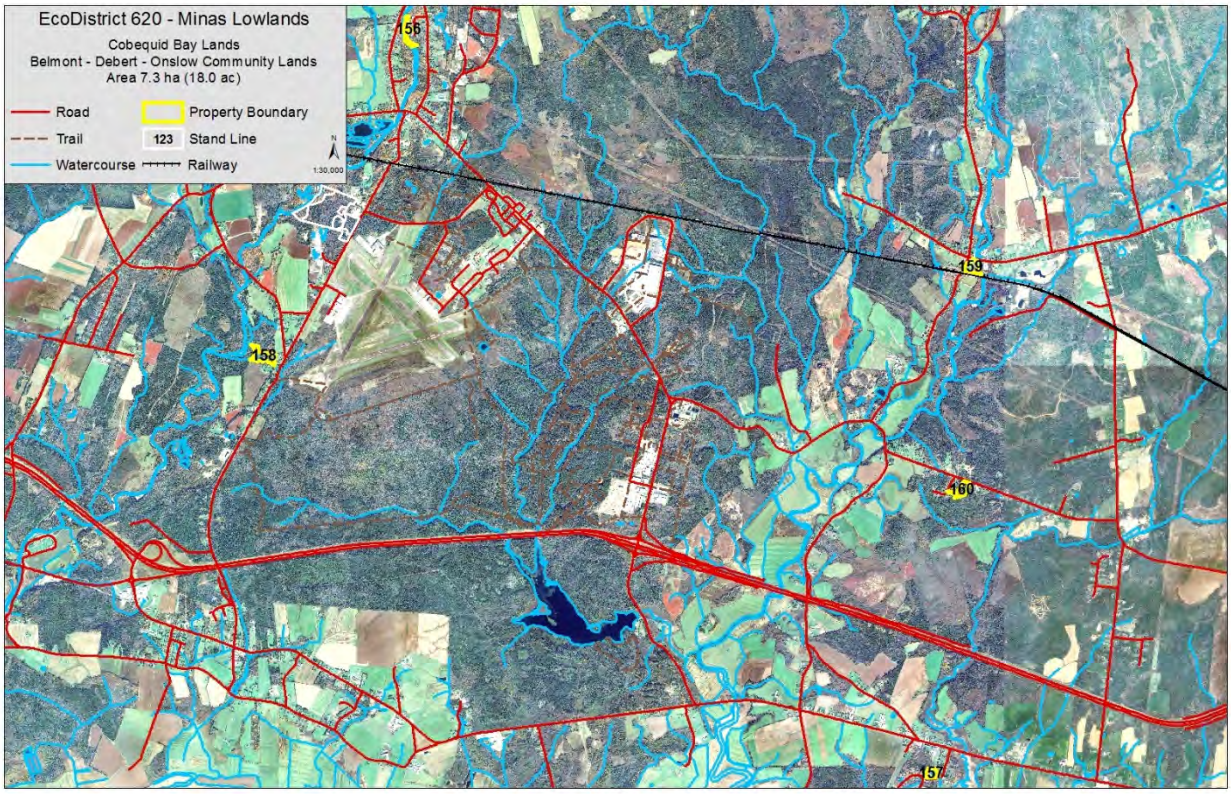
Recommendations

The Cobequid Trail management practices should favour native species adapted to salt water spray and wind exposure. The presence of toxic flora is a public concern and continued identification, and signage should be maintained. At the Fundy Discovery Site the red oak along the bank should be protected and encouraged. Avoiding the use of non-native plants when landscaping is suggested. Refer to the Ecological Park and Recreation Management section for more information on best management practices.

Cobequid Trail in Lower Truro

Belmont/Debert/Onslow Community Lands

Area 7.3 ha



Location	PIDs	Area (ha)	Land Designation	Features	Forest Ecosystem(s)
Oakland Drive Park,	20276374 Stand	1.0	Recreation	Playground Parkland	No woodlands

Lower Onslow	157			Trails Pond	
Pine Tree Dr., Crowes Mills	20331831 Stand 160	1.4	Greenspace		Black spruce wetland
Belmont Ballfield	20321766 Stand 159	1.5	Recreation	Ballfield Parkland	Riparian, Chiganois River
Charlotte Court, Debert	20152732 Stand 156	1.0	Greenspace		Riparian forest of hemlock, yellow birch, sugar maple, Debert River
Debert Sewage Treatment #2	20241014 Stand 158	2.3	Industrial		Old floodplain channel Riparian forest

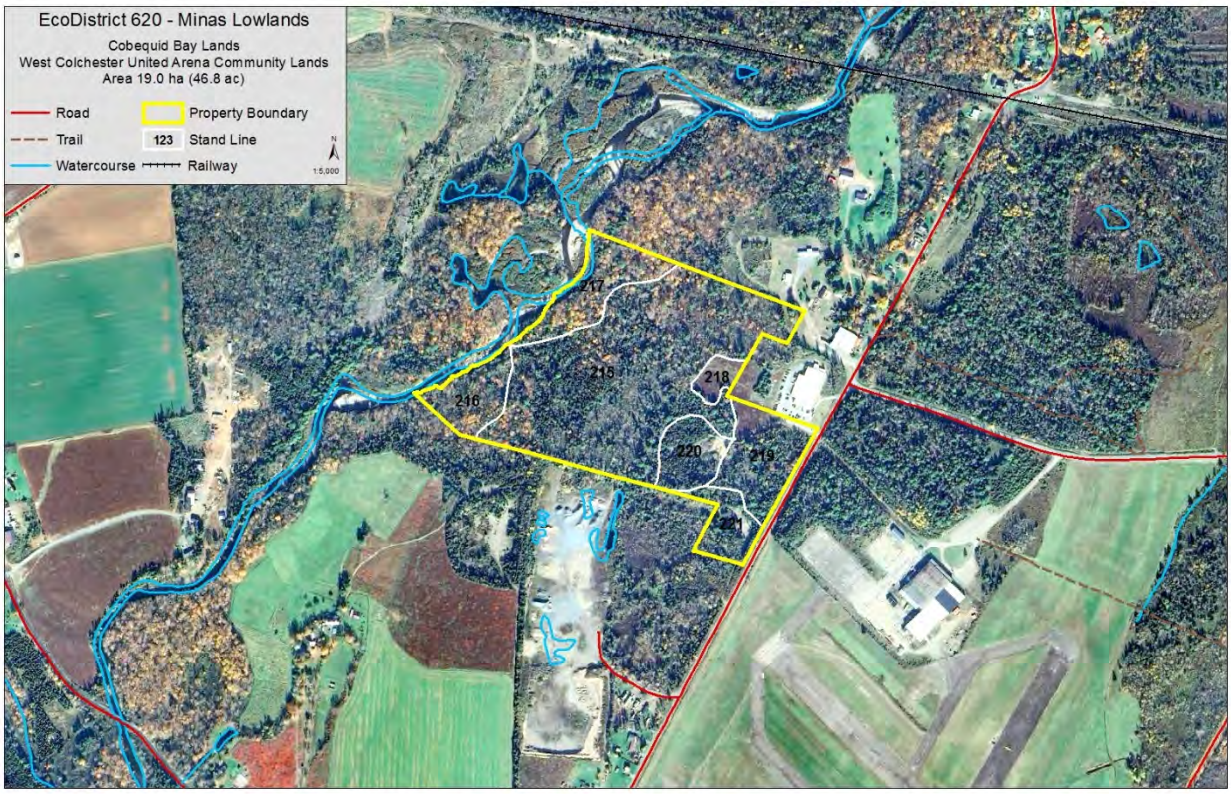
Charlotte Court **(Stand 156)** is a very narrow late successional forest along the Debert River floodplain. Along most rivers these forests are relatively rare due to the soils being desired for agriculture. This forest is on gravelly soils and as such may have been ignored but as a biodiversity feature it has value. There is currently some encroachment on the property with clean up efforts of Fiona windthrow. Further downstream a much larger and similar forest occurs on the lands associated with the West Colchester United Arena. **The riparian and old channel forest associated with Stand 158 was not visited but should be recognized as a potential biodiversity hot spot for floodplain flora and habitat.**

Recommendations

Maintaining the integrity of the Charlotte Court forest should be a priority by maintaining and encouraging long-lived species such as sugar maple, yellow birch, and hemlock. For activities elsewhere refer to the Ecological Park and Recreation Management section for more information on best management practices.

West Colchester United Arena Community Lands

PIDs 20114567, 20114534
Area 19.0 ha



These Community Lands include stands 216 to 221. The largest part of this multi-stand woodland **(Stand 215)** had been extensively damaged by past wind events which was further exacerbated by Fiona. The soils here support vegetation types typical of the Wabanaki-Acadian Forest and late successional forests would include red spruce, white pine and yellow birch. Along the Debert River is an exceptional example of a mature shade tolerant hardwood forest **(Stands 216 and 217)** of yellow birch, sugar maple, and ironwood (Image 8) on the old floodplain. These types of forests are rare along the rivers flowing to Cobequid Bay as much of the original forest was cleared for agriculture. This stand has high biodiversity value as the habitat it provides for certain species of birds and mammals.

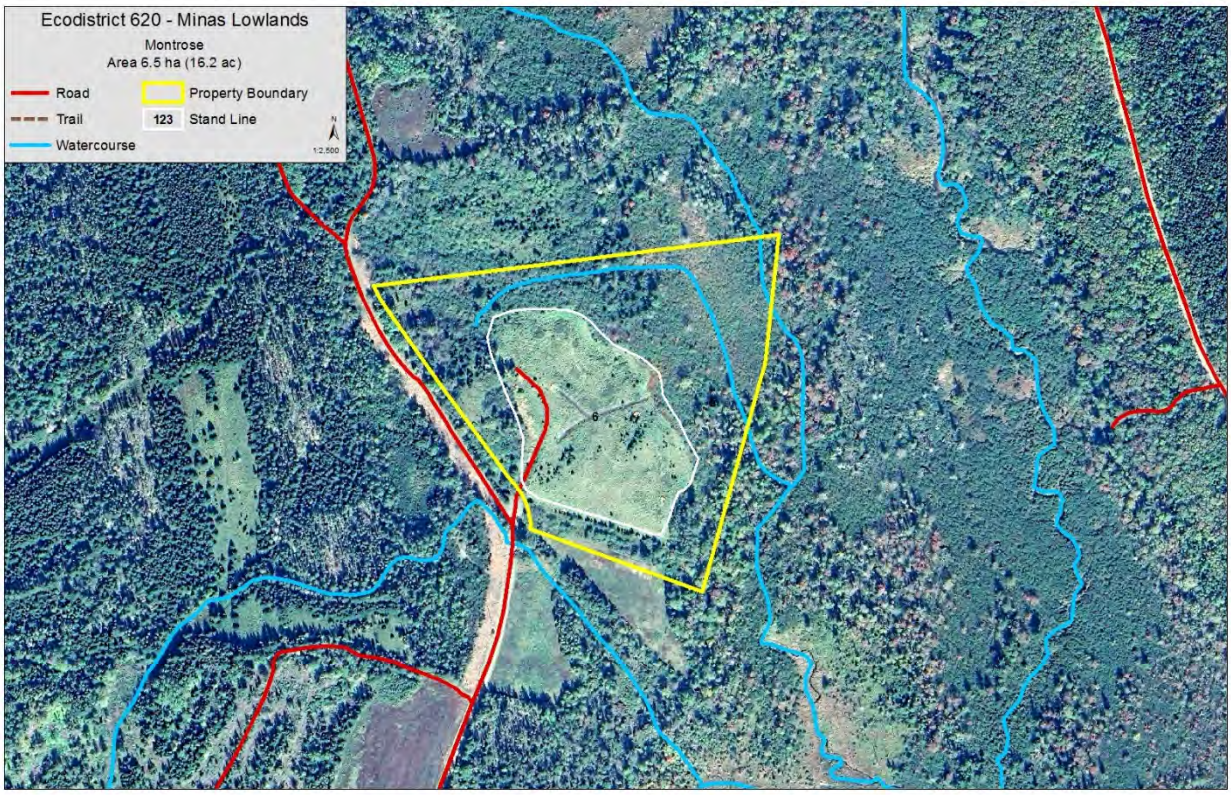
Recommendations

Stands 215 and 219 should have a salvage cut treatment to cleanup these severely damaged forests, followed by planting of red spruce.

Montrose

PID 20201851

Area 6.5 ha



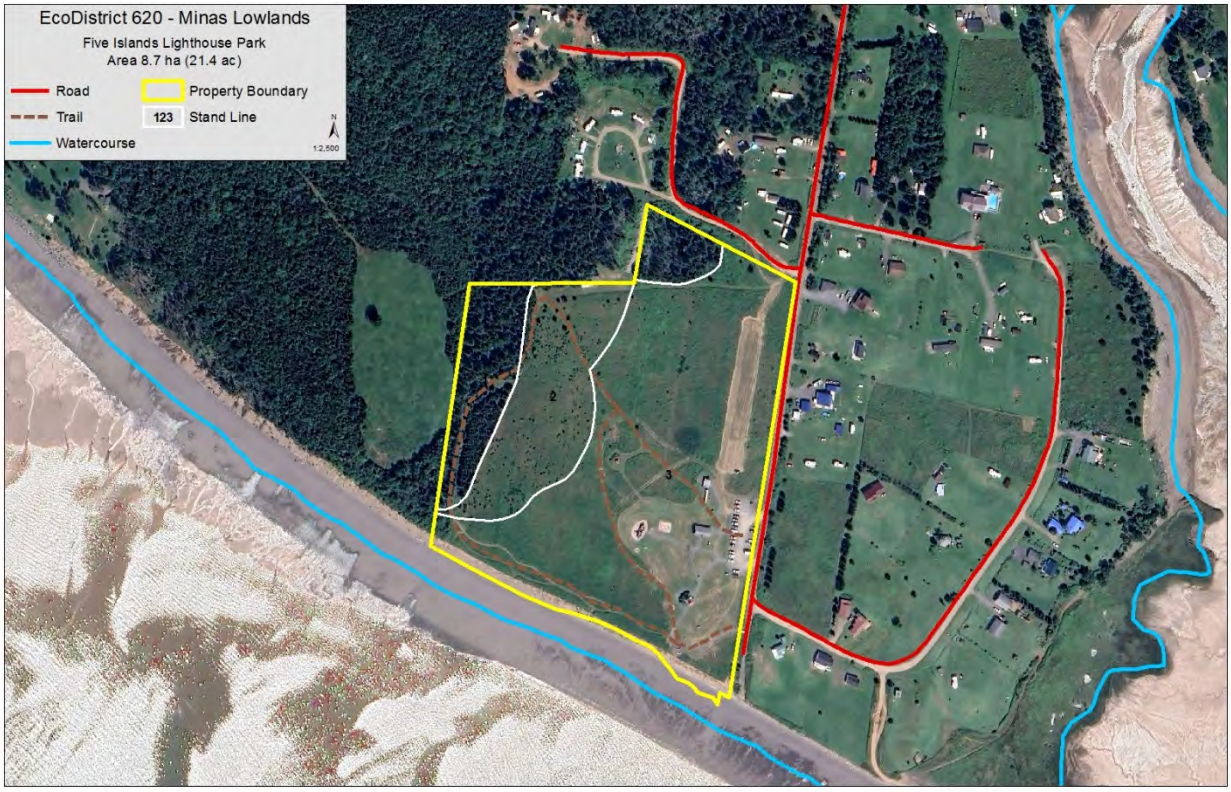
This property was formerly a landfill and has revegetated with grasses **(Stand 6)**. Natural regeneration to white spruce has started. Surrounding the former landfill **(Stand 5)** is a sparse mixedwood of white spruce, red maple, and poplar on the west and south sides. A significant alder wetland on the north and east sides is the headwater of a small stream.

Recommendations

Subject to any on-going reclamation requirements, **Stand 6** could be planted with native trees and/or shrub species, such as white spruce, serviceberry, etc. in order to improve wildlife habitat and carbon capture benefits. If left as is, this site is likely to seed in with shade intolerant short-lived species and shrubs during the next 20 years.

Five Islands Lighthouse Park

PID 20408407
Area 8.7 ha



The park is primarily an open field with recreational facilities and trails. Two small stands **(1 and 4)** of old field white spruce forests are located on the western portion with a trail through most of **Stand 1**. Natural regeneration on the former fields has started with noticeable young white spruce in **Stand 2**. All the southern boundary of this park borders the tidal flats of Five Islands and has a walking trail along the shoreline.

Recommendations

Stand 2 should be allowed to continue to fill in with natural regeneration, mainly white spruce, thereby adding a new, younger forested area to this park.

Minas Lowlands Ecodistrict 620

Image 1. Young balsam fir under older red spruce and white pine. Note older windthrow most likely from hurricane Juan (Stand 85, Debert Industrial Lands, Map 4).

Image 2. Fiona windthrow of white spruce (Stand 83, Debert Industrial Lands, Map 1).

Image 3. Young regenerating black spruce and tamarack
(Stand 107, Debert Industrial Lands, Map 2).

Image 4. Large white pine, approximately 70 cm in diamter
(Stand 132, Debert Industrial Lands, Map 3).

Image 5. Pure red pine forests naturally established after the decommissioning of Camp Debert (Stand 134, Debert Industrial Lands, Map 4).

Image 6. Hillshade enhanced Lidar showing the arrangement and abundance of intact old foundations of Camp Debert (Stand 134, Debert Industrial Lands, Map 4).

Image 7. Old foundations of Camp Debert
(Stand 134, Debert Industrial Lands, Map 4).

Image 8. Shade tolerant hardwood forest along the Debert River floodplain (Stand 88).

Image 9. Deer blind and cleared shooting lane (Stand 71).

Image 10. Pre-commercially thinned plantation (Stand 73).

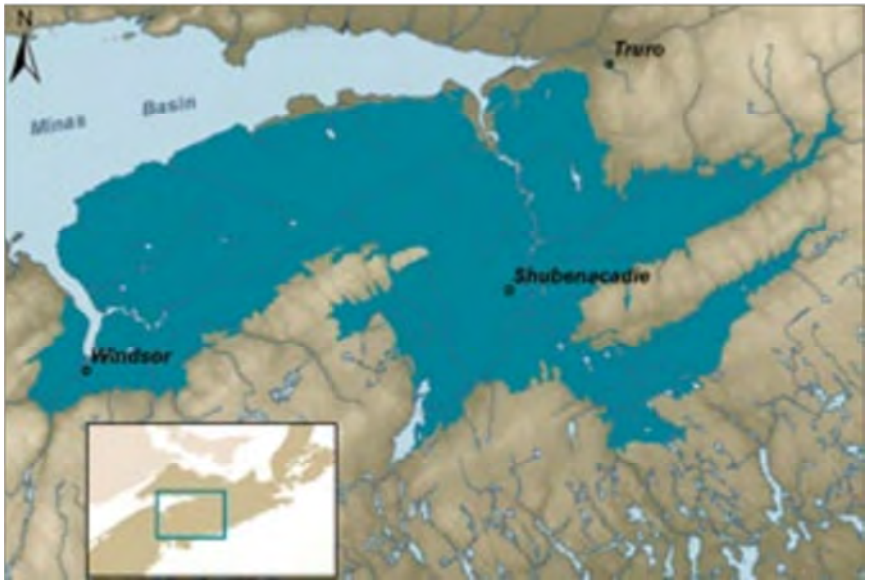
Image 11. Poorly stocked plantation Stand 73 due to heavy ericaceous shrub layer.

Image 12. Galloping Brook with downed trees from hurricane Juan.

3.4.5 Central Lowlands Ecodistrict 630

Number of PIDs: 3
Total Area: 33.3 ha (82.2 acres)

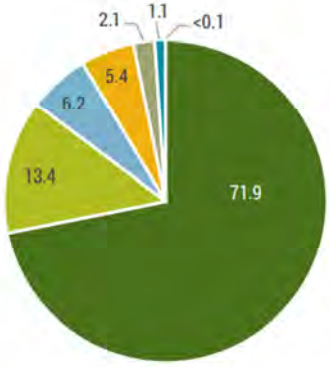
Ecodistrict Summary



The Central Lowlands Ecodistrict (630) includes gently rolling terrain and the floodplains of several major rivers, including the Stewiacke and Shubenacadie – which are significantly influenced by the daily tides of the Bay of Fundy. Most of the ecodistrict is fairly level, with hummocky to undulating topography, and elevations seldom exceeding 90 m above sea level. The climate is conducive to farming and the area has been extensively used for dairy and beef production, as well as growing forage, corn, and soybeans. This ecodistrict is underlain by Carboniferous era shale, limestone, sandstone, and gypsum. Karst topography is common on areas underlain by gypsum. Forest cover in this ecodistrict is influenced by predominantly moist soils, many of which are fine textured, and support coniferous forests of black and red spruce, white pine, hemlock, and early successional forests of white birch, red maple, and aspen. On better drained hills late successional forest of mixed Wabanaki-Acadian Forest species such as yellow birch, red spruce, hemlock, sugar maple, and to a lesser extent beech, will occur. Alluvial soils along major rivers have been used extensively for farming with the result that natural riparian floodplain forest of elm, white and black ash, and sugar maple are now rare.

Ecodistrict 630
Percentage Land Cover

Forest/Woodland	71.9
Agriculture	13.4
Wetlands	6.2
Urban/Industrial	5.4
Shrub/Heathland	2.1
Water	1.1
Sparsely Vegetated	<0.1

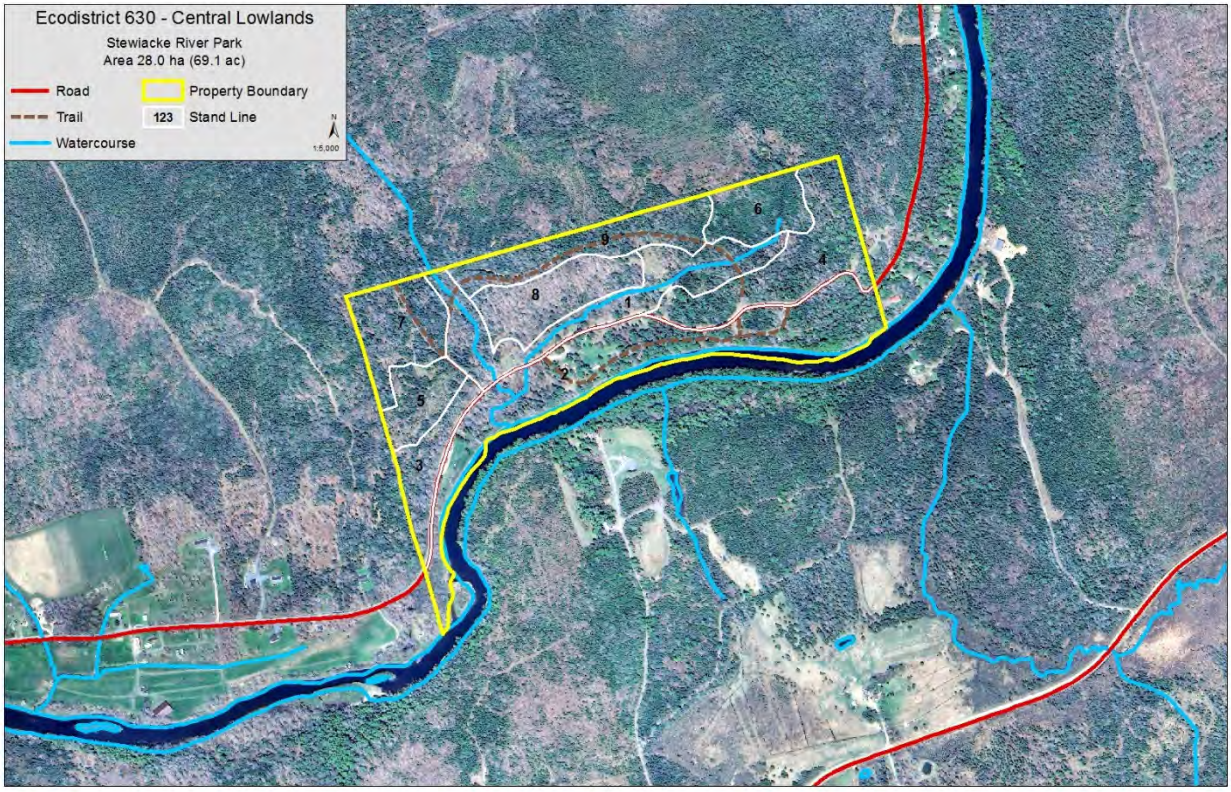


There are four properties included in the Central Lowlands Ecodistrict. The Stewiacke River Park is the largest and includes site conditions that support three forest ecosystems – upland Spruce-Hemlock Forests, Shade Tolerant Mixedwood Forests, and Floodplain Forests. Three

smaller properties are at Wittenburg Road, Stewart Hill Road, and Cross Roads and aside from a small, wooded portion at the former Wittenburg landfill none of these three properties have manageable forest.

Stewiacke River Park

PID: 20077541
Area: 28.0 ha (69.1 acres)



The moist, fine textured soils over most of the park have the potential to support shade tolerant forest of late successional Wabanaki-Acadian species such as hemlock, red spruce, yellow birch, and sugar maple. Natural disturbances include hurricanes, fire, and insects and these have infrequently disturbed this upland forest creating opportunity for long-lived (old growth), uneven-aged late successional forests. Balsam fir is a significant short-lived species in these forests. Some of the upland area was once cleared for pasture but when abandoned (ca 1930's) reforested to white spruce. The Sutherland family, who arrived from Scotland in 1803 farmed this area. The foundation of their home is located near the beginning of the walking trail into the upland forest (across from day use park) **(Image 1)**.

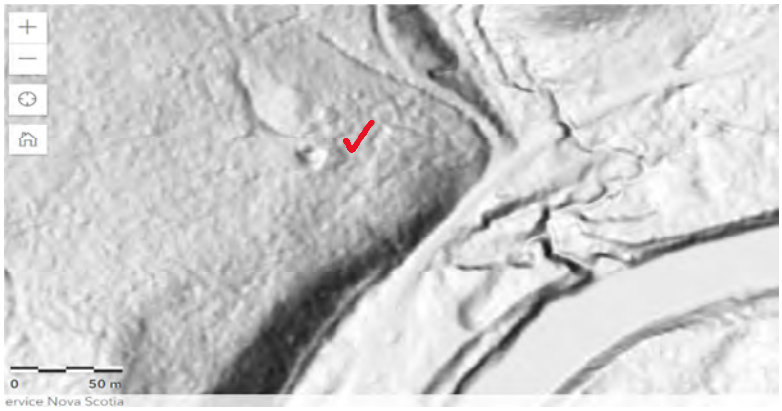


Image 1. Hillshade imagery showing the location of the Sutherland homestead foundation.

Image 2. Stewiacke River looking up river from near the entrance to the park.

At one time floodplain forests dominated extensive areas along the Stewiacke River **(Image 2)** but the soils were also rich and stone free and preferred for agriculture and converted to fields, pasture, and croplands. However, when this floodplain farmland is abandoned, early successional forests can include black cherry, chokecherry, red maple, alders, and willows soon followed by white spruce, tamarack, and white pine. Only a small portion of the park near the entrance may still be subjected to annual flooding. Much of the old floodplain at the park is no longer annually enriched with alluvial deposits and it has slowly changed into upland sites supporting forests of red spruce, hemlock, white pine, and yellow birch.

Parkland (Stands 1, 2)

The old floodplain with its history of agricultural use is now the prime area for park activities and infrastructure **(Stand 2)**. There are natural forested areas of hemlock and red spruce and a few small areas of white spruce on recently abandoned agricultural lands. Along the riverbank are red oak and white pine. Old river channels dissect the area some of which are still significant wetlands. Scattered throughout are several large snags and cavity trees which serve as habitat for many wildlife species. Management activities in the parkland have maintained/preserved many

of the natural biodiversity features such as snags **(Images 3 and 4)** and downed coarse woody material. Two small streams converge and enter the Stewiacke River near the park entrance and park infrastructure has carefully maintained the integrity of this important biodiversity feature. The same is true for the riparian zone along the streams (**Stand 1**). Natural regeneration to hemlock, red spruce, white pine, yellow birch, and red oak is occurring throughout and will be important in maintaining the natural forest condition of the old floodplain and riparian zone.

Recommendations

Ecological Park and Recreation Management (EPRM) is the recommended treatment here. The goal is to maintain safe conditions in high use public areas while encouraging long-lived species and discouraging non-native species.

Image 3. White pine snag in parkland area.

Image 4. Pileated woodpecker cavities in softwood snag along river.

Steep slope and roadside wetland (Stand 3)

A rich steep slope leads to a linear wetland (swale) that borders the park roadway. White ash and sugar maple indicate the richness of the forested slope. The steep slope is sensitive to erosion and the swale to roadside sediments/pollutants. The wetland may have been exacerbated by the road. As a biodiversity feature this small stand provides critical habitat in the park for salamanders and

frogs including spring peepers, breeding habitat for dragonflies, and terrestrial habitat for wood turtles.

Spruce, Hemlock, Fir Forest (Stands 4 and 6)

This gently sloping site with well to imperfectly drained fine textured soils supports late successional species appropriate for the area **(Image 5)**. There are both young and old patches of red spruce and balsam fir with hemlock and white pine scattered throughout. There appears to have been no influence from a history of agriculture but there has been past forest harvesting. Windthrow from hurricane Juan is still visible throughout the area but a young forest of red spruce and fir is establishing. The downed wood provides both habitat and recycles nutrients back into the site.

Recommendations

Portions of **Stand 6** are suitable for pre-commercial thinning (PCT) treatment, if done soon. This treatment will favour long-lived shade tolerant species such as red spruce, hemlock, white pine, and yellow birch and reduce the abundance of shorter-lived species such as balsam fir and white birch.

Image 5. Evidence of windthrow, large remnant overstory, and abundant red spruce and fir regeneration (Stand 4).

Previously harvested old field white spruce (Stands 5 and 7)

These two stands show evidence of previous agricultural influence, possibly old field, and poorly cleared pastures. The current mix of white spruce, balsam fir, red maple, and white birch is an

early successional forest. This area would typically support a late successional forest of shade tolerant species such as red spruce, yellow birch, and hemlock. Soils are moist, moderately rich, and fine textured with the richness of the soils expressed by the presence of white ash. Ruts from the previous harvest (approx.15 years ago) in Stand 5 indicate the sensitivity of this site to heavy logging machinery.

Recommendations

Stand 5 should be left to grow and develop and checked again in 5+ years for pre-commercial thinning, favouring long-lived species such as red spruce, hemlock, and white pine and discouraging the shorter-lived shade intolerant species such as aspen and white birch. **Stand 7** could be checked for possible harvest in 5-10 years leaving long-lived species and fill planting where required.

Red maple, balsam fir mixedwood forest (Stands 8,9)

Soils in this stand are better drained and again this site may have been an old pasture that reforested to white spruce. Following harvesting of the white spruce a mixedwood stand of red maple, aspen, balsam fir, and white spruce reclaimed the site. **Stand 8**, primarily a red maple forest **(Image 6)** has had the white spruce cut and left on site (possibly damaged during hurricane Juan or killed by bark beetle). **Stand 9** is a mixedwood forest with red maple, aspen, balsam fir and white spruce. Overtime both sites should eventually restore to a typical late successional softwood forest of red spruce, hemlock, and white pine.

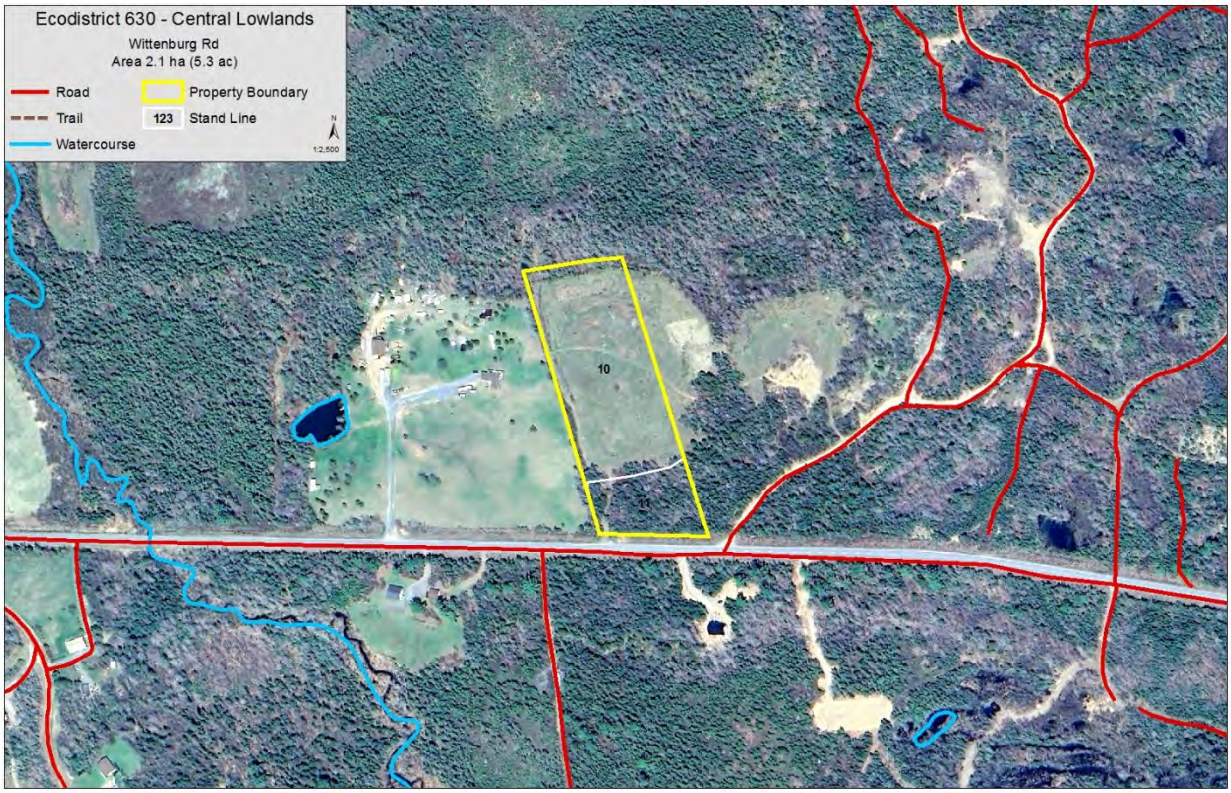
Recommendations:

These stands should be monitored to look for opportunities to increase and restore the late successional mixedwood forest comprised of longer-lived species such as red spruce, hemlock, yellow birch, and white pine while maintaining a component of red maple. In addition, as walking trails are nearby, EPRM should be done here.

Image 6. Red maple in **Stand 8**, many originating as sprouts from cut stumps. Grasses and ferns dominate the forest floor.

Wittenburg Road

PIDS: 20079349
Area: 2.1 ha (5.3 acres)



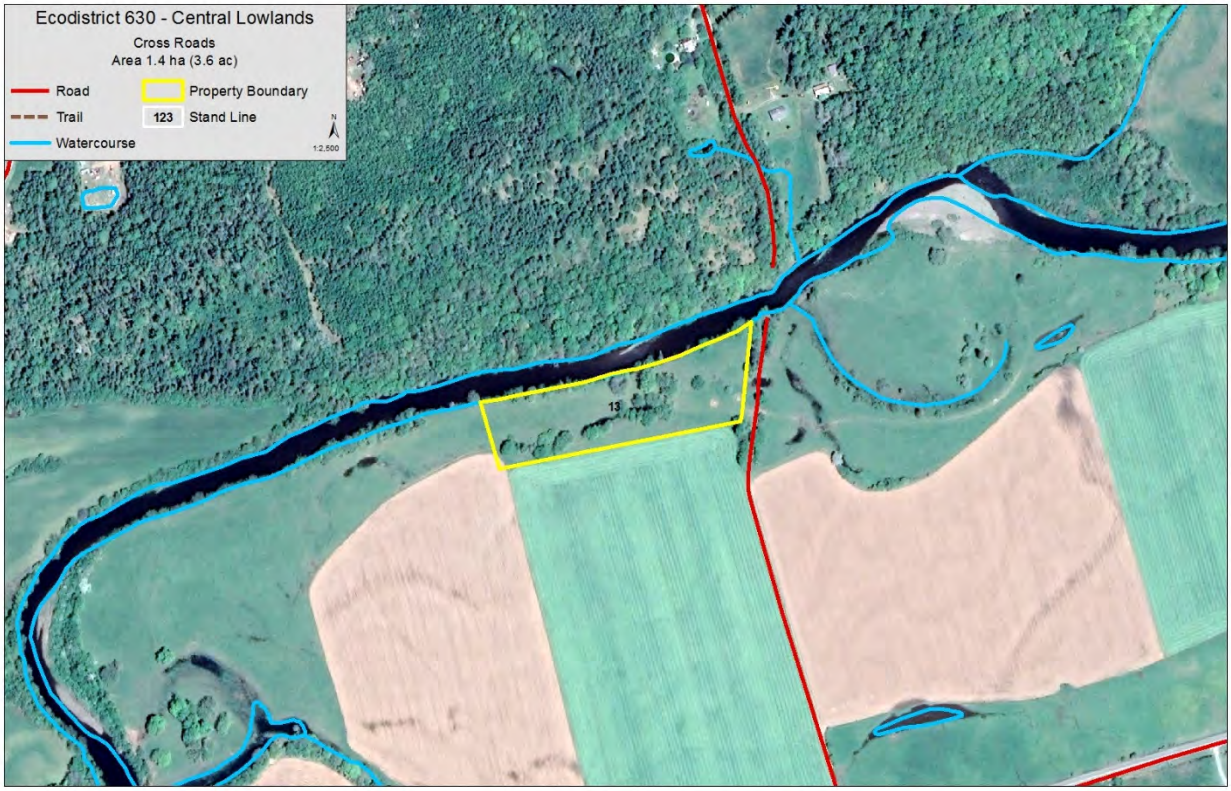
The former landfill site has been revegetated to grass species with a few naturally regenerated white spruce and white pine (<3m). Next to Wittenburg Road is a small stand of immature shade intolerant hardwood, mostly grey birch, white birch and aspen with a few scattered white spruce, black spruce and fir. This site would have originally supported a late successional forest of white pine and black spruce on the gravelly coarse textured soils.

Recommendations

Subject to any on-going reclamation requirements, **Stand 10** could be planted with native trees and/or shrubs species, such as white pine, serviceberry, etc. in order to improve wildlife habitat and carbon capture benefits. If left as is, this site is likely to seed in with shade intolerant species and shrubs during the next 20 years.

Cross Roads

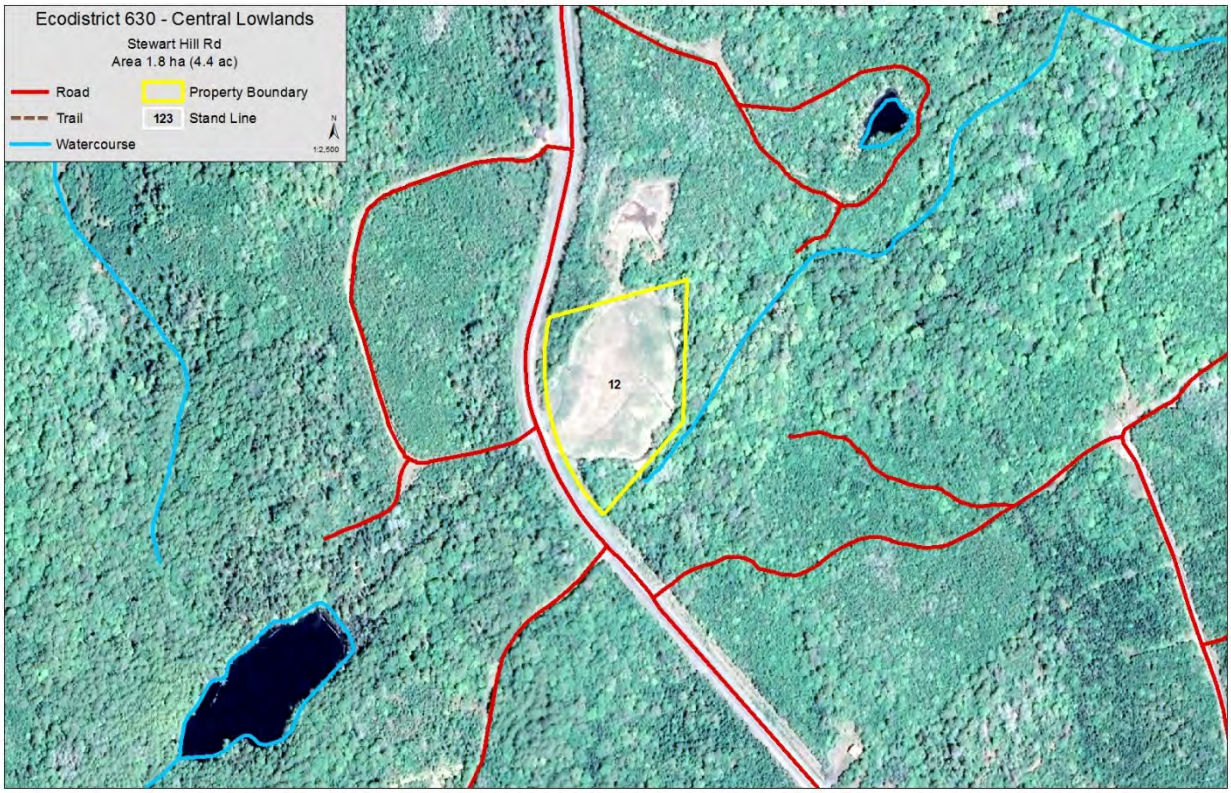
PIDS: 20054219
Area: 1.4 ha (3.6 acres)



A small acreage of floodplain is currently being used for cattle pasture. **(Image 7)**. There are a few scattered hardwoods (maple, white ash, cherry) offering shade for the cattle. The old roadway with bridge footings and berms **(Image 8)** that once crossed the river at this location are still present (crossing was dismantled ca 1960?). Fencing keeps the cattle from accessing the river. The invasive shrub, multiflora rose, has established on the site. Along the Stewiacke River where periodic flooding enriches the soils forests of elm, sugar maple, white ash, black ash, and black cherry would have been typical.

Stewart Hill Road

PIDS: 20052619
Area: 1.8 ha (4.3 acres)



This property lies at the boundary of the Central Lowlands Ecodistrict (630) and the Rawdon/Wittenburg Hills Ecodistrict (410) on north facing slopes of Stewart's Hill. Formerly a landfill site it has been revegetated with grass species and has monitoring wells and berms **(Image 9)** constructed to reduce seepage/leaching of buried materials into an adjacent ephemeral stream that eventually flows to Goshen Brook and the Stewiacke River. There is a telecommunication tower on the site **(Image 10)**. This hilly well drained site would have originally supported a late successional shade tolerant hardwood or mixedwood forest of sugar maple and yellow birch with scattered red spruce and hemlock.

Recommendations

Subject to any on-going reclamation requirements, **Stand 12** could be planted with native trees and/or shrubs species, such as white pine, serviceberry, etc. in order to improve wildlife habitat and carbon capture benefits. If left as is, this site is likely to seed in with shade intolerant species and shrubs during the next 20 years.

Image 7. Cross Roads pastureland along the Stewiacke River.

Image 8. Abandoned road infrastructure at Cross Roads, Stewiacke.

Image 9. Gravel berms for mitigation of off-site movement of landfill sediments.

Image 10. Revegetated landfill and microwave tower at Stewart's Hill.